

PERSONAL COMPUTER

THE COMPLETE COMPUTING WEEKLY

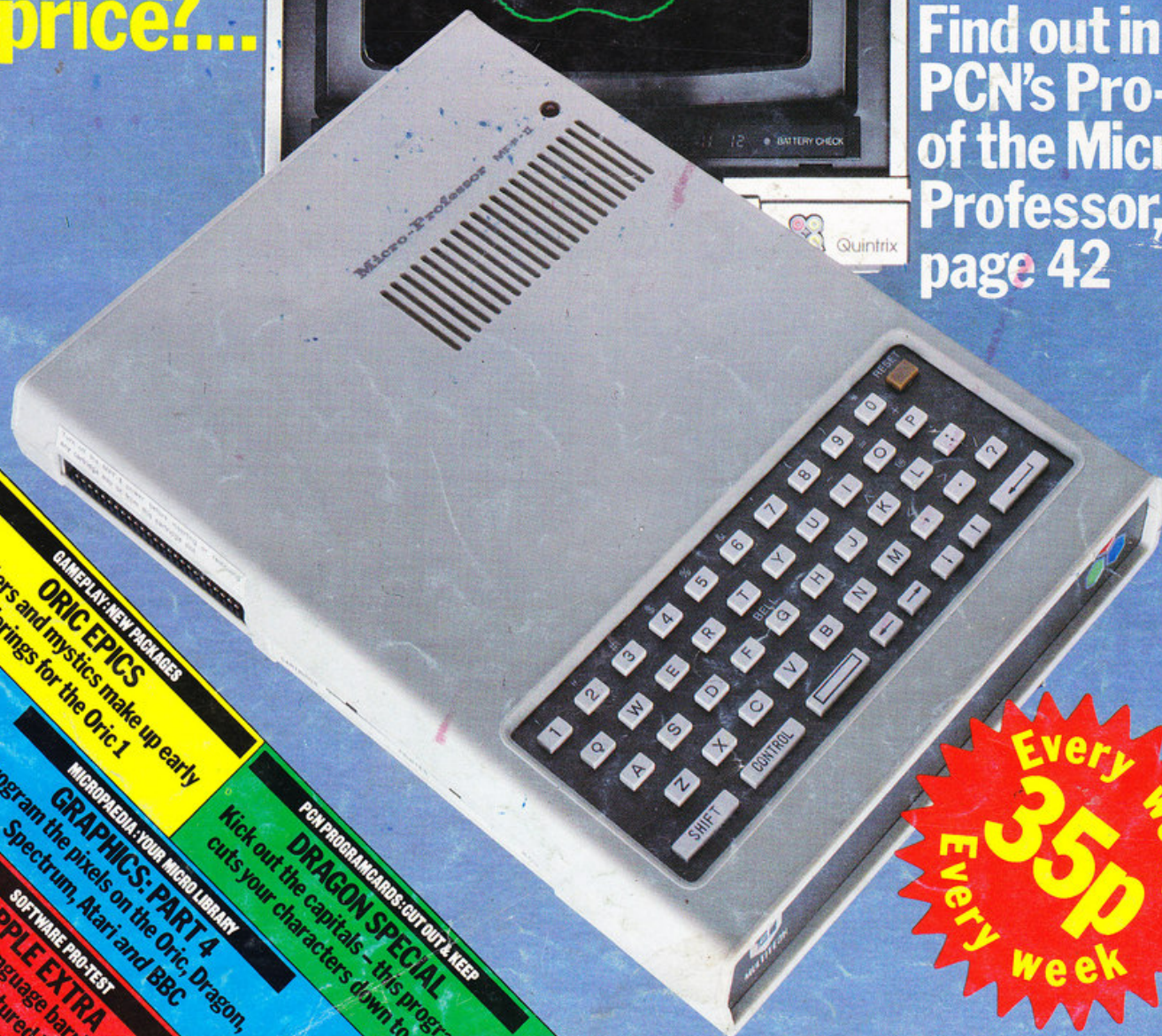
NEWS

MAY 6-MAY 13 1983 Vol 1 NO 9 35p

The same
bite for
half the
price?...



Find out in
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of the Micro-
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GAMEPLAY: NEW PACKAGES
ORIC EPICS
Monsters and mystics make up early
offerings for the Oric 1

MICROPAEDIA: YOUR MICRO LIBRARY
GRAPHICS: PART 4
Program the pixels on the Oric, Dragon,
Spectrum, Atari and BBC

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REGULARS

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Is the writing on the wall for space invaders? Geof Wheelwright reckons your Atari can do more than play games...



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PCN PRO-TEST: SOFTWARE

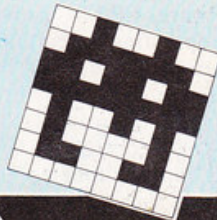
Apple: Structured Basic

Richard King reviews a disk package aimed at the more experienced programmer, who'll appreciate its wealth of features

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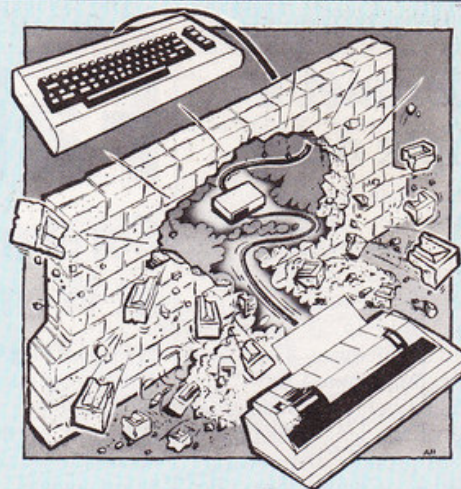
An easy-to-use package with a five-option menu to put a sparkle on your screen



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CHARACTER SET EDITORIAL: Editor Cyndy Miles Deputy editor Geof Wheelwright Production editor Keith Parish Sub-editors Peter Worlock, John Lettice News editor David Guest News writers Ralph Bancroft, Wendie Pearson Software editor Shirley Fawcett Systems editor Max Phillips Hardware editor Richard King
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H/H lets loose colourful Tiger

By Ralph Bancroft

A machine once dubbed the Tangerine Dream Machine had its first public outing last week.

Called the Tiger, it is being made by H/H Microcomputers, which bought the concept from Tangerine Computers last year and has developed it into a personal computer costing £2,795 and expected to interest business users.

The central feature of the Tiger is its triple processor.

A Z80A with 64K random access memory provides the power for running applications software. CP/M is provided as the operating system and H/H is offering a range of business software from Peachtree and Sapphire as optional extras.

A 6809 controls the keyboard and input/output to external devices such as printers. It can also be used to run software by adding on optional memory.

Finally, a 7220 processor with 96K dedicated RAM con-

trols the impressive colour graphics of the Tiger. At its highest resolution it can generate a screen of 512 by 512 pixels in eight colours. In this mode high speed vector, arc and figure drawing are available.

The text mode produces a screen resolution of 640 by 256 pixels and 80 characters by 24 lines. The third mode is the standard Prestel display of 40 characters by 24 lines.

The Tiger has a built in Prestel modem that includes auto-dial and auto-answer facilities.

The other interfaces on the machine include a cassette port, light pen, colour monitor, IEEE-488 port, parallel printer, RS232 serial port and a networking interface.

The micro has twin 5¼ inch double sided double density disk drives giving a total of two megabytes of storage.

The company can be contacted on 0954-81140.

Library loans out Sinclairs

Home computer buffs in Gloucestershire can now take machines out on loan from a local library.

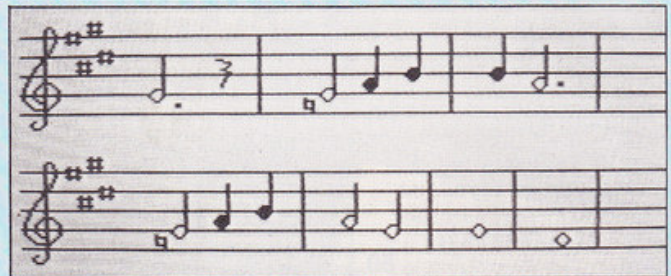
Gloucestershire County Library is pioneering a scheme to make micros available more easily. At the Hucclecote branch to the north of Gloucester ten Spectrums are being hired out for £5 a week.

This pilot scheme in computer literacy opened last week, and if it is successful more branch libraries in the county

could operate a similar service later in the year.

A spokesman for the County Library said that Bedfordshire and Derbyshire had already made detailed enquiries.

The scheme is intended to pay for itself. For £5 you get a 16K Sinclair Spectrum, a cassette recorder and blank cassette, and a carrying case. The library's overheads, besides the cost of the equipment, include the provision of facilities to test the systems, and staff have to be trained to give advice where it is needed. For these reasons the service will not be offered at all the libraries in the county.



SPECTRUM SINGS — Perhaps to reassure you that what you are hearing from your ZX Spectrum is music, Bellflower Software's Music Maker displays its tune on the screen as the notes are played. The program plays melodies in 11 different keys and offers you a choice of 12 time signatures. Three familiar tunes come with the software, and by experimenting you can add your own and let the system do the sight reading for you. Music Maker is intended to be practical, educational, and fun. It is available now for £5.75 from Bellflower on 01-903 1816.

Micronet's Apple delay

Further snags have hit would-be Micronet members. This time it's Apple owners who will have to wait a little while longer.

The hold-up is with the terminal software. The company commissioned to write it has fallen behind schedule because of the length of time it took to produce the software for the Commodore Pet machines.

Micronet has now hired another firm to do the work, and is confident that the software will be available from the start of June.

Apple users should have been able to go on-line to Micronet from April 15, but as we reported last week delays in writing the documentation put back the start dates for a number of micros.

One group of Apple owners who won't be affected by the additional two-week delay are those who already have a modem. Providing they have the software to link up to Prestel they can browse around most of the Micronet pages.

Fair comment

Foreign stars at Wembley

By Richard King

The Computer Trade Fair at Wembley was a quiet affair — but most of the kit on view needed to be seen rather than heard anyway.

The oddest thing was that even though the event was well-attended, with plenty of interesting stands, many of the larger or more vociferous British companies were conspicuous by their absence.

In fact a noticeable proportion of the stands had been taken by the British representatives of non-British manufacturers, such as Sirtel, which is selling the Micro-Professor II. It had a half-height 40-track drive for this diminutive cousin of the Apple II, and a range of new (and quite impressive) software.

The Pluto graphics board, which is actually slightly smarter than most micros with its

8088 processor and high-speed picture buffer, was doing some amazing doodles in multiple colours just inside the door.

Had the show been open to the public rather than just 'trade' visitors, there would definitely have been a wall of people around the H/H stand. This company, formerly a maker of sophisticated musical electronics, was demonstrating its Tiger computer (see above).

Consultants in Office Power (COP), had a very interesting box called the Office Brain. This is a mix between a network controller, a file-server and a straight computer.

New Sord at Brum fair

By Sandra Grandison

There was something to interest most of the thousands who packed into Bingley Hall, Birmingham last week, for the Midland Computer Fair.

As expected a wealth of new products was on show — in

particular software packages were out in full force. There were also some interesting additions, and the first public appearance of the Sord M5 machine (PCN, April 29).

The M5 attracted a lot of interest, displaying its powerful graphics capabilities.

The Sord M5 will be available in June, and potential users can look forward to a 32K RAM board, disk drives and joy pads to be released later this year. A users club dedicated to the Sord M5 will also be formed.

On the new software front, A & F Software had Adventure I and Adventure II for the Oric 1 machine at £6.90 each, and a package called Painter at £8 for the BBC model B.

Salamander Software had six packages on its stand. For the Oric there were Games Compendium at £7.95 and Oric Trek at £9.95. Games for the Dragon 32 included Star Jammer, price £7.95; Nightflight, £7.95; Super Skill Hangman, £7.95 and a picture drawing program called Graphics System at £24.95.

Sinclair opens fire

Sinclair Research has triggered a much-predicted and long-awaited price war.

In cutting the price of a ZX81 from £50 to £40, a 16K Spectrum from £125 to £99 and a 48K Spectrum from £175 to £130, the company has given less experienced newcomers a lot to think about — and a bonanza for buyers could be on the way.

Sinclair seems to have held its prices for as long as possible, to the point where it had to cut them in order to maintain its leading position. Oric will be hit hardest. The company has already admitted that it will not be able to supply its 16K

machine for its originally advertised price of £99.

Chances are that Oric was going to reprice the 16K machine to match the Spectrum at £125. Now, for a mere £5 more, you can buy a 48K Spectrum. Unless Oric can follow suit, sales will undoubtedly be damaged.

And Sinclair's characteristic ability to pull the rug out from under the market is going to create problems in the under £100 market. The Spectrum is the first generally available colour computer under £100. Japanese marketing has timidly priced its imitation Spectrums

at £70 and £80, and these machines come with rather stingy 4K and 8K memories. There will have to be rethinks here before machines such as the Textet reach you.

Further up the market, price are just beginning to move. There are still the customary discounts or freebie monitors, printers and anything else that's difficult to clear to keep old lines moving. Prime examples are the Vic 20, TI 99/4A and Osborne 1. But the threat of IBM-style business machines at around £1,000, such as the Advance 86, is going to mean a major reorganisation.

Cheap and cheerful business systems such as the Microdecision, Cromemco C10, and the Osborne 1, currently selling for around £1,400, will either have to disappear or be repriced underneath the new 16-bit systems.

Already, some established systems have been repriced to make room for newer models. The Tandy Model III is down from £1,600 to £1,300 for its business system. The Sirius 1, the machine which established the £2,395 16-bit price, can now be bought for £1,995.

But a price war could damage small UK firms.

Government backs micro research

The Government's cash bonanza for computer research — the Alvey money — may be good for industry, but don't expect to see any super-clever micros in the shops for several years yet.

The Government announcement last week that it is to put £200 million into the development of so called 'fifth generation' computers is its response

to the massive research programmes going on in countries like Japan.

The money will go to universities and companies conducting research into the four key areas of advanced information technologies: software; very large scale integration (cramming more circuits onto a chip); the man-machine interface (making computers more user-friendly by, for example, using ordinary speech), and knowledge-based systems.

You can be sure that the first machines will be costly.

Codata 3300 tackles micro big league

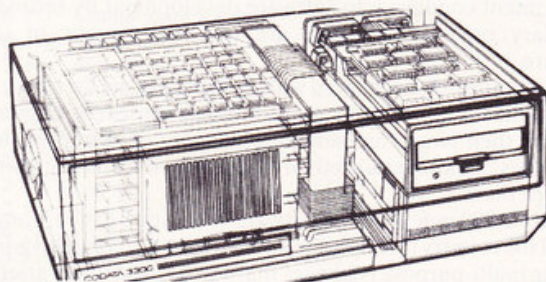
Last week saw the launch of a new supermicro in the same class as the Sage and the Tandy Model 16.

The Codata 3300, made by Codata Systems Corporation of California and distributed in the UK by Cambridge Micro Computers, Cambridge, is based on the 8MHz 68000 processor and runs the full imple-

mentation of the Unix Version 7.0 operating system.

At £8,900 for the basic system consisting of micro-processor, 320K RAM, 12Mb Winchester and 1Mb floppy disk drive, the micro uses the multibus standard bus system and can accommodate ten or more users.

Its 320K memory is upgradable to 1.5 Mb, and 12,33 or 84 Mb of storage are available on high speed Winchester. It also takes 5¼in floppies, cartridges or magnetic tapes, and hardware expansion options.



Joystick frees Sinclair keys

For ZX81 and Spectrum users still controlling their games packages from the keyboard, a company called Success Services has produced a joystick controller.

At £18.95 the Pickard Controller plugs straight into your

Sinclair without interfering with any other add-ons. It allows you to use any keys on the machine.

Success Services is on Walsall (0922) 402403. The device will be Pro-Tested in a future issue of PCN.

Database for IBM PC and Apple II

Database software for Apple II and IBM PC users has arrived in the UK from Applied Software Technology of California.

The database system is called Qbase, and in versions for the Apple and IBM machines it costs £139 plus VAT.

Qbase was designed to help you assemble and maintain a database, and according to its UK distributor Pete and Pam Computers it includes error-checking routines to make sure that all the data you store and

manipulate is wholly accurate.

At the other end of the process, in extracting material from the database, Qbase has a report preparation feature. You select which information you need, and the Qbase software offers options on format, sorting, sub-totals and summaries. Once you have defined the reports you need, the database management system holds the formats for future use.

Data from Qbase can be used in another Applied Software Technology product, Versaform, which serves as a business form processor.

For more information contact Pete and Pam on 01-769 1022.

Missing Lynx

If you were looking forward to seeing a more powerful Lynx this week, forget it.

In March, Computers promised a 96K upgraded Lynx, CP/M and single and twin disk drives by the end of April (PCN, April 1).

This is not to be, and on top of it, Computers is still having problems with its RS232 interface.

'The RS232 is not entirely functional at present and the hardware boys are wrestling with it as a top priority,' said a spokesman for Computers.

Disk drives are now scheduled for launch in May or June, along with a Centronics parallel printer interface for 'under £50', allowing you to use any Centronics-type printer.

An approximate price of £299 was given for the 96K, but this may change. The upgrade should be £75. 'We are watching the market and in particular the Spectrum's price', said the spokesman.

The launch of the 96K, 128K and CP/M systems is now scheduled for September, but software is due in two weeks.

VIEW FROM JAPAN



Software – the hardest nut to crack

From George Faas

Japan has made huge inroads in the UK in just about every technology-related industry it has turned its hand to. But in the field of creating personal computer software, similarly huge mountains stand in its way. This is largely because the kind of person best suited for the creation of software is hardly the kind that the Japanese mold usually produces.

Software developers are non-conformists who work alone, fiddling hour after hour with intractable material in a highly individualistic way. They are seldom the team-player types who work for large Japanese corporations on a lifetime employment basis.

Nonetheless, the personal computer industry is fast going the way of the television and camera businesses, where the prices of hardware have come tumbling down, and the real money is now to be made in 'software' — TV programming and film.

The Japanese have noted the figures that are bandied about for the home and personal computer market's expected growth. For instance, sales of microcomputer floppy disk drives are expected to rise to close to five times their present amounts within the next five years.

Big push for development

Sales of floppies are to a certain extent tied to sales of software. The potential for growth in this area has not escaped the Japanese. But they also recognise that software developers are 'creative mavericks' much like artists.

The distinction between art and craft is not lost on Japan. The country has long been known for its high volume manufacture of imitations — which can, if you like, be called craftsmanship rather than artistry.

Now the big firms in Japan are trying to create a working environment conducive to software development by setting up subsidiary organisations that are less bureaucratic in their structure.

What is more, disenchanted with trying to pursue their creative urges within a corporate structure, some Japanese engineers have quit their large-company jobs in favour of entrepreneurial enterprises. Small specialised software companies have grown up to accept them.

Nearly 2,000 independent software companies have sprung up around the country in the past few years, with the common goal of creating multi-purpose packages that can be used for a variety of personal computer applications.

Conformity creates obstacles

Developers have been particularly strong in the area of video games, but Japan continues to trail western countries in the development of various other kinds of software by at least five years.

Their tradition of conformity and lack of creativity is an obvious obstacle to software development (in modern history the Japanese can claim no single revolutionary product like the telephone, the camera, the light bulb, the automobile, the aeroplane or the computer).

Another giant problem is the tremendous volume of research needed to gain an intimate knowledge of users' software requirements in each of the world's markets.

To get around these problems the Japanese have been forced to co-operate with or purchase successful foreign software houses that can provide and develop software to operate on Japanese machines.

The indications are that they will continue to follow the shortest distance between two points by exploiting foreign expertise rather than by developing their own software industry.

Micros move in on television

You can look forward to more computer programmes on TV in the summer and autumn with the chance to join in, as the stations in question are looking for volunteers.

Granada Television is looking for families in the North-West to take part in a five-part series using computer games.

Granada's intention is that the children should be micro users and the parents should be taught by the children, aged between four and 17. Producer Robin Kent says she expects most of the young boffins to be around 12 years old.

Provisionally named *Chip In*, the series will be shown every Wednesday from August 3, between 6.30pm and 7pm, and each programme will feature a competition.

It will be looking for what it considers the best original computer program, and there will be reports on people who have designed programs for practical purposes.

Robin Kent said: 'We are trying to de-mystify computers. In the next decade or so, people who don't know how to use

them will be as disadvantaged as those who can't read or write. Children take to computers like ducks to water but their parents are totally flummoxed by these strange machines.'

The series is meant to be entertaining as well as educational, and it is this kind of audience the BBC is also aiming at with *Making the Most of the Micro — Live*, a two-hour live show to be screened at 11am on Sunday October 2.

The audience will be made up of micro users and people will use various different micros, live. There will also be a phone-in, letters and a question-and-answer section.

People interested in volunteering or attending the BBC programme should contact director Patrick Titley on 01-743 8000, extension 8018.

If you're opting for the Granada series, contact Robin Kent in Manchester on 061-832 7211, extension 2002. Filming for this one will start in May throughout the North West.

Granada has pioneered this kind of programme with its Talkback show.

No longer out of stock

Stock control on your CP/M system is now one of the options in MAP Computer Systems' range of business software.

The stock control software generates master files for each stock line, posts receipts and items issued from stock, and

allows for adjustment after stock checks. Its reporting capability offers ten different formats.

The software costs £450. For further information contact MAP in Oldham on 061-624 5662.

Irish users should note that MAP software, with support and maintenance, is now available through Seepm Software of Dublin.



More accurate control and speedier response are what Kraft Systems of the US promises you with its Precision Joystick for the IBM PC. How are these features achieved? The manufacturer has incorporated toggle switches with spring centring, like the gear change on a Ford Fiesta, or free floating operation. You can also fine-tune the device by using its dual axis trim controls, and Kraft says that it has made sure the two fire buttons are conveniently positioned for the business end of the stick. It costs £37.95 plus VAT and is available in the UK from Pete and Pam Computers on Rawtenstall (0706) 227011.

Kuma counts to ten

By Wendie Pearson

A ten-piece suite of business software for Epson HX20 users is taking shape.

Kuma's Deskmaster series is being developed in numerical order, but the latest elements to be released are Deskmasters 3, 6 and 7.

At £29.50, Deskmaster 3 is a spreadsheet program which runs on the basic 32K Epson and on the expanded 48K version. 'It's a good, cheap working spreadsheet calculator

for a machine with a big demand for such a thing,' says Kuma sales manager Jon Day.

Deskmaster 6 is a general purpose decision-maker's program. It is designed to analyse business options and also costs £29.50.

A slight departure from the business theme is Deskmaster 7, at £19.50. It allows you to write applications programs on the Epson in 6301 machine code, which Mr Day claims is a first for Kuma.

The earlier elements in the series are Deskmasters 4, 2 and 1 (PCN, April 15).

Deskmaster 4 is a £29.50 program which transforms the Epson into a telex terminal using the £220 Sendata acoustic coupler.

You can use it to link the Epson with other computers.

And if you need a word processing package, Deskmaster 2 sets out to do that for £29.50, while Deskmaster 1 is an 'office aid' — a desk top

printing calculator.

Deskmaster 5 remains shrouded in mystery — the company will say only that it is an 'enhanced communications package' due out in a month.

Kuma also produces Computax, a £49.50 program separate from Deskmaster, for the Epson. This calculates income tax for insurance and tax consultants.

For further information, contact Kuma on Maidenhead (0628) 71778.

Anatomy of a micro

To help you find your way round the IBM PC, software supplier CACI has launched a training package either for individuals or training departments.

The package, PC Tutor, is supposed to guide you through all aspects of the PC's operation. It is menu-driven, so that if you are already acquainted with computing you will be able to skip over basic sections.

Beginning with keyboard layout it moves through PC-DOS commands and utilities to more advanced features like function keys and communications.

CACI is better known as a supplier of software for mainframes and has built up a reputation particularly for its database expertise. It has turned its attention to the IBM PC, a spokesman said, because 'our business is to provide total solutions'.

CACI is on Fleet (02514) 22133.

Pocket print

If you think a pocket computer would suit your needs have a look at the new FX802P.

It's the first pocket machine from Casio that has a built-in printer, and it carries a recommended retail price of £95.95. Shop around and you may be able to buy one for £15 less.

Based on the earlier FX700P, the micro features a revised keyboard layout with conventional qwerty keys arranged in staggered rows and an extended space bar.

It can be programmed in Basic with a maximum capacity of 1,568 steps, and has 26

calculator-style memories. This capacity can be rearranged to hold up to ten separate programs and as many as 226 memories.

Like other models in the range, the FX802P has non-volatile storage so that memory and data can be retained.

Programs can also be stored on a normal cassette recorder by using the FA3 cassette interface, which costs £25.95.

The batteries give up to 100 hours' use with a separate rechargeable cell being used for the printer. The printer will print 3,000 lines before the cell needs recharging.

PCN Charts

PCN Charts follows the rise and fall of the UK's best-selling micros. This fortnightly top-of-the-shops list tells you what's selling best over the counter; it does not take account of mail order and does not count deposit-only orders. This week's figures show the number of machines sold in the two-week period ending a week before publication date (in this case May 6), so these charts tell the story in high streets between April 16 and April 30.

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

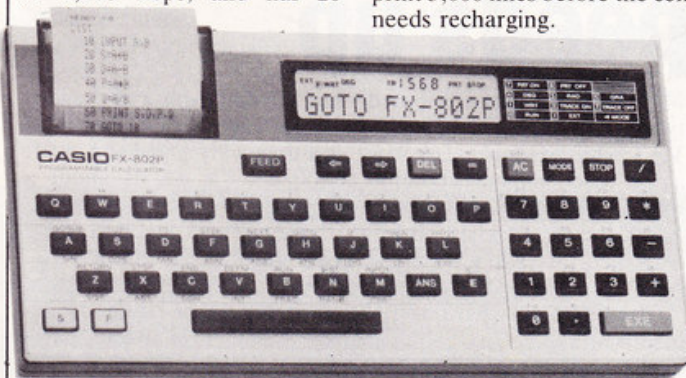
Top Twenty up to £1,000

	MODEL	PRICE	DISTRIBUTOR
▶ 1 (1)	Sinclair Spectrum	£125	(SI)
▲ 2 (3)	Sinclair ZX81	£50	(SI)
▲ 3 (5)	Atari 400	£160	(AT)
▼ 4 (2)	BBC Model B	£399	(AC)
▲ 5 (7)	Commodore Vic 20	£170	(CO)
▲ 6 (10)	Texas TI99	£150	(TE)
▼ 7 (4)	Dragon 32	£200	(DR)
▲ 8 (12)	Commodore 64	£345	(CO)
▲ 9 (11)	Newbrain A	£228	(GR)
▼ 10 (8)	Oric 1	£100	(OR)
▼ 11 (9)	Sharp PC 1500	£170	(SH)
▼ 12 (6)	Lynx 48	£225	(CA)
▲ 13 (18)	Epson HX20	£472	(EP)
▲ 14 (14)	Atari 800	£400	(AT)
▲ 15 (16)	Jupiter Ace	£90	(JU)
▲ 16 (—)	Apple IIE	£969	(AP)
▼ 17 (13)	Sharp PC 1251	£80	(SH)
▲ 18 (19)	Colour Genie	£224	(LO)
▲ 19 (—)	TRS 80 Model 1	£199	(TA)
▼ 20 (17)	Acorn Atom	£174	(AC)

Top Ten over £1,000

▶ 1 (1)	Sirius 1	£2,754	(ACT)
▶ 2 (2)	Osborne 1	£1,581	(OS)
▲ 3 (5)	IBM PC	£2,392	(IBM)
▲ 4 (6)	Commodore 8032	£1,029	(CO)
▼ 5 (4)	HP 86A	£1,541	(HP)
▼ 6 (3)	Olivetti M20	£2,754	(OL)
▶ 7 (7)	Apple III	£2,780	(AP)
▲ 8 (9)	Sanyo MBC 1000	£1,195	(SA)
▲ 9 (10)	Xerox 820	£2,415	(RX)
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AC Acorn Computers. ACT — ACT Sirius. AP — Apple Computers. AT — Atari International. CA — Computers. CO — Commodore. COL — Colt Computer Systems. DR — Dragon Data. EP — Epson. GR — Grundy Business. HP — Hewlett-Packard. IBM — IBM. IC — Icarus Computers. JU — Jupiter Ace. LO — Lowe Electronics. OL — Olivetti. OR — Oric. OS — Osborne Computers Corporation. RX — Rank Xerox. SA — Sanyo Marubeni. SH — Sharp. SI — Sinclair. TA — Tandy. TE — Texas Instruments.



Olivetti woos business with multi-lingual M20

Olivetti is trying to draw more of you towards its M20 micro by adding to its range of languages and operating systems.

Within two weeks the company expects to announce MS-DOS on the M20, and add Pascal and a compiled Basic to the machine's range of high-level languages.

Olivetti launched the M20 with its own operating system, PCOS, and Microsoft Basic. By adding to its software resources (and by putting out an 11Mb hard disk option earlier this year) Olivetti is clearly trying to woo a wide range of people to use the machine for business.



The Olivetti M20 micro: now geared up for more business users.

Cheap RAM is Vic-me-up at a price of just £29

Startech Software of Liverpool has released a 16K RAMpack for the Vic 20, and at £28.95 the price compares favourably with Commodore's version — recommended retail price is £79.99.

Also out is a new lightpen for drawing pictures on the Atari, Vic 20, Commodore and BBC micros, at £25 including VAT.

It comes with a free game, Concentration, which is a card-playing exercise.

Two new games with some graphics are also available for the Commodore 64. A full-blown Startrek game costs £6.95 including VAT, and at the same price is Plague, an adventure game featuring life-and-death situations in which you have to find an antidote.

Plague will also be available for the Sinclair Spectrum in a fortnight.

Startech is at 208 Aigburth Road, Liverpool 17, tel: 051-727 7267.

Smart printer

If you're looking for an intelligent printer that doesn't have ideas above its station, check out the new DDTSP83 from Data Design Techniques.

One of the features of this low-cost printer (£325 plus VAT), is that it can be used with most micros that have an RS232 or Centronics interface.

The DDTSP83, a dot matrix printer, has a speed of 80CPS, sprocket or friction feed, offers different font types and uses a cartridge ribbon. In addition, it's capable of drawing bit-image graphics.

Contact Data Design Techniques on Welwyn Garden 34774.

Sharp speeds up

Go-faster circuitry for the Sharp MZ80A and MZ80K has arrived in the form of an add-on board from software house Kuma.

This £69.95 circuit board plugs into the motherboard, increasing the operating speed from 2½MHz to 4MHz.

Kuma has also adapted software for the Sharp systems.

NEC's door step

by George Faas

The day may be fast approaching when you won't even have to step beyond your front door to buy a home computer.

In Japan, Nippon Electric Company (NEC) has begun door-to-door sales of a home microcomputer. 'At this point, we can't just sit and wait for customers to come into the stores. We have got to go out and get them,' a company spokesman says.

'We have to appeal directly to the housewives and students and begin to teach them about the benefits of having a personal computer in the home,' he adds.

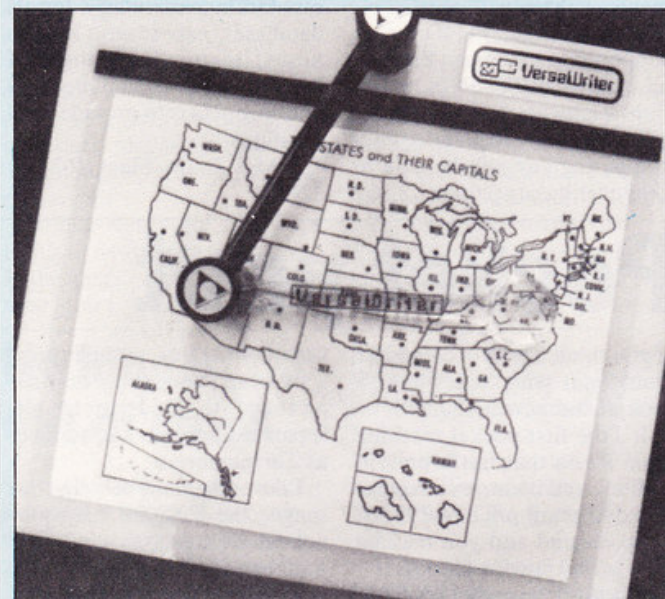
'The home electronic age is coming fast and most of them still don't know much about it.'

An estimated 3 per cent of Japanese homes now have a

computer on the premises.

The device that NEC is presenting to unsuspecting Japanese householders is the PC6001. The keyboard and operating unit cost ¥89,800 (about £250). 'It is good enough for low-end home uses like video games and high-end uses like education,' the spokesman said. 'When selling home-to-home your machine needs to be able to accommodate a variety of software, and the PC6001 will run up to 600 different programs.'

The move to doorstep selling was necessary, the spokesman said, in order that NEC should keep its 48 per cent share of the Japanese personal computer market. It has meant re-training the salesmen before they are assigned to 60 of the company's sales offices in major cities.



DIGITISED DRAWING. What you see here is the Versawriter, a digitiser drawing board and software system intended to make for easy graphics input on the IBM PC or Apple II. Aimed at art departments and graphics buffs, it costs £199 plus VAT and therefore compares favourably in price with Apple's Graphics Tablet, a similar device that sells for a whopping £449. The Versawriter is made by Versa Computing of California, and it is available in this country through IBM or Apple dealers or you can buy it direct from Pete and Pam Computers, tel: 01-769 1022.

Microtype is a cassette-based typing tutorial at £34.50 plus VAT, while Mailpro at £69.95 is a disk-based mailing list option for Wordpro, the existing £79.95 word processing package. Both are for use on the MZ80A.

Three games have been written for this model, too. Adventure Paragon costs £8 plus VAT

and is a dungeons-and-dragons fantasy game, while Forward D is a time-warp game at £14.95. Millipede, at £8, is about a confused centipede with a million legs which chases you and gets bigger all the time.

You can buy the board and software direct from Kuma (0628-71778) or from Sharp dealers.

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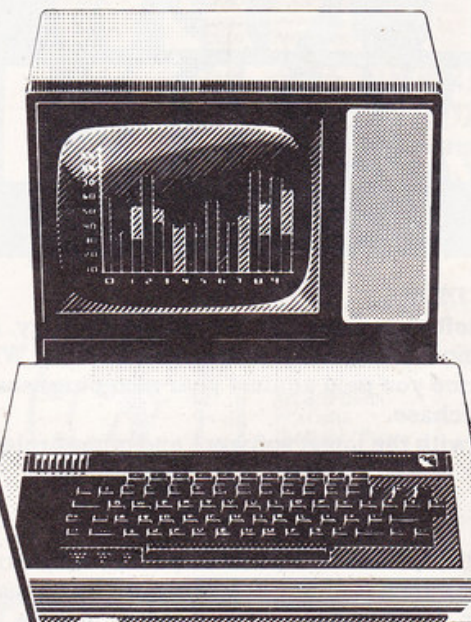
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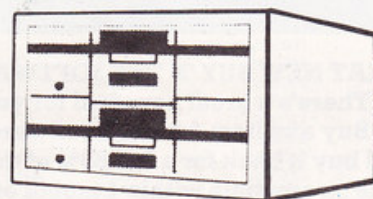
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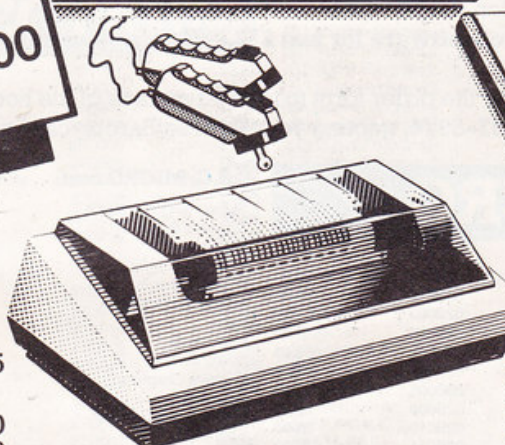
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We have got off to a flying start, and it is great to see that so many people have responded to the idea so warmly. In fact, the response has been so good that we have been almost overwhelmed.

As you probably know, shortly after our launch there was a legal dispute with a software house which was concerned that we were encouraging program copying. I am pleased to tell you that the matter has since been settled amicably and stock deliveries to us are proceeding without interruption. Buy 'n Try is not a software library, and every customer signs an undertaking not to copy software purchased from us.

Both the enormous response and temporary delivery delays have meant that some postal and telephoned orders have not been fulfilled within our normal 14 day limit. However, we have pulled out all stops to dispose of the back-log. If your order has been delayed, please accept my personal apology ... we are doing everything possible to rush it through.

Software Centre has already opened new Buy 'n Try stores at Ilford and Leicester, and we have plans for many more. We exist to give you the best service, to offer the finest programs from the most reputable software houses, and to offer the widest choice through what is probably the most extensive program catalogue in the country.

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Once again, thank you for your support. I am glad to report that we are back on target for quick deliveries ... and we aim to stay that way. Because your satisfaction is ours too.

Yours sincerely

Bill Canning

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Pirate's Padlock

The National Computing Centre is testing a security device that could make the transmission of software over the telephone far more common.

Made by Open Computer Services of Brighton, Padlock is an encoding/decoding device costing approximately £250, and it comes with or without a modem.

It has a public and a private key, and by using the public key

software can be sent down the phone in coded form to another user.

In this form, the program is scrambled, but when it enters Padlock the private key burnt into its circuitry unscrambles the program.

Padlock also includes a clock, so that a time-limit can be set on software loans. It is driven by a Z80 microprocessor with 64K of RAM.

According to Mike Page, marketing director of Open, no-one, including the owner, need know the private key number that corresponds with the public key.

The National Computing Centre is to test Padlock on behalf of Micronet in mid-May, and has laid down specifications and standards that Micronet will need to offer software protection.

Falcon micro doubles as a terminal



The Falcon from Freight Computer Services.

If your company owns a Honeywell and the DP manager won't let you have your own personal micro, ask instead for a Falcon intelligent terminal.

The Falcon is made by Freight Computer Services, a subsidiary of the National Freight Corporation, and is a microcomputer designed to look like a Honeywell terminal.

The machine is based on the Z80A chip and runs the CP/M operating system, so a wide range of software is already available.

There is a choice of options, starting with the Falcon 1000, costing £2,000. For this you would get 64K of random access memory, twin floppy disk drives of 380K each, two RS232C serial interfaces and one Centronics parallel interface.

A Honeywell V7200 interface is available for an extra £85 and a Honeywell V7700 interface for £115. This company is also offering an add-on view-data package for £690.

The Falcon system will be built in the UK at Freight Computer Services' Enfield factory. The company also operates a computer bureau and a page printing service.

Freight Computer Services can be reached on St Albans (0727) 37353.

Sonic vroom

The first game off the grid from recently formed software company Microsonic is called Grand Prix and it is for the Texas Instruments 99/4A.

You control a car displayed at the top of the screen and dodge randomly positioned cars as you negotiate a winding track. One unusual feature of Microsonic's game is that your score will be displayed after 20 moves.

Grand Prix costs £3.95 from Microsonic, 85 Malmesbury Road, Cheadleholme, Cheshire.

New Tandy gives greater growing space

Tandy isn't letting any grass grow under its feet — it has just launched another new system in the US, barely a month after its introduction of the Model 100.

The most recent newcomer to Tandy's catalogue is the TRS80 Model 4. Although unspectacular in some respects, Model 4 will give Model 3 users somewhere to go when they outgrow their systems. A Model 3 to 4 upgrade kit was also unveiled last week, costing \$800.

The Model 4 is an 8-bit system with 64K of RAM, and it runs CP/M. For \$2,000 you will get it with two built-in floppy disk drives, an 80-column screen and a print spooler. For about \$1,000 less Tandy is offering a 16K version.

Tandy was unable to say when this machine will see the light of day in the UK. As for the Model 100 (PCN, April 15) Tandy now expects to have the first units here in the autumn.



COMMODORE CASSED — Commodore decided it was about time it re-vamped its ugly cassette unit. The result is the new C2N 'datasette' pictured. Apart from the new casing there are few changes from the current version. The tape-heads have been improved to withstand oxide build-up and the electronics have been tweaked to make the machine more reliable. It costs £46.

Soft sprung

Micromega's spring software offering has been designed for the Sinclair Spectrum, and will be available in the shops from mid-May.

Costing £4.95 each, the tapes present a selection of games.

Monte Carlo has two casino

games — blackjack and craps. The animated graphics for the latter even include a hand that throws the dice.

Roulette displays the full table on-screen and starts you off with £500 worth of chips.

Brainstorm has two puzzles, one using letters and the other numbers.

BCC built for business

Businesses shopping around for a micro can add the BCC System 4000 to their list.

The British-built computer, made by Country Computers, offers 64K of RAM, a monitor, one 10Mb hard disk, a Z80A processor and CP/M 2.2 as its operating system. It has a full qwerty keyboard.

Nigel Coster, technical director of the system's distributor,

Business Computer Centre (BCC) said: 'The cost of the 4000 has been kept down because only British components have been used — it was built in the UK from scratch.'

'It's a standard machine which runs all CP/M software. We think it's reliable — and this is reflected in the low maintenance charges that we offer.'

In addition to its large hard

disk storage, the BCC System 4000 is also compatible with Televideo and Superbrain floppies, and can use most Centronics and serial printers.

A fully-configured system complete with accounting software and peripherals is priced at £3,995.

The System 4000 is available from Business Computer Centre, 01-580 4273.

This businessman won't visit Micro City '83 because he says technology can't help his company



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PCN MONITOR

Fame delays Imagine star

Two new games are on the way from Imagine, the Liverpool-based software house that aims to produce two original games a month.

Molar Maul runs on the Spectrum and comes complete with a high-resolution mouth, toothbrush and toothpaste. Your job is to stop gremlins from attacking your teeth.

Frantic, written by the now famous 16-year-old Eugene Evans for the Vic 20, features an astronaut floating down a tube to find hidden treasure.

'Eugene's output has suffered due to all the publicity he's had, so we've banished him home for a few days to finish the game,' said Bruce Everiss,

Imagine's general manager.

Molar Maul is available now and Frantic should be ready next week — both are £5.50 including VAT and p&p. However, no-one has been able to buy the heavily advertised Ah Diddums (PCN Monitor, March 18).

Mr Everiss said he was embarrassed about the delay, but that by the middle of this week, the game should be trimmed down to 8K so it can fit the Spectrum's 16K — half of which is needed for graphics.

Imagine's policy now is that it will not advertise a game until it is written, finished, debugged and 'played to death' by its evaluators.



FLOWER POWER — This latest IBM PC imitator should reach our shores by June. Called Tulip System 1, it is produced appropriately enough in the Netherlands by Computdata and should sell here for £3,700. The 16-bit micro, based on the 8086 microprocessor with a clockspeed of 8Mhz, has 128K of RAM expandable to 896K. It runs MS/DOS and CP/M-86 and has a floppy disk capacity of 750K along with 5 or 10Mb hard disks. As far as graphics go, it has low resolution as standard with high resolution as an option.

IBM card's drive-away deal

You can buy a 64K RAMpack for the ZX81 for as little as £44, so to be asked to pay £282 for a 64K RAMCard for the IBM may appear a bit cheeky.

But this is no ordinary RAMCard and the IBM is certainly no ordinary micro.

The product in question is made by Microsoft and, using the software provided, can be configured as normal extension memory or as a RAM drive or a mixture of both.

When configured as RAM drive, the IBM is fooled into thinking that the RAM is really

a disk drive, and so reads and writes to the memory in the same way as it would for a real disk drive.

Since the RAMCard can hold a maximum of 256K (cost £570) this can be particularly useful in applications where speed is important and the program you are using involves frequent disk accesses.

If you want a RAMCard try your local IBM dealer. In case of difficulty phone Pete and Pam Computers on 01-769 1022. This company has some RAMCards in stock.



Random Access is PCN's forum for readers with a point of view to express.

Letters come from people like you, so pull out your INKEY finger and feed us a line. If it's of star quality PCN will add £10 to your spreadsheet.

Address us at Random Access, *Personal Computer News*, VNU, Evelyn House, 62 Oxford Street, London W1A 2HG.

Hi-fi hook-up for your Beeb

In response to Neil Mackay's query (*PCN*, April 22) 'can a hi-fi cassette deck be used with the BBC micro' my own model B is used with an Akai stereo cassette deck (model CS-705D) with excellent results.

Provided I clean the heads regularly, saving and loading are 99 per cent reliable. I suspect that the residual 1 per cent is due to defective tapes. I use a Tandy 5-pin to 5-pin DIN ready made lead to connect the deck and the micro.

Motor control is of course not possible using this method but this does not seem to be much of a loss as you still have to rewind manually.

Also I suspect that it results in the deck being left switched to PLAY — although the motor is not running — for long periods with undesirable effects on the pinch wheel.

R Mazinke,
Prestel 0689 55360

Thanks, Mr Mazike, for sending our first letter via Prestel, let's have some more . . . Ed.

Key questions about typercast performers

I know most home computer users are not expert typists when they get their first machine. But after a while you do get quite proficient.

I was therefore surprised to read that the all-too-common qwerty keyboard was designed

withstand high-speed typing.

Keyboards have now appeared that enable the typist to type up to four times faster. If this is so it surely would be a great advantage to introduce them into the new industrial and commercial markets.

But because typists have learnt to type on the qwerty keyboard no manufacturer wants to be committed to producing them.

There would surely be no better place to introduce them than into the mass home computer market by makers such as Sinclair and Oric.

This introduction would have a number of advantages.

First, almost all users would be people with little or no previous typing experience so there would be no problems about people having to re-learn their keyboard layout.

Second, many of the owners of these small computers are teenagers and once they have learned to use the keyboard they will demand the same design, so persuading other producers to alter the keyboard layout on their machines.

P Brown Kenyon,
Saltford, Avon.

PCN takes a detailed look at microcomputer keyboards in our pull-out *Micropaedia*, issue 11, out on May 20 . . . Ed

Multifile disks for BBC micro

I must take issue with Ian Birnbaum's assertion that the only way to put more than 31 files on a BBC disk is to patch the DOS itself. I have written a program which will allow up to 60 files to be stored on one disk, though only 30 are immediately accessible at any one time.

Once the disk is set up a simple * command takes over to a second catalogue. All DOS facilities are available within each catalogue, though *BACKUP can only be used successfully in certain well-defined circumstances.

In principle my idea could be extended to allow storage of any number of files on one disk, though the overheads involved make this less worthwhile as an objective.

If any reader would care to contact me at 34 Humberstone Road, Cambridge, I will supply program information.

BJ Holley,
Cambridge.

Compact keyboard wanted for Spectrum

I am annoyed about the Spectrum keyboard. All the professional-style keyboards currently available actually house the Spectrum, making it as big as Vic 20. Is this necessary?

Why does nobody make a keyboard that sticks on top of the computer, replacing the rubber keys. If it can be done on little ZX81 in the form of the Klik-keyboard at £26, it can surely be done on the Spectrum.

Alexander Malmaeus,
London SW20

Computers and the grand design

I have been moved to respond to the rash of 'game playing vs serious programming' letters that have been appearing in your Random Access column over the past few weeks.

I am writing this letter after having read the offering from Gordon Milne — a fellow Aberdonian (no relation), whose letter I consider to be the worst of the lot.

In the main he says that he agrees with Mr Parsons that using these machines solely to play games is a 'gross waste of computers', and that people who wish to do so should buy themselves a machine 'dedicated to playing games'.

The crucial line in his letter says: 'Surely it is far better to use computers for what they were designed for'. I would be happy to comply — if Gordon Milne could define just what he thinks computers were 'designed for'.

Computers are not normally designed to perform any particular task, this is what separates them from (say) arcade games machines on the one hand, and calculators on the other. You buy one and then make it do what you want it to do — and therein lies the fascination. Games are as valid a use for computers as the (equally trivial) task of solving simultaneous equations.

If Gordon Milne applied his own brand of logic to himself then he shouldn't be using a computer either. He should be solving his mathematical problems on a dedicated maths machine — ie a calculator.

I would certainly agree with the view that people who use

their home computer solely to play games (bought rather than written by themselves), are missing out on a great deal of the benefit (fun?) to be had from computers. I might even be persuaded that too much game playing could be harmful (the people concerned may forget or never learn how to interact socially).

But it is nonsense to suggest that game playing in general is a 'gross waste of computers'. After all, the 'dedicated games machines' are in many cases not only less flexible, but more expensive too!

I find that people who never play games are usually boring individuals lacking imagination — and I would probably regard a no-game computer the same way.

Don Milne,
Rosemount, Aberdeen

More of the difference

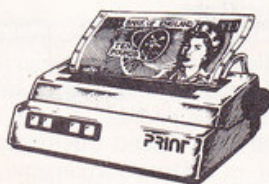
I want to comment on Max Phillips' Routine Inquiries reply to ID Walters of Albertillery, Gwent (*PCN*, April 15) regarding the question of comparing the Newbrain with the BBC micro. Surely it is like comparing a grapefruit with a banana? The fruits that is, not any machines under those brands names.

Bench tests for speed can be made to show some crazy results; in fact one person in the press recently compared his ZX81 with an IBM PC! All that can be said of the Newbrain BBC Micro is that they are different, principally because they use different chips at the microprocessing end, the Z80 and the 6502.

The Newbrain uses its operating system to make program writing a joy, with hardware editing features many mainframes and minis have lacked for years. The 6502 is a chip lending itself to the games market, with video and colour handling ability ahead of the Z80, 8080, 8085 family . . . the same features put it in a class ideally suited to many industrial applications.

The BBC micro is superior in one respect, in that if you wish to pay over £60 for a base micro system without peripherals then you can have both the Z80 and the 6502 in the same box. Now if the 6502 was all that

PCN £10 Star Letter



more than a century ago to try to slow down the typist by placing the most common letters a long way apart, because the mechanisms of those days could not

good, why put the Z80 in the box as well?

It puzzles me why a full review of the Newbrain screen handling has not appeared. As long ago as 1970 I worked with some terminals from Delta Data Systems which had 3K of local memory and screen handling similar to the Newbrain. Ever since I've been looking for video editing as good as these professional videos, only to find it on one of the lowest priced professional micros. Not even IBM displays offer the same potential.

Anthony D Hodge,
Independent Newbrain User
Group, Wakefield.

Jupiter Ace comes up trumps

On April 5 I sent my Ace back to Jupiter Cantab for repair as the keyboard was faulty. I had previously phoned Jupiter and was told that it might be two or three weeks before I got my machine back.

'Well, here we go again,' I thought.

One week later, Stephen Altwasser (at Jupiter) phoned me to say that my Ace had been fitted with the new keyboard and case and would be in the post the next day.

Two days after that, it arrived, gleaming and in perfect condition. Now that's what I call service.

Thank you, Jupiter Cantab.

Garry Knight,
London SE10.

You see — it is possible! Other manufacturers please copy . . . Ed.

Lets practice what we teach

We would appear to be very slow in this country, or Scotland at least, in adapting the micro-computer as a teaching tool in education.

The problems in introducing the micro to this area are many but the key factors holding back progress would appear to be:

- Inadequate and inappropriate in-service training for lecturers in the use of the new resource.
- The failure to provide adequate educational software for most syllabus areas.
- The failure of MEP to realise that there are lecturers who can program fairly well and these people should be utilised in writing software in their own specialist areas.

In my own area of teaching (business studies) the syllabuses in many subjects, for example accounting, appear to be wholly out of step with what is taking place in industry. Few accounting lecturers could demonstrate an understanding of how an integrated accounting system works on a micro and be able to produce business documents from the micro.

It is time for education to bring its syllabus content up to date to reflect the use of the new technology in industry and commerce and to re-examine its methods of assessing students.

For example, to assess an accounting student, many practical tests could be devised using a small micro accounting system and this would be more relevant and meaningful for the student, education and society as a whole.

Knowing all too well the speed of change in education, this may never take place.

J McLaughlin,
Edinburgh

Home computers: Let's get serious

The discussion (PCN April 8) on the use of home computers for playing games seems to miss one important point — simply that of demand. The software for other uses just does not seem to be available.

No amount of protestation will change the fact that practically every home microcomputer owner will use it to play games, so one can hardly blame the software houses for catering to this market. I have nothing against games, but let us hope that users soon begin to realise that there are in fact far more exciting and entertaining things to do on a computer.

For example, modelling and simulation, not necessarily with any application in mind, but just as a way of discovering how things work. Mechano and Lego sets let you build simple models.

With a computer, you can build a 'working' model of almost anything from the solar system to an internal combustion engine, and observe it working on a high-res graphics display.

Where is the software to assist these sorts of uses? The only good Spectrum program for analysing and plotting data that I've come across is Grasp, which is produced by Camel Micros.

Until users wake up to the possibilities, I'm afraid that such programs will be few and far between.

S Marshall,
Wadebridge, Cornwall

Standing up for my Atari

With reference to your Data-basics section on micros, the statement about the Atari causes me some concern.

I would like to know your classification of 'a games computer', as you so readily called the Atari.

I am the proud owner of this so-called games computer and find it to be the most competent micro.

I am amazed that this games computer can control four disk drives, a multichannel RS232 interface and communications box, and a unique program recorder (fully controllable with use of POKEs, all at the same time with no problems or conflicts between hardware or software.

It has 320 × 192 high resolution graphics, not 160 as stated by you. Also regarding the speed, by turning the GTIA processor off using POKE 559, 0 the machine becomes 30 per cent faster.

As most computer magazines, including your good selves, are very anti Atari I doubt if you will print this letter but perhaps it will make you investigate fully before you make further demoralising and rash statements.

FJ Dowdall,

Westcliff on Sea, Essex.

There's no criticism implied by saying it's a games computer, and you're right, it's a very comprehensive machine. But it is sold as a games machine by Atari, and without a true keyboard it isn't the equal of the 800. We are by no means anti-Atari (see page 26) and are only too pleased to receive articles from Atari owners. And yes, you're right about the maximum dot resolution . . . Ed

Pocket dictatorship

Journalist Iain Fraser Grigor asked about a medium-priced printer (PCN April 1). I think I have a solution which will give him all that he asks for, and possibly more.

Has Mr Grigor thought of buying a Microwriter?

The Microwriter is 'just' a

word-processor. He wouldn't need to buy a micro-computer to go with it. And it is not only portable but is so small that it is held in one hand and operated with one hand — rather like using a calculator. It has its own carrying bag, and thus is ideal for taking to interviews, to pubs or wherever one's work happens to be. It has an LCD display so that it is easy to check what has been written, and the scroll back and forward facility allows a full check of text wherever one is working.

Mr Grigor wants to use his own TV for word-processing; with a Microwriter he can do just this. And thus creation and editing of text can be just like using a full word-processing system.

The Microwriter's internal memory will at present hold up to about 1,500 words, quite enough for one feature article. And Microwriter will soon be doubling the internal memory to 16K — enough for two articles.

But storage capacity isn't a problem. Work created on a Microwriter can be stored on tape — on mini-cassettes or ordinary C60s or C90s. This gives the Microwriter the capacity to have the book-length memory that Mr Grigor requires.

And one C90 will hold about 200 pages of A4 text.

And as to printing copy, nothing could be simpler. Link the Microwriter to the printer of your choice — I plumped for a Facit daisywheel electronic typewriter, but there are reasonably priced daisywheels without keyboards.

Mr Grigor could add a modem to his facilities for the Microwriter some day. He rightly points to the advantage that would accrue from this for a journalist.

So, for an outlay of £485 plus the cost of a printer Mr Grigor could satisfy his needs. For a writer there is much more to a Microwriter than I have mentioned here.

Like Mr Grigor I also looked around the whole of last year for a sensible small-scale word-processing package. I came up with this — and Microwriter Ltd is a British company as well.

Ann Stanyer,
Earlsdon, Coventry

And, to back her obvious enthusiasm with example, she added that this letter was written on a Microwriter . . . Ed

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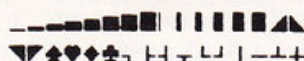


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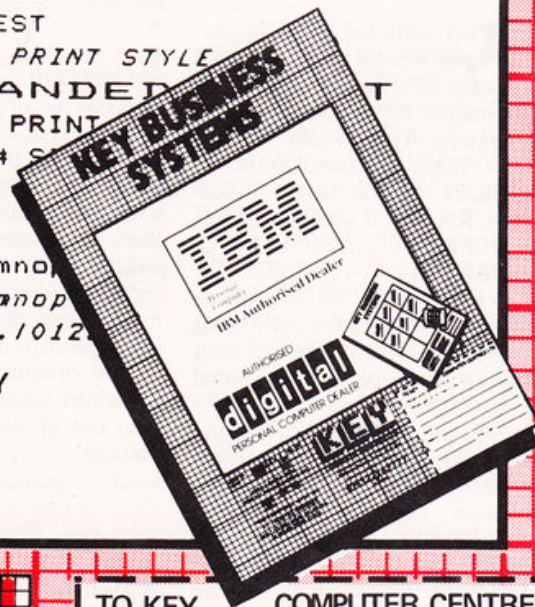
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Loopholes in the language

QI have spent a lot of time programming in Fortran on minis and mainframes where the following structure is quite common:

```
DO 100 I=1,100
```

```
•
•
• IF (X.LT.O) GO TO 200
```

```
•
•
• 100 CONTINUE
```

If I try the equivalent form on my Lynx, viz:

```
10 FOR I=1 TO 100
```

```
•
•
• 50 IF X<0 THEN GOTO 200
```

```
•
•
• 100 NEXT I
```

I eventually get an error message saying that the return stack is full. Is this a general problem with Basic or is it unique to the Lynx?

*Kym Wilson,
West Byfleet, Surrey*

AIn traditional marketing jargon, it's not a problem with Basic, it's a feature. It is common to most Basic interpreters. You should not use GOTO to leap out of FOR . . . NEXT, GOSUB . . . RETURN and, if you have them, DEFPROC . . . ENDPROC, REPEAT . . . UNTIL or WHILE . . . WEND! You may get away with it for a while but in the end you fill the stack or at best introduce more potential bugs than you need to.

In languages like Fortran and Pascal, you use GOTO to get out of things you don't want to finish. Perhaps an error has occurred or the user wants to go back to the menu. In Basic, GOTO is used as a standard way of getting from place to place, especially in a Basic with no multi-statement lines such as ZX81 or Lynx Basic. So a Basic GOTO doesn't clear the stack, or finish FOR . . . NEXT loops properly, and so on.

There are, of course, cases where you want to leap out of a loop. One way is to tamper with the loop index. In your example

```
you could re-write line 50 as:
50 IF X>= 0 THEN GOTO 60
52 I = 100
54 GOTO 100
```

This little horror is not only a little cryptic but it just aborts a loop prematurely. So if you wanted to leap back to the menu or whatever, you'd have to set a flag and have an extra IF THEN after the NEXT. You may have gathered that it isn't the best of solutions.

So what do you do? Go back to using IF . . . THENs with your own counter and index variables. You can have any structure you like and leave it whenever you want to. FOR . . . NEXT is simply:

```
10 I=start value
20
```

```
•
•
• 50 I=I+1
```

```
60 IF I<limit THEN 20
```

REPEAT . . . UNTIL looks like:

```
10 REM here's where the REPEAT would be
20
```

```
•
•
• 50 IF condition not true THEN 20
```

WHILE . . . WEND is:

```
10 IF condition not true THEN 60
20
```

```
•
•
• 50 GOTO 10
```

60 REM rest of program

If you try to stick to structures like these, you'll find you can use them without having to have the relevant words in your Basic.

They also become easy to recognise when you're trying to make sense of programs you wrote perhaps days before.

And, of course, on those rare occasions when you need to leap out of closed structures, you can.

Vic disturbs the peace

QWhy does my television hum when I POKE the screen black on my Vic 20? It only happens with this colour.

*R Hampson,
Ilfracombe, Devon.*

AWhat tune does it hum? Seriously, it's to do with the way TVs work . . . it'll do it for any black screen, not just a VIC 20. The colour guns which

produce the display are always switched on and charged up. To get black, they must be suppressed and that sudden squashing of their signal creates a lot of magnetic inductance. Which makes it hum.

Hmmm . . . or so the theory goes. Fortunately, Vics are quiet micros. You should hear a BBC scroll or a Spectrum think.

Happiness is . . . the right micro

QI don't own a micro and would appreciate your advice before I buy. I want a machine for games and for education. My son is taking his O-levels next year and my daughter three years after that. I'm also interested in word processing and music synthesis.

Would a BBC B be better than a Commodore 64? Could a Lynx be sufficient?

*N A Foden,
Wotton-under-Edge, Glos.*

AFor some reason Commodore 64 vs BBC B is the most popular buying dilemma. I don't want to start a flood of 'my micro is better than yours' letters by mentioning this. But it does seem that newcomers can't decide between the two.

The simple answer is that it doesn't really matter. The machines have a similar price and performance. You ought to try out both machines, read their manuals and see some of the programs available. If possible, talk to people who own and use the machines. Then buy the one you're happiest with.

My own personal preference at the moment would be for the BBC, simply because it has a bias towards schools and there is more software available for it now. But Commodore and the Commodore software houses will put a stop to that in the next couple of months. The BBC is also a little cramped on memory — but then we're beginning to waste time comparing specs.

Similar comments apply to the Lynx. It's more than capable of handling the job, especially with the sort of software being developed for it.

But, if you're trying to buy now, there is little point in waiting. There is always something better around the corner.

It might seem unhelpful but you are on your own. The fact that you've narrowed the field down to the machines you've specified suggests that you know more about your buying decision than many people.

Go on, take the plunge. Buy the one you feel happiest with!

More than skin deep

QWhat makes an IBM look-alike a look-alike? Surely any 8088-based micro with MS-DOS will run IBM programs, and so be IBM compatible?

*Keith Blake,
Rochdale, Lancs*

AThe real test of IBM compatibility is that you can stick a copy of the Microsoft Flight Simulator in Drive A and run it! But seriously folks . . .

At a software level you're right in that any MS-DOS system (8088 or 8086 based) will run a straightforward MS-DOS program. But there are bits and pieces specific to the IBM PC such as its graphics, screen control codes and so on.

Some systems look just like an IBM to the program and so run IBM-specific stuff. Others run MS-DOS but do the graphics and so on in their own sweet way.

At the next level, you have to be able to read a program into the computer's memory to run it. So you need to be able to read, and preferably write, IBM disks.

MS-DOS is clever enough to be able to automatically recognise and adjust to different disk formats so this isn't hard to achieve. Many MS-DOS machines can easily swap disks with each other.

Notable exceptions are the Sirius with its variable speed disk drives, and the Dot and Samurai, both of which got the diameter of the disks wrong.

There's one other major point of compatibility. The IBM has five slots into which you can throw all sorts of add-ons, including, in the IBM's case, minor things like memory, interfaces and the graphics adaptor.

A real IBM look-alike should have IBM slots, to take the growing range of wonderful plug-ins. You'll find some port-

ables don't have them because they are so big that the computers come out looking like IBMs with handles on.

Then there's a question of looks.

Some compatibles don't look like the IBM, some incompatibles do! The only thing worth looking for is that the keyboard could be an identical layout to the PC's. This helps if you're working with IBM specific documentation as the keys are where they are supposed to be.

It also has the disadvantage that most of the PC lookalike keyboards are nasty things from the same manufacturer. It's the sort of keyboard you'd expect on a business computer from Sinclair Research.

Which brings us back to the Flight Simulator. Because it's on an IBM disk, and relies closely on IBM hardware, it is a reasonable, if haphazard, test of IBM compatibility. You try flying on a keyboard that isn't PC layout!

No PEEKing at Lynx screen

QI have recently purchased a Lynx computer and, although I am very pleased with it, I would like to know more about its PEEKs and POKes. Can you tell me how to PEEK the screen so that I can see if there's a particular character in a certain position?

Are there any books planned about the Lynx and when will they be available?

Neil Davies,
Cannock Staffs.

AIt isn't possible to directly APEEK a character back from the screen in the same way you can a Vic or ZX81. Firstly, the Lynx's display memory is separate from the user RAM and isn't accessible unless you personally bank-switch it into memory. Secondly, the memory contains the patterns of the characters, not their ASCII codes. So a routine to look for characters would have to switch the memory in, PEEK back the pattern and compare it with those in the character set.

You're talking about a fairly complex and slow piece of machine code and it gets even more complicated if you try to read characters that aren't on the normal 40x24 cells.

So you've got to find another way of doing it. The best is to keep your own screen map,

which tells your program which screen codes went where. When the information becomes available, it should be possible to build this into the character out routines so that it is transparent to the program.

As for Lynx books, there are lots being planned. But 'planned' is very much the word. Granada has managed to get *The Lynx and How to Get the Most from It* by Ian Sinclair out first.

Watch the Readout pages for more.

The publication that is worth waiting for is the Computers Newsletter. This has got all the technical information you're likely to need for such jobs as bank switching and so on. If you've sent your guarantee card back, you should be getting your copy very soon.

Communication breakdown

QI have just purchased an Oric I and have been looking for software for it. A friend said that you can use some BBC micro software on it. Is this true?

Do you know what happened to the free Forth tapes Oric was giving away?

M Musa,
New Southgate, London.

AYou can't use BBC programs on an Oric. Your friend may have made the mistake because the Oric uses the same microprocessor as the BBC (the 6502) and because the Basics are similar. But BBC Basic has a whole pile of new commands over the normal 8K Microsoft Basic used on the Oric.

So, while it might be easy to convert an Oric program to run on the BBC, it would be something of a job to go the other way.

There is a rumour that Oric will be producing a BBC-like Basic for the Oric in the future. But if, and when, that happens, it's still not going to load and run BBC Basic programs without some conversion. So for Oric software, you are just going to have to wait.

Oric Forth is available. Mail order customers who ordered 48K machines will receive it free. Those who ordered 16K and got 48K (everybody who ordered 16K) will not get it. The Forth works only on the 48K machine.

If you bought your Oric from a dealer, you should find he has the Forth tapes in stock at £15 each.

In a spin on BBC disks

QI am thinking about buying a BBC model B but I am a bit confused about the disk drives. Could I buy one disk drive and then upgrade to two drives later? Or do I have to buy another two drives?

D Sillet,
Camberley, Surrey

AAs far as Acorn's own drives go, you can buy a single 40-track drive or a dual 80-track drive.

If you want two 40 track drives, you can buy a second but you'll need an extra cable from your dealer in order to get them both into the same socket.

Given this, and the massive range of independent drives, you can cook up any configuration you want.

You shouldn't need to worry about upgrading. Just make sure that you buy what you need now plus a little bit extra when you first get the system. Remember that low capacity, single disk drives are painful!

Copying is a necessary hassle so if you have a serious application, you should consider getting two drives right from the start.

Fiddling with files

QI have heard the terms 'serial' and 'random access' when talking about disk files. Can you explain the difference and say when they are used?

Robbie Pudifer,
Liverpool

AIt's a question of how the files are organised and accessed. Both systems use the same basic structure; the file is divided into records and fields. So in an address file, each entry would be a record and within each record there would be a name field and an address field.

With a serial file, the information is stored as one long stream with no wasted space or gaps.

It may be physically split up on a disk but it's logically just one solid lump. When you read and write a serial file, you can't jump about within it. If you

want to read in the twentieth record, you must read through the first 19 to get there.

So serial files are slow and awkward — if you want to alter a record, usually the whole file has to be rewritten — but they don't waste any space. With a tape-based system such as ordinary cassettes you're stuck with serial files.

In contrast, in a random file every record is padded out, so that it is the same length. If you want the twentieth record you can say so and the disk operating system can figure out where it is and get it for you. You can access the records directly, in any order you like.

So random files work only with media where you hop about from place to place, such as disk drives. They are much faster than serial files but they do waste space in that every record has to be padded to the same length.

If you want a classic example of the differences in access time between the two, compare looking for a particular song on a cassette (serial) and on a record (random access). On the record, you can just lift the needle and drop it down where you like.

On a small micro, you are usually stuck with serial files, though if they are small enough to read into RAM, you can simulate a random file.

Just put the data in a two dimensional array, where the first subscript picks the record number and the second is the field number. This is usually the most convenient way of looking after a data file from a Basic program.

Going back to a little more of the computer science, there are guidelines for choosing between the two systems. Random files are suited to applications where only a few select records will be looked at. If you're talking about a membership list, then you are going to update just a few subscriptions every day.

Serial files are used when most of the records are going to get updated. If you have a mailing list, chances are you'll print the whole thing out whenever you use it.

Once you get into file handling, you'll discover that these are just the first two and most obvious techniques. There are lots of in-between and improved systems that can work on even a humble cassette micro with 48K RAM.

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Lisp lists unlocked

An ordinary printout of a piece of Lisp is fairly incomprehensible due to the large number of brackets involved. In order to overcome this problem, the BBC computer Lisp interpreter uses the function Sprint, which when applied to a list prints it out with indentations to highlight its logical structure. In practice this is quite good but occasionally one is still left running a finger up the screen to see which bracket belongs underneath which bracket.

A better scheme is to use Teletext mode to print each indentation in a different colour. To do this all that is necessary is to redefine the function XTAB as follows:

```
(DEFUN XTAB (S)
  (PRINC)
  (PRINC (CHARACTER
    (PLUS 129 (REMAINDER
      (QUOTIENTS 3) 7))))
  (LOOP (UNTIL (MINUSP
    (SETQ S
      (DIFFERENCE S 1))))
    (PRINC BLANK)))
```

If it is desired to retain the ordinary function of XTAB, then the above may be defined as another function — ZTAB, say — and the call of XTAB in SPRINT can be changed to a call of this new function.

D J Pilling,
Blackpool, Lancs.

Flash varied on your VDU

This may seem like yet another method of turning the BBC's cursor off, but it's bug free, is used extensively by Acornsoft, and works on all the operating systems (0.1, 1.0, 1.1 and 1.2). Try VDU 23;10,32;0;0;

You can restore the cursor and vary its flash rate with this

as well. Change the 32 to 103 to restore the cursor in MODEs 0 to 6, and change it to 114 for MODE 7. Subtract 96 from these values and the cursor stops flashing. Subtract 32 from the values and you get a faster flash.

Using this and VDU 23;11,X;0;0;0; you can create just about any type of cursor you want. X should be <=7 in MODE 0,1,2,4,5, <=9 in 3 and 6, and <=19 in MODE 7.

You can get a few extra colours by using out of range GCOL statements, that is GCOL X,1 with X>3. Most of these produce odd vertical stripes, but some produce new colours depending on MOS version, MODE, any VDU 19 statements and the second parameter of GCOL.

Experiment with the following program:

```
10 MODE 2
20 FOR X=3 TO 255
30 GCOL X,1
40 MOVE 0,1279:MOVE
  1279,1023:PLOT 85,0,0
50 PRINT X
60 REPEAT UNTIL GET=3
70 CLS
80 NEXT X
```

If you've got the 1.2 MOS, you might be interested in GCOL 108,1 (pale green), GCOL 231,1 (deep pink) and GCOL 146,1 (pale yellow).

A W J Timme,
Huddersfield, Yorks.

Atom listings safeguarded

I've discovered a simple way to protect Atom listings. It involves a carefully prepared REM statement as the first line of a program. Type a line number, then REM. Now hold down the CTRL key and press L-U-C. Press RETURN and the screen goes totally blank. You can recover the program by pressing BREAK and entering OLD.

This routine works as long as the line isn't deleted. So pick an odd line number such as 67 for the REM.

Paul Ralphs,
Moston.

Oric gets on the right lines

Page 43 of the Oric manual contains a short program to demonstrate the Oric. After a provisional manual, a full version, an errata and a final

manual have been produced, it's still a short program. About three lines short. It should read:

```
5 HIRES
10 FOR N=0 TO 199
15 FOR Z=0 TO 239 STEP 6
20 X=RND(1)*8,16
25 CURSET Z,N 3
30 FILL 1,1,X
35 NEXT Z
40 NEXT N
```

You'll also find that CSAVE "PICNAME", A#A000, E#BFEO will save your high resolution pictures.

M Ellis,
Sutton Park, Hull.

The big bang in Tandy colour

I have found an effective technique for doing explosions on a Tandy Colour Computer and probably the Dragon as well. Take the object to be exploded in a GET-PUT rectangle.

PUT the object back in the same place but alter the shape of the rectangle. This will destroy the information when it is redrawn. Repeat the process several times for a really good explosion.

Nathan Cox,
Walsall, West Midlands.

Get to the bottom of your Spectrum

It isn't usually possible to print at the bottom of the Spectrum screen on the lines reserved for its reports. Try:

```
10 POKE 23659,1:
  POKE 23689,2
20 PRINT AT 22,0;"ZX
  SPECTRUM COM-
  PUTER"
30 POKE 23659,2
40 PAUSE 0
```

The PAUSE is only there to stop the message being overwritten by a report. You don't need it in an actual program. An even shorter way is just to PRINT#0;"ZX SPECTRUM COMPUTER".

G Hughes,
Tywyn, Gwynedd.

Determined degrees for the Ace

The Ace manual gives listings for trig words such as SIN, COS and TAN. But these work in radians. To convert to degrees, define a word:

```
:DEG 57.2958 F/;
```

So to find the sine of 25 degrees, enter 25. DEG SIN F.

You can transfer most words

that appear in Basic to Forth simply by figuring out what they do. For example, you could have :NOT 0= ;.

A couple of other tips — to clear the Ace memory, enter 0 CALL. Don't waste time typing 0 VARIABLE name 0 VARIABLE another name and so on. Just define VV as : VV 0 VARIABLE ; and use VV name VV another name.

Ralph Lorenz,
Solihull, Midlands.

Co-ordinates made absolute

Spectrum users who wish they could use absolute screen co-ordinates rather than the relative x,y co-ordinates, could try: DRAW xcord-PEEK 23677, ycord-PEEK 23678

If you are going to use this regularly, you could have a line LET A=23677: LET B=23678. Alternatively you could define a function, DEF FNx(a)=a-PEEK 23677 and DEF FNy(a)=a-PEEK 23678, and then use: DRAW FNx(xcord), FNy(ycord).

David Topping,
Penhow, Gwent.

De-screen the Dragon

If you're trying to handle a lot of data on a Dragon, then you'll need as much memory as possible. Typing PCLEAR1 frees up to three high resolution screens, but you've still got one left. To use that, you would expect to be able to type PCLEAR0. But this produces an error message. You can get rid of that last screen by POKEing 31,0. After this, printing MEM gives you 32551... within 217 bytes of the magical 32K.

Peter Wells,
London W10.

The case in question for BBC

It's a bit fiddly typing in BBC programs in a mixture of capitals and lower case. If you put the caps lock on, then typing a letter key produces a capital. If you hold the shift down and type a letter, you also get a capital. Now type shift and caps lock. Typing a letter still produces a capital. But typing shift and a letter produces lower case.

D Palmer,
Isleworth, Middx.

Do you know how to spell proper? Barry Miles shreds the word and tests spelling checkers.

A spell with your word processor

If you were asked to buy a spelling checker to go with your word processor, you'd probably feel a little insulted. After all, you know how to spell — don't you?

You probably don't spell as well as you think. And errors can easily creep into even the best writer's copy. But with modern wordprocessing packages and spelling checkers, those problems can largely be eliminated.

The ability to correct your typing before printout is a real benefit (limited by the fact that certain spelling mistakes are hard to see on the screen, but blatantly obvious on paper). Which brings us to the spelling checker; a nice complement to print-out proofing.

In the same way you might think someone ill-educated if they speak poorly, you might find this article less credible if you see spelling mistakes in it.

Software packages that solve this problem for you go beyond the traditional mathematical applications of computers and perform complex character manipulation and comparison to make sure you spell well. The spelling checker puts a dictionary in the computer's memory when you load it.

Most spelling checkers have dictionaries which can be tailored to fit the needs of the writer, so that if you're writing about mental health services you don't have to constantly remember how to spell 'psychiatrist'.

It's a well-established principle in creative writing that the quality of ideas and expression is enhanced if you're unencumbered by the details of spelling and punctuation. With a spelling checker, you have new power to put that idea into practice.

On my Commodore 64 I use the t150 Superspell program. When writing on the 64, my fingers move as fast as possible (and as fast as the muse supplies the ideas), paying no attention to what comes up on the screen. I'm not a touch typist, so I have to look at the keyboard all the time.

When the file is safely saved on the disk, the second part of the operation comes into play: I run the spelling checker. The program's menu gives me a chance to select a linefeed — very handy for those printers set to provide no automatic linefeed when the host computer sends out a carriage return. When that's done I select from a range of options. My most likely choice is to check a file or check a statistical printout.

The other choice is even more sensational. The file is examined and the number of words, sentences and paragraphs counted. Those statistics are then printed on the screen and can later be fed to the printer. And those statistics are of more than passing interest.

Considerable research has gone into improving the readability of written English and various indices have been concocted to calculate this. One of those is

called the fog index. The higher the number of the index, the more difficult it is to study the subject matter. You will probably agree that long words are generally more difficult to understand than short ones — and long sentences harder to read than their briefer counterparts. In a long sentence, you must carry more in your mind until the end of the sentence. The average person can consider only seven pieces of information at once, so the fewer the ideas in a sentence, the better. The fog index measures the extent to which you are being long-winded and hard to understand by looking at the length of sentences and words.

In addition to assessing long-windedness, the spelling checker can also count the number of times a given word occurs in your text. Then, armed with your Thesaurus, you can proceed to put some variety into your normally bland prose.

The next stage is to edit the file. This is the best bit of all: the machine loads the file, a screenful at a time, and highlights each of the words it doesn't recognise. The number of words your program will recognise is determined by the breadth of its dictionary. The program I use is well-provided for: offering British, American or combined dictionaries, each about 30,000 words long, although some spelling checkers can have dictionaries as small as 3,000.

But the more you use the spelling checker, the more you can add to its

```
>LIST
10 PRINT "WHAT IS YOUR SPELLING OF ELEPHANT?"
20 INPUT A$
30 IF A$<>"ELEPHANT" THEN PRINT "NO, YOU'RE WRONG" ELSE PRINT "YES, THAT'S RI
GHT":END
33 GOTO 10
```

They say elephants never forget people who hurt them.

And what worse injury could you inflict on the burdensome beast of Burma than to spell its name wrong? This program will bother you for the correct spelling of 'ELEPHANT' until you get it right.

But we didn't bring you all the way down this page to tell you how to spell elephant. This program illustrates the basic principle behind spelling checkers — a process known as string comparison — and how it can be applied.

The first line of the program is merely

a PRINT statement asking you for a spelling. In a real spelling checker program, the machine would automatically ask the question for every word in the text, and in a simple spelling checker it would ask you which word in the text you want to check. The second method, however, is usually more closely tied to a Search and Replace operation for word-processing.

Line 20 simply asks for the character string, in this case your spelling of elephant.

Line 30 is where all the business is done. The first IF . . . THEN clause

determines whether or not your spelling is correct — and then prints 'NO, YOU'RE WRONG' if the spelling is incorrect. If the spelling is right, then it prints 'YES, THAT'S RIGHT' and ends the program.

Line 33 is a simple Goto statement that begins the program all over again if your answer was wrong.

A simpler way to get the program to end one line sooner might be eliminating Line 33 and print 'NO, THE WORD IS SPELLED . . . ELEPHANT' instead of 'NO, YOU'RE WRONG' and asking again.

Spell around the clock

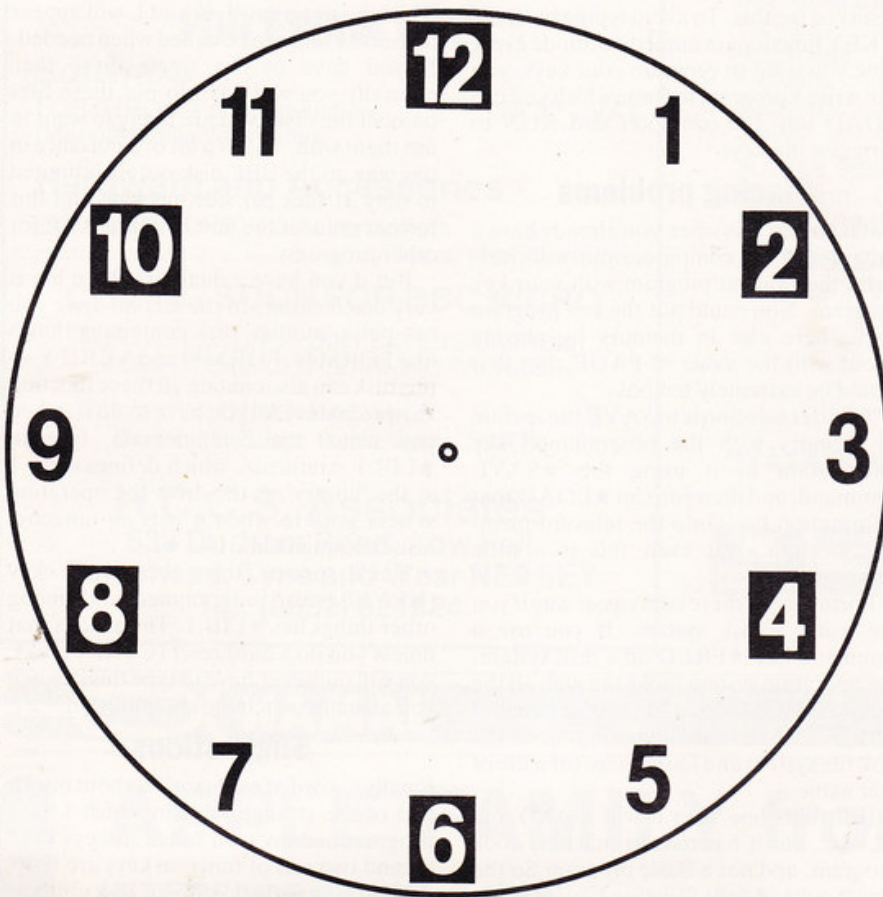
Proof-reading can be a mind-numbing task. It consists largely of going over and over the same block of text looking for

mistakes. But it just so happens that computers are perfectly suited for that sort of work.

The PCN spelling checker in this diagram ticks off the seconds, doing all the tedious work for you in the manner and order described in the text below.

All spelling checkers work slightly differently — and the less expensive ones

usually don't carry out all the tasks described here — but the diagram should give a general idea of what you can expect from such a package. The segmentations are not real-time representations of how long each of these steps take; if they were, the typing of your original document would take up so much room you would hardly notice the other steps.



2 First you need the original document to check, so put your thinking-cap on and type your work of art, which is no doubt chock full of spelink mistakes.

4 The spelling checker then scans the first page of the document, checking it against the words in its dictionary. The spelling checker gives you an opportunity to pass invalid words without editing them or adding them to the dictionary, edit words which may be spelled wrong, add words to the dictionary if they're not already there.

6 The spelling checker then goes through the other pages of your slim volume, and checks in the same way.

8 Then the spelling checker re-scans for mistakes in the corrections. A good checker should also have facilities to scan either all or any part of file for the occurrences of certain words — so that if you're prone to use the word 'user' in an article about people who operate computers, the spelling checker will highlight the word 'user' and expunge all the irrelevant uses of it.

10 A good spelling checker should also have facilities to do word counts, paragraph counts and sentence counts.

12 And finally the spelling checker should give you all the normal word-processing functions for communication with the printer — including an ability to number paragraphs and print out word count and occurrence statistics.

dictionary. Of course, when you add words to the dictionary make sure they're correctly spelled.

Superspell goes one further because you can select from a variety of dictionaries, and may even have a number of disks with different dictionaries on each. For instance, because spelling checking takes longer the longer your dictionary is, you may find it worthwhile to keep a small subset of words in a short dictionary for special purposes.

One important feature is to examine how you will go about adding words to your dictionary. If you can add and delete at will, this is most flexible. However, once you have done this, you cannot be quite sure whether your dictionary contains errors.

I prefer the approach which maintains a separate user dictionary, which can be printed out and carefully checked for accuracy before merging it into the total dictionary.

Anyway, the editing of the file is a gratifying experience. You simply sit there and hit a key, and the cursor highlights the

offending word in reverse field. You can then decide whether to accept the spelling, and later add it to your dictionary. You may also accept the spelling, but decide not to add it to the dictionary, perhaps because you are not likely to use the word again. For example, it might be a proper name.

You may also edit the word. The program I use has all these facilities. Unfortunately, you can only edit within the word itself, and at each end of it. Therefore if you happen to spot the sort of error which the program cannot, for example "whether" spelt "weather", or a piece of bad grammar, you must get out your word processor again. However, the speed with which the cursor jumps automatically from word to word is a pleasure, and the editing of the file is a brief and pleasant task. Superspell takes the wise precaution of copying your file under another name, before re-saving the new version under its original name.

It will then add the new words to your user dictionary.

You may choose never to merge your own dictionary into the main store. This

will cost you a time penalty, but there is an alternative. You may duplicate the dictionary disk, so that you can always go back to it if you need to delete a word which turns out to have crept into your user dictionary unnoticed, and has therefore been irrevocably added to the main dictionary.

The time taken to check a document is brief indeed, and the effect on your workload is dramatic. The tedious bit is that the disk is protected, so you must take it in and out as you load up the program, and put in the dictionary! But this is a small price to pay.

Future developments would include the widespread availability of spelling checkers from within the word processor itself, so that you do not need to close down the word processor in order to check your typing.

Some research has been done into allowing the machine to suggest better phrases for you, but this is in its early stages, and the results are a little bizarre sometimes.

Creative writing is still in the hands of us humans, at least for a while.

Paul Beverley shows you how to increase the number of programmed function keys on your BBC.

Fully functional

The BBC micro's ten programmable function keys are one of the most attractive features of the machine. They can be made to produce any output you want them to, and are therefore a considerable aid to programming.

But if you use the function keys to the full, you soon find that life would be even easier if you had more.

And if you've gone over to a disk system, and want to use things like **★INFO**, **★ACCESS** and **★COPY** as well as **LIST**, **RUN** etc, you'll certainly want more than ten.

Don't panic! With a disk system it's easy to have several levels of programming of the function keys, and to change from level to level with only three key-strokes. In order to understand how this is possible, we need to look first at how the function keys are actually programmed, second at the way the disk system works, and then put the two ideas together to see how to make up a comprehensive set of function keys.

Storing functions

When you program function keys using the **★KEY** command, the text you program them with is stored in certain memory

locations within the computer. There are 256 bytes — from B00 to BFF — which are reserved for this. To avoid typing in all the **★KEY** functions in immediate mode every time you want to program your keys, you can write a program in Basic which you can **LOAD** into the computer and **RUN** to program the keys.

Placing problems

But if you do this when you already have a program in the computer, you will overwrite the original program with your key program. You could put the key program somewhere else in memory by playing about with the value of **PAGE**, but that would be extremely tedious.

A better solution is to **SAVE** the section of memory with the programmed key information in it using the **★SAVE** command, and then you can **★LOAD** that information back into the relevant memory location. But even this is a little cumbersome.

Fortunately, there is an easier way if you are using a disk system. If you use a command like **★FRED** on a disk system, the operating system looks through all the sideways ROMs for a file by the name of **FRED**. If it can't find one, it goes to the disk file system and looks there for a file of that name.

If it finds one then it will **LOAD** and **RUN** it, but it has to be a machine code program, and not a Basic program. So the idea is to turn your function key information into a machine code program which can then be called by, say, **★J** <return>, ie just three keystrokes.

When you create a machine code file on disk (or tape for that matter) you say something like **★SAVE "FRED"3000 35FA 3210**. What this does is **SAVE** the contents of memory locations 3000 to 35FA, and specify that when this is later **Loaded** and **Run**, the execution address is actually 3210 (hex). What we do therefore is to create a machine code program just at the end of the memory used for storing the programmed keys. In fact the program has one single instruction — **RTS** (return from subroutine) which is the equivalent of **END** in Basic (lines 120, 130, for example).

Solved

When you say **★J**, the operating system **LOADs** the function keys from B00 to BFF and jumps to BFF. On seeing the **RTS**, it returns to wherever it came from, Basic, Wordwise or whatever, as if nothing had happened. Using BFF does limit use of the function keys to 255 bytes instead of 256, but since the whole idea is to provide several levels of programming, this should never be noticed.

The only other thing to do is to put the disk you're going to use into the drive and **RUN** the program. **J**, **K** and **L** will appear to the disk and can be called when needed. If you have only a single drive then naturally you will have to put these files onto all the disks you are likely to want to use them with. This is a bit of a nuisance in one way, as the BBC disk system is limited to only 31 files per side anyway, and this further reduces the number of files left for other programs.

But if you have a dual disk drive life is very much easier. In the second drive you can put a 'utilities' disk containing things like **FORM40**, **FORM80** and **VERIFY** — this disk can also contain all these function key programs. All you have to do is, when you switch the computer on, type in **★LIB:1** <return>, which defines drive 1 as the 'library', ie the drive the operating system goes to when it gets an unrecognised command line like **★J**.

You'll notice that the break key (**KEY10**) is also programmed, and among other things has **★LIB:1**. This means that unless you do a hard reset (**CTRL break**), you will only ever have to type this in when you actually switch the computer on.

Suggestions

Finally a word of explanation about one or two of the strange ways in which I have programmed my own function keys. The second two sets of function keys are fairly straightforward to do with the disk utilities. One worth mentioning is at line 250 and is a single key version of listing a program onto a printer. It consists of switching off the paged mode using **CTRL O**, then **LISTO 7** to give a listing with indentations to show the structure of the program, then **LIST**, switch on the printer (**CTRL B**), then finally switch the printer off (**CTRL C**).

The first set of function keys in lines 10 to 100 are the ones I use while I am developing Basic programs. Most are obvious, except for lines 60 and 70. The idea of these is that, if like me you are a little nervous about losing your program, then you can keep **SAVEing** the latest version by pressing key 6.

What you do is to specify, by using function key 5, what the name of the program should be, and then key 6 prints the current file name on the screen. You can therefore check that it really is the name you want to use before you press the **RETURN** key, and actually **SAVE** the program onto the disk.

With a little thought, it should be possible to produce a number of other routines, tailoring them to your own needs. This, of course, is the beauty of function keys.

```

10 *KEY0MODE:MVDU19;4;0;:M:N:ML:IM
20 *KEY1MODE:MVDU19;4;0;:M:N:ML:IM
30 *KEY2:ORUN:IM
40 *KEY3LISTO7:IM
50 *KEY4LISTO0:IM
60 *KEY5$%1BF0="
70 *KEY6P..$%1BF0..MSAVE$%1BF0
80 *KEY7LOAD"
90 *KEY8CHAIN"
100 *KEY9AUTO
110 *KEY10OLD:MF12,5;MF11,25;M:LIB:1:M
120 P%=&BFF
130 [RTS:]
140 *SAVE"J"B00 BFF BFF
150
160 *KEY0*ACCESS
170 *KEY1*COPY
180 *KEY2*DELETE
190 *KEY3*RENAME
200 *KEY4*DRIVE
210 *KEY5*LIB
220 *KEY6*INFO *.IM
230 *KEY7*INFO *IM
240 *KEY8*CAT:IM
250 *KEY9:OLISTO7:ML:1B:M:C
260 *KEY10OLD:MF12,5;MF11,25;M:LIB:1:M
270 P%=&BFF
280 [RTS:]
290 *SAVE"K"B00 BFF BFF
300
310 *KEY0*SPOOL
320 *KEY1*EXEC
330 *KEY2*ENABLE:IM
340 *KEY3*BACKUP
350 *KEY4*DESTROY
360 *KEY5*WIPE
370 *KEY6*COMPACT
380 *KEY7*TITLE
390 *KEY8*BUILDO
400 *KEY9*TYPE
410 *KEY10OLD:MF12,5;MF11,25;M:LIB:1:M
420 P%=&BFF
430 [RTS:]
440 *SAVE"L"B00 BFF BFF

```

This program allows you to have three separate sets of functions stored on your function keys, each of which can be accessed with only three keystrokes.

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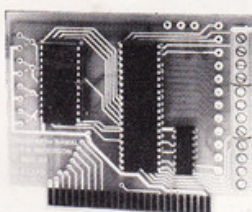


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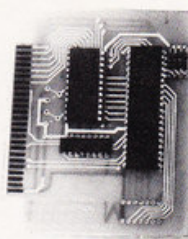


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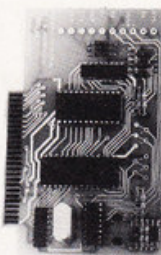
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Put away the space invaders, says Geof Wheelwright. Your Atari is capable of much more . . .

Write on, Atari

The Atari 800 is well known for its ability to process invaders from space quickly — but not your garden variety words and sentences.

However, rest assured, it can be done. There are several good word-processing programs available for the Atari, with prices ranging from £50.

Whichever package you choose, there are a few oddities in the Atari 800 that you should consider. Firstly, the 800 — like the Apple II — is a native 40-column machine and you're not going to get a true 80-column screen that shows exactly what your printout will look like unless you spend extra money for an 80-column card.

Such cards have been available in the US for several years, but even an Atari official couldn't say where we might buy one here.

Once you've accepted that you will probably be working with only a 40-column screen, you should recognise the limitations of the Atari 800's exterior design. To start with, the 800 won't accept any printer other than Atari's own — unless you buy the £129 Atari 850 interface module (which gives you four serial ports and one parallel port and contains a second processor, memory and programmable ports).

The interface module is well worth the money, but it's unfortunate Atari couldn't have designed some of the connections on that module into the actual computer. After all, for about the same price Acorn's BBC Micro will accept most printers without spending any extra money for interfaces (other than the obligatory printer cable — which costs an extra £26.95 anyway).

So by now you've spent £400 on the computer, another £150 on the interface module and cable, around £400 for a good dot-matrix printer — perhaps the Epson MX80 FT, an average of £75 on the word-processing package and close to £300 for the disk drive.

By the time you tot up all that, you'll have to spend about £1,325 before you can even start word processing on the Atari.

Cutting corners

But there are corners you can cut — you could share a printer with someone else if you don't need it that much, you could use Atari's £50 tape recorder instead of disks for storing your data (although only a few companies offer good Atari word processors in either cartridge or cassette form).

If you did opt for a cartridge word processor, used cassettes for file storage and went without a printer, you could obviously cut your costs by as much as £800.

The fact that you can consider a cartridge word processor is one of the great plusses to the 800's design. If you use such a cartridge, it will reside in the machine from boot-up without taking any of your existing RAM space and leaving your disk drive or cassette recorder free for data storage only.

The fact that companies like Acorn have taken up this concept (in its View word processing on a chip for the BBC micro) demonstrates how valuable it can be.

Another unique Atari word-processing feature is the use of orange system keys on the right hand side of the machine, which

most programs employ to help toggle between menus on the packages.

If you're using the Atari 400 rather than the 800, you'll find even more of a limitation on the keyboard.

The 400 has a flat membrane keyboard, although you can buy 'proper' keys to stick on the board, or a replacement board to fit over the existing one. Because the 400 is more or less a compromise machine — falling between the title of games machine and computer because it doesn't seem to be quite one or the other — it has half the cartridge capacity of the 800 and a third of the memory.

But it does have exactly the same keyboard layout as the 800, can run word-processing packages written for the 800 (in cartridge form) and costs £240 less than its bigger brother.

Screen adjustment

Whichever machine you opt for, you will still have the 40-column screen to contend with — and a rather bright sky-blue display. You may find the white on blue display a little hard on your eyes after a while and will be thoroughly confused the first time the Atari screen starts blinking in different colours.

An easy solution to this problem is tuning out the colours on your colour TV, so that you get a rather less offensive black and grey screen with white text.

Another annoying little feature of the Atari is the 'ticking' sound made by the keys when you hit them. For a while, it's a nice little novelty that tells you when you have really pressed a key, but after that it's a pain in the neck.

It is possible to turn off that 'ticking' through an instruction in the software — the Letter Perfect program doesn't have that ticking — but it's something you have to keep in mind when you buy a word-processing package.

Most word-processing packages, especially cartridge-based ones, would be difficult to modify so that the keys are silent. If you want quiet keys, buy a package that keeps them quiet to start with.

Another aspect of the Atari computers that doesn't seem to be fully employed by a lot of word processors is the joystick inputs. It seems a shame that most packages don't use the joysticks to move the cursor around the screen, but perhaps with the advent of Apple's mouse this will change.

And it wouldn't be surprising if Atari was one of the first to develop such a system, as many of its games and applications programs make creative use of the joysticks.

Since the Atari 800 has four joystick inputs, there is lots of room for that kind of control.

A word in three ways

To find out more about the 800's word-processing capabilities, next week we look at three packages — Atari's own Word Processor, LJK Enterprises' Letter Perfect, and the Text Wizard package from DataSoft Inc.

They range in price from £68.95 for Text Wizard to £109.95 for Letter Perfect. The Atari word processor sits closer to Letter Perfect at the higher end of the range — it sells for £99.95.

All the packages are disk-based, although Letter Perfect is available as a cartridge and Atari's soon-to-be-released £59.95 Atariwriter will be offered on both cassette and cartridge.

Don't start worrying about how to weigh these packages against one another right now, because next week's article will also include a comparison chart telling you at a glance what each of the packages will do and how much you're spending to get the various features on each program.

And don't forget that all these packages can run on the Atari 400 as well as the 800, although you often hear that the cheaper machine's flat keyboard is a turn-off for people used to 'real' typewriter keyboards. Nonetheless, it is £250 cheaper than the 800 and can run many of the same packages.

We'll look at how text is displayed, how easy the commands are to get at and understand, how much each package can do, which printers can be controlled by the program without complicated custom-written printer-driver routines. Program documentation will also be under scrutiny as often the manual can make the difference between saving and losing crashed word-processing files.

On most word-processing packages there is an escape from disaster — it's often just a matter of finding it in time. And we've created as many disasters as we can to test the efficiency of our three test text manipulators.

This screen shows the 40-column display of UK's Letter Perfect word-processing package. Most packages have a similar display, with the familiar Atari blue background and white lettering. Note the wrap-around feature and the on-screen display of carriage returns. There is also a status line at the top of the screen showing the number of free bytes remaining in the editor.

```

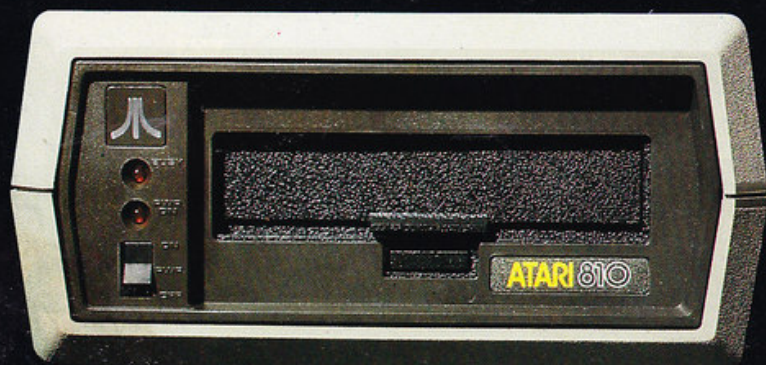
LETTER PERFECT(TM)      Free: 26318
MACBETH<
SCENE FIVE ACT V

There would have been time for such
a word.<
TO-MORROW, and to-MORROW, and
to-MORROW<

Creeps in this petty pace from day
to day<
To the last syllable of recorded
time;<

And all our yesterdays have lighted
fools<
The way to dusty death. Out, out, brief
candle!<

```



The Atari disk drive is larger than most and requires its own independent power supply. You'll note there are two lights on the drive — one indicates there is power going to it while the other performs the standard 'in use' function.

Here, of course, is the centre of the system — the 48K Atari 800 computer. The keys are full-travel, making for easy touch-typing, and the four orange keys on the side help you to toggle through various menus on different programs. Also note the location of the ESC key in the upper-left hand corner — it's almost a universal method of controlling where you are in the word-processing packages.



Perhaps most essential is the interface module through which you can plug a printer and your disk drive. Again this box requires its own power supply and must be switched on separately from the rest of the system. On many other machines, the capabilities of the interface module are actually built into the micro and one power supply — not the Atari's three — is needed to run a computer, disk drive and printer interface.

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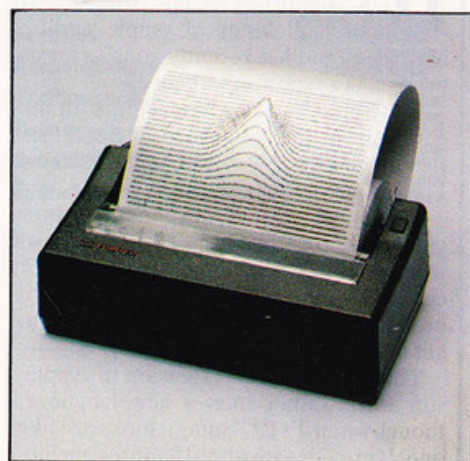
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Structured Basic offers a wealth of features for Apple owners. Richard King minds his language.

Super structure

U-Microcomputers is one of the bigger UK supporters of the Apple II. It makes all kinds of Apple add-on hardware, and has recently gone as far as producing a new motherboard.

Structured Basic is a new venture for the company, in that it is pure software, rather than the hardware/software combinations U-Microcomputers has usually sold.

It's aimed at fairly experienced programmers who have at least some idea of what goes on inside their machines. It could be used by novices, but they'd probably need a modicum of assistance to get the most from the language.

The program is an extension to Applesoft Basic rather than a new language, though when it's **RUN**ning it looks just like one. It provides advanced features, including real Procedures with parameter-passing and local variables — much the same as those found in BBC Basic.

Structured Basic **RUN**s on any version of the Apple, provided that Applesoft is available. It was tested on a Revision 2 Apple II with an Apple RAMcard, 80-column screen and two disk-drives, and seemed quite at home.

It has to be admitted that Applesoft Basic is not the world's most advanced language.

Over the years there have been several attempts to extend and/or 'improve' the smaller Basics, on the Apple and on other machines, either by using sophisticated pre-processors or command extension packages.

The first type works by taking a source file containing special words which can be recognised by the pre-processor, which it then converts to regular Basic. At the end of the process the result is **SAVE**d, and can be **RUN** normally.

A command-extender works differently in that it has the privilege of looking at the program before the normal interpreter. It too is looking for special words, but works *during* the **RUN**, as opposed to before. Whenever such a word is found, the command-extender uses one of its routines, does the job, and then the normal interpretation continues.

On the Apple, instead of the extender looking at every byte of the program and passing anything not recognised to the main interpreter, the extender is only called when the & keyword is found.

Examples of this kind of program for the Apple are Ampersort, AmperDOS, Amperware, Amper-magic, the Routine Machine, Amper Manager and PUF. These are mostly dedicated to enhancing the normal keywords.

Structured Basic is also an 'Amper' program, and uses the &-vector extensively. However, it is much more than these,

extending the language by adding to the control structures, as well as improving variable-, screen- and error-handling. Interestingly, it does not attempt to provide the kind of facilities found in the Amper-programs mentioned earlier, since these can still be used with Structured Basic.

Features

The package provides the programmer with the control-structures **WHILE** . . . **ENDWHILE**, **REPEAT** . . . **UNTIL**, **IF** . . . **THEN** . . . **ELSE**, **IF** . . . **CASE** . . . **ELSE** . . . **ENDIF**, **PROCEDURE** . . . **FINISH**, a whole load of new words for handling the various display modes, as well as several utility words, mostly concerned with memory allocation.

But there is one really big surprise, and it's almost worth buying Structured Basic just to get it. With the **Overlays** feature, it is entirely possible to write, and **RUN**, a single Basic program that completely fills several floppy-disks, or even an entire Winchester drive . . . and that's a few Meg, no matter which way you look at it.

It achieves this incredible performance by allowing the programmer to specify that a section of the program may be 'non-resident'. Whenever it is wanted, it is **LOADED** from a library which is held on disk. As soon as it is no longer required, the memory occupied is released, and can be used to hold another routine.

Careful arrangement of procedure-blocks can make this an extremely effective way of getting the odd gallon or two into a thimble.

Of course, it's possible even in raw Applesoft, but it isn't easy, which is why very few people have used the technique. Structured Basic makes it a positive pleasure. All that is needed is to write the Procedure, then do a **PSAVE** (procedure **SAVE**), which stashes it in the library.

If it is not in memory, it will be **LOADED** from disk as soon as a line containing a **DO** or **USE** 'procedurename' statement is executed. If it was called with a **USE**, it is dumped as soon as it **FINISH**es. If, however, you want it to stay in memory you just call it with **DO** procedurename, which doesn't dump it on exit.

If the required Procedure is not found, you are asked if you want to abort or to try another disk.

Presentation

The documentation is quite adequate and explains how to use the program as well as how the program works. It's not a tutorial on how to program with structured languages, although a few examples are given, so the novice would need more tuition.

There's a passable contents page, but each subject is referred to by its paragraph-number (eg 2.1.4), rather than its page, and there's no index, which is not good.

The packaging is much better than is usual for software. It isn't common to find the disks protected by a good inch of foam on either side.

The disk itself is clearly labelled, and even the envelope is distinguishable by the logo stuck on the front.

Getting started

Installation of the program is effected by booting the machine normally, and then running the startup program. A copyright notice appears and you're away.

Actually learning Structured Basic is easy if you have any experience of structured languages. It's very like BBC Basic, so treatises on that dialect should prove helpful to those who need assistance. Of course there are a few differences, but overall it's sufficiently close to be within hailing distance.

Performance

It takes time, and lots of it, to become really fluent in any language, human or computer, so this review is necessarily only a preliminary examination of the possibilities of Structured Basic. Suffice to say that the demonstration programs worked, ran acceptably quickly, and were moderately understandable, despite there being little or nothing in the way of **REMs** in them.

It isn't that it is difficult to write in Structured Basic, but the enormous extensions made to Applesoft by this program positively beg to be used for large programs and large programs take time.

Reliability

The program appeared to be very robust indeed, which makes a pleasant change. Hitting **RESET** simply returned to immediate mode with **DOS** up, and apart from some fairly predictable memory-clashes with other utilities, which made the machine bomb out all over the place, no errors were encountered.

Structured Basic has a large number of additional error-codes, each with an appropriate message, to take care of the extra mistakes that can be made with this program. **ELSE** with no **IF**, for example, or **REPEAT** with no **UNTIL**.

There is a major difference in the error-handling, too. Instead of the normal **ONERR GOTO** construct, which often calls one huge routine which is supposed to handle everything, the programmer is provided with a kind of 'do this unless there's a problem, in which case do that.' This allows simpler code, since the kinds of

errors which are likely to occur inside any given block are fairly limited, and therefore the problem can be handled inside the same block.

The memory-clashes need some explanation. Apple users have done a considerable amount of work to improve on the Apple's dismal editing facilities and there are many utilities which can be LOADED into the machine to overcome this limitation. PLE is perhaps the most famous, followed by CRAE and Power-Editor.

The features found in such utilities include insert and delete for characters, words or lines, as well as find and replace, programmable cursor-moves, user-definable keyboard macros, and so on. When such a program is installed, the Apple often has superior editing facilities. The only problem is that it is very unpleasant to do without them once you've got used to having them.

Sad to say, Structured Basic doesn't work very well with them. It works, after a fashion, but is anything but reliable, so you have to do without. The reason is that the utility grabs all I/O, looks at it, does whatever's necessary, and only then does Structured Basic get a go.

Since the whole operation of Structured Basic is based on the assumption that it is first in the queue, the results of this conflict are exotic, to say the least. It's a pity this wasn't considered in the design, because even if these utility programs can never be RUN in conjunction with it, similar features could have been added. Insert and delete for characters is almost essential, and would save a lot of retyping when developing programs.

Verdict

Structured Basic would be a very good choice for anyone who finds Applesoft limiting and slow, not to mention impos-

sibly difficult to read, but doesn't want to start thinking in reverse with Forth and hates the very idea of Pascal with its mind-wrenching complexities.

It's simple to use, easy to learn, reasonably quick in operation, and has some quite outstandingly useful facilities. I wouldn't mind adding it to my own library, and that isn't something I say very often.

RATING

Features
Documentation
Performance
User interface
Reliability
Overall value



Name Structured Basic Application Language
System Apple II, Apple II+, Apple IIc Price
£104.95 Publisher U-Microcomputers (0925)
54117 Format Disk Outlets Mail order

1
JLIST

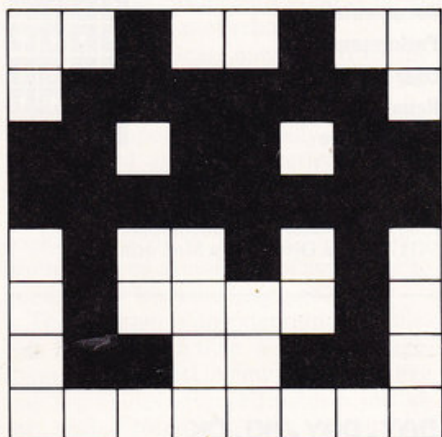
```
290 PROCEDURE CHECKDAY,D$,MO$,DY$,YR$,I,LY,MAXDAY,DAY,MO,OK
295 DATA JAN,FEB,MAR,APR,MAY,JUN,JUL,AUG,SEP,OCT,NOV,DEC
300 IF NOT LEN (VD$)
305 :: THEN DIM VD$(12)
310 :: FOR I = 1 TO 12: READ VD$(I): NEXT
315 VD$ = "X"
320 ENDIF
325 :: DO MNTH
330 :: IF OK THEN DO YEAR: ENDIF
335 :: IF OK THEN DO DAY: ENDIF
340 :: IF OK THEN DD$ = YR$ + MO$ + DY$
345 :: ELSE DD$ = ""
350 :: ENDIF
355 :: GDAY = OK
360 FINISH
```

1
JLIST

```
935 PROCEDURE CHECKENTRY,F$,L,I,OK,T$,J: REM PASS G$ FROM CALLING ROUTINE
940 T$ = LEFT$ (F$,1)
945 GOOD = 0
950 IF G$ < > "" THEN
955 : IF T$ = "Y",T$ = "A",T$ = "£",T$ = ":",T$ = "D"
960 :: CASE :GOOD = (G$ = "Y" OR G$ = "N")
965 :: CASE :GOOD = 1
970 :: CASE DO CHECKNUM,G$
975 :: CASE DO CHECKSET,G$
980 :: CASE
985 :: DO CHECKDAY,G$
990 :: IF GDAY
995 :: THEN GOOD = 1
1000 :: ELSE G$ = "DD/MMM/YY"
1005 :: ENDIF
1010 : ENDIF
1015 : ELSE GOOD = 1
1020 ENDIF
1025 IF LEN (G$) > L THEN G$ = LEFT$ (G$,L): ENDIF
1030 FINISH
```


Karl Dallas does a little plotting with a package that gives you power over your pixels.

Vic character forming recipe



Back to the Drawing Board — How to create a space invader using the expanded grid.

Every Commodore user knows that the Commodore graphics are rather crude, unless you can get into the character generator itself. With the Vic 20, this is possible although the owners' manual gives you no guidance at all on how to do it.

The Programmers' Reference Guide has a fairly detailed section on how to tackle the problem, but the bit pattern calculation is a cumbersome process. Which is where this powerful machine code program comes into its own to take the battle out of the bit setting.

Features

There are five menu options offered. View Set displays the character set, and if any new characters have been generated, it flashes between the old and new sets.

Drawing Board displays an 8x8 grid on which you can create a new character. You can also call up an existing character to see how it is made up; so, for example, it becomes clear how an arrangement of squares can produce the apparent curve at the bottom of the 'spade' graphic.

You have the option of modifying the character, allocating it to a specific keystroke, and then saving it in memory. (Saving new characters to tape comes later).

Sketch Pad produces a blank screen on which you can try out the new characters, once they have been created. Revert undoes everything done so far, and returns to the basic Vic character set. Save New Set saves the new character set (including the Vic's own unmodified set), allowing the characters to be used in a Basic program bearing in mind the fact that Pixel Power itself takes up 2½ K of memory, which may not leave much memory space.

Programs using the new character set must start with the line: 10 POKE 36869,205

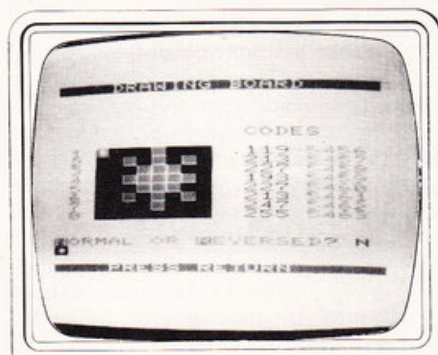
to activate the set, and before SAVEing it in the normal way, the direct command POKE 44,18 must be keyed in.

Then, any time the appropriate keystroke is made in a program, the new character will be generated to the screen, but it will have its old meaning unless used in a PRINT command or similar.

So if, say, you redesign the '>' character as a Maltese cross, then the Maltese cross symbol will still mean 'greater than'.

Presentation

The four cassette-sized pages of notes on how to use the program are extremely clear and free from the usual ambiguities. More



experienced programmers who have worked their way through the appropriate pages in the Programmers' Reference Guide may find it confusing that the grid depicted is numbered 1 to 8, while that in the Commodore manual is numbered 0 to 7, but this is not a major problem.

In use

Pixel Power is extremely easy to use, but if you choose the wrong option there seems to be no way out of it except by going through all the questions (RETURN will work every time) to get back to the menu.

The RUN/STOP key will abort the program, allowing you to RUN again, returning via a slightly flashy title display to the menu.

The Drawing Board function is the most involved of the five options, but still straightforward in use. Pressing the figure '1' fills in a square, while '2' blanks it out. It is possible to move around the grid using the cursors, but when the cursor goes behind a filled-in square, it can't be seen.

On pressing RETURN, the decimal coding of the new character you have created is shown, with the prompt:

CHARACTER TO CONVERT

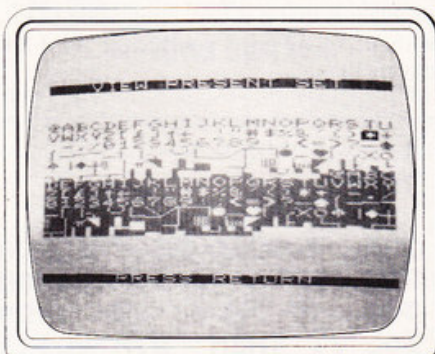
Any keystroke, say @, prompts the next question: NORMAL OR REVERSED?

Then, according to your answer, the actual locations to be POKEd are displayed by the side of the decimal coding, and RETURN brings back the menu.

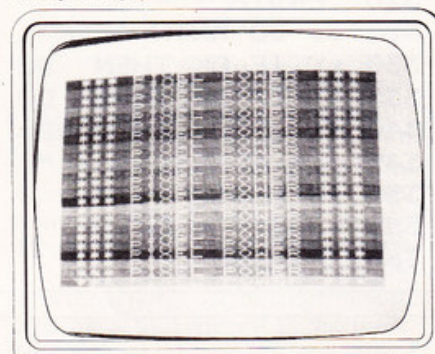
To re-modify a modified (or specially created) character during the Drawing Board function, pressing the appropriate key for that character will call it back onto the grid, where further changes can be made.

Verdict

This package is extremely easy to use, and by combining groups of 8x8 characters it



Left, the act of creation, while the View Set command, above, shows you what you've got.



should be possible to build up quite impressive graphics.

The documentation advises you to experiment on graph paper to begin with, and this is sound advice, but it is hard to do anything really disastrous. If you try to do so, the Revert option can be used to put you back to the beginning again.

Pixel Power gives a valuable insight into how the computer works, so it is highly recommended.

RATING

Features
Documentation
Performance
User interface
Reliability
Value for money



Name Pixel Power Application Creation of user-definable graphics System Vic 20 8K Price £7.95 Publisher Pixel Productions Format Cassette Language Machine code Outlets Distributed by Quicksilver, 0703 20169

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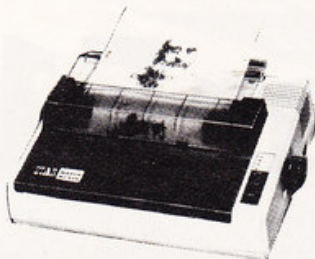
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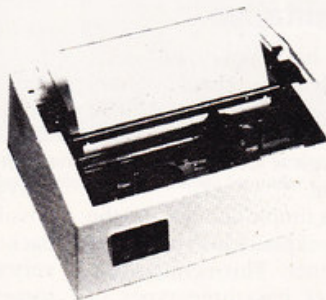
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Can you get a full-featured dot-matrix printer for £289? Barry Miles tries switching on a Star.

Reach for the Star 510 printer

The Star 510 is yet another contender in the growing low-priced but full-featured printer market. The idea here is to sacrifice print quality for print flexibility and a range of feed methods so that the price can stay down.

The Star is a dot matrix printer which can operate at 100cps. Its 9 by 9 matrix gives good characters and the wide variety of types and pitch makes it suitable for many applications.

Presentation

It weighs 7kg and has a solid feel — its plastic case is sturdy and quite pleasant in appearance. The packaging was adequate — the only problem is that your attention isn't drawn to the transit screws until some way into the manual.

Getting started is simple enough and the manual adequately explains how to put the various parts together. This is important because the printer has three types of paper feed, which is most unusual. You are supplied with all the fittings for tractor feed, continuous paper roll, or separate sheets. This gives the user great flexibility and the paper roll is made easy to use by the good tear-off facility on the cover.

The cover has been well thought out — it is easily removed when not wanted but stays firmly in place when it is, significantly reducing the noise level.

There are warning lights on the right hand panel, which tell you whether the printer is on-line, ready or powered up, and whether the paper is in place. These lights would be more informative if their

labels were in colour instead of being merely embossed on cream-coloured plastic. Judicious use of a felt-tipped pen can do the trick here, but it shouldn't be necessary.

The switches nearby give you an instant form and line feed, and switch you off-line to enable these functions to be implemented.

Lifting the lid, you are struck by the fact that the cartridge ribbon has been vetoed and an ordinary typewriter nylon ribbon substituted. This will enable you to keep the running costs low, which is an important factor when considering the merits of a budget printer.

The paper is held firmly to the platen of the friction feed by a no-nonsense bar of heavy metal, so it looks as if it will be possible to remove the paper out of the back of the machine without damaging a very thin strip of metal, as is the case with some printers.

The bail bar moves easily, and the switch that takes you from tractor mode to friction and back works smoothly, if somewhat stiffly. The removal and refitting of the tractor is easily accomplished.

Features

An attractive feature is that the four Dip switches which control important functions are on the back of the machine, out of the way but accessible: other manufacturers please note.

The functions are:

■ Paper Out.

■ Buffer-Full Printing: This results in

carriage returns having no effect, so that printing takes place as a continuous line, and then only when the buffer is full! Most users will want to set this to 'off'. In this mode printing takes place as soon as a carriage return is received by the printer.

■ Interface selection: Sets the interface to seven or eight bits, according to your choice.

■ Line Feed: allows an automatic linefeed if you wish, but its instruction is overridden by the switch which controls the buffer.

The machine is supplied with a parallel interface TTL level fitted as standard, and there is an option to have serial (RS232C/ current loop). The Centronics connection worked perfectly on connecting up the printer and removing the transit screws.

The manual is rather dull. It appears to have been put together by a boffin on a small budget. The cover is utilitarian, and the print is very small. It contains about 90 per cent information about the mechanism, and only 10 per cent details of how to control the machine and software.

It is very unlikely that a beginner would be able to get the machine running satisfactorily, without returning with the manual and a perplexed look to his friendly local dealer.

The more experienced user will find it aggravating that no explanation is given for the difference between enhanced printing and double strike, and more importantly, there is no indication of incompatibilities between various modes.

You have to carry out research to

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One of the big advantages of the lower-priced dot matrix printer is its ability to output lots of different typefaces. Here are just some of the faces available on the Star 510. These print-out samples are reproduced slightly smaller than actual size.

discover whether you can have double strike and emphasised at the same time, and in all pitches. A simple table would have solved this irritation completely.

Up and running

The machine goes into self-test mode if you switch it on with the line feed button depressed. This is always a good scheme, because interfacing can be a problem, and at least you know that the machine is OK mechanically and electrically once this test has performed satisfactorily.

The 4K buffer fitted as standard means that the printer will be faster in use than its rated 100 cps simply because 4K of data can be sent to it and control immediately returned to the host computer, which can then get on with doing something else.

The noise of operation is acceptable although the paper feed mechanism makes a bit of a tinny noise. I was pleased to note that even 85g per square metre paper was firmly held in place by the tractor mechanism.

I found that it was not possible to wind back the paper past the perforations, because they catch on the retaining bar which holds the paper to the platen.

The font design used is an attractive one, but the 17 pitch characters, although smaller, are very close together, especially the capitals. Similarly, the 12 pitch option results in overcrowding, because narrower characters are not used.

On the other hand, the double-width characters are very pleasing aesthetically, and the double-striking and enhanced modes of printing place the second impression in just the right spot to fill in the gaps very well. The effect is very close to typescript.

You have eight international character sets, and italic as well as normal characters. The 9 x 9 matrix will give you 10, 12 or 17 characters to the inch, resulting in 80, 96 or 132 characters on a line. In the enlarged characters, you get 40, 48, and 66 characters to the line respectively. The line pitch is programmable at 1/6, 1/8, or in any number of 72nds, or 144ths of an inch.

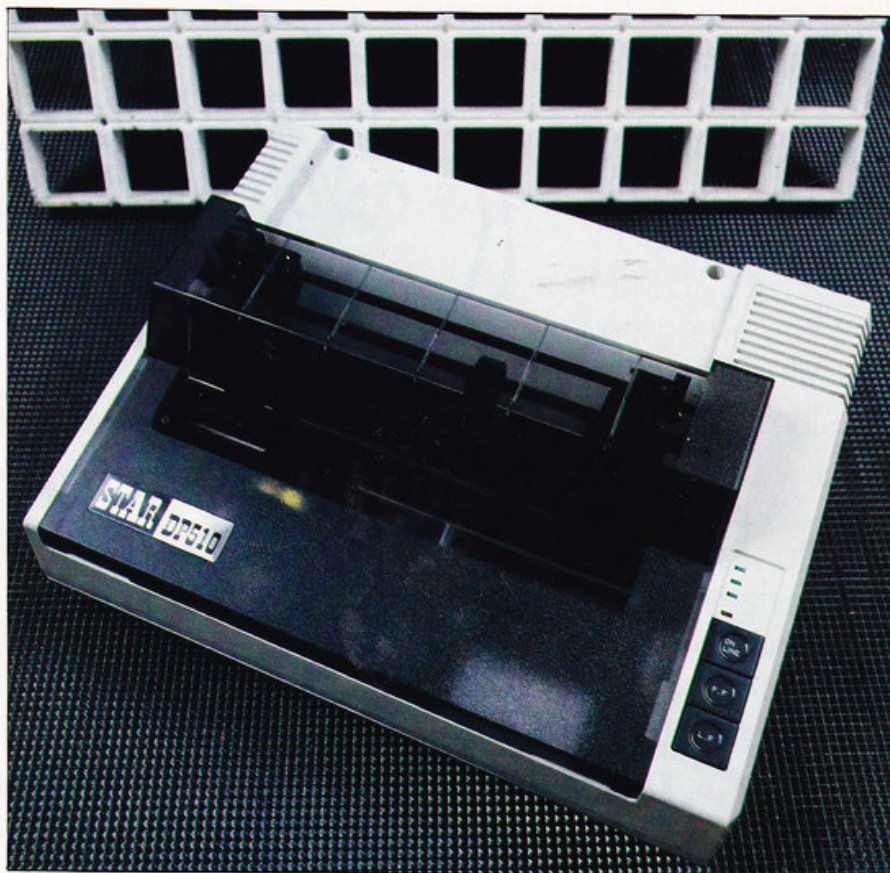
Bit image graphics are available in single or double density, in a 480 or 960 dot matrix. Fractions, mathematical symbols and block graphics characters are available.

The available commands make the printer very versatile.

Vertical and horizontal tabs may be set. Condensed and enlarged characters can be switched on and off within a line. Pitch changes may be made within a line. Form length may be set in lines, and page length in inches. Back space is available, which facilitates underlining.

In addition, you may switch on underline mode, during which all characters are underlined until you tell the Star to stop. You may also set the printer's left margin.

Superscripts and subscripts are supported, whereupon the machine goes into unidirectional mode. You may set the header line at other than the standard sixth line, which will affect the next page jump when the page length has been set.



Rocketing to Stardom? The Star is another matrix printer aimed at the small business/hobbyist micro-user, and is one of an increasing number of such printers selling for under £300.

Skipping over perforations may be set and switched off, and you may decide whether you want a slashed or unslashed zero to be printed.

The paper out warning may be switched out to allow you the facility of using single sheets, should you so wish.

On initialisation, the defaults set are 10 characters to the inch, and 66 lines to the page, not 72 as stated in the manual. The manual has also not been revised to take account of further changes for the UK market.

The character set available on power up is the English one.

According to tests, the machine, which

is bi-directional and logic-seeking, works at the rated speed.

Verdict

The Star is versatile, if somewhat noisy, and its only major defect is in the manual's quality.

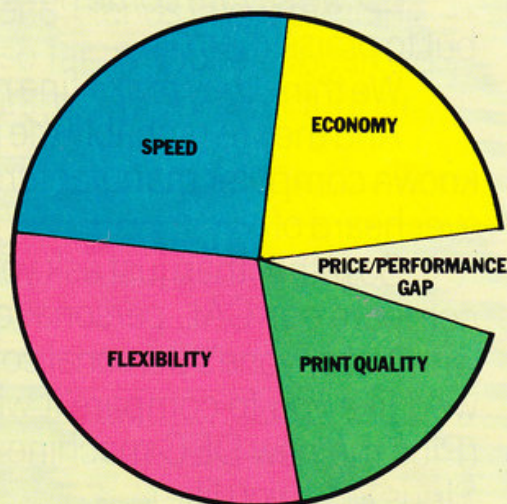
Its price/performance ratio is reasonable, but at £289 plus VAT, it is not going to set the world running to the door of the suppliers in a very competitive market.

Machine Star DP 510 dot matrix printer
Price £289 plus VAT **Speed** 100CPS
Interfaces Centronics Parallel, RS232 C
Serial Contact Micro Peripherals 0256 56468.

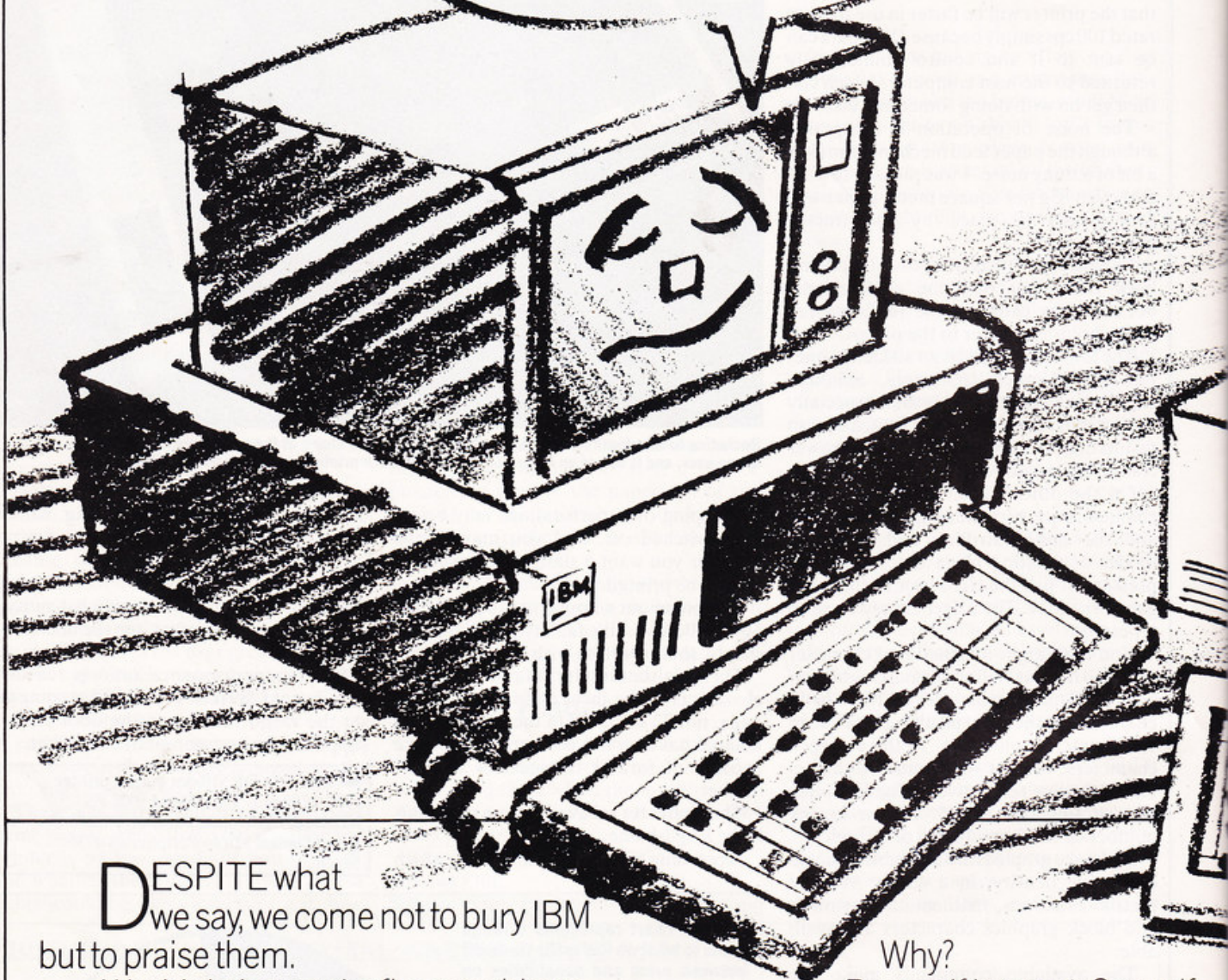
This pie chart represents a rough guide to what we feel is the trade-off between price and capabilities on the Star 510, as determined by the PCN Peripheral Pro-Test.

It's based on the premise that a high capability in one direction will cause either a low capability in another or a higher price. For this reason 'economy' is a negative way of expressing price — the cheaper the printer the bigger the economy segment.

If a printer has lots of everything it will close the price/performance gap — obviously a wide gap doesn't represent a good buy, 15 degrees is good and none is excellent.



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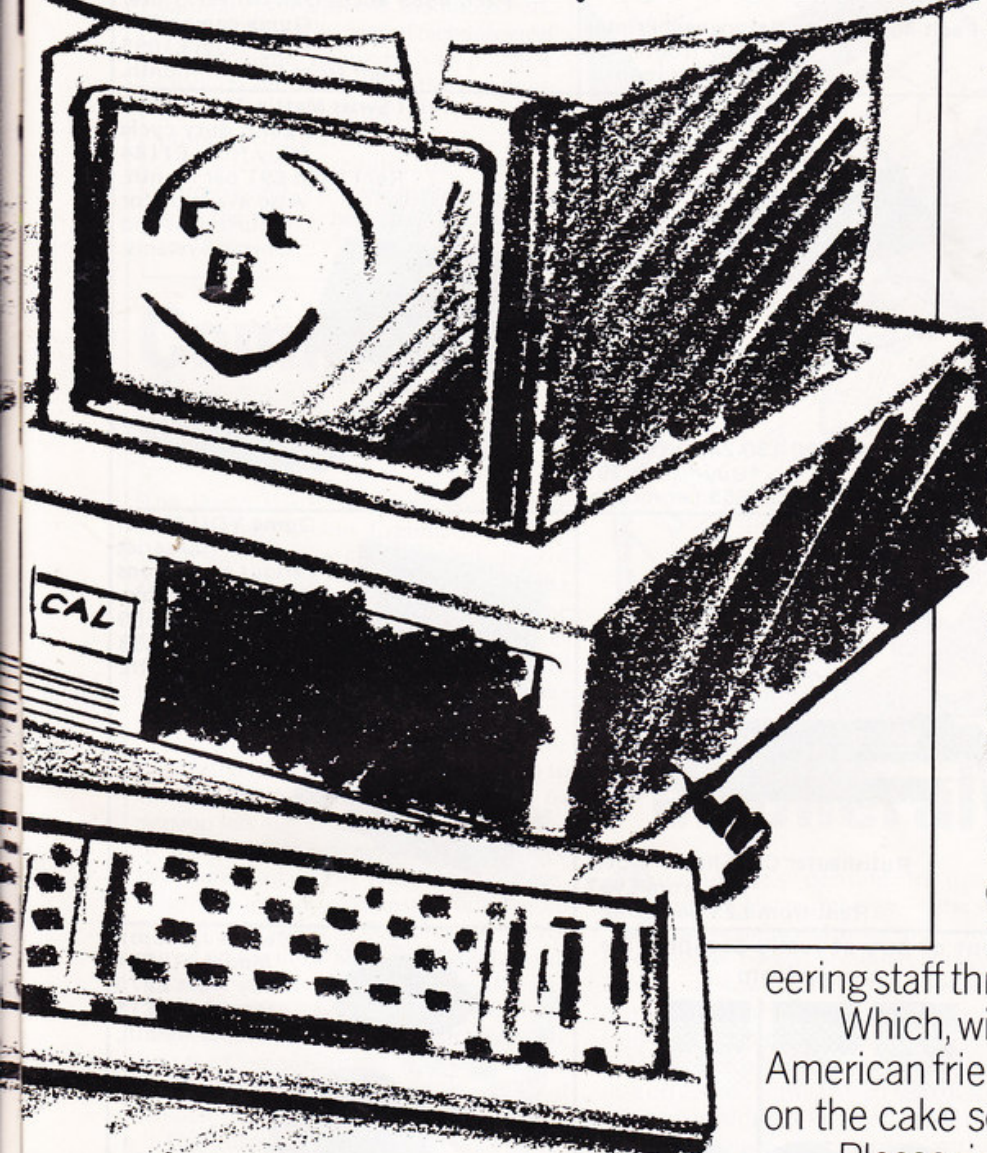
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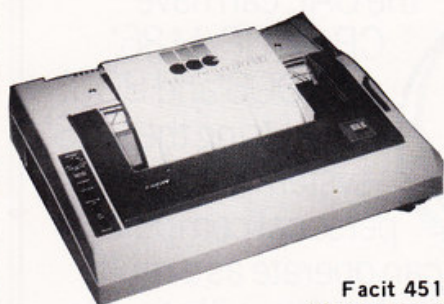
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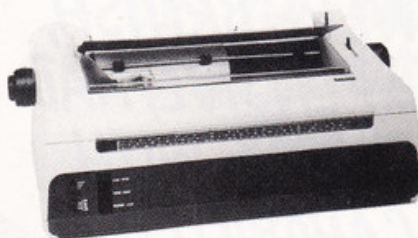
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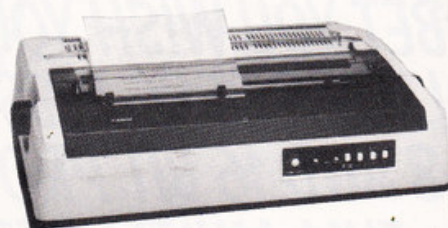
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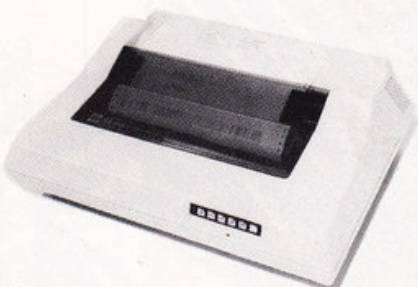
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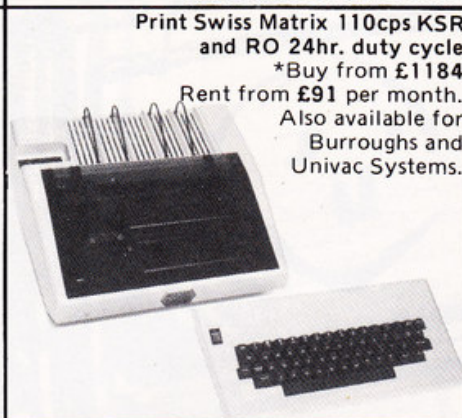
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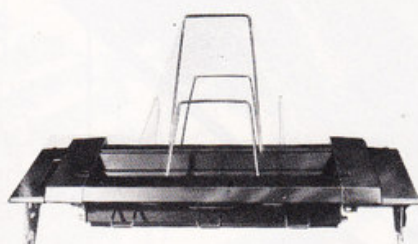
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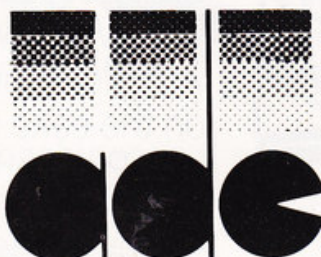


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The Commodore 64 has caused upgrade problems. Barry Miles looks at two ways of tackling them.

Fresh connection

Users often find it difficult to configure the peripherals they really want due to what seems the thoughtlessness of the manufacturer. These interface compatibility problems are, to some extent, attributable to the pace of technological development. In the rush to put new products on the market, the permutations of compatibility are often not properly considered.

Whatever the reasons, the Commodore 64 and Vic have suffered along with the rest — here are two possible solutions.

Commodore in contact

The Dams IEEE interface is a device to put the Vic and Commodore 64 in touch with the more sophisticated range of peripheral devices available through the IEEE interface. The connection to the IEEE peripherals is through an edge-connector, as on the printed circuit board of the Commodore 4000 and 8000 series computers.

Up to 15 separate devices can be connected through the Dams interface to the Vic or 64 simultaneously. The 64 version has automatically relocating code in its ROM to allow plug-in cartridge programs to co-exist with the interface. Also, the memory expansion slot is used for the interfacing, but the slot is reproduced on the interface so that you can still add memory, or cartridge-based software.

There are two sets of code in the Dams chip within the 64 version which relocate into the Commodore 64. The first locates itself at C000, the second at 8000, if needed.

The purpose is to avoid memory conflicts by enabling programmers to use whichever locations are convenient. For example, word-processor designers are able to use the full memory for text if they access the code at 8000.

The Dams interface has eliminated a bug which is in both the 64 and Vic. If you attempt to input from a file on a device which is not connected, or not switched on, the computers 'hang' instead of giving the correct 'device not present' error message. With the Dams interface connected, the message is received.

The manual gives full details of the jump tables in the code, so that machine code programmers may interface correctly with the Dams device.



Peripheral problems

Commodore's decision to use the existing Vic peripherals — the serial printer and serial disk drive — for the Commodore 64 was presumably taken to keep costs down. But it was a source of considerable irritation to loyal users of Commodore Pet products.

Many Pet users already had printers, disk drives and perhaps even hard disks. So to enter the world of high resolution colour graphics, music and sprites with the Commodore 64 apparently meant leaving behind their efficient parallel peripheral devices.

Most were understandably unwilling to spend even more money on very slow serial disk drives or a flimsy, noisy printer. realising this, when Commodore announced the Commodore 64 computer, it promised a plug-in add-on would be made available so users could connect IEEE interfaced devices — disk drives and printers especially.

This IEEE cartridge, however, has yet to emerge, and may not for at least one more month. In any case, it is probable that the Commodore cartridge will use some of the 64's RAM, and therefore may be

incompatible with some programs which happen to use part of that memory.

It was inevitable that another add-on company would fill the gap. Oxford Computer Systems was actually producing its small, neat Interpod at the end of March.

The Interpod is actually a small-scale computer in its own right, using none of the computer's RAM. Its proud boast is that it will hook any peripheral to the 64 or Vic, and PCN's tests show this to be true.

This sort of product is important because the 64 is claimed to be a business machine, and as such must have access to twin disk drives of reasonable speed. The need to back-up important data is ever-present, if vital business information is not to be lost.

The Interpod or something similar is a 'must' for the serious user. With its addition, and that of the Commodore monitor promised quite soon, the 64 should realise its full potential.

Buyers are likely to be a little surprised on opening the container, because they find that the Interpod is not so neat a device in use as the pictures accompanying the advertisements would have led them to

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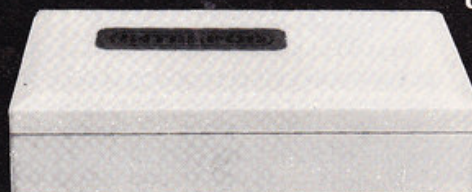
turns the computer into a really powerful system.

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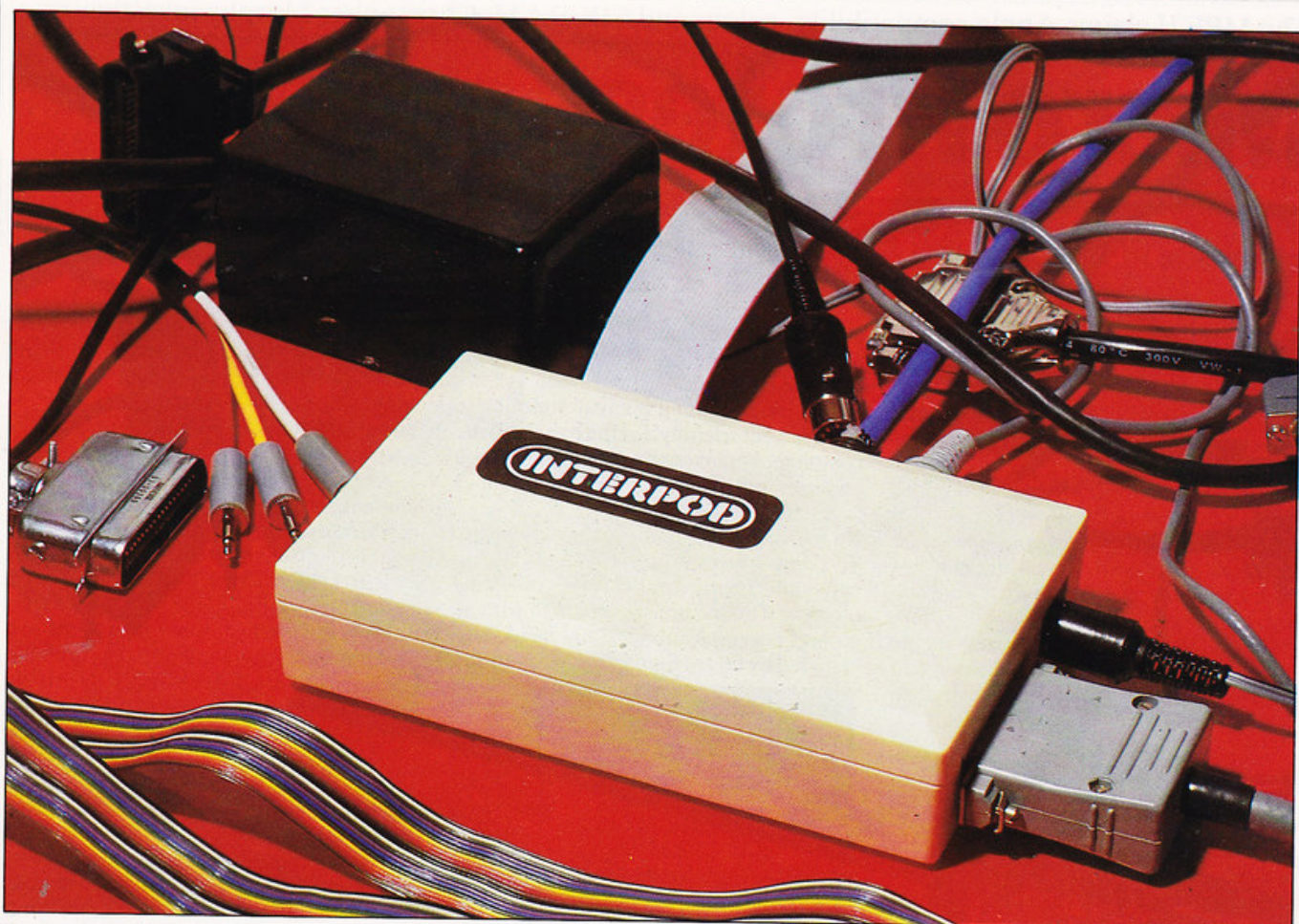
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INTERPOD

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£125



All wires lead to the Interpod — more a computer than an interface, it has its own transformer.

439 believe. In order to have some RAM on board, and for safety reasons, a transformer is supplied. In order to have no possible memory conflicts and a completely self-sufficient device, a power supply is necessary, but it would have been better if the pictures had shown this.

Similarly, the Interpod does not allow you to use the Pet with the Vic or 64 peripherals.

The manual, seven sheets of A4, gives all the information you are likely to need. On power-up the device does a 1.5 second self-test, and then you are ready to go. Device addressing is transparent, but it is nevertheless a good idea to change the device number of the IEEE parallel device if you are using two with the same device number, otherwise the Interpod will always select the serial device. A program to change the device number of the disk unit is included in the documentation.

A strong warning is given that you should make all connection and disconnection with the computer switched off. This is important, since the Interpod will cope with up to a total of 30 serial and/or parallel IEEE devices at once, together with one RS232C device.

Because the pod is a computer in its own right, you can interrogate its command channel, and send a variety of commands to it to change baud rates, carriage return delays, and convert CBM ASCII to standard ASCII for instance.

This considerably enhances the capability of the Interpod, which all in all, is a

commendable product, and should do well in circumstances where the extra facilities justify the extra cost over simpler solutions.

Item Dams IEEE Interface Manufacturer Dams
Price £49.95 Tel: (051) 548 7111.

Item Interpod Manufacturer Oxford Computer Systems
Price £125 Tel: (0993) 812700.

The race to interface

The race to get the Dams and Interpod IEEE interfaces onto the market has been on for some time. There was one major difficulty to overcome, and Dams and Oxford Computer Systems solved it at the same time.

It involved getting the device to cope with both serial and parallel devices at the same time. This was important, because many users would want to copy files from a serial drive to a parallel one, (perhaps only borrowed temporarily).

It is interesting to examine the two approaches: Oxford Computer's Interpod is a very small, stand-alone, dedicated computer, which makes no demands on the memory of the host computer, and therefore cannot clash with the memory requirements of any program LOADED into that machine. This has required the use of a transformer, at additional cost.

Dams has adopted the cheaper approach of plugging into the memory expansion.

You can adjust the features of the Interpod, and can interface to RS232C

devices; the Dams device you take as it comes.

The Dams interface is claimed to run faster than the Interpod, because it looks for an IEEE parallel device first and converts to serial if necessary, whereas the Interpod looks for a serial device first, and then a parallel.

Interpod, however, can cope with twice as many IEEE devices as the Dams device — although it is difficult to imagine that this is of great importance to many users.

The Dams device permits you to have both the serial printer and the serial disk connected, because you do not tie up one of the serial DIN sockets. Interpod does use one of those sockets, and if you want to use the 1515 printer to dump high resolution graphics, or Commodore graphics, and also use both types of disk drive at once, this could be significant.

The prices are so different, at £49.95 versus £125, that you will need to have very good reason indeed to part with the extra cash.

The MPF II claims Apple compatibility, colour and 64K RAM. Christopher Murphy investigates.

Micro Professor —oriental Apple?

The Micro-Professor (MPF) II is a product of Taiwan, or more correctly, the Multitech Industrial Corporation. It is not a new machine: Multitech launched it in the US two years ago, and it comes to Britain with a reputation for offering an architecture very like the Apple's, but for a much lower price.

The similarity between the two machines is so great that Multitech has been obliged to pay Apple a fee for each Micro-Professor sold.

Obviously the ability to run Apple software is a strong selling point, but can the Micro-Professor stand as a machine in its own right?

Presentation

While the Apple has the bulk and stylish design of an office typewriter, its distant cousin looks like an overgrown calculator in a grey, slablike casing with a keyboard measuring just $2\frac{3}{8} \times 6\frac{1}{8}$ ins.

It does feature interface points for a full range of peripherals and a prominent speaker grill, but the general impression is one of austerity. Still, nobody buys micros for their looks — or do they?

The tiny keyboard has a complete set of character and function keys, but it is less than easy to operate. The shift and space keys are particularly awkward to use on this scale, but fortunately Multitech makes a larger extension keyboard, though this is sold separately.

The machine has a 64K memory. A 16K version apparently exists but has not been imported. It should be noted that the figure of 64K includes ROM and inevitably the monitor takes chunks of RAM for its own purpose.

The end result is that only about 38K is available for the user, or less (about 30K) if high resolution graphics are wanted.

This is no more than the space allocated for programming on some smaller and cheaper machines.

Documentation

Documentation for the Micro-Professor consists of a User Manual, an introduction to Basic programming and two supplementary leaflets. The information given in these publications is fairly comprehensive, though there are various inaccuracies.

It is a pity that the text often reads like a translation from Chinese, with many examples of bad grammar and clumsy expression. Few concessions are made to the European or even the American reader.

The User Manual is sensibly illustrated

and informative. It includes a listing of the monitor program, which is good news for machine code fans.

The programming manual attempts to be very 'user friendly' for the benefit of the complete beginner. It is cluttered with cartoons, none of which contributes much to the text.

One drawing has the remarkable caption, 'in order to comprehend human behavior, please look at the following picture.' The picture shows a man with an atomic energy symbol in his head, surrounded by bits of human body connected



The Micro-Professor with the 'beautifully finished' expansion keyboard.

by arrows. This is scarcely the first step in understanding computers, as the manual claims.

Operation

It is possible to use the built-in keyboard in two modes. Basic instructions may be entered character by character, or alternatively by pressing single keys, as on the Spectrum. An overlay is provided to identify single key functions, and another card matches keys with graphic characters. This second card is the right size to be used as an overlay, but for some reason the spaces representing the keys have not been punched out.

For the screen display you have the choice of using a television set or a monitor, sockets being provided for both. The Micro-Professor was tested for this review with a large colour TV and a black and white portable. With these sets the display was a little unstable — characters became fuzzy and unreadable from time to time.

This might be overcome by careful tuning, but the machine does seem to be rather sensitive as far as the display is concerned. Perhaps a monitor would solve the problem.

The Micro-Professor is capable of reacting badly to mains transients, ie, slight fluctuations in the power supply. Events which do not even cause the screen to flicker may have dramatic results elsewhere.

At one point during the tests the contents of RAM (a large program) were converted into garbage, because a light was switched on in a room next to the office.

This kind of thing can be just a little annoying . . .

Problems with power fluctuations are said to trouble machines based on the 6502 microprocessor; I have certainly experienced them with the Oric, which uses the 6502A.

Incidentally, the Micro-Professor does not work on 9 volts, like UK-built micros, but has 5 volt and 12 volt lines. An adaptor for the British mains supply is provided.

The character set is adequate but not generous. It includes neither lower case letters nor a £ sign. The latter omission is only to be expected in a machine designed in a dollar economy, but as an extra (over the Apple) there are special graphic symbols (à la Pet).

The speaker sounds far louder than the Spectrum's and almost as powerful as the Oric's. Do not expect anything like PING or ZAP in the Micro-Professor's instruction set, however. There are no specific instructions for sound at all.

Making a noise involves POKEing to a special address, a flexible if tedious approach. You have to proceed by trial and error, since the manual gives little information on the subject. With patience it is possible to produce music and sound effects.

There is a PRINT FRE(0) instruction which is supposed to give the number of free bytes. It is less helpful than it appears to be, since it returns a negative value. The manual gives no advice on how this should be interpreted, but in fact its 'twos complement', so the real figure is 65535 — FRE(0), which works out to about 38K.

The monitor program behaves like the one on the Apple II, and is very nearly identical.

The Basic instruction set is, well, basic, without the frills and goodies of some later implementations. There is no REPEAT . . . UNTIL loop facility for example. There are no INK, PAPER or BACKGROUND instructions either (COLOR must be used instead). For those who do not value their sanity, there is the ability to run Forth. As yet, no other languages have been announced.

Micro-Professor Basic performs arith-

PCN PRO-TEST HARDWARE

metic to eight decimal places, not nine as stated in the manual. The rate at which programs run can be varied using the SPEED instruction. A total of 256 speeds of execution are possible, with the fastest being assumed if none is specified.

The PRINT instruction is executed

slowly under all circumstances. It was tested with the following program, which prints the integers from 1 to 100:

```
10 FOR X = 1 to 100
```

```
20 PRINT X
```

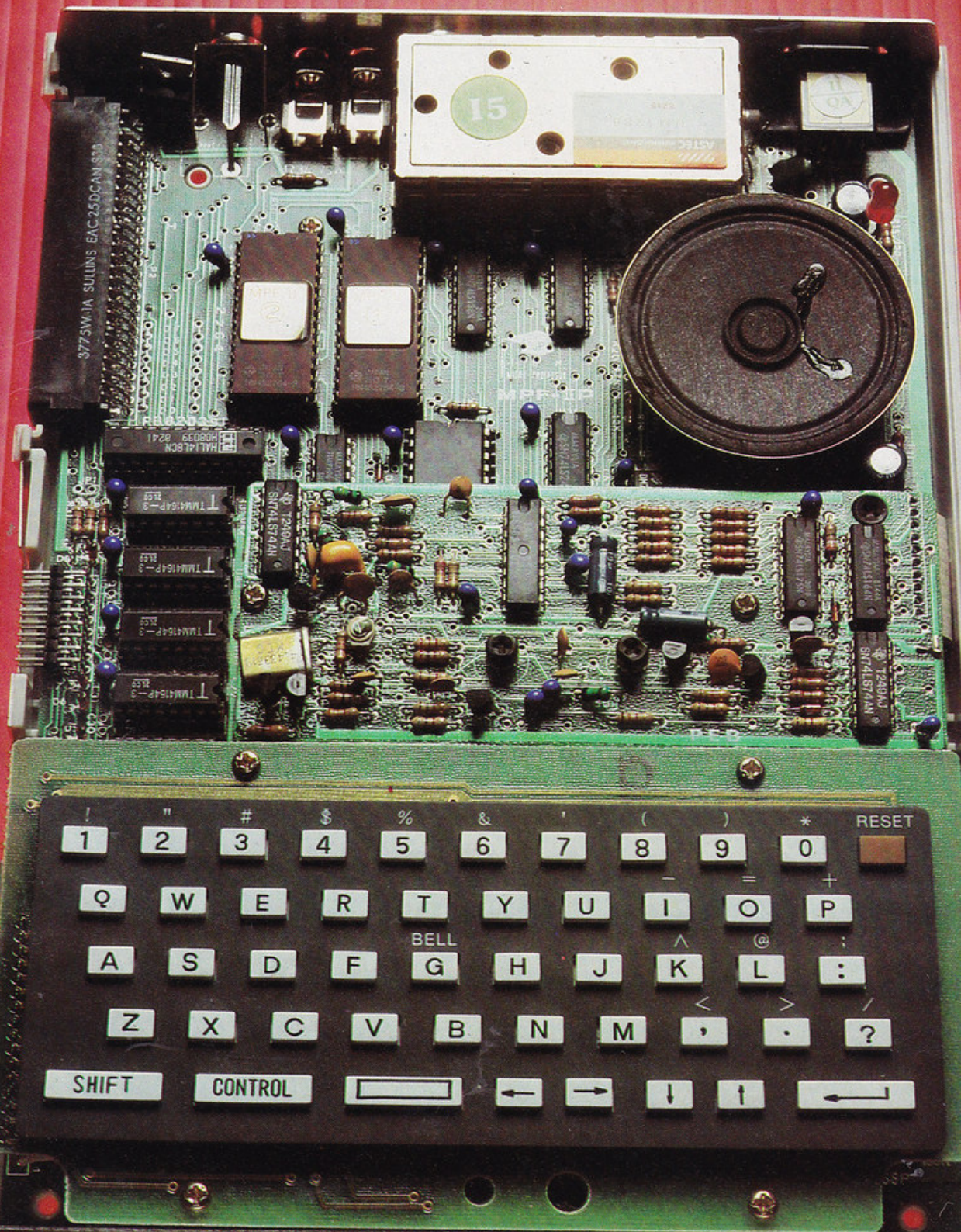
```
30 NEXT X
```

This took 20.4 seconds to display all the

numbers. The same program took 10.5 seconds on an Oric and 5.9 seconds on a Spectrum.

Editing facilities are rather limited. According to the manual, program lines may be changed once entered, but the machine tested would not allow this. The

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Peeling an MPF II reveals its neat, modern interior. At top left is the single, not-quite-Apple expansion slot with the printer and expansion keyboard sockets below it. The 6502 main processor is tucked away underneath the colour encoder board in the centre of the system. The Micro-Professor's RAM is hidden under the keyboard.

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PROGRESS REPORT



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CP/M, MP/MII and CP/Net are all trademarks of Digital Research Inc.

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Right — The useful keyboard overlay identifies the layout for single-key entry.

Below — The expansion keyboard is Sinclair Spectrum style but features a real space-bar and two shift keys.

Bottom — The external modulator and power-pack, the latter featuring a helpful on/off switch.



only alternative is to retype the whole line if an alteration has to be made. A minor drawback perhaps, but it represents either a bug in the ROM software or poor design (not to mention misleading documentation).

Programs can be monitored through the TRACE instruction, which will display the line number being executed.

The screen display is 40 characters wide and 24 lines deep. High resolution (280 × 192 pixels) and low resolution (40 × 48 pixels) displays are available, though with only four pastel colours. These are blue, green, orange and purple, plus black and white.

Storage

Programs may be SAVED on tape in two formats. One is recognised only by the Micro-Professor, the other is Apple II compatible. Multitech supplies a single tape lead which must be swapped between the microphone and earphone sockets on the recorder. Surely a double lead would have been more convenient.

The lead for the test machine had a broken connection, but when this was repaired, it was found that programs could be loaded without difficulty, but they could not be SAVED on either of the two cassette recorders on hand.

Hopefully this problem will only be encountered with a few makes of recorder.

Few details of the floppy disk drive are available. It seems, however, that the disks will not have an Apple compatible format. This is a blow to anyone hoping to run Apple software on the Micro-Professor, since much of it is sold or exchanged on disk.

Nevertheless, the existence of a disk system will be an advantage to users who require business or scientific applications.

No separate drive is needed for cartridges, which simply slot into the side of the Micro-Professor itself. When a cartridge is fitted, the program on it is LOADED automatically.

Expansion

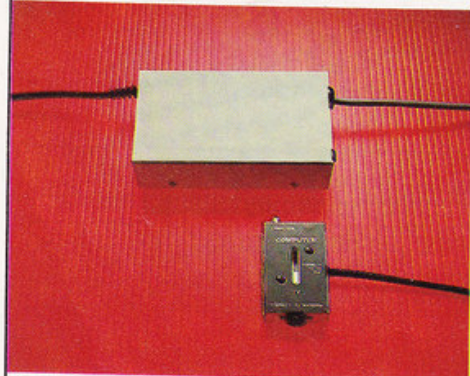
Multitech offers a surprisingly wide selection of peripherals. The Micro-Professor will handle keyboard, joystick, TV/monitor, printer, cassette tape, floppy disk and cartridge (though not all at once). This variety is one of the strengths of the machine.

The disadvantages of the built-in keyboard have already been mentioned,



SPECIFICATION

Price	£269.00
Processor	6502
RAM memory	64K
ROM memory	16K
Screen	40 × 24 text, 280 × 192 graphics (6 colours)
Keyboard	44 key calculator-type (add-on membrane-type available)
Interfaces	Parallel printer, 1 (almost) Apple bus connector
Storage	Tape, either MPF 11 format or Apple format
Software supplied	Diagnostic cassette
OS/Language	Applesoft Basic
Distributor	Sirtel 0733 236010



but the extension keyboard is very different. It is beautifully finished and easy to use with keys in soft plastic, but firmer than those on the Spectrum.

The layout is different from the smaller keyboards: there are two shift keys and a real space bar.

This unit is excellent value for money, even if it does sport a key whose only function is to carry the Multitech trade mark. The smaller keyboard can be used while the larger is connected; but the Micro-Professor is not a true multi-port machine.

Joysticks are generally reckoned to be a must for fast arcade games. They have to take plenty of punishment from youngsters defending the bottom of the screen from rampaging graphics. Sadly the joystick sold for the Micro-Professor seems likely to give up before the aliens do, and does not have the crispness of movement a junior marksman might demand.

The machine can use any printer with a Centronics interface. Multitech's own printer is of the thermal type, and can deal with text or graphics. It uses plain white paper, which is better than the smudgy silver stuff you need for the printer on the Spectrum.

Support

Dealers are being supplied with Multitech-written software for demonstration purposes, but it is not clear whether any will be sold to the public.

The Micro-Professor comes with a useful diagnostic program called Micro-Nurse on cassette which puts the hardware and software through their paces, incidentally giving an introduction to their capabilities.

I have seen three other Multitech programs — they are unimpressive. One works out the details of loans, giving the results in dollars, and does nothing your friendly neighbourhood pocket calculator could not achieve.

The other two were games, Gobbler (guess what it turned out to be) and TIE Fighter Docking. For the uninitiated, Twin Ion Fighters are spacecraft flown by the villains in *Star Wars* films. The game itself is about as interesting as waiting for a tape to LOAD.

Verdict

To summarise, as a competitor in the Spectrum/Oric market the Micro-Professor is disappointing. Its price is rather high for the programming facilities available, and less than two-thirds of the memory is usable for Basic. Though Multitech is promoting this product as an educational aid, it is unlikely to fare well against the Spectrum (which is cheaper) or the BBC Model B (which is more advanced).

On the other hand it does have some nice features. It will support a proper floppy disk system, which may prove superior to the 'microdrives' being cooked up for some other machines.

Finally it is *largely* Apple II compatible though it can only use Apple programs from tape.

When compatibility breaks down

The advertising for the MPF II says that it is 'Apple compatible'. But just how compatible is it? As long as you're running in Applesoft Basic, it's very similar indeed. But if you are using anything else, the differences are more noticeable.

In particular, the memory map is much changed . . . the area from \$400 to \$7FF is used by the monitor (probably for the single-key entry of Basic). As a result, the two screen pages are handled in a very different way. Instead of there being separate areas of memory set aside for text and graphics, the two are in the same place, so that TEXT PAGE 1 and GRAPHICS PAGE 1 are mapped onto each other. The same applies to both PAGE 2s.

Graphic improvement

There is another major difference, in that whereas PAGE 2 GRAPHICS is at \$4000 on the Apple, it is at \$A000 on the MPF II. This eliminates the annoying 'forbidden area' which appears whenever high resolution graphics are used.

This clogs up the Apple's RAM, producing a memory-map which has one small area at the bottom (from \$800 to \$3FFF), with the program starting at \$800, and a larger one from \$6000 to HIMEM, which is usually used for data. On the MPF II there is just one large area free, extending from \$4000 to HIMEM (with only one page used), and the default program-start is at \$4000.

Of course, on both machines the actual start of program can be set to any place in memory, so this is not a problem . . . more of a point to note.

However, it is far from certain that it will be possible to modify some of the more advanced high resolution utility programs or games, especially if they use PAGE 2, and I suspect that the same will apply to those programs which use TEXT PAGE 2.

There is another very noticeable difference in the low resolution colour set. Unlike the Apple, which has 16 colours counting black and white, and a completely different set for high resolution, with only eight colours (if you count WHITE 1 and BLACK 1 as not being the same as WHITE 2 and BLACK 2).

In actual operation this will make little or no difference, since we have become thoroughly used to weird colours on the Apple, especially when running Stateside software.

Memory

The machine itself has a full 64K of memory, with the area from \$D000 to \$FFFF being either RAM or ROM depending on the setting of a soft-switch. This is another difference between the Apple and the MPF, since the standard Apple has

only 48K, with the top end of this being ROM.

Of course, now that the price of RAMcards is so low, a very large number of Apples have one installed as a matter of course, providing not only a full 64K, but also an *extra* 4K which is double banked at \$D000.

The MPF with its straight-line memory does not have this, which implies that programs like the UCSD p-system will not work, since they must have this double bank, as well as the second bank of RAM at \$E000 to \$FFFF, which the MPF II *does* have.

The most important detail to consider when assessing the relative similarity between the two machines is the capacity to handle add-on peripherals. Since the MPF II has only one peripheral connector, it is obvious that there must be some major differences. At first sight the pin-assignments are very close . . . the address and data lines are in the same places, as are many of the other signals such as DMA in and out, NMI, IRQ, RES and the power-lines.

The difference comes in the fact that there are several pins which carry different signals. These pins carry signals concerned with selecting the slot on the Apple, as well as some of the 'oddities' like USER1. On the MPF II these seem to be involved with page-selection, and according to the documentation, change value depending on the area of memory being referenced.

Card problems

This will not cause any problems with some of the simpler add-on cards, especially those which use only the address, data and power lines, but if any of the more unusual signals are required, then there may be problems.

Another important question concerning the relative compatibility is — disks. Will they run or not? Well, looking at the pin-values on the disk-controller, it would appear that there would be no conflict.

However, since the process of booting the disk depends on there being a particular piece of code at \$Cn00 (usually \$C600), since the peripheral connector does not follow this scheme exactly, and since there is only one of them, I am suspicious.

The importers, Sirtel, say that this is not possible, and in fact is not really necessary since they will be producing their own disks in the near future.

Unfortunately, these will quite definitely *not* be Apple compatible.

Frankly, I didn't want to shove my own card into the slot since I value my disk controller, and I certainly couldn't afford to blow it up.

Richard King



ORIC EPICS

ORIC-1 Rescue the Rod

Name Dungeons of Intrigue **System** Oric-1 **Price** £5.50 **Publisher** ASL Software, 66 Ffordd Llywelyn, Little Acton, Wrexham, Clwyd **Format** Cassette **Language** Basic **Outlets** Mail order

The Dungeons and Dragons theme is very much in evidence in this game from ASL.

Centuries ago, says the blurb, Zorroth the mystic managed to make his getaway from the evil elves of the land of El Galador. Zorroth hid in the dungeons of his castle, hotly pursued by the elves, but after days of wandering along the corridors, the elves finally caught up with him.

Thereupon, Zorroth uttered a magical spell and vanished — and with him disappeared the mighty Rod of Power.

Objectives

You must enter the dungeons and find the Rod of Power. Along the way, you will encounter many dangers which you must avoid, but you go armed with your own abilities.

You also have a sum of money with which to buy objects such as axes and lanterns, and you may choose what character you would like to be — Dwarf, Priest, Fighter, and so forth.

In play

After choosing my character and buying my equipment, I set

off into the dungeons. So far, so good, but that was where the problems began. When the main program was run, the message: 'setting up dungeons and monsters' appeared, along with a jumble of apparently random numbers.

Then the hash appeared, meaning that I could enter a command. So I entered 'W' for walk, and the machine immediately crashed.

That didn't seem to be the program's fault, but the play-back level needs to be set carefully when LOADING.

I found that the screen layouts were really pretty poorly designed, with text sometimes overlapping, and worse still, when I encountered a new situation or character, the computer's description of what was happening would literally flash onto the screen, then the program would move on.

Battles with monsters were exciting, though. 'Watch out !!! Monsters' is the only early warning you get, then the battle for your life is on. After each move I made it would give me a blow-by-blow report.

Verdict

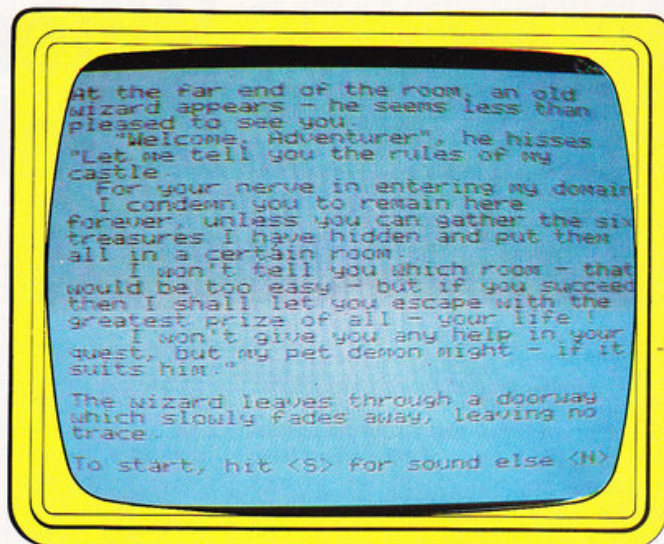
It's a real shame that the game's screen layouts are so messy.

The game has a good theme, and there are plenty of situations which should keep the player going for quite a while. But I hope that ASL will tidy up the games, since it deserves better.

David Janda

RATING

Lasting appeal
Playability
Use of machine
Overall value



ORIC-1 Fortress of fear

Name The Castle **System** Oric-1 16K or 48K **Price** £8 **Publisher** Bug-Byte, 051-227 2642 **Format** cassette **Language** Basic **Other Versions** None **Outlets** Mail order, computer shops, WH Smiths.

After much bragging about his exploits in the Gr'n Xanth wars, the young man takes up the challenge (and bet) from the local villagers, and decides to go into The Castle and hopefully return with any treasures that might be hidden there. But will he return?

Objectives

You must find, take and keep hold of six treasures that are hidden in the Castle. After all the treasures have been found, they must be put in a particular room. What room you put them in is for you to find out. Your main weapons are your wits.

In play

There were no instructions on how to play the adventure on the cassette sleeve, just some blurb about adventures in general and some tips. After loading the game, a message from a wizard appeared on the screen telling me what I had to do. From the start I decided to draw a map — the best way to tackle most adventures anyway.

The commands to the computer are of the GET, PUT, LOOK type and proved to be difficult to use on some occasions.

The screen is divided into two

parts. The top part displays your position, what you can see and where you can go (north, south etc).

The lower half of the screen is where you type in your response and also is used to give the computer's reply. At the beginning of the game you are given an option as to whether you would like the keyboard to sound or not. There are no graphics.

After wandering about the Castle I picked up a few things such as a jar, hammer, knife and so on. Going south I came across an animal, a rope and a shovel.

After examining the animal — it looks like a werewolf — I tried to tie it up, kill it, attack it, bribe it, but it was no use.

After trying to go elsewhere a few more times the message 'Out of memory...' appeared.

I tried the game another half dozen times, and found that dealing with the werewolf would crash the machine.

Verdict

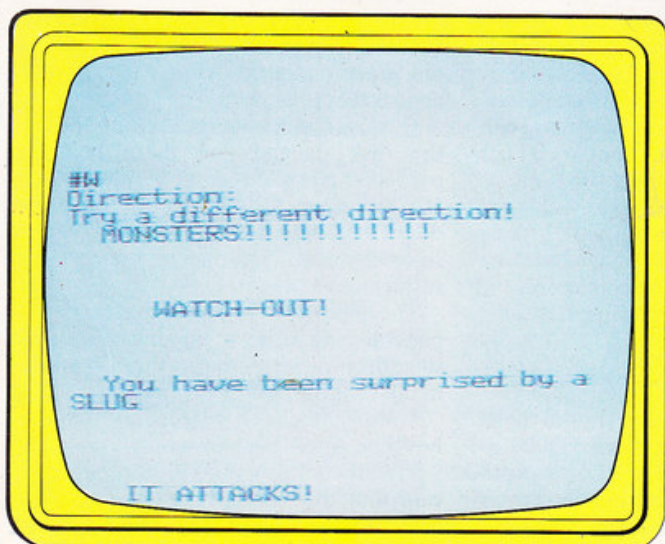
There are many places to explore in The Castle and, I am sure, many sticky situations to get out of. But if you don't know many commands you'll find it hard to do anything at all.

The game looked interesting at first but my interest soon dwindled due to the restraint of not knowing many commands. I felt that discovering how to proceed in this game was just too difficult, and the inevitable crashes put me off.

David Janda

RATING

Lasting appeal
Playability
Use of machine
Overall value



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BBC B

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Name Starship Command System
BBC Model B Price £9.95
Publisher Acornsoft, 0223 316039
Format Cassette **Outlets** Acorn dealers

There are plenty of Star Trek-type games for the BBC micro, but the latest Acornsoft offering has a few novel ideas of its own. In Starship Command you are a Starfleet captain. This is your first starship, so you need to prove yourself.

And with far more aliens to fend off than you can possibly hope to defeat, proving yourself won't be easy.

Objectives

The basic idea of the game is to stop alien spaceships taking over the final frontiers of space — not to mention going where no human hand has set foot. Or something of that kind. It's a one-player game, but you can rig the odds a bit by giving either yourself or the enemy small or large torpedoes, to be fired out of the front of the spacecraft.

The aliens have obviously decided to move in on our galaxy in a big way, because they just keep coming at you. There's no way you can stop them all, so after stopping as many as possible, you turn tail and get out fast by escape capsule.

In play

First, you must decide on the

size of the torpedoes you want to give to your ship and to the enemy. Then you're in deep space, with the aliens all around you.

You hit an alien amidstships with one of your torpedoes, with a mighty explosion, but then another alien sneaks up behind you and rams you, and you're in trouble.

Now your energy level starts to flash — there's nothing for it but to get out in the escape capsule. You hit the ejector button, and the sound of your ship's engines dies away, till with a tremendous explosion, bits of your doomed vessel are flung into space.

If you scored over 90 points, you are put back in command of your hastily rebuilt spaceship, but this time the aliens are much bigger and more powerful.

If you've managed to wipe out a suitably high number of aliens, you can put your name onto the high score table. You're given only one chance in this game, and play is fast, but you do have some control over the speed.

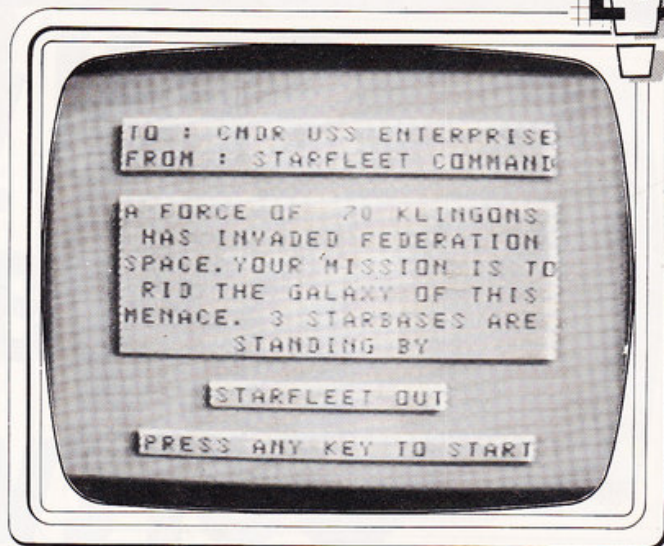
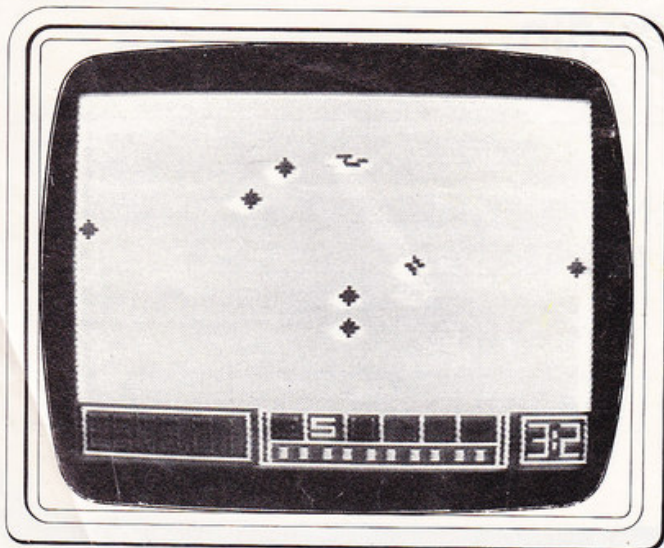
Verdict

This game will take time to learn, but I think it's well worth the effort. I have now managed to push my high score up to 1,155, but Acornsoft says scores of 3,000 have been achieved. That could take a while, but I am certainly well and truly addicted myself. I would recommend it.

Kevin Williams

RATING

Lasting appeal
Playability
Use of machine
Value for money



DRAGON Talking Spock

Name Dragon Trek system Dragon 32 (+ joystick) Price £9.95
Publisher Salamander Software (0273 771942) **Format** Cassette
Language Basic **Other versions** Tandy shortly **Outlets** Mail order, Spectrum shops and other dealers

Star Trek is now an established computer favourite, and as this seems to be the first version for the Dragon, and a good one at that, it should be a required purchase. If you don't know the game it's hard to describe, but it's like Space Invaders meets Battleships under the eye (or possibly the ear) of Mr Spock.

Objectives

You are in charge of the Starship Enterprise, and as if keeping the ship in full working order wasn't tricky enough, you're also meant to be ridding the Galaxy of Klingons in the shortest possible time.

As well as joystick control for the ship, there are numerous keyboard entries, principally the one which gives you a view of the whole Galaxy, which can measure 6x6, 8x8, or 10x10 according to the difficulty level.

First impressions

The game comes with a 16-page flight manual, which tells you everything you need to know. The mass of information seems daunting at first, but plunging in and playing is a good way to learn.

In play

The first thing to remember is

that this is a real-time game, so if Mr Spock wants to visit the toilet he'd better do it before he starts battling for the survival of the Galaxy, otherwise he might find there's no ship to come back to. That little problem dealt with, and having allocated some of your energy units to form a safety shield around the ship, you can then move conventionally or time-warp to any of the squares in the Galaxy and deal with the Klingons.

Three types of phasers can be fired at them, if your energy level is high enough, or alternatively you can zap them with very slow torpedoes, though zap is hardly the right word. The torpedoes are launched and directed by joystick.

The graphics are extremely good, especially if you try to wander out beyond the known limits of the Galaxy (not a wise move). But there isn't much in the way of sound effects, apart from a few pings and beeps. Mind you, with only about 1½K of memory left when LOADED, there's not a lot of room for incorporating an inter-galactic hit parade, so it's certainly testing the Dragon to the full.

Verdict

Dragon Trek may seem expensive, but if you want a game that's going to last beyond the first few plays it's worth it. Even the easy levels are hard, and one look at the hard levels, with 81 Klingons wandering the Galaxy, is enough to make anyone say 'Beam me up, Scotty.'

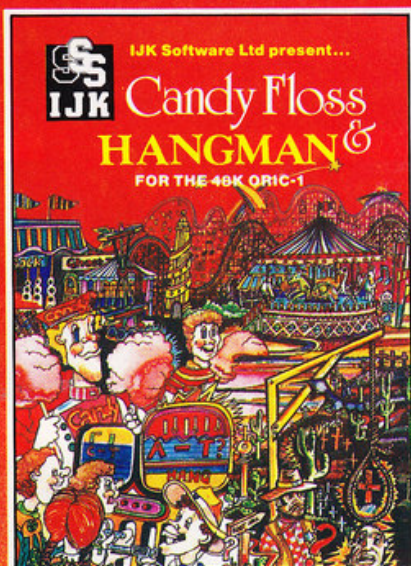
Mike Gerrard

RATING

Lasting appeal
Playability
Use of machine
Overall value



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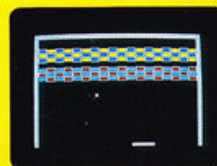


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PUZZLES

SPECTRUM

Planned to perplex

Name Nowotnik Puzzle System 16K
Spectrum Price £4.95 **Publisher** Phipps Associates, 78 21215
Format Cassette **Language** Machine code **Outlets** Mail order

To compare the Nowotnik Puzzle with the Rubik Cube wouldn't be far off. It's a battle of wits and anyone can play it. Whether you solve or not is a matter of stamina.

Objectives

You have a choice of two puzzles; each has four levels of difficulty and the start position is also the completed form of the puzzle — four large coloured squares.

To solve puzzle one you have to move one half of the puzzle at a time horizontally or vertically. The keys one to eight move the halves, and the numbers and arrows on the screen indicate directions.

In puzzle two, the screen is divided into vertical and horizontal strips. Again the finished puzzle is four brightly coloured squares. When you play this puzzle the strips rotate about the centre and the squares on the trips rotate to their opposite positions.

When solving this puzzle you select C for column or R for row, then press an identifying letter to move it into the position you want.

The aim of the game is solving

the puzzle in the minimum number of moves.

In Play

I opted for puzzle one, at level one. On the screen appeared four large brightly coloured squares. Then the fun began. On went the music and the squares danced merrily on the screen into a jumbled form.

To remind you what you're aiming for, the right-hand corner of the screen shows a picture of the finished puzzle, and in the left hand corner a counter keeps tabs on the number of moves.

The puzzle certainly baffled me — I had clocked up 300 moves and was still no nearer to solving it.

Admitting defeat, I confronted puzzle two.

It took me a while to get the hang of this one. I had to carefully work out where I wanted the vertical and horizontal strips to go, by identifying the column or row on the screen I wanted moved.

Sometimes a column would disappear from its position on a musical note and reappear in an unexpected position.

Verdict

This game is well suited to the Spectrum and makes good use of graphics and sound. The musical theme each time you move a piece adds a touch of originality to the art of puzzle solving.

Sandra Grandison

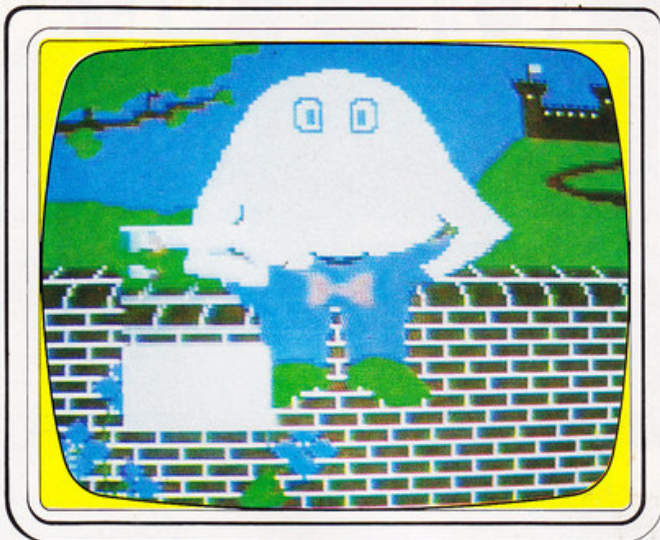
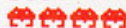
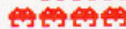
RATING

Lasting appeal

Playability

Use of the machine

Overall value



ATARI

Joystick jigsaw

Name Humpty Dumpty and Jack and Jill System Atari 400/800 **Price** £14.95 approx. **Publisher** Thorn EMI Video, 01-836 2444 **Format** Cassette **Outlets** Laskys, Micro C, retailers.

Remember those old plastic puzzles with 15 lettered or numbered squares you could slide around a frame to make words or patterns? That's the inspiration for this jigsaw program from Thorn EMI.

Objectives

You get a picture of Humpty Dumpty — or Jack and Jill, on the other side of the tape — and you decide how many pieces it is to be sliced up into; anything from 9 to 36. You also decide how thoroughly the pieces should be shuffled.

Then, before your very eyes, the computer removes one piece, and slides the other pieces around the screen to shuffle them, playing the appropriate nursery rhyme as it goes. You then use the joystick to put a large square cursor onto any square of your choice that is adjacent to the empty space, and the computer slides that square into the space.

And so you carry on, until you either manage to reconstruct the original picture, or flee gibbering into the middle distance.

In play

After each program is loaded, you get a glance — but only the very briefest glance — at the

finished picture, before an enormous Thorn EMI title screen descends and covers half of it up. You aren't warned to take a good look at the picture.

Then you pick your skill level and the puzzle size using the SELECT or OPTION keys, not the joystick, and it's very easy to flick past the level you want.

There's a vast difference between the difficulty of level four and that of level five — I found five impossible, while four was a 30-second job.

Level three is strictly for the pre-scholars, because it only moves about two or three squares. As for Level 6... no matter how towering your intellect, I defy you to crack a size 6, level 6 puzzle in less than an afternoon.

Still, the graphics are a giggle, though there is something very odd about this Dumpty. 'Jack and Jill' shows you a rather chimpanzee-like Jack, head clutched in hands, and a dismal-looking Jill sprawled halfway down the Hill.

You get a reward — of sorts — if you finish the game. In 'Humpty', all you get is another wink from the hero, but in 'Jack and Jill', you get a quick look at Jack tucked up in bed.

Verdict

There's something in this game for everybody, youngest included, but I suspect the appeal for any one person will be limited.

All in all, a good idea, well executed, but please, Thorn EMI, give us a copy of the picture to look at as we play.

Shirley Fawcett

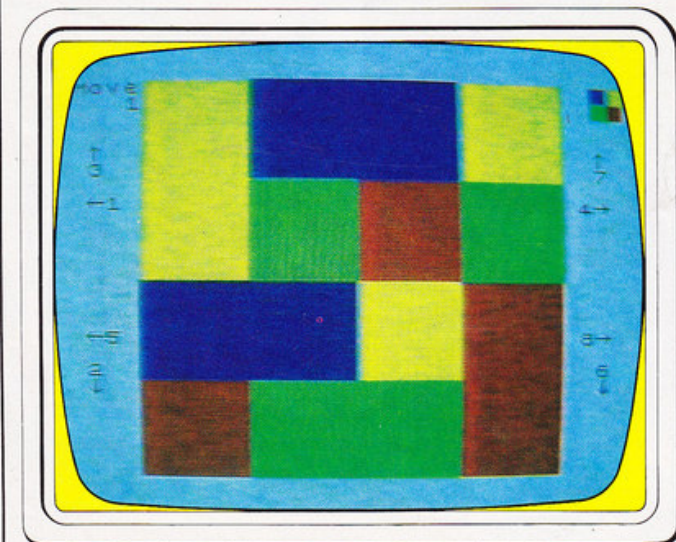
RATING

Lasting appeal

Playability

Use of machine

Value for money



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SPECTRUM — 16K

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Dept. PCN 1

PCN ProgramCards

Another delve into our large stock of *your* programs this week giving 11 PCN ProgramCards for you to cut out and keep. The programs are designed to cover both large and small machines, common and not so common, games and applications plus utilities.

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

This week

Dragon owners will be pleased to see our first program this week as it presents a technique which is currently unavailable on the standard machine. It offers lower case characters and the capability to mix text and graphics in high-resolution graphics modes.

Submitted by Barry Hazel, of Bicester,

Oxfordshire, the program is a demonstration of the method to define characters in high-resolution graphics vectors and display them in a simple way.

The serialised Commodore database program from Ray and Alison Schofield, of Cheltenham, continues with two more ProgramCards and eventually builds up into an easy-to-use facility. No doubt many of you will be able to adapt this program for use on other machines using different hardware: disks, perhaps?

How many of you remember the spoof 'The Selsdon Man'? Well, we hope that Rowan Vacher is not he, as he has sent to us '... my first attempt at games programming ...' for the Sinclair Spectrum.

This game, *Monsters*, contains all the right ingredients — good use of the computer, good graphics design and the appropriate amount of randomness to keep the player happy. As the program is designed to run on the 16K version this should appeal to many of you.

Last week's subroutines and example program demonstrated facilities for array handling. This week the subroutine is a facility to search a sorted array for selected strings of data using 'wildcard' inclusion in the selection criteria. The example program demonstrates this and also uses the subroutines from last week.

Reward offered

If you want to see your own programs in print send them to the Programs Editor at the address below and we will endeavour to get them onto cards as quickly as possible.

It would be a great help if they were on disk or cassette with a listing and a note of requirements etc. As if fame were not enough we will even send you real money (a cheque actually) on publication, at our standard rates.

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

PCN ProgramCards

Lower Case

Card 1 of 3

8309LC1/3

A program demonstrating the facilities of lower case character generation in high resolution graphics mode.

```
10 *****LOWER CASE LETTERS*****FOR USE IN HIGH*****RESOLUTION
MODES*****
13 *****COMPLETE CHARACTER SET GIVEN INCLUDING NUMBERS AND SYMBOLS THOUGH ANY NOT
REQUIRED MAY BE OMITTED AT WILL*****
14 *****
30 DIM LC$(95)

32 LC$(32)=""BR5"
33 LC$(33)=""BR1U1BU2U3BD6BR2"
34 LC$(34)=""BU4BR1D1BR1U1BD4BR2"
35 LC$(35)=""BR1U6BR1D6BR1BU2L3BU2R3BD4BR2"
36 LC$(36)=""BU1F1R1E1H1L1H1E1R1F1BU1G1BL1BD2G1BR5"
37 LC$(37)=""E4BL4D1R1U1L1BF4U1L1D1R1BR2"
38 LC$(38)=""BR4H3U1R1D1G2F1R1E2BF2"
39 LC$(39)=""BU6BR1D1BD5BR2"
40 LC$(40)=""BR2H2U2E2BD6BR2"
41 LC$(41)=""BR1E2U2H2BD6BR4"
42 LC$(42)=""E2NL2NH2NU2NE2NR2NF2D2BR4"
43 LC$(43)=""BR2U4BG2R4BF2"
44 LC$(44)=""E1L1BD1BR3"
45 LC$(45)=""BE2R3BF2"
46 LC$(46)=""BE1R1BF1"
47 LC$(47)=""E4BD4BR2"
48 LC$(48)=""U6R3D6L3BR5"
49 LC$(49)=""BR2NU6BR2"
50 LC$(50)=""BU6R3D3L3D3R3BR2"
51 LC$(51)=""R3U3NL3U3L3BD6BR5"
52 LC$(52)=""BU6D3R3BH1D4BR3"
53 LC$(53)=""R3U3L3U3R3BD6BR2"
54 LC$(54)=""U3R3D3L3U6R3BD6BR2"
55 LC$(55)=""BU6R3D6BR2"
56 LC$(56)=""R3U3L3U3R3D3L3D3BR5"
```

Dragon 32 Dragon Basic

Application: General interest/Utility
Author: Barry Hazel

30 DIMensioned array for the full character set
32-56 First section of high resolution vectors for each character within the set. If any characters are not required then just omit them. However, the remaining characters must be defined at the correct ASCII value. For example: Upper case "A" is ASCII value 65 thus the vector string must be defined as LC\$(65) = ... etc

ZX81**16K****SPECTRUM****16/48****DRAGON****32****TANDY****LEVEL 2****BBC****A/B****AWARI**

- ★ The ancient African game of logic. It takes 2 minutes to learn the rules but far longer to master the tactics.
- ★ Select the 'Goat-herd' level of play and it's an addictive game for children (8+) that exercises their minds – not their laser fingers.
- ★ Select the 'Witch-doctor' level and it's a threat to your sanity. We haven't beaten it and we wrote it!

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- ★ Over 200 places to explore in this machine code game using advanced data compression techniques.
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NAME

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PCN 1

Lower Case

Card 2 of 3

8309LC2/3

```

57 LC$(57)="R3U6L3D3R3D3BR2"
58 LC$(58)="BE1R1BU2L1BF3"
59 LC$(59)="BR1E1L1BU2R1BD3BR2"
60 LC$(60)="BR2H2E2BD4BR2"
61 LC$(61)="BU1R2BU2L2BD3BR4"
62 LC$(62)="E2H2BF4"
63 LC$(63)="BU5U1R3D3L2D2BD1D1BR4"
64 LC$(64)="BR2L1H1U2E1R2F1D3H1U2L1G1F1R1BD1BR3"
65 LC$(65)="BU4R3D4L3U2R3BF2"
66 LC$(66)="NU8R3U4L3BD4BR5"
67 LC$(67)="U4NR3D4R3BR2"
68 LC$(68)="R3UBD4L3D4BR5"
69 LC$(69)="U2R3U2L3D4R3BR2"
70 LC$(70)="BR1UBNR2D4L1R2BD4BR2"
71 LC$(71)="BD4R3UBL3D4R3BR2"
72 LC$(72)="UBD4R3D4BR2"
73 LC$(73)="U4BU2U1BD7BR2"
74 LC$(74)="BD4R3UBD4BR2"
75 LC$(75)="UBD6R1NE2F2BR2"
76 LC$(76)="UBD8BR2"
77 LC$(77)="U4R2ND4R2D4BR2"
78 LC$(78)="U4R3D4BR2"
79 LC$(79)="U4R3D4L3BR5"
80 LC$(80)="R3U4L3D8U4BR5"
81 LC$(81)="BF4UBL3D4R3BR2"
82 LC$(82)="U4R3D1BD3BR2"
83 LC$(83)="R3U2L3U2R3BD4BR2"
84 LC$(84)="BR1U4R1L2R1U2D6R2BR2"
85 LC$(85)="NU4R3NU4BR2"
86 LC$(86)="BU4D2F2E2NU2BF2"
87 LC$(87)="NU4R2NU4R2NU4BR2"
88 LC$(88)="E4BL4F4BR2"
89 LC$(89)="NU4R3U4D8L3R3U4BR2"
90 LC$(90)="BU4R3G3D1R3BR2"
91 LC$(91)="BR2L2U6R2BD6BR2"
92 LC$(92)="BU4F4BR2"
93 LC$(93)="R2U6L2BD6BR4"
94 LC$(94)="BR2U6NG2F2BD4BR2"
95 LC$(95)="BU3NE2NF2R4BD3BR2"

```

57-95

Second and final section of character vector definitions. This full list of definitions cover the standard character set for ASCII values 32-95

Lower Case

Card 3 of 3

8309LC3/3

```

199 *****EXAMPLES OF TEXT*****
200 PMODE4:SCREEN1,1:PCLS

```

```

210 ME$="LOWER CASE TEXT IN PMODE 4"

```

```

220 SC$="BM10,15"

```

```

230 SI$="S6"

```

```

240 CO$="C5"

```

```

250 GOSUB1000

```

```

260 ME$="ABCDEFGH IJKLMN O PQRSTU VWXYZ1234567890!@%&'()*<>?"

```

```

270 SC$="BM10,35":SI$="S4":GOSUB1000

```

```

280 ME$="1234567890ABCDEFGHIJKLMN O PQRSTU VWXYZ"

```

```

290 SC$="BM5,55":SI$="S6":GOSUB1000

```

```

300 ME$="!" + CHR$(34) + "E%&'()*+,-./;<=>?@[" + CHR$(92) + "]" + CHR$(95)

```

```

310 SC$="BM2,75":SI$="S8":GOSUB1000

```

```

320 ME$="ABKG435789!@%>@^"

```

```

330 SC$="BM2,105":SI$="S12":GOSUB1000

```

```

340 ME$="HSPEOR*&E"

```

```

350 SC$="BM10,150":SI$="S20":GOSUB1000

```

```

360 ME$="PRESS KEY TO CONTINUE"

```

```

370 SC$="BM50,180":SI$="S6":GOSUB2000

```

```

380 GOTO200

```

```

998 GOTO998

```

```

999 *****DISPLAY MESSAGE*****

```

```

1000 DRAW SC$+SI$+CO$

```

```

1010 FOR I=1 TO LEN(ME$)

```

```

1020 DRAW LC$(ASC(MID$(ME$,I,1)))

```

```

1030 NEXT

```

```

1040 RETURN

```

```

1999 *****FLASH MESSAGE*****

```

```

2000 FL=1

```

```

2010 CO$="C5":FL=-FL

```

```

2020 IF FL > 0 THEN CO$="C0"

```

```

2030 GOSUB1000

```

```

2040 IF INKEY$="" THEN 2010

```

```

2050 RETURN

```

200 Set graphic display mode and clear screen

210 ME\$ is data string passed to the display routine

220 SC\$ is the screen co-ordinates value passed to the display routine

230 SI\$ is the setting of the scaling factor to be used by the display routine

240 CO\$ is the selected colour setting passed to the display routine

250 Perform display routine

260-270 Display of example character set at scale 4

280-290 Display of example character set at scale 6

300-310 Display of example special characters including some not available from the keyboard at scale 8

320-330 Scale 12 display

340-350 Scale 20 display

360-370 Display flashing prompt

380 Repeat whole display forever

1000 Routine to display character string according to vectors stored in LC\$(32-95). Set co-ordinates, scale and colour

1010 Loop for extraction of characters from string ME\$

1020 Draw individual character using vectors as defined

1030 Repeat until string exhausted

1040 Return to main line

2000 Routine to "flash" prompt. Set flag to one

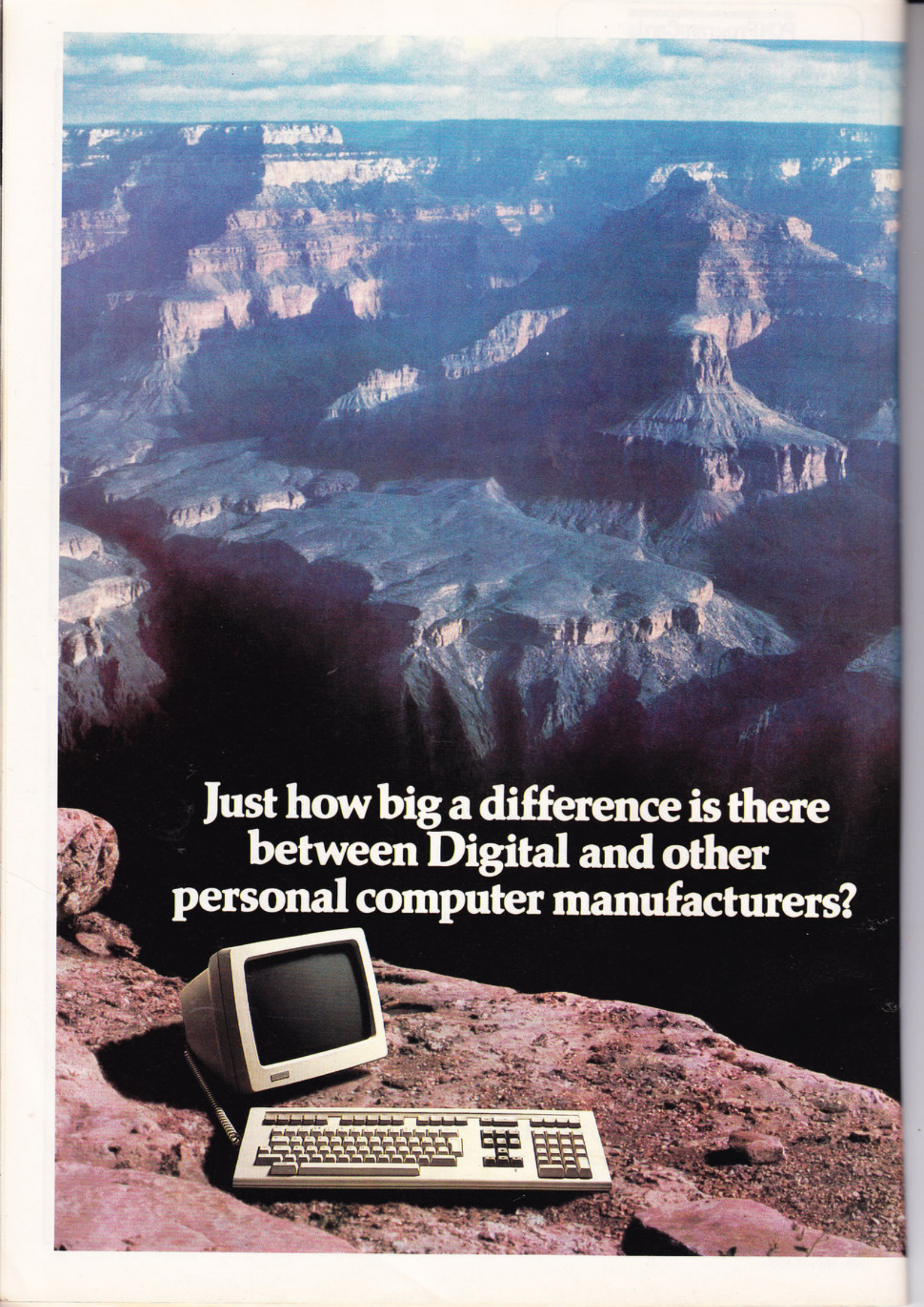
2010 Set foreground colour. Invert flag setting

2020 Alternately change foreground colour to background

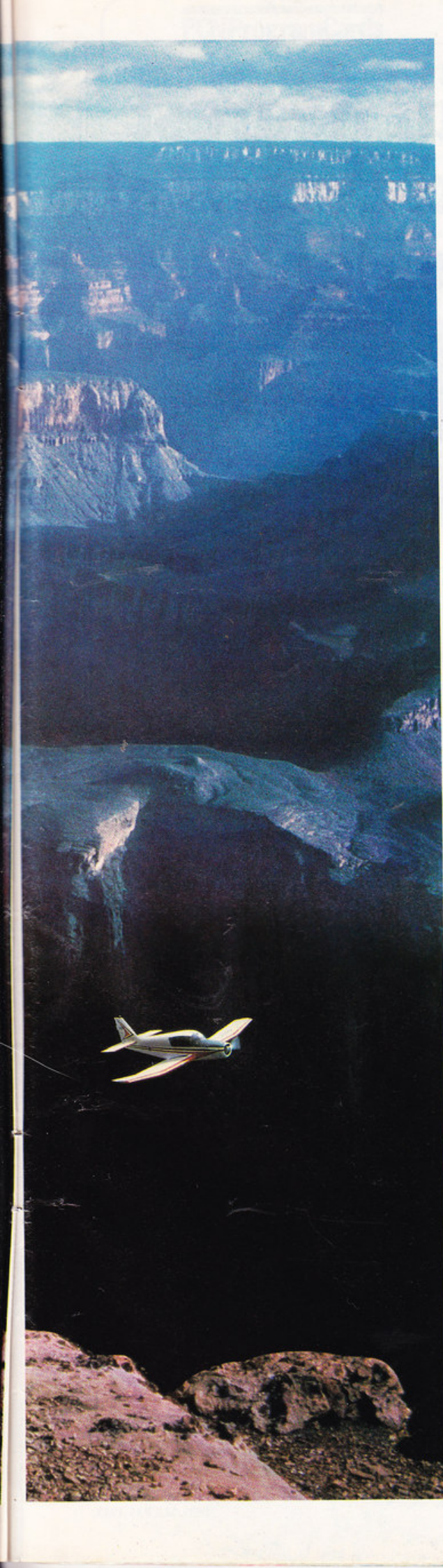
2030 Perform display routine

2040 If no key pressed then repeat flash routine

2050 Return to main line

A vintage personal computer setup, including a CRT monitor and a keyboard, is placed on a rocky ledge. The background is a vast, deep canyon with layered rock formations, likely the Grand Canyon, under a blue sky with some clouds. The computer is positioned in the lower-left foreground, and the text is centered in the middle of the image.

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Micro Business Systems PLC, Cannon Street,
London EC4. Tel: 01-621 1122.

Personal Computers Ltd., 220-226 Bishopsgate,
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Rank Xerox (UK) Ltd., The Xerox Store,
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The Xerox Store, 76-77 Holborn,
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Software Sciences, Thorn (EMI) House,
14 Old Park Lane, London W1. Tel: 01-499 7099.

Software Sciences, 88 Old Street,
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(Motor Dealers & Manufacturers)*

Key Computer Centres, Enterprise House,
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Micro Business Systems PLC,
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Microfacilities Ltd., 7-9 Church Road,
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(Sperrings Computer Shops Ltd.),
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Southampton. Tel: 0703 39571.

Software Sciences, Abbey House,
282-292 Farnborough Road, Farnborough,
Hants. Tel: 0252 544321.

South East Computers Ltd.,
Unit 2, Castleham Road,
Castleham Road Industrial Estate,
Hastings, Sussex. Tel: 0424 426844.

South East Computers Ltd., 29 High Street,
Maidstone, Kent. Tel: 0622 681263

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Computacenter, Theatre Square, Swindon,
Wiltshire SN1 1GN. Tel: 0793 612341/2.

Rank Xerox (UK) Ltd., The Xerox Store,
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Bristol BS99 7AX. Tel: 0272 277828.

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Nailsea, Nr. Bristol. Tel: 0272 851462/3.

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MMS Ltd., Ketwell House,
75-79 Tavistock Street, Bedford MK40 2RR.
Tel: 0234 40601.

Zygal Dynamics PLC, Zygal House,
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Cardiff CF1 1EW. Tel: 0222 40118.

Sigma Systems Ltd., 266 North Road,
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SCOTLAND

Micro-Centre (Complete Microsystems) Ltd.,
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Tel: 031-556 7354.

Micro Business Systems PLC,
Turnhouse Airport, Edinburgh.
Tel: 031-333 1000.

Pilgrim Business Machines Ltd.,
28 Walker Street, Edinburgh.
Tel: 031-226 5528.
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Pilgrim Business Machines Ltd.,
Northfield Place, Aberdeen. Tel: 0224 645104.

Rank Xerox (UK) Ltd., The Xerox Store,
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Tel: 041-333 0495.

NORTHERN IRELAND

Systems Plus Ltd., 19 Glengormley Park,
Newtownabbey, Northern Ireland.
Tel: 023-134 2117.

DIGITAL UK HEADQUARTERS

Digital Equipment Co. Limited, P.O. Box 110,
Reading RG2 0TR. Tel: 0734 868711.

*Vertical market application speciality.

digital

CBM Database Card 5 of 12

Continued from last week

8309CD5/12

```

4300 PRINT:PRINT "U=7.3"
4301 RESTORE
4302 PRINT "INPUT DATE REQUIRED TO FIND AS A RANGE OR A SINGLE DATE"
4303 PRINT " AS SAY 830101.830331 FOR A RANGE"
4304 PRINT " AS SAY 830112.830112 FOR NO RANGE THAT IS FOR A FIXED DATE"
4305 INPUT T(1),T(2)
4306 PRINT "DO YOU WANT OUTPUT TO PRINTER Y/N ":INPUT PT$
4307 IF PT$="" THEN GOTO 4320
4308 IF PT$="Y" THEN GOTO 8700:PRINT "OUTPUT TO PRINTER"
4309 FOR I= 1 TO N
4310 READ A$,B,C,D
4311 IF A$="" THEN PRINT "END OF DATA"
4312 IF A$="" GOTO 4090
4313 IF (C)=T(1) AND (D)=T(2) THEN PRINT C,A$,TAB(30)B,D
4314 NEXT I
4315 IF A$="" THEN PRINT "END OF DATA"
4316 PRINT:PRINT:RETURN

4395 PRINT:PRINT:RETURN
4400 PRINT:PRINT "U=7.4"
4401 RESTORE
4402 PRINT "INPUT CHEQUES REQUIRED TO FIND AS A RANGE OR A SINGLE ITEM"
4403 PRINT " AS SAY 255090.255110 FOR A RANGE"
4404 PRINT " AS SAY 255100.255100 FOR NO RANGE THAT IS FOR A FIXED ITEM"
4405 INPUT H(1),H(2)
4406 PRINT "DO YOU WANT OUTPUT TO PRINTER Y/N ":INPUT PU$
4407 IF PU$="" THEN GOTO 4420
4408 IF PU$="Y" THEN GOTO 8800:PRINT "OUTPUT TO PRINTER"
4409 FOR I= 1 TO N
4410 READ A$,B,C,D
4411 IF A$="" THEN PRINT "END OF DATA"
4412 IF A$="" GOTO 4090
4413 LET E=INT(D)
4414 IF (D)=H(1) AND (D)=H(2) THEN PRINT D,A$,TAB(30)B,C
4415 NEXT I
4416 IF A$="" THEN PRINT "END OF DATA"
4417 PRINT:PRINT:RETURN
4495 PRINT:PRINT:RETURN
4599 PRINT:PRINT:RETURN

```

4300 Line feed, prompt
4304 Set read printout to 1
4305-4307 Prompts

4310 Responses
4320-4326 Printer prompt and response. If yes do printer function

4330-4370 Loop to display single or range record(s)

4390 Double line feed, return to main line
4395 Ditto!
4400 Line feed, prompt
4404 Set read pointer to 1
4405-4407 Prompts

4410 Responses
4420-4426 Printer prompt and response. If yes do printer function

4430-4470 Loop to display single or range record(s)

4490-4599 Each line is double line feed and return to main line

CBM Database Card 6 of 12

Continued next week

8309CD6/12

```

5000 RESTORE:PRINT:PRINT "X=8 - SORT ROUTINE"
5010 A=0
5012 FOR I=1 TO N
5013 READ A$,B,C,D
5014 A=A+1
5015 IF A$="" THEN PRINT "A=":(A-1):PRINT
5016 IF A$="" THEN GOTO 5019
5017 NEXT I
5018 PRINT "VALUE OF P TO INPUT IS ":(A-1):PRINT:PRINT
5019 PRINT "IF SORTING SUBJECT INPUT 1"
5020 PRINT "IF SORTING SUM INPUT 2"
5021 PRINT "IF SORTING DATE INPUT 3"
5022 PRINT "IF SORTING CHEQUE INPUT 4"
5023 PRINT "INPUT 1 OR 2 OR 3 OR 4"
5024 INPUT P
5025 ON P GOTO 5200,5400,5600,5800

5200 PRINT:PRINT "X=8.1 - SORT ROUTINE"

5202 PRINT "VALUE OF P TO INPUT IS ":(A-1):PRINT - INPUT P"
5203 INPUT P
5204 RESTORE
5205 FOR I=1 TO (P)
5206 READ A$(I),B(I),C(I),D(I)
5207 NEXT I
5208 PRINT "DO YOU WANT A SECOND SORT ON SUM? Y OR N ":INPUT V$
5209 IF V$="Y" THEN PRINT "SECOND SORT WILL BE BY SUM"
5210 IF V$="N" THEN PRINT "SECOND SORT WILL BE BY DATE"
5211 FOR I=1 TO (P-1)
5212 FOR J=1 TO (P-I)
5213 IF A$(I) < A$(I+J) THEN GO TO 5220
5214 IF A$(I) > A$(I+J) THEN GO TO 5270
5215 IF V$="Y" THEN GO TO 5000
5216 IF V$="N" THEN GO TO 5000
5217 LET L=A$(I):M=B(I):N=C(I):O=D(I)
5218 LET A$(I) = A$(I+J):B(I)=B(I+J):C(I)=C(I+J):D(I)=D(I+J)
5219 LET A$(I+J)=L:B(I+J)=M:C(I+J)=N:D(I+J)=O
5220 NEXT J:PRINT I,J:PRINT "INCREMENT 1"
5221 NEXT I:PRINT I,J:PRINT "INCREMENT ENDED"
5222 PRINT "DO YOU WANT OUTPUT TO PRINTER Y/N ":INPUT Q1$
5223 IF Q1$="" THEN GOTO 5354
5224 IF Q1$="Y" THEN GOTO 7000:PRINT "OUTPUT TO PRINTER"
5225 FOR I=1 TO P
5226 PRINT A$(I),TAB(20)B(I),C(I),D(I)
5227 NEXT I
5228 RETURN

```

5000 Set read pointer to 1, prompt
5010-5019 Loop to count and display number of records in file

5020-5070 Prompts and response

5080 Selection of appropriate routine according to input
5200 Routine for sorting by subject.
5202-5205 Line feed, prompt
5210 Prompt and response
5215-5230 Store records

5231-5233 Secondary field sort prompt, response and display

5240-5350 Bubble sort loop including second field adjustment

5352-5356 Prompt and response for printer output. If yes do printer function

5360-5390 Display sorted file, return to main line

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Monsters Card 1 of 4

8309M1/4

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```
10 LET a=PEEK 23675+256*PEEK 23676

20 FOR b=a TO a+111
30 READ c: POKE b,c: NEXT b

40 DATA 240,23,31,63,99,107,127,60,15,232,248,252,198,214,254,60
41 DATA 27,12,24,48,96,192,192,192,192,216,48,24,12,6,3,3,3
42 DATA 0,0,0,112,192,192,127,127,0,0,0,14,3,3,254,254
43 DATA 225,229,127,127,112,63,12,60,135,151,254,254,14,252,48,60
44 DATA 127,225,237,97,127,15,25,16,254,135,183,134,254,240,144,156
45 DATA 28,4,5,61,33,33,115,82,196,68,204,8,8,8,156,148
46 DATA 153,90,60,24,24,36,36,66,231,231,66,66,66,66,66
53 GO SUB 5000

54 LET a$="ab": LET b$="cd": LET t=1: LET sp=3: LET j=0: LET score=0
55 INK 7: BORDER 0: PAPER 0: CLS
60 LET z=2
70 FOR a=3 TO 27 STEP 6
80 PRINT AT 0,a: INK z:AT 1,a:b$
90 LET z=z+1: NEXT a
100 FOR c=2 TO 26 STEP 6
110 PRINT AT 6,c: BRIGHT 1: INK 6: "+++": NEXT c
120 PAUSE 200: LET b=3: LET x=3: LET i=2: LET s=1: LET tot=1
129 IF b>27 THEN GO TO 4000
130 PRINT AT 0,b: " :AT 1,b: "
137 LET f=20: LET g=14
139 PRINT AT 3,0: " :AT 4,0: "
140 PRINT AT 3,x: INK 1:AT 4,x:b$
150 LET x=x+INT (RND*sp)+j: BEEP .006,1
155 IF x<0 THEN LET x=0
165 IF x>30 THEN LET x=0: LET s=s+1: LET tot=tot+1
167 IF tot=15 THEN GO TO 4000
```

Sinclair Spectrum Spectrum Basic

Requirements: 16K
Application: Game
Author: Rowan Vacher

10 Extract absolute address for ASCII table for lower case alphabet
20-30 Loop to load "a" — "n" with user defined graphics
40-46 Data statements for user defined graphics. Each requires four characters

53 Introduction and instruction routine
54 Initialise values for first wave of monsters
55 Clear screen
60 Set colour of first monster to 2
70-90 Loop to display 5 different coloured monsters
100-110 Set barriers in position
110 "+++" = 3 inverse Graphic 8 characters
120 Wait. Set wave initial values
129 Check for end of wave
130-139 Remove monster from display and set up start position
140 Draw monster in new position
150 Calculate new position of monster
155 Not off screen!
165 Monster completes traverse of screen. Update counts of monsters used
167 All monsters used—end of game

Monsters Card 2 of 4

8309M2/4

```
210 LET i=INT (RND*10)

220 IF i=3 THEN PLOT x=8,130: DRAW OVER 1:0,-129: BEEP .005,25
230 IF i=3 THEN PLOT OVER 11x=8,130: DRAW OVER 1: INK 6:0,-129: BEEP .005,25
240 IF i=3 AND x=g THEN GO TO 9000

300 PRINT AT 4,g: INK 5: "n"
310 PRINT AT 21,g: BRIGHT 1: INK 4: "a"
316 IF x=7 OR x=13 OR x=19 OR x=25 THEN GO SUB 6000

320 IF INKEY$="0" THEN GO SUB 700
325 IF INKEY$="f" THEN GO SUB 1000
330 IF INKEY$="i" THEN GO SUB 800
342 IF s=3 THEN LET s=0: LET b=b+6: LET i=i+1: PRINT AT 4,g: " :AT 21,g: " : G
O TO 128
350 GO TO 139

710 PRINT AT 4,g: "
720 PRINT AT 21,g: "
730 IF g<30 THEN LET g=g+1
731 PRINT AT 4,g: INK 5: "n":AT 21,g: BRIGHT 1: INK 4: "a"
740 RETURN
810 PRINT AT 4,g: "
820 PRINT AT 21,g: "
830 IF g>3 THEN LET g=g-1
831 PRINT AT 4,g: INK 5: "n":AT 21,g: BRIGHT 1: INK 4: "a"
840 RETURN
1000 PRINT AT 3,0: " :AT 4,0: "

1010 PRINT AT 4,g: "
1011 PRINT AT 3,x: INK 1:AT 4,x:b$
1015 BEEP .01,-1
1020 LET f=f+1
1030 PRINT AT 4,g: INK 5: "n"
1031 IF (x=g OR x+1=g) AND f=3 THEN GO SUB 2000
1035 IF f=7 THEN GO SUB 3000
1036 IF f=0 THEN PRINT AT 4,g: " :AT 21,g: " : LET score=score-10: LET f=20: GO
TO 342
1040 GO TO 1010
```

210 Calculate laser variable
220-230 Zap! Splat! Pow! Laser fired
240 Aargh! Hit by laser—execute death routine
300-310 Draw player's figure
316 Select bomb dropping routine if monster in correct position
320-330 Perform appropriate routine for left, right or fire/shield
342 Got 'im! Pick out new monster to play
350 Round again
710-740 Routine to move player right

810-840 Routine to move player left

1000-1040 Routine to either fire missile or raise bomb shield depending upon proximity of bomb. Update scores.

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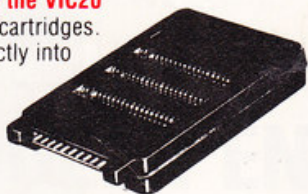
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Monsters Card 3 of 4

8309M3/4

```

2000 LET a=3: PRINT AT 3,1: INK 1:"EE":AT 4,1:"*": FOR a=10 TO -3 STEP -1: BEEP
.01,a: NEXT a: PAUSE 20
2001 PRINT AT 3,1: INK 1:" " :AT 4,1:" "
2002 LET score=score+100: LET x=1: GO TO 342
3000 LET g2=INT ((g+1)/3)
3002 LET g3=(INT (g2/2))*2
3004 IF g2>g3 THEN PRINT AT f,g1:"":AT 8,g-1:"++":AT 9,g-2:"++++":AT f,g1:" "
AT 8,g-1:" " :AT 9,g-2:" " :AT 21,g1:" " : BEEP .01,-1: BEEP .01,-3: LET f=20:
LET score=score-10: GO TO 342
3020 RETURN

4000 IF t=3 THEN CLS : GO TO 4500

4005 IF t=2 THEN LET a$="ij": LET b$="kl": LET t=3: LET sp=6: GO TO 56

4010 LET sp=4: LET j=-1: LET t=2: LET a$="ef": LET b$="gh": GO TO 56

4500 PRINT AT 0,0:score:AT 4,10:"YOU'VE SCORED"
4510 FOR a=0 TO 31
4520 FOR b=175 TO 167 STEP -1
4530 IF POINT (a,b)=1 THEN PRINT AT 102-b,a: INK 3:"+"
4540 NEXT b
4550 NEXT a
4560 PRINT AT 0,0:" " :AT 21,4:"Press any key for another go"
4565 PAUSE 0
4570 RUN 50
5000 BORDER 0: PAPER 0: INK 6: CLS
5010 PRINT AT 5,10: FLASH 1:"MONSTERS":AT 6,10:"*****"
5012 PRINT AT 10,2:"Do you want instructions?":AT 12,7:"Press (y) or (n)"
5020 PAUSE 0
5025 IF INKEY$<>"y" THEN RETURN
5030 IF INKEY$="y" THEN CLS : PRINT AT 2,4:"The object of the game is to destroy
as many monsters as possible, using as few missiles as you can whilst avoidi
ng BOMBS and LASERS." :AT 8,3:"1 Monster scores 100 A wasted missile score
s -10":AT 12,31:"ab":AT 13,31:"cd":AT 12,14:"ef":AT 13,14:"gh":AT 12,25:"ij":AT 13
,25:"kl":AT 15,41:"(1) FOR LEFT (0) FOR RIGHT":AT 17,81:"(4) FIRES MISSILE":AT 19,
41:"(f) ALSO RAISES BOMB SHIELD":AT 21,71:"Press any key to continue"
5040 PAUSE 0
5050 RETURN

```

2000-2002 Yippee! Monster hit by missile routine. Score updated

3000-3020 Oops! Missile slams into barrier routine. Score reduced

3004 "+" = Graphic 6: "++" = 3 Inverse Graphic 7: "++++" = Inverse Graphic 7, space, Inverse Graphic 7, space, Inverse Graphic 7

4000 Third wave complete, clear screen, do score display etc

4005 Set values for third wave of monsters and execute

4010 Set values for second wave of monsters and execute

4500 Score routine

4510-4550 Show score in large numbers

4530 "+" = Inverse Graphic 8 character

4560-4570 Prompt and rerun game

5000-5050 Introduction/instruction routine

5010 "+++++" = 10 Graphic 3 characters

Monsters Card 4 of 4

8309M4/4

```

6000 LET w=5: GO TO 6010
6005 PRINT AT w-1,x1:" "
6010 PRINT AT w,1: INK 6:"*": BEEP .005,w
6014 IF INKEY$="f" THEN GO SUB 8000
6015 IF INKEY$<>"f" THEN PRINT AT 19,g-1:" "
6016 IF INKEY$="0" THEN GO SUB 700
6017 IF INKEY$="1" THEN GO SUB 800
6020 LET w=w+1
6025 IF w=20 AND x=x0 THEN PRINT AT 19,x1:" " :AT 20,x1: INK 4:"*":AT 21,x1:"E": BEE
P 2,2: GO TO 9000
6030 IF w=21 THEN PRINT AT 20,x1:" " :AT 19,01:" "
RETURN
6040 GO TO 6005
7010 RETURN
8000 PRINT AT 19,g-1: INK 3:"++":AT 18,01:" "
8003 IF w=18 THEN GO SUB 8010
8005 RETURN
8010 IF x=x0-1 OR x=x0 OR x=x0+1 THEN PRINT AT 18,x1:"*": BEEP .01,-3: PRINT AT 18,
x1:" " :AT 17,x-1:"++":AT 16,x-2:"++++":AT 15,x-3:"+++++":AT 17,x-1:" " :AT 1
6,x-2:" " :AT 15,x-3:" " : BEEP .01,-3
8015 LET w=20: LET x=x+1
8020 RETURN

9010 PRINT AT 21,g1: INK 6: FLASH 1:"m":AT 20,g1: INK 6: FLASH 1:"n"
9015 FOR a=1 TO 31 FOR b=20 TO 40: BEEP .005,a+b: NEXT b: NEXT a
9030 CLS : PRINT AT 2,10: INK 6:"YOU ARE DEAD": GO TO 4500

```

6000-6030 Bomb dropping routine

6010 "+" = Inverse Graphic 5 character

8000-8005 Set shield in position

8000 "++" = 3 Graphic 3 characters

8010-8020 Bomb hits shield

8010 "++++" = 3 Inverse Graphic 7:

"++++" = Inverse Graphic 7, space,

Inverse Graphic 7, space, Graphic 4:

"+++++" = Inverse Graphic 7, 2 spaces,

Inverse Graphic 7, 2 spaces, Inverse Graphic 7

9010-9030 Player killed

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Wildcard Search Card 1 of 1

8309SubWS

A subroutine to allow user defined WILDCARD character to search data string arrays

Written in Microsoft Basic, can be modified to run on all machines.

```

6350 REM Subroutine WILDCARD
6400 FOR C = 0 TO NZ: F(C) = 0: F$(C) = "": NEXT C

6450 FOR I = 0 TO M%: I$(I) = 0: NEXT I

6500 C = 0: FL = 0
6600 FOR M = 1 TO LEN(B%)
6700 IF MID$(B%,M,1) = WC% THEN F(C) = F(C) + 1: C = C + 1
6800 IF MID$(B%,M,1) <> WC% THEN F(C) = 2: F$(C) = F$(C) + MID$(B%,M,1)
6900 FL = FL + 1: IF C > NZ THEN M = LEN(B%): C = NZ
7000 NEXT M
7100 IF LEN(B%) <> FL THEN FL = -1: RETURN

7200 B% = F$(0): GOSUB 5300

7300 IF C = 0 AND F(0) = 2 AND F$(0) = A$(IX) THEN FL = 1: RETURN
7350 IF C = 0 AND F(0) = 2 THEN FL = 0: RETURN
7400 IF F(C) = 0 THEN C = C - 1
7500 FL = 0: I = 0

7600 FOR J = IX TO NR% - 1
7650 B% = A$(J)
7700 FOR M = 0 TO C
7800 FO = 0
7900 IF F(M) = 1 THEN B% = RIGHT$(B%,LEN(B%) - 1): FO = 1
8000 IF F(M) = 2 THEN B% = RIGHT$(B%,LEN(F$(M)))
8100 IF F(M) = 2 AND B% = F$(M) THEN FO = 1: M = C
8200 IF F(M) = 3 THEN GOSUB 8700
8300 IF FO = 0 THEN M = C
8400 NEXT M
8500 IF FO = 1 THEN I$(I) = J: I = I + 1: FL = 2
8600 NEXT J: J = 0: RETURN
8700 FOR L = 1 TO LEN(B%) - LEN(F$(M))
8800 IF F$(M) = MID$(B%,L,LEN(F$(M))) THEN FO = 1: B% = RIGHT$(B%,LEN(B%) - (L
+LEN(F$(M)) - 1)): RETURN
8850 IF M = 0 THEN RETURN
8900 NEXT L: RETURN

```

6400 Search string array initialised. Must be user defined

6450 Extracted index array initialised. Must be user defined

6500 Initialise flag and counter

6600-7000 Loop to analyse search string. WC% is user defined WILDCARD character

7100 Check search string not too long or complex

7200 Set value for binary search and perform BEXTRACT (8308SubSE)

7300-7350 No WILDCARD used

7400 Align search array

7500 Initialise flag and index array counter

7600-8600 Loop to search data array

7700-8400 Loop to search individual data string

8700-8900 Routine to compare against embedded string
NOTE: FL = 0 — No match found
FL = 1 — Exact match
FL = 2 — Wildcard match found, indices in I\$(*)
FL = -1 — Bad search string

Array Handler Card 1 of 1

8309AH

A program to demonstrate the use of subroutine WILDCARD requiring BSORT and BEXTRACT routines (8308SubSE) using simple data entry

BBC Model B BBC Basic

```

1000 REM A Program to demonstrate the use of subroutine WILDCARD using BSORT, B
EXTRACT
1100 M% = 49: NZ = 2

1200 DIM A$(M%), I$(M%), F(NZ), F$(NZ): WC% = "£"

1300 FOR IX = 0 TO M%
1400 PRINT "PLEASE ENTER DATA - BLANK IS END OF DATA INPUT"
1500 NR% = IX
1600 INPUT A$(IX): IF A$(IX) = "" THEN IX = M%
1700 NEXT IX
1800 PRINT "DATA ENTRY COMPLETED - PLEASE WAIT DURING SORT"
1900 IF NR% = 0 THEN PRINT "NO DATA ENTERED": GOTO 1300
2000 GOSUB 3800
2100 PRINT "RECORDS SORTED = "; NR%
2200 IX = 0
2300 REPEAT
2400 PRINT "SELECT DATA FROM ARRAY - BLANK GIVES NEXT RECORD"
2500 PRINT "TO EXIT - TYPE END"
2600 INPUT B$: IF B% = "END" THEN PRINT "PROGRAM ENDED": END
2700 IF B% <> "" THEN GOSUB 6400
2800 IF FL = -1 THEN PRINT "STRING TOO COMPLEX": GOTO 3100
2825 IF IX = NR% THEN PRINT "LIST EXHAUSTED": GOTO 3100
2850 IF FL = 0 THEN PRINT "NO RECORDS FOUND": GOTO 3100
2875 IF FL = 1 THEN PRINT "RECORD = "; IX+1: " DATA : "; A$(IX): IX = IX+1:
GOTO 3100
2900 PRINT "RECORD = "; IX(J)+1: " DATA : "; A$(IX(J)): J = J + 1
2925 IF IX(J) = 0 THEN PRINT "LIST EXHAUSTED": GOTO 3100
3100 UNTIL FALSE

```

1100 Define sizes of array and search string variables

1200 DIMension arrays, define WC% as Wildcard character

1300-1700 Data entry routine

1800-2100 Prompts and sort using BSORT (8308SubSE)

2300-3100 Search string entry and execution loop with prompts

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	NJPPPSAL	LTR	22K	B21108
	NJPPPSAL	LTR	22K	B21020
	CLOSING	TXI	4K	B20914
	INTRO	TXI	8K	B20914
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		Cost per square foot lease analysis		
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'The Complete Spectrum ROM Disassembly' by Dr Ian Logan and Dr Frank O'Hara, published by Melbourne House at £9.95 (paperback, 236 pages)

This is an awful warning for those who are contemplating taking someone else's ROMs to pieces. Just as you're about to finish, all your friends rush round with a complete and newly published rendering of the heap of hexadecimal on your bedroom floor.

Messrs Logan and O'Hara have been through all 16K of Spectrum ROM carefully, discovering what everything does and how it does it. Rather than me.

The book is basically a long commented source program starting at 0000 and going through to 386CH. There are a few helpful bits, such as an index to routines and some samples of Basic, to explain some of the algorithms used in ROM. But it could do with some overview material, giving you a chance to see how the Basic works in general and explaining some of the more mathematical aspects in detail.

As it is, *The Disassembly* is something of a monster, even if it's better than a 16384 hex byte monster.

What do you get from the book?

It's an obvious aid for writing your own programs, as you can use the ROM routines. You could persuade the ROMs to do the fiddly bits for you, such as floating-point calculations and circle drawing. In particular, the book will help with adding powerful USR commands to the Basic.

The other role of the book is as an educational text, something like the complete works of Thomas Hardy, both in value and readability.

It's a good practical example

of what a Basic interpreter looks like. If you're trying to design your own you could borrow — *oops*, learn from — bits of this. So even if you have never been near a Spectrum, *The Disassembly* could be worth reading.

But a word of caution: there is a danger of writing your own programs just as an extension to the Spectrum's ROMs. You usually rely on them to a limited extent but the detail the book gives you could tie your program firmly to one set of ROMs.

And there is nothing to stop slight updates to the ROMs causing your programs to stop working. Think how many really good Spectrum programs reached the market long before this 'must for serious programmers'.

But *The Disassembly* is a useful and interesting book. Great — if you like that sort of thing.

I wonder which users are next in line for Messrs Logan and O'Hara's altruistic diligence? How about the BBC's huge and rather fickle 32K ROMs, gentlemen?

MP



Astrology: A look into the future, by Sam D Roberts, published by Ing W Hofacker at \$9.95 (paperback, 38 pages, available through Maplin).

The aim of this booklet is to show owners of the Atari 800 (48K minimum) how to use the micro to calculate a horoscope. The last part of the book is made up of a program listing which does most of the donkey work for you.

The irony of using a computer, perhaps the pinnacle of man's scientific achievement, to assist in the calculation of the ancient art of astrology appeals to me, though I am not a great

fan of the supernatural — being born on a black Friday I can't really afford to be.

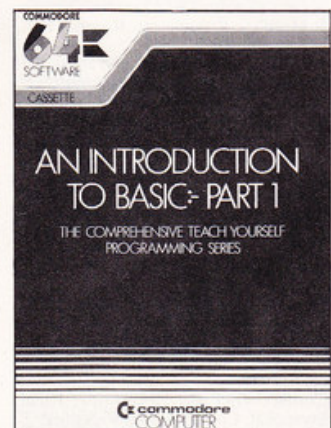
The book's aims are clearly defined and it goes about its task with minimum waffle. The whys and wherefores of astrological method and how it relates to the program are unfolded, as much as they can be in 38 pages.

The idea, as I understand it, is first to determine your precise time of birth in terms of Greenwich Mean Time, in conjunction with the longitude of your birth-place. From this information the program computes the various permutations — the 'houses', the constellations and the aspects between the planets.

This information can be presented in the form of circular horoscope and a couple of tables showing the constellations and aspects. As the book says, this output can also be put to paper with the proper graphics printer to hand or be viewed from the screen.

With all this information and a few intuitive jumps, you can make some sense of the horoscope as it applies to you. The program itself is about 400 lines in length so it would probably be a good idea to check your current boredom threshold against the planets before you start.

It's the usual tatty production job, but for the three or four Atari users who happen to like astrology it's surely a must. IS



'An Introduction to Basic: Part 1' for the Commodore 64 by Andrew Colin, published by Commodore Business Machines UK at £14.95 (paperback, 156 pages, plus two cassettes and small flow-charting template).

This is another of the package deals from Commodore which offers a book and two cassettes, together with a flow-charting template. The similar product for the Vic has been very

successful, as was its forerunner *Strathclyde Basic*, which was one of the earliest cassette-based programs from Commodore, and which sold very well indeed.

Professor Colin does not write in a stuffy way, and his introduction is ideally pitched for the newcomer. The book is voluminous and has 15 sections, each one likely to take a couple of solid evenings' work and usually including some reading, some practical work, some programming and a self-test questionnaire. Experiments are included with every unit.

The course is entirely sequential and the user is discouraged from dipping into its contents with dire warnings that each part is dependent upon the previous part. The units are well-designed and take you from absolute beginnings through tracing errors, flow-charting, and on to fairly advanced commands (from the new user's viewpoint), to the use of colours and sound.

Computer games are also dealt with, and the use of the internal clock and random function for games of chance are considered.

Useful appendices cover mathematical aspects of the 64, details of the precision that the machine can achieve, and standard functions available on the computer. In addition, the answers to selected problems are provided, and common errors discussed.

This last should be particularly valuable in the light of Professor Colin's experience of teaching with the aid of Commodore machines.

The programs accompanying the manual are far from an afterthought, as they contain a large number of quizzes, to check your understanding.

The dynamic nature of these computer demonstrations offers a greater interest-level than is usual with only a book, and their interactive nature makes them fun. You also have good demonstrations of the sound, graphic, and colour capabilities of the machine, and useful tests of your typing ability and reaction times.

All in all, this is an interesting package, and well worth the amount asked for it. The manual which accompanies the Commodore 64 is not the best of such books, and this package will bridge the gap for the beginner until more detailed works come out.

BM

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

We publish a list of each section on alternate weeks. This week it's the turn of user groups, which are listed alphabetically by machine.

USER GROUPS

Acorn

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

Essex National Acorn Atom User Group. Program magazine. Contact Alan Carr, 105 Fairhole Avenue, Gidea Park, Romford, Essex.

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

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

Apple

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

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

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

Hertfordshire British Apple Systems User Group. Meets at Old School, Branch Road, Park Street, St Albans, Hertfordshire, on first Tuesday and third Sunday each month. Tuesday and third Sunday each month. Annual subs: £12.50, joining fee: £2.50. Publishes magazine. Contact John Sharp, 09273 75093.

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

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

Atari

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

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

London Silica Atari 400/800 User Club. New club, library planned, newsletter. Contact Richard Hawes on 01-301 1111.

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

Atom

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

BBC

Laserbug is an international user group for the BBC micro. Produces monthly

magazine. Subs: £12 for one year, £6 for six months. Contact Paul Barbour, 10 Dawley Ride, Colnbrook, Slough, Berks.

Beebug. Ten magazines with programs. Discount deals, library and query service. Contact Sheridan Williams or David Graham at PO Box 50, St Albans, Hertfordshire AL1 2AR.

Bournemouth BBC User Group. Meets at Lansdowne Computer Centre, 5 Holdenhurst Road, Bournemouth on first and fourth Wednesday of month at 7.30pm. Contact Norman Carey on 0202 749612.

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

North London BBC Micro Users Group. Meets at The Prince of Wales, 37 Fortune Green Road, on Tuesdays at 7pm. Wide range of skills and expertise. Contact Dr Leo McLaughlin, Department of Chemistry, Westfield College, University of London, Kidderpore Avenue, London NW3 7ST, 01-405 0109.

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

Comal

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

Commodore ICPUG

Barnsley. Subs: £7.50. Contact Bob Wool, 13 Word Green, Barnsley, South Yorkshire, 0226 85084.

Blackpool. Meets at Arnold School, Blackpool, on third Thursday of month. Contact David Jarrett, 197 Victoria Road, Thornton Cleveleys, Blackpool FY5 3ST.

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

Carrickfergus. Contact David Bolton, 19 Carrickburn Road, Carrickfergus, Antrim BT38 7ND, 09603 63788.

Cheltenham. Meets at The Cheltenham Ladies College on last Thursday of month at 7.30. Contact Alison Schofield, 78 Hesters Way Road, Cheltenham, Gloucester, 0242 580789.

Clwyd. Contact John Poole, 6 Ridgeway Close, Connah's Quay, Clwyd CH5 4LZ.

Corby. Contact Peter Ashby, 215 Wincobn Way, Corby, Northamptonshire, 05363 4442.

Coventry. Meets at Stoke Park School and County College at 7pm on fourth Wednesday of month except July, August, December. Subs: £2.50. Contact Will Light, 22 Ivybridge Road, Styvechal, Coventry, Warwickshire.

Derby. Meets at Derby Professional Colour every other Tuesday at 7pm. Contact Robert Watts, 0332 72569.

Durham. North-East Pet and ICPUG. Meets at Lawson School, Burnley at 7pm second and third Mondays of month. Contact Jim Cocalis, 20 Worcester Road, Newton Hall Estate, Durham.

Essex. No meetings, software library. Contact Simon Kniveton, 097 086 303.

Hainault. Meets at Grange Remedial Centre, Woodman Path, Hainault. Contact Carol Taylor, 101 Courtlands Avenue, Cranbrook, Ilford, Essex.

Glasgow. Contact Dr Jim MacBrayne, 27 Daidmyre Crescent, Newton Mearns, Glasgow, 041-639 5696.

Gloucester and Bristol Area. Meets at 23 Sheppard Leaze, Wotton-under-Edge, Gloucester, on last Friday of month.

From time to time we will be focusing a feature on an individual club or user group. If you've just started your own user group or if your group is planning something of special interest, then drop us a line and we'll spread the word. Write to Clubnet, *Personal Computer News*, VNU, 62 Oxford Street, London W1A 2HG.

Hampshire. Meets at 70 Reading Road, Farnborough, on third Wednesday of month. Contact Ron Geere, 109 York Road, Farnborough, Hants, 0252 542921.

Hertfordshire North. Meets at Provident Mutual Assurance, Purwell Lane, Hitchin, on last Wednesday of month. Contact B Grainger, 73 Minehead Way, Stevenage, Herts SG1 2HS, 0438 727925.

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

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

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

London North. Contact Barry Miles, Department of Business Studies, North London Polytechnic, Holloway Road, London N7, 01-607 2789.

Norfolk. Contact Peter Petts, Bramley Hale, Wretton, King's Lynn, Norfolk PE33 9QS, 0366 500692.

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

Slough. Meets at Slough College on second Thursday of month at 7.30pm, visitors — 65p adults, 40p students. Contact Brian Jones, 53 Beechwood Avenue, Woodley, Reading RG5 3DF, 0734 661494.

South-East. Regional Group. Meets at Charles Darwin School, Jail Lane, Biggin Hill, Kent, on third and fourth Thursday of month at 7.30pm. Subs: £7.50. Free library, discount service, courses and newsletter. Contact Jack Cohen, 30 Brancaster Road, Newbury Park, Ilford, Essex, 01-597 1229.

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

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

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

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

Commodore Pet

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

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

Pet User Group Crawley. Contact Richard Dyer, 33 Parham Road, Ilfield, Crawley.

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

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

Pet Users Group. Meets at Polytechnic of North London, Eden Grove, Room 320. On alternate Tuesdays, 6pm. Meets at Barry Miles on 01-607 2789.

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

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

Commodore Vic

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

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

Norfolk. Proposed club. Contact J Blair, 11 Beach Road, Cromer, Norfolk, 0263 512849.

Compucolour

Caversham. Compucolour Users Group UK. Meets at Community Centre, Caversham Park Village twice a year. Subs £15. Contacts with USA, Australia and Canada. Newsletter, program library. Contact Peter Hiner, 11 Pennycroft, Harpenden, Hertfordshire, 05827 64872.

CP/M

Irish CP/M Users Group. Subs: £5, meets monthly in Dublin area. Newsletter.

UK CP/M Users Group. Subs: £7. Software library, newsletter, help service. Contact Lesley Spicer, 11 Sun Street, London EC2M 2QD, 01-247 0691.

COSMAC

COSMAC Users Group. Contact James Cunningham, 7 Harrowden Court, Harrowden Road, Luton, Bedfordshire, 0582 423934.

Digital Equipment

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

Education

Birmingham. Education ZX80/81 User Group. Subs: £2.50. Contact Eric Deeson, Highgate School, Balsall Heath Road, Highgate, Birmingham B12 9DS.

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

Dublin. Computer Education Society of Ireland. Subs: £3. Contact Dairmuid McCarthy, 7 St Kevins Park, Kilmacud, Blackrock, Co. Dublin.

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

Worcestershire. Mini and Microcomputer Users in Education. National organisation. Contact R Trigger, 48 Chadcotte Way, Catshill, Bromsgrove, Worcestershire B61 0JT.

Forth

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

Forum

Forum 80 Users Group. Contact Frederick Brown, 421 Endike Lane, Hull HU6 8AG.

FX-500-P

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

Genealogists

Society of Genealogists Computer Interest Group. Subs: £3. Newsletter. Contact Anthony Camp, 01-373 7054.

ICI

ICI Micro Users Group. Meets fortnightly. Contact Keith Heron, 32 Norfolk Road, Congleton, Cheshire.

Intel MDS

UK Intel MDS Users Group. Newsletter. Contact Lewis Hard, c/o S.P.A.C.E., The Old Coach House, Court Row, Upton-on-Severn, Worcester WR8 0NS.

Ithaca Audio S100

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

Jupiter Ace

Jupiter Ace Users Group. Subs: £7. Newsletter, add-ons. Contact John Noyce, Remsoft, 18 George Street, Brighton BN2 1RH.

Mattel

Mattel Intellivision TV Game Group. Proposed group to organise games, competitions. Contact Warrington 62215 after 4pm.

Medical

Durham. Primary Health Care Group. Contact Dr Alastair Malcolm, British Computer Society, Chevelly Park Medical Centre, Belmont, Durham, 0385 64282.

London. Medical Micro Users Group. Newsletter. Contact Medicom, 1-2 Hanover Street, London W1.

Middlesex. TRS-80 Medical and Laboratory Users. Newsletter. Contact Dr Robinson, The Residency, Northwick Park Hospital, Harrow, Middlesex.

Nascom

Berkshire. Nascom Thames Valley User Group. Meets at Frogmore Hotel, Windsor, on Thursday fortnightly, 8pm. Newsletter. Contact Mike Rothery, 37 Eaton Wick Road, Eton Wick, Windsor, Berkshire, Windsor 56106.

Birmingham Nascom User Group. Meets at Davenport Social Club, Granville Street, Birmingham on the last Thursday of month, 8pm. Contact Martin Sidebotham, 021-744 3093.

International Nascom Microcomputer Club. Subs: £5. Newsletter, program library. Contact 80 Oakfield Corner, Sycamore Road, Amersham, Buckinghamshire HP6 5EQ.

Merseyside Nascom User Group. Meets at Mona Hotel, St James Street, Liverpool, on the first Wednesday of month, 7.30pm. Contact Mr T Searle, 051-526 5256.

Newbrain

Brighton Independent Newbrain User Group. Subs: £5. Monthly newsletter, SAE to J Hudson, 6 Swanborough Place, Whitehawk, Brighton.

Wakefield Independent Newbrain User Group. Contact Anthony Hodge, 15 St John's Court, Wakefield WF1 2RY.

Ohio

Ohio Scientific User Group. Subs: £5. Newsletter. Contact Tom Graves, 19a West End, Street, Somerset, 0458 45359.

Oric

Oric Owners Group. Subs: £10. Communicates through bi-monthly newsletter. Contact Paul Kaufman, 3 Club Mews, Ely, Cambridgeshire.

Osborne

British Osborne Owners Group. Subs: £10. Newsletter. Contact J Anglesea, Flat 19, Rowan House, Milton Road, Handsworth, Birmingham B20 2JR.

OSI

OSI UK User Group. Contact Richard Elen, 12 Bennerley Road, London SW11 6DS.

Pascal

Pascal User Group. Subs: £9. Contact Nick Hughes, PO Box 52, Pinner, Middlesex HA5 3FE.

PDP

Buckinghamshire. PDP8 User Group. Newsletter. Contact Nigel Dunn, 21 Campion Road, Widmer End, High Wycombe, Buckinghamshire, 0494 714483.

Hertfordshire. PDP11 User Group. Information service only. Contact Peter Harris, 119 Carpenter Way, Potters Bar, Hertfordshire EN6 5QB, 0707 52091.

Pilot

UK Pilot User Group. Contact Alec Wood, Wirral Grammar School for Boys, Cross Lane, Bebington, Wirral, Merseyside LG3 3AQ.

Prestel

ACC National Prestel Committee. Administrates Club Spot 800 (hobbyists on Prestel). Contact secretary, Rupert Steele, St John's College, Oxford OX1 3JP.

Research Machines

Birmingham. Research Machines 380Z. Contact Peter Smith, Birmingham Educational Computing Centre, Camp Hill Teachers Centre, Stratford Road, Birmingham B11 1AR.

Leamington Spa. West Midlands RML User Group. Contact Spencer Instone, c/o 59 Avenue Road, Leamington Spa, 0359 64282.

Newcastle. NERML 380Z User Group. Meets monthly at Micro-Electronics Education Centre of the Polytechnic Coach Lane Campus. Subs: £5. Contact Mr Hatfield or Mr Reed, Computer Unit, Northumberland Building, Newcastle Polytechnic, 0632 326002.

Oxford. Research Machines National User Group. Contact RML, Mill Street, Osney, Oxford OX2 0BW, 0865 249866.

Oxford. Research Machines Ltd National User Group. Contact M D Fisher, PO Box 75, Oxford OX4 1EY.

Sharp MZ80

Postal MZ80K User Group. Contact Noel Williams, 07425 88058.

Aberdeen. International Sharp Users Group. Subs: £3. Newsletter. Contact Graham Knight, c/o Knights Computers, 108 Rosemount Place, Aberdeen, 0224 630526.

Essex. Sharp MZ80K User Group. Contact Joe Street, 16 Elmhurst Drive, Hornchurch, Essex RM11 1PE.

Leeds. Sharp PC1211 Users' Club. Subs: £5. Newsletter. Contact Jonathan Dakayne, 281 Lidgett Lane, Leeds LS17 3AQ.

Somerset. Sharp MZ80 Users Club. Contact Tim Powell, Computer Centre, Yeovil College, Yeovil, Somerset BA21 4AE.

Sinclair

Brighton. ZX Users Group. Contact J Ireland-Hill Jnr, 145 Godwin Road, Hove, Brighton.

Aylesbury. Sinclair ZX Computer Club. General monthly meeting, newsletter. Equipment for hire, specialist meetings, library. Contact secretary, Ken Knight, 0296 5181.

Colchester. Sinclair User Group. Meets fortnightly. Contact Richard Lawn, 102 Prettygate Road, Colchester, Essex.

Cardiff. ZX Club. Meets on last Sunday of month, 2pm. Subs: £5. Telephone service, software library. Contact Mike Hayes, 54 Oakley Place, Grangetown, Cardiff, 0222 371732.

Edinburgh. ZX. Meets at Claremont Hotel, Claremont Crescent, Edinburgh on second and fourth Wednesdays every month, 7.30pm. Subs: £5 adults, £3 juniors, students, OAP and unemployed. Newsletter. Contact John Palmer, 56 Meadowfield Drive, Edinburgh, 031-661 3183.

Glasgow. ZX80/81 User Group. Contact Ian Watt, 10 Greenwood Road, Clarkston, Glasgow, 041-638 1241.

Liverpool. ZX Computer Club. Meets at ZX Computer Centre, 17 Sweeting Street, Liverpool, on Wednesday, 6.30pm. Contact Keith Archer, 051-260 4950.

London. National ZX User Club. Monthly magazine 'Interface'. Contact Tim Hartnell, Interface, 44-48 Earls Court, London W8.

London. Sinclair User Group. Meets at Polytechnic of North London, Room 2-5 Tower Block, Monday, 6.30pm. Contact Irving Brand, Polytechnic of North London, Holloway Road, London.

Staffordshire. ZX80/81 National Software Association. Subs: £6. Newsletter, software available on cassette. Contact 15 Woodlands Road, Wombourne, Staffordshire WV5 0JZ.

Suffolk. ZX Amateur Radio User Group. Newsletter. Contact Paul Newsman, 3 Red House Lane, Leiston, Suffolk. SAE essential. No telephone enquiries.

Surrey. Guildford ZX81/80 Users Group. Meets Fridays, club magazine. Contact A Bond, 54 Farnham Road, Guildford, Surrey GU2 5PE, 0483 62035.

Surrey. ZX80/81 User Club. Newsletter. Contact David Blagden, PO Box 159, Kingston-upon-Thames, Surrey KT2 5UQ.

Solihull. Sinclair Club. Contact J Edwards, 296 Blossomfield Road, Solihull, West Midlands, 021-705 1647.

West Sussex. Hassocks ZX Micro User Club. Contact Paul King, 25 Fir Tree Way, Hassocks, West Sussex.

Sirius

Sirius User Group. Newsletter, program library. Contact Ray D'Arcy, Sirius User Club, The Microsystems Centre, Enterprise House, 70-71 Gordon Street, Luton, 0582 412215.

68XX

68XX Special Interest Group. Contact Tim Turner, 63 Millais Road, London E11 4HB, 01-558 3681.

Software

London. Software Group. Meets at Polytechnic of North London, Room 2-3 Tower block Thursday, 6pm. Contact Mike Duck at Polytechnic of North London, Holloway, London N7.

Oxford. Program of the Month Club. Discount programs, newsletter. Contact Mr Durrant, 55 St Thomas Street, Oxford OX1 1JG, 0855 250333.

Sorcerer

Liverpool European Sorcerer Club. Monthly meetings. Subs: £7.50, newsletter. Contact Colin Marle, 32 Watchyard Avenue, Formby, near Liverpool L37 3JU, 070 48 72137.

Surrey. Exidy Sorcerer User Group. Newsletter, program exchange. Contact Andy Marshall, 44 Arthurs Bridge Road, Woking, Surrey GU21 4NT.

Spreadsheet

International Electronic Spreadsheet Users Group. Newsletter. Contact UK Alpha House, 7th Floor, Rowlandway, Manchester M22 5RG.

Tangerine

Bristol. Tangerine Homebrew. Contact A Coates, 35 Mogg Street, St Werburghs, Bristol BS2 9UB.

Bournemouth. Tangerine Users Group. Hardware and software suppliers. Contact Bob Green, 16 Iddesleigh Road, Charminster, Bournemouth.

Texas Instruments

Leeds. TI99/44 User Group. Meets at 30 Gipton Wood Road, Leeds 8, Mondays 7pm. Subs: £6. Contact I Youlden, 0532 401408.

Manchester. TI User Group. Proposed new club. Contact T Grimshaw, 21 Allingham Street, Longsight, Manchester.

Manchester. TI9900 User Group. Software, data libraries. Contact Chris Cadogan, Department of Computer Science, University of Manchester M13 9PL.

Swansea. National TI 58/50 User Group. Subs: £5.50. Program exchange, newsletter. Contact R Murphy, Department of Electronic Engineering, University College, Singleton Park, Swansea, South Wales.

Triton

Triton User Group. Subs: £4. Newsletter, software exchange. Contact Nigel Stride, Transam Ltd, 12 Chapel Street, London NW1, 01-402 8137.

TRS-80

Birmingham. National TRS-80 User Group. Meets at Adam & Eve Pub, 1st Floor, Bradford Street, Birmingham on last Friday of month. Subs: £2.50. Newsletter, software library. Contact Michael Gibbons, 1 New Street, Castle Bromwich, Birmingham B38 9AP, 021-747 2260.

Bolton. Northwest TRS-80 User Group. Meets at Barton Aero Club, Barton Aerodrome, Irlam, near Manchester on last Wednesday of month, 8pm. Subs: £8. Sub-group meets at Crown Hotel, Blackfriars Street, on first and third Monday of month. Newsletter, software library. Contact Melvin Franklin, 40 Cowlees, Westhoughton, Bolton, Lancashire.

Chelmsford. TRS-80 User Group. Contact Michael Dean, 22 Roughtons, Galleywood, Chelmsford, Essex.

Durham. North East TRS-80 User Group. Meets at Information Technology Centre, Gateshead on the third Wednesday of month, 7pm. Subs: £5. Newsletter. Contact J Dunn, 8 Etrich Terrace, North Gateshead, County Durham.

Edinburgh. Scottish TRS-80 and Genie User Group. Meets at Mansion House Hotel, Milton Road, second Thursdays of month, 7.30pm. Contact Dick Mackie, 3 Warrander Park Crescent, Edinburgh EH9 1DX, 031-229 6032.

Isle of Wight. TRS-80 User Club. Meets at London Hotel, Ryde on last Friday of month, 7.30pm. Contact Sean Coulson, 0903 614589.

Kent. TRS-80 User Group. Contact Alan Reid, 22 Woodeys Road, Rainham, Kent, 0634 367012.

Liverpool. UK DOSPLUS User Group. Contact Peter Tootill, 101 Swanside Road, Liverpool L14 7NL.

Liverpool. Merseyside TRS-80/Video Genie User Group. Meets second Thursday of month, 7.15pm. Contact Peter Tootill, 101 Swanside Road, Liverpool L14 7NL, 051-220 9733.

London. TRS-80 Genie Group. Meets at Central Common Room, The Residency, Northwick Park Hospital on first Sunday of month. Contact Dr Nick Robinson, Central Room, The Residency, Northwick Park Hospital.

London, SW. TRS-80 User Group. Contact Ron Everitt on 01-394 2123.

Merseyside. TRS-80 Level 1 User Group. Subs: £5. Software library, newsletter. Contact N Rushton, 123 Roughwood Drive, Northwood, Kirby, Merseyside.

Milton Keynes. National TRS-80 and Genie User Group. Fee £7 for six months, newsletter. Contact Brian Pain, 24 Oxford Street, Stony Stratford, Milton Keynes.

Northants. TRS-80 Users Group. Meets at Welwyn Park Community Centre on alternate Thursday at 7pm. Subs: £12. Saturday workshop. Contact Neil Griffiths, 0858 65718.

Nottingham. East Midlands TRS-80 Users Group. Newsletter. Contact Mike Costello, 15 Langbank Avenue, Rise Park, Nottingham NG5 5BU, 0602 751753.

Colour Genie
National Colour Genie User Group. Subs: £10. Products monthly newsletter, has software library and prepares national workshops. Contact Marc Leduc, 46 Highbury Avenue, Nottinghamshire NG6 9DB.

UCSD

Hants. UCSD System Users Society. Contact John Ash, Dicoll Data Systems Ltd, Bond Close, Kingsland Estate, Basingstoke, Hants RG2 0QB.

Oxford. UCSD Pascal UK Users Group. Contact Malcolm Harper, Oxford University Computing Laboratory Programming Research Group, 45 Banbury Road, Oxford OX2 6PE.

CUA

CUA User Group. Contact Adrian Waters, 9 Moss Lane, Romford, Essex.

6502

Bedfordshire. 6502 User Group. Contact Walter Wallenborn, 21 Argyle Avenue, Luton, Bedfordshire LU3 1EG, 0582 26967.

Hants. 6502 Users Club (Southern Region). Contact Steve Cole, 70 Sydney Road, Gosport, Hants.

DATA BASICS

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 (thousand 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 \times lines The number of characters that can be displayed across the screen and the number of lines down.

PRICE GUIDE

£50	Commodore 4016	£632	Transam Truscan	£1,985
£57	Research Machine 480Z	£650	IDS Data Machine	£1,995
£80	DAL PC	£684	Tandy TRS-80 Model	£1,999
£90	Apple II	£779	Kenilworth 83N	£2,012
£90	Commodore 500	£799	Caltext Micro	£2,019
£100	HP 75C	£883	LSM3	£2,064
£125	Sharp MZ80B	£900	Haywood 9000 Composite	£2,064
£150	Commodore 8032	£1,129	Hawk Model 110	£2,070
£160	Commodore 710	£1,144	Positron 9000	£2,134
£170	Microdecision	£1,144	Research Machines 380Z	£2,147
£170	Fujitsu FM8	£1,150	Superbrain JR	£2,150
£174	Sanyo MBC 1000	£1,195	Future Computers FX-20	£2,156
£179	Positron 900	£1,259	Comart Communicator	£2,180
£199	Commodore 8096	£1,374	Adler AlphaTronic P2	£2,197
£200	Pasaba 40	£1,437	Gene III	£2,242
£218	NEC PC8000	£1,454	Kemtron K2000E	£2,242
£224	Colour Genie	£1,489	Rair Black Box 320S	£2,242
£225	Computers Lynx	£1,489	Sanyo MBC 2000	£2,242
£240	Televideo TS-800 Series	£1,495	Toshiba T-200	£2,242
£240	HP 86A	£1,541	TMK 332	£2,242
£269	Osborne I	£1,581	Bonsai SM 3000	£2,294
£269	Signal 10025	£1,599	CAL PC	£2,294
£289	APL Signet	£1,610	North Star Horizon	£2,294
£289	Zenith 289-81	£1,668	Sanyo MBC 1250	£2,294
£327	Benis 108	£1,683	Casu Mini C2	£2,300
£330	Tandy TRS-80 Model III	£1,699	Seed System I	£2,300
£345	Commodore Spr. Pet 9000	£1,719	Sharp PC3201	£2,300
£399	Gemini Galaxy 2	£1,719	HP 85	£2,360
£430	British Micro Mini 803	£1,720	HP Series 100, 120	£2,362
£431	Microsolution Brit. Genius	£1,840	Sord M23P	£2,369
£454	Toshiba T-100	£1,900	IBM PC	£2,392
£472	Sord M23	£1,932	Xerox 820 Model II	£2,415
£549	Transwarc BC2	£1,949	Haywood 3000	£2,439
£549	Kenilworth 83G	£1,953		

LSM4	£2,472	DEC PC 325	£3,080	Corvus Concept	£4,887
Canon CX-1	£2,500	Direct 1000	£3,093	ICI PC Model 31	£4,939
Adler Alphatronic P2U	£2,524	Equator	£3,099	Cromeco System 3	£5,170
IO Tech Iona	£2,539	Equator Table-Tops 925	£3,105	Cromeco Five 1000	£5,175
HP 87XM	£2,571	ITT 3030	£3,105	Fortune 32.16 System 2	£5,204
Quantum 2000	£2,587	Monroe OC 8810	£3,162	Zeus 4	£5,400
Seed System 19	£2,600	HP Series 20w Model 16A	£3,211	Hawk Model 2110	£5,405
Enterprise 1000	£2,645	Samurai	£3,214	Molecular M200	£5,462
Facit 6520	£2,645	Torch	£3,277	Altos 800 15	£5,663
Olympia Boss Model A	£2,645	Sord M223	£3,306	Durango F85	£5,744
Britannia Baby	£2,657	Kontron RS180	£3,392	Marin Chip M9900	£5,750
Adler Alphatronic P3	£2,696	Columbia PC 1600-1	£3,392	SWTech Products S0/9	£5,750
Eagle II	£2,702	Digico Prince	£3,450	BASF 7100	£5,805
Aimarc 801	£2,708	Barcellos AMT 100	£3,450	Sord M243	£5,842
DEC Rainbow 100	£2,714	Kalamazoo 1050	£3,560	Archives IV	£5,905
ICI PC Model 10	£2,754	Cromeco System 2	£3,576	ICI PC Model 32	£6,037
Millbank SX10	£2,754	Digital Microsystems 3	£3,674	Rair Business Computer	£6,037
Olivetti M20D	£2,754	Decision-1 Computer 012	£3,674	Digital Microsystems 4	£6,210
Sirius I	£2,754	Televideo TS 1602-C	£3,795	Superstar	£6,296
Victor 9000	£2,754	Adds Multivision	£3,795	Facal 6000	£6,327
North Star Advantage	£2,766	Clenio Pronto	£3,795	Eagle 1600	£6,497
Apple IIc	£2,780	Panasonic JD8000M	£3,795	TI System 200-250	£6,695
Sonyo MBC 4050	£2,817	Kemtron K3000	£3,795	Compucorp 675	£6,780
Bonsai SM 4000	£2,842	DEC PC 350	£3,850	Sundance I	£6,969
Logica VTS Vitesse	£2,863	Vector 4	£3,852	Pascal Mod. Microengine	£7,003
Decision-1 Computer O111	£2,869	Sage II	£4,019	Diablo 3000	£7,250
Eagle III	£2,950	Eagle IV	£4,190	Onyx 5001 MU	£7,607
Zenith 289-81	£2,978	C-1010	£4,197	Sundance II	£8,205
Monroe EC8800	£2,990	Tandy TRS-80 Model 16	£4,199	Haywood Hinet	£9,550
Philips P3500	£3,000	Hytech H4500	£4,310	Altos 856-10	£9,631
Tanberg EC10	£3,000	BMC OK11F800 Model 2A	£4,360	Micro Five 3000	£10,350
Archives I	£3,002	ADS 42	£4,500	Sundance 16	£11,480
Cromeco System 1	£3,025	Televideo TS-807H	£4,533	Spectrum	£11,443

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 + Tv** 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, 5¹/₄" 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 Databases can be kept right up to date. This guide has been meticulously researched and the information collected from individual distributors listed.

ABBREVIATIONS

£3,039	ICL PC Model 31	£4,939	Ap: APL
£3,099	Comenco System 3	£5,170	As: Assembly
£3,105	Micro Five 1000	£5,175	Ba: Basic
£3,105	Fortune 32:16 System 2	£5,204	Co: Cobol
£3,162	Zeus 4	£5,400	Cm: Cortal
£3,211	Hawk Model 2110	£5,462	Fr: Fortran
£3,214	Molecular M200	£5,663	Pa: Pascal
£3,214	Altos 800-15	£5,744	
£3,277	Durango F85	£5,750	
£3,306	Marin Chip M9900	£5,805	
£3,392	SW Tech. Products S0.9	£5,842	
£3,392	BASF 7100	5,905	
£3,450	Sord M243	£6,037	
£3,450	Archives IV	£6,037	
£3,560	ICL PC Model 32	£6,210	
£3,576	Rair Business Computer	£6,296	
£3,674	Digital Microsystems 4	£6,327	
£3,714	Superstar	£6,497	
£3,795	Racal 6000	£6,695	
£3,795	Eagle 1600	£6,780	
£3,795	Ti System 200-250	£6,969	
£3,795	CompuCorp 675	£7,003	
£3,850	Sundance I	£7,250	
£3,852	Pascal Mod. Microengine	£7,607	
£4,019	Diablo 3000	£8,205	
£4,190	Onyx 5001 MU	£9,550	
£4,197	Sundance II	£9,631	
£4,199	Haywood Hinet	£10,350	
£4,310	Altos 856-10	£10,480	
£4,310	Micro Five 3000	£11,442	
£4,360	Sundance 16		
£4,500	Spectrum		
£4,533			

HARDWARE

Make and model	Price inc VAT	Processor type	Speed in Mhz	Standard RAM	Max RAM — normally at extra cost	Display		Graphics	Keyboard		Interfaces built-in				Storage		Operating system	Languages inc	Other languages available	Distributor	Comments
						Max characters	Method (at extra cost)		Type of keyboard	No. of function keys	Numeric pad	No. of RS232	No. of Centronics	No. of IEEE 488	No. of others	No. of expansion slots	Cassette facility				
Acorn Atom	£174	6502	1	2K	40K	32x16	Tv(M+)	●	256x192	W						1	●	Cassette	BaAs	A1	Hobbyist micro
Adds Multivision	£3,795	8085A	5	64K	256K	80x25	M		640x240	W	28	1			1			CP/M2.2, Muon	Ba	A2	Multi user system
Adler Alphatronic P2	£2,197	8085A	3	48K	64K	80x24	M			W	6	2			1			CP/M	Ba	T1	Good software choice
Adler Alphatronic P2U	£2,524	8085A	3	64K		80x24	M			W	6	2			1			CP/M	Ba	T1	£327 buys extra storage
Adler Alphatronic P3	£2,696	8085A	3	64K		80x24	M			W	6	2			1			CP/M		T1	16 bit option-promised
ADS 42	£4,500	8085A	4	32K		40x8	M		40x8	W		3			3		●	Holland Automation	Ba	A3	Intelligent cash register
Almarc 801	£2,708	Z80	4	64K	512K	80x25	(M+)	●		W		2			11			CP/M		A4	8-bit range goes to 20Mb
Almarc 1601	£3,445	8086	8	128K	1Mb	80x25	(M+)	●		W		2			11			CP/M86		A4	Pseudo 16-bits go to 20Mb
Altos 800/15	£5,663	Z80	4	192K	208K	80x24	M			W	8		1					MP/M		L1	Multi user business machine
Altos 856-10	£9,631	8086	10	512K	1Mb	80x24	M			W	16	6						Xenix	Xenix	L1	The 16-bit version
APL Signet	£1,610	Z80A	4	64K		80x25	Tv(M+)	●	256x192	*		2						APL, CP/M	Ap	M1	*APL terminal recommended
Apple II	£776	6502	1	48K	128K	40x24	Tv(M+)	●	256x192	W					8			CP/M, DOS 3.3, UCSD-P	Ba	A8	Plenty of software and extras
Apple III	£2,780	6502	2	128K	256K	80x24	(M+)	●	560x192	W		1			4			SOS, DOS		A8	Will emulate Apple II
Archives I	£3,003	Z80	4	64K		80x25	M	●	240x100	W	23	2	1		1			CP/M		S1	Standard CP/M + graphics
Archives IV	£5,905	Z80	4	512K		80x25	M	●	240x100	W	23		1		1			CP/M, MP/M		S1	Hard disk version
Atari 400	£160	6502B	1.79	16K		40x24	Tv	●	320x192	T					7		●	Cassette		A5	Games computer, Basic extra
Atari 800	£400	6502	1.8	16K	48K	40x24	Tv(M+)	●	320x192	W					7		●	Cassette	Ba	A5	Versatile, good graphics
Barcellos AMT 100	£3,450	Z80A	4	64K	256K	80x24	TvM			W	8	1	1		2			CP/M	BaCo	B1	Up to four users
BASF 7100	£5,805	Z80A	4	64K		80x24	M			W	26	1	1					BOS	Ba	C1	Hard disc promised
Basis 108	£1,683	6502	1	64K	126K	80x24	TvM	●	820x168	W	15	1	1		6					C12	Apple bus, Z80, 80 columns
BBC Micro Model A	£299	6502	1.8	16K	32K	40x30	Tv(M+)	●	320x256	W	10			1				MOS	BaAs	A1	Upgradable to Model B
BBC Micro Model B	£399	6502	2	32K		80x30	Tv(M+)	●	640x256	W	10		1		5			MOS	BaAs	A1	Versatile and expandable
BMC OKI II 800, Model 20	£4,360	Z80B	5	64K	256K	80x25	M	●	640x200	W	15	1						CP/M	Ba	E1	Built-in printer
Bonsai SM 3000	£2,294	Z80	2	64K		80x24	M		80x24	W	14	1	1					CP/M		B2	CP/M business machine
Bonsai SM 4000	£2,842	8088	5	128K	256K	80x24	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		80x25	Tv(M+)		80x25	W	11	2	1					CP/M	AsBaCo	B3	Cobol language included
British Micro Mimi 803	£1,720	Z80A	4	64K		80x25	(M+)		512x256	W	17	1	1		1			OS/M		B4	This is CP/M compatible
C-1010	£4,197	6502	1	64K	128K	80x24	TvM		256x192	W	12	1	1		1		●	CP/M, DOS, UCSD-P	Ba	C2	Apple II compatible
CAL PC	£2,294	8088	5	128K	256K	80x25	TvM	●	256x512	W		2	1		1			CP/M	Ba	C3	Also Z80B Processor
Caltext Micro	£2,019	Z80A	4	64K	256K	80x24	TvM			W	36	1	1		3			CP/M		C3	Range of software included
Camputers Lynx	£225	Z80A	4	48K	192K	40x24	Tv(M+)	●	248x256	W		1	1				●	Cassette	Ba	C5	Unusual — promise of CP/M
Canon CX-1	£2,500	6809	4	128K	256K	80x24	M		80x25	W	15	3	1	1	2			MCX	BaAs	C6	Pascal, Fortran as extras
Casio FX 702P	£90	Cust.		2K		20x1	LCD			C							●	Cassette	Ba	C4	Pocket computer
Casu Mini C2	£2,300	Z80A	4	64K			(M+)			*		4	1		6					C7	*Choose your own terminal
Clenio Pronto	£3,795	Z80A	4	64K	1Mb		Tv(M+)			*		2	2		18			CP/M	Ba	C8	*Choice of terminal
Clenio Table-Top 925	£3,105	Z80A	4	64K	128K	80x25	M			W	11	2	2					CP/M		C8	Watch out for the weight
Columbia PC1600-1	£3,392	8088	4.77	128K	1Mb	80x24	M	●	640x200	W	10	2	1		8			CP/M, MS-DOS	Ba	I1	An IBM lookalike
Commodore VIC 20	£170	6502	1	5K	32K	22x23	Tv(M+)	●	176x158	W	8				3		1	Kernal	Ba	C9	Very popular home micro
Commodore 64	£345	6510	1	64K		40x25	Tv(M+)	●	320x200	W	8				3			Kernal	Ba	C9	Good value for money
Commodore 500	£799	6509	1	128K	896K	40x25	Tv(M+)	●	320x200	W	10	1	1	1	3	1		Kernal	Ba	C9	Available by summer?
Commodore 4016	£632	6502	1	16K	32K	40x25	TvM			W					1		3	Cassette, PETDOS	Ba	C9	The original PET
Commodore 710	£1,144	6509	2	128K	896K	80x25	TvM			W	10	1	1	1	2	1		Kernal	Ba	C9	Might be a long wait
Commodore 8032	£1,129	6502	1	32K	96K	80x25	TvM			W					1			Cassette, PETDOS	Ba	C9	The 80-column PET
Commodore 8096	£1,374	6502	1	96K		80x25	TvM			W					1			Cassette, PETDOS	Ba	C9	Fully expanded PET
Commodore Super Pet 9000	£1,719	6502	2	96K		80x25	TvM			W		1	1	1	2			Cassette, PETDOS	Ba	C9	Top of the range
CompuCorp 675	£6,780	Z80	4	64K	256K	80x20	M			W	20	1			4			CompuCorp		C10	Unusual O/S

HARDWARE

Make and model	Price inc VAT	Processor type	Speed in MHz	Standard RAM	Max RAM — normally at extra cost	Display		Graphics	Keyboard		Interfaces built-in				Storage		Operating system	Languages inc	Other languages available	Distributor	Comments	
						Max characters columns × lines	Method (at extra cost)		Colour capability	Max dot resolution	Type of keyboard	No. of function keys	Numeric pad	No. of RS232	No. of Centronics	No. of IEEE 488						No. of others
Comart Communicator CP100 Cortex	£2,180 £454	Z80 9995	4 12	64K 64K	512K 1Mb	80×24 40×24	M Tv(M+)	●	256×192	W 12	● 1	2	1		10	●	2×390K5¼F	CP/M	BaAs	●	C13	Business CP/M micro Mainly sold as £340 kit
Corvus Concept	£4,887	68000	8	256K	1Mb	120×60	M	●	720×560	W 10	● 2			1	4	●	2×390K5¼F	Merlin	Pa	●	K1	A4 shaped screen
Cromemco System 1	£3,025	Z80	4	64K		80×24	(M+)	●	450×735	W 20	● 1				8		2×390K5¼F	CDOS, Crom		●	C13	Designed for business
Cromemco System 2	£3,560	Z80	4	64K		80×25	(M+)			W 20	● 1				21		2×390K5¼F	CDOS, Crom		●	C13	Large business machine
Cromemco System 3	£5,170	Z80	4	64K		80×25	(M+)			W 20	●				21		2×1.2Mb8F	CDOS, Crom		●	C13	Top end Cromec
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	3		2×400K5¼F	CP/M		●	D2	Competitor for IBM PC
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
DEC PC 350	£3,850	PDP11/23	N/A	256K		132×24	M	●	960×240	W 20	● 2				4		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
Decision-1 Computer MDC-012	£3,674	Z80A	4	64K	192K		(M+)*			*				3	1	1	1×400K5¼F+1×5Mb5¼H	CP/M	Ba	●	I2	*You choose the terminal
Diablo 3000	£7,250	8085	3	32K	64K	80×24	M			W 8	● 1			4			2×1.8Mb8F	DACL	Ba	●	B5	Unusual O/S
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
Digital Microsystems DMS-4	£6,210	Z80A	4	128K	½Mb		(M+)*			*				4			2×512K8F	MP/M		●	D4	*Depends on terminal chosen
Direct 1000	£3,093	Z80	4	64K		80×25	M	●	132×28	W		2					2×300K5¼F	CP/M		●	D5	Standard CP/M machine
Dragon 32	£200	6809E	1	32K	64K	32×16	Tv(M+)	●	256×192	W				1	4	1		Cassette	Ba		D6	Tandy colour lookalike
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					2×500K5¼F	CP/M	Ba	●	M3	Includes WP/SS software
Eagle III	£2,950	Z80A	4	64K		80×24	M		80×24	W	● 1						2×1Mb5¼F	CP/M	Ba	●	M3	Includes WP/SS software
Eagle IV	£4,190	Z80A	4	64K		80×24	M		80×24	W	● 2	1			1		1×1Mb5¼F+1×12.5Mb5¼H	CP/M	Ba	●	M3	Includes WP/SS software
Eagle 1600	£6,497	8086	8	128K	512K	80×25	M	●	720×352	W 24	● 2	1		1	8		1×1Mb5¼F+1×12.5Mb5¼H	MS-DOS, CP/M 86		●	M3	High speed IBM copy
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
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
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	Still on a promise
Genie I	£330	Z80	1.7	16K	48K	64×16	Tv(M+)		128×48	W				1	1	1		Cassette	Ba	●	L2	Compatible with TRS 80/I
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	£2,242	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	£224	Z80	2.2	16K	32K	40×24	Tv(M+)	●	160×96	W 8	● 1	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
Hawk Model 110	£2,070	Z80A	4	64K	256K	*	(M+)*	●	*	*		2	1		3		2×390K5¼F	CP/M, MP/M2		●	L6	*Choose your terminal
Hawk Model 2110	£5,405	Z80A	4	64K	256K	*	(M+)*	●	*	*		2	1		3		1×390K5¼F+1×21MbH	CP/M, MP/M2		●	L6	*Choose your terminal
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
Haywood Hinet	£10,982	Z80	4	64K	128K	80×24	M			W 34	● 3	1		1			1×11Mb8H	CP/M		●	H1	Large network machine
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	£1,541	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

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HP Series 100, 120	£2,362	Z80A	3.68	64K	80x24	M	80x24	W 8	2	1	1	1	2	CP/M	Ba	H2	Top end HP business system
HP Series 200 Model 16A	£3,212	68000	8	128K	750K	M	80x25	W 5	1	1	1	1	2	HP		H2	Genuine 16-bit
Hytech H4500	£4,310	Z80	4	64K	208K	M	80x25	W 26	1	1	1	1	3	CP/M	Ba	H3	Standard CP/M micro
IBM PC	£2,392	8088	4.7	64K	576K	(M+)	80x25	W 10	1	1	1	1	5	MS-DOS	Ba	I9	Slow but reliable
ICL PC Model 10	£2,754	8085	3	64K	256K	Tv(M+)	80x24	W 11	2	2	2	2	8	CP/M	Ba	I4	Repackaged Rair Black Box
ICL PC Model 31	£4,939	8085	3	256K	256K	(M+)	80x24	W 11	4	4	4	4	8	CP/M, MP/M	Ba	I4	Multi user Black box
ICL PC Model 32	£6,037	8085	3	256K	80x24	(M+)	80x24	W 11	8	8	8	8	8	CP/M, MP/M	Ba	I4	Top of ICL range
IDS Datamachine	£1,995	Z80	4	64K	1Mb	Tv(M+)	*		2	2	2	2	15	CP/M	Ba	I8	*Depends on terminal
IO Tech Iona	£2,539	Z80	4	69K	960K	M	80x24	W 12	1	1	1	1	8	CP/M		I5	Good colour versatility
Irvine Business Systems	£1,489	Z80	4	64K		M	80x25	W	2	2	2	2		CP/M		I6	Inexpensive CP/M machine
ITT 3030	£3,105	Z80A	4	64K	256K	Tv(M+)	80x24	W 8	1	1	1	1	1	CP/M, BOS		I7	Top end business system
Jupiter Ace	£90	Z80	3.25	3K	51K	Tv(M+)	32x24	C					1		Fr	J1	Native Forth machine
Kalamazoo 1050	£3,450	8085	6	64K			80x24	W 10	1	1	1	1		Kalamazoo		K3	Only Kabor language
Kemtron K2000E	£2,242	Z80	4	64K		(M+)	80x24	W	2	2	2	2	11	CP/M		K4	Scientific Keyboard
Kemtron K3000	£3,795	Z80	4	64K	256K	(M+)	80x24	W	2	2	2	2	14	CP/M, MP/M		K4	For scientific use
Kenilworth 83G	£1,953	Z80A	4	64K		TvM	80x25	W 10	1	1	1	1	5	CP/M		K5	British portable
Kenilworth 83N	£2,012	Z80	4	64K		TvM	80x25	W 10	1	1	1	1	5	CP/M	Ba	K5	Includes Basic
Kontron RSI 80	£3,306	Z80	4	64K	128K	M	80x25	W 16	2	2	2	2	8	Kontron	Ba	K6	O/S CP/M based
LSI M3	£2,064	Z80	2.5	64K		M	80x24	W 31	1	1	1	1		CP/M		L3	Big, British and CP/M
LSI M4	£2,472	8088	5	128K	256K	M	80x24	W 31	2	2	2	2	1	CP/M 86, CP/M80		L3	Z80 for 8-bit software
Logica VTS Vliesse	£2,863	8086	5	64K	256K	M	80x24	W 12	1	1	1	1	4	CP/M, MS-DOS	Ba	L4	High-res colour graphics
Marin Chip M9900	£5,750	9900	3	64K	1.6Mb	M	24x80	W 8	4	4	4	4	12	MOS, MDEX	Ba	M2	Genuine 16-bit
Micro Five 1000	£5,175	8088	8	128K	512K	TvM	25x80	W 20	10	10	10	10	2	*		F2	*Choose your own O/S
Micro Five 3000	£10,350	8086	5	128K	1Mb	TvM	25x80	W 20	5	5	5	5	3	*		F2	*Choose your own O/S
Microdecision	£1,144	Z80	4	64K		(M+)	80x24	*	2	2	2	2		CP/M	Ba, Pilot	I2	*Terminal extra
Microsolution British Genius	£1,840	Z80	4	64K		TvM	80x24	W 21	1	1	1	1		CP/M		M4	'Genius' by nature?
Millbank SX10	£2,754	Z80A	4	65K	256K	M	80x25	W 10	2	2	2	2	1	CP/M	As	M5	Scientific applications
Molecular M200	£5,462	Z80	4	64K	320K	(M+)		*	2	2	2	2	16	CP/M	BaAs	G2	*Terminal required
Monroe EC8800	£2,990	Z80A	3	128K		M	40x24	W 32	3	3	3	3	3	Monroe	BaPaPilot	F3	Only 40-character screen
Monroe OC8810	£3,162	Z80A	3	128K		M	80x24	W 32	3	3	3	3	2	Monroe	BaPa	F3	Bigger model available
Multitech MPFII	£269	6502	1.2	64K		Tv(M+)	40x24	C	1	1	1	1	1	Cassette	Ba	S8	Apple soft compatible
Nascom 2	£327	Z80A	4	2K	64K	Tv(M+)	16x48	W	1	1	1	1	4	NAS, SYS	BaAs	L5	Old reliable
Nascom 3	£549	Z80	4	48K		Tv(M+)	16x48	W	1	1	1	1	4	NAS, SYS	BaAs	L5	Fully expanded Nascom
NEC PC8000	£1,454	Z80	4	32K	64K	M	80x25	W 10	2	2	2	2		CP/M, NEC, DOS	Ba	N1	Superb colour graphics
New Brain A	£269	Z80A	4	64K	512K	M	80x24	C	2	2	2	2	1	Cassette	Ba	G3	A lot of promise
North Star Advantage	£2,766	Z80	4	64K		*	80x24	W 15	1	1	1	1	6	CP/M		T9	16-bit option
North Star Horizon	£2,294	Z80	4	64K	512K	*		*	2	2	2	2	1	North Star DOS	Ba	T9	*Choose your own terminal
Olivetti M20D	£2,754	Z8000	3	160K	512K	M	80x25	W	1	1	1	1	5	PCOS	Ba	B6	Real 16-bit
Olympia Boss Model A	£2,645	Z80A	4	64K		M	80x28	W 10	1	1	1	1	4	CP/M		O1	Useful 28 lines on screen
Onyx 5001 MU	£7,607	Z80A	4	128K	256K	*	*	*	5	5	5	5		CP/M	Ba	T2	*Terminal extra; other models
Oric 1	£100	6502A	1	16K	48K	Tv(M+)	40x28	C					1	Cassette	Ba	O2	Expects Delivery delays
Osborne 1	£1,581	Z80	4	64K		M	52x24	W 10	1	1	1	1		CP/M	Ba	O3	Portable, includes software
Panasonic JD 800M	£3,795	8085A	4	60K		M	80x24	W 21	3	3	3	3		CP/M	Ba	P1	Larger model costs £5,002
Pasca 640	£1,437	Z80A	4	64K		M	80x24	W	1	1	1	1		CP/M		W1	Regular CP/M micro
Pascal Modular Microengine	£7,003	WD9000	2	128K		*	*	*	4	4	4	4	8	UCSD-P	Pa	P2	*Terminal extra
Phillips P3500	£3,000	Z80A	4	64K	320K	M	80x25	W 11	2	2	2	2		Turbo-DOS	Co	P3	Fast O/S as standard
Positron 900	£1,259	6809	1	64K	256K	(M+)	*	*	4	4	4	4	3	O/S9	Ba	P4	*You choose your terminal
Positron 9000	£2,134	6809	1	64K	256K	TvM	80x24	W 12	4	4	4	4	3	O/S9	Ba	P4	Multi user version
Quantum 2000	£2,587	Z80A	4	64K	512K	M	80x25	W 18	1	1	1	1	5	CP/M		Q1	Mono, low-res graphics
Rair Black Box Model 3/20S	£2,242	8085	5	64K	512K	M	80x25	W 10	2	2	2	2	8	CP/M	Ba	R1	*VDU extra; many versions
Rair Business Computer	£6,037	8088	5	256K	1Mb	(M+)	80x25	W 21	1	1	1	1	4	CP/M, PCDOS	Ba	R1	Hybrid 8/16 bit
Racal 6000	£6,327	Z80	5	64K	256K	M	80x26	W	1	1	1	1		CP/M		R2	CP/M languages available
Research Machines 380Z	£2,147	Z80A	4	32K	56K	Tv(M+)	40x24	W	4	4	4	4		CP/M	Ba	R3	Widely used in schools
Research Machines Link 480Z	£650	Z80A	4	32K	256K	Tv(M+)	40x24	W 4	2	2	2	2	1	Cassette	Ba	R3	CP/Net version available
Sage II	£4,019	68000	8	128K	512K	(M+)	*	*	2	2	2	2	1	UCSD-P System	BaAsPaFn	T10	*Terminal extra

Make and model

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Make and model	Price inc VAT	Processor type	Speed in MHz	Standard RAM	Max RAM at extra cost	Display		Graphics	Keyboard		Interfaces built-in				Storage		Operating system	Languages inc	Other languages available	Distributor	Comments
						Max characters	Method (at extra cost)		Type of keyboard	No. of function keys	No. of RS232	No. of Centronics	No. of IEEE 488	No. of others	No. of expansion slots	Cassette facility					
Samurai	£3,214	8086	4.6	128K	768K	80x25	M	720x400	W	17	3	1	1	3	2	2x1.2Mb8F	MS DOS, CP/M 86		M6		High-res colour graphics Standard CP/M model
Sanyo MBC 1000	£1,195	Z80A	4	64K		80x25	M	80x25	W	17	3	1	1	1	1	1x320K5¼F	CP/M	Ba	L1		High-res graphics
Sanyo MBC 1250	£2,294	Z80	4	64K		80x40	M	640x400	W	24	2	1	1	1	1	2x640K5¼F	CP/M	Ba	L1		High-res graphics
Sanyo MBC 2000	£2,242	8085A	5	64K		80x24	M	80x24	W	24	2	1	1	2	2	2x328K5¼F	CP/M	Ba	L1		Big disc model costs £3,622
Sanyo MBC 4050	£2,817	8086	5	128K	512K	80x24	M	80x24	W	24	2	1	1	1	1	2x640K5¼F	CP/M 86	Ba	L1		Pseudo 16-bit
Seed System 1	£2,300	6800	2	32K	64K	80x24	M	80x24	W	3	2	2	2	8	8	2x160K5¼F	DOS 68 Flex OS-9	Ba	S3		Aging business machine
Seed System 19	£2,600	6809	2	48K	1Mb	80x24	M	80x24	W	3	2	2	2	8	8	2x160K5¼F	OS-9	Ba	S3		Latest from Seed
Sharp M280A	£549	Z80	2	48K		40x25	M	80x50	W	10	3	1	1	1	1		Sharp Basic	Ba	S4		CP/M facility extra
Sharp M280B	£900	Z80	4	64K		80x25	M	320x200	C	10	3	1	1	1	1		Sharp Basic	Ba	S4		Unusual keyboard
Sharp PC1251	£79.95	Cust.	.58	4.2K			LCD	24x1	C	18	3	1	1	1	1		Sharp Basic	Ba	S4		Pocket computer
Sharp PC1500	£170	Cust.	1.3	3.5K	11.5K	26x1	LCD	156x7	C	6	1	1	1	2	2		Cassette	Ba	S4		Optional 4-pen plotter
Sharp PC3201	£2,300	Z80A	2.6	64K	112K	80x25	M	160x50	W	10	2	1	1	5	5	2x500K5¼F	Sharp Basic	Ba	S4		Powerful Sharp Basic
Signet 10025	£1,599	Z80B	6	64K		80x24	M	512x512	W	10	2	1	1	1	1	2x200K5¼F	CP/M, Macnos	Ba	A6		Choice of keyboards
Sinclair ZX81	£50	Z80A	3.5	1K	16K	32x24	Tv	64x44	C	10	2	1	1	1	1		Cassette	Ba	S5		Sold a million
Sinclair Spectrum	£125	Z80A	3.5	16K	48K	32x24	Tv	256x192	C	10	2	1	1	1	1		Cassette	Ba	S5		Very popular home micro
Sirius I	£2,754	8088	5	128K	896K	80x25	M	800x400	W	7	2	1	1	4	4	2x600K5¼F	CP/M 86, MS/DOS	Ba	A7		IBM style
Sord M5	£218	Z80A	4	4K	16K	40x24	Tv(M+)	256x196	C	10	2	1	1	2	2		Cassette	Ba	S6		Japanese home computer
Sord M23	£1,932	Z80A	4	128K		80x25	M	640x200	W	14	2	1	1	2	2	2x330K5¼F	Sord O/S, SB80	BaPips	S6		CP/M compatible
Sord M23P	£2,369	Z80A	4	128K		80x25	Tv(M+)	640x200	W	14	2	1	1	2	2	2x290K3¼F	Sord O/S, SB80	BaPips	S6		Complete with suitcase
Sord M223	£3,277	Z80	4	64K		80x25	M	640x200	W	15	2	1	1	4	4	2x350K5¼F	Sord O/S, SB80	BaPips	S6		Standard business machine
Sord M243	£5,842	Z80	4	192K		80x25	M	640x400	W	15	2	1	1	4	4	2x1Mb8F	Sord O/S, SB80	BaPips	S6		Large and powerful
SW Technical Products SO/9	£5,750	6809	2	256K	1.2Mb	80x24	M	80x24	W	15	2	1	1	16	16	2x1.5Mb5¼F	Flex, Unixflex	Ap	M1		Top end SWTP
Spectrum	£11,442	68000	8	256K	4Mb		(M+)				4	1	1			2x720K5¼F	Mirage	Ap	M1		*As terminal
Sundance I	£6,969	Z80A	4	64K	256K	132x24	M	128x48	W	4	1	1	1			1x7Mb5¼H	CP/M	Ba	T2		Ordinary CP/M machine
Sundance II	£8,205	Z80A	4	128K	256K	132x24	M	80x24	W	4	1	1	1			1x7Mb5¼H	CP/M	Ba	T2		Middle-range Sundance
Sundance 16	£10,480	Z8001	6	256K	1Mb	80x24	M	128x48	W	4	1	1	1			1x14Mb5¼H	BOS	Ba	T2		Tape backup for hard disc
Superbrain JR	£2,150	Z80	4	64K		80x24	M	560x240	W	15	2	1	1	1	1	2x160K5¼F	CP/M	Ba	I10		Bigger models available
Superstar	£6,296	Z80	4	64K		80x24	Tv(M+)	80x24	W	15	2	1	1	8	8	1x10Mb5¼H+1x400K5¼F	CP/M 80	Ba	B7		Includes hard disk
Tandberg EC10	£3,000	8080A	2	64K		80x25	M	80x24	W	15	2	1	1			1x250K8F	CP/M, TOS	Ba	T3		Very early machine
Tandy TRS-80 Model I	£199	Z80	1.7	16K	48K	64x16	Tv(M+)	128x48	W	10	2	1	1				TRS-DOS	Ba	T4		Old faithful
Tandy TRS-80 Model II	£1,999	Z80A	4	64K	256K	80x24	M	80x24	W	2	2	1	1			1x500K8F	TRS-DOS	Ba	T4		Big business machine
Tandy TRS-80 Model III	£1,699	Z80A	2	48K		64x16	M	128x48	W	10	2	1	1			2x184K5¼F	TRS-DOS	Ba	T4		Latest TRS80
Tandy TRS-80 Model 16	£4,199	68000	8	128K	512K	80x24	M	576x424	W	2	2	1	1			2x1.2Mb8F	TRS-DOS	BaAs	T4		True 16-bit
Tandy TRS-80 Colour Computer	£240	6809E	1	16K	32K	32x16	Tv	256x192	W	10	2	1	1				Cassette	Ba	T4		Very popular
Tandy TRS-80 Pocket Computer	£57	Cust.				24x1	LCD	24x1	C	5	1	1	1				Cassette	Ba	T4		Single-line display
Tandy TRS-80 Pocket Computer 2	£179	Cust.	1.3	2.6K	16K	26x1	LCD	156x7	C	6	1	1	1				Cassette	Ba	T4		Plotter available
Televideo TS-80ZH	£4,533	Z80	4	64K		80x24	M	80x24	W	15	2	1	1			1x256K5¼F+1x7Mb5¼H	CP/M	C11			Recently upgraded
Televideo TS-800 Series	£1,495	Z80A	4	64K		80x24	M	80x24	W	15	2	1	1				CP/M	C11			Standard CP/M machine
Televideo TS 1602-C	£3,714	8088	5	128K	256K	80x24	M	576x424	W	15	2	1	1			2x256K5¼F	CP/M-86	C11			Graphics, but no colour
Texas Instruments TI-99/4A	£150	9900	3.5	16K	52K	32x24	Tv(M+)	256x192	W	12	1	1	1	2	2		DOS	Ba	C15		This has sprite graphics
TI System 200-250	£6,695	9900	4	64K		80x24	M	80x24	W	12	1	1	1			1x5Mb5¼H	UCSD-P, PX10	C15			Bigger version available
TMK 332	£2,242	8085A	5	64K		80x24	M	190x96	W	22	2	1	1			2x320K5¼F	CP/M	Ba	P5		*6502 I/O processor
Torch	£3,214	Z80*	4/2	96K		80x30	TvM	640x256	W	15	1	1	1	4	4	2x400K5¼F	CPN	Ba	T6		CP/M compatible
Toshiba T-100	£1,900	Z80A	4	64K	96K	80x25	TvM	640x200	W	8	1	1	1	2	2	2x256K5¼F	CP/M	Ba	O4		Pro test March 18
Toshiba T-200	£2,242	8085	2.6	64K		80x24	M	80x24	W	15	1	1	1			2x256K5¼F	CP/M	Ba	O4		Standard CP/M machine
Transcan	£1,983	Z80A	4	64K		80x24	TvM	540x288	W	15	2	1	1	5	5	2x190K5¼F	CP/M	C11			S-100 machine

Transtec BC2	£1,949	Z80A	4	64K	256K	80x24	M	80x24	W 13	W 15	W 17	W 19	W 21	W 23	W 25	W 27	W 29	W 31	W 33	W 35	W 37	W 39	W 41	W 43	W 45	W 47	W 49	W 51	W 53	W 55	W 57	W 59	W 61	W 63	W 65	W 67	W 69	W 71	W 73	W 75	W 77	W 79	W 81	W 83	W 85	W 87	W 89	W 91	W 93	W 95	W 97	W 99	W 101	W 103	W 105	W 107	W 109	W 111	W 113	W 115	W 117	W 119	W 121	W 123	W 125	W 127	W 129	W 131	W 133	W 135	W 137	W 139	W 141	W 143	W 145	W 147	W 149	W 151	W 153	W 155	W 157	W 159	W 161	W 163	W 165	W 167	W 169	W 171	W 173	W 175	W 177	W 179	W 181	W 183	W 185	W 187	W 189	W 191	W 193	W 195	W 197	W 199	W 201	W 203	W 205	W 207	W 209	W 211	W 213	W 215	W 217	W 219	W 221	W 223	W 225	W 227	W 229	W 231	W 233	W 235	W 237	W 239	W 241	W 243	W 245	W 247	W 249	W 251	W 253	W 255	W 257	W 259	W 261	W 263	W 265	W 267	W 269	W 271	W 273	W 275	W 277	W 279	W 281	W 283	W 285	W 287	W 289	W 291	W 293	W 295	W 297	W 299	W 301	W 303	W 305	W 307	W 309	W 311	W 313	W 315	W 317	W 319	W 321	W 323	W 325	W 327	W 329	W 331	W 333	W 335	W 337	W 339	W 341	W 343	W 345	W 347	W 349	W 351	W 353	W 355	W 357	W 359	W 361	W 363	W 365	W 367	W 369	W 371	W 373	W 375	W 377	W 379	W 381	W 383	W 385	W 387	W 389	W 391	W 393	W 395	W 397	W 399	W 401	W 403	W 405	W 407	W 409	W 411	W 413	W 415	W 417	W 419	W 421	W 423	W 425	W 427	W 429	W 431	W 433	W 435	W 437	W 439	W 441	W 443	W 445	W 447	W 449	W 451	W 453	W 455	W 457	W 459	W 461	W 463	W 465	W 467	W 469	W 471	W 473	W 475	W 477	W 479	W 481	W 483	W 485	W 487	W 489	W 491	W 493	W 495	W 497	W 499	W 501	W 503	W 505	W 507	W 509	W 511	W 513	W 515	W 517	W 519	W 521	W 523	W 525	W 527	W 529	W 531	W 533	W 535	W 537	W 539	W 541	W 543	W 545	W 547	W 549	W 551	W 553	W 555	W 557	W 559	W 561	W 563	W 565	W 567	W 569	W 571	W 573	W 575	W 577	W 579	W 581	W 583	W 585	W 587	W 589	W 591	W 593	W 595	W 597	W 599	W 601	W 603	W 605	W 607	W 609	W 611	W 613	W 615	W 617	W 619	W 621	W 623	W 625	W 627	W 629	W 631	W 633	W 635	W 637	W 639	W 641	W 643	W 645	W 647	W 649	W 651	W 653	W 655	W 657	W 659	W 661	W 663	W 665	W 667	W 669	W 671	W 673	W 675	W 677	W 679	W 681	W 683	W 685	W 687	W 689	W 691	W 693	W 695	W 697	W 699	W 701	W 703	W 705	W 707	W 709	W 711	W 713	W 715	W 717	W 719	W 721	W 723	W 725	W 727	W 729	W 731	W 733	W 735	W 737	W 739	W 741	W 743	W 745	W 747	W 749	W 751	W 753	W 755	W 757	W 759	W 761	W 763	W 765	W 767	W 769	W 771	W 773	W 775	W 777	W 779	W 781	W 783	W 785	W 787	W 789	W 791	W 793	W 795	W 797	W 799	W 801	W 803	W 805	W 807	W 809	W 811	W 813	W 815	W 817	W 819	W 821	W 823	W 825	W 827	W 829	W 831	W 833	W 835	W 837	W 839	W 841	W 843	W 845	W 847	W 849	W 851	W 853	W 855	W 857	W 859	W 861	W 863	W 865	W 867	W 869	W 871	W 873	W 875	W 877	W 879	W 881	W 883	W 885	W 887	W 889	W 891	W 893	W 895	W 897	W 899	W 901	W 903	W 905	W 907	W 909	W 911	W 913	W 915	W 917	W 919	W 921	W 923	W 925	W 927	W 929	W 931	W 933	W 935	W 937	W 939	W 941	W 943	W 945	W 947	W 949	W 951	W 953	W 955	W 957	W 959	W 961	W 963	W 965	W 967	W 969	W 971	W 973	W 975	W 977	W 979	W 981	W 983	W 985	W 987	W 989	W 991	W 993	W 995	W 997	W 999	W 1001	W 1003	W 1005	W 1007	W 1009	W 1011	W 1013	W 1015	W 1017	W 1019	W 1021	W 1023	W 1025	W 1027	W 1029	W 1031	W 1033	W 1035	W 1037	W 1039	W 1041	W 1043	W 1045	W 1047	W 1049	W 1051	W 1053	W 1055	W 1057	W 1059	W 1061	W 1063	W 1065	W 1067	W 1069	W 1071	W 1073	W 1075	W 1077	W 1079	W 1081	W 1083	W 1085	W 1087	W 1089	W 1091	W 1093	W 1095	W 1097	W 1099	W 1101	W 1103	W 1105	W 1107	W 1109	W 1111	W 1113	W 1115	W 1117	W 1119	W 1121	W 1123	W 1125	W 1127	W 1129	W 1131	W 1133	W 1135	W 1137	W 1139	W 1141	W 1143	W 1145	W 1147	W 1149	W 1151	W 1153	W 1155	W 1157	W 1159	W 1161	W 1163	W 1165	W 1167	W 1169	W 1171	W 1173	W 1175	W 1177	W 1179	W 1181	W 1183	W 1185	W 1187	W 1189	W 1191	W 1193	W 1195	W 1197	W 1199	W 1201	W 1203	W 1205	W 1207	W 1209	W 1211	W 1213	W 1215	W 1217	W 1219	W 1221	W 1223	W 1225	W 1227	W 1229	W 1231	W 1233	W 1235	W 1237	W 1239	W 1241	W 1243	W 1245	W 1247	W 1249	W 1251	W 1253	W 1255	W 1257	W 1259	W 1261	W 1263	W 1265	W 1267	W 1269	W 1271	W 1273	W 1275	W 1277	W 1279	W 1281	W 1283	W 1285	W 1287	W 1289	W 1291	W 1293	W 1295	W 1297	W 1299	W 1301	W 1303	W 1305	W 1307	W 1309	W 1311	W 1313	W 1315	W 1317	W 1319	W 1321	W 1323	W 1325	W 1327	W 1329	W 1331	W 1333	W 1335	W 1337	W 1339	W 1341	W 1343	W 1345	W 1347	W 1349	W 1351	W 1353	W 1355	W 1357	W 1359	W 1361	W 1363	W 1365	W 1367	W 1369	W 1371	W 1373	W 1375	W 1377	W 1379	W 1381	W 1383	W 1385	W 1387	W 1389	W 1391	W 1393	W 1395	W 1397	W 1399	W 1401	W 1403	W 1405	W 1407	W 1409	W 1411	W 1413	W 1415	W 1417	W 1419	W 1421	W 1423	W 1425	W 1427	W 1429	W 1431	W 1433	W 1435	W 1437	W 1439	W 1441	W 1443	W 1445	W 1447	W 1449	W 1451	W 1453	W 1455	W 1457	W 1459	W 1461	W 1463	W 1465	W 1467	W 1469	W 1471	W 1473	W 1475	W 1477	W 1479	W 1481	W 1483	W 1485	W 1487	W 1489	W 1491	W 1493	W 1495	W 1497	W 1499	W 1501	W 1503	W 1505	W 1507	W 1509	W 1511	W 1513	W 1515	W 1517	W 1519	W 1521	W 1523	W 1525	W 1527	W 1529	W 1531	W 1533	W 1535	W 1537	W 1539	W 1541	W 1543	W 1545	W 1547	W 1549	W 1551	W 1553	W 1555	W 1557	W 1559	W 1561	W 1563	W 1565	W 1567	W 1569	W 1571	W 1573	W 1575	W 1577	W 1579	W 1581	W 1583	W 1585	W 1587	W 1589	W 1591	W 1593	W 1595	W 1597	W 1599	W 1601	W 1603	W 1605	W 1607	W 1609	W 1611	W 1613	W 1615	W 1617	W 1619	W 1621	W 1623	W 1625	W 1627	W 1629	W 1631	W 1633	W 1635	W 1637	W 1639	W 1641	W 1643	W 1645	W 1647	W 1649	W 1651	W 1653	W 1655	W 1657	W 1659	W 1661	W 1663	W 1665	W 1667	W 1669	W 1671	W 1673	W 1675	W 1677	W 1679	W 1681	W 1683	W 1685	W 1687	W 1689	W 1691	W 1693	W 1695	W 1697	W 1699	W 1701	W 1703	W 1705	W 1707	W 1709	W 1711	W 1713	W 1715	W 1717	W 1719	W 1721	W 1723	W 1725	W 1727	W 1729	W 1731	W 1733	W 1735	W 1737	W 1739	W 1741	W 1743	W 1745	W 1747	W 1749	W 1751	W 1753	W 1755	W 1757	W 1759	W 1761	W 1763	W 1765	W 1767	W 1769	W 1771	W 1773	W 1775	W 1777	W 1779	W 1781	W 1783	W 1785	W 1787	W 1789	W 1791	W 1793	W 1795	W 1797	W 1799	W 1801	W 1803	W 1805	W 1807	W 1809	W 1811	W 1813	W 1815	W 1817	W 1819	W 1821	W 1823	W 1825	W 1827	W 1829	W 1831	W 1833	W 1835	W 1837	W 1839	W 1841	W 1843	W 1845	W 1847	W 1849	W 1851	W 1853	W 1855	W 1857	W 1859	W 1861	W 1863	W 1865	W 1867	W 1869	W 1871	W 1873	W 1875	W 1877	W 1879	W 1881	W 1883	W 1885	W 1887	W 1889	W 1891	W 1893	W 1895	W 1897	W 1899	W 1901	W 1903	W 1905	W 1907	W 1909	W 1911	W 1913	W 1915	W 1917	W 1919	W 1921	W 1923	W 1925	W 1927	W 1929	W 1931	W 1933	W 1935	W 1937	W 1939	W 1941	W 1943	W 1945	W 1947	W 1949	W 1951	W 1953	W 1955	W 1957	W 1959	W 1961	W 1963	W 1965	W 1967	W 1969	W 1971	W 1973	W 1975	W 1977	W 1979	W 1981	W 1983	W 1985	W 1987	W 1989	W 1991	W 1993	W 1995	W 1997	W 1999	W 2001	W 2003	W 2005	W 2007	W 2009	W 2011	W 2013	W 2015	W 2017	W 2019	W 2021	W 2023	W 2025	W 2027	W 2029	W 2031	W 2033	W 2035	W 2037	W 2039	W 2041	W 2043	W 2045	W 2047	W 2049	W 2051	W 2053	W 2055	W 2057	W 2059	W 2061	W 2063	W 2065	W 2067	W 2069	W 2071	W 2073	W 2075	W 2077	W 2079	W 2081	W 2083	W 2085	W 2087	W 2089	W 2091	W 2093	W 2095	W 2097	W 2099	W 2101	W 2103	W 2105	W 2107	W 2109	W 2111	W 2113	W 2115	W 2117	W 2119	W 2121	W 2123	W 2125	W 2127	W 2129	W 2131	W 2133	W 2135	W 2137	W 2139	W 2141	W 2143	W 2145	W 2147	W 2149	W 2151	W 2153	W 2155	W 2157	W 2159	W 2161	W 2163	W 2165	W 2167	W 2169	W 2171	W 2173	W 2175	W 2177	W 2179	W 2181	W 2183	W 2185	W 2187	W 2189	W 2191	W 2193	W 2195	W 2197	W 2199	W 2201	W 2203	W 2205	W 2207	W 2209	W 2211	W 2213	W 2215	W 2217	W 2219	W 2221	W 2223	W 2225	W 2227	W 2229	W 2231	W 2233	W 2235	W 2237	W 2239	W 2241	W 2243	W 2245	W 2247	W 2249	W 2251	W 2253	W 2255	W 2257	W 2259	W 2261	W 2263	W 2265	W 2267	W 2269	W 2271	W 2273	W 2275	W 2277	W 2279	W 2281	W 2283	W 2285	W 2287	W 2289	W 2291	W 2293	W 2295	W 2297	W 2299	W 2301	W 2303	W 2305	W 2307	W 2309	W 2311	W 2313	W 2315	W 2317	W 2319	W 2321	W 2323	W 2325	W 2327	W 2329	W 2331	W 2333	W 2335	W 2337	W 2339	W 2341
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Wanted ZX Spectrum 16 or 48K, must be in good condition. Leeds 641505.

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Atari 400 computer complete with cassette player, basic cartridge, tutorial and graphics manuals, Star Raiders, Joystick etc. (eight months guarantee remaining). Boxed as new only £195. Reading 416382.

For sale Atari VCS perfect working order, new joysticks and mains adaptor cartridges include Space Invaders, Asteroids. Actual value £170. Asking price: £130 ono after 4pm, Newquay 3693. Ask for Allan.

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Printer cable for TRS-80 (Centronics parallel). £25. Steve Barrett 584-5000 ext 3575 (day) 651-4249 (evenings).

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Vic 20 Adventureland cartridge. £16. 3K RAM. £15. Both as new. 28, Sidney Street, Folkestone, Kent. 50926.

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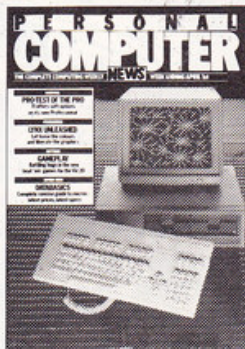
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Features: computer chess, Ocam parallel processing language, Victor/Sirius function keys.
ProgramCards: Towers of Bramah (Pascal), Biorhythm (Apple II), Roman Year (Apple II), Shape Utility (Apple II).
Gameplay: Darts, Soccer (Atari); Castle of Riddles (BBC Model B); Pimania (Spectrum); Flight Simulator (IBM PC).
Databasics: micros and peripherals.



Issue 2, March 25
Pro-Tests: Toshiba T100, Casio PB100, ZX81/Basicare, Vic speech synthesiser, Spectrum spreadsheet, IBM graphics, BBC word processing.
Features: Colecovision, micro backgammon, nursery computing.
Gameplay: Ultima II (Apple), Trader (ZX81), Starquest (Vic 20), Hungry Horace (Spectrum).
ProgramCards: String editor (Spectrum), Analogue Clock (BBC Model B), Chart generator (Spectrum), String extract/replace.
Databasics: full software listings.



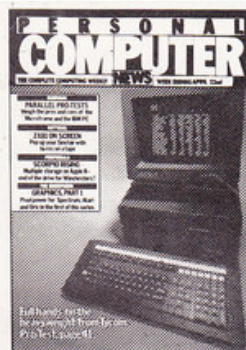
Issue 3, April 1
Pro-Tests: TI Professional, Apple speech synthesiser, Facit 410 printer, IBM keyboards, Petspeed compiler, Sirius toolkit, Dragoncalc.
Features: Atom upgrade, Lynx programming, Apple music.
Gameplay: Mangrove (Vic 20), Mutant Herd (Vic 20), Compendium (Dragon), Patience (Spectrum), Noughts and Crosses (Dragon), Great Britain Ltd (Spectrum), Ulysses (IBM PC).
ProgramCards: Magnify (Spectrum), Spider (Vic 20), Firing Range (BBC).
Databasics: micros.
Micropaedia: Anatomy of the BBC, part 3.



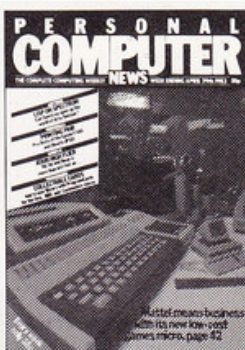
Issue 4, April 8
Pro-Tests: Pied Piper Communicator, Olympia ESW3000 printer, Namal Supertalker, Commodore Calcresult, Spectrum Pascal, Cashbook (BBC).
Gameplay: Dark Crystal (Apple II), St George (Dragon), Wizard War (Dragon).
ProgramCards: Fruit Machine (C64), Tunesmith (Oric), Array Editor.
Databasics: peripherals.
Clubnet Micropaedia: Go Forth, part 1.



Issue 5, April 15
Pro-Tests: Commodore 700, Ikon Hobbit, 1-2-3 (IBM), ZX81 machine code.
Features: speech packs, monitors.
Gameplay: Grand Prix (Dragon), Derby Day (Spectrum), Deadline (Apple).
ProgramCards: Wacky Racers (Oric), Fruit Machine (C64), Parse Integer.
Databasics: Software.
Clubnet: full list of user groups.
Micropaedia: Go Forth, part 2.



Issue 6, April 22
Pro-Tests: Tycom Microframe, IBM PC, Scorpio Disks, Dragon sound module, ZX81 graphics, Bottom Line Strategist (CP/M), PaperClip word processor.
Features: IBM PC DOS, BBC word processing, PC-1251.
Gameplay: Mined Out (Spectrum), Transylvanian Tower (Spectrum), Lunar Lopper (Apple II), Evolution (Apple II).
ProgramCards: Wacky Racers (Oric), Mortgage Comparison (Sharp MZ80K), Computer Set Up (BBC), Day of Week.
Databasics: micros.
Micropaedia: Graphics, part 1.



Issue 7, April 29
Pro-Tests: Mattel Aquarius, Epson FX80, Olivetti JP101, Lisp on Spectrum, Vic 20 assembler, Supergrat on Victor/Sirius.
Features: Dealer support, Atari graphics.
Gameplay: Krakit (ZX81), Cruising On Broadway (Spectrum), Kaktus (Vic 20), Fantastic Voyage (ZX81).
ProgramCards: CBM controls, Computer Set Up (BBC), Wacky Racers (Oric), Julian Dates.
Databasics: Peripherals.
Micropaedia: Graphics part 2.

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Anatomy of the BBC micro

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Go Forth

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

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

Graphics

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

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

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Hot tip

If you work with computers in a British office block, watch out for summer.

According to a study by UK design consultants, the lack of air-conditioning is a real problem in high-tech high-rise.

And we can vouch for that. PCN's Torch began to crash after just half-an-hour's work. It couldn't be put down to over-zealous use, so we diagnosed overheating. The office's hot-house atmosphere, a sweltering work room which neither open windows nor anti-sun blinds can alleviate, was too much for Torch.

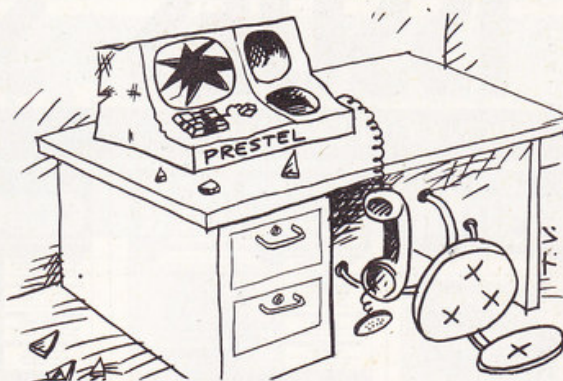
But we've solved it now. We've propped it up with two large blocks so the air can circulate faster to the fan intake (which, oddly enough, is underneath the machine).

Syntax Errors

St George drags on

Whoops! What's worse than an error is an incorrect correction. Gremlins again. The people at Computer Rentals want you to know that they reckon St George and the Dragon for the Dragon 32 (PCN, April 8) takes up 25K — not 29K.

Laugh line



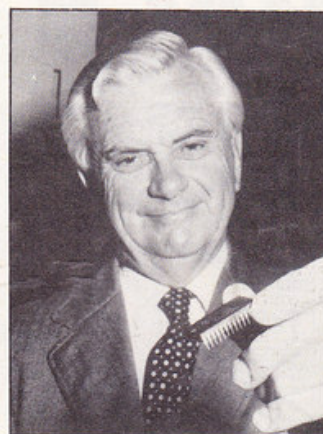
The game of Vandals has impact but lacks lasting appeal.

Okay you wits and wondrous captioners... so a good number of you proved smarter than your average PCN pundit! Entries for laughline, where we asked you to caption a cartoon none of us could understand, almost flooded in. We had more than 40 by the closing date, April 29.

Trying to choose the funniest

was not such a joke, but after careful sifting the cartoonist, Anthony Vesely and the editor agreed that the £20 prize should go to Mr C Blake of Portsmouth, whose winning laughline is printed above.

And since we think you enjoyed the competition (it gave a lot of light relief here) we'll do it again.

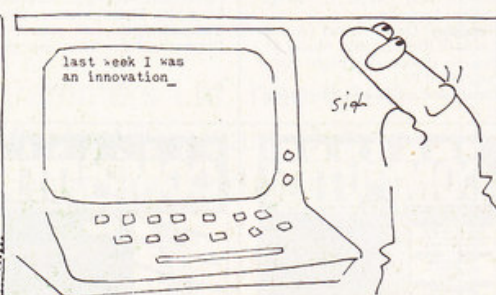


Newcaster Kenneth Kendall has clocked up a lot of hours on the BBC — but now he's taken time out to become a talking computer. He's keeping it in the family, though. His dulcet tones have been used by Acorn Computer for the voice chip for the BBC micro. And Acorn says it's the first English accent used in a home computer.

Acorn, it seems, really is a chip off the old Beeb block...

PAL2000

by Mollusc.



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UK EVENTS

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Computer Open Day Exhibition	May 12	The Post House, Southampton	Tracey Cannon, Reed Exhibitions, 01-643 8040 Philip Le Masurier, BETA, 01-405 6233
Compec Scotland	May 17-19	Kelvin Hall, Glasgow	Mario Meoli, Online Conferences, 09274 28211 Tony Kaminiski, Couchmead Communications, 01-778 1101
International Word Processing Exhibition	May 24-27	Wembley Conference Centre, Wembley	John Riding, Database Publications, 061-405 8500
Computers In The City	May 24-26	Barbican, London	
Computer Open Day	May 26	Strathmore Kotel, Luton	
Apple '83	June 3-5	Fulcrum Centre, Slough	
Office Automation Show & Conference	June 7-9	Barbican Centre, London	
4th Commodore Computer Show	June 9-11	Clapp & Polliak, 01-747 3131 Cunrad International Hotel, London	Commodore Business Machines UK, 75 74111, Ext 220 Roy Bratt, Reed Exhibitions, 01-643 8040
Computer Fair	June 16-19	Earls Court, London	

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
Compec Europe Exhibition	May 3-5	Centre Rogier, Brussels	Tracey Cannon, Reed Exhibitions, 01-643 8040
National Computer Conference & Exhibition	May 16-19	Anaheim, USA	American Federation of Information Processing Societies, 1815 N Lynn Street, Arlington, VA 22209 CETIA, PO Box 259, Roseville, Sydney, N S W 2069
Computers, Communications & Electronic Technology Exhibition & Conference	May 31-June 3	Melbourne, Australia	
International Computer Technology	June 7-10	Hong Kong Exhibition Centre, Hong Kong	Terry Hill, Industrial & Trade Fairs International Ltd, 021-705 6707



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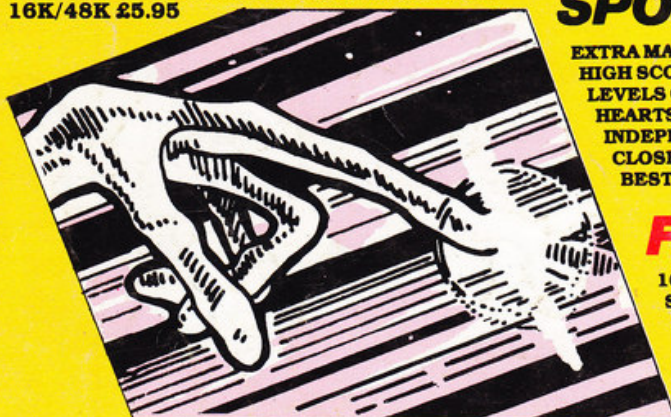
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