

PERSONAL

COMPUTER

THE COMPLETE COMPUTING WEEKLY **NEWS** MAY 27-JUNE 2, 1983 Vol 1 No 12 35p

Will the Japanese smash into British homes with the Sord M5?

Find out in PCN Pro-Test, page 42



SOFTWARE PRO-TEST

SPECTRUM SCRIBES
Two ways to put WP power on your micro

PROGRAMMING

ORIC NOTES
From Bleep to Beethoven in two easy lessons. Part 1 today

PERIPHERAL PRO-TEST

APPLE TURNOVER
Games control enters a new sphere with the TG Trackball

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Authors: I. & C. Andrew

ATARI 400/800 MAGIC WINDOW

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Author: M. Walker

As part of the plan to expand their range to cover all the most popular personal computers QUICKSILVA are proud to introduce 3 new programs for the BBC Computer, plus a version of their popular "MINED-OUT" game for the Dragon and also a character generating program for the Atari 400/800 "MAGIC WINDOW".

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**Micropaedia
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Two-part giving you the complete run-down on mechanics, storage, options and maintenance.

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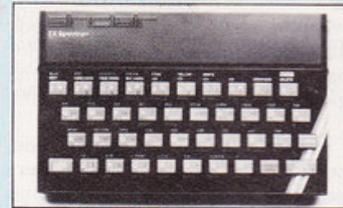
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 For less than £50, a peripheral that brings a familiar arcade aid into the home — and onto the Apple II. Ian Scales keeps it rolling.



PCN PRO-TEST: HARDWARE

- Enter the Sord M5** 42
 The spearhead of the Japanese assault on the UK market is here. At £190 it's double the price of its competitors, but the difference is worth it, says Richard King.



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 Peripherals editor Ian Scales Listings editor Sandra Grandison Editor's assistant Harriet Arnold Art director Jim Dansie Art editor Jimmy Egerton Assistant art editor Floyd Sayers Art assistant Dolores Fairman Publishing manager Fiona Collier Publishing assistant Jane Green ADVERTISING: Advertisement manager Nic Jones Assistant advertisement manager Sue Hunter Sales executives Robert Stallibrass, Matthew Parrott, Bettina Williams, Ian Whorley, Sarah Barron, Roxanna Johnston, Christian McCarthy Production manager Eva Wroblewska Advertisement assistant Jenny Dunne Subscription enquiries Simon Maggs Subscription address 53 Frith Street London W1A 2HG 01-439 4242 Editorial address 62 Oxford Street London W1A 2HG 01-636 6890 Advertising address 62 Oxford Street London W1A 2HG 01-323 3211 Published by VNU Business Publications, Evelyn House, 62 Oxford Street London W1A 2HG © VNU 1983. No material may be reproduced in whole or in part without written consent from the copyright holders. Photoset by Quicksset, 184-186 Old Street, London EC1. Printed by Chase Web Offset, St Austell, Cornwall. Distributed by Seymour Press, 334 Brixton Road, London SW9, 01-733 4444. Registered at the PO as a newspaper

BBC fills a slot

By Geof Wheelwright

The long-promised cartridge software socket for the BBC Micro will be available within two weeks.

Acorn Computers said last week that authorised BBC Micro service centres will be offering a speech synthesis/cartridge upgrade for £55 from June 1. And London BBC dealer Technomatics confirmed that it should be receiving the upgrade kits within two weeks.

The upgrade kit does two things: it fills in the perforated slot at the

left-hand side of the BBC's keyboard with an interface to plug in cartridge-based software, and it gives your BBC Micro the power of speech.

An Acorn spokesman said 'cartridge software that used the socket is expected 'in a few months' and would be 'competitively priced'. The user manual for the system, however, says that the range of cartridge software will include games, applications programs and sophisticated speech synthesis.

To use the cartridge socket, you will also need a BBC with an upgraded 1.2 machine operating system rather than the 0.1 operating system issued with many early BBCs. If it hasn't been carried out already, this upgrade will be done for no extra charge when you get the speech synthesis/cartridge ROM system installed.

The Acorn announcement points to a trend towards cartridges on popular computer software as more makers take this path.

64K question: plan a micro

Two Brighton companies have come together to make a unique offer to fans of the Forth language — design your own micro.

The companies, Remsoft which sells Forth software, and Advanced Text Products which makes typesetting equipment based around Apple II circuit boards, want to produce a 64K colour machine and are asking potential users to help them draw up the final design.

They are inviting people to write in for a questionnaire (see page 34), the results of which will be used to define the proposed machine's specification. As an added incentive, prizes of £100 in cash, a free machine and free software are being offered.

The basic concept for the machine is a 6502 processor with 64K of RAM, disk interface for the Sony 3½in microfloppy, RS232 serial interface, built-in modem, parallel port, RGB colour output, cassette interface and an expansion bus. The language for the machine would be Forth 79.

Explaining the decision to circulate the questionnaire, Paul Winter, Advanced Text Systems' managing director said, 'I believe that certain things are missed out in producing a new machine. Not least of which is asking potential users what they want.'

The companies say they are 99 per cent certain to go ahead, but the level of response will be important.

PCN HELP-SCREEN

An occasional column in which PCN takes up the cudgels of behalf of micro-users.

Prestel rethink on bank holiday charge

By Ralph Bancroft

Following intervention by PCN, Prestel is to look again at its policy of charging domestic users for computer time on bank holidays. But there will be no change in the policy for this week's Spring Bank Holiday.

The pricing rethink follows complaints from Micronet subscribers who found that they were charged 5p a minute for using Prestel on Easter Monday.

Vernon Quaintance, Prestel database manager for the Association of London Computer Clubs, not only decided to contest his Prestel bill, he also put up a warning on the club's news pages on Micronet. 'Between Christmas and the New Year, Prestel was free so I was amazed to find that I had been charged for computer time when using the system on Easter Monday,' he said.

Richard Hease, Micronet's managing director, also expressed surprise that a time charge was being

levied. 'This is the first I have heard about it. You have my full support to persuade Prestel to drop the charge,' he said.

According to Prestel, the Christmas price break was a special arrangement.

After agreeing to see if the charges could be dropped for Monday's bank holiday, David Musson, head of marketing, told PCN: 'Unfortunately, the Prestel software cannot distinguish users.

'An important part of our business is travel agents and many of them will be open on that day so we will not be able to drop the time charge for the coming bank holiday. However, we are prepared to look at future bank holidays on case by case basis,' he said.

The longer-term view looks even better. Mr Musson confirmed that as part of Prestel's updating of its computer network it will introduce software that will be able to distinguish between domestic and business users. And that could mean free use of Prestel on every bank holiday.



At long last Oric — with 16K

The 16K Orics have landed. The company confirmed last week that it has been shipping the machines for two weeks.

Would-be owners who have spurned the offer of buying their loaned 48K models should now be receiving 16K versions.

The 16K Oric should turn up in stores in July, and in a package with applications it will cost £129.95.

Oric Products has also launched its first peripheral, the Oric Colour Printer with black, blue, red and green on tap. It is due in the shops in June for £169.95.

Memory boost with Atari 400

The Atari 400 is not just a 16K machine.

Although Atari doesn't like to talk about it, you can make your Atari 400 do almost everything its more expensive sibling the 800 is capable of.

For £69, the Silica Shop and other independent Atari dealers around the country will upgrade your 16K Atari 400 to 48K — giving you a machine capable of running large programs, doing word processing and other serious computing applications. The actual price is £99, but you get a £30 discount on the trade-in of your existing 16K board.

The Atari 400, like the 800, will run Atari's interface module to use disk drives and printers (at a cost of £130) and with the 48K memory will run business packages.

But the 48K 400 doesn't have a second cartridge slot and can't be upgraded any further than 48K or handle an 80-column card. Silica sells an 80-column card for the 800 at £249 installed. And the price advantages of the 48K Atari 400 have been somewhat reduced by the announcement of a price cut to £300 on the 800, but the extra memory is still a good buy for those who already own the 400.

The 16K board exchange will officially void Atari's warranty on the 400, but since almost all the dealers selling the upgrade are Atari service centres they still service upgraded Atari's under warranty. And an Atari spokesman said the company has not yet refused service to an upgraded machine.

£120 invader

By Sandra Grandison

A Hong Kong company has set up shop in Britain with a new £120 home computer called the Comx 35.

With promised features of 35K RAM expandable to 67K, colour, built-in joystick and 16K ROM this machine should turn heads in the home computer field.

In addition to its main features, you can expect to get a full size keyboard, an 1802A processor and compatibility with teletext and videotext. The sound of this little black box covers eight octaves, 1,024 tones, 16 volume steps, and the graphics are user definable.

And to make the package more attractive £40 worth of software is thrown in.

There are ten packages in all — five games, and more serious applications include a telephone directory, monthly expenditure, records management, inventory and personal accounting.

The company behind this device is Alys Computers UK, a subsidiary of Germaine Video in Hong Kong. Ernie Chan, director of Alys Computers and marketing manager of the parent company, said: 'The Comx 35 is the first generation of a series of computers. We intend producing more computers.'

'I think our machine matches up to the TI99/4A, Spectrum, Dragon, Oric and Vic 20 in terms of capability.'

First shipments of the new micro are on the way.

Frills of the show

From David Guest, Anaheim, USA

You can count the attractions of Anaheim on two fingers. On one side of the street is Disneyland, and on the other is the exhibition centre that hosts the National Computer Conference (NCC) every few years.

Fantasies dominate both places, but what makes the NCC more interesting is the possibility that some of the fantasies will eventually find their way on to the shelves of your local shop.

Some will be stillborn and some will have to spend more time on the drawing board. But one way or another the NCC exhibition, conference and jamboree gives a fair idea of which way the wind is blowing.

It is far from being a PC show and bright Californians pushing back the frontiers of science in their garages don't get much room until they achieve multi-million dollar turnovers. Even allowing for out-

breaks of gimmickry, it is a conservative show.

The white-heat of technology glows most strongly around the edges of the exhibition. The NCC has spilled over from the Anaheim Convention Centre into the car park, where large tents have been pitched, and into the nearby Disneyland Hotel.

By coincidence these areas are the most uncomfortably hot as the town swelters in a heat wave. In the tents (known as the Pavilion) there is talk of insurrection and legal action as the temperature climbs to 113 degrees and visitors hurry away before their shirts dissolve.

Possibly by coincidence the tents house some of the more interesting Japanese companies.

Sord is there with the M5 and a new 68000-based PC, the M68, which has a memory capacity of up to 4Mb and a subsidiary Z80A processor for 8-bit work. It will sell for about \$5,000 when it comes out

in the US in three months.

Toshiba is there with a portable T100 personal computer, a new T300 business system, and the P1350 printer which gives letter-quality work, high-speed drafts, or dot-addressable graphics at the flick of a switch.

Sony and Sharp are there. Sony's highlights are high-capacity floppies, business and graphics software, a personal word processor, and the SMC-70G Genlocker dedicated graphics system for about \$3,000. Sharp had one of the stars of the show, the PC-5000, plus the hand-held PC-1500 and the PC-1250 student's computer kit.

Back in the main hall, where the carpets are colour-coded to let you know where you are, most of the big names are gathered. Visicorp draws good crowds with a demo of VisiOn — a lady called Lisa conducts the demo. At the Apple stand another Lisa is on show, but the latest offering is the Appletalk — fine if

you want to tie several Apples into an IBM network. Tandy has the very impressive Model 100, and the TRS-80 Model 4, but for reasons of snobbery it has left the cut-down \$120 colour computer, the MC-10, at home.

Texas Instruments and Epson are concentrating on software, TI for the Professional and Epson for the HX-20.

Likewise IBM as far as the PC is concerned — but this is a mainstream show and IBM's main attraction is a mini, the System 36, the main interest of which is the fact that it has been launched at all.

Capacious disks, voice input systems, touch-sensitive screens, all manner of clever and sometimes highly-priced equipment is on view. When it all comes into High Street shops there will be some fun to be had.

And the frivolous splendours of Disneyland will probably be available in a holographic display.



SIDE SHOW — Resplendent in an electric blue case, the Kaypro 10 (PCN, issue 11, May 20-26) was too far from the main exhibition area to take much of the limelight. But a portable with a 10Mb Winchester and applications software that sells for \$2,795 set the cat among a few pigeons. Osborne is hinting strongly that the Kaypro division of Non-Linear Systems will be a flash in the pan — it may be so, but for the time being there is no denying that it is flash.

Tandy cuts colour cost

For a cheap way into colour computing the Tandy MC-10 should be worth a look when it crosses the Atlantic.

A 4K cut-down version of the Colour Computer, the MC-10 sells for \$120 in US stores. It is driven by a 6803 processor and runs Micro Color Basic. It has a firm Spectrum-like keyboard, a cassette port and room for a 16K RAM expansion. This is due in August and will cost \$50.

The unit weighs less than 2lbs. It gives you a choice of eight colours and 255 tones for sound effects, and with the MC-10 you can drive a display of 16 lines of 32 characters.

Tandy took the unusual step of putting the MC-10 straight into its stores, by-passing the NCC.

Print for all

A thermal printer/plotter that will run off most micros could be on sale in the UK this year for less than £200.

You can hook the Alphacom 1842 up to RS232, Centronics, or IEEE 488 interfaces, or to Commodore 64 and Vic 20s, or Atari systems.

In the 1842 Alphacom has merged an Olivetti printer mechanism with a plug-in module which controls the interface to your micro and hence character generation. It will cost \$200 in the US and should be in production next month.

It prints at 80cps with 40 characters to a line. The unit weighs only 4lbs and measures 10¼ x 7½ x 4in.

Alphacom products are distributed in the UK by Dean Electronics of Wingfield Row. (0344) 885661.

Sharp bursts bubble barrier

Sharp's PC-5000 bubbled to the top of the wave of new portables to appear at the NCC.

It looks much like the Gavilan (PCN, issue 10, May 13-20) without a touch-sensitive panel. It has a typewriter keyboard, a canted LCD that folds away, weighs 11lbs and fits into an attaché case.

But the basic system, with 128K of RAM, also carries 128K of bubble memory storage. This means that when the power is off data is not lost — bubble memory is slower than conventional memory but non-volatile. It is a technology that has defeated some of the most famous names in the semiconductor business (eg National Semiconductor in the US, Plessey in the UK).

Disk drives are an optional extra. They have 320K capacity, and Sharp says they will be compatible with IBM PC floppies.

The printer, a dot-matrix thermal device, is also optional. It prints at 37cps across an 80-character span.

The system is built around an Intel 8088 and runs on rechargeable batteries or from an AC adaptor. MSDOS will come in an ordinary



Sharp's PC-5000 with fold-away LCD and 128K of bubble memory.

ROM cartridge but Sharp plans to add bubble cartridges of various business applications.

The LCD panel folds flat over the keyboard when you aren't using the machine. It displays eight lines of 80 characters, or upwards of 51,000 pixels with bit-mapped graphics. So that nobody is in any doubt over Sharp's intentions for the PC-5000, it supports the full IBM PC character set.

Deliveries of the PC-5000 will begin in the US in autumn, and the price will be about \$2,500.

Floppy squash

Among media manufacturers pushing up the capacity of floppies at the NCC the efforts of Sony and Tandon to fit a quart into a pint pot were particularly notable.

Sony's 3½in microfloppy now comes in a double-sided version with 1Mb, and Tandon's 3½in TM35 line of drives also has a new peak of 1Mb.

When system builders start using these units in new machines their storage will cost roughly \$280 per

megabyte from Sony, and \$228 from Tandon, which starts production in July.



Tandon's TM35 microfloppy drive.

VIEW FROM AMERICA



The American dream is tax deductible

From Chris Rowley

Opinion polls and consumer surveys are an American obsession and they often provide intriguing snapshots of the nation today.

For instance, when questioned about their leisure activities recently only 15 per cent admitted going to a bar or nightclub once a week. So forget Las Vegas, this is still a puritan nation.

In the same study only 54 per cent of respondents confessed to having sex at least once a week. So forget the sexual revolution too. Slightly more of them owned to digging the garden and of course a healthy 72 per cent watched a lot of TV.

However, in another study as many as 5 per cent of American homes were found to be infested with home computers. Again, in a Gallup poll 17 per cent of Americans said they were 'very interested' in owning a home computer. Another 19 per cent were 'fairly interested' and only 45 per cent were 'not at all interested'.

Even more astonishing in the land of individuals, when 10 per cent in any study will give the wrong name for the President of the United States, only two per cent in the Gallup poll didn't know enough about computers to form an opinion.

Clearly, Americans know the information age is upon them. And a lot of them are concerned that without computer 'smarts' they will end up as mush brains unable even to keep up simple conversation. Indeed, that 45 per cent who are not at all interested in owning a computer are disproportionately old. Americans over 50 have little interest in the pesky things, except of course when quizzed in their roles as parents and grandparents, when they suddenly evince extreme interest.

Everyone here wants to be reassured that their kids will get computer smarts so they can hold up their end of a simple conversation and, more important, find a job. Hence a great proportion of the machines bought were purchased by adults for use by children.

Fifty per cent or more of home computer buyers spend \$1,000 or less for their machines. However, there is a significant second stroke to the US market. Some studies show that as many as 23 per cent of home computer buyers spent \$2,000 or more on their machines.

When questioned about what they use their computers for in a multiple response query, 51 per cent said 'video games' and 46 per cent claimed 'business/homework'. 'Child's learning tool' also scored 46 per cent and 'adult learning tool' was placed fourth with 42 per cent. 'Word processing' was way down the list at 18 per cent and 'counting calories for my diet plan' rated a mere four per cent, thank god.

Another study examined software sales and found that while games took 57 per cent, a hefty 22 per cent stood under the heading 'educational purposes' and another 18 per cent under 'home management'.

Naturally games software outsells the rest. Games get consumed and replaced. And who needs more than one spreadsheet.

Who are all these folks buying home management software? After all, how many of us need a computer to work out our cheque book transactions?

Well, maybe they really do need to. One study found that mean income for computer buyers was \$26,800, while the mean income for non-buyers was \$21,600. Home computer buyers have so far been predominantly well off. Of course, the ever lower prices of popular machines may change this year if all goes as predicted by industry sages.

Oddly enough, that gap in mean incomes matches very neatly the \$5,000 tax deduction that one can take in America on a computer used for business purposes. No wonder everyone is foregoing Bourbon and Budweiser down at the Dew Drop Inn. They're all crouched over their business homework. No survey has actually gone so far as to run a Nielson-style test. Nielson machines measure what TV watchers watch for the networks and advertisers. But one does perhaps wonder how much of that tax deductible business homework might really turn out to be 'Crush, Crumble and Chomp' or an 'Adventure on Purple Panagora'.

Nippy micro from Japanese

A triple Japanese alliance has unveiled a fast micro that bridges the gap between portables and desktop systems.

National Panasonic, Matsushita and Fujitsu are responsible for the Duet 16, which will be sold in the UK by the Lambart group.

It uses an 8086 processor and has an option allowing the use of the 8087 arithmetic co-processor, comes with 128K of RAM as standard, upgradable to 512K.

A clock speed of 8MHz gives it an edge over many machines in the same class, and this is amply demonstrated by the speed and smoothness of the graphics, which have a resolution of 640x400 and have eight colours. The graphics run at much the same speed as

machines which have dedicated graphics processors.

On-line storage is respectable at 720K per drive, giving a total of 1.44Mb, but 10 or 16Mb 5¼in Winchester drives are promised soon.

Lambart is in the process of putting together a dealer network but expects the machine to be on sale in June, at £2,595 for monochrome and £2,995 for colour.

The new micro is both a desktop machine as well as a 'portable'. The main module is 99x398x325mm and it weighs-in at 10.6Kg (3.8x15.7x12.8in and 23.4lbs) which puts it in the Osborne/Ajile range. To convert it you just clip on the carrying-handle and head off for the wide blue yonder.

Tycom first in UK with new MSDOS

Tycom this week became the first UK manufacturer to deliver copies of version 2 of the MSDOS operating system from Microsoft.

MSDOS 2 is a revamped version of the operating system that has some features similar to those found on Unix-like systems. Support for hard disks; tree-structured directories; batch-type operations; shells; and piping, where the output from one program becomes the

input for another, are included.

Buyers of Tycom's Microframe 12 will be able to choose between MSDOS 2 and CP/M 86. And the company expects most will want MSDOS 2.

Users of CP/M 86 will be able to buy MS DOS as an optional extra for £184. This is considerably more than the £58.65 price that IBM will charge owners of the IBM PC.

The price charged by Tycom is a reflection of the quantity of MSDOS 2 systems it expects to sell.

'IBM will be buying considerably more copies of MSDOS 2 than us so they can buy it cheaper,' a company spokesman said. 'But we will be keeping the price under review.'

The essential database

A free database is likely to be a standard feature of new machines in the near future. This bonus will bring database sales to the level of business micro sales within three years, according to US research company Strategic Inc.

This conclusion comes in a report

called *Micro DBMS—The Universal Applications*. The report argues that you want maximum capabilities from your software.

You also need the assurance that programs and data won't lose their value just because of a change in the system, it adds.

DR's answer

Digital Research's answer to its arch-rival Microsoft's MBasic has hit the shelves of local computer shops, in the shape of Personal Basic.

Personal Basic is Digital Research's first fully fledged Basic interpreter, and it claims to be written to the MBasic specification. So it should be possible to execute some MBasic source code without modifying it, according to Chris Lusby Taylor, Digital Research's technical support consultant.

'The source code is a complete MBasic, but some of the commands have been changed to make them

more CP/M-like,' said Mr Lusby Taylor. 'We have also extended the debugging facilities with TRACE and FOLLOW commands to let you step through a program and keep track of any changes to the variables.'

The language itself has not been extended, he said.

Personal Basic slots in beneath Digital Research's CBasic, its compiled implementation.

The interpreter runs in 96K under CP/M-86, MP/M-86 and Concurrent CP/M-86, all Digital Research's 16-bit operating systems, and it will cost £100 a copy.

Oric tapes in a twist

Oric believes its won't-load-blues will soon be over.

The company has sent its software duplicator packing — claiming it is to blame for the loading problems. But it's a move which could make it difficult to get hold of Oric programs, since the same company was in charge of national software distribution.

Cosma Sales in Witney was duplicating and packaging Oric's own-brand software and distributing Tansoft and independent programs to Laskys, Dixons, and Smiths until a few days ago.

Paul Johnson, Oric's technical

director, said that his company blames Cosma's methods of duplication for tens of thousands of software cassettes that wouldn't load. Cosma, however, blames the machines for the trouble.

'It's all off with Cosma,' said Mr Johnson. 'There was a technical problem with the tapes that seemed to be quite widespread, and people started saying that there was something wrong with the Oric cassette system. But we're using a system that's been in use for years. The problem is purely down to the quality of the duplication.'

The worst offenders have been

the welcome tapes sent out with the micro itself, Mr Johnson claimed. 'Most people probably won't be too bothered about the welcome tape,' he said. But Tansoft cassettes have also been giving problems, and the chain stores have been sending back 'tens of thousands' of tapes over the past few weeks, according to Mr Johnson.

Mr Sobey, managing director of Cosma, is just as sure the problem has nothing to do with his company.

'The Oric machines appear to have a problem,' he said. 'We test our production rigorously, and our data duplication company is of the

highest quality. We can take any sample Oric likes, and load it.'

But Paul Kuczora of Salamander — whose packages were to have been officially approved Oric software — is unhappy about the new arrangement. 'It leaves Laskys, Dixons and Smiths up in the air,' he complained to PCN.

Hot micros

The next time somebody sidles up to you in a pub and says: 'Psst, wanna buy an Oric with database software,' try making a citizen's arrest.

The 3D Computer Shop in Belmont, near Sutton, was broken into on Sunday May 22, and close to £5,000 worth of home computers

were taken. The thieves' haul included 20 Orics, two Dragons, and all the Oric database software they could grab.

Witnesses say four people broke in and got away in an Escort estate.

If you see anything that strikes you as suspicious, call the police or 3D's managing director Peter Klecha on 01-642 2534.

ZX super soft

New software from JRS Software could speed-up ZX81 loading.

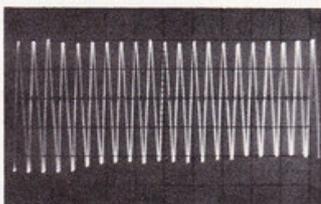
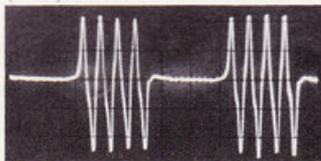
The company has modified its programs so loading time is said to be down to one minute instead of the more usual four minutes.

The input/output signals have been changed, effectively altering the waveform to take full advantage of the machine's circuitry. The maximum frequency has also been limited to 4kHz to help produce reliable operation when low-cost tape recorders are used.

There are five home-written games for the ZX81 with fast-loading capacity: Games Tape II at £4.95; Lost Island at £4.95; Graphics Toolkit at £5.95; Battleships at £4.95 and the newly

released game, Space Trek at £4.95.

Contact JRS in Worthing on (0903) 65691.



Souped up software: top, the ZX81 loads two bits of information. Bottom, 21bits loaded in the same time.

£100 off Atari

Atari has joined the price war (PCN issue 11) by dropping the tag on the Atari 800 48K by a whopping £100. The new price is £299.99 and still includes the free basic programming kit.

The Atari 400 has dropped £10 from £159.99 to £149.99, but this time it too comes with the programming kit.

Apple has also jumped on the merry-go-round by dropping the Apple III's price from £2,869 to £2,395 for the 256K version.

It has discontinued the 128K version as the 256K was much more popular, but will continue to supply 256K upgrade kits for the 128K at the normal price of £680.50.

Apple has package deals out too

— six in all, available now from 135 Apple III dealers in the UK.

One example is the Business System for £3,430, containing items to a value of £3,832. This consists of the micro itself, System Software Product Training Pack, Apple Writer III and Product Training Pack, VisiCalc III and Product Training Pack, Apple Dot Matrix Printer and Cable Kit and full Interface Kit.

Not to be outdone, the Colour Genie has also marched into battle at a new price of £194, down from £225. The Genie III will sell at £1,897.50 as opposed to £2,240.50.

You could also save money if you go to Boots for your micro. On May 19 the Dragon's price went down from £199.50 to £175.

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 fortnight before publication date (in this case May 27), so these charts tell the story in high streets between April 29 and May 13.

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

Top Twenty up to £1,000

	MODEL	PRICE	DISTRIBUTOR
▶ 1 (1)	Sinclair Spectrum	£99	(SI)
▶ 2 (2)	Sinclair ZX81	£40	(SI)
▲ 3 (10)	Oric 1 (48K)	£169	(OR)
▼ 4 (3)	Atari 400	£150	(AT)
▼ 5 (4)	BBC Model B	£399	(AC)
▼ 6 (5)	Commodore Vic 20	£170	(CO)
▲ 7 (12)	Lynx 48	£225	(CA)
▲ 8 (9)	Newbrain A	£228	(GR)
▲ 9 (14)	Atari 800	£300	(AT)
▼ 10 (7)	Dragon 32	£200	(DR)
▲ 11 (13)	Epson HX20	£472	(EP)
▼ 12 (8)	Commodore 64	£345	(CO)
▲ 13 (—)	Sharp MZ80A	£549	(SH)
▼ 14 (6)	Texas TI-99/4A	£150	(TE)
▶ 15 (15)	Jupiter Ace	£90	(JU)
▼ 16 (11)	Sharp PC 1500	£170	(SH)
▼ 17 (16)	Apple IIe	£969	(AP)
▲ 18 (20)	Acorn Atom	£174	(AC)
▼ 19 (18)	Colour Genie	£224	(LO)
▼ 20 (19)	TRS 80 Model 1	£199	(TA)

Top Ten over £1,000

▶ 1 (1)	Sirius 1	£2,754	(ACT)
▲ 2 (3)	Olivetti M20	£2,754	(OL)
▼ 3 (2)	Osborne 1	£1,581	(OS)
▲ 4 (5)	IBM PC	£2,392	(IBM)
▼ 5 (4)	Commodore 8032	£1,129	(CO)
▲ 6 (7)	Apple III	£2,780	(AP)
▲ 7 (—)	Superbrain II	£2,070	(IC)
▼ 8 (5)	HP 86A	£1,541	(HP)
▶ 9 (9)	Xerox 820	£2,415	(RX)
▲ 10 (—)	Epson QX10	£1,995	(EP)

AC — Acorn Computers. ACT — ACT Sirius. AP — Apple Computers. AT — Atari International. CA — Computers. CO — Commodore. 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. SH — Sharp. SI — Sinclair. TA — Tandy. TE — Texas Instruments.

Desq mixes it

By David Guest

Software that will let you mix and match applications packages from different software houses is being developed in the US.

The Desq, from Quarterdeck Office Systems, will sell for \$395. You'll need 256K of RAM and 5Mb on a hard disk to use the package, and at first it will run only on IBM PCs or compatible systems, but if it lives up to Quarterdeck's promises it should repay the investment.

'The basic idea,' said Quarterdeck's Gary Saxer, 'is that people would like to be able to run several programs — not necessarily from the same manufacturer — at the same time. It's multi-tasking,

essentially. It's difficult even on big systems but we are trying to produce an environment that will make it easier.'

Much of the memory that the Desq needs is used by the applications. It will, for example, let you build a Supercalc file and load it into Multiplan or WordStar. At the terminal, it presents you with a window facility, and you can also use a mouse.

The only package that the Desq can't handle so far is VisiCalc, which loads in a fixed location in memory and interferes with the Desq's memory management. 'Copy protected programs also give trouble because they all believe

their disk is in drive A, and packages that write direct to the screen are difficult,' said Mr Saxer, but he added that the Desq could still work with them.

'Most packages don't need to be altered at all for the Desq,' he said.

The system is written in a proprietary artificial intelligence language. It includes functions that will let you customise it for the kind of operations you'll be running regularly, and Quarterdeck says that it is working on improving the level at which the Desq integrates packages.

The Desq will make its debut in the US later this year. Quarterdeck is on 0101-213 392 9851.

Model module

If you're serious about money, Comshare's Fastplan II could come in handy for, as the company says, it's a 'financial modelling system designed for serious business planners'.

Not surprising, then, that it costs £603.75 and will run on the IBM PC and the Sirius under MSDOS. Later versions will run on 8-bit machines under CP/M.

Fastplan II will face stiff competition from similar products, such as Bottom Line Strategist for use on CP/M from Pete & Pam at £345.

Comshare also plans a disk-based applications guide for Masterplan, its £281.75 spreadsheet.

You'll be able to buy Fastplan II from 100 Comshare dealers throughout the UK or direct from the company in Whitehall, London SW1, on 01-222 5665.



NEAT NETS — Home computers including the ZX81, Spectrum, BBC, Dragon and Jupiter Ace can be tied into the Multiload, which could be a cheap introduction to networking. A network for four home computers costs £7.98 and lets you transmit programs, data and screen content from one device to the others, while multi-saving lets one computer record onto various tape players simultaneously. The product is available now from Network Computer Systems on Luton (0582) 508616.

Business packs for the big four

Fresh from across the Atlantic are four software packages for some of the top-selling business machines — Sirius, IBM PC, TRS-80 II and Apple II or III.

The new releases offer financial modelling, graph and chart creation, a telecommunications program, and a cash analysis package.

All are disk-based and run on the UCSD p-system, version 4.1. Publisher Ferox International hopes to have them running under MSDOS by the summer.

Ferox Modeller is a financial modelling system allowing you to create and solve models, ask 'what

if...?' questions and print reports. Control is under a main menu and seven sub-menus. The price tag is £862.50.

Among the competition are Intelligence UK's Micromodeller at £741.75 and Systematics International's Microfinesse at £776.25.

Graphpower, price £258.75, gives you high resolution colour graphics allowing you to create pie and bar charts and line graphs while a 'slide show' feature enables graphs to be saved for later presentation.

The telecommunications package, LogOn, costs £149.50, and allows you to connect different machines together.

Consultants Edge allows you to create your own menu for financial analysis of balance sheets, cash flow forecasts, etc. It will cost you £207.

All are available in the UK from Dataflex on 01-748 4176.

Fair's share

June 16 to 19 are dates for your diary: several companies have announced they will launch new products at the Earl's Court Computer Fair.

Star of the show will probably be the new low-cost micro from Memotech. Pitched at the lower end of the market (PCN, April 29—May 6) it promises to be a strong challenger to Spectrums, BBCs and Orics.

Also at the show will be Virgin Games, showing its first products for the BBC, Spectrum and Vic 20, and announcing new packages planned for other machines.

Encotel's EDS range of micros will also be a Fair feature. For £2,875 you get two 340K floppies, monitor, keyboard, CP/M and a network interface. The more pricey models run under TurboDos, and have a multi-user capacity with up to 16 workstations.

And there'll be the opportunity for a sneak preview of Maplin's dial-up shopping system.

VIM spreads the word

By Nigel Cross

With the Voice Input Module (VIM) from Voice Machine Communications of California, talking to your computer takes on a new meaning.

Currently available for Apple II, II+, IIe, Franklin Ace and Basis machines, this facility will be extended to cover other machines in the near future. VIM comes as a plug-in PCB with all operating software to build, edit and train vocabularies.

The vocabularies can accept up to 80 words or phrases (to 1.6 seconds in length) in memory at any one time, and it has the ability to load many other vocabularies from disk, thereby extending the flexibility of the system.

The VIM PCB acts as an intermediary between the keyboard and the keyboard decoder by recognising spoken words or keyboard input. This is then passed

to the computer as a standard ASCII string.

The heart of the system is a 16 channel audio spectrum analyser controlled by a 68B03 microprocessor. This drives firmware resident in an onboard 4K Eprom. The vocabulary and voice patterns are in an extra 8K RAM, which is also onboard.

User interface is available through a Shure microphone with an optional foot-pedal switch for easy operation.

Development of this system has taken 14 years so far, and represents a step forward for machines at relatively low cost.

The manufacturer claims that the system is accurate to 98 per cent of input, within 125 milliseconds of phrase completion — VIM will be given a PCN Pro-Test in issue 15.

The UK distributor for VIM is CGD, on 01-878 4072. It costs £899 inclusive of VAT.



VIM and Apple in action

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*As seen on BBC's Tomorrow's World on 17 March 1983



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B.B.C. MICRO

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

B.B.C. MICRO cont.

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

COMMODORE 64

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

DRAGON 32

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

NB. Software Centre is not a software library.

DRAGON 32 cont.

Mem Req'd	Supplier	Code No	Price
	Dragon Data	17C011	£24.95
	Dragon Data	17C012	£7.95
	Dragon Data	17C013	£7.95
	Dragon Data	17C016	£7.95
	Dragon Data	17C017	£7.95
	Dragon Data	17C018	£7.95
	Dragon Data	17C022	£7.95
	Microdeal	21C028	£8.00
	Microdeal	21C029	£8.00
	Microdeal	21C030	£8.00
	Microdeal	21C031	£8.00
	Microdeal	21C032	£8.00
	Microdeal	21C033	£8.00
	Microdeal	21C034	£8.00
	Microdeal	21C035	£8.00
	Microdeal	21C036	£8.00
	Microdeal	21C037	£8.00
	Microdeal	21C038	£8.00
	Microdeal	21C039	£8.00
	Microdeal	21C040	£8.00
	Microdeal	21C041	£8.00
	Microdeal	21C042	£8.00
	Microdeal	21C043	£8.00
	Microdeal	21C044	£8.00
	Microdeal	21C045	£8.00
	Microdeal	21C046	£8.00
	Microdeal	21C047	£8.00
	Microdeal	21C048	£8.00
	Microdeal	21C049	£8.00
	Romik	10C050	£9.99
	Microdeal	21C055	£8.00
	Microdeal	21C056	£8.00
	Microdeal	21C060	£8.00
	Salamander	62C061	£9.95
	Salamander	62C062	£7.95
	Salamander	62C063	£7.95
	Salamander	62C064	£7.95
	Salamander	62C065	£7.95
	Salamander	62C066	£7.95
	P.S.S.	64C067	£7.95
	P.S.S.	64C068	£12.95
	P.S.S.	64C069	£12.95
	P.S.S.	64C070	£7.95
	P.S.S.	64C071	£12.95
	Microdeal	21C072	£8.00
	Microdeal	21C073	£8.00
	Dragon Data	17C074	£7.95
	Gemini	63C075	£19.50
	Gemini	63C076	£19.95
	Gemini	63C077	£19.95

SINCLAIR SPECTRUM

Mem Req'd	Supplier	Code No	Price
48K	Quicksilva	12D047	£6.95
48K	Quicksilva	12D048	£6.95
16K	Quicksilva	12D049	£4.95
16K	Quicksilva	12D050	£4.95
	DK Tronics	09D063	£4.95
	DK Tronics	09D064	£4.95
	DK Tronics	09D065	£4.95
	DK Tronics	09D066	£5.00
	Micro Gen	06D067	£6.95
	Micro Gen	06D068	£5.50
	Micro Gen	06D068	£5.95
16/48K	Silversoft	29D001	£5.95
16/48K	Silversoft	29D002	£5.95
48K	Silversoft	29D003	£5.95
16K	Addictive	50D070	£6.95
16/48K	Artic	25D071	£4.95
16/48K	Artic	25D072	£4.95
16/48K	Artic	25D073	£4.95
48K	Artic	25D074	£9.95
48K	Artic	25D075	£9.95
	Imagine	05D076	£5.50
	Imagine	05D077	£5.50
	Artic	25D078	£6.95
	Artic	25D079	£6.95
	Artic	25D080	£6.95
	Artic	25D081	£6.95
	Artic	25D083	£4.95
	Artic	25D084	£4.95
	Artic	25D085	£2.50
	Artic	25D086	£7.00
	Artic	25D087	£29.95
	Artic	25D088	£6.95
	Artic	25D089	£9.45
	Artic	25D090	£9.95
	J.K. Greye	32D091	£4.95
	Melbourne H.	65D092	£6.95
	Melbourne H.	65D093	£14.95
	Melbourne H.	65D094	£5.95
	Melbourne H.	65D095	£5.95
	Melbourne H.	65D096	£5.95
	Quicksilva	12D097	£4.95
	Titan	22D098	£5.00
	Microgen	06D099	£6.95
	Microgen	06D100	£5.95
	P.S.S.	64D101	£8.95
	P.S.S.	64D102	£4.95
	P.S.S.	64D103	£4.95
	Gemini	63D104	£19.50
	Gemini	63D105	£19.95
	Gemini	63D106	£5.95
	Gemini	63D107	£19.95
	Gemini	63D108	£19.95
	Gemini	63D109	£19.95
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	Chess Player		
	Space Intruders		
	Meteor Storm		
	Meteoroids		
	3D Tanx		
	Centipede		
	Ground Force Zero		
	Master Chess		
	Socers Castle		
	Cosmic Raiders		
	Orbiter		
	Ground Attack		
	Starship Enterprise		
	Football Manager		
	Gobbleman		
	Invasion Force		
	Frog/Showdown		
	Spectrum Assembler		
	Voice Chess		
	Schizoids		
	Ah Diddums		
	Adventure A		
	Adventure B		
	Adventure C		
	Adventure D		
	Invaders		
	Galaxians		
	Bug 1		
	Bug 2		
	Forth		
	Micro Chess		
	Chess		
	Krakit		
	Arcadia		
	Penetrator		
	Hobbit		
	Spectrum 1		
	Spectrum 2		
	Spectrum 3		
	Mined Out		
	Ground Force		
	Mad Martha		
	Mines of Saturn		
	M Coder		
	Ghost Hunt		
	Maze Death Race		
	Database Management Systems		
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	Decision Maker		
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	Selective Mailing List		
	Commercial Accounts		

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Load up your Lynx

At long last, Lynx software is on its way to dealers, while the launch of the 96K has been brought forward to June from September (*PCN* issue 9, May 6-13), according to Computers spokesman Ian Banks.

If the company makes it on time, it will kill three birds with one stone, since its promised disk drives and Centronics parallel printer interface are also due out around then.

Mr Banks says Computers is currently evaluating more than 25

games for the Lynx. The company's first home-written game is Numerons, a 'really mad educational game', for £9.90.

The monsters in this space-invaders-type game are in fact numbers, so if you want to kill 16, you have to fire the multiples 8 and 2 at it simultaneously.

Cassette-based Teach Yourself Basic is written by Viscount Software and sells for £6.95; both can be ordered from Spectrum Centres.

Steve Cole, assistant sales manager at Spectrum's Welwyn Garden City head office, said: 'We have full stocks of these games, and Spectrum Centres must re-order them instead of just waiting for them to arrive, as we don't keep software on back-order.'

More games are being produced for the Lynx by Gem Software. Monster Mine, Sultans Maze, Golf, Games Pack 3 (which contains a combination of Reversi,

Snake and Pontoon) and Gempack 4 cost £7.95 each. These are available only by mail order at present, but Gem will supply Spectrum's head office with supplies in a fortnight.

Romik has also come out with some games, namely Moons of Jupiter and others.

Gem can be contacted in Sawbridgeworth, Herts, on (0279) 723567, while Romik can be found on Slough 71535.

Printing in parallel

Owners of the Epson HX20 and Newbrain micros can now use printers with a Centronics-type parallel interface.

Kuma Computers has produced a serial/parallel conversion device that plugs into the RS232 port. It

costs £114.30 including VAT.

■ Kuma has also released a further three packages in its Datamaster series for the Epson. DM 8 (a mailing list) and DM 9 (a database) cost £33.95. DM 10 (a label maker) costs £20.10 (0628 71778).

Mr Micro re-maps the Vic

Frustrated Vic 20 users can now deal with the idiosyncrasies of the Vic's memory mapping when memory expansion cards are being used.

A Manchester-based company, Mr Micro, has produced a plug-in board called the RAM Dam. It works by fooling the computer into

thinking you are using a 3K expansion when in fact an 8K or 16K expansion cartridge is being used.

Until now, users have had to rely on special routines.

RAM Dam costs £13.95 and comes with a free game. Mr Micro is on 061-728 2282.

Duo from Diablo

Printer technology is set to take another stride forward as Diablo plans to launch two new printers in the UK in September.

The Model 630 ECS (for extended character set) crams 224 printable characters onto one print wheel, and should interest users with word processing software allowing two or more typefaces in any one document. It comes with an interface that allows direct connection to an IBM PC.

Diablo is not putting a UK price on it yet, but in the US it costs \$2,300.

The other printer will attract

those who want a low cost way of printing out high resolution colour graphics. It costs \$1,200 in the US, and will print in seven colours plus black using the ink jet principle.

The ink comes in cartridge form and is sprayed out at a resolution of 120 dots an inch, but compared with dot matrix printers it is slow, printing text at 20 cps.

Martin Housecho, Diablo's manager for technical support, Europe, said from its Woking office: 'It will do you graphics, charts, text, you name it. The high speed ones are always more expensive, and this one gives you total graphic control.'



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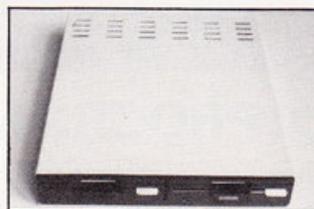
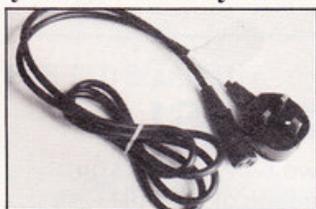
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Traumas of the triewriter

P Brown Kenyon is absolutely right in his assertion that modern electronic keyboards could easily handle much faster speeds than are at present possible on the ancient qwerty layout.

Unfortunately there are vast numbers of 'tripewriters' which are still mechanical in operation and, even for a fairly slow operator, still cannot handle any real speed. I would regard myself as a medium-speed, fairly accurate operator using touch method, and I can get the keys to clash fairly alarmingly quite often.

At first I was impressed by the ergonomically designed 'squashed dolly-mixture' keyboard, until I thought about it and wondered if the designer had remembered that there are usually a couple of arms attached to those hands which are to operate the keyboard.

And what of my back? I could imagine that after a couple of hours hard slog (however soft the touch) my back would be aching, necessitating yet another visit to my beloved osteopath.

PCN £10 Star Letter



While I am in the mood to bang on about keyboards another point I feel would be usefully remembered by the manufacturer is 'Yes I really would like a machine with a soft touch — but I do like to feel sure that I have actually pressed a key and that it did operate'. Keyboard operation is one rather large factor in my choice of machine.

I feel that a decent sized thumb-operated space bar is an absolute must, partly on the grounds of ease of use and also because I hate waste, and see no point in having the damn things if they are not to be used (thumbs).

As to speed of operation on a conventional keyboard, I might ask of P Brown Kenyon what speed he can actually type at? I knew a lady who could bang away at 95wpm, and that on an Imperial 66 or some such. Unless I am writing off the top of my head and have at my disposal a word processor and dictionary facility, I doubt very much that even with practice I could get much faster.

While typing this letter I had a brilliant idea. Why don't we, the people wot will use 'em, design what we think we want?
*Jan Allen,
London W2*

We at PCN put our thoughts on paper in last week's Keyboards Micropaedia, and agreed with a lot of what you say. Now it's up to the designers. — Ed.

Programmers vs processors

I fully support Mr Brown's criticism of reviewers moaning about the lack of touch type keyboards on the cheaper home computers. It seems these terribly hard done by reviewers expect an ordinary home computer to act like the more professional (expensive), dedicated word processor machines found in the office. And that if a computer owner can't type 500 words in five seconds then life is simply not worth living.

I hardly think the Spectrum or any other home computer was made for the intention of word processing or fast typing.

A potential computer owner will want a computer that does the job of computing; he is not going to worry about whether the keyboard is full-travelling or not. Reviewers should criticise faulty keyboards that cost hundreds of pounds where speed is important, and not the cheap computers that are meant for enthusiasts.

*R Ould,
Selly Oak, Birmingham*

Point taken, Mr Ould, but enthusiasts still give keyboards a fair pounding — Ed.

Tycom Microframes — six of the best

I was surprised at your reviewer's less-than-charitable comments on the Tycom Microframe (*PCN April 22*).

I would not presume to comment on his technical assessment, but I can vouch for the machine's satisfactory performance in the demanding multi-user environment of a busy London hotel, where it is in use 24 hours a day, seven days a week by unsophisticated staff.

We now have six Microframes installed, and if these continue to perform as they are doing at this moment we shall probably have over 50 around the world by the end of this year.

Incidentally, one of the main attractions of the design of this machine to us is the bolt-on expandability your reviewer seems so much to decry.

*Alan Boyce,
Director of Group Systems,
Trusthouse Forte PLC, London W1.*

On course for micro training

We are pleased to be able to reassure Mr McLaughlin (*PCN May 6-13*), that help is now available in Scotland for in-service training and advice on the use of microcomputers. The Secretary of State for Scotland established the Microelectronics Educational Development Centre (MEDC) in 1980 to provide training and advisory services to the post-school educational sector as well as to industry.

Initially the emphasis was on industrial applications but this has now been extended to all aspects of information technology. A series of 16 different courses and seminars are available free to staff from Scottish colleges and universities during the months of May and June alone. Throughout the year, MEDC staff are available to co-operate with other institutions in providing courses for or with their own staff.

MEDC is based at Paisley College and is funded by the Scottish Education Department to provide these services free to colleges and universities. We would be pleased to add Mr McLaughlin's name to our mailing list and discuss

with him the provisions of courses he and his colleagues might feel most appropriate.

Courses already available range from micro-processor control systems to database languages and business applications, and can include any applications of microcomputers in education, industry and commerce.

Our contacts with visitors from many European and international educational authorities suggest that this innovation of the Scottish Education Department has no direct equivalent elsewhere. We rely on our colleagues in other institutions to guide our development in the absence of such models, and welcome visitors to the permanent display of a wide variety of microcomputers and software.

*Peter Williams,
Director, MEDC,
Paisley College, Scotland.*

Microdriven to distraction

I was very sad to read in *PCN* this week that Sinclair will not be making his Microdrives to work with other popular home computers. Although I have not got my first microcomputer yet, the Spectrum was not on my short list, but the idea of a cheap alternative to the cassette as storage in the Sinclair Microdrive was.

I only hope now that a third party will come out with an interface that will make it possible to use it with other micros like the Vic 20, Dragon, Atari etc.

*David Leslie,
Colchester, Essex*

Support your local Micro-Prof

I am a loyal fan of *Personal Computer News*. However, I was disappointed about the coverage of the Micro-Professor from Taiwan (*PCN May 6-13*). As a Taiwanese and owner of this computer, I felt you failed to appreciate its qualities.

This computer has a great future. It is the type that many of us have imagined with its memory 64K RAM and 16K ROM and portability.

It also has features of bigger, more expensive models, includ-

ing six colours, a sound board, high and low resolution graphics equal to the BBC Model B, a vast software range matching that of the ZX81 and Spectrum, and a vast range of low priced software.

Many people are blind to these facts due to the ineffective promotion and dismal coverage it has received by all concerned. This computer may be what many people are looking for.

I hope you will do it justice with a longer, more thoroughly researched, article.

Hsi-yun Sung,
Bletchley, Bucks.

Although the MPF's memory is large, it's not as large as you say. It has 64K RAM and 16K ROM, but not at the same time. It has sound, but only one speaker and no real sound generator, so making sounds uses CPU time. It has high-resolution graphics, but not the same as the BBC. As Richard King, hardware editor, says, the MPF is adequate, but no major advance.

But then that's only his opinion. Others will, no doubt, differ — Ed.

Miss out mail malingerers

Sadly it has become a common thing to hear complaints over the deliveries (or rather non-deliveries) of software companies, over the last few months.

Although we are unable to force software companies to send the goods within their specified time, we can help matters.

1. Before ordering, phone the company and check on availability of the item. Then you will know whether to expect delay, and they have no real excuse.
2. If possible, order by phone to save time.
3. If remaining time is running short, contact them and threaten to cancel.
4. If or when they exceed the time limit, cancel your order.

However, there is one way to get your software/hardware items easily. High Street stores are now offering an expanding range of software, and many computer shops are opening. So the easiest, safest and quickest method is to pay a visit to

your local shop, and avoid all the excuses.

I am not saying that all software companies are bad (in fact some offer tremendous services), but sadly the majority are, and none of us likes to take the risk.

Paul Smith,
Cheam, Surrey.

Don't Beeb cruel to Commodore

That's it, I've heard enough (to coin a familiar phrase). Just because you BBC and Spectrum owners like to argue among yourselves there is no need to drag us 64 owners in.

Mr McAlpine makes sense when recommending prospective buyers to analyse their future needs and wants for a micro computer and consequently buy one that is individually suited to the user, and not, as in many cases, because Joe Bloggs owns one or (dare I say it) that it is British.

For Acornsoft to do justice to the BBC (when using maximum resolution) it must make full

use of the 10K or so available. Therefore, creators of software for the 64 wish to give the same service by writing software harnessing the much larger memory available.

Thus, using memory efficiently, alongside the other great virtues of the 64, such as 'automatic collision detection' and 'priorities', true value-for-money software can and is being produced. This can be seen on Llamasoft programs for the 64, so come on, PCN, let's see a review for a 64 program.

In response to Mr Pease, nowhere do I see Mr Bowden stating or implying a 64 has a higher resolution than a BBC. I think Mr Bowden is implying what can be done in 10K.

On the matter of resolution capability, I am sure you will agree with me when comparing the Atari's graphical qualities. It is one of the best picture makers when talking in terms of home computers, even though its resolution is lower than a BBC's.

Shailandra Sethi,
Welwyn Garden City,
Herts

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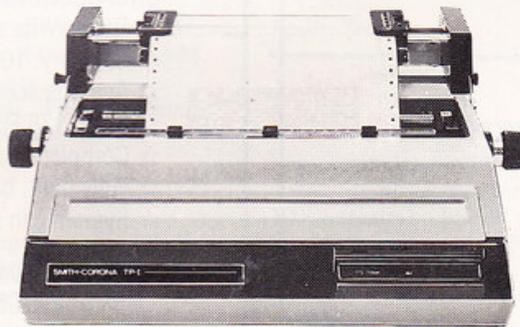
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Lynx problems addressed

Here are a few addresses in the Lynx's system RAM. They are mostly operating system routines, and by altering their contents you can make them point to your own routines and thus build new features into the operating system:

- &6200/1 Write character to screen
 - &6202/3 Printer driver
 - &6204/5 Read a character from keyboard
 - &6263/4 PLOT routine
 - &626D/E Write byte to screen
 - &6288/A Called during error handling, normally contains RET, NOP, NOP
 - &6295/6 NMI vector
 - &6298/9 INT vector
 - &62A7/8 Put byte to cassette
 - &62BC/D Input routine
- Chris Cytera,
Bracknell, Berks

Grubbing out garbage

If you're developing a large program involving big arrays on the Oric, you may find that the character set suddenly starts changing. This is the famous garbage collection problem in Microsoft Basic. Although it looks like you've got around

28K free, unused and discarded strings are filling memory.

The solution, as always, is to insert a line X=FRE(" ") at regular points in your program. Asking for the amount of free memory forces the Basic to clear up old strings, and hence avoids the problem.

S W Lucas,
Cheadle Hulme, Cheshire

Clocking-on time for BBC

Here's a quick way of getting a real time clock on the BBC. Define function keys 0 and 1 exactly as shown:

```
*KEY0 CLS:I. "Hours, mins, secs", H%, M%, S%:  
TI.=100*(S% + M%*60 + H%*3600)M
```

```
*KEY1 CLS:TI. = TI.  
MOD8640000:P.;TI.  
DIV360000;":";(TI.  
DIV6000)MOD60;":";(TI.  
DIV100)MOD60|M
```

Press FO and type in the time. From now on, pressing F1 will tell you the time.

James Bridson,
Barnsley, South Yorkshire

Backwards bangs for Tandy

Here's a short machine code subroutine (see illustration below) that might come in useful for Tandy Color Computer and Dragon users. The routine reverses the text screen, and is great for explosions and the like. Set DEFUSR0 = 16350. The routine can be called within a Basic program with A = USR0(0). Dragon users may want to change the addresses because of their 32K RAM.

R Maloney,
Bradford, West Yorkshire

Dragon: the whole scroll

The program above allows you to scroll the Dragon's hi-resolu-

```
>LIST  
10 CLEAR 300,30000  
20 X=30000  
30 ^ SCROLL DOWN  
40 DATA 8E,1D,DF,EC,83,ED,88,20,8C,06  
 ,10,24,F6,39  
50 FOR D=1 TO 14: READ A#: POKE X+D,V  
AL("&H"+A#):NEXT  
60 ^ SCROLL UP  
70 DATA 8E,06,00,EC,88,20,ED,81,8C,1D  
 ,DF,2F,F6,39  
80 FOR D=1 TO 14: READ A#: POKE X+D+1  
00,VAL("&H"+A#):NEXT  
90 PMODE 4,1:SCREEN 1,1:PCLS: ^ DEMO  
100 FOR D=1 TO 100: LINE -(RND(255),RN  
D(195)),PSET:EXEC 30001  
110 FOR D=1 TO 100: LINE -(RND(255),RN  
D(195)),PSET:EXEC 301001:NEXT:PCLS:GOTO  
100
```

tion screens (PMODE 3,1 and PMODE 4,1) up or down. The machine code routine is relocatable at any address. Call it with EXEC 30101 to scroll up and EXEC 30001 to scroll down.

Darren Eteo,
Hessle, North Humberside

Bigger bangs on the Oric

If you find that EXPLODE, PING and SHOOT are too short on your Oric then you can lengthen them with a PLAY statement straight after the sound statement. For example, 10 EXPLODE:PLAY 7,7,x,y —where x is the envelope mode and y is the duration.

Using this, you can even hear the effect backwards and so on according to the third number. And note that y can be in the range 0-65535, and not 0-32767 as stated on page 101 of the manual.

G Tansey,
Poole, Dorset

Tidy up Newbrain lines

Many printers produce a condensed type giving more than 120 characters a line. If you try this with a Newbrain, you'll discover it puts a CR, LF after every 80 characters. Here's a short Basic routine to beat this. It looks through the list of opened files for the printer (8) and sets its line length to 132. Call this immediately after the printer file is opened:

```
100 FOR a = PEEK(86) + 256  
 *PEEK(87) + 1 TO PEEK  
(100) + 256 *PEEK(101)  
STEP 6  
110 IF PEEK(a) = 8 POKE  
PEEK(a+3) + 256 *PEEK  
(a+4) + 1,132
```

120 NEXT a
130 RETURN
R W Tuley
Ockbrook, Derbyshire

A PEEK to adapt programs

I know a couple of PEEKs for the Spectrum. Try PEEK 23733. If you've got a 16K Spectrum, the answer is 255. You can use this in your own programs so that the program can adapt to the size of machine it is running on. For example, an adventure game might run with 100 or 500 rooms depending on which machine it was on.

PRINT 65536-USR 7962 gives you the number of free bytes left on the system.

Garry Hawkins,
Thorplands, Northampton

Lightening Oric's LOAD

There's a problem when you LOAD machine code sub-routines or data from tape within an Oric program. It LOADs the data but then stops dead at the READY prompt.

You can avoid this by POKEing #60 (RTS) into the location directly before the starting address of the data to be SAVED. Then you SAVE the routine to start automatically.

When it LOADs, it RUNs of its own accord.

The first thing it does is hit the RTS, so it returns to Basic. So you can LOAD the routine, and it will continue RUNning.

As an example, if the data started at #9800, you could use: POKE #97FF,60
CSAVE "Routine",A#97FF,E # (end address),AUTO
Andrew Hampson,
Skelmersdale, Lancashire

```
>  
>  
>LIST  
10 CLEAR 200,16349  
20 FOR X=1 TO 19  
30 READ B: POKE 16349+X,B  
40 NEXT X  
50 NEW  
60 DATA 142,4,0,134,64,168,132,167,13  
2,48,1,140,6,0,38,243,126,180,244  
>  
>
```



ROUTINE INQUIRIES

Got a query? Max Phillips opens the pod door Hal. Send all those unanswerables here. No personal replies promised but you never know . . .

Write to: Max Phillips, Routine Inquiries, *Personal Computer News*, VNU, Evelyn House, 62 Oxford Street, London W1A 2HG.

The protection racket

Q I own a BBC model B and am developing some games for it. Can you please explain what procedures are necessary to apply for copyright, and the costs involved.

*D C West,
Basingstoke, Hants*

A Just mention two well known words software and copyright and you've got an instant legal mudbath but here's a workable basis.

As far as music, writing and so on goes, you automatically get copyright of your own work in this country. You don't even need to stick (C), your name year of first publication, on the product in the UK though it is necessary in other countries and it's a worthwhile notice here.

I don't see why this shouldn't apply to software but since the solution predates the problem, people have yet to find out if it does.

So assume that you've got copyright on your programs. Put a BIG notice to that effect on your cassettes, documentation and title pages. It's worth talking to your solicitor if you want a more detailed explanation, or simply to get the wording of the notice right.

Remember that you can't copyright stuff like the names of your games this way. If you reckon that the majors are going to use your names to sell their crude old games, then you should get the things trademarked. But that's a different arcade game entirely.

Micro sales from the outside

Q Why, whenever I enter a computer shop do I get ignored and some times thrown out? I am 13 and have a 48K Oric. People of my age do buy software . . . if I get chance before I'm thrown out. I am always polite.

*Toby Simpson,
Norwich, Norfolk*

A I've no idea why a good shop would want to throw you out. He who laughs longest department . . . if the bad ones eject their customers then they aren't going to make it.

Of course, if it's a business dealer selling and demonstrating to major customers then the shops may have a point. If you start screaming, shouting, Keyboard-loitering (an offence under the 1984 'Just one more game' Act) or perhaps asking *too* technical questions, you could have problems. Or be offered a job.

Seriously though, the shops to be in are those which let you look at books, software and, if you're in the market for one, new machines. You may find that buying something is a great help. Once you let the shop know that you don't view it as a cheap arcade then you should be able to establish a working relationship.

Selling computers is a costly and difficult business, so computer shops have traditionally been somewhat hostile to people who walk in off the street to see what's new. Now that the market place looks a bit like a Pacman battlefield, it's a different story. Shops will, just like the computers, have to get a good sight more user friendly.

Keep in touch with your Torch

Q I own a Torch and would like to join Miconet. When I contacted them they told me that it couldn't be done. Yet in your article on Miconet (*PCN, Issue 8, April 29 - May 6*) you say that you use a Torch. So what is the correct answer?

*Roy Curnow,
Norwich*

A *Ralph Bancroft writes:* It is really six of one and half a dozen of the other. Provided that you have a Prestel registration it is perfectly possible to access most of the pages of Miconet since they are in the public domain of Prestel.

However, you won't be able to access the pages containing the telesoftware and a few of the information pages, or use the mailbox facility. To do so you must be a member of Miconet's closed user group (CUG) and to do that you have to pay Miconet's annual subscription.

The telesoftware pages are unlikely to be of value to you as they are written in a special format that is unlike normal programming languages. To take advantage of it you need a downloader program that automatically loads the software from the Prestel pages and decodes it to run on your machine.

As far as I know there is no proprietary downloader program for the Torch, and even if there were, there is no software on Miconet or anywhere else on Prestel specifically for the Torch.

Miconet promises its members at least 100 free programs for their machines. In the circumstances, it is a promise that it couldn't keep for Torch users. That is why you (and 138 others) have been told it isn't possible to join Miconet.

I have spoken to Richard Hease, Miconet's managing director, who is sympathetic to the plight of Torch owners. After all, it is (at the time of writing) the only micro with a built in British Telecom approved modem. And it would be nice to be able to talk to other micro users through mailbox.

Mr Hease has agreed to write to the 139 Torch owners who have already contacted Miconet, offering them the opportunity to take out a subscription. Unlike other members they won't have to pay an initial joining fee to cover the cost of the acoustic coupler and terminal software. Any other Torch owners who want to join should contact Miconet on 01-837 3699.

Making a hash of the print

Q I have an Acorn AP-100 printer which reproduces most characters perfectly. But if I type in a £ on the screen, I get a ' on the printer. Also, typing a # on the screen produces a £ on the printer.

Please could you tell me how to overcome this as it is terribly annoying.

*J G Munt,
Woodford Green, Essex*

A All together now . . . repeat after me 'Hash (#) is the same as pound (£).' You ought to learn it anyway because as far as your average computer is

concerned, there really is no difference.

Characters are stored and identified in a computer using a code called ASCII. The A stands for American so there never used to be a £ sign. Most manufacturers stuff one in, using the code for # (code 35). So # and £ are the same thing. Depending on the computers and printers you use, you'll get all sorts of confusion.

The best way to avoid this is to read them as the same character. So you should be happy with a price of #120 or a program instruction PRINT1, A\$

In your own case, the situation is further complicated by the presence of a £ key on the keyboard. If this prints a ' (open single quote), chances are it is generating ASCII 96. Whoever put the £ on the key has probably redefined the ' as a £. But the printer will get a 96 and that's what it will print.

You don't say but I'd hazard a guess you're using a BBC micro (£ keys that generate 96s . . . it's a giveaway). If so, and you're using anything but MODE 7, you should be able to redefine the # sign to look like a £. If it's your own program, you could even kludge the keyboard so that a 96 typed on the £ key is immediately translated to a 35.

A software wish for the Genie

Q I am considering buying a Colour Genie but I am reluctant because there is very little software for it. In Databasics, you list it as a games machine. From reviews I've read it's much better than the Dragon and as good as the Lynx. What's your opinion?

*J E Bradford,
Stroud, Glos.*

A You're right to be suspicious of a machine with very little software. Both the Colour Genie and the Lynx are in this awkward position and it's difficult to judge a micro until software starts to appear.

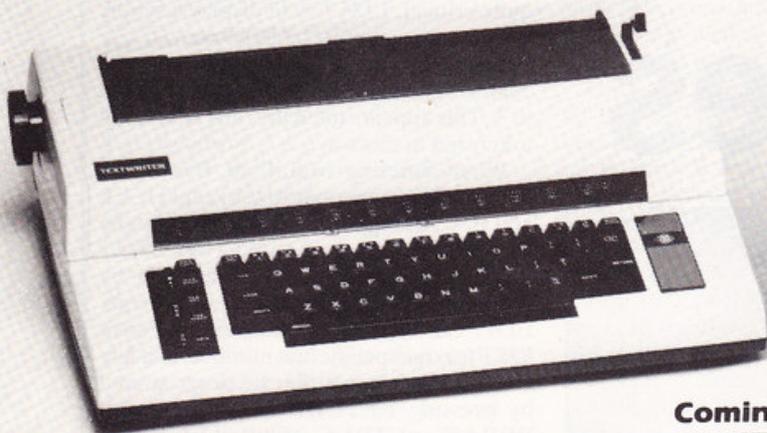
You can either risk buying a computerised white elephant or play safe and let the others do the risking for you.

As for the Colour Genie being listed as a games machine in Databasics, it's only an estimate of how the machine will turn out.

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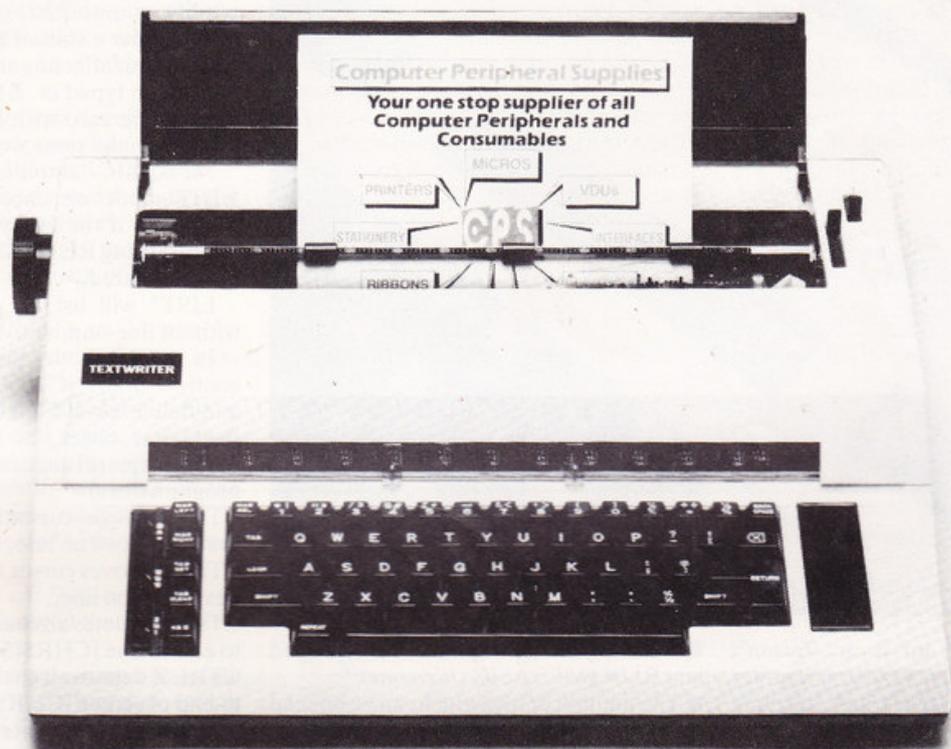


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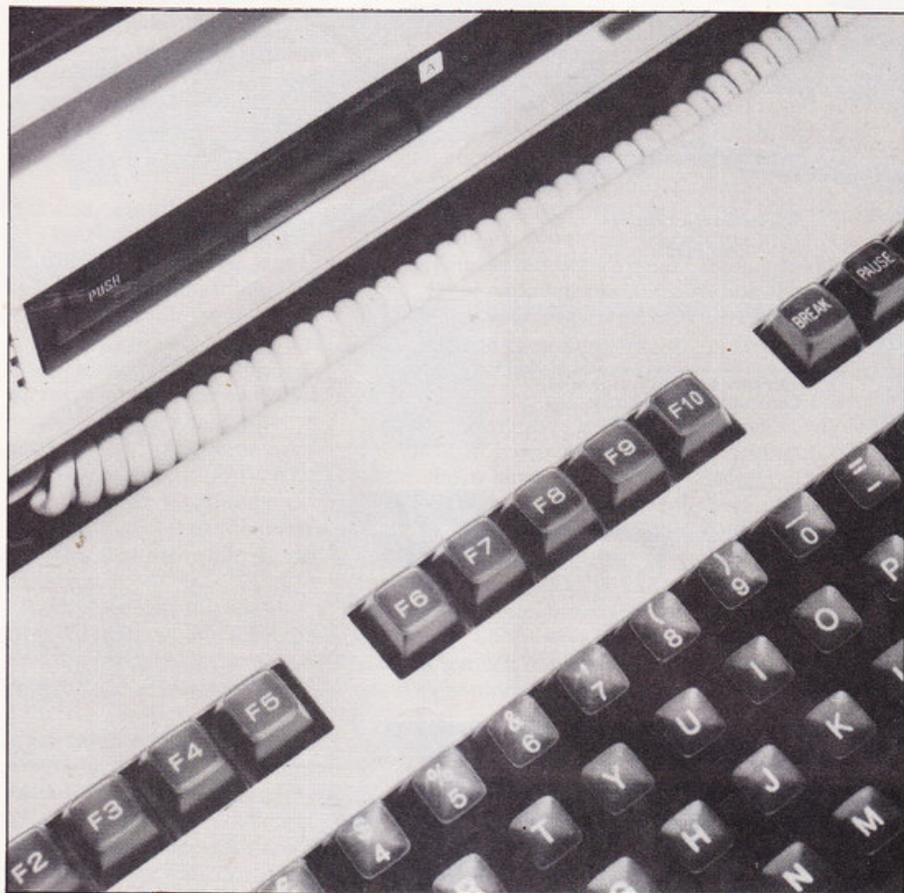
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Hot on the heels of our Hardware Pro-Test, Karl Dallas gets down to Basic on the Epson QX10.

Micro of many faces



Without MultiFont Basic, Epson's powerful new QX10 computer would merely be a nice machine with 256K of memory, pleasant ergonomics and attractive, slim-line contours — thanks, mainly, to the specially designed integral disk drives. But with the MultiFont and special graphics commands, plus the extras Epson has added to its version of CP/M, its capabilities become so special that its software deserves an assessment in its own right (*the QX10 itself was reviewed in PCN, May 20*).

The QX10 system disk contains CP/M and MultiFont Basic, as well as a number of transient commands, of which 11 are unique to the machine. If left in drive A, the disk boots automatically on power-up. The machine enters MultiFont Basic with the MFBASIC command and returns to regular CP/M with SYSTEM.

The SYSTEM command can also be executed from within a MultiFont Basic program.

A number of parameters can be added to the MFBASIC command, namely:

- Defining a first program to be LOADED and RUN (MFBASIC *(filename)*)
- The number of files which can be opened at any one time up to a maximum of 15 (default 3)
- The upper memory boundary in hex, reserving a memory area for storage of machine language programs but correspondingly reducing the amount of memory which can be used for variables or Basic program text
- Maximum record length of random files, specified in either decimal, hex or octal, up to 256 bytes max (default 128)
- Stack area size, between 256 and 1,024 bytes (default 512 bytes)
- Buffer size for each RS232C port, max 1,024 bytes, 0 renders RS232C ports inoperative (default 256)
- Error message language — English, French or German (default English).

Basic line numbers must be in the range between 0 and 65529. One quirk I noticed is that a SYNTAX ERROR will be registered if they are not entered in caps in the WIDTH 80 mode, but in the WIDTH

40 mode they will be changed to caps if entered in lower case. This is no problem in the WIDTH 80 mode, since the caps lock key operates only on the alpha keys (but SHIFT changes the case to lower case).

In WIDTH 40 mode, spacing can be quite critical: LIST40 will display a syntax error because it must be LIST 40.

Each line must be limited to 256 characters, but PRINT can be abbreviated to ?. This appears to be the only command tokenised in this way.

When entering MultiFont Basic programs, all keys are operative except HELP and ESC, though the ESC function can be written into a program with CHR\$(27).

Existing lines can be edited either by retyping or LISTing in the normal way. EDIT can be used in a manner similar to LIST for one specific line number, and any changes made can either be programmed by pressing RETURN or aborted with BREAK or CTRL C. (Shifted RETURN enters a new or edited program line as readily as unshifted, unlike some basics, which allow a shifted RETURN to exit a line without affecting any changes that may have been typed in. BREAK or CTRL C can also be used with LIST to abort such changes in the same way as with EDIT.)

MFBASIC automatically enters the EDIT mode on encountering a syntax error, but if the faulty line is edited and entered using RETURN, then all variables will be cleared.

LIST* will list all program lines but without line-numbers.

In addition to the obvious cursor control, home, CLS, back-space, insert and delete keys, CTRL can be used with five letter codes, as follows (character string in square brackets can be used within program lines):

CTRL B moves cursor to first character of previous word on line;

CTRL F moves cursor to first character of next word on line;

CTRL E deletes all characters from cursor to end of line [CHR\$(5)];

CTRL Z deletes all characters from cursor to end of screen [CHR\$(26)].

'Line' in this context means to next carriage RETURN, which may be up to 256 characters away (screen-width, unless redefined with the WIDTH command, defaults to 80 columns).

Variable names may be up to 40 characters long but they must begin with a letter (not FN which will be interpreted as indicating the beginning of a user-defined function) and must not be one of the 167 reserved words.

String variables must be terminated by "\$" (dollar sign). Numeric variables may be integer (eg A%), single-precision of seven significant digits, rounded to six digits for display or print-out (eg A!), or double-precision of 16 significant digits, printed as 16 with leading zeroes suppressed (eg A#).

All characters are significant, eg VARIABLE and VARIETY will be treated as distinct variables.

The most obvious difference between

MultiFont Basic and all others is, as its name implies, its ability to display or print out any one of 16 different character fonts, namely (in order of style numbers):

- 0 — OCR B-Font
- 1 — Bodoni
- 2 — Old English
- 3 — Flash Bold
- 4 — Commercial Script
- 5 — Helvetica Light
- 6 — Helvetica Light Italic
- 7 — Helvetica Medium Italic
- 8 — Broadway
- 9 — American Typewriter Medium
- 10 — Light Italic
- 11 — Helvetica Medium
- 12 — Bodoni Italic
- 13 — Sans Serif Shaded
- 14 — Microgramma Extended
- 15 — Old German.

Old English and Old German are near-unreadable Gothic scripts of small value, and the same might be said of Commercial Script, which is a sort of copperplate, but the remaining 13 are a good workable range of faces, though the absence of an English classic such as Times betrays the transatlantic mind behind the selection.

The significance of this development in the future of computer printing cannot be over-emphasised. When the sophistication of this concept is matched by the quality of dot matrix printers we may be able to date the beginning of the end of the daisywheel from the launch of the Epson QX10.

Any typestyle from 1 to 15 can be defined by pressing the style selection keys SF1, SF2, SF3, SF4, at the top right-hand of the keyboard in various combinations, which can be expressed as hex or decimal numbers, eg Bodoni can be selected by turning on SF4 (lighting an LED on the key) and leaving off the remainder.

A font can be selected within a program by the command.

OPTION STYLE [font number]

but this is possible only in the WIDTH 40 mode.

It can also be changed within a program by invoking the STYLE\$ function, syntax **PRINT STYLE\$ f2** (string variable, old font no, new font no).

There are some quirks. If a font has been selected by the style selection keys, no font but the boot-up sans can be used for writing program lines without creating a syntax error. But if a font has been selected by invoking the OPTION STYLE command (which can be used in direct as well as program mode), then it will not only accept program lines but will also LIST and give screen messages in the new font.

There is also some confusion between what is represented by font numbers 0 and 16. One part of the manual refers to the fonts being numbered 0-15, another 1-16. 1-15 are the same in both cases, and 0 and 16 seem to be the same font, but it looks rather as if different usages may require 0 or 16, and may result in errors if the wrong convention is used in the wrong place. Only experience will reveal if this is so, and I haven't had the machine long enough to

discover whether this is confused manual writing or a real glitch.

There is no simple way of varying the character-size as well as font, though invoking the WIDTH 40 command will display double-size characters compared with WIDTH 80. However, since a WIDTH command also clears the screen (in direct as well as programming mode), this isn't the way to mix different sizes.

Once the font has been selected by use of the OPTION STYLE command, it becomes the default font, but it can be mixed with other fonts programmed as character strings within quotes and using the style selection keys.

One way different sizes might be achieved could be by way of the program's ability to ZOOM a graphic image to a larger or smaller size, but while the demo disk includes an illustration of this effect, the manual contains no help on how to achieve this.

If you want to experiment with a zoom within a program (say, by using a FOR...NEXT loop to zoom it forwards), be sure to zoom it back with another loop, using minus steps, so that you don't have to reboot.

A tip: if the necessary routine is saved to the battery-backed CMOS chip in ASCII, using the SAVE "CMOS:" A command, it will always be there when you want it,

even after power down and back up again, and can be re-LOADED or MERGED.

The same of course goes for any other frequently used subroutine, as long as it doesn't exceed 2K in length.

The zoom is quite interesting if it is employed to examine the character set, not only the 16 different fonts, but also the 32 graphics symbols accessible from the keyboard by holding down the GRPH SHIFT key and the alpha keys.

GRPHSHIFTB, for instance, displays a little man.

These cannot easily be redefined within Basic, but they can within CP/M by using the unique CHARADEP command. This displays 12 of the more interesting characters, with slight variations (for instance, the CP/M little man is walking, while in MFBasic he is stationary, facing front). Any one of them can be modified and 48 others can be specially created, using a blown-up 14 x 18 matrix display, entering a 1 for a filled block, 0 for a blank block.

Each user-defined character is coded as a two-byte internal code from F7A0 to F7ED Hex and the new set can be SAVED to a system disk. The matrix includes a non-printing line for instructing the printer on proportional spacing.

Most of the graphics commands are self-evident (see list), with one or two exceptions.

MultiFont Basic Graphic Commands

	EFFECT
BIT ON/OFF	Toggle for selection of bit image mode at printer.
CIRCLE	Draws circle, ellipse or arc.
CLS	Clears screen, homes cursor.
COLOUR	Selects foreground, background colour for screen display.
CONNECT	Draws lines between specified points.
GCURSOR	Displays graphic cursor (+), reads co-ords into variables.
GET@	Reads specified range of display dots into variable array.
LINE	Draws straight line between two points.
LOCATE	Moves cursor to specified position.
OPTION COUNTRY	Selects one of eight international character sets.
OPTION STYLE	Changes character font in the WIDTH 40 mode.
PAINT	Fills areas with specified colour.
PRESET	Resets display dot at specified display co-ordinates.
PSET	Turns on display dot at specified graphic co-ordinates.
PUT@	Displays a graphic pattern (stored by GET@) on the display screen.
WIDTH 40/80	Sets number of characters to 40 or 80.

BIT is required to output most control codes to a printer, for instance:

BIT ON: LPRINT CHR\$(27); CH\$(75); CHR\$(90); CHR\$(0):**BIT OFF** can be used to place an Epson printer in high-resolution graphics mode and reserve 90 columns for graphics. **BIT OFF** must be commanded before outputting MultiFont characters to the printer.

COLOR will treat all colour numbers above 0 as white, unless a colour card is fitted, whereupon 1 to 7 gives blue, red, violet, green, light blue, yellow and white, respectively. The parameters are **COLOR** [foreground colour, background colour]. **COLOR >0,0** prints white on black (actually green on black, with phosphor screen) on a monochrome monitor.

LINE (X1, Y1)-(X2, Y2), will draw a line between the two co-ordinates, but **LINE (X1, Y1)-(X2, Y2), B** will draw a rectangle of which the line between the two co-ordinates is the diagonal. **LINE (X1, Y1)-(X2, Y2), BF** will paint in the rectangle.

If any 16-bit hex number from 0000 to FFFF is appended, the line will be one of 17 different kinds of dots or dashes. In this case, BF cannot be specified, but its omission must be represented by commas, eg:

LINE (100,30)-(300,30),, &H49 will print a line of faint triple dots.

If lines are drawn across each other, then quite complex cross-hatching and screens are possible.

IF ZAP, PING and EXPLODE have paled, Bob Maunder will make your Oric go with a bang.

Now you've digested all the information about the Oric 1's graphic capabilities in our Graphics Micropaedia (PCN April 15-22 to May 13-20 inclusive), you'll need sound to make the picture complete. This week we begin a two-part feature on how to make your Oric more tuneful.

Sound out your Oric

You've probably already experimented with the small set of pre-defined Oric sounds — ZAP, for example. But the machine has a much greater sound potential than these sound commands might lead you to think.

The most prominent sound to come out of the Oric is the click it makes each time you hit the keys. You can turn this off and on with the CONTROL F command, and you also do this within a program by typing: PRINT CHR\$(6).

But there is a problem with this method. The instruction is only a toggle, and will turn the sound on or off, depending on its placement in the program.

You can get round the problem by altering one of the Oric's system variables held in memory page zero: this is the keyboard toggle byte, and it lives at location 026A. The fifth bit holds 0 if the key sound is on, and 1 if it's off.

It is therefore possible to POKE a 1 into this bit to ensure the tone will remain switched off. Since address 026A also contains other important switches, such as cursor toggle and the double height toggle, it's important to preserve the other bits in their normal states.

P=PEEK (#26A): POKE #26A,P OR 8

Thus the fifth bit is changed to 1 if it was 0, but stays as 1 if it was 1 before.

There are four pre-defined sound commands on the Oric: ZAP, SHOOT, EXPLODE and PING. All four may be used in programs, while PING is identical to the effect of pressing CONTROL G on the keyboard. Try this demonstration program:

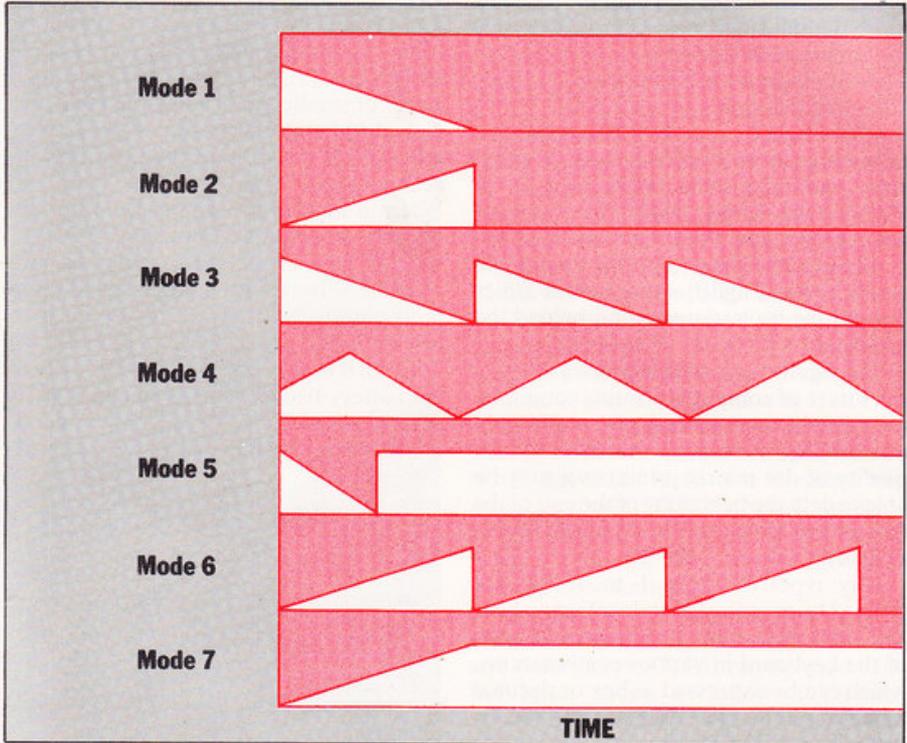
```
10 FOR N=1 TO 10000: PING: NEXT
```

To understand the full sound facilities provided on the Oric, we should consider three specialised commands: SOUND, MUSIC and PLAY. As a general rule of thumb, MUSIC and PLAY are used for musical sounds, and SOUND and PLAY for other sound effects.

The most useful sound command is PLAY 0,0,0,0 — it switches off the sound! When experimenting with these effects you'll often end up with a program that leaves a siren ringing at maximum volume even when the program has stopped running.

If you include the instruction PLAY 0,0,0,0 as the last line of the program, it shuts off the sound. In a real emergency hit CONTROL F and RETURN before the neighbours axe down your front door.

The Oric has three tone channels and three noise channels. You can therefore have three different tones and three different noises all at the same time. The



The waves in this diagram show how the envelope mode (EM) works on the Oric. In Mode 1, the sound falls, in 2 it rises, in 3 it rises sharply, falls slowly and rises sharply again. Modes 3 to 7 all produce continuous sound, while 1 and 2 produce sounds of finite length.

PLAY command controls which channels are used and in what way. It has the following form:

```
PLAY T,N,EM,EP
```

T is a number from 0 to 7, and controls various combinations of tone channels. These are switched on according to this table:

T	Channel(s) on
0	none
1	1
2	2
3	1 and 2
4	3
5	1 and 3
6	2 and 3
7	1, 2 and 3

The N in the PLAY statement controls combinations of the noise channels in exactly the same way T switches on the tone channels, with values 0 to 7 as above. EM and EP define the sound envelope, or shape. EM is the envelope mode and EP the envelope period.

EP is easier to understand — it has values between 0 and 32767, and controls

the duration of the envelope, or how long it takes the sound to start and end. The envelope mode is best illustrated by the diagram above.

This becomes much clearer when we hear the different sound shapes. In the following program you enter the envelope mode value, and the program plays it with the note C sharp:

```
5 REM DIFFERENT ENVELOPE
  MODES
10 INPUT "Envelope mode (1-7) ";EM
20 EM=EM AND 7: IF EM=0 THEN
  STOP
30 MUSIC 1,3,3,0
40 PLAY 1,0,EM,1000
50 WAIT 500
60 PLAY 0,0,0,0
70 GOTO 10
```

Modes 3 to 7 are continuous shapes, but are stopped by line 60.

NEXT WEEK How you create chords with the Oric's sound commands, and how you can accompany music and changing octaves with pictures.

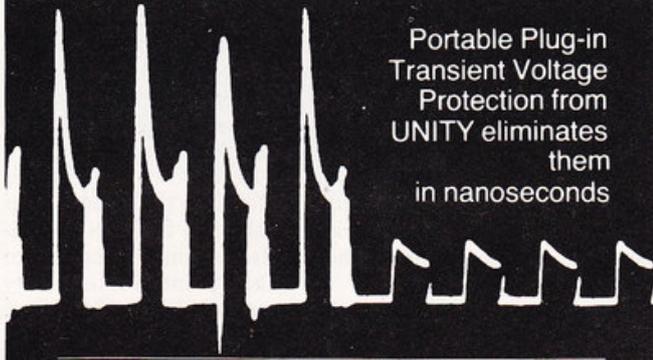
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Harold Gibson shows how the Tandy Color computer can produce good graphics with less graft.

Tandy colour clues

With all the excitement and interest in new colour computers, some old reliables tend to be forgotten.

The Tandy Color Computer is one such machine. As the pictures on the opposite page show, the Tandy computer is quite capable of producing good colour graphics without a great deal of in-depth programming knowledge.

Take the first picture (Figure 1), for example. It's created in the Tandy's PMODE 4 and features a bluish background. The background is not fully blue, because blue is not generally available in that mode, but this program gives you blue as an extra high-resolution colour.

The blue is generated by including both a PMODE 3 and a PMODE 4 statement while setting up a graphics screen. The format for this combined statement is demonstrated in the first listing.

In the second listing, the picture — a dodecahedron — is a product of PMODE 4, and is based on a standard circle construction. Circle-based displays — such as the polygon — are developed from a simple FOR . . . NEXT loop containing three trigonometric functions. The X and Y co-ordinates are first calculated and stored to single dimension arrays — or AX and AY.

One of the benefits of this method is that any of these values may be taken from the array at any time and used in whatever manner you choose. The geometry of this procedure is illustrated in the diagram below. It consists of a right-angle triangle in a semi-circle:

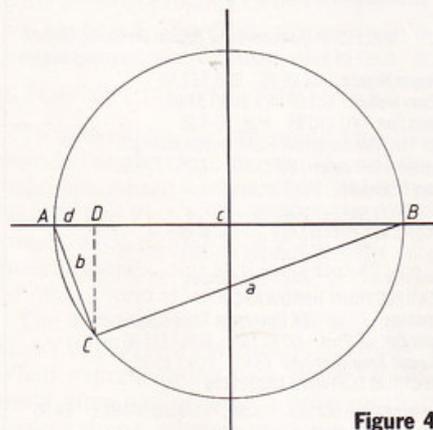


Figure 4

The angle at B takes its value from the first line of the FOR-NEXT loop (LINE 100) and increases from zero to maximum as the loop cycles through the step sizes input. This means the angle at C (the right angle) is driven round the semi-circle. Using the current value for the angle at B and the diameter AB, the length of the side AC is calculated, *ie* $AB\sin ABC$.

The angle ACD is always equal to angle ABC, so we can use $b\cos(ACD)$ to

calculate side CD, and $b\sin(ACD)$ to find the length d. The geometry is taken care of in lines 130 to 150.

Polygons always look good in high resolution, and are often used in adverts for expensive micros. These are not really difficult with a circumscribing circle.

Decide how many sides the polygon is to have — 'P' in our example — and then use this value to determine the step size in the FOR-NEXT loop.

If the Polygon has nine sides, make 'P'=9 (line 30) so that each step = $\pi/9$. The results of the calculations need not be displayed, but can be by means of the PSET statement.

The LINE instruction is used to draw a line between each point in turn (lines 190 and 200) to give the outline. Another LINE statement is then used to connect the points internally (line 230). An alternative method is to use, say, a hundred steps (*ie* $\pi/100$), although some care is then needed when choosing the array elements to be used as parameters in the LINE instruction.

Otherwise, some surprises result — and there are enough surprises in the Color Computer without adding to them. In the FOR-NEXT loop, the step size determines the number of pixels set in constructing the circle, and the counter is used to initialise the array elements. Listing 2 shows how to include the geometry in your programs.

In order to keep the display as attractive as possible, the circle really needs to be centred on the screen. This is achieved by using suitable values of X and Y (line 90) and adding them to the values just calculated.

For example, if you require your circle to be 150 diameter, let $X=53$.

The high resolution screen is 256 wide, so we have $256-150$ divided by 2. This will be added to the value calculated for AD, and the total will be stored in array AX.

In the same example, Y would be made 92, which would be added to the value for CD, and this total stored in array AY. You will notice that π has been used in the FOR-NEXT loop format — this is because of the relationship between the circle and π .

The Colour Computer calculates all angles in radians. A radian is defined as that angle subtended at the centre of the circle by an arc equal in length to the radius. It follows that there are two π radians in 360 degrees, and the computer reads the value of the angle ABC in radians.

If you want an ellipse, it can be drawn on the screen by using the circle method described above, and including in either the AX or the AY calculation a division factor. An example of this is line 520 in Listing 1. This shortens the co-ordinate

and has the effect of squeezing the circle. It is certainly much easier than using the elliptical formula, and is very similar to Radio Shack's approach to the ellipse in its extended Basic.

Whether the major or the minor axis lies horizontal depends on whether the X or the Y ordinate is shortened.

The elliptical shape shown in Figure 1 is calculated and stored in the same way as the previous examples, the LINE statement is then used to join one of the points to each of the other points in turn. Try running the program in Listing 3 — some really pretty colours result.

Breaking prohibition

One of the interesting things about these PMODE 4 displays is the normally prohibited colours that are generated. The method used to obtain the blue background displayed in Figure 1 sometimes results in a nasty green colour; this can be overcome by resetting the computer or by including an instruction to set up the screen to COLOUR SET 1.

The blue background colour used in Figure 1 can also be produced by using the PSET instruction contained in two nested loops. If the step size is varied, different hues can be obtained, although you are working in PMODE 4. The foreground colour is buff. Some very pleasing effects can also be had in PMODE 3 using this method, especially when working in COLOUR SET 1.

Text in high resolution can be produced by using the DRAW instruction. Either use a complete statement for each letter as required as in Listing 1, or enclose all the variables except the X and Y co-ordinates in quotes to make a string expression, and give this the name of the letter to be reproduced. Add the co-ordinates later when required.

For example, if an 'A' was required, the string could take the form:

```
A$="U4;E3;N;U1;F3;N;D4;L3"
```

At the point in the program where it was needed the whole instruction would read:

```
DRAW"BM124,98;" + A$
```

All the programs in this article should also work on the Dragon 32 computer with little or no modification. Even the PMODE and other graphics commands don't change.

The Dragon and Tandy use almost identical versions of Microsoft Basic, and run the same 6809 processor. Look for more details on Dragon and Tandy compatibility in next week's PCN, where we'll show how to convert cassette-based software from one machine to another and what changes have been made to the two machines' Basics.

GRAPHIC ANGLES

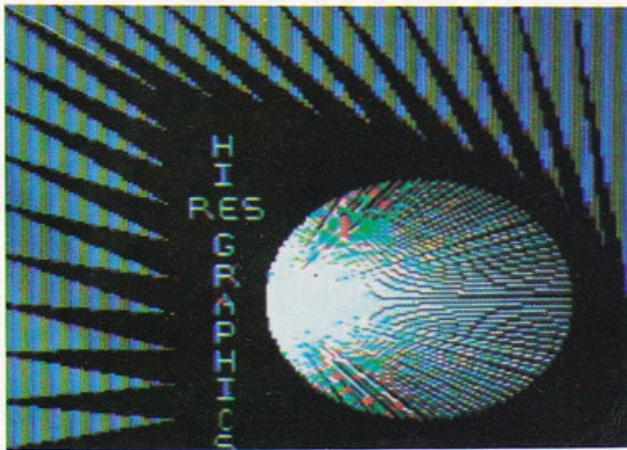


Figure 1: A collage combining text and elliptical graphics.

```

10 'LISTING ONE-COLAGE
20 PMODE4.1:PCLS:SCREEN1,1
30 DIMAX(60),AY(60):DIM BX(150),BY(150)
40 PMODE3:PCLS7:PMODE4:'PRODUCES BLUE BACKGROUND
50 SCREEN1
60 PI=3.14259
70 I=PI/30
80 C=0:'SETS COUNTER TO ZERO
90 X=205:Y=192
100 'READ VALUES INTO ARRAY A
110 FOR J=2.3561925 TO PI STEP I
120 C=C+1
130 AC=100*ASIN(J):'CALCULATES LENGTH AC SEE FIG 4
140 AX(C)=AC*ASIN(J)+205
150 AY(C)=AC*COS(J)+192
160 NEXT J
170 COLOR 4:'SET UP ORDINATES FOR LINE
180 FOR K=0 TO 256 STEP 23

```

```

190 FOR L=AX(K) TO AX(C)
200 FOR M=AY(1) TO AY(C)
210 LINE(K,0)-(L,M),PSET
220 NEXT M:NEXT L:NEXT K
230 FOR P=0 TO 192 STEP K
240 FOR R=AX(1) TO AX(C)
250 FOR S=AY(1) TO AY(C)
260 LINE(0,P)-(R,S),PSET
270 NEXT S:NEXT R:NEXT P
280 COLOR 5
290 'PRINT TEXT
300 DRAW"BM90,64:U8:B/D4/R6/U4:B/D4/D4"'"LETTER H
310 DRAW"BM90,76:R6:B/L3:U8:R3:B/L3/L3"'"LETTER I
320 DRAW"BM90,190:R5:E1/U2:H1/L5:H1/U2:E1/R5"'"LETTER S
330 DRAW"BM95,178:G1/L2:H1:U6:E1/R2:F1"'"LETTER C
340 DRAW"BM95,166:R6:B/L3:U8:R3:B/L3/L3"'"LETTER I
350 DRAW"BM90,154:U8:B/D4/R6/U4:B/D4/D4"'"LETTER H
360 DRAW"BM90,142:U8:R5:F1:D3:G1/L5"'"LETTER P
370 DRAW"BM90,130:U4:E3:N/U1:F3:N/D4/L3"'"LETTER A
380 DRAW"BM90,118:U8:R5:F1/D2:G1/N/L5:F3/D1"'"LETTER R
390 DRAW"BM94,102:R2:D2:G1/L4:H1/U6:E1/R4:F1"'"LETTER G
400 DRAW"BM98,90:L5:H1/U3:R5:B/L5/U3:E1/R5"'"LETTER E
410 DRAW"BM90,90:U8:R5:F1/D2:G1/N/L5:F3/D1"'"LETTER R
420 DRAW"BM102,90:R5:E1/U2:H1/L5:H1/U2:E1/R5"'"LETTER S
430 'CENTRAL DISPLAY
440 P=100:SS=PI/P
450 DIA=120:C=0
460 X=110:Y=125
470 'READ VALUES INTO ARRAY B
480 FOR I=0 TO PI STEP SS
490 C=C+1
500 AC=DIA*ASIN(I)
510 BX(C)=AC*ASIN(I)+X
520 BY(C)=AC*COS(I)+Y
530 NEXT I
540 FOR J=1 TO P
550 FOR C=1 TO P
560 COLOR 5
570 'PRODUCE PATTERN
580 LINE(BX(1),BY(1))-(BX(C),BY(C)),PSET
590 NEXT C:NEXT J
600 GOTO600

```

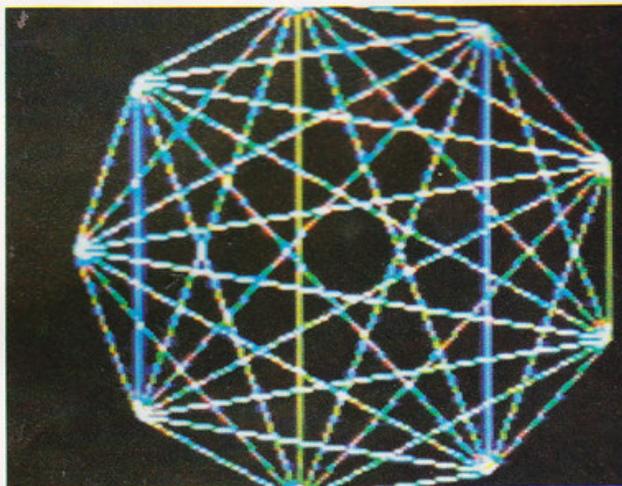


Figure 2: A dodecahedron developed from the geometry in the illustration opposite.

```

10 'LISTING TWO-POLY 9
20 DIM AX(12),AY(12):'DIMENSION ARRAY
30 P= 9:'POLYGON HAS P SIDES
40 PMODE 4.1:PCLS :SCREEN1,1
50 PI=3.14159:DIA=150:SIDE=PI/P
60 'FIX SIZE OF BASE CIRCLE
70 DIA=150:SIDE=PI/P
80 C=0:'SET COUNTER TO ZERO
90 X=50:Y=92:'CENTRE DISPLAY ON SCREEN
100 FOR I=0 TO PI STEP SIDE
110 C=C+1
120 'CALCULATE VALUE OF AC IN FIG 4
130 AC=DIA*ASIN(I)
140 AX(C)=AC*ASIN(I)+X:'CALCULATES VALUE OF AC IN FIG 4
150 AY(C)=AC*COS(I)+Y:'CALCULATES VALUE OF CD IN FIG 4
160 NEXT I
170 FOR J=1 TO(P-1)
180 'OUTLINE POLYGON ON SCREEN
190 LINE(AX(C),AY(C))-(AX(J),AY(J)),PSET
200 LINE(AX(J),AY(J))-(AX(J+1),AY(J+1)),PSET
210 FOR L=1 TO P
220 'DRAW INTERIOR OF POLYGON ON SCREEN
230 LINE(AX(L),AY(L))-(AX(J),AY(J)),PSET
240 NEXT L
250 NEXT J
260 GOTO260

```

```

10 'LISTING THREE-PRINT
20 'DIMENSION ARRAY A
30 DIM AX(151),AY(151)
40 PMODE 4.1:PCLS :SCREEN1,1
50 PI=3.14159
60 DIA=150:'FIXES DIA OF BASE CIRCLE
70 SIDE=PI/150:'SETS NUMBER OF
80 'DOTS ON SCREEN
90 C=0:'SETS COUNTER TO ZERO
100 X= 56:Y=92
110 'READ VALUES INTO ARRAY
120 FOR I=0 TO PI STEP SIDE
130 C=C+1
140 'CALCULATE LENGTH AC
150 'IN FIG 4
160 AC=DIA*ASIN(I)
170 AX(C)=AC*ASIN(I)+X
180 AY(C)=AC*COS(I)+Y
190 PSET(AX(C),AY(C),7)
200 NEXT I
210 C=0:'SET COUNTER TO ZERO
220 FOR J=1 TO 150
230 C=C+1:'INCREASE COUNTER
240 LINE(AX(38),AY(38))-(AX(C),AY(C)),PSET
250 NEXT J
260 GOTO260

```

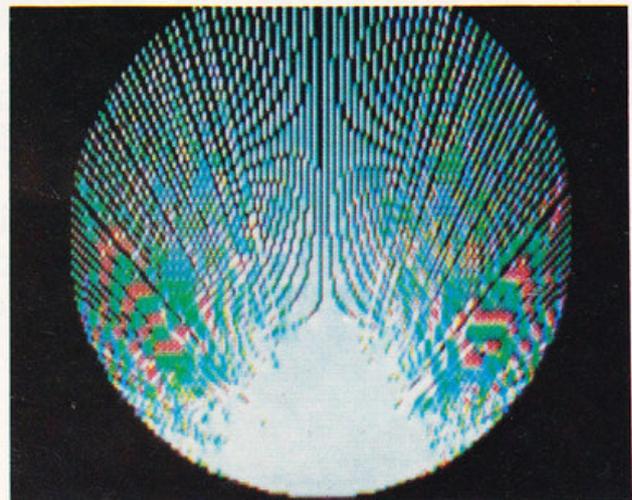


Figure 3: A shell-type circle using normally prohibited colours.

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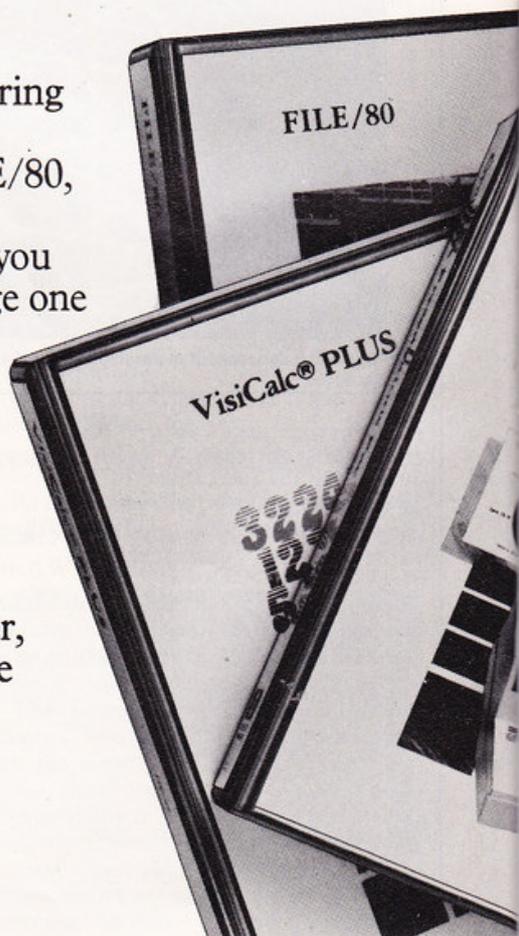
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Two-way stretch to Spectrum word processing. Ted Ball screen tests a pair of packages.



Gabrielle Izen

Shifty looks good

Word processing is one the main applications for microcomputers, but the Spectrum and ZX Printer are not suitable for preparing and producing large quantities of printed output.

However, Shifty can be useful if you already have a Spectrum and need only small amounts of text printed, and it overcomes one limitation of the ZX Printer by printing sideways on the paper, allowing lines longer than the normal 32 characters.

Shifty allows you to type in and edit text, format the text for printing, save the text on tape, and load text from tape.

Features

Before you can start to enter new text you are asked for the maximum number of paragraphs and the maximum number of characters you want. When you have given this information you get the prompt 'Press FLASHCUMPRINT key (h = help)'.

FLASHCUMPRINT is a mnemonic made up of the initial letters of the commands in the menu. At the beginning the only useful commands are 'H', which displays the full menu, and 'N', for next paragraph, which allows you to start typing in your text.

While you are entering text you can also make changes and corrections by moving the cursor around and inserting and deleting text, in the same way as editing a line of Basic. However, Shifty provides a

full-screen editor, so you can move the cursor up and down through the lines of text, as well as left and right.

When you have finished with a paragraph you press the ENTER key and you get back to the FLASHCUMPRINT prompt.

If you want to edit any paragraph, you use 'C' to call up the paragraph, and you can then use the full-screen editor on it in the same way as before.

With 'F', for Find, you are asked for a string and Shifty searches the whole text for the string. If it finds it, it displays the section of text and you can then continue looking for more appearances of the string, or return to the menu.

Shifty does not allow you to edit immediately it has found a string: you have to return to the menu and then call up the paragraph for editing.

The 'A', 'U', 'M' and 'R' commands allow you to manipulate paragraphs. 'A' joins two consecutive paragraphs to make a single paragraph, 'U' splits a paragraph in two, and you move the cursor to the point where you want the paragraph to be split.

'M' moves a paragraph to a different position in the text, and 'R' removes, or deletes, a paragraph.

'I' allows you to insert a special message into the text. The special message has to be put into the program, in data statements, and you can have as many different messages as you want, as the insert command asks you for the line number where the message begins and the number of data items to be used.

If you are going to use the same special messages frequently, you can save a copy of the program with the messages in it.

'L' and 'S' are Load and Save. When Shifty saves text, it also saves two other data files and you have to watch the screen, to press a key when Shifty is ready to save the next data file. When the saving is finished, Shifty asks you to rewind the tape and play it, and automatically goes into VERIFY mode.

'P' prints the text. You are asked for the first and last paragraphs to be printed, the line length (which may be anything from 20 to 88 characters), the spacing between lines (one of three values), whether you want the right margin justified and whether you want to view the text on the screen or get it out on the printer.

If you select a line length of more than 32 characters, Shifty will automatically print the text sideways.

Only a limited amount of formatting is allowed. Apart from the formatting in the Print command, all you can do is include a special character in the text to force the printing to continue on a new line.

Anything else you have to do yourself. For example, to centre a heading you have to put the right number of spaces in front of it according to the line width you select for printing.

Getting started

The documentation consists of four closely printed sheets of A4 paper, and explains

the hardware you need for Shifty and how to use it.

Although the documentation includes everything you need, it is not organised very well; the headings are not the same as the commands, so if you want details of a particular command, you have to scan through the instructions until you find what you want.

There is a sample text file on the tape, and if you start by reading through the instructions and practising on the sample text, you will soon be able to use Shifty without more than occasional help from the menu or the instructions.

In use

On the whole, Shifty is fairly easy to use, with the same abbreviated menu coming up after each operation has been finished, and with each command giving full prompts for the information required of you.

However, it is sometimes tedious to use. With the Print command you have to give all the formatting information every time, even if you just want several identical copies of the same text.

You can also spend a lot of time saving and verifying backup copies if you are working on a long file, and since Shifty does not allow file names for saved text, you also have to be careful to keep records of the text you have on tape.

Shifty is a little slow in formatting text that is to be printed sideways, but the speed does not really matter unless you are printing large amounts of text.

Reliability

There are a few minor bugs that drop you into Basic if you give invalid responses to the prompts.

For example, if you ask for more than the recommended maximum number of characters when setting up you get an 'Integer out of range' or 'Out of memory' error, according to the size of the number you put in.

The tape supplied for review was an advance copy and these bugs may be fixed in the production version. The instructions do tell you how to get back into the program after a crash without losing your text.

Verdict

Shifty is certainly good enough for any word processing you will want to do on the Spectrum — in fact it is almost too good for the Sinclair hardware.

Printing the text sideways enables you to get the maximum use out of the ZX Printer.

The ratings reflect the features of the Shifty program itself and do not take into account the limitations of the Spectrum and ZX Printer.

You should remember, however, that the Spectrum keyboard does not allow touch-typing and is difficult to use for typing large amounts of text, and even though Shifty can print up to 88 characters you get only 22 lines to a 'page' when it is printing sideways.

RATING
Features
Documentation
Performance
Usability
Reliability
Overall Value



Name Shifty **Application** Word processor **System** 48K ZX Spectrum with ZX Printer **Price** £7.50 including VAT **Publisher** Work Force, 140 Wilden Ave, Luton, Beds **Format** Cassette **Language** Basic

Spinning a line

A word processor should allow you to edit, format and manipulate blocks of text in order to produce a nicely printed output. Despite its name this program is not a word processor — it is just a very simple line-orientated text editor.

When you load the program it comes up with a menu giving you the options Exit, Help, Clear Machine for Input, Edit Text, Print Text, Load Text and Save Text. The only instructions included are displayed by Help, which prints three screens of information about the editing commands and special uses for some keys.

The instructions for the editor commands are very brief, and it took a lot of trial and error to find out what some of them did.

The editor allows you to select a line for editing, insert new lines, and delete lines. When you are editing a line you can delete characters with the usual SHIFT and 'O' keys, but to insert characters within a line you first have to open up space by pressing the SHIFT and '9' keys together, once for each character to be inserted.

When you do this you lose the characters at the right hand end of the line, but there is a bug which sometimes makes the characters at the end of the line being edited overwrite the beginning of the next line.

Calling this program a word processor is an exaggeration, and even as a text editor it is poor. I have seen better editors included with assemblers and programming languages priced at only little more than Quicksilva is asking for this.

RATING
Features
Documentation
Performance
Usability
Reliability
Overall value



Name Word Processor **Application** Text editor **System** 48K ZX Spectrum **Price** £5.95 **Publisher** Quicksilva **Format** Cassette **Language** Basic

Having created your database, what do you do with it? Pete Galliard tests a package that puts it to use.

Write files

Estate Agents Vendor Position Report.							
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The kind of output possible with PFS:Report.

The logical follow-up to a database package has to be a report writer package, since only the most sophisticated databases have many facilities built in to let you format your information.

So, hard on the heels of the PFS:File package I looked at last week comes PFS:Report — and indeed, PFS:Report will work only with files created with PFS:File.

I tested the package on an IBMPC, using the estate agency database created last week, but you can also get hold of versions for the Apple II and III.

Features

PFS:Report lets you select the information from your PFS files that you want to include in your reports, define the layout, including headings and totals, and finally print the report.

You can use the same kind of specifications to retrieve records as you use with PFS:File — matching complete fields or parts of fields, numeric fields or ranges of fields. Then, when you have picked out the set of records you want to use, you select the title, the type of printer, and the number of lines per page and page width.

Finally, you choose which fields to print and in what order, across a maximum of 16 columns, and you pick the field on which the records are to be sorted by defining it as Column One. Sorting is optional — to produce an unsorted report, Column One must be dropped. Up to three columns can be derived from the data in other columns.

Presentation

PFS:Report is every bit as well presented as its sister file package. You get a pair of diskettes, one for back-up, in a box together with the familiar easy-to-read manual, packed with numerous examples, screen photographs, indexes, and glossaries.

There are full details of how to set up your printer to work with the package, but as with PFS:File, there's no programmer's manual, because there are no facilities for more sophisticated users to add their own touches to the software.

In Use

Getting started could hardly be simpler, with a single command which takes you directly to a master menu. From here, you can choose to design and print a report; to pre-define a report design which you can then save if you want to use it frequently; or to set new headings for an already-defined report.

The first step in preparing a report is to pick the records you wanted to include, by setting out its retrieval specifications.

To search for records containing a particular character string, you simply enter that string preceded or followed by two dots where information before or after that string is to be ignored. ..N3, for example, will dig out all the records with addresses in London N3 from the estate agency file.

You can also use the @ character to

replace characters you cannot specify exactly — S@3, say, will let you search for houses in London SW3 and SE3. And you can choose numeric ranges against which records are to be matched — select every record from the housing file where the house price field is between £35,000 and £50,000, for example.

In short, you have the same kind of record retrieval options as PFS:File.

There's a second menu, the Report Options menu, to let you pick your report's vital statistics. The report's title can be up to one line in length, and you must also specify your printer page width and the number of lines to be printed per page.

You get a screen with the names of all the fields on your chosen file, and you number those fields you wish to include in the report in the order in which you want them to appear across the page. The first two fields you select will be the sort key, if you choose to have the records sorted into alphanumeric sequence.

Numeric columns can be totalled at two levels, with a subtotal each time the sort key changes, and a grand total at the end of the report. You can also choose to calculate final averages and sub-averages for numeric columns, and for any type of column you can print a count of the number of entries in that column.

You can also carry out simple calculations using the standard arithmetic functions to generate up to three columns from the data in the other columns.

Reliability

I tried to crash the package, but it stood up well and was resilient. There were a few cumbersome procedures to be gone through when, as I was printing the report, I found that I really needed to change some of the data on the files. Because the two PFS packages are sold as separate products, I had to go back and re-load the PFS:File diskette to make my changes, which is a real nuisance. I would have preferred to see an option to copy both packages onto a single diskette.

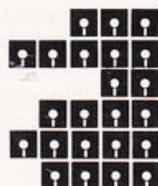
I also found PFS:Report a slow performer, especially when sorting files.

Verdict

The finished reports are very simple, and tabular in format. If this is how you want your reports to look, then this package makes it very easy to prepare them. But if you want to put together more customised reports, you will find PFS:Report's abilities a severe constraint.

RATING

- Features
- Documentation
- Performance
- User interface
- Reliability
- Overall value



Name PFS:Report Application Report generator
System IBM PC, 64K Publisher Software
Publishing Corp Format Disk Other versions
Apple II and III Outlets Personal Computers,
01-377 1200

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Remsoft, in conjunction with a leading British O.E.M company, would like to make the following announcement that will be of special interest to people using or considering using the FORTH language;

WE INVOLVE YOU IN THE DESIGN.

The OEM company concerned have designed the kernel of a powerful microcomputer utilising Forth as the primary language. However, unlike most contemporary Microcomputer manufacturers, we have decided to ask the potential users of this machine which features they would like to see incorporated or left out at the design stage. The alternative is to foist a machine on the market and hope for the best. We do not agree with this philosophy as we feel that the end user should play a valid role in the design of the machine. We will send you a comprehensive questionnaire and utilise the resulting data to enhance the proposed machine's specification.

WHY FORTH?

Forth, we feel, is not just another change in the fashionable aspects of computer languages, Forth is a sophisticated language that will meet the demands of a new generation of computer users. Microcomputer users are developing skills that involve programming at machine language level for their particular hardware application. They require a flexible and adaptable high-level language. Forth is destined to become that new and powerful tool. Forth will provide the necessary catalyst for many skills as it enables machine language programming to be readily intermixed with high level language statements. Forth is fast and compact and ideally suited to educational, machine control environments, laboratory, home and experimental applications. The Microelectronics hardware industry has achieved greater levels of integration such as Single chip Modems and Speech Synthesisers making it easier for users to include these powerful devices in their systems at a low cost. We hope that our final machine will fulfil the needs of a growing industrial, academic, scientific and home computer market, one that is beginning to demand more versatility at a lower cost. You can see from the preliminary specification of our Forth-based machine that we have included two recent and significant advances: the Sony Microfloppy and 64k RAM chips. The questions you will be answering will enable us to determine such things as which second high level language should be co-resident (if at all), the type of I/O structure and what type of keyboard should be incorporated, whether the disc controller should be on-board and the cost penalties involved in these decisions.

PRIZES

As an added incentive we are offering the following prizes to be drawn at a later date.

A 1st Prize of £100 in cash plus the proposed machine and Remsoft software to the value of £100.

2nd Prize of the proposed machine plus £50's worth of Remsoft Software.

(See below for conditions).

We will now describe the kernel machine that will be subject to changes resulting from your data.

HARDWARE

2 Mhz processor. 6502. Disc interface for Sony Microfloppy 3½ inch standard. (70 track at present, 80 track when released).

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FIRMWARE

Resident Interpreter and Compiler for FORTH 79, single precision integer (16 bit). Screen Editor. I/O device drivers and data handlers. 6502 Macro Assembler. Extra Macro Assemblers for different processors will be available later. System monitor and utilities. Double Precision integer (32 bit) extension vocabulary. Various Mathematical routines will be made available at a later date and other utilities.

REMSOFT, specialist Forth software house, will be supplying a full range of Forth programs for this machine. Conditions of entry; The machines will be awarded as prizes only if we decide to go ahead and manufacture them, we will however still award the £100 cash prize.

Please send in your name and address to: REMSOFT, FREEPOST, BRIGHTON, BN1 1ZW, to receive your serial numbered questionnaire. We will draw the prizes on a date to be announced in this magazine. Allow 2 weeks for the questionnaire to arrive.

Max Phillips casts a critical eye over Molimerx's File Handling system for the Colour Genie.

File under 'failed'

It doesn't happen very often. We got review software shortly before we could get hold of one of the elusive new Colour Genies, so someone's making an effort. But the Molimerx File Handling tape isn't that much of an effort. It's crude, and priced over the odds.

Features

File Handling is a Basic program that looks after a list of names and addresses. There's room for 68 but you can fit 95 in if you suppress the Colour Genie's graphics screen and make extensive modifications to the program.

You can't set up your own files with your own fields, not without changing the program anyway.

Features and facilities are adequate. Records are kept sorted on the first field. You can list, search, edit, delete and add records and LOAD/SAVE from tape. But there's no support for a printer.

Presentation

Again, adequacy appears to be the target. The cassette is bagged and labelled and there are two photocopied sheets, mostly trying to explain why it's so difficult to load Colour Genie programs.

This is a real gem — I remember packaging like this. You used to get Tandy Model 1 programs with the same sort of unimpressive presentation years and years ago. It would be very enjoyable to show these people what yer average £5.95 Spectrum programs look like these days.

Now, nobody can document a program in two sides of paper. Especially if the first half is about cassette loading and the last quarter is blank. Even so, the manual is ridiculously technical.

The Colour Genie is aimed at first timers, who perhaps have bought File Handling because they thought that £16 would get them a useful database. They will be overjoyed to be told to edit the program at almost every turn, and to have to battle with phrases like 'Search is not a true instring search'. Good. It sounds horribly painful.

It's hard to believe but the manual also has an amazing pompous streak. It should frighten the life out of any eager child. How about 'If you answer in the affirmative then . . . What's wrong with 'Pressing Y will . . . or 'Type Y for Yes and . . .'

There is one example in the documentation. Lonely as it may be, it's a welcome concession to the (apparently unlikely) event that an inexperienced human being might try to use the program. It's a shame it doesn't work.

HAR will find Harding, it says. Not on the review copy it won't. Or perhaps I'm supposed to whip up a quick fold-to-capitals and compare routine. Come to think of it, the program just doesn't work if

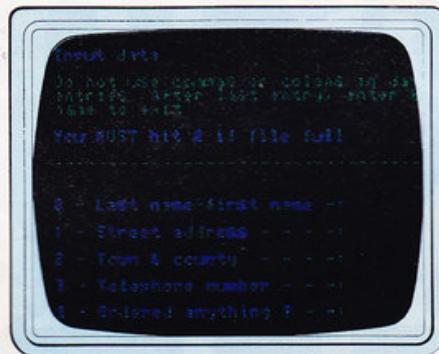
you've got the caps lock key down.

The documentation is a classic. But neither from the point of view of literary nor computing achievements.

Getting started

There's little to do after reading the documentation but get started. After all, you've still no idea what the program actually does apart from the advice that it's interactive and the machine guides you through the program.

It's easy enough . . . the manual mentions the word CLOAD and you can probably figure out that you're supposed to type RUN as well. Then you just explore the program. It doesn't take long.



File Handling records are fixed to name, two-line address, phone and 'ordered anything' fields.

In use

You can't really expect a lot from a Basic program running in under 9K. But you could expect more than this. There was hardly any discernible user interface. Instead, commands and options seemed to be haphazard and inconsistent. Press RETURN for some options, not for others. A menu with numbers. A UCSD-style command line. Push a letter. And so on.

Coupled with the haphazard use of a few COLOUR statements and you get the impression the program was ported (or perhaps thrown) from a TRS80 machine. There are plenty of howlers for hackers. Remember the old joke 'Press enter to continue??' The ? at the end of this cryptic question results from a lazy use of the INPUT statement. Molimerx has added new life . . . the Colour Genie has a RETURN key, not an ENTER key.

Of course, File Handling is not intended for much more than an example program or demonstration. But that doesn't mean you can get away with a bad program. Take the case of the user who wants to kill the graphics screen and squash an extra 27 names in.

First of all, why does the program not spot the extra memory and use it? There's a function called FRE in the Basic specially for this. But the program apparently hasn't

spotted this fact, so you have to mod it. You change the amount of reserved string space in the CLEAR statement from 4900 to 7500 as directed. Then you'd expect to change the line which sets the maximum number of records.

But this isn't set up as a constant at the start of the program. The manual says 'Throughout the program . . . the numbers 67 and 68 will be found. These should be increased to . . . 95 and 96! Usually, in programming, you set important constants once at the beginning of the program. Just who are supposed to be the beginners . . . the users? Or the authors?'

Looking at File Handling as an example program could seriously damage your enthusiasm. The horror continues. 'Some experimentation may be required to balance the CLEAR statement against the number you insert . . . ' Fine. You mean Molimerx has not had time to check what a reasonable set of figures would be.

Reliability

There's not a lot to go wrong. In its favour, it does validate inputs and it does trap against most silly errors. I'd still like to be prevented from searching and editing non-existent records. You can even delete them . . . but it's hard to tell.

Verdict

It's hard to pass a verdict when a sentence would seem more appropriate. File Handling for the Colour Genie has the look of a rushed product.

It's not unique — any new machine is accompanied by such products and it's great to see that Lowe Electronics and houses like Molimerx have attempted to support a new machine.

But should this be representative of Colour Genie software, then I'd think more than twice about buying one.

What I can't believe is the price. Assuming it's a rush job, a stopgap for someone who can't program and is desperate for anything that CLOADs, I'd estimate around £2.95. I checked with Molimerx, at least twice, and File Handling costs £15.93.

RATING	■ ■ ■ ■
Features	■ ■ ■ ■
Documentation	■ ■ ■ ■
Performance	■ ■ ■ ■
Usability	■ ■ ■ ■
Reliability	■ ■ ■ ■
Overall value	■ ■ ■ ■

Name File Handling **Application** Address lits
System Colour Genie 16K **Price** £15.93
Publisher Molimerx, Bexhill (0424) 220391
Format: Cassette **Language:** Basic **Other versions:**
TRS80 model 1 and 3, Video Genie model 1
and 2 **Outlets** Mail order and dealers.

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A full-featured economic dot matrix printer from CTI earns applause from Barry Miles.

Nice priced print

This is a medium priced dot matrix printer, operating at 80 cps and with a wide range of capabilities, intended to provide good general purpose printing in a wide variety of type styles.

The case is substantial and quite good-looking in a two-tone coffee and cream effect. A single transit screw had to be removed to get going, and attention was drawn to this both on the case and in the manual. Unfortunately the manual refers to two screws, which might cause some frustration.

The machine weighs only 5.3 kilos, and has a solid feel to it. It is supplied with four fairly substantial rubber feet, which enabled me to perch it quite safely on top of my VDU.

Setting up

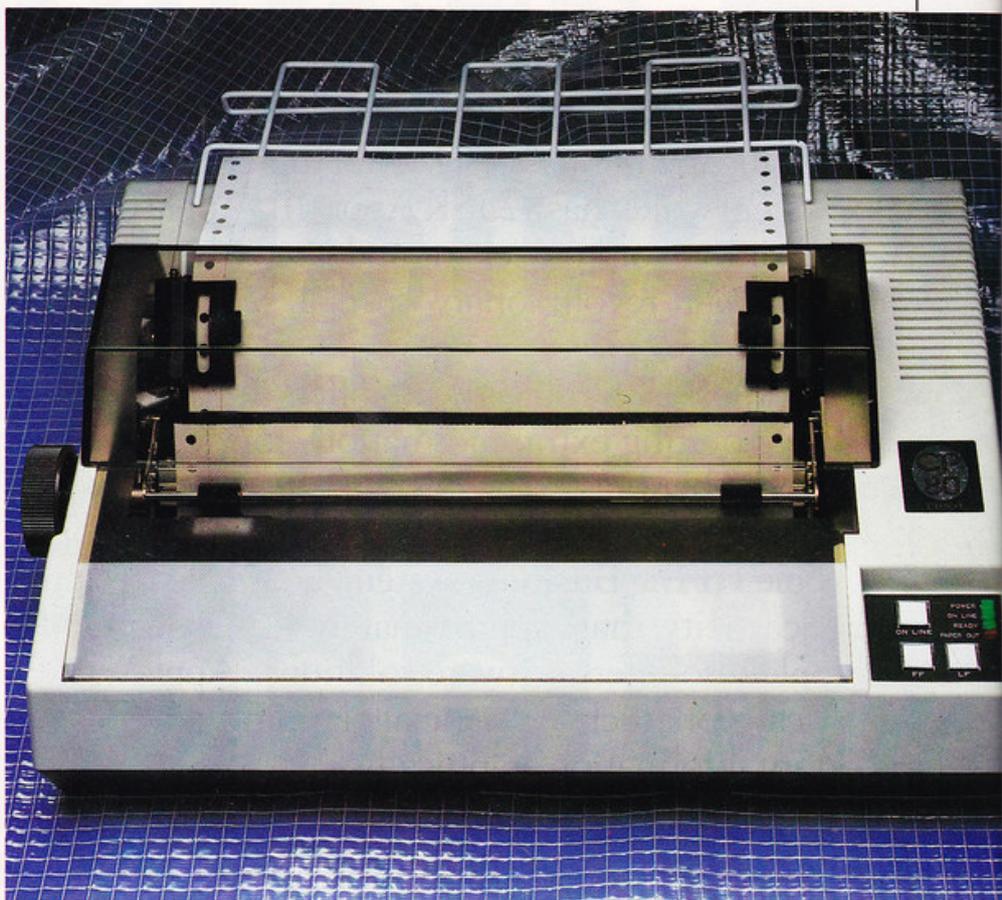
Getting started was straightforward, although the manual is a bit difficult to follow in places, partly because of the small print, and partly because the translation from the Japanese is incomplete in places.

The approach of the designers is attractive. They have provided for tractor and friction feed, but there is no need for the tractor to be removed to make way for the friction, and the installing of the paper is simplicity itself.

The paper is delivered over a rail on a wire grid, and after printing, returns the same way. The paper-retaining clips are designed so that the paper rests on the top after it has been printed.

Finally, the right hand sprocket is easily moved to accommodate difficult paper widths, merely by overcoming the friction of the grip.

The grouping of the control switches is convenient. The buttons for form feed, line feed, and to switch on and off-line are grouped next to the green indicator lights.



The CP80's paper feed mechanism gets top marks for thoughtful design.

Also nearby is the red Paper Out light, all of this in a very small square area, right at the front of the machine.

It would have been very welcome if the dip switches had been equally accessible, but this was not to be. It is a case of, off with the cover and hunt the switch.

This is a pity, because so many options

are available that you would like to get access to the 12 controls more easily, although you can send all the commands from software.

Curiously, the ribbon is a carbon film. Furthermore, it is labelled as if it can be reloaded up to four times. This is fascinating, because I have never seen a film ribbon in a dot matrix printer, and I would have thought the film would not be strong enough. The idea of trying to reload the cartridge with a new film ribbon is quite mind-boggling.

Holding down the line feed button while switching on the machine, and continuing to hold it, results in a print of the entire character set. This includes some graphics, and symbols for hearts, clubs, diamonds and spades.

The smoked plastic lid is extremely easy to move on and off, and cuts noise levels considerably. In addition, you are able to tear off the paper easily, though somewhat wastefully, over 4in from the print line.

The machine is supplied with a Centronics parallel interface as standard, and there is an option to have a serial RS232C.

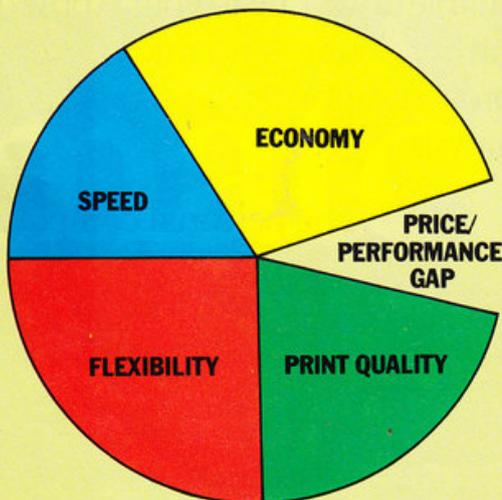
Documentation

The manual is quite thorough, and goes to some trouble to help beginners through

This pie chart represents a rough guide to what we feel is the trade-off between price and capabilities on the CTI CP80 type 1, 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.



QUESTION

WHERE CAN I BUY

NEWBRAIN 'A' 32K	FOR	£268.00
NEWBRAIN 'AD' 32K	FOR	£298.00
SINCLAIR ZX81 1K	FOR	£48.00
SINCLAIR SPECTRUM 16K	FOR	£99.00
SINCLAIR SPECTRUM 48K	FOR	£129.00
ORIC-I 48K	FOR	£168.00
SINCLAIR ZX PRINTER	FOR	£39.00
SINCLAIR ZX81 RAM PACK	FOR	£28.50
SEIKOSHA GP-250X PRINTER	FOR	£260.00
SEIKOSHA GP-100A PRINTER	FOR	£215.00
BMC BM12E GREEN MONITOR	FOR	£100.00
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The rollerball effect will soon be felt in micros. Ian Scales gives the TG Trackball a whirl.

Put a top-spin in your game

Last week's PCN Micropaedia's 'possible keyboard' featured a track ball on its left side. Instead of using the rather inappropriate clutch of keys found on most micro keyboards to send the cursor about the screen we considered a possible alternative.

This type of device will become more common in the future as computer manufacturers try to develop more 'user friendly' techniques for interfacing micro users to their micros. Apple's mouse for the Lisa (PCN March 18) is an example of what we are likely to see appearing.

The track ball is not actually a new concept. It is an interesting variation on the joystick and its most obvious immediate use is in game playing. With a joystick you indicate to the computer which direction you want the game object to move in — the computer then takes over and carries out the movement at its own pace. There can be nothing more frustrating than watching the gremlin you are trying to eliminate descend to the bottom-left corner of the screen while you, in the right corner, hold the joystick hard left trying to get over and blast it into oblivion with no hope of catching up.

The track ball overcomes this by directly matching the position of the cursor with the position of the ball. As the ball can actually be turned through several complete revolutions this can be achieved with maximum accuracy.

To move from one side of the screen to the other requires a quick spin of the ball, but small movements can still be achieved with precision.

The beauty of the system is that the user has full control over the speed of the screen object. In game playing this can be such an improvement that it becomes much easier to play — often defeating the built-in difficulty-factor. You soon instinctively know how the screen object is going to react to a given spin, so if you're waiting for an explosion to settle down on the screen you can actually spin the ball in the right direction and be positioned to fire the next missile, or whatever, at the invader once the screen clears.

Game playing aside — the track ball concept obviously has potential in cursor movement for more prosaic tasks — word processing immediately springs to mind. What a joy to be able to position the cursor in the right place with a quick flick of the



The TG track ball uses what looks like a snooker ball seated between three wheels. Two of the wheels drive the two-dimensional cursor and are at right angles. The third splits the difference and provides a support on the other side.

The user simply rolls the ball in the direction in which he wants the object to move on the screen.

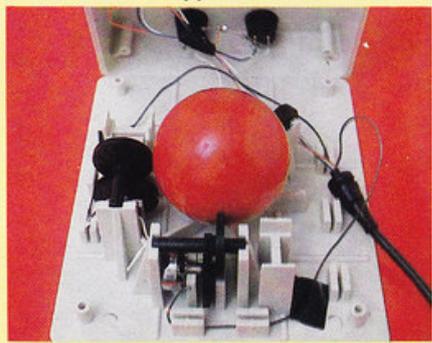
If the desired direction is up the screen, the user rolls the ball as if he expects it to move in that direction. As only horizontal movement is required the ball rotates at right-angles to the wheel controlling lateral movement and therefore doesn't move it.

The other wheel, controlling vertical movement, moves directly against the ball sending the cursor up the screen to its desired position. Rolling the ball cross-wise between the two wheels causes both

wheels to move sending the cursor in a diagonal direction.

Firing buttons are positioned on the left-hand side of the unit.

Although it is not the answer to every problem, the track ball surpasses the traditional controls of keyboard and joystick for several applications.



palm, while using the other hand to enter editing instructions.

We tested a track ball device destined for the Apple II. The TG track ball is a rather garish looking object — more like a baby's plaything than a piece of computer equipment.

It is obviously targeted fair and square at the action games market but it's not very cheap, weighing in at £49.95.

When you prise the bottom off the thing and take a peek inside you find a lot of plastic componentry and very little else.

The track ball fits into the Apple's games port on the back of the main board and

simply takes over the joystick routines on any of the games programs and it worked well on the variety of Apple action games we tried.

A word of warning, however. Once the action heats up and the palms start sweating — the ball tends to lose its grip against the plastic wheels and you find yourself having to bear more weight on the ball to get the cursor to move. The only solution is to clean the ball off with a dry cloth.

Name TG Track Ball **Price** £44.95 **Interface** Apple games port **Contact** SBD Software 01-870 9275.

The first of the new Japanese micros has penetrated the UK. Richard King duels with the Sord.

The Japanese invasion: Sord points the way?

The Sord M5 is the first real sign of the storm that's bound to break when the Japanese finally enter the UK market. Actually, the same storm is going to come down around the ears of the Americans too, though perhaps not at the same time.

Of course, Japanese machines have been on sale before, so it's not as if there's been no warning, but apart from Sharp, until now they have limited themselves either to the full-blown business machines on the one hand, or odd little pocket-machines on the other.

The Sord M5 is the first machine which genuinely embodies the kind of production engineering and marketing we have become accustomed to in the photographic and hi-fi fields.

Presentation

At first sight the M5 looks rather like a Sinclair Spectrum. It measures a little over 10in by 7in, and is about 1½in deep. The colours are two shades of a greenish grey, with yellow details and white lettering, which gives it a faintly military look.

The packaging consists of a cardboard box in a slip-over cover, which contains some expanded foam to hold everything in place. It is quite adequate for the job it's supposed to do, but would hardly be tough enough to be used on a daily basis.

Documentation

In most respects the documentation is quite superb. It consists of the Basic-I manual and a thin users' guide, which thankfully avoids those revoltingly self-congratulatory lapses which all too often disfigure otherwise satisfactory manuals. You know the sort of thing... 'Press RETURN and your super-powerful XJ9m/2 computer, running DSU — Disgustingly Small Unix — in .05K, will immediately solve your problem.' This usually means that it will take a long time to

work out the sum of two small whole numbers. Big deal.

Thankfully, the Sord manuals restrict themselves to the job, which is that of explaining how the machine works, rather than in congratulating you in your incredible perspicacity in shelling out your hard-earned shekels for the machine.

There are also no great slabs of text telling you how to use some add-on thingie which has not yet been produced, and which flees backwards down the corridor of time every time people ask about it. Sord simply says there are plans to produce additional hardware and programs, and leaves it at that.

The only quibble I have, and it's not a major one, is that in the Basic-I manual there are passages which could be hard for a novice to understand, especially where error-messages are concerned.

For example, Error 13 means 'conflicting data types', and the suggested remedy is to 'Resolve the conflict' — that's all. Now many people will know exactly what that means, but it isn't at all obvious without prior experience. Error 16, 'Variable error', is even less helpful, since it actually means that you've got something in the wrong order. The solution is to 'Correct the order', but there's nothing to tell you what might be wrong with it.

But there is one really major omission. It's obvious if you have any solid experience, it's absolutely essential for full understanding of the machine, and it is simply ignored except for frequent references in the program-listings.

Memory addresses, that's what. They are alluded to in the listing of Basic

keywords and functions, and it is evident that preceding any number with an ampersand sign will cause it to be treated as a hexadecimal quantity. But little more can be gleaned without spending a whole lot of hours with pencil and paper, poking about in the memory, recording what happens, and trying to decipher the results.

Associated with this is a lack of hard information on the subject of graphics. Much is suggested, but there isn't a real exposition to be found, which is a pity, since it is evident from what is present that there is a wide range of possibilities open to an imaginative programmer. He'd better have a few months spare, too, because I suspect there's fun to be had there.

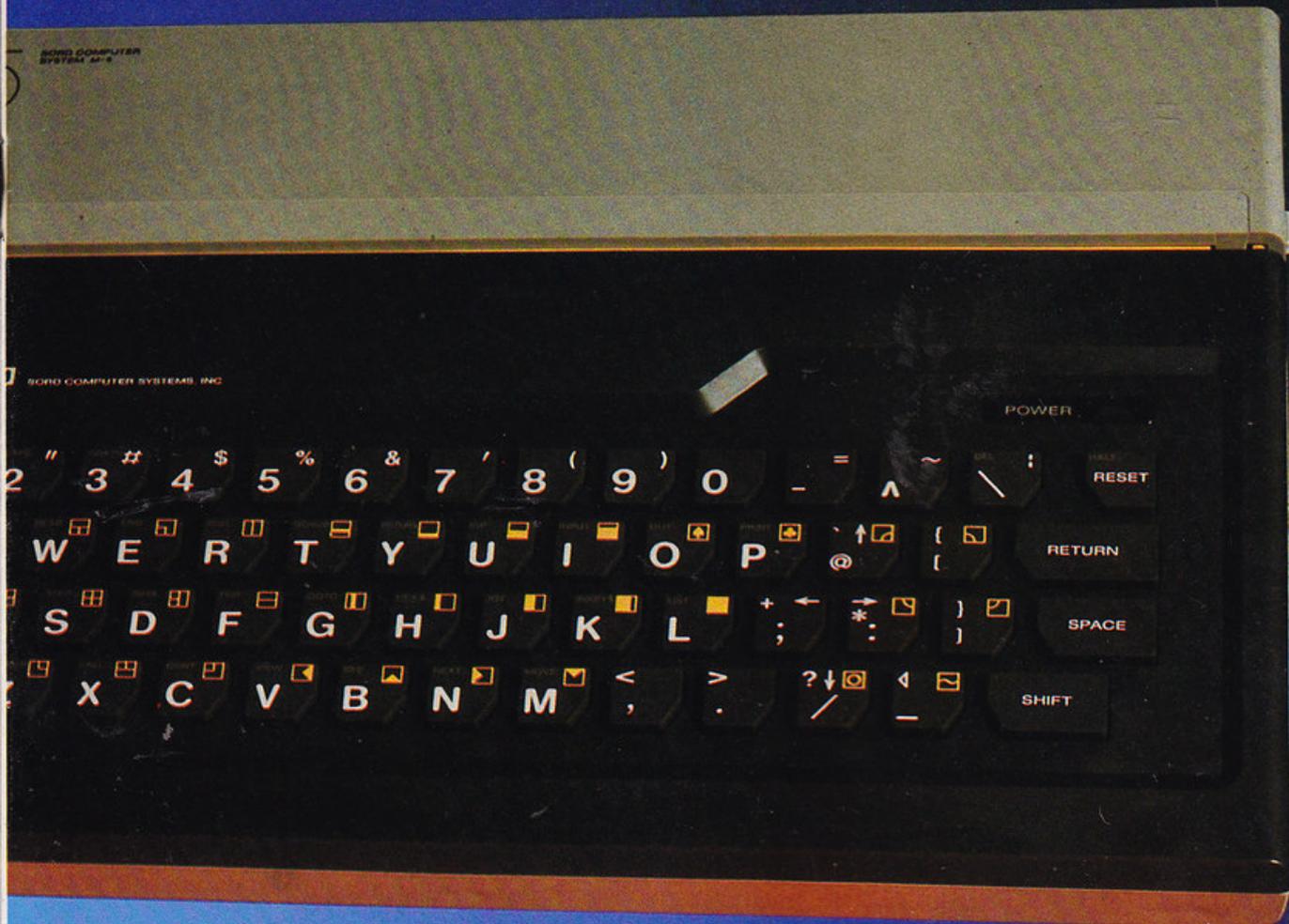
Construction

The general construction is of a very high quality. It feels solid, almost rugged, and would doubtless stand up to considerable rough treatment.

Naturally this isn't exactly recommended, but any machine which is aimed at the younger user must be designed with such considerations in mind.

The only point which might cause some concern is the lid, which lifts up to reveal





Clean and neat in design, the Sord M5 has many features in common with many 'home computers' — multi-function keys in particular, but not all the functions or symbols are marked.

the cartridge-socket. It might be thought that this could break, but it is designed to come off if excess pressure is applied to it . . . very clever.

The rest of the construction is of an equally high standard. There are proper connectors for everything, so no more problems with power-supplies which spend most of their time delivering 5.5 volts to the carpet.

Keyboard

As is usual for machines of this type, the keyboard is of the membrane variety, à la



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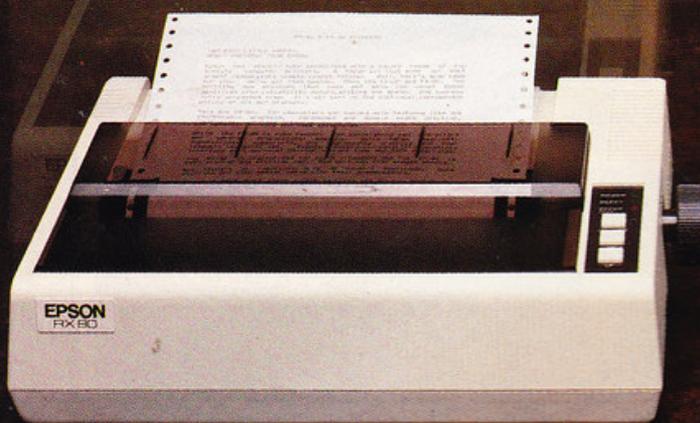
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◀43 Sinclair Spectrum. There is a noticeable difference in the feel, which is much lighter in touch than the Spectrum. The most obvious feature is the shape of the keys, which are square, but have the bottom right corner cut off, for some reason.

Apart from this oddity, the layout is much as one has come to expect, except that there are two shift keys. There's no space-bar, just a slightly larger than normal key on the right hand side.

As might be expected, each key has multiple functions, including both upper and lower case, single-key Basic entry, control functions and graphics. In fact, each key does even more than is suggested by the legends on the keys, since there are two sets of graphic symbols and only one is shown.

There's an 'editing keypad' built around the @ ; : and / keys, so you can imagine there's plenty going on!

Screen

The quality of the display was frankly impeccable — steady and clear, with good definition and well-separated colours. Compared to the tatty output so often associated with lower-end/home machines, it was a pleasure to use.

In fact, I didn't even have to retune my TV, which is casually set to channel 36. Supposedly all computers and VTRs put out their signal on this channel, but they seldom hit it exactly. The Sord does, dead on.

On examining the character-set, I couldn't help feeling that Sord either went

a bit over the top, or passed up an opportunity when they decided which symbols to include.

In total there are 224 displayable symbols; the complete ASCII set, extending from 32 (space) to 126 (tilde), followed by the first set of graphics, which goes up to 159. There's another set from 224 to 255, but the bit in the middle (from 160 to 223) is used for a whole bunch of oddballs. Among these are a few useful ones like the £-sign (as well as the Yen), a collection of those little marks used to mark footnotes and just about every single vowel/accent combination used in any language anywhere!

I rather felt that these latter, in particular, would be so seldom used that they are wasted. . . would it not have been better to include a wider selection of graphics? After



As is common with smaller machines, there is a plethora of boxes and bits which plug in. The most significant is the plug-in ROMpack, seen sticking up from the machine.



all, who needs an i with a Rumanian accent?

The so-called 'sprite graphics' are the most interesting feature of the display, which can be moved around a screen. The VIC and ANTIC chips in Commodore and Atari machines produce very similar effects, but the generator in the M5 is exactly the same as that in the TI99/4A.

There are four separate graphic modes: 32 by 24 or 8 by 8 areas, which is defined as Graphic mode 1; 40 by 24 of 6 by 8 blocks, generally used for text; 64 by 48 of 4 by 4 blocks which is called Multicolour mode, and at the very top end you can have up to 32 sprites moving against a 16-colour picture with 256 by 192 dots, and still have a backdrop in one of 16 colours! This last is called Graphic 2 mode, and is the one which attracted me most.

Unfortunately, organising and looking after the substantial data-areas necessary to use it effectively is far from easy, and really needs some special functions to do it properly. I imagine that these are in Basic-G, since it wasn't really practical to try in Basic-I because of lack of information and memory.

Although it can't really be described as part of the display, it is worth mentioning the sound capabilities, largely because this is also controlled by a special processor. In this three sound channels are provided, together with one noise channel, and by programming with verve and panache some pretty amazing sounds can be made.

Storage

Program and data-storage are on cassette. In this respect the M5 is on a par with any other machine which uses this method, which is slow, clumsy, and awkward at best, and impossible at worst.

The most that can be said for it is that at least it's cheap and available, and that the M5 saves and loads tape with some degree of consistency.

Expansion

Full details of the expansion capabilities of the M5 are not yet available, but appear to be impressive. As it stands, the machine

comes with one ROM cartridge which contains Basic-I. This plugs into the slot at the back, and by this means the M5 eliminates the worst limitation on machines at this level, which is that they tend to be stuck with whatever language is provided by the management. Extra languages (if available) invariably take up valuable RAM, limiting their usefulness.

There is a built-in Centronics printer interface, as well as ports for the 'joypads', cassette and TV. This is a bit different, since there are three separate sockets. It transpires that one puts out a modulated TV-type signal, and the other two put out unmodulated picture and sound signals which can be put directly into the newer type of TV, which is designed to be used with VTRs and other stuff.

Sord has plans which will definitely make a big difference to its new baby. The company is working on a 32K memory upgrade, a disk drive and a printer, as well as several application programs in ROM cartridges. Adding that lot to this machine will transform it into something quite serious, I feel. Look for these in the autumn.

Operation

People who test machines tend to get a bit jaundiced after a while. All too often the new miracle machine spends a lot of its time masquerading as a pile of useless junk which has as its outstanding characteristic the ability to produce nothing at all which even the most charitable person could call useful (or even intelligible).

Happily, the Sord M5 does much to

dispel such glums. It works first time, doesn't need a lot of mollycoddling and jiggery-pokery to persuade it to continue doing so, and what's even better, it continues to work well. You don't have to balance cold cartons of milk on top, shove matches in the back to keep the plugs in, or press the keys with several pounds' force to make them respond.

In fact, the nicest thing you can say about the M5 is that in operation it is almost invisible, and this is exactly as it should be. Far too many machines force the user into unnatural habits instead of getting on with the job of responding to the user's commands.

The supplied Basic-I is pretty much a standard Microsoft type, though there are certain minor differences, notably in the keywords. ASC() becomes ASCII(), STR\$() is changed to NUM\$(), and there are a number of new commands which deal with the manipulation of sprites. There is also a new word in HEX\$(), which converts the string in the brackets into its HEX (base 16) equivalent. This has been seen before, but only in the larger Basics, and its sheer convenience makes it well worthwhile here, especially for manipulating the memory.

Verdict

Even though the Sord M5 has a rather small memory and is almost double the price of its competitors, I feel that it is definitely worth the difference, since the savings which will be found in programming with the sprite-graphics as against doing it the hard way will be considerable.

In fact, the memory is not as small as it might be thought, since the M5 has a completely separate area of RAM dedicated to this. The Spectrum purports to have 48K, but of that a good 7K is used for the screen, so there's only 40K or so left. This isn't as big as you might think, since you would have to put in a lot of code to handle the graphics.

On the M5, most of the work is done for you, and all that is left is the need to work out what to do next, rather than how to do it. My only reservation is over the documentation, which suggests that there is considerable untapped potential in this machine, but then fails to provide the keys. I wanted to know much more about the beast.

Quality costs a little more, but it's usually worth paying for. I feel that the Sord M5 is a quality machine, and would strongly recommend it to anyone considering buying a small micro for experience.

SPECIFICATION

Price	£189.95
Processor	Z-80A running at 3.58MHz
RAM memory	4K user-memory, 16K video memory, expandable to 32K
ROM memory	8K, expandable to 16K with ROM cartridge
Screen	16 colours, 265 letters, numbers and symbols, 4 display modes
Keyboard	Membrane type with 55 keys
Sound	3 voice channels, 1 white noise, 7 'special sounds'
Interfaces	Tape (with remote control), Centronics parallel printer, TV to channel 36, Composite video and sound
Storage	Tape
Distributor	High street stores

Each week in Gameplay we test a selection of new games and give our verdict on their value.

HOUSEKEEPING HEIST

SPECTRUM

Martha the killer

Name Mad Martha System 48K
Spectrum Price £6.95 Publisher Mikrogen Format Cassette
Language Basic Outlets Mail order

You've zapped aliens by the barrel-load, and you've munched dots till they're coming out of your ears. You've worn your brain cells down to stumps trying to kill giants and go north and enter castles and find mysterious black boxes on concealed ledges in subterranean caverns.

Maybe from time to time you've wondered why hardly anyone writes games that combine the two.

Well, now somebody has, in the shape of this deeply sexist game, Mad Martha (men get chopped up in this one!).

Objectives

You are the weedy Henry Littlefellow, a puny specimen of manhood improbably married to a strapping great wife Martha. Martha likes nothing better than to go charging after you with an axe, given the slightest provocation: must be a founder member of the Society for Cutting Up Men (that's SCUM to you).

But you plan to thumb your nose at her by stealing the week's housekeeping money and hitting the town to gamble and drink it away. You'll have

to lay hands on the loot without alerting the lovely Martha, though, or you can wave this world goodbye.

First impressions

The label hardly does justice to this completely dotty adventure. There's a rather washed-out looking picture of the mighty Martha, axe in hand, gaining on the sweating Henry. There's a brief set of loading instructions, an even briefer set of adventure commands, and that's it.

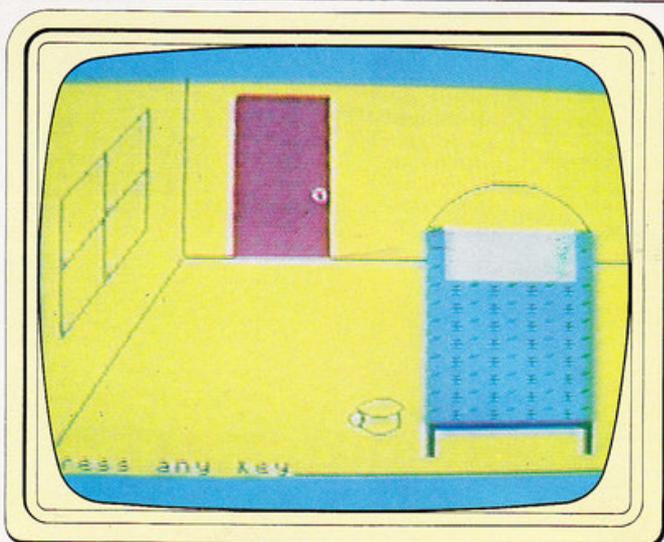
There's no hint that you can save the game, though while loading the game it pauses to ask you if you want to load a new game.

Then it's into a title screen which gives you the gist of the plot and tells you: 'If you escape with the lolly, you can explore the bright lights at your leisure . . . or peril! Hit a key to begin, the Spectrum plays a real Hollywood-style B movie theme tune, and the hunt is on . . .

In play

You're in the bedroom, complete with blue bed, purple door and a chamber pot. One thing this program isn't shy about is the use of colour. No wonder Henry feels the urge to get out from time to time.

You scuttle around the house, with plenty of jollies in store for you as you open the various doors, though sadly, the pictures are only there when you first enter a particular room. You have to banish them if you want to carry on playing. The nursery is tasty, complete



with giant teddy bear. The *pièce de résistance*, though, must be 'The WEE ROOM', which of course stars 'The Throne'.

There's something rather weird about the geography of the house. You land up near an understairs cupboard at one point, and if you decide to try going upstairs, you land up in the bedroom again. You never actually come *downstairs*, though. And objects which you find in cupboards and take away with you somehow miraculously seem still to be there if you take a second look in the cupboard. Minor points, maybe, but they could do with being tidied up.

Hungry cats and crying babies are the biggest danger in this part of the program, as they are liable to bring your sweet spouse running. Once that happens, there's not a thing you can do about it. You get a grandstand view of your own execution, complete with instant tombstone (will someone please write a program *without* tombstones in it?).

I found the cash and helped myself. So far, so good, but I was immediately brought to a standstill by the discovery that, to get any further, I would have to beat what I found to be a very tricky arcade-style game. I plugged away at the game, time and time again.

Time and time again I failed to beat it, Martha came running, and it was back to square one.

I would have welcomed some short cut to get me to this point with just a couple of commands rather than making all 20-odd moves to get there — especially since response times are dreadfully slow.

At long last, heart in mouth, I

cracked it. Picked up enough pound notes, didn't trip over the cat too many times, still had a life left. I was on top of the world, assuming that now I would be able to save the game, and wouldn't have to go through all that lot again, or explore the house for the twenty-fifth time.

But then came an even worse shock . . . and I won't spoil your undoubted pleasure by telling you what came after that. Suffice it to say that the only way I got an idea of what else happens was by taking a look at the program listing.

And there's certainly a good deal in there. Casinos, with plenty of opportunity to fritter away your ill-gotten goodies at roulette, pubs, cinemas, even an establishment named 'Fifi's Fun Emporium'. Gosh.

But don't ever forget that this part of the program, too, is not the least bit Martha-proof. Save the game, for goodness sake, before you do something daft and get the chop. Again.

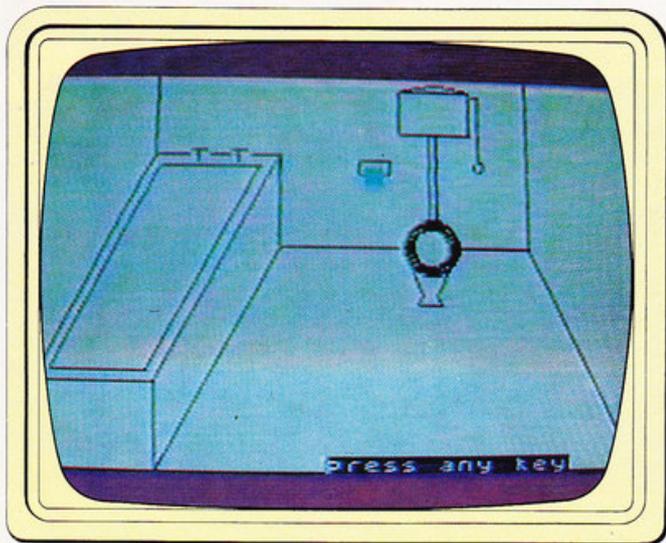
Verdict

This is a game to invest in — but only if you have either the patience of a dead donkey, or you're a natural wonder at unexpected arcade action. It's funny, it's genuinely original, and the graphics are great though it's a shame they vanish when the text appears.

True, it's sexist and violent — but after all, it isn't every day that the *women* get a chance to take a swing at the *men*. So get a slice of the action . . .

Shirley Fawcett

RATING	
Lasting appeal	★★★★
Playability	★★★★
Use of machine	★★★★
Value for money	★★★★



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ARCADE ACTION

SPECTRUM

Fry the mushroom

Name Frenzy **System** Spectrum 16K
Price £4.95 **Publisher** Quicksilver,
 0703 20169 **Format** Cassette **Outlets**
 WH Smith, Boots, Menzies, Currys

Frenzy may be set in deep space, around the Forts of Falnon in the distant Faluvian Empire, but it bears more than a fleeting resemblance to Berzerk, a fast-action game you may have met much nearer home, at your local arcade.

In Frenzy, as in Berzerk, alien annihilation is the name of the game.

Objective

The enemy in Frenzy is a pack of Roboids, rogue killer robots and 'three meters of mechanical hell,' which lurk in the maze of a wrecked space station.

Only one can play, and your task is to destroy the Roboids by using the keys 6 to 0, which move you left, right, up, down, and fire your blaster.

Points are scored when you hit a Roboid, with the running total displayed at the top of the screen, along with the number of lives you have left to you. You have three lives in all, but one is lost each time you run into any of the walls of the maze, or collide with a Roboid or are hit by an exploding pod.

First impressions

The game is relatively easy to play, but I didn't like the way the control keys were posi-

tioned so close together. Identification of the control keys was made easy by the inclusion of a template.

In Play

The Roboids, which look like mushrooms with little feet, move around the maze at a sedate pace as you zap them into oblivion. Occasionally the shooting spree is interrupted by an exploding pod which can cost you a life.

I quickly developed a strategy to avoid the exploding pod. By leaving the maze via one of the exits provided you would find yourself in another maze, minus the pod. But the disadvantage of this is that if you have only two Roboids to destroy, the new maze fills up with yet more of the little perishers.

In all there are five levels of play.

The graphics are quite good, but the sound is poor, as well as being low in volume. It is extremely easy to get a high score, as 30 is considered high.

Verdict

A boring game at first but with perseverance it slowly grew on me.

The sound could have been better, and the points needed to achieve a high score should have been increased.

Overall the game is quite an accurate representation of its arcade counterpart, though minus the sound. **Trevor Jones**

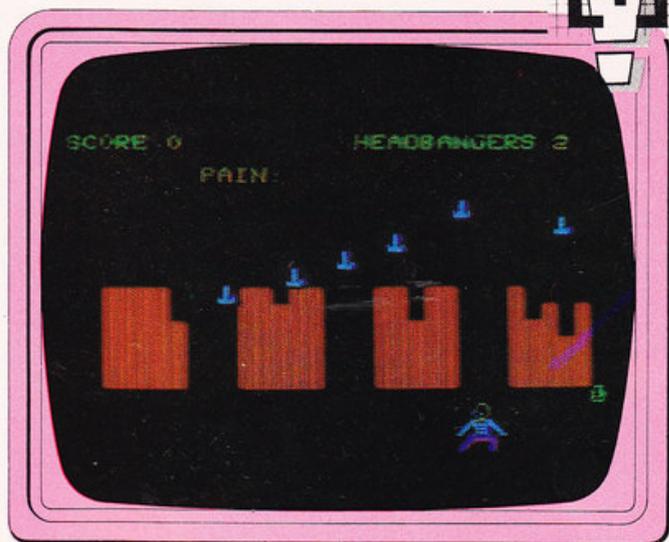
RATING

Lasting appeal

Playability

Use of machine

Overall value



SPECTRUM

Cash on the nail

Name Headbanger **System** 48K
Spectrum Price £4.95 (+ 50p if by mail order) **Publisher** Llamasoft,
 07356 4478 **Format** Cassette
Language Basic with m/code sub-routines **Other versions** None **Outlets**
 Mail order, W H Smith, Menzies and other dealers

ous instructions, about which the best that can be said is that you needn't sit through them if you don't want.

In Play

As Chico runs back and forth he can earn points by nutting the hammers, though he has to be directly under them as a body blow will lose him one of his three lives. He starts to get a headache after ten blows, as who wouldn't, and he must then attempt to nut one of the occasional red hammers, which carry aspirin.

He can in fact hit a red hammer at any time, though the longer he leaves it the more points he scores.

The hammers come down ever faster, of course, and with the red ones increasingly difficult to pick out you must eventually succumb and ascend to headbangers' heaven for a score.

However, long runs are rare because the character is too big and clumsy to manoeuvre through the torrent of tools no matter how nimble-fingered you might be.

Verdict

With such a wealth of material available for the Spectrum, it's hard to see why anyone would go out and buy this. You are offered a high-score facility, and your score is graded from Barry Manilow, to Headbangers. Try as I might, and I didn't feel that much incentive. I couldn't get beyond a score of 9,600, which made me a Donny Osmond Class I. **Mike Gerrard**

With a game called Headbanger you maybe don't expect anything too subtle, which is just as well as you certainly don't get it. The storyline is different from Space Invaders, but the idea is the same, and the main difference is that here you're actually encouraged to get under the missiles raining down on you and let them smack you on the head.

Presumably it's aimed at masochists and those with a mental age of six or under.

Objectives

The man with the iron head is Chico — no relation to Donkey Kong's Mario, of course — and you must run him along the bottom of the screen to transport bags of money from right to left.

There are four blocks providing shelter from the hammers coming down from heaven, and each bag of cash successfully moved restores one of the blocks. Chico is moved by the 'n' and 'm' keys.

First impressions

The review copy didn't come with the four-colour insert that is apparently now ready, but in any case the game itself includes the long and allegedly humor-

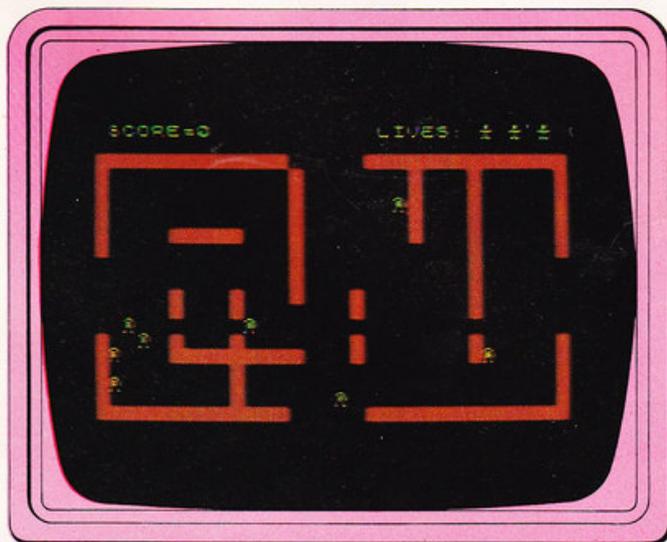
RATING

Lasting appeal

Playability

Use of machine

Overall value



48K SPECTRUM

WAVE

“ VALHALLA is an animated graphics adventure whose undisguised intention is to steal the title of "best micro adventure game bar none" from THE HOBBIT.

The 48K program which will be released on July 15, uses a new operating system MOVISOFT and boasts a number of HOBBIT-like features. There are 20 significant characters, each with their own aims and objectives.

You are a minor God set the task of recovering Odin's Golden Helmet. To complete this

you will also have to master three lesser tasks, one of which is to rescue IDUN, a maiden responsible for the Golden Apples which keep the Gods youthful.

The games' designer, LEGEND, claims that the program involves a sophisticated degree of interaction. For example, should an enemy overhear you telling a friend some important information, he will try to ruin your plans.

LEGEND stresses that the personality of each of the characters is genuinely independent "as opposed to pseudo independent behaviour

like Thorin sitting down and singing about gold or Gandalf walking off with your door for no reason".

The moving graphics are reportedly of cartoon quality, with both background and foreground movement illustrating the events of the plot.

Pretty impressive claims.

HOBBIT fans will no doubt feel both intrigued and sceptical..

Watch this space.”

...Graham Taylor,
Software Editor,
POPULAR COMPUTING WEEKLY -26th MAY'83

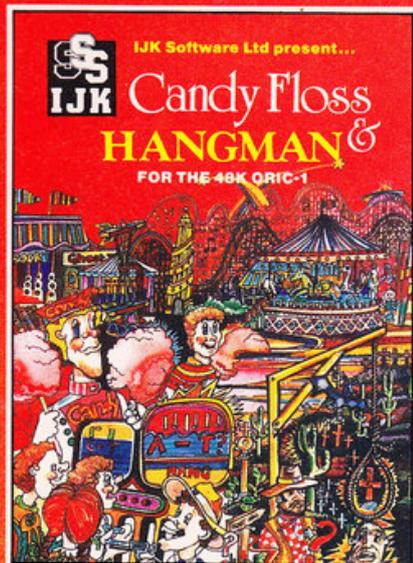
MOVISOFT



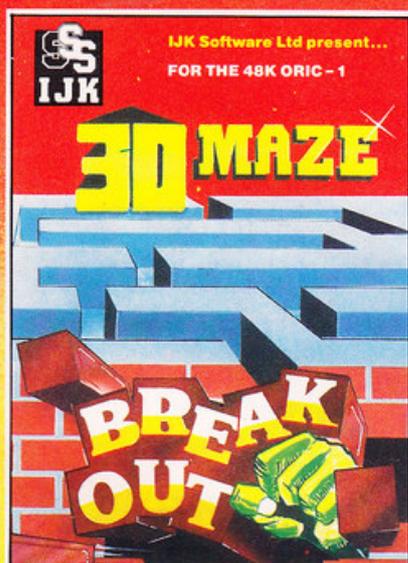
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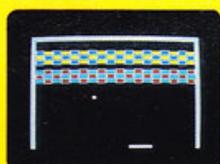
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To launch our series of round-up pages, Shirley Fawcett puts the finger on Oric games.



Oric extravaganza

Oric games are finally starting to bust out all over, and all those benighted souls who've been waiting for the machine are getting their hands on it at last. We have had a fair number of Oric tapes plopping through our letterbox, so this week we've given a bunch of them a speedy spin.

DEATH SATELLITE



'You have materialised on Death Satellite', trumpets Adventure 1 from A & F Software. Also known as Death Satellite, this is a terrible tale of geiger counters and deserted space stations, skeletons on beds and radioactive waste rooms, and radiation pills that don't work.

Death Satellite, despite its rather technicolour name, is a plain black-and-white-and-occasionally-red text adventure, with what looks like a fair number of twists and turns, and a good-sized space station to explore.

You kick-off with the obligatory loud Oric squeak — the only sound effect I came across in a game where even the geiger counter doesn't actually tick — and with a scrappy little sheet of instructions telling you ten of the usual TAKE, NORTH etc commands.

There are lift shafts and control rooms, medical centres and engineering workshops to be found. You also need fuel, if you are ever to make a getaway from the Death Satellite. But the only getaway you're likely to make will be the one I made several times, by dropping dead from radiation sickness.

OTHELLO



Othello, from Kenema Associated, is a version of the well-worn computer game where you slap your counters either side of your opponent's and see their counters change colour to become yours.

The instructions for this one are fairly good, although they're only there within the program, not printed on the packaging. But there are other

drawbacks.

Yes, it is true, the Oric is a micro that prides itself on its sound-generating abilities. But good grief, must eager Othello players racking their brains to plan their game strategy five moves ahead have their ears assaulted?

And therein lies the other rub with this game. If you opt to play against the computer — and let's face it, there's not much point in buying a computer cassette if you just want to play a board game with another human being — you might as well allow a good afternoon for every time you play. You'll need it.

I started the game up. A bright red board, with two 'black' — actually transparent red — and two white pieces at the centre appeared. I asked the Oric to make the first move. More than three minutes later, it was still thinking deeply about what to do next. Even after it finally made up its mind, it had the nerve to announce that it was 'Checking' the new move, which it made in a flurry of really very loud Space Invaders noises.

'You must realise that the Oric plays a fairly high level game, and because of this takes a fair time to think before it moves', the instructions warn you. Indeed.

ORIC TREK



Oric Trek comes from Salamander Software, and if I thought Othello was loud, Trek leaves it way behind. It's something of an empty-room-behind-closed-doors job. Still, Star Trek was meant to be played with volume turned up, and this version won't disappoint in that respect.

Oric Trek is more or less the same animal that Salamander has already put out for the Dragon and others. It comes in the usual tough plastic box with a Chekhov or Kirk or somebody on the cover. This character looks a bit like Rudi Nureyev about to have his teeth out in front of Spaghetti Junction — but it beats the packaging on most Oric software.

You choose your game's level of difficulty, and its length — anything from long to even longer, based on the size of galaxy you get to defend. You are issued with a ten page manual telling you how to play, and trotting you through the meanings of the Status Light, the Energy Warning Light and the Uhura Light.

You can launch hyperprobes and photon torpedoes, and fire your phasers, instruct Scotty to power up the shields, whizz around the galaxy on quadrant power and dock with Starbases. You can get shot at by Klingons and fly into supernovae and fall down black holes. And finally, if all else fails, you can blow up spectacularly. Stirring stuff.

MULTIGAMES



Tansoft's own Oric Multigames 1 is altogether quieter. Five — yes, count them — games reside on this cassette, just waiting to provide you with 'Hours of Family Fun'. Take your pick or two from Bandit, Projectiles, Colour Match, Quest and Reversi.

I had a go with Quest, which turned out to be a fairly decent adventure game set among the usual fantasy props of rambling forests, caverns, ravines, mazes and oaken doors, usually locked. I found a spot marked 'Bilbo Was Here', but no Bilbo. I also found no way out of the adventure.

Bandit, on the other side of the tape, turned out to be a fruit machine game, and had the whole PCN office cracking-up with laughter. It doesn't do much but what it does, it does with very silly sound effects.

There's a very nasty melody that gets played each time you pull the handle of your machine and the reels spin around. Then, if you hit the jackpot, there's a rather bizarre set of zap, zap, zap sounds and the sight of round things — presumably coins — falling out of the machine's payout slot.

As for Projectiles and Colour Match, I couldn't get them to LOAD for love nor money. Reversi I did manage to raise from the dead, only to find a less

elegant-looking and even slower-playing version of Othello than the Kenema one. Here, the board is no more than a matrix of red dots, and although you're asked to name your moves by entering X, Y numbers, no X or Y is marked on the axes of the board.

AWARI



Awari, from Kenema once more, is pleasant enough, if rather unambitious. It's that good old African game where you move stones around 12 holes. The instructions for this game are once again only to be found within the game, not on the cassette label, but it's easy to get the hang of it.

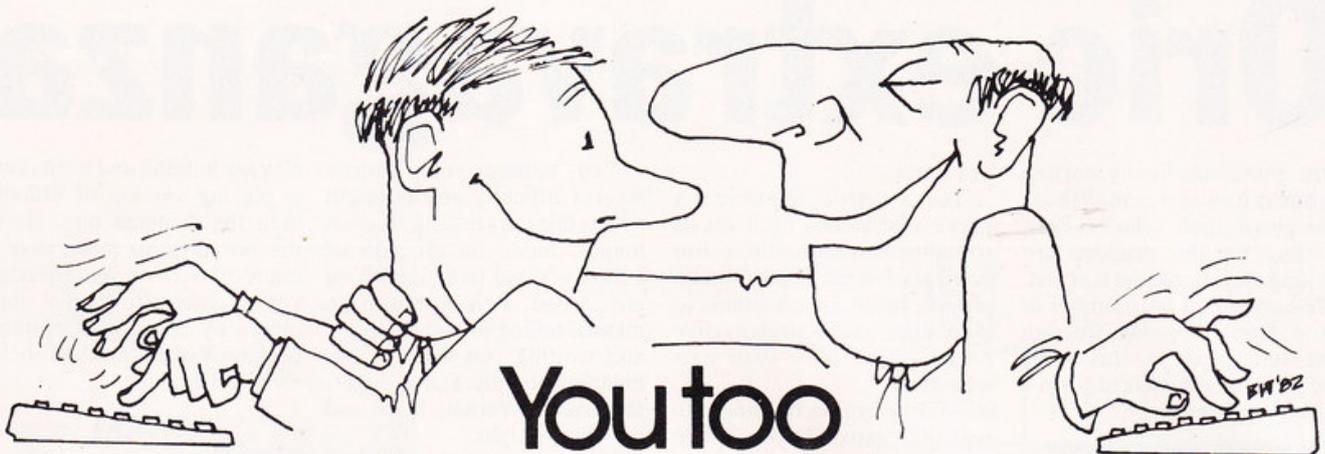
Unfortunately, there's not a lot to this game. The board is simply a green rectangle numbered top and bottom, there are different levels of play, and there's a jolly chinking sound as you move the stones around the board.

OUT-TAKES



At least Awari LOADs. Among the PCN pile of the also-rans for the Oric — that's games that simply would not LOAD at all — are Zodiac Adventure from Tansoft, an everyday tale of treasure hunting with — apparently — lots of sound effects, music and colour, and Salamander's Games Compendium, featuring such goodies as Donkey Derby, Kingdom, Viper and Space Station.

Salamander Software — 27 Ditchling Rise, Brighton, E Sussex BN1 4QL, (0273) 771942 — Oric Trek, £9.95; Games Compendium, £7.95 — mail order, Spectrum, Oric dealers.
Kenema Associates — 1 Marlborough Drive, Worle, Avon BS22 0DQ, (0934) 21315 — Othello, £6.60; Awari, £5.50 — mail order, Oric dealers. **A & F Software** — 830 Hyde Road, Manchester M18 7JD, (061) 223 6206 — Adventure 1 (Death Satellite), £6.90 — mail order, Oric dealers. **Tansoft** — 3 Club Mews, Ely, Cambs, (0353) 2271 — Zodiac, £9.99; Oric Multigames 1, £6.90 — mail order, Oric dealers.



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PCN Program Cards

Once more we have rummaged through the Program Editor's pile of submitted goodies to produce another fine selection of PCN Program Cards. Don't forget to cut these nine cards out and file for future reference with all the others you already have.

This week

We start with a timely small program sent to us by Rex Tingey, of Holywood — the one in County Down, not the film place. In keeping with the obsession of the media with the forthcoming General Election you can use this program on election night to keep track of the results as they come in.

Once your results are entered it is a simple step to produce multicolour bar charts of each individual result or, with a small amount of effort, extend it to show the state of the nation as a whole. Perhaps if you are fast enough you can even manage to predict the outcome before the huge

computers used by the television companies and their pundits.

All you need to beat these people is a Commodore 64; the program itself takes up only 2K! If you have a different computer Rex tells us it should be fairly easy to convert to other machines. We wish you well with it.

As promised last week, all you BBC owners/users can, with the program from A Randles, of New Brighton, Merseyside, now start trundling through the memory of the machine to see what it's doing.

Facilities available in this neatly structured program are options to tabulate memory in hexadecimal, modify memory in hexadecimal, convert decimal to hex and vice versa.

Philip Arnold, of Thornton Heath, Surrey, has made available to us his entertaining game Munchman. This is a Pacman-like maze game written in Basic for the Sinclair Spectrum showing good

graphics capability with animation.

Philip himself is a student member of the Croydon Microcomputer Club (whose meeting was reported in last week's Clubnet) and has produced many good games for a variety of machines.

There's money in them programs

Are we to assume that most of you are not interested in receiving financial rewards for the fruits of your computerised labours? Surely not! Well, the answer is to send in your program, on disk or cassette, with a plain paper listing and brief notes.

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Contributions should be sent to: Programs Editor, *Personal Computer News*, VNU, Evelyn House, 62 Oxford Street, London W1A 2HG.

PCN Program Cards

Election Barchart Card 1 of 1

8312EB

A small program to display results of elections in bar chart format. Refer to ProgramCard 8307CC for control character explanation.

```

1 N$(1)="BARGATE":N$(2)="WYNCHURCH":N$(3)="SOUTHWAY":N$(4)="MIDSTONE"
10 N$(5)="FRAYTON":SP$=""
20 FORI=1TO7:READA$(I):NEXT:FORI=0TO5:READV$(I):NEXT
30 FORI=0TO5:READC$(I):NEXT:GOSUB999
40 FORG=1TO5:FORH=0TO5:READX$(G,H):NEXT:NEXT
50 INPUT"WARD   "W$:L=LEN(W$):Z=19-INT(L/2)
60 FORG=1TO5:IFW$=N$(G)THENI10
80 NEXT:IFW$="AGAIN"THENMISTAKE=9:GOTO50
90 IFW$="RESULT"THENGOSUB1000:FORI=0TO5:V(I)=R(I):NEXT:FL=9:GOTO200
100 PRINT"SPELLING!":FORX=1TO2000:NEXT:GOTO50
110 IFMISTAKE=9THENM1=0:GOTO130
120 GOSUB1000:FORI=0TO5:V(I)=0:NEXT
130 INPUT"CONS      "C$:V(0)=LEN(C$)
140 INPUT"LABR      "L$:V(1)=LEN(L$)
150 INPUT"LABIN     "B$:V(2)=LEN(B$)
160 INPUT"ALLC      "C$:V(3)=LEN(C$)
170 INPUT"LABI      "I$:V(4)=LEN(I$)
180 INPUT"INDP      "D$:V(5)=LEN(D$)
200 FORI=0TO5:SP=V(I):IFSP>5THENSP=5
210 NEXT:TT=INT(SS/40):IFTT<500THENTT=INT(SS/30)
220 IFTT<100THENTT=INT(SS/23)
230 GOSUB999:PRINTSPC(2)" "W$ " "
240 S=7:FORI=0TO5:X=V(I)/TT:Y=INT(X)
250 FORJ=0TO3:PRINTC$(I)" "LEFT$(SP$,Y)A$(INT(S*(X-Y)))
260 IFJ=1THENPRINT" "V$(I)STR$(V(I)):PRINTTAB(12)X$(G,I)
270 NEXT:PRINT" "I":NEXT:IFFL=9THENFORI=0TO5:V(I)=0:NEXT:FL=0
300 GETA$:IFA$=""THEN300
310 SS=0:GOTO50
900 DATA" "," "," "," "," "," "," "," "
910 DATA"CON,LAB,LIN,ALC,LBI,IND," " "," "," "," "," "
920 DATA"WHITE,SMITH,WEAVER,CHARLTON,MAHMUD,FIELD,BLACK,GROSS,PACKER,WARLEY"
930 DATA"NEWTON,YESTEY,GREEN,TAYLOR,WEARER,HOCSON,CRAWLEY,BESTON,BROWN,COBB"
940 DATA"SMITHSON,BILTON,STIGMAN,WILLEY,BLUETT,STREET,ENGLISH,TARGE,GOFFE,FULTON"
999 PRINT" "SPC(9)" "RESULT OF BY-ELECTION":RETURN
1000 FORI=0TO5:R(I)=R(I)+V(I):NEXT:RETURN
    
```

Commodore 64 Commodore Basic

Application: General Interest

Author: Rex Tingey

1-10	Defines the ward names as subscripted variables. Can be extended
20	Loads Data statements from 900. Used for fine tuning of graphics
30	Loads Data statements from first part of 910
40	Loads Data statements from second part of 910 and 920-940
50-110	Routine to check inputs
120	Routine to add previous results to running total
130-180	Input routine for results by party
200-220	Find highest result for length of longest bar
230	Display heading and ward name for results
240-270	Loop to display colour bars and over-printed names and results
300	Hold on keyboard entry for next result
310	Next result
900-940	Data statements required for display, party and candidate information
999	Subroutine to display heading
1000	Subroutine to sum total results

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PCNProgramCards

Memory Utility Card 1 of 4

8312MU1/4

A well structured and useful utility to help tabulate and modify memory with added options to convert to and from hexadecimal

```
10 ON ERROR GOTO 1320
20 CLS
30 MODE 6:VDU 19,0,4,0,0,0
40 PROCMENU
50 END
60 DEF PROCMENU
70 CLS
80 PRINT"          MENU"
90 PRINT
100 PRINT"      1.TABULATE      2.MEMORY MODIFY"
110 PRINT
120 PRINT"      3.HEX to DEC      4.DEC to HEX"
130 PRINT
140 PRINT"      5.EXIT"
150 PRINT
160 INPUT"INPUT YOUR SELECTION No "S
170 IF S=1 THEN PROCTABULATE
180 IF S=2 THEN PROCMEMMOD
190 IF S=3 THEN PROCHEXDEC
200 IF S=4 THEN PROCDECHX
210 IF S=5 THEN END
220 IF S<1 OR S>5 THEN PROCMENU
230 ENDPROC
240 REM **TABULATION PROCEDURE **
250 DEF PROCTABULATE
260 LOCAL COL,ROW,SCROLL,INDEX,START
270 COL=12:ROW=1:SCROLL=0:INDEX=0
280 CLS
290 PRINT"          MEMORY TABULATOR"
300 PRINT"      This routine will allow you"
310 PRINT"      to display the contents of"
320 PRINT"      memory 8 bytes at a time."
```

BBC model B BBC Basic

Application: Utility

Author: A. Randles

10 Error trap
20-30 Set up screen features—white on blue
40-50 Main program calls menu procedure and then ends
60 Menu procedure
70-150 Display menu selections

160 Prompt with response
170-210 Selection criteria

220 Try and follow the instructions!

240 Memory tabulation procedure

260-270 Set up and define local variables

280-320 First part of tabulator instructions

PCNProgramCards

Memory Utility Card 2 of 4

8312MU2/4

```
330 PRINT"      From 0 to FFFB & from any"
340 PRINT"      start address of your choice."
350 PRINT"      You can enter the start address"
360 PRINT"      in DECIMAL or HEX & you must"
370 PRINT"      precede the hex No with the &"
380 PRINT"      hex sign.Press space bar once"
390 PRINT"      to step, hold down to scroll,"
400 PRINT"      press return to EXIT TABULATOR."
410 PRINT
420 INPUT"INPUT THE START ADDRESS "M#
430 START=EVAL(M#)
440 IF START<0 OR START> 65528 THEN 70
450 CLS
460 PRINTTAB(0,ROW)~START+INDEX
470 FOR P=1 TO 8
480   PRINT TAB(COL,ROW);~START?INDEX
490   INDEX=INDEX+1
500   COL=COL+3
510   NEXT P
520 IF SCROLL=0 THEN ROW=ROW+1
530 IF ROW=23 THEN SCROLL=1:PRINTCHR$(13)
540 COL=12
550 A$=GET$
560 IF START+INDEX=65536 THEN START=0:INDEX=0
570 IF A$=" " THEN 460 ELSE PROCMENU
580 ENDPROC
590 REM **DECIMAL TO HEX CONVERTOR **
600 DEF PROCDECHX
610 CLS
620 PRINT"          DECIMAL TO HEX"
630 PRINT"      RANGE 0 to 65535"
640 INPUT"INPUT THE DECIMAL No "A
650 IF A<0 OR A>65535 THEN PROCDECHX
660 PRINT
670 PRINTA" DECIMAL= ";~A" HEXADECIMAL"
680 PRINT
690 PRINT"      Have you finished input Y/N"
700 INPUT A#
710 IF A#="Y" THEN PROCMENU ELSE PROCDECHX
720 ENDPROC
```

330-410 Second part of tabulator instructions

420 Prompt and keyboard response
430 Convert input string to decimal (if necessary)
440 Stay within appropriate range
450 Clear screen
460 Display start address in hex
470-510 Loop to display byte by byte information in hex.

520-530 Routine to check for scroll facility at bottom of screen

550-570 Routine to deal with next block or end of routine as well as checks for within range

590 Procedure for decimal to hex conversion
610-630 Conversion instructions

640 Prompt and keyboard response
650 Stay in range
660-680 Display decimal with hex equivalent

690-710 Prompt and keyboard response for another value or not

THE FIRST OF THE SECOND GENERATION

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

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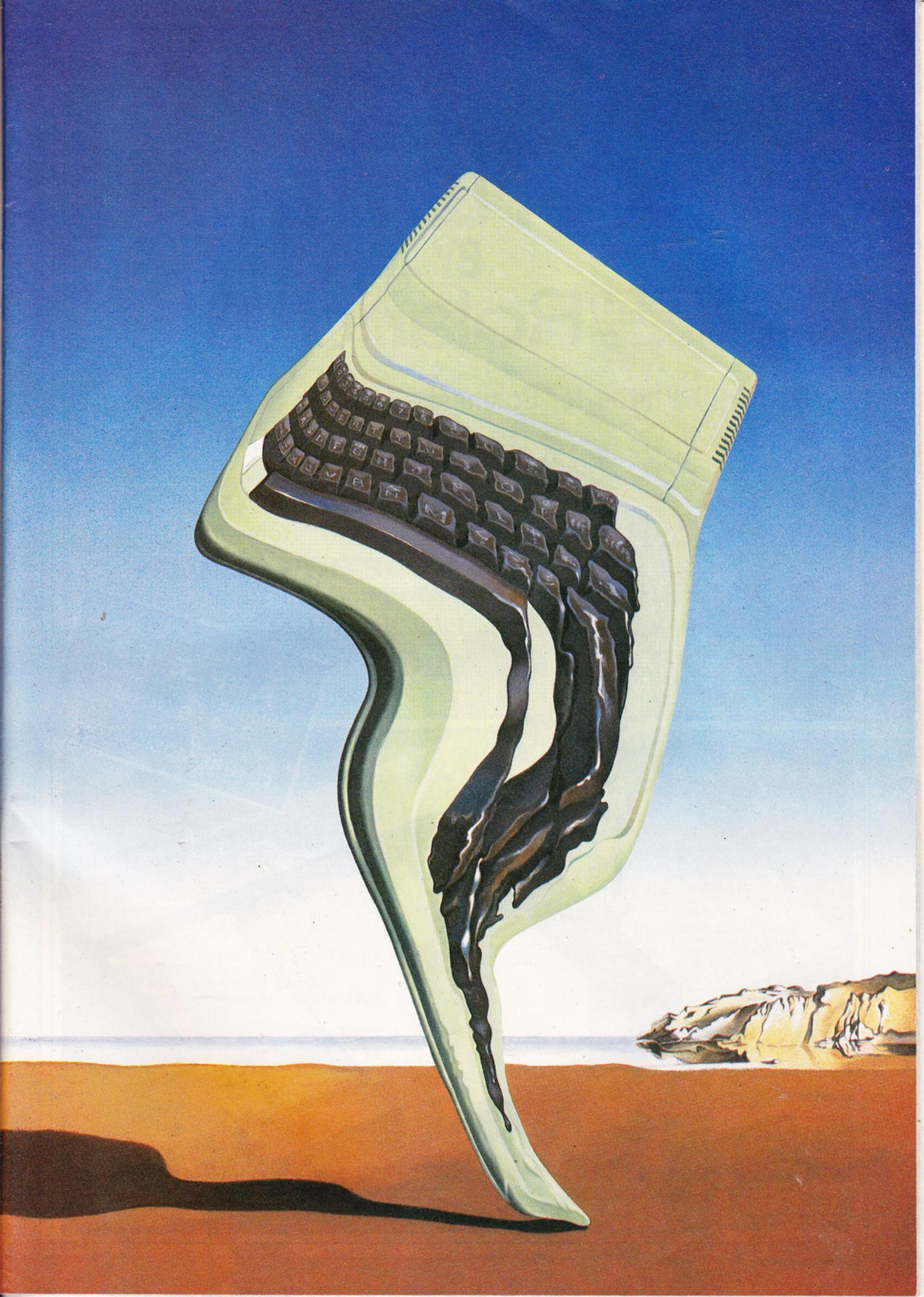
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PCNProgramCards**Memory Utility Card 3 of 4**

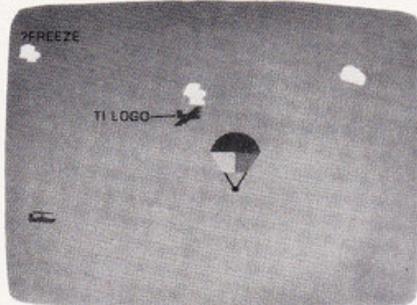
8312MU3/4

730	REM **HEX TO DECIMAL CONVERTOR **	730	Procedure for hex to decimal conversion
740	DEF PROCHEXDEC		
750	CLS	750-790	Conversion instructions
760	PRINT" HEXADECIMAL TO DEC"		
770	PRINT		
780	PRINT" Input the hex No preceded by &"		
790	PRINT" RANGE &0 to &FFFF"		
800	INPUT A\$	800	Input string in hex
810	X=EVAL(A\$)	810-820	Convert to decimal and check for range
820	IF X<0 OR X>65535 THEN PROCHEXDEC		
830	PRINT	830-850	Display hex with decimal equivalent
840	PRINTA\$" HEXADECIMAL= ";X" DECIMAL"		
850	PRINT		
860	PRINT" Have you finished input Y/N"	860-880	Prompt and keyboard response for another value or not
870	INPUT A\$		
880	IF A\$="Y" THEN PROCMENU ELSE PROCHEXDEC		
890	ENDPROC		
900	REM **MEM MODIFY PROCEDURE **	900	Procedure for memory modification option
910	DEF PROCMEMMOD		
920	CLS	920-980	Memory modify instructions
930	PRINT" MEMORY MODIFY"		
940	PRINT		
950	PRINT" To modify memory first enter address"		
960	PRINT" in hex or dec precede hex with &"		
970	PRINT" RANGE 0 TO 32766----&0 TO &7FFF"		
980	PRINT		
990	INPUT" INPUT ADDRESS "A\$	990	Prompt and keyboard response for address
1000	X=EVAL(A\$)	1000-1010	Convert input string to decimal and check range
1010	IF X<0 OR X>32767 THEN PROCMEMMOD		
1020	L=0:D=?X	1020	Set increment flag to zero (L), D is byte value

PCNProgramCards**Memory Utility Card 4 of 4**

8312MU4/4

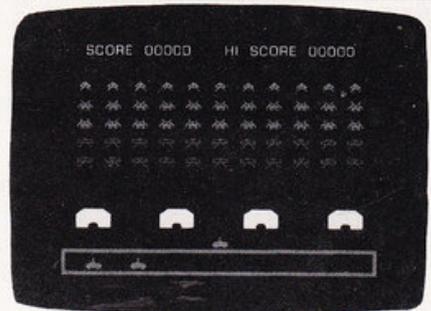
1030	CLS:PRINT	1030-1070	Displays address and byte contents in decimal and hex
1040	PRINT" HEX ADDRESS ";~X;" HEX CONTENTS "~D		
1050	PRINT:PRINT		
1060	PRINT" DEC ADDRESS ";X;" DEC CONTENTS "D		
1070	PRINT		
1080	IF L=1 THEN PROCINC	1080	Check increment flag for modification complete
1090	PRINT"Input the new data byte in"	1090-1100	Prompt and keyboard response
1100	INPUT"HEX or DEC use & with hex "D\$		
1110	D=EVAL(D\$):IFD<0QRD>255 THEN PROCMEMMOD	1110	Convert input string to decimal and check range
1120	?X=D	1120	Store new value
1130	L=L+1:GOTO 1030	1130	Increment flag by one to print new value
1140	ENDPROC		
1150	DEF PROCINC	1150	Procedure to increment address by one on request
1160	PRINT:PRINT	1160-1180	Prompt and keyboard response
1170	PRINT"Do you want to modify the next byte"		
1180	INPUT"ENTER Y/N "Y\$	1190	Check out of range
1190	IF X>32766 THEN PROC RANGE	1200	If response is "Y" then increment address by one
1200	IF Y\$="Y" THEN X=X+1 :GOTO 1020	1210	Back to the menu
1210	PROCMENU		
1220	END		
1230	ENDPROC		
1240	REM **OUT OF RANGE PROCEDURE **	1240	Procedure called when value out of range
1250	DEF PROC RANGE	1260-1280	Display error message and pause
1260	CLS		
1270	PRINTTAB(12,12)"ADDRESS OUT OF MAX RANGE"		
1280	FOR T=1TO 6000 :NEXT		
1290	PROCMENU	1290	Back to the menu
1300	ENDPROC		
1310	REM ** ERROR FOUND ROUTINE **	1310	Procedure to deal with trapped errors
1320	CLS	1330-1360	Display error message then pause
1330	PRINTTAB(2,12)" YOU FORGOT & IN FRONT OF A HEX No"		
1340	PRINTTAB(2,14)" OR PRESSED RETURN WITH NO INPUT etc"		
1350	PRINTTAB(2,16)" START AGAIN"		
1360	FOR T=1TO 9000:NEXT T		
1370	PROCMENU	1370	Back to the menu



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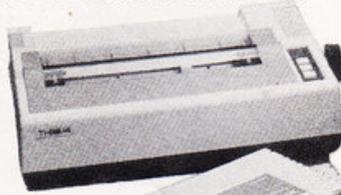
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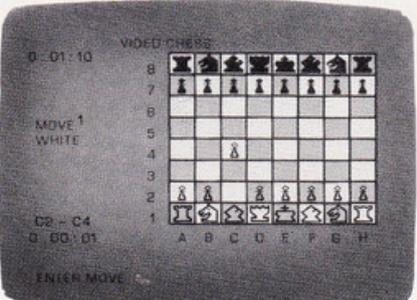
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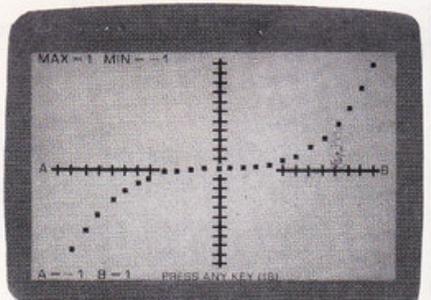
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Munchman Card 1 of 4

8312M1/4

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```

5 BORDER 7: PAPER 7: INK 0:          CLS
10 FOR I=144 TO 163:                  FOR J=0 TO 7 : READ A:          POKE USR CH
R*(I)+J,A:                            : NEXT I                          256*PEEK 23
15 DEF FN                               T():=INT ((65536*PEEK 23674+
673+PEEK 23672)/ 50)
20 DEF FN X(A)=A-22528
40 LET Z$="000000": LET S1=1:        LET TIME=0 :                  LET COUNT=1
50 DIM I(4): DIM S$(5):              DIM F(4): DIM G(4):          DIM P(4): D
IM S(4): DIM O(4): DIM L(4)          READ I(I),F(I),G(I),S$(I):   NEXT I: REA
D S$(I)
99 REM                                  ** NEW GAME
100 LET M=3: LET SC=0:                LET ME=25000: LET EM=0:      CLS
199 REM                                  ** NEW SHEET
200 LET N=179: GO SUB 6000
299 REM                                  ** RE-SET MAN&GHOSTS          POSIT
IONS
300 FOR I=1 TO 4:                      LET S(I)=149:                LET P(I)=1+
364+22528: LET O(I)=32: LET L(I)=0:   NEXT I: LET MP=624+22528
350 BORDER 2
370 POKE 23560,0
399 REM
400 LET PL=PEEK 23560
449 REM

450 PRINT INK 0:AT 0,10:              Z$(1 TO 6)-LEN              (STR$ SC))
:SC: AT 0,26:M
470 GO TO 4000-
489 REM                                  (SGN (M*2-1)*1000)
499 REM ** SET POSITION OF MAN          ** ROUTINES
500 LET R=INT (A/32):                 OR GHOST
999 REM ** GHOST MOVEMENT           LET C=A-R*32: RETURN

1000 LET GT=GT+F(RND):               LET GC=PEEK GT:             IF GC=63 OR
GC=59 THEN LET O(G)=-150*SGN (GC-60)+ 162*(GC<>59)+20*(GC=63):
LET A=FN X(P(G)):                   GO SUB 500:                 PRINT AT R,
C: INK 7: " ": LET P(G)=GT:         LET A=FN X(P(G)):          CHR$ S(G):
GO SUB 500: PRINT AT R,C: INK 5:
RETURN
1100 LET L(G)=0: RETURN
    
```

Sinclair Spectrum Spectrum Basic

Requirements: 48K
Application: Game
Author: Philip Arnold

5	Set up screen
10	Load Data from 9000-9190
15-20	Define calculation functions
40	Set up initial values for game
50	DIMension arrays
55	Load Data from 9200
100	Initialise values for new game
200	New page
300-370	Reset man and ghosts
400	Single key input. "Q" — Up, "S" — Down, "O" — Left, "P" — Right
450	Print score routine
500	Routine to set man and/or ghost
1000	Move ghost out of cage
1100	Set ghost flag to zero

Munchman Card 2 of 4

8312M2/4

```

1499 REM ** MAN EATEN
1500 LET M=M-1: FOR G=1 TO 4:         LET A=FN X(P(G)):           GO SUB 500:
PRINT AT R,C: INK 3+SGN (O(G)-150)+
5*(32=O(G)):CHR$ O(G)
1550 NEXT G: RETURN
1999 REM ** MAN EAT GHOST
2000 LET SC=SC+G(S1):
2010 LET A=FN X(P(G)):               LET S1=S1+1
C: INK 3+SGN (O(G)-150)+ 5*(32=O(G)):CHR$ O(G) PRINT AT R,
2050 LET O(G)=32: LET L(G)=0:       LET P(G)=366+22528:        RETURN
2999 REM ** MAN ROUTINE
3000 LET TI=FN T():                 IF TI-TIME>=30 AND        TI-TIME<35
THEN FOR G=1 TO 4:                 LET S(G)=149: NEXT G:
BORDER 2
3020 LET A=FN X(MP): GO SUB 500:     PRINT AT R,C: INK 2:      S$(I)
3050 IF PL<79 OR PL>83 OR PL=82     THEN GO TO 4000
3070 LET I=PL-78-(PL=83)
3100 LET MT=MP+F(I):
3150 IF MC<59 OR MC>63 OR MC=62     LET MC=PEEK MT
3200 GO TO (ABS (MC-58)-(MC=63))   THEN GO TO 4000
3500 IF N<1 THEN GO TO 200         *100+6400
3510 LET COUNT=3-COUNT
3520 IF COUNT=2 THEN LET I=5
3550 LET A=FN X(MP): GO SUB 500:     PRINT AT R,C: INK 7: " ": LET MP=MT:
LET A=FN X(MP): GO SUB 500: PRINT AT R,C: INK 2:S$(I)
3600 IF SC>=ME AND EM=0 THEN       LET M=M+1: LET EM=1
3999 REM ** GHOST ROUTINE
4000 FOR G=1 TO 4
4020 LET A=FN X(P(G)):             GO SUB 500:                 PRINT AT R,
C: INK 3+SGN (O(G)-150)+ 5*(32=O(G)):CHR$ O(G)
4100 LET RND=INT (RND*4)+1:        LET GT=P(G)+F(RND):      LET GC=PEEK
GT
4200 IF GC=63 OR GC=59 OR GC=60     THEN LET O(G)=-150*SGN (GC-60)+1
62*(GC<>59)+ 20*(GC=63):        LET P(G)=GT: GO TO 4600
4300 IF GC=57 AND L(G)=0 AND       S(G)=149 THEN LET L(G)=1:  GO SUB 1000
: GO TO 4600
4400 IF GT=MP AND PEEK 23624<32     THEN GO SUB 1500:
MP): GO SUB 500: PRINT AT R,C: INK 7: " ": GO TO 300 LET A=FN X(
4500 IF GT=MP THEN GO SUB 2000
4600 LET A=FN X(P(G)):             GO SUB 500: PRINT AT R,C: INK 5:CHR$
S(G)
4650 NEXT G: GO TO 400
4999 REM
5000 CLS : PRINT " "
ring " :SC: " Points""
5100 PRINT "Do You Wish To Play Again ?"
    
```

1500-1550	Routine for man eaten by ghost
2000-2050	Routine for ghost eaten by man
3000-3600	Routine for movement of man about maze
4000-4650	Routine for random movement of ghost
5000-5100	Oops! Dead. Score and prompt

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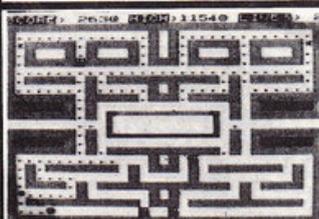
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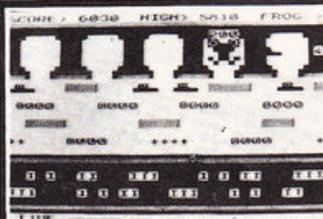
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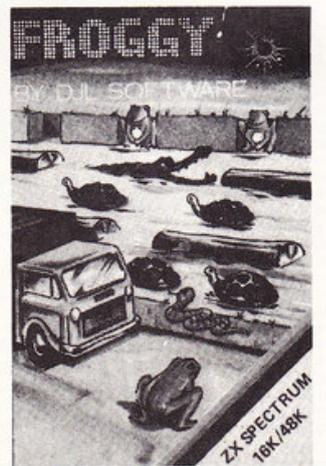
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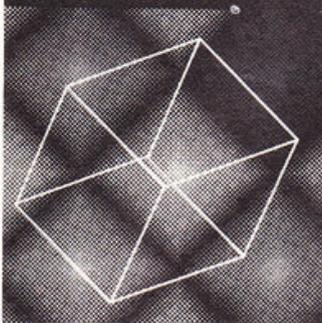
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'Vic Graphics', by Nick Hampshire, published by Duckworth at £6.95 (paperback, 188 pages).

Hands up all Vic owners who want to do advanced graphics on their machines. That many, huh? All right, hands up everyone who thinks a book titled *Vic Graphics* will show you how? What a trusting bunch we all are.

As a first step, enter a book shop, pick up a copy and examine the back cover. You will find a smart blue sticker, painstakingly attached by those awfully nice Duckworth people, which says: 'The Commodore Super Expander Cartridge is required to run the programmes (sic) in this book.'

Now, hands up all of you who don't have that little extra. Pity.

As those unfortunates shuffle sorrowfully out of the bookstore, the rest of us can proceed, looking forward to all those exciting graphic things like using colour, user defined characters and graph plotting.

Whaddya mean, you read all that in the manual and the magazines? Some of you must have missed it. Anyway there's lots more. How about scaling and stretching, rotating and moving? Sounds like physical fitness for micros, but unfortunately, *Vic Graphics* will not make you a super-fit graphics programmer — that's figuratively speaking, of course.

Because . . . this is not a book that will teach you how to do these wondrous things. It shows you how (not at all the same thing), and if you take the time and effort to enter all the forty-odd programs in the book, you can't help but absorb some of the principles involved. Unfortunately, Mr Hampshire does not go overboard on explanation.

One phrase you will encounter again and again, in varying forms, goes something like this: 'I will not go into the mathematical detail here, many excellent books have been written on the subject . . .' (from page 131).

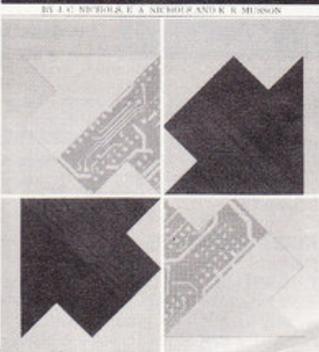
What are these books? Mr Hampshire neglects to tell us. Still with it so far? Okay, as a reward we move on to the really hunky stuff — 3D displays.

As the author points out in his introduction, this leads us into fields such as computer aided design, flight simulators and other state of the art applications.

So turn to page 160 and repeat after Mr Hampshire (it's down at the bottom, after all the exciting blurb): 'All programs in this section required 16K RAM expansion.' If that isn't quite clear, repeat after me: 'All programs in this section required 16K RAM, super expander and therefore some kind of motherboard.'

Now . . . hands up everyone still in the game. Aha! So few. Sorry Mr Hampshire, such a small readership does not a bestseller make. **PW**

Z-80 MICROPROCESSOR ADVANCED INTERFACING WITH APPLICATIONS IN DATA COMMUNICATIONS



'Z80 Microprocessor Advanced Interfacing with Applications in Data Communications', by J C Nichols, EA Nichols and KR Musson, published by Howard W Sams at \$19.95 (paperback, 346

Z80 Microprocessor Advanced interfacing with Applications in Data Communication — if the title sounds like a mouthful, try the book!

This is definitely not for beginners. When they say 'advanced', they mean it, but happily that doesn't mean that it's unreadable, as is so often the case.

However, there's so much in here that there's no room for any light-heartedness.

What there is, in abundance,

is great wedges of heavy stuff. It starts with a description of the machine which will be used as a test-bed. It's called the Nano-computer-HL (High-Level, that stands for), and the book covers it in great detail.

Such detail, in fact, that it will be very difficult indeed to relate the information to a real computer. By that, I mean one you can toddle off to the shops and actually buy.

From that point on, it gets really difficult. You'd better have a pretty good idea of exactly what does go on inside a microprocessor, since the book assumes you already do.

Now, don't get the idea that I'm slating the book — far from it. I cannot applaud the authors loudly enough for producing a book which is not another 'How to make a zillion pounds in a weekend on your ZX81'.

It is about time people realised that these machines are capable of remarkable feats if programmed correctly, and that in order to do so, the most important resource is information.

In all, this is an excellent book for anyone who wants to understand the Z80, but be warned, you'll have to do some mental press-ups. **RK**

'Electronically Speaking: Computer Speech Generation' by John P Cater, published by Howard W Sams at £12.70 (paperback 230 pages).

All the signs are that the coming peripheral is the speech synthesis card. Certainly a lot of work has been done on this subject, and several large companies offer chips or systems.

Electronically Speaking: Computer Speech Generation by John P Cater is one of those rare books which courts disaster by dealing with a very fast-moving subject, but which arrives at the precise time when there is a slight lull in activity.

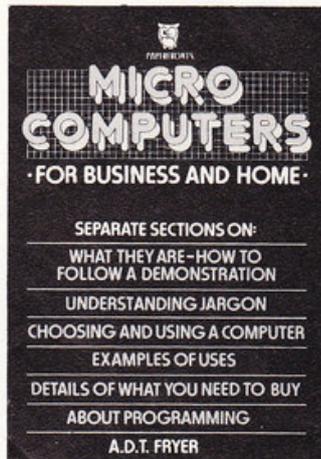
As a result, it doesn't just cover a selection of speech boards and chips, it covers all the currently available products.

As a bonus there are several appendices, including a dictionary of related terminology, a bibliography of advanced reading, and a selection of speech-synthesis circuits.

The book doesn't just limit itself to actually making sounds which are intelligible — it also examines such subjects as the history of speech-synthesis (did you know that research started

in the 1700s?), the physiology of human speech, the mechanics of speech generation, and most important of all, the actual reasons for wanting to make a computer talk at all.

Any book which addresses a complex subject such as artificial speech stands a better than evens chance of being completely unreadable. Thankfully, this book is not one of these. It's written with a light touch, has plenty of (appropriate) humour, and some very useful tables. **RK**



'Microcomputers for Business and Home', by ADT Fryer, published by Elliot Rightway Books (Kingsway, Surrey) at 85p (paperback 126 pages).

For the know-nothings among you looking for an introduction to micro, this might just be the one. Nothing's better than hands on experience when it comes to getting to grips with a micro, but *Microcomputers for Business and Home* is probably the next best thing.

As the reader is assumed to be someone who doesn't yet have a micro, the approach is very basic: its value lies in the concise and straightforward definitions and descriptions. At the risk of stating the obvious, the author has tried not to make any assumptions in the early chapters about what you know.

Seven sections take you progressively deeper into the subject — from buying a micro, through a description of actual programs, to how to design a program. Each new jargon word used is briefly defined, and common terms are set out at the start of the section in which they'll be used.

The book leans, if anything, a little too heavily on the business side, but nevertheless it is good value, and is a helpful introduction to anyone interested in micros. **HA**

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

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

Each issue will also focus on the activities of an individual club or group with a fly-on-the-wall report. First club to feature in the series is the Cambridge Microcomputer Club.

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

Cambridge punters

It comes as no surprise that Cambridge Microcomputer Club attracts some of the real experts, given that its catchment area can lay claims to being the UK's micro capital.

On my evening visit last week, 30 members gathered with their pints in the back room of the Portland Arms to listen to talks given by two of their members.

David Juett, chairman of the club, spoke on various ways of assembling bits of test gear and putting electronic components together in a useful and inexpensive way.

Then Roger Smith took the floor and told us about a computer he had built. He had dropped a Sinclair ZX80 board into a box and added a few extras — more RAM, software, an RS232 board and an enhanced keyboard — to produce what he called 'a poor man's BBC.'

During the evening's activities members also had the opportunity to glance at some special offers from a company called Nolansco Electronics. Up for grabs were Vic 20s and Commodore 64s for a years hire — and games cartridges at £1 a week.

Derek Tripp, one of the organisers, told me: 'Fifty per cent of our members are involved professionally with computers in one way or another. And since the club's first meeting two years ago we've had some interesting products to look at — sometimes before they are launched.'

'Some of the people who set up Computers have been members of the club. And because we have a wide range of contacts we've got close tabs on what's happening in the micro field.'

His remarks were confirmed by the high standard of the technical articles in the club newsletter.

The next get together is actually their annual general meeting. A talk on satellite communications is included, and a look at the new Tiger machine is planned for July.

Sandra Grandison



Name: Cambridge Microcomputer Club. **Venue:** Portland Arms, Mitchums Corner, Cambridge. **Meetings:** Third Wednesday of every month, 8pm. **Contact:** Derek Tripp, 0223 315662.

After the talks, members of the Cambridge club (far left) put down their pints to lay hands on the Torch and the Oric. Left — Roger Smith's 'poor man's BBC' — a Sinclair ZX80 board with extras.

CLUBS

AVON

Multi-User Club produces bi-monthly magazine, subs: £7.50. Contact Valerie Boyde-Shaw, Nailsea 851337.
Worle Computer Club. Meets at Woodsprings Inn Functions Rooms on alternate Mondays at 7-10.30pm (annual subs: £12). Contact S W Rabone, 18 Castle Road, Worle, Weston-super-Mare, Avon, tel: 0934-513068

BEDFORDSHIRE

Bedford Amateur Computer Club. Meets at Star Rowing Club, Bedford, on the first and third Tuesday of each month at 8pm (annual subs: £3). Contact Rowan Bird, 74 High Street, Great Barford, Beds MK44 3LB, tel: 0234-870763.
Chiltern Computer Club. Meets at Five Bells, Eaton Bray, Near Dunstable, Leighton Buzzard on second and fourth Monday of each month (annual subs: £2 senior members, £1 under-14s). Contact Steve Betts, 42 Wallace Road, Eaton Bray, Bedfordshire OUG2DF, tel: 0525-220922.
Luton College Computer Club. Contact John Rodger, tel: 0582-3411.
Luton Computer Club. Contact JP Fletcher, 1 Trowbridge Gardens, Luton, Beds LU2 7JY, tel: 0582-450687.

BERKSHIRE

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

BIRMINGHAM

Birmingham Amateur Computer Club. Meets at CBS Consultants, Watery

tel: 022 029-583.

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

CHESHIRE

Altrincham Computer Club. Meets at N. Cestrian Grammar School, Durham Road, Altrincham, fortnightly. Contact Martin Hickling at 39 Barrington Road, Altrincham, Cheshire WA14 1HZ, tel: 061-941 4547.
Brunel Computer Club. Meets at St Werburgh Community Centre on alternate Wednesdays at 7 to 10pm. Contact Mr R Simpson at 4 The Coats, Stockwood, Cheshire.
Cheshire Computer Club. Contact W Collins at 37 Garden Lane, Chester, Cheshire.
Crewe Computer Users Club meets at Buffaloes Club, Earl Street, Crewe, Cheshire, on the third Thursday of each month at 8pm. Contact Bram Knight on 0270-623375.
Holmes Chapel Micro Club meets at Liesure Centre, Holmes Chapel at 7.30 to 9.30pm on the first and third Tuesday of each month (annual subs: £5 adults: £2.50 children, OAP and students. Or weekly subs: 30p adults, 20p children). Contact Margaret Baker, at 1 Helton Close, Crewe, Cheshire, tel: 0477-34238.
Kinder Peek Computer Club meets at Bew Mills School every Monday, sub: £2 per quarter, £1 members under 11. Contact John Eary, New Mills 43870.
New Mills & District PCC meets at New Mills School, fortnightly on Fridays at 7 to 9.30pm, meetings 35p. Contact Mr G M Flanagan at 11 Sundown Close, New Mills, Stockport, Cheshire SK12 3DH, tel: 0663-44051.
Northwest Computer Club meets

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

BUCKINGHAMSHIRE

Aylesbury Computer Club. Meets at Quarrendon Youth Club every Friday at 7.30pm (annual subs: £5). Members also meet at Mandsville County Secondary School the first Thursday of each month at 7pm. Contact Ken Knight, 22 Mount Street, Aylesbury, tel: 0296-5181.
Chiltern Microcomputer Club. Meets at the Garden Centre, School Lane, Chalfont St Giles, on the first Wednesday of each month (annual subs: £4 for six months). Contact Mrs W Tibbitts at Ellwood, Deanway, Chalfont St Giles, Buckinghamshire, tel: 024-07 4906.
Iver Computer Club. Contact P A Seal at 1 Ormonde Flats, Church Road, Iver Heath, tel: 0753-652792.
Iver Computer Society meets at Huntsmoor room, Iver Village Hall on the second and fourth Thursday every month at 7.30. Contact John Haigh, 141 Leas Drive, Iver Bucks, SL0 9RP.
CAMBRIDGE
Cambridge Microcomputer Club, meets on the third Wednesday of each month. Contact Derek Tripp at 3 Spurgeons Avenue, Waterbeach, tel: 0223-315662.
Haverhill Microcomputer Club, meets at St Mary's Church Hall, Camps Road, Haverhill, on the second, third and fourth Wednesday of each month at 7.30 to 10.30pm (annual subs: £3 adult: £1 OAP and students: meetings 25p). Contact Andrew Holliman, at 5 Trinity Close, Balsham, Cambridge CB1 6DW,

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

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

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

CLEVELAND

Cleveland Micro Club meets on the second and third Tuesday of each month, under 18s on second of the month, over 21s on third Tuesday of the month. Contact J Telford at 13 Weston Crescent, Norton.
Stockton Amateur Computer Club meets at YMCA, Stockton, each alternate week at 7-9pm. Subs: adults £4, families £6, juniors £2, meetings 30p. First week: programmer's evening, second week: workshop/games evening. Contact Peter Cheshire, 60 Croft Road, Eaglescliffe, Stockton-on-Tees, Cleveland TS16 0DY.

CORNWALL

Cornish Radio Amateur Club — Computing Section. Contact Bob Reason at 24 Mitchell Road, Camborne, Cornwall.
Cornwall Area Computer Club. Contact M F Grove at 35 Causeway Heard, Penzance.
St Austell Computer Club and Computer Town meets at ECIP Labs, Penpewan Road, St Austell, fortnightly on Mondays at 7.30pm. Contact NG Day at 2 Clendale Close, St Austell, Cornwall PL25 3DD.

DERBYSHIRE

Derby Micro Society meets at Littleover Church Hall, Sheperd Street, on every other Thursday at 7pm. Annual subs: £5, £2.50 children, £7.50 for families, 50p entrance non-members. Contact Mike Riordan, tel: 0332-769440.
Glossop Computer Club, Contact John Dearn, 2 Spinney Close, Glossop, Derbyshire.

DEVON

Exeter & District Computer Club meets at Exeter School, Magdalene Road, Exeter, on the second and fourth Tuesday every month. Annual subs: £7.50 adults, £2.00 for students. Technical library. Contact Ian Hodgeson, 21 Dean Street, Exeter, tel: 0392-50812.

Exeter & District Amateur Computer Club meets second Tuesday every month. Annual subs: £7.50. Contact Doug Bates, Fortescue House, Stoke Cannon, Exeter. Specialist meetings on third and fourth Tuesday.

Torbay Users Computer Club meets at Devon Computer Services, 96 Dartmouth Road, Paignton on Mondays fortnightly. Annual subs: £2.00 juniors, £5.00 adults, meetings 20p, children welcome. Technical library available.

DORSET

Bournemouth Area Computer Club meets at Kinson Community Centre on the third Wednesday every month. Annual Sub: £5 adults; £2.50 juniors. Contact Peter Hibbs, 54 Rynnyede Avenue, Bournemouth, Dorset BH11 9SE, tel: 0202 576547.

TOPIC meets at Canteen English Truck Centre on the second and fourth Wednesday every month at 7pm. Annual subs: £5, reduced fees for students. Contact David Washford, 1 Alexander Road, Bournemouth, Dorset BH6 5JA.

Purbeck Computer Club, contact 31 North Street, Wareham, Dorset BH20 1AD.

DURHAM

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

ESSEX

Genius Computer Club, subs: £1 ZX81 members, £1.50 Spectrum members. Contact 30 Webber House, North Street, Barking, Essex.

Brentwood Amateur Computer Club, proposed new club. Contact R Sadler, 18 Wamescot Road, Brentwood, Essex CM15 9HD.

Springfield Computer Club meets on the first Friday of every month. Contact Stephen Cousines, 1 Aldeburgh Way, Springfield, Chelmsford, Essex CMI 5PB, tel: 0245 50155.

Colchester Microprocessor Group meets at University of Essex on the second and fourth Wednesday of every month at 7.30pm. Annual subs: £5. Contact Information Centre, University of Essex, near Colchester.

Stanway School Computing Club, only school members at present. Contact G Floyd, c/o Physics Department, Stanway School, Stanway, Colchester, Essex.

Dragon Independent Owners Association, produces newsletter, gives discount on software, subs: £8. Contact Doug Bourne, School House, Nevron Road, Rayleigh, Essex.

Romford Club, a new club. Contact Mr D Norden, 138c Church Road, Romford, Essex.

South East Essex Computer Society meets at Hockey Club at Roots Hall, near

Southend Football Stadium on Wednesday at 7.30pm. Open to members over 14. Contact Robin Knight, 128 Little Waking Road, Little Waking, Southend-on-Sea, Essex, tel: 0702-218456.

GLOUCESTERSHIRE

British Amateur Electronics Club. Independent club with newsletter, beginner's section, library, annual exhibition catering for all ages. Contact Mr J Margetts, 3 Bishopstone Close, Golden Valley, Cheltenham.

Cheltenham Amateur Computer Club meets on the third Tuesday of each month at 7.30pm. Contact Mike Pullin on 0242-25617 or Robin Phelps on 0242-584343.

GCHQ, Contact D W Adam, 16 Court Road, Prestbury, Cheltenham.

Cheltenham Amateur Computer Club meets at Prestbury Scout Headquarters, on the third Tuesday of every month at 7.30pm. Annual subs: £3. Contact M Hughes, 36 Riverviews Way, Cheltenham, Gloucs.

HAMPSHIRE

Commodore Computer Club, inaugural meeting at Bury House, Bury Road, Gosport on May 6 at 7.30pm. Contact Brian Cox, Fairham 280530.

HANTS

Fareham and Portsmouth Amateur Computer Club. Contact Alan Smith, c/o Francis Close, Lee-on-the-Solent, Gosport, Hants PO13 8HB, tel: 0705-550907.

RAF Odiham Computer Club. Contact c/o Officer i/c, Royal Air Force, Odiham, Nr Basingstoke, Hants.

Southampton Amateur Computer Club meets at Medical Science Building, Bassett Crescent, East Southampton, on the second Wednesday of every month at 7.30pm. Annual subs £5, £3.50 students & OAPs. Contact P Maddison, 'Gardenways', Chilworth Towers, Chilworth, Southampton SO1 7JH.

HEREFORD

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

HERTFORDSHIRE

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

HUMBERSIDE

Grimsby Computer Club meets at Grimsby Central Library fortnightly on Mondays at 7.30pm. Contact Jenson Lee, 29 Park View, Cleethorpes, tel: 0472-4259.

Scunthorpe & District Microprocessor Society meets at Community Centre, Lindun Street, Scunthorpe, every Tuesday at 7.30pm. Annual subs £2, families £5. Contact G Hinch, 21 Old Crosby, Scunthorpe, South Humberside DN15 8PU.

KENT

Canterbury ACC proposed new club. Contact L Fisher, 21 Manwood Avenue, St Stephens, Canterbury, Kent CT2 7AH.

Medway Amateur Computer & Robotics Organisation meets on the first Tuesday and third Wednesday of every month. Annual subs £5. Contact Paul Cameron, Small Community Centre, Lordwood Lane, Lordwood, Chatham, Kent, tel: 0634-63036.

North Kent Amateur Computer Club

meets at Lecture Theatre, Charles Darwin School, Jail Lane, Biggin Hill, Kent, on the first Thursday of every month at 7.30pm. Annual sub £3, £1 students. Contact Iain House, 28 Canadian Avenue, Catford SE6 3AS, tel: 01-690 5441.

Orpington Computer Club meets at The Large Hall, Christ Church, Chaterhouse Road, Orpington, Kent, every Friday at 8pm-10.30pm. Insurance cover for all members' equipment while on club premises. Contact Mr R Pyatt, 23 Arundel Drive, Orpington, Kent BR6 9JF, tel: Orpington 20281.

Amateur Computer Club, annual subs: £4.50 (£2 for under 18s, OAPs). Contact Rupert Steele, St John's College, Oxford OX1 3JP.

National Personal Computer User Association, annual subs £12. Contact Eric Keeley, 11 Spratling Street, Manston, Ramsgate, Kent.

Sevenoaks School Computer Club. Contact G Sommerhoff, Technical Centre, Sevenoaks School, Sevenoaks, Kent, tel: 0732-456340.

Tunbridge & Tunbridge Wells ACC. Contact Ray Szatkowski, 1 Cromer Street, Tunbridge, Kent, tel: 0732-355960.

LANCASHIRE

Blackburn Micro Computer Club. Contact Roger Longworth, 12 Sharp Close, Accrington, Lancs.

Bolton Computer Club meets at E4/24 Bolton Institute of Higher Education, Deane Road, Bolton, on Thursdays. Annual subs: £1. Contact David Atherton, 16 Douglas Street, Asherton, Manchester M29 9FB, tel: 0942-876210.

Burnley Computer Club meets at Carleton Hotel, Standish Street, on Tuesdays 7.30-11pm. Contact Clive Tallon, 27 Bassett Street, Burnley, Lancs BB10 3EQ.

Chorley Computer Club meets at Townley Arms, Chorley, every other Tuesday at 8pm. Contact Chris Hicks, 131 Market Street, Chorley, Lancashire.

Ribble Valley Computer Club meets at Staff Canteen, Pendle Carpets Ltd, West Bradford, on the second and fourth Monday of every month at 7-9pm. Contact Ian Thornton-Bryar, 25 Southfield Drive, West Bradford, Clitheroe, Lancs BB7 4TU.

Lancaster & Morecambe Computer Club. Contact Sarah Blackler, tel: 0524-33553.

South Chadderton Computer Club meets at Turf Lane Centre, Turf Lane, Chadderton, on Thursdays at 7-9.30pm. Contact Mr Jakeman, 26 Marble Street, Derker, Oldham, Lancs. Tel: 061-678 0547.

LEICESTERSHIRE

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

LINCOLNSHIRE

Lincoln Computer Club, meets at Blandings Public House, High Street, Lincoln on the first and third Wednesday of every month. Contact John Clifford, 448 Newark Road, Lincoln LN6 8RX, tel: 0522 2168.

Skegness Computer Club, meets at County Hotel every other Monday, 7-9.30pm. Contact Reg Potter, 118 Beresford Avenue, Skegness, tel: 0754 3594.

LIVERPOOL

BBC Microgroup Liverpool meets at Old Swan Technical College, Liverpool, on the first Wednesday of every month. Contact Nick Kelly, 56 Queens Drive, Walton, Liverpool L46 8SH.

LONDON

Croydon Micro-Computer Club meets on the first and fourth Tuesday of every month. Contact Vernon Gifford, 111 Selhurst Road, Selhurst SE25 6LH, tel: 01-653 3207.

Computer Users Club. Contact Tony Latham on 01-304 3910.

East London Amateur Computer Club meets at Harrow Green Library, Cathall Road, E11, on the second and fourth Tuesday of every month at 7-10pm. Annual subs: £5. Contact Fred Linger on 01-554 3288.

Forum-80 London, contact Leon Jay on 01-286 6207.

Forum-80 Wembley, contact Victor Saleh on 01-902 2546.

Harrow Computer Group meets at Harrow College of Higher Education, Room W24, Northwick Park, on alternate Wednesday at 7pm. Contact Bazyle Butcher on 01-950 7068.

Imperial College Microcomputer Club meets at room 145, level 1, on Tuesdays at 7.30pm. Contact Tim Panton, c/o I.C. Union Office, Prince Consort Road, London SW7 2BB.

London School Computer Club. Contact Burlington Danes School, Dane Building, DuCane Road, Hammersmith, London.

Metropolitan Police Amateur Computing Club meets on the first Thursday of every month at 7pm. Contact S Farley on 01-725 2428.

North London Hobby Computer Club meets at the Polytechnic of North London, Holloway, London N7 8DB, on every Monday, Tuesday, Wednesday and Thursday during term time and one evening a week during holidays. Annual subs: adults £25, family £40, jobless, pensioners, poly students £5. Contact Robin Bradbeer 01-607 2789.

Paddington Computer Club meets at Paddington College, 25 Paddington Green, London W2 1NB. Contact Peter Hill on 01-723 5762.

Post Office HQ Microcomputer Club meets at room B145, River Plate House, 12-13 South Place, off Moorgate, on the second Thursday of every month. Contact Vernon Quaintance, British Telecom Enterprises, Cheapside House, 138 Cheapside EC2U 6JH, tel: 01-726 4716.

Richmond Computer Club meets at Richmond Community Centre, Sheen Road, Richmond, on the second Monday of every month at 8pm. Contact Bob Forster, 18a The Barons, St6 Margarets, Twickenham, Middlesex, tel: 01-892 1873.

The SOBAT Computer Club meets once a fortnight. Subs: £4. Produces monthly letter. Contact Mr T Kayani, Berridge House, Hillfield Road, London Nw6.

South East London Microcomputer Club meets at Thames Polytechnic, Greens Ends, Woolwich SE18, on alternate Wednesdays at 7pm. Annual subs: £5. Contact Peter Phillips, 61 Grainger Road, SE3, tel: 01-853 5829.

Southgate Computer Club, annual subs: £2.50. Contact Panos Koumi, 33 Chandos Avenue, London N14.

Southgate Technical College Computer Club meets at Room W102 Southgate Tech, fortnightly on Thursdays at 7.30pm. Annual subs: £5. Contact Kevin Pretorius on 01-882 2282.

West London Personal Computer Club meets at Back room, Fox & Goose pub, Hanger Lane, Alperton, on the first Tuesday of every month at 7.45pm. Annual subs: £5 adults, £2.50 under 16s & pensioners. Contact Graham Brain on 01-997 8986.

MANCHESTER

Manchester Computer Club meets at the Department of Computer Science, Manchester University, Oxford Road, Manchester, on the first and third Thursday of every month at 7.30pm. Contact David Wade, 061-941 2486.

Small Business Computer Users Club. Proposed new club to meet the last Tuesday every month, subs: £7.50. Contact K Wadsworth on 061-740 7232 after 5pm.

MERSEYSIDE

Bolton Computer Club meets Room E4/E24 Bolton Institute of Higher Education, Deene Road, Bolton, on Thursdays. Annual subs: £1. Contact David Atherton, 16 Douglas Street, Atherton, Manchester M29 9FB.

Merseyside Microcomputer Group meets at Merchant Taylor's School, Crosby, on second Thursday every month. Contact Mr F Shaw, 14 Albany Avenue, Eccleston Park, Prescot, tel: 051-426 5536.

Southport Computer Club meets weekly. Contact Ian Bristone, 28 Weld Road, Southport, Merseyside PR8 2DL, tel: 0704-64524.

Wirral Microcomputer Users Group meets at Birkenhead Technical College every Monday. Contact J Phillips, 14 Helton Close, Birkenhead, Merseyside

Remember

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

L439HP.

MIDDLESEX

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

NOTTINGHAMSHIRE

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

NORFOLK

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

OXFORDSHIRE

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

SHROPSHIRE

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

SOMERSET

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

STAFFORDSHIRE

Alsager Computer Club, meets at

Alsager Comprehensive School, Stoke-on-Trent, Staffs, fortnightly on Tuesday. Contact Rex Charlesworth on 09363-77270.

The Amateur Computer Club of North Staffs meets on the third Wednesday every month. Annual subs £3. Contact J Roll, 16 Hill Street, Hednesford, Staffordshire WS12 5DS.

ICL Birmingham Branch Micro Club, c/o WBA Ecclestone, 26 Browns Lane, Tamworth, Staffs.

Tame Valley Computer Club, contact Tim Marshall, 32 Milton Avenue, Leyfields, Tamworth, Staffordshire B79 8JG.

SUFFOLK

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

SURREY

Ashtead Computer Club meets on the last Thursday of every month. Contact P Palmer, 8 Corfe Close, Ashtead, Surrey.
Thames Valley Computer Club meets in Griffin Pub, Caversham. Annual subs £1.50p a meeting. Contact Phil Warn, Reading RG4 8TA.

Thames Valley Amateur Computer Club meets at Griffon, Caversham, on the first Tuesday of every month. Contact Brian Quarm, 25 Roundway, Camberley, Surrey GU15 1NR, tel: Camberley 22186.

Ewell Micro Club, contact Dave De Silva, 316 Kingston Road, Ewell, Surrey KT19 0SU.

Farnham Computer Club, meets at Farnham 6th Form College, Morley Road, Farnham, Surrey on the second Wednesday every month. Annual subs: £2. Contact Adam Sharp, 14 Thorn Road, Boundstone, Farnham, Surrey.

West Surrey Computer Club meets at Paddock Room, Green Man Public House, Burpham, Guildford, the first Thursday of every month. Annual subs £5. Contact Chris Karney on 0483-68121.

ITN Computer Club meets on Fridays. Contact A Bond, 54 Farnham Road, Guildford, Surrey GU2 5PE, tel: 0485 62035.

TI Home Group, annual subs: £12. Contact P Dicks, 157 Bishopsford Road, Morden, Surrey.

CBBS London meets on Sundays 4-10pm. Contact P Goldman, PO Box 100a, Surbiton, Surrey KT5 8HY.

Sutton Library Computer Club meets at Central Library, St Nicholas Way, Sutton, Surrey, on the first Friday of every month at 6pm and second and third Tuesday of every month. Annual subs: £6, £4 OAPs, £2 family. Contact Dave Wilkins on 01-642 3102.

Atari Computer Enthusiasts meets at 8 Cosdach Avenue, Wallington, Surrey SM6 9RA, subs: £20. Contact Adrian Miles, tel: 01-647 1713.

Association of London Computer Clubs, contact Len Stuart, 89 Mayfair Avenue, Worcester Park, Surrey KT4 7SJ.

Worthing & District Microcomputer Club meets at Rose Wilmot Youth Centre, Littlehampton Road, Worthing, on alternate Sundays 11am-1pm. Annual subs £4 adults, £2 students, £5 family. Contact B. Thomas, 11 Gannon Road, Worthing, W. Sussex, BN11 2DT, tel: 0903 36785.

SUSSEX

West Sussex Microcomputer Club meets at Room R06, Robinson Road Annexe, Crawley, on the first and third Monday every month. Annual subs: £6 adults, £3 students. Contact J Clarke, 31 Hyde Heath Court, Pound Hill, Crawley, W Sussex, tel: 0293-884207

Mid-Sussex Microcomputing Club. Contact Jeff Hayden, 2 Hillary Close, East Grinstead, W Sussex RH19 3XQ.

Micro Enthusiasts, new club proposed. Contact G Diannage, 16 Malvern Street, Hove, Sussex BN3 3YR.

Arun Microcomputer Club meet at Wick Amenity Centre, Wick Farm Road, Littlehampton, W Sussex, on the first Monday of every month at 8pm, and third Sunday of every month at 6pm. Fees: £3 six months, £1 joining fee. Contact P Cherriman, 7 Talbot Road, Littlehampton, West Sussex DN17 7BL.

TYNE & WEAR

Newcastle upon Tyne Personal Computer

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

WEST MIDLANDS

Cannock Computer Society meets at Cannock Computer Systems, Old Penkridge Road, Cannock, fortnightly. Annual subs: £3 adults, £1 students. Contact Terry Sale, 20 Redwood Drive, Chase Terrace, Walsall WS7 8AS.

Walsall Computer Club meets at Park Hall Community School on the second and fourth Monday every month 6.45-9.45pm. Annual subs £5 adults, £3.50 students. Contact Alison Hunt, 58 Princes Avenue, Walsall, W Midlands, WS1 2DH, tel: 0922-23875.

National Westminster Personal Computer Society. Contact P Moore 021-236 6176, ext 382.

Central Program Exchange, annual subs: full membership £25 Europe, small users service £10 Europe. Contact Mrs Judith, tel: Wolverhampton 28521.

West Midlands Amateur Computer Club meets at Enfield School, Love Lane, Stourbridge, on the second and fourth Tuesday every month. Annual subs £4, £3 full-time students. Contact John Tracey, 100 Booth Close, Brierley Hill, Kingswingford, W Midlands, tel: 0384-70097.

WILTSHIRE

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

WORCESTER

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

YORKSHIRE

Barnsley Co-Operative Computer User Group meets at Co-Op Social Club, Pogmore, Barnsley, on the last Tuesday every month at 7.30pm. Annual subs £1. Contact James Bridson, c/o 39 Kereford Hall Road, Barnsley, South Yorks S70 6NF, tel: 0226-41753.

Doncaster Amateur Computer Society meets in YMCA, Wood Street, on the first Wednesday every month. Contact John Wilkinson, 316 Bawtry Road, Doncaster, S. Yorkshire, tel: 0302-868379.

Greenhead Grammar School Computer Club. Contact Brian Smith, Greenhead Road, Keighley, West Yorks BD20 6EB, tel: 0535-62828.

Huddersfield Computer Club meets every Monday. Contact Chris Townsend, 760/4 Manchester Road, Linthwaite, Huddersfield, tel: 0484-657299.

Leeds Microcomputer Users Group meets at 8 Regent Street, Chapel Allerton, fortnightly on Thursday at 6pm. Contact David Parsons, 22 Victoria Walk, Horsforth LS18 4PL.

Program Power, contact R Simpson, 5 Wensley Road, Leeds LS7 2BX, tel: 0532-683186.

Pennine & District Computer Club meets at 26 Mill Hey, Haworth, W Yorks, on Saturday and Sunday. Contact Douglas Bryant, 26 Mill Hey, Haworth, W Yorkshire, tel: 0535-43007.

Shipley College Computer Group meets on Tuesdays. Contact Paul Channell, tel: 0274-595731.

South Yorkshire Personal Computer Group meets at General Lecture Theatre, St Georges Building, Mappin Street, Sheffield, on second Wednesday every month at 7.30pm. Annual subs: £4. Contact Paul Sanderson, 8 Vernon Road, Tetley, Sheffield S17 3QE.

Thurnscoe & District Micro Users' Club meets at Thurnscoe Comprehensive School, Physics Lab, Clayton Lane, Thurnscoe, every Wednesday at 7.30pm during school term. Contact Mr James Davis, 62 Tudor Street, Thurnscoe East, tel: 0709-893880.

West Yorkshire Microcomputer Group meets on Tuesdays. Contact Phillip Clark, c/o Suite 204, Crown House, Armley Road, Leeds LS12 2ES, tel: 0532-632532.

York Computer Club meets at the Enterprise Club every Monday at 8pm. Contact K Thomas, Green Lea, Ripon

Road, Harrogate, North Yorkshire HG1 2BY, tel: 0904-38239.

SCOTLAND

Bishopton Computer Club meets at 'Cwa Ben', Sachelcourt Avenue, Bishopton, Renfrewshire, on Sunday once a month (next meeting May 22 at 2.30pm). Contact Alasdair Law, 10 Dunglass Road, Bishopton, Renfrewshire PA7 5EF.

Edinburgh Home Computing Club meets at Claremont Hotel, Edinburgh, on the 2nd, 3rd and 4th Wednesday of the month, produces bi-monthly newsletter. Contact I. Robertson, 031-441 2361.

Scottish Amateur Computer Society, contact Mike Anthony, 46 Moredun Park Gardens, Edinburgh EH17 7JR.

Central Scotland Computer Club meets at Falkirk College of Technology, Grangemouth Road, Falkirk, on the first and third Thursday every month. Contact James Lyon, 78 Slamannan Road, Falkirk FK1 5NF.

Fife Computer Users Club meets fortnightly. Subs: adults, £5; under 18s, £3. Contact Murray Simpson, 31 Tom Steward Lane, St Andrews, Fife, Scotland KY16 8YB.

Grampian Amateur Computer Society meets at 35 Thistle Lane, Aberdeen, on the second and fourth Monday every month at 7.30pm. Annual subs: £12, £5 student, £2.50 junior. Contact Alan Morrison, 21 Beech Road, Westhill, Skene, Aberdeenshire AB3 6WR.

Kemnay Computer Club meets weekly. Contact S Stubbs, 15 The Glebe, Kemnay, Inverurie, Aberdeenshire.

Inverness Personal Computing Club meets every second Tuesday at 7.30pm. Subs: adults £5, juniors £2.50. Contact Gyl Mackenzie, 38 Ardonnell Street, Inverness IV2 3EX, tel: 0463-220922.

Perth & District Amateur Computer Society meets at Hunters Lodge Motel, Bankfoot, on the third Tuesday of every month at 7.30pm. Annual subs £5.

Contact Alastair McPherson, 154 Oakbank Road, Perth PH1 1HA.

Skye and Lockalsh Computer Society, proposed new club. Contact C Manvell, 25 Breacais Isola, Isle of Skye IV42 8QA.

Strathclyde Computer Club meets at Wolfson Centre, 106 Rottenrow, Glasgow, on the third Wednesday of every month. Contact B Duffy, 24 Lomand Drive, Conderrat, Cumbernauld G4 8NW.

WALES

Abergele Computer Club meets at Abergele CI Offices every Thursday at 7.30-10pm. Annual subs: £5 adults, £2.50 juniors. Contact W Jones, 77 Millbank Road, Rhyl, Clwyd.

Colwyn Computer Club meets at the Greens Hotel, Colwyn Bay, at 7pm. Contact D Bevan, c/o Abergele Road, Colwyn Bay, Clwyd LL29 7PA.

81 Club annual subs: £30 + vat. Contact Mike Hayes, tel: 0222-371732.

Gwent Amateur Computer Club meets at St Mary's Institute, Stow Hill, every Thursday at 7.30pm. Annual subs: £3.50. Contact Rothery Harris, 16 Alanbrook Avenue, Newport, Gwent, Wales NP23 6QJ.

Pencoed Amateur Computer Club meets fortnightly on Saturdays at Pencoed Library. Subs: adults, £5; OAP's and students, £3.50. Contact Philip Williams, on 05473 287.

Pontypool Computer Club meets at The Settlement, Roackhill Road, Pontypool, Gwent, on every Friday. Contact Graham Loveridge, on Pontypool 2827.

Swansea & South West Wales Amateur Computer Club meets on the last Friday every month. Contact Paul Griffiths, 1 Prescelli Road, Penlan, Swansea SA5 8AF.

NORTHERN IRELAND

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

EIRE

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

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Make and model

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 x lines	Method (at extra cost)	Colour capability		Type of keyboard	No of function keys	Numerc pad	No of RS232	No of Centronics	No of IEEE 488	No of others	No of expansion slots						
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	Ba	●	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	Ba	●	A4	8-bit range goes to 20Mb		
Almarc 1601	£3,445	8086	8	128K	1Mb	80x25	(M+)	●		W		2			11		CP/M86	Ba	●	A4	Pseudo 16-bits go to 20Mb		
Altos 800/15	£5,663	Z80	4	192K	208K	80x24	M			W	8		1				MP/M	Ba	●	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+)*	●		*		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	Ba	●	A8	Will emulate Apple II		
Archives I	£3,003	Z80	4	64K		80x25	M	●	240x100	W	23	2	1		5		CP/M	Ba	●	S1	Standard CP/M + graphics		
Archives IV	£5,905	Z80	4	512K		80x25	M	●	240x100	W	23	2	1		3		CP/M, MP/M	Ba	●	S1	Hard disk version		
Atari 400	£160	6502B	1.79	16K		40x24	Tv	●	320x192	T					7	●	Cassette	Ba	●	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		
BASEF 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	●	MOS	BaAs	●	C12	Apple bus, Z80, 80 columns		
BBC Micro Model A	£299	6502	1.8	16K	32K	40x30	Tv(M+)	●	320x256	W	10	1			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 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	Ba	●	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	Ba	●	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 Model 803	£1,720	Z80A	4	64K		80x25	(M+)		512x256	W	17	1	1				OS/M	Ba	●	B4	This is CP/M compatible		
C-1010	£4,197	6502	1	64K	128K	80x24	TvM		256x192	W	12	1	1		8	●	CP/M, DOS, UCSD-P	Ba	●	C2	Apple II compatible		
CAL PC	£2,294	8088	5	128K	256K	80x25	TvM	●	256x512	W	36	1	1		5		CP/M	Ba	●	C3	Also Z80B Processor		
Calltext Micro	£2,019	Z80A	4	64K	256K	80x24	TvM			W	36	1	1		3		CP/M	Ba	●	C3	Range of software included		
Computers 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	●	C4	Pascal, Fortran as extras		
Casio FX 702P	£90	Cust.		2K		20x1	LCD			C							Cassette	Ba	●	C6	Pocket computer		
Casu Mini C2	£2,300	Z80A	4	64K			(M+)			*		4	1		6		Cassette	Ba	●	C7	*Choose your own terminal		
Clenlo Pronto	£3,795	Z80A	4	64K	1Mb		Tv(M+)			*		2	2		18		CP/M	Ba	●	C8	*Choice of terminal		
Clenlo Table-Top 925	£3,105	Z80A	4	64K	128K	80x25	M			W	11	2	2				CP/M	Ba	●	C8	Watch out for the weight		
Columbia PC1600-1	£3,392	8088	4.77	128K	1Mb	80x24	M	●	640x200	W	10	2	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	Kernel	Ba	●	C9	Very popular home micro		
Commodore 64	£345	6510	1	64K		40x25	Tv(M+)	●	320x200	W	8				3		Kernel	Ba	●	C9	Good value for money		
Commodore 500	£799	6509	1	128K	896K	40x25	Tv(M+)	●	320x200	W	10	1	1	1	3	1	Kernel	Ba	●	C9	Available by summer?		
Commodore 4016	£632	6502	1	16K	32K	40x25	TvM			W							Cassette, PETDOS	Ba	●	C9	The original PET		
Commodore 710	£1,144	6509	2	128K	896K	80x25	TvM			W	10	1	1	2	1		Kernel	Ba	●	C9	Might be a long wait		
Commodore 8032	£1,129	6502	1	32K	96K	80x25	TvM			W							Cassette, PETDOS	Ba	●	C9	The 80-column PET		
Commodore 8096	£1,374	6502	1	96K		80x25	TvM			W							Cassette, PETDOS	Ba	●	C9	Fully expanded PET		
Commodore Super Pet 9000	£1,719	6502	2	96K		80x25	TvM			W							Cassette, PETDOS	Ba	●	C9	Top of the range		
CompuCorp 675	£6,780	Z80	4	64K	256K	80x20	M			W	20	1			4		CompuCorp	Ba	●	C10	Unusual O/S		

Make and model

HARDWARE

Make and model	Price inc VAT	Processor type	Speed in Mhz	Standard RAM	Max RAM - normally at extra cost	Display		Graphics resolution	Keyboard		Interfaces built-in				Storage	Operating system	Languages inc	Other languages available	Distributor	Comments
						Max characters x lines	Method (at extra cost)		Colour capability	Type of keyboard	No. of function keys	Numeric pad	No. of RS232	No. of Centronics						
Comart Communicator CP100	£2,180	Z80	4	64K	512K	80x24	M		W	2	1			10	CP/M	BaAs		C13	Business CP/M micro	
Cortex	£454	9995	12	64K	1Mb	40x24	Tv(M+)	●	W 12	1						Pa		M2	Mainly sold as £340 kit	
Corvus Concept	£4,887	68000	8	256K	1Mb	120x60	M		W 10	2			1	4	Merlin			K1	A4 shaped screen	
Cromemco System 1	£3,025	Z80	4	64K		80x24	(M+)	●	W 20	1			8		CDOS, Crom			C13	Designed for business	
Cromemco System 2	£3,560	Z80	4	64K		80x25	(M+)		W 20	1			21		CDOS, Crom			C13	Large business machine	
Cromemco System 3	£5,170	Z80	4	64K		80x25	(M+)		W 20	1			21		CDOS, Crom			C13	Top end Cromec	
DAI PC	£684	8080	2	48K		60x24	Tv(M+)	●	W	1					Cassette	Ba		D9	Optional maths chip	
Datac Micro Controller	£431	Z80	2	16K		40x24	Tv(M+)		W	1			1	1		Ba		D1	Mainly used in labs	
DEC Rainbow 100	£2,714	8088	N/A	64K	192K	132x24	M		W 20	2			3		CP/M			D2	Competitor for IBM PC	
DEC PC 325	£3,080	PD111/23	N/A	256K		132x24	M	●	W 20	2			1		P/OS			D2	Mini in micro clothing	
DEC PC 350	£3,850	PD111/23	N/A	256K		132x24	M	●	W 20	2			4		P/OS			D2	Mini in micro clothing	
Decision-1 Computer MDC-011	£2,869	Z80A	4	64K	192K		(M+)*		*	3	1		1		CP/M	Ba		I2	*Buy your own terminal	
Decision-1 Computer MDC-012	£3,674	Z80A	4	64K	192K		(M+)*		*	3	1		1		CP/M	Ba		I2	*You choose the terminal	
Diablo 3000	£7,250	8085	3	32K	64K	80x24	M		W 8	1			4		DACL	Ba		B5	Unusual O/S	
Digico Prince	£3,392	Z80A	4	64K		80x25	M		W 50	2			7		CP/M			D3	Unusual keyboard	
Digital Microsystems DMS-3	£3,576	Z80A	4	64K			(M+)*		*	3	1		1		CP/M			D4	*Choice of terminal	
Digital Microsystems DMS-4	£6,210	Z80A	4	128K	1/2Mb		(M+)*		*	4					MP/M			D4	*Depends on terminal chosen	
Direct 1000	£3,093	Z80	4	64K		80x25	M		W	2			2		CP/M			D5	Standard CP/M machine	
Dragon 32	£200	8809E	1	32K	64K	32x16	Tv(M+)	●	W				1	4	Cassette	Ba		D6	Tandy colour lookalike	
Durango F85	£5,744	8085A	5	64K	196K	80x64	Tv(M+)		W	4			1	12	Star Basic	BaCo		C3	Built in printer	
Eagle II	£2,702	Z80A	4	64K		80x24	M		W	2	1		1		CP/M	Ba		M3	Includes WP/SS software	
Eagle III	£2,950	Z80A	4	64K		80x24	M		W	1			1		CP/M	Ba		M3	Includes WP/SS software	
Eagle IV	£4,190	Z80A	4	64K		80x24	M		W	2	1		1		CP/M	Ba		M3	Includes WP/SS software	
Eagle 1600	£6,497	8086	8	128K	512K	80x25	M	●	W 24	2	1		1	8	MS-DOS, CP/M 86			M3	High speed IBM copy	
Enterprise 1000	£2,645		8	64K			M		W 10	2	2		2		Enterprise			D7	Micro Nova 16-bit	
Epson HX20	£472	6301	1	16K	32K	20x4	LCD		W 13	2			2		Cassette	Ba		E2	Powerful portable	
Equator	£6,842	Z80A	4	64K	448K	80x24	M		W 14	7	1		1	8	CP/M, MP/M, Turbo DOS			E3	Two bigger models available	
Facit 6520	£2,645	Z80	4	64K	128K	80x24	M		W 8	2			2		CP/M, Facit DOS	Ba		F1	Concurrent printing	
Fortune 32:16 System 2	£5,204	68000	6	256K	1Mb	80x24	M	●	1024x1024	W 16	1		1	20	Unix			I3	Genuine 16-bit	
Fujitsu FM8	£1,150	6809	1	64K		80x25	(M+)	●	640x200	W 10	1		1	4	Flex	Ba		S2	Good for business graphics	
Future Computers FX-20	£2,156	8088	8	128K	1Mb	80x25	M		800x400	W 20	2		2		CP/M 86, MS-DOS			E1	Still on a promise	
Genie I	£330	Z80	1.7	16K	48K	64x16	Tv(M+)		W	4	1		1	1	Cassette	Ba		L2	Compatible with TRS 80/1	
Genie II	£299	Z80	1.7	16K	48K	64x16	Tv(M+)		W 4	1			1	1	Cassette	Ba		L2	Speeded-up Genie I	
Genie III	£2,242	Z80A	3.2	64K		80x24	M		W 8	1	1		1	3	New DOS	Ba		L2	CP/M costs extra	
Colour Genie	£224	Z80	2.2	16K	32K	40x24	Tv(M+)	●	W 8	1	1		2	1	Cassette	Ba		L2	Home games machine	
Gemini Galaxy 2	£1,719	Z80	4	64K	512K	80x25	M		W 10	1	1		1	5	CP/M			G1	Low cost British system	
Hawk Model 110	£2,070	Z80A	4	64K	256K		(M+)*	●	*	2	1		3		CP/M, MP/M2			L6	*Choose your terminal	
Hawk Model 2110	£5,405	Z80A	4	64K	192K	80x25	M		W 34	2	1		3		CP/M, MP/M2			L6	*Choose your terminal	
Haywood 9000 Composite	£2,064	Z80A	4	64K	128K	80x24	M		W 34	3	1		1	8	CP/M	As		H1	Designed for network	
Haywood Hinet	£10,982	Z80	4	64K	128K	80x24	M		W 34	3	1		1	1	CP/M			H1	Large network machine	
HP 75C	£883	Cust.	N/A	16K	24K	32x1	(M+)		C				1	4	HP	Ba		H2	Calculator/computer	
HP 85	£2,360	Cust.	N/A	16K	32K	32x20	M		W 8	1			4	4	Cassette	Ba		H2	Engineers' machine	
HP 86A	£1,541	Cust.	N/A	64K	512K	80x24	M		W	1	1		2	4	HP	Ba		H2	CP/M optional	
HP 87XM	£2,571	Cust.	N/A	128K	640K	80x24	M		W 14	1	1		3	4	HP DOS	Ba		H2	Special technical uses	

Model	Price	Z80A	3.68	64K	80x24	M	80x24	W	8	2	1	1	CPM	Ba	H2	Top end HP business system
HP Series 100, 120	£2,362	Z80A	3.68	64K	80x24	M	80x24	W	8	2	1	1	HP	Ba	H2	Genuine 16-bit
HP Series 200 Model 16A	£3,212	68000	8	128K	80x25	M	80x25	W	5	1	1	2	HP	Ba	H2	Standard CP/M micro
Hytech H4500	£4,310	Z80	4	64K	80x25	M	80x25	W	26	1	1	3	CPM	Ba	H3	Slow but reliable
IBM PC	£2,392	8088	4.7	64K	80x25	(M+)	80x25	W	10	1	1	5	MS-DOS	Ba	I9	Repackaged Rair Black Box
ICL PC Model 10	£2,754	8085	3	64K	80x24	Tv(M+)	80x24	W	11	2	1	8	CPM, MPM	Ba	I4	Multi user Black box
ICL PC Model 31	£4,939	8085	3	128K	80x24	(M+)	80x24	W	11	4	1	8	CPM, MPM	Ba	I4	Top of ICL range
ICL PC Model 32	£6,037	8085	3	256K	80x24	(M+)	80x24	W	11	8	1	15	CPM, MPM	Ba	I8	*Depends on terminal
IDS Datamachine	£1,995	Z80	4	64K	1Mb	Tv(M+)				2	2	8	CPM	Ba	I5	Good colour versatility
IO Tech Iona	£2,539	Z80	4	69K	80x24	M	80x24	W	12	1	1	8	CPM	Ba	I6	Inexpensive CP/M machine
Invine Business Systems	£1,489	Z80	4	64K	80x25	M	80x25	W	8	2	1	1	CPM	Ba	I6	Top end business system
ITT 3030	£3,105	Z80A	4	64K	80x24	Tv(M+)	80x24	W	8	1	1	1	CP/M, BOS	Fr	J1	Native Forth machine
Jupiter Ace	£90	Z80	3.25	3K	32x24	Tv(M+)	80x24	C	10	1	1	11	Kalamazoo		K3	Only Kabol language
Kalamazoo 1050	£3,450	8085	6	64K	80x24	Tv(M+)	80x24	W	10	2	1	11	CPM		K4	Scientific Keyboard
Kemtron K2000E	£2,242	Z80	4	64K	80x24	(M+)	80x24	W	10	2	1	14	CPM, MPM		K4	For scientific use
Kemtron K3000	£3,795	Z80	4	64K	80x24	(M+)	80x24	W	10	1	1	5	CPM		K5	British portable
Kenilworth 83G	£1,953	Z80A	4	64K	80x25	Tvm	80x25	W	10	1	1	5	CPM	Ba	K5	Includes Basic
Kenilworth 83N	£2,012	Z80	4	64K	80x25	Tvm	80x25	W	10	1	1	8	Kontron	Ba	K6	O/S CP/M based
Kontron RSI 80	£3,306	Z80	4	64K	80x25	M	80x25	W	16	2	1	8	CPM	Ba	K6	O/S CP/M based
LSI M3	£2,064	Z80	2.5	64K	80x24	M	80x24	W	31	1	1	1	CP/M		L3	Big, British and CP/M
LSI M4	£2,472	8088	5	128K	80x24	M	80x24	W	31	2	1	1	CP/M 86, CP/M80		L3	Z80 for 8-bit software
Logica VTS Vitesse	£2,863	8086	5	64K	80x24	M	80x24	W	12	1	1	4	CP/M, MS-DOS	Ba	L4	High-res colour graphics
Marin Chip M9900	£5,750	9900	3	64K	24x80	M	24x80	W	8	4	1	12	MOS, MDEX	Ba	M2	Genuine 16-bit
Micro Five 1000	£5,175	8088	8	128K	512x512	Tvm	512x512	W	20	10	1	2	*		F2	*Choose your own O/S
Micro Five 3000	£10,350	8086	5	128K	512x512	Tvm	512x512	W	20	5	3	3	*		F2	*Choose your own O/S
Microdecision	£1,144	Z80	4	64K	80x24	(M+)	80x24			2	2	2	CPM	Ba, Pilot	I2	*Terminal extra
Microsolution British Genius	£1,840	Z80	4	64K	80x24	Tvm	80x24	W	21	1	1	1	CPM		M4	'Genius' by nature?
Milbank SX10	£2,754	Z80A	4	65K	80x25	M	80x25	W	10	2	1	1	CPM	As	M5	Scientific applications
Molecular M200	£5,462	Z80	4	64K	320K	(M+)				2	2	1	CPM	BaAs	G2	*Terminal required
Monroe EC8800	£2,990	Z80A	3	128K	40x24	M	40x24	W	32	3	3	16	CPM	BaAs	G2	Scientific applications
Monroe OC8810	£3,162	Z80A	3	128K	80x24	M	80x24	W	32	3	2	1	Monroe	BaPaPilot	F3	Only 40-character screen
Multitech MPFI	£2,689	6502	1.2	64K	40x24	Tv(M+)	40x24	W	32	3	2	1	Monroe	BaPa	F3	Bigger model available
Nascom 2	£327	Z80A	4	2K	64K	Tv(M+)	64x96	C		1	1	1	Cassette	Ba	S8	Apple soft compatible
Nascom 3	£549	Z80	4	48K	16x48	Tv(M+)	48x96	W		1	1	4	NAS, SYS	BaAs	L5	Old reliable
NEC PC8000	£1,454	Z80	4	32K	80x25	M	80x25	W	10	2	1	4	NAS, SYS	BaAs	L5	Fully expanded Nascom
New Brain A	£269	Z80A	4	32K	80x30	Tv(M+)	640x220	C		2	2	1	CP/M, NEC, DOS	Ba	N1	Superb colour graphics
North Star Advantage	£2,766	Z80	4	64K	80x24	M	80x24	W	15	1	6	1	Cassette	Ba	G3	A lot of promise
North Star Horizon	£2,294	Z80	4	64K	512x256	M	512x256	W		2	1	9	CPM	Ba	T9	16-bit option
Olivetti M20D	£2,754	Z8000	3	160K	80x25	M	80x25	W		1	1	5	PCOS	Ba	B6	*Choose your own terminal
Olympia Boss Model A	£2,645	Z80A	4	64K	80x28	M	80x28	W	10	1	4	4	CPM	Ba	O1	Useful 28 lines on screen
Onyx 5001 MU	£7,607	Z80A	4	128K	256K					5	1	8	CPM	Ba	P2	*Terminal extra; other models
Oric 1	£169	6502A	1	48K	40x28	Tv(M+)	240x200	C		1	1	1	Cassette	Ba	O2	16K promised soon
Osborne 1	£1,581	Z80	4	64K	52x24	M	128x32	W	10	1	1	1	CPM	Ba	O3	Portable, includes software
Panasonic JD 800M	£3,795	8085A	4	60K	80x24	M	80x24	W	21	3	1	3	CPM	Ba	P1	Larger model costs £5,002
Pascal 640	£1,437	Z80A	4	64K	80x24	M	80x24	W		1	1	1	CPM	Ba	W1	Regular CP/M micro
Pascal Modular Microengine	£7,003	WD9000	2	128K						4	4	8	UCSD-P	Pa	P2	*Terminal extra
Philips P3500	£3,000	Z80A	4	64K	80x25	M	80x25	W	11	2	2	3	Turbo-DOS	Co	P3	Fast O/S as standard
Positron 900	£1,259	6809	1	64K	256K	(M+)				4	1	3	O/S 9	Ba	P4	*You choose your terminal
Positron 9000	£2,134	6809	1	64K	256K	Tvm	480x240	W	12	4	1	3	O/S 9	Ba	P4	Multi user version
Quantum 2000	£2,587	Z80A	4	64K	192K	M	80x25	W	18	1	1	5	CPM	Ba	Q1	Mono, low-res graphics
Rair Black Box Model 3/20S	£2,242	8085	5	64K	80x24	(M+)	160x75			2	8	8	CP/M	Ba	R1	*VDU extra; many versions
Rair Business Computer	£6,037	8088	5	256K	1Mb	M				2	2	4	CP/M, PCDOS	Ba	R1	Hybrid 8/16 bit
Racal 6000	£6,327	Z80	5	64K	256K	M	80x26	W	21	1	1	1	CPM	Ba	R2	CP/M languages available
Research Machines 380Z	£2,147	Z80A	4	32K	56K	Tv(M+)	40x24	W		1	1	4	CPM	Ba	R3	Widely used in schools
Research Machines Link 480Z	£650	Z80A	4	32K	256K	Tv(M+)	40x24	W	4	2	1	2	Cassette	Ba	R3	CP/Net version available
Sage II	£4,019	68000	8	128K	512K	(M+)				2	1	1	UCSD-P System	BaAsPaFmI	T10	*Terminal extra

HARDWARE

Make and model	Price inc VAT	Processor type	Speed in Mhz	Standard RAM	Max RAM - normally at extra cost	Display		Graphics resolution	Keyboard		Interfaces built-in				Storage Capacity per disk and disk size	Operating system	Languages inc	Other languages available	Distributor	Comments
						Max characters columns x lines	Method (at extra cost)		Colour capability	Type of keyboard	No of function keys	Numeric pad	No of RS232	No of Centronics						
Samurai	£3,214	8086	4.6	128K	768K	80x25	M	720x400	W	17	3	1	1	3	2x1.2Mb8F	MS DOS, CPM 86	Ba	M6	High-res colour graphics	
Sanyo MBC 1000	£1,195	Z80A	4	64K		80x25	M	80x25	W	17	1	1	1	1	1x320K5¼F	CPM	Ba	L1	Standard CPM model	
Sanyo MBC 1250	£2,294	Z80	4	64K		80x40	M	640x400	W	17	1	1	1	1	2x640K5¼F	CPM	Ba	L1	High-res graphics	
Sanyo MBC 2000	£2,242	8085A	5	64K		80x24	M	80x24	W	24	2	1	1	2	2x328K5¼F	CPM	Ba	L1	Big disc model costs £3,622	
Sanyo MBC 4050	£2,817	8086	5	128K	512K	80x24	M	80x24	W	24	1	1	1	1	2x640K5¼F	CPM 86	Ba	L1	Pseudo 16-bit	
Seed System 1	£2,300	6800	2	32K	64K	80x24	M	80x24	W	3	2	2	2	8	2x160K5¼F	DOS 68 Flex	Ba	S3	Ageing business machine	
Seed System 19	£2,600	6809	2	48K	1Mb	80x24	M	80x24	W	3	2	2	2	8	2x160K5¼F	OS-9	Ba	S3	Latest from Seed	
Sharp MZ80A	£549	Z80	2	48K		40x25	M	80x50	W	3	2	2	2	8	2x160K5¼F	Sharp Basic	Ba	S4	CPM facility extra	
Sharp MZ80B	£900	Z80A	4	64K		80x25	M	320x200	C	10	2	2	2	8	2x160K5¼F	Sharp Basic	Ba	S4	Unusual keyboard	
Sharp PC1251	£79.95	Cust.	.58	4.2K			LCD	24x1	C	18	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		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	2x500K5¼F	Sharp Basic	Ba	S4	Powerful Sharp Basic	
Signet 10025	£1,599	Z80A	6	64K		80x24	M	512x512	W	10	2	1	1	1	2x200K5¼F	CPM, Macnos	Ba	A6	Choice of keyboards	
Sinclair ZX81	£40	Z80A	3.5	1K	16K	32x24	Tv	64x44	C		1	1	1	1	2x200K5¼F	Cassette	Ba	S5	Sold a million	
Sinclair Spectrum	£99	Z80A	3.5	16K	48K	32x24	Tv	256x192	C		1	1	1	1	2x600K5¼F	Cassette	Ba	S5	Very popular home micro	
Sirius I	£2,754	8088	5	128K	896K	80x25	M	800x400	W	7	2	1	1	4	2x600K5¼F	CPM 86, MS/DOS	Ba	A7	IBM style	
Sord M5	£218	Z80A	4	4K	16K	40x24	Tv(M+)	256x196	C		1	1	1	2		Cassette	Ba	S6	Japanese home computer	
Sord M23	£1,932	Z80A	4	128K		80x25	M	640x200	W	14	2	1	1	2	2x330K5¼F	Sord O/S, SB80	BaPips	S6	CPM compatible	
Sord M23P	£2,369	Z80A	4	128K		80x25	Tv(M+)	640x200	W	14	2	1	1	2	2x290K3½F	Sord O/S, SB80	BaPips	S6	Complete with suitcase	
Sord M223	£3,277	Z80	4	64K		80x25	M	80x25	W	15	4	1	1	4	2x350K5¼F	Sord O/S, SB80	BaPips	S6	Standard business machine	
Sord M243	£5,842	Z80	4	192K		80x25	M	640x400	W	15	4	1	1	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	560x240	W	15	1	1	1	1	2x1.5Mb5¼F	Flex, Uniflex	Ba	S7	Top end SWTP	
Spectrum	£11,442	68000	8	256K	4Mb		(M+)		*		4			16	2x720K5¼F	Mirage	Ap	M1	*As terminal	
Sundance I	£6,969	Z80A	4	64K	256K	132x24	M	132x24	W	4	1	1	1		1x7Mb5¼H	CPM	Ba	T2	Ordinary CPM machine	
Sundance II	£8,205	Z80A	4	128K	256K	132x24	M	132x24	W	4	1	1	1		1x7Mb5¼H	CPM	Ba	T2	Middle-range Sundance	
Sundance 16	£10,480	Z8001	6	256K	1Mb	80x24	M	80x24	W	5	1	1	1		1x14Mb5¼H	BOS	Ba	T2	Tape backup for hard disc	
Superbrain JR	£2,150	Z80	4	64K		80x24	M	80x24	W	15	2	1	1	1	2x160K5¼F	CPM	Ba	I10	Bigger models available	
Superstar	£6,296	Z80	4	64K		80x24	M	80x24	W	15	2	1	1	1	1x10Mb5¼H+1x400K5¼F	CPM 80	Ba	B7	Includes hard disk	
Tandberg EC10	£3,000	8080A	2	64K		80x25	M	80x24	W	15	1	1	1		1x250K8F	CPM, TOS	Ba	T3	Very early machine	
Tandy TRS-80 Model I	£199	Z80	1.7	16K	48K	64x16	Tv(M+)	128x48	W	16	1	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	2	1	1	1		2x184K5¼F	TRS-DOS	Ba	T4	Latest TRS80	
Tandy TRS-80 Model 16	£4,199	68000	8	128K	512K	80x24	M	80x24	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	1	1	1	1			Cassette	Ba	T4	Very popular	
Tandy TRS-80 Pocket Computer	£57	Cust.	1	1.9K		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	CPM	C11	Recently upgraded		
Televideo TS-800 Series	£1,495	Z80A	4	64K		80x24	M	80x24	W	15	2	1	1		2x256K5¼F	CPM-86	C11	C11	Standard CPM machine	
Televideo TS 1602-C	£3,714	8088	5	128K	256K	80x24	M	576x424	W	15	2	1	1			DOS	C11	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		UCSD-P, PX10	Ba	T5	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	Ba	T5	Bigger version available	
TMK 332	£2,242	8085A	5	64K		80x24	M	190x96	W	22	2	1	1		2x320K5¼F	CPM	Ba	P5	*6502 I/O processor	
Torch	£3,214	Z80*	4	96K		80x30	TvM	640x256	W	15	1	1	1	4	2x400K5¼F	CPN	Ba	T6	CPM compatible	
Toshiba T-100	£1,900	Z80A	4	64K	96K	80x25	TvM	640x200	W	8	1	1	1	2	2x256K5¼F	CPM	Ba	O4	Pro test March 18	
Toshiba T-200	£2,242	8085	2.6	64K		80x24	M	80x24	W	15	1	1	1	1	2x256K5¼F	CPM	Ba	O4	Standard CPM machine	
Transam Truscan	£1,983	Z80A	4	64K		80x24	TvM	640x288	W	15	2	1	1	5	2x190K5¼F	CPM	Ba	T7	S-100 machine	

Transtec BC2	£1,949	Z80A	4	64K	256K	80x24	M	80x24	W 13	2	1	8	CPM	T8	Fully definable characters
Vector 4	£3,852	8088	5	128K	256K	80x24	M	80x24	W 15	1	1	2	CP/M, CPM 86	A4	8-bit and pseudo 16-bit
Victor 9000	£2,754	8088	5	128K	896K	80x25	M	800x400	W 7	2	1	4	CP/M 86, MS-DOS	D8	Same as Sirius 1
Wilkes YD8110	£4,025	8086	5	128K	896K	80x24	M	960x624	W 21	1	1	6	CP/M 86	W2	Standard CPM machine
Xerox 820 Model II	£2,415	Z80A	4	64K	80x24	M	M	1024x512	W 18	2	2	2	CP/M	R4	Powerful graphics
Zenith 120-22	£2,978	8088	5	128K	192K	80x25	M	640x225	W 18	2	1	5	CP/M, MS-DOS, Z Basic	Z1	Graphics includes turtle
Zenith 289-81	£1,668	Z80	2.5	48K	64K	80x24	M	80x24	W	2	1	1	CP/M	Z1	Elderly CPM machine
Zeus 4	£5,400	Z80	4	64K	320K	80x25	(M+)	80x25	W 11	10	10	10	CP/M, Muse	M5	Designed as multi-user

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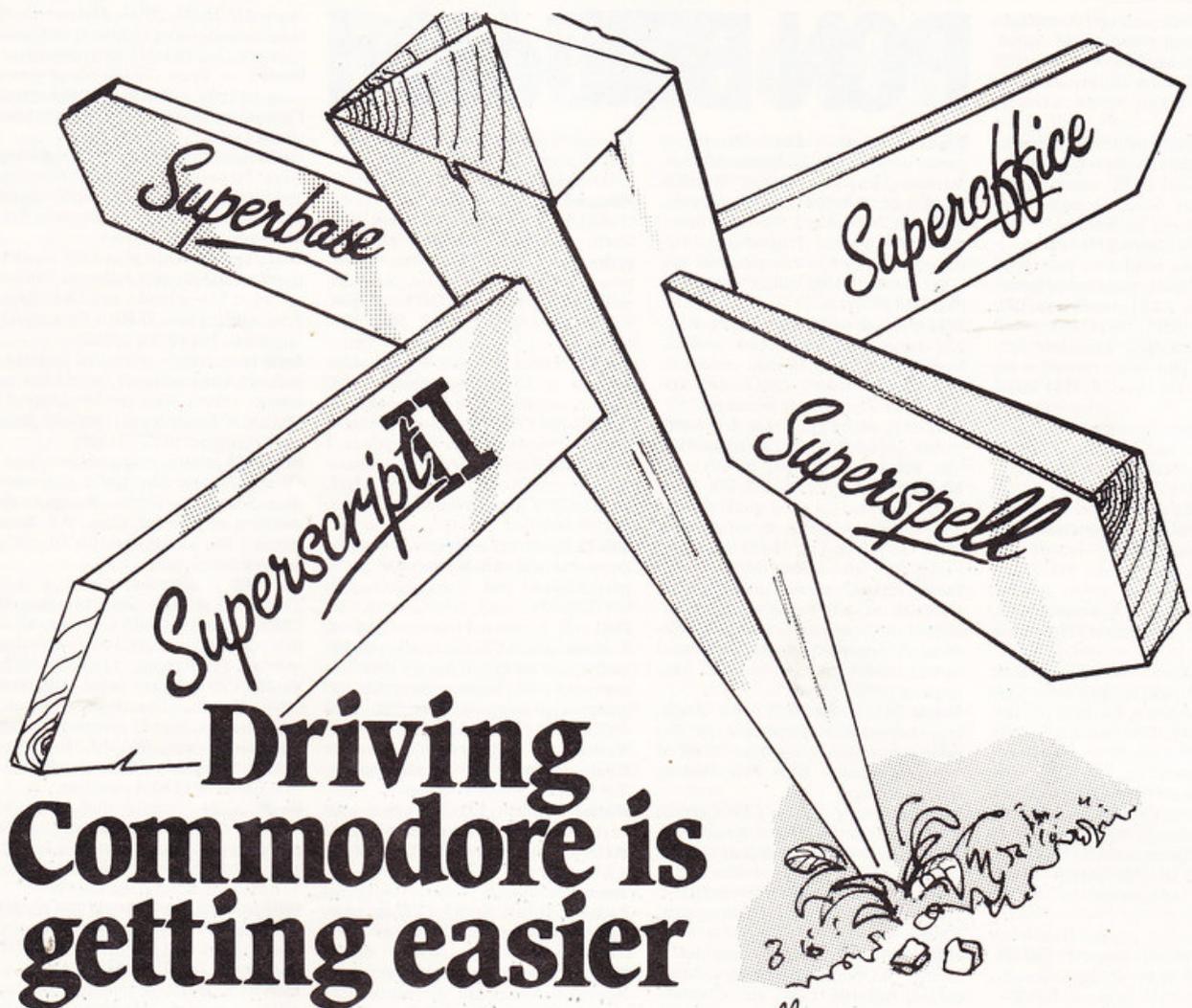
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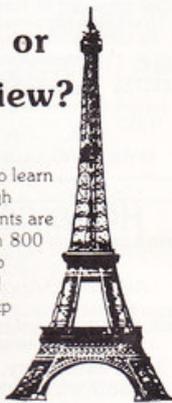
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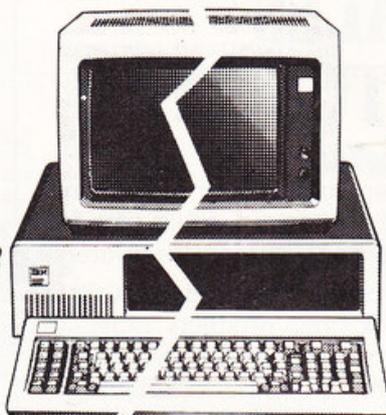
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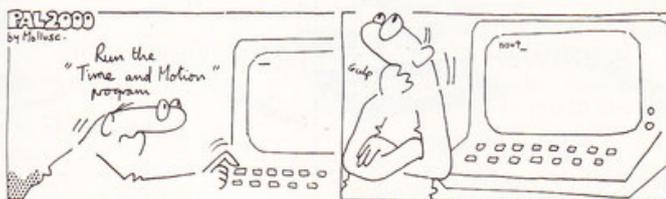
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'Yes. We couldn't call it an Ajile here, a printer company has the name,' said an AJ executive.



Syntax Errors

Slipped digit

If you want to contact Success Services about the Pickard Joystick Controller featured on page 40 of issue 11, try telephoning 0922-402403. A digit slipped out in the original — sorry.

Line out

In the first part of our ZX Phone Home two-part graphics extravaganza (PCN, issue 10) there's one line missing and one line misnumbered in the Computer Art program. Line 100 should read: 100 IF X<1 THEN X=60 and the line that was line 100 should be line 110. Got that? Just in case, here is what the two lines should look like once you've fixed them.

```
100 IF X<1 THEN X=60
110 IF INKEY$<>" THEN PLOTX, Y
```

Knuckles have been duly rapped!

PCN DATELINES

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

Organisers who would like details of coming events included in

PCN Datelines should send the information at least one month before the event. Write to PCN Datelines, Personal Computer News, 62 Oxford Street, London W1A 2HG.

UK EVENTS

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Micro '83	June 1	Conway Hotel, Dunmurry, Belfast	Micro 1, 0232 664391/2
Apple '83	June 3-5	Fulcrum Centre, Slough	John Riding, Database Publications, 061-456 8500
ZX Microfair	June 4	Alexandra Palace, London	Mike Jonstone, 01-801 9172
Office Automation Show & Conference	June 7-9	Barbican Centre, London	Clapp & Polliak, 01-747 3131
4th Commodore Computer Show	June 9-11	Cunard International Hotel, London	Commodore Business Machines UK, 75 74111, Ext 220
Blackburn Computer Fair	June 11	King George's Hall, Blackburn	Bradley Enterprises, 0772 312677
South of England Personal Computer Fair	June 12	Exhibition Hall, Wood Green School, Witney	Julian Wilde, 0993 2355
Computer Fair	June 16-19	Earls Court, London	Roy Bratt, Reed Exhibitions, 01-643 8040
Computer Open Day Exhibition	June 16	Holiday Inn, London	Tony Kaminiski, Couchmead Communications, 01-778 1101
Compec North '83	June 21-23	Belle Vue, Manchester	Roy Bratt, Reed Exhibitions, 01-643 8040
Leeds Software Fair	June 21	John Taylor Teacher's Centre, Leeds	Graham Creighton 0532 782181
BBC Micro User Show	June 24-26	Renold Building, UMIST, Manchester	Database Publications, 061-456 8500

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
Computers, Communications & Electronic Technology Exhibition & Conference	May 31-June 3	Melbourne, Australia	CETIA, PO Box 259, Roseville, Sydney, N S W 2069
International Computer Technology	June 7-10	Hong Kong Exhibition Centre, Hong Kong	Terry Hill, Industrial & Trade Fairs International Ltd, 021-705 6707
International Micro Computer Exhibition	Aug 2-5	Kuala Lumpur, Malaysia	Conference & Exhibition Management Services SDN BHD, 9-A Jalan SS24/8 Taman Megah, Petaling Jaya, Selangor
National Computer Business & Office Systems	Aug 16-19	Auckland, New Zealand	Trade & Industrial Exhibitions, 12 Heather Street, Parnell, PO Box 9682, Auckland

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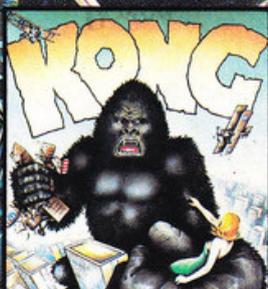
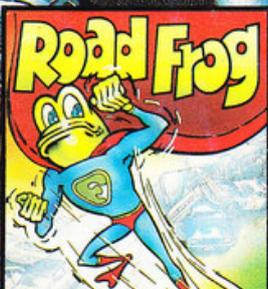
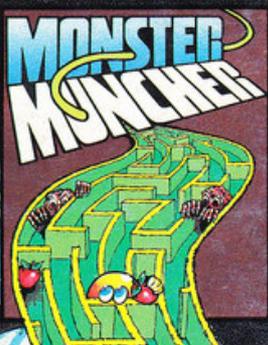
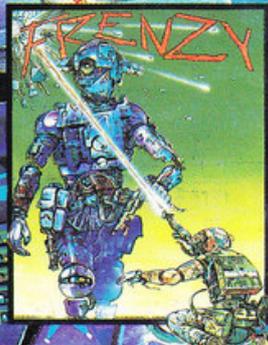
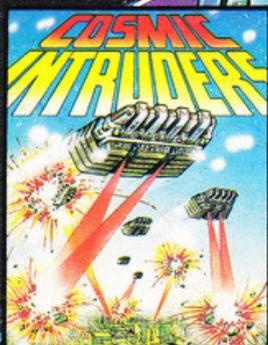
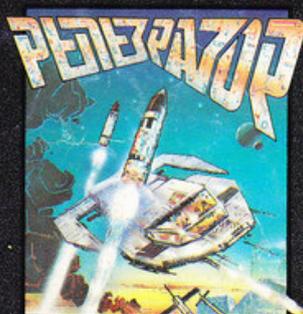
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