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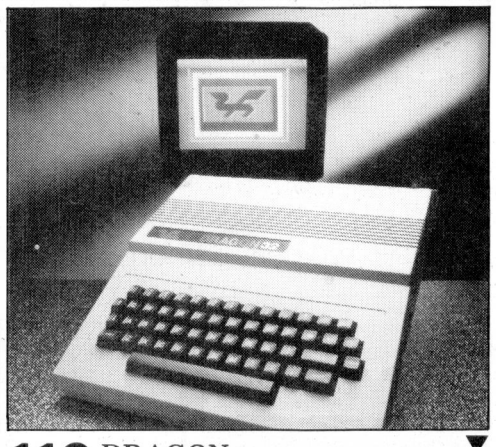


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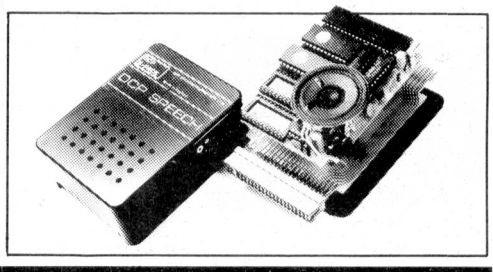




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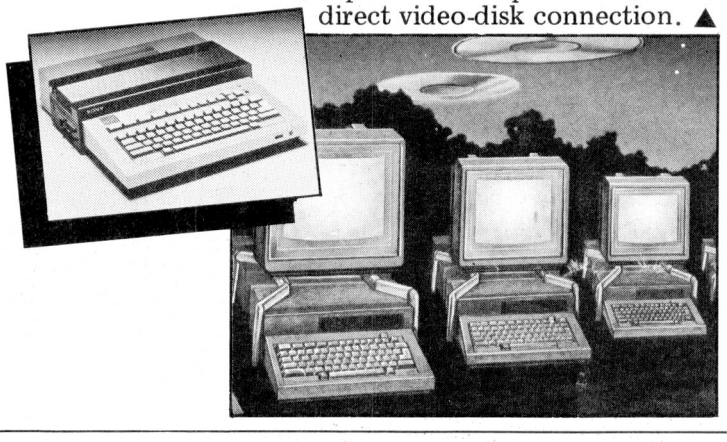
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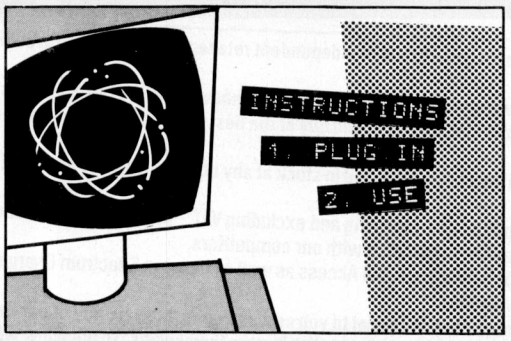
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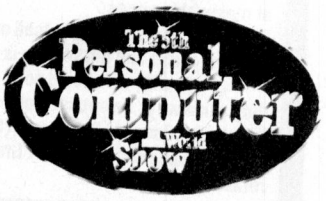
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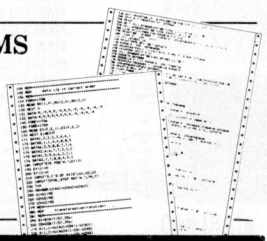
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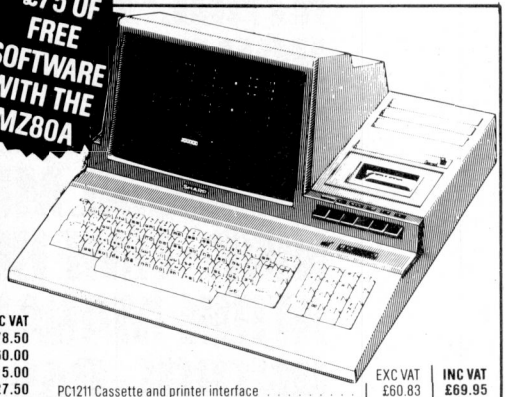
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New ZX81 Software from Sinclair.



A whole new range of software for the Sinclair ZX81 Personal Computer is now available – direct from Sinclair. Produced by ICL and Psion, these really excellent cassettes cover games, education, and business/household management.

Some of the more elaborate programs can only be run on a ZX81 augmented by the ZX 16K RAM pack. (The description of each cassette makes it clear what hardware is required.) The RAM pack provides 16-times more memory in one complete module, and simply plugs into the rear of a ZX81. And the price has just been dramatically reduced to only £29.95.

The Sinclair ZX Printer offer full alphanumerics and highly-sophisticated graphics. A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. So now you can print out your results for a permanent record. The ZX Printer plugs into the rear of your ZX81, and you can connect a RAM pack as well.

Games

Cassette G1: Super Programs 1 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Invasion from Jupiter. Skittles. Magic Square. Doodle. Kim. Liquid Capacity.
Description – Five games programs plus easy conversion between pints/gallons and litres.

Cassette G2: Super Programs 2 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Rings around Saturn. Secret Code. Mindboggling. Silhouette. Memory Test. Metric conversion.
Description – Five games plus easy conversion between inches/feet/yards and centimetres/metres.

Cassette G3: Super Programs 3 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Train Race. Challenge. Secret Message. Mind that Meteor. Character Doodle. Currency Conversion.
Description – Fives games plus currency conversion at will – for example, dollars to pounds.

Cassette G4: Super Programs 4 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Down Under. Submarines. Doodling with Graphics. The Invisible Invader. Reaction. Petrol.
Description – Five games plus easy conversion between miles per gallon and European fuel consumption figures.

Cassette G5: Super Programs 5 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £4.95.
Programs – Martian Knock Out. Graffiti. Find the Mate. Labyrinth. Drop a Brick. Continental.
Description – Five games plus easy conversion between English and continental dress sizes.

Cassette G6: Super Programs 6 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £4.95.
Programs – Galactic Invasion, Journey into Danger. Create. Nine Hole Golf. Solitaire. Daylight Robbery.
Description – Six games making full use of the ZX81's moving graphics capability.

Cassette G7: Super Programs 7 (ICL)
Hardware required – ZX81.
Price: – £4.95.
Programs – Racetrack. Chase. NIM. Tower of Hanoi. Docking the Spaceship. Golf.
Description – Six games including the fascinating Tower of Hanoi problem.

Cassette G8: Super Programs 8 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £4.95.
Programs – Star Trail (plus blank tape on side 2).
Description – Can you, as Captain Church of the UK spaceship Endeavour, rid the galaxy of the Klingon menace?

Cassette G9: Biorhythms (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – What are Biorhythms? Your Biohythms.
Description – When will you be at your peak (and trough) physically, emotionally, and intellectually?

Cassette G10: Backgammon (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £5.95.
Programs – Backgammon. Dice.
Description – A great program, using fast and efficient machine code, with graphics board, rolling dice, and doubling dice. The dice program can be used for any dice game.

Cassette G11: Chess (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Chess, Chess Clock.
Description – Fast, efficient machine code, a graphic display of the board and pieces, plus six levels of ability, combine to make this one of the best chess programs available. The Chess Clock program can be used at any time.

Cassette G12: Fantasy Games (Psion)
Hardware required – ZX81 (or ZX80 with 8K BASIC ROM) + 16K RAM.
Price – £4.75.
Programs – Perilous Swamp. Sorcerer's Island.
Description – Perilous Swamp: rescue a beautiful princess from the evil wizard. Sorcerer's Island: you're marooned. To escape, you'll probably need the help of the Grand Sorcerer.

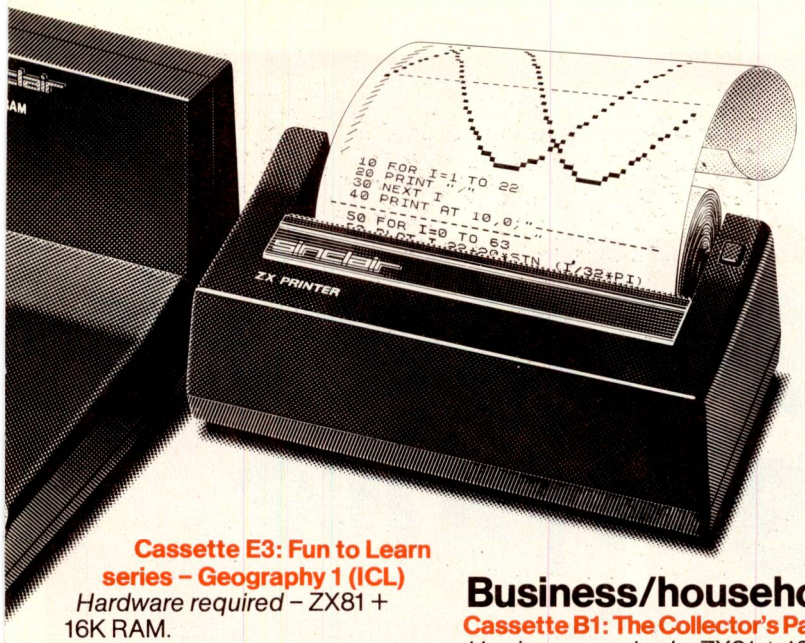
Cassette G13: Space Raiders and Bomber (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £3.95.
Programs – Space Raiders. Bomber.
Description – Space Raiders is the ZX81 version of the popular pub game. Bomber: destroy a city before you hit a sky-scraper.

Cassette G14: Flight Simulation (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £5.95.
Program – Flight Simulation (plus blank tape on side 2).
Description – Simulates a highly manoeuvrable light aircraft with full controls, instrumentation, a view through the cockpit window, and navigational aids. Happy landings!

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Cassette E1: Fun to Learn series – English Literature 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Novelists. Authors.
Description – Who wrote 'Robinson Crusoe'? Which novelist do you associate with Father Brown?

Cassette E2: Fun to Learn series – English Literature 2 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Poets, Playwrights. Modern Authors.
Description – Who wrote 'Song of the Shirt'? Which playwright also played cricket for England?



Cassette E3: Fun to Learn series – Geography 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Towns in England and Wales. Countries and Capitals of Europe.
Description – The computer shows you a map and a list of towns. You locate the towns correctly. Or the computer challenges you to name a pinpointed location.

Cassette E4: Fun to Learn series – History 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Events in British History. British Monarchs.
Description – From 1066 to 1981, find out when important events occurred. Recognise monarchs in an identity parade.

Cassette E5: Fun to Learn series – Mathematics 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Addition/Subtraction. Multiplication/Division.
Description – Questions and answers on basic mathematics at different levels of difficulty.

Cassette E6: Fun to Learn series – Music 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Composers. Musicians.
Description – Which instrument does James Galway play? Who composed 'Peter Grimes'?

Cassette E7: Fun to Learn series – Inventions 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Inventions before 1850. Inventions since 1850.
Description – Who invented television? What was the 'dangerous Lucifer'?

Cassette E8: Fun to Learn series – Spelling 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Series A1-A15. Series B1-B15.
Description – Listen to the word spoken on your tape recorder, then spell it out on your ZX81. 300 words in total suitable for 6-11 year olds.

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Cassette B1: The Collector's Pack (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £9.95.
Program – Collector's Pack, plus blank tape or side 2 for program/data storage.
Description – This comprehensive program should allow collectors (of stamps, coins etc.) to hold up to 400 records of up to 6 different items on one cassette. Keep your records up to date and sorted into order.

Cassette B2: The Club Record Controller (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £9.95.
Program – Club Record Controller plus blank tape on side 2 for program/data storage.
Description – Enables clubs to hold records of up to 100 members on one cassette. Allows for names, addresses, 'phone numbers plus five lots of additional information – eg type of membership.

Cassette B3: VU-CALC (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £7.95.
Program – VU-CALC.
Description – Turns your ZX81 into an immensely powerful analysis chart. VU-CALC constructs, generates and calculates large tables for applications such as financial analysis, budget sheets, and projections. Complete with full instructions.

Cassette B4: VU-FILE (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £7.95.
Programs – VU-FILE. Examples.
Description – A general-purpose information storage and retrieval program with emphasis on user-friendliness and visual display. Use it to catalogue your collection, maintain records or club memberships, keep track of your accounts, or as a telephone directory.

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	G2: Super Programs 2	31	£4.95	
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	G5: Super Programs 5	34	£4.95	
	G6: Super Programs 6	35	£4.95	
	G7: Super Programs 7	36	£4.95	
	G8: Super Programs 8	37	£4.95	
	G9: Biorhythms	38	£6.95	
	G10: Backgammon	39	£5.95	
	G11: Chess	40	£6.95	
	G12: Fantasy Games	41	£4.75	
	G13: Space Raiders & Bomber	42	£3.95	
	G14: Flight Simulation	43	£5.95	
	E1: English Literature 1	44	£6.95	

Qty	Cassette	Code	Item price	Total
	E2: English Literature 2	45	£6.95	
	E3: Geography 1	46	£6.95	
	E4: History 1	47	£6.95	
	E5: Mathematics 1	48	£6.95	
	E6: Music 1	49	£6.95	
	E7: Inventions 1	50	£6.95	
	E8: Spelling 1	51	£6.95	
	B1: Collector's Pack	52	£9.95	
	B2: Club Record Controller	53	£9.95	
	B3: VU-CALC	54	£7.95	
	B4: VU-FILE	55	£7.95	
	ZX 16K RAM pack	18	£29.95	
	ZX Printer	27	£59.95	
	Post & packing – *only* if ordering hardware		£2.95	

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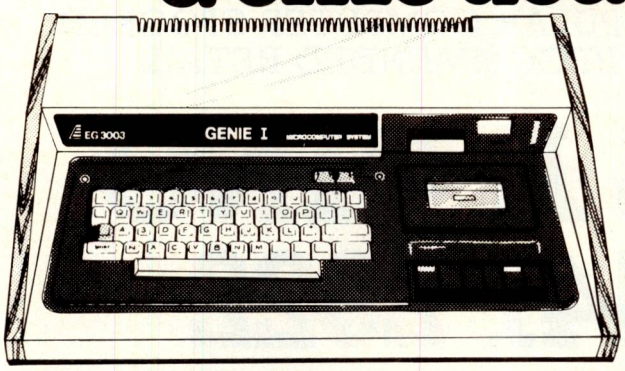
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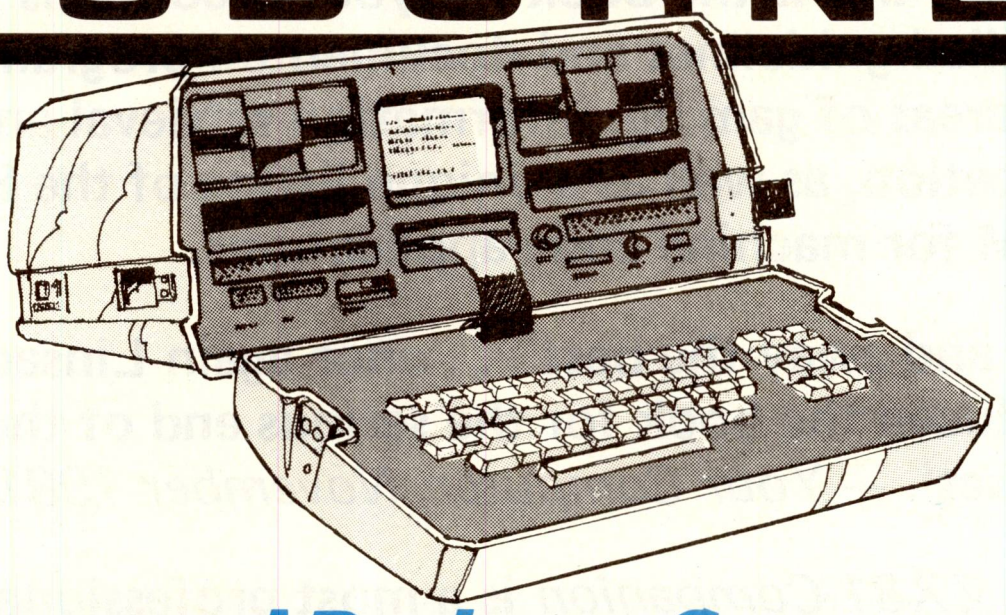
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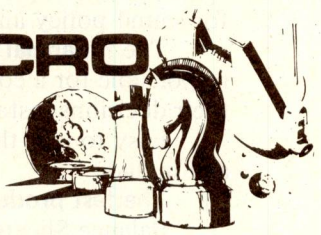
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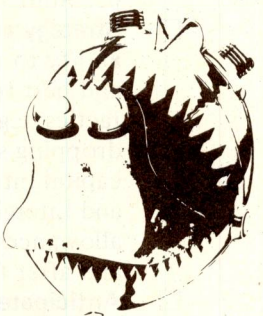
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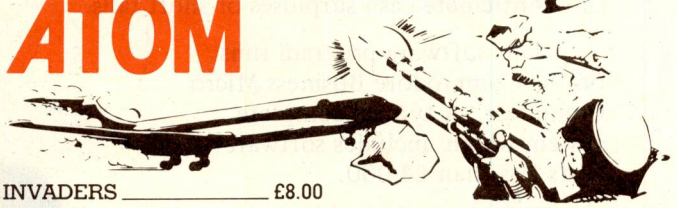
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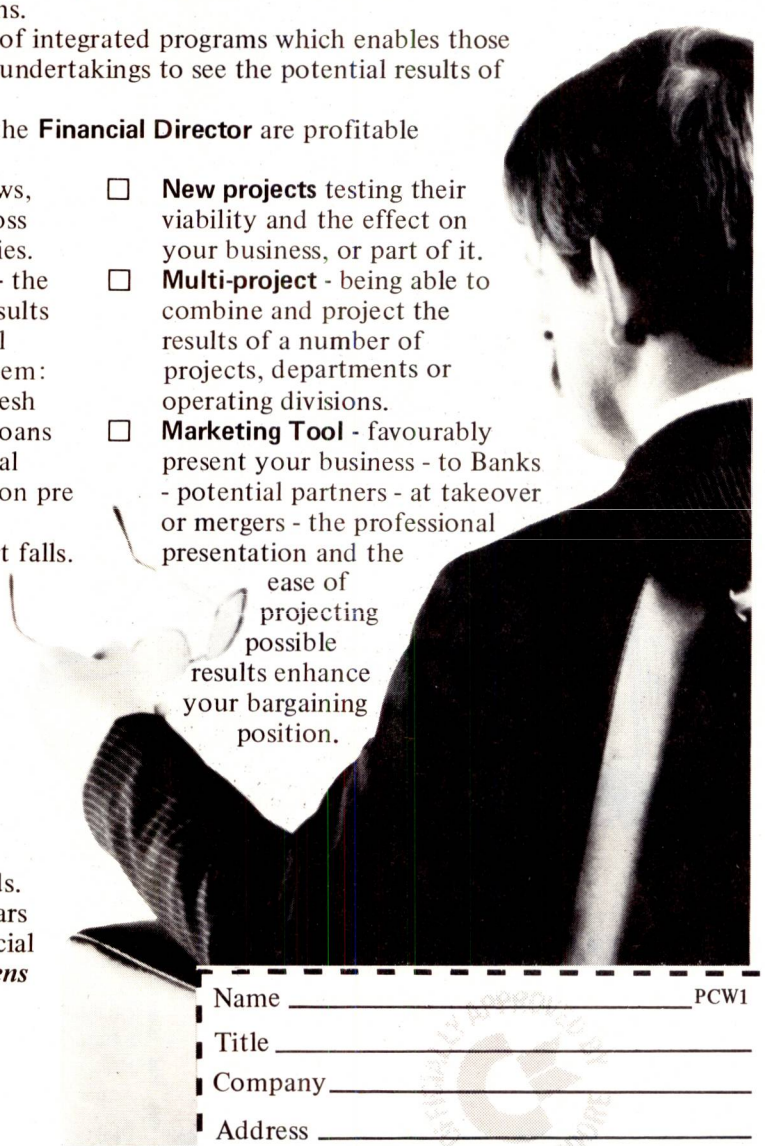
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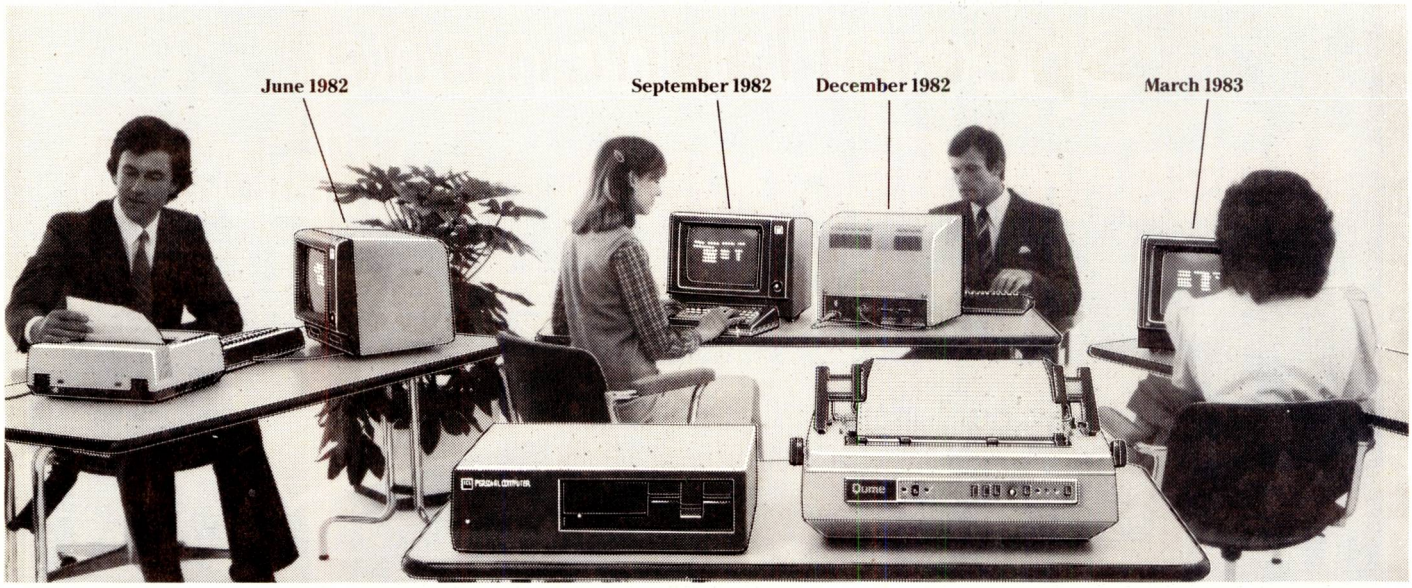
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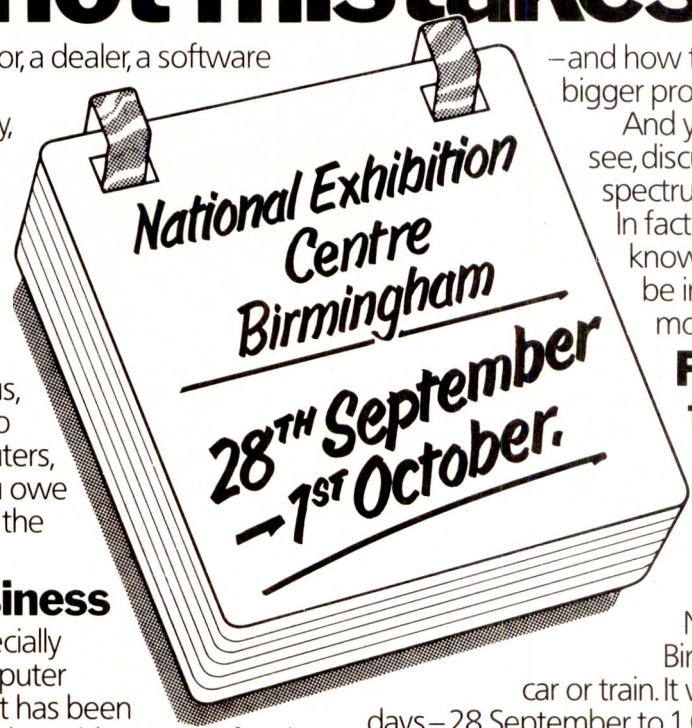
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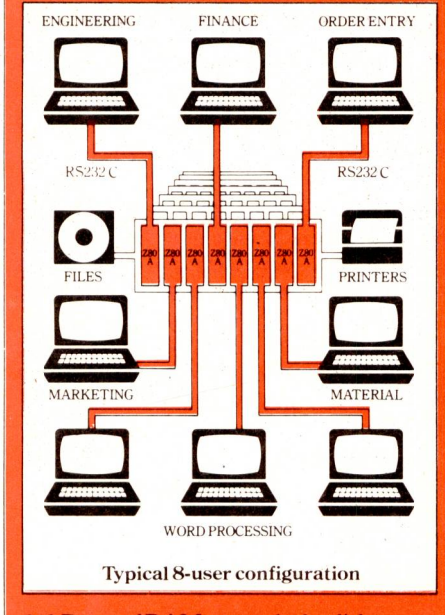
New multicomputer gives low entry price for multi-user system

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Central box contains tape, disk, MegaBUS and up to 32 application processors

THE M200 SERIES is a powerful microprocessor based system designed to support multiple CP/M users. It is a multiprocessor system: each user is allocated an application processor, comprising the Z80A microprocessor with 64 kBytes of RAM and two I/O ports. Each application processor is a 4 in x 9 in card. A Z80A based file processor, with its own



Typical 8-user configuration

64 kBytes of RAM, controls the disk management and manages other shared peripherals.

Application processors are linked to each other and to the file processor within the central box via a unique high-speed bus – the MegaBUS. Remote and local user terminals are connected to their respective application processors via twisted pair RS232 cable.

MegaBUS interprocessor link
Key to the M200's performance is the high speed MegaBUS interprocessor link. This leading-edge design supports communication between the independently operating application processors and the file processor at a speed of 1.25 MBytes/second. Additionally, the unique protocol of the MegaBUS allows application processors to communicate directly with each other without involving the file processor. The MegaBUS is a contention bus design, using a protocol known as Carrier Sense Multiple Access with Collision Detection (CSMA/CD).

n/STAR™ operating system
The n/STAR operating system provides a unique variety of features. CP/M compatibility allows existing CP/M based application programs to run in a multiple user environment. Additionally, concurrent file sharing is provided by implementation of the unique record-locking features of n/STAR. System password security, private and common user files, foreground/background processing capability and print spooling are among other features provided by n/STAR.

File Processor
The file processor contains a Z80A microprocessor, 64 kBytes of RAM with parity checking, and the floppy disk controller. The n/STAR operating system resides in the file processor, using approximately one half of its RAM capacity. The remainder of the RAM is used to provide a 32-kByte disk buffer pool, which greatly enhances the system throughput in multiple user applications. The file processor also provides a parallel port designed to support attachment of an additional peripheral such as a printer.

Configurations
The minimum configuration, one-off price £4250, consists of the file processor, a 10 MB 5¼ in Winchester disk drive, a 500 kB 8-in floppy disk drive, and the n/STAR operating system.

Upgrades to the system are very simple. All that is required is the insertion of an additional application processor into the unit. n/STAR automatically reconfigures itself to recognise the newest user. Every additional user, up to a total of 255, is implemented in the same manner.

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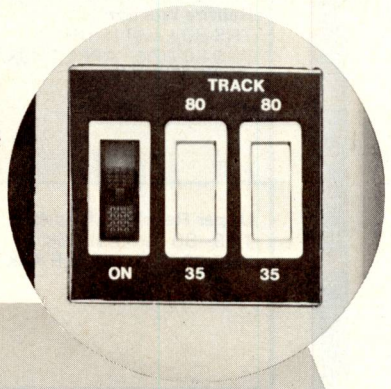
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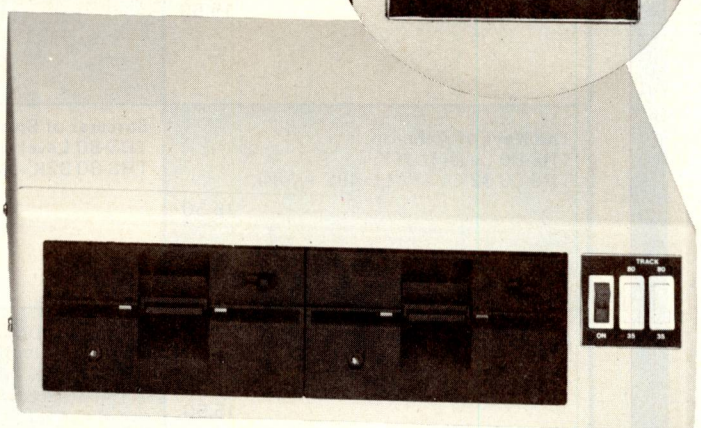
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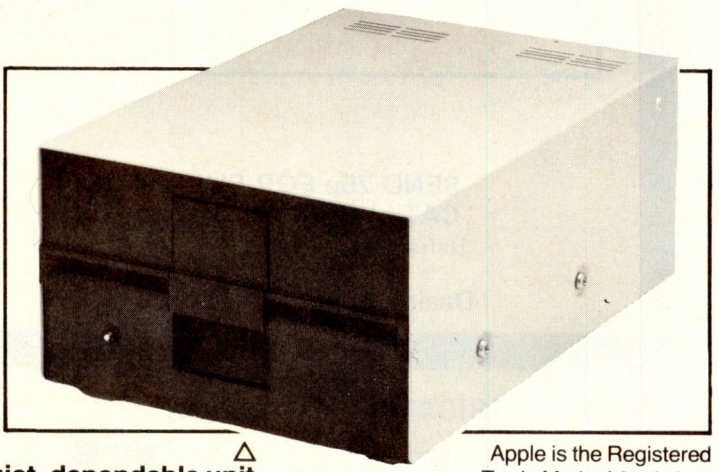
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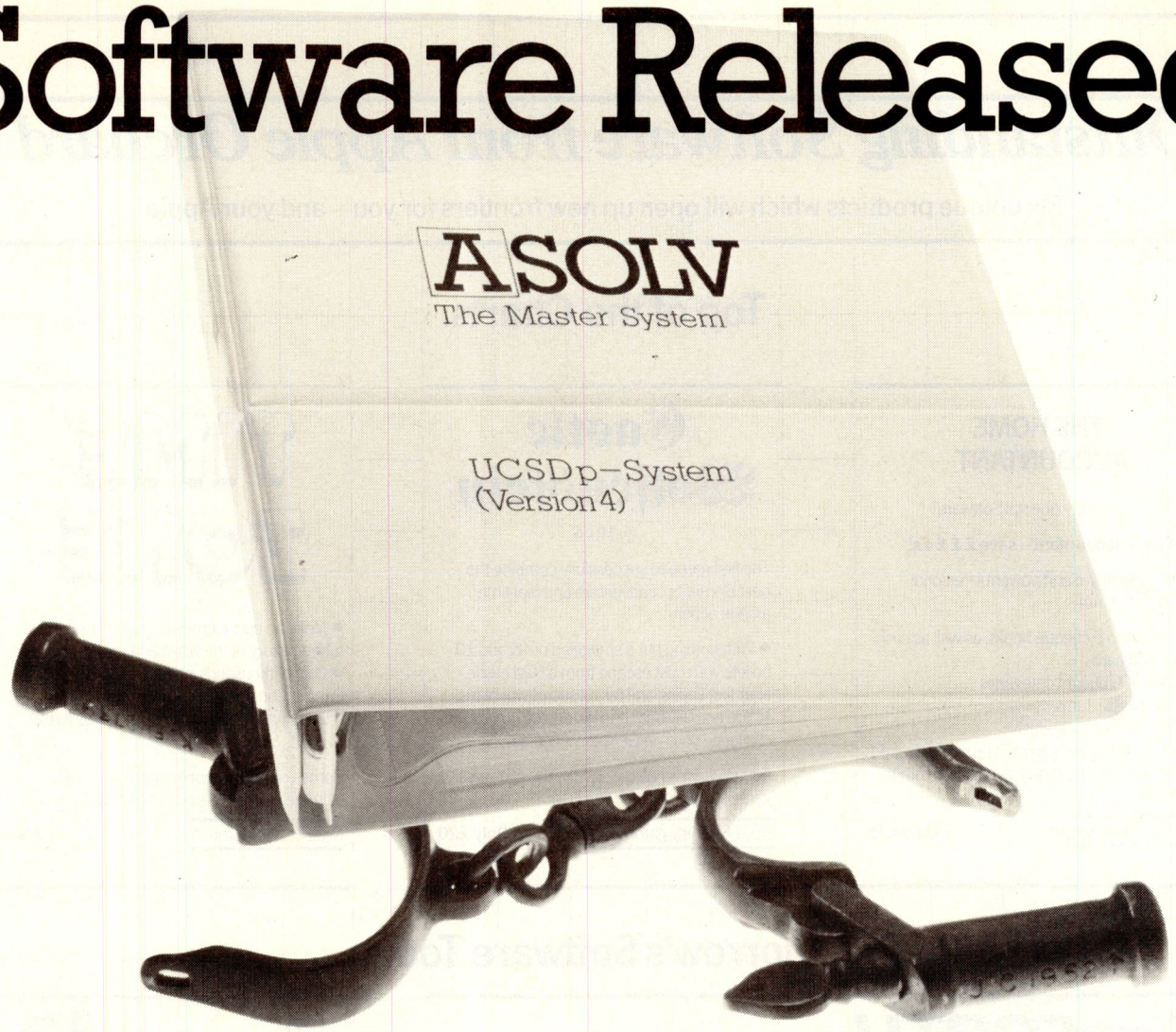
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The Hardware Barrier

Whatever microcomputer you own or use its capability has been limited by the availability of software as this is generally designed to run on a specific type of machine. And all too often that important software package has been unavailable on your machine. This restriction has necessitated the benefits of hardware being traded off against software availability with consequent loss in efficiency. Now there's the Master System.

The Key to Freedom – The Master System

The Master System removes the language barrier imposed by a machine giving you total freedom of choice in both software and hardware. So that you can select the software best suited to your needs to run on the machine you prefer. It also means that you can write a program in your choice of languages, confident that it can run on **any** microcomputer upgraded to the Master System **without change or amendment.** As a result software can be made more versatile and with a far broader application.

The Master System – Powerful and Comprehensive

The Master System – the UCSD p-System (Version 4) software is the operating system of the future. It comprises a powerful suite of languages including Pascal, Basic, Modula 2 and Fortran and corresponding compilers. Cobol will be available shortly.

Choose your Language

Different computer languages offer different benefits to the user. Such is the Master System's versatility that even a program having modules written in different languages can be run and executed. This allows you to capitalise on the advantages of particular languages avoiding their weaknesses.

An Investment for the Future

With advances in microcomputer technology happening so fast, your major concern is whether your investment in today's technology will be protected in the future. The Master System is designed to give your needs that protection. Software and Hardware houses such as IBM, Apple and ACT Sirius 1 have already adopted the Master System and it is gaining rapid worldwide acceptance. More than 30,000 users have chosen it. Increasingly the Master System will enable you to take advantage of the latest software releases. As your computing needs grow you may outgrow the capacity of your microcomputer, the Master system ensures that your investment in software programs and important data is protected without restricting your future hardware options.

Complete Documentation

The Master System is currently available as a software package comprising a diskette and comprehensive documentation. The Master System is also being built to accommodate Winchester based systems.

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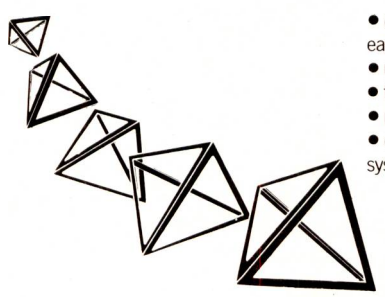
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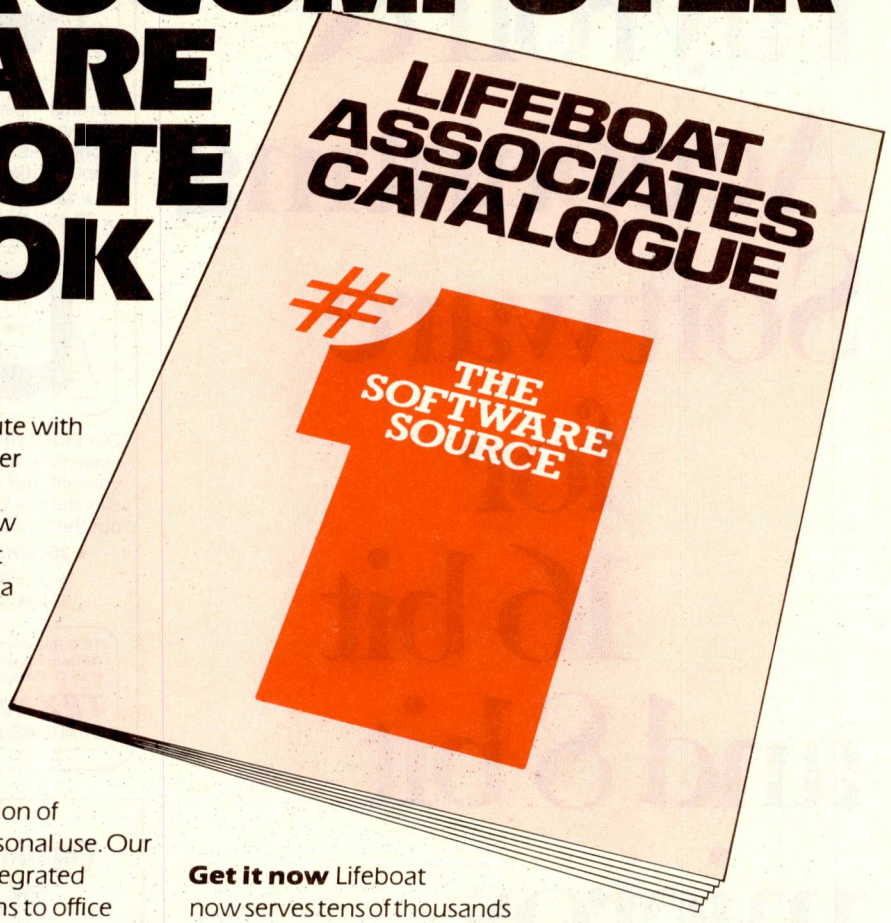
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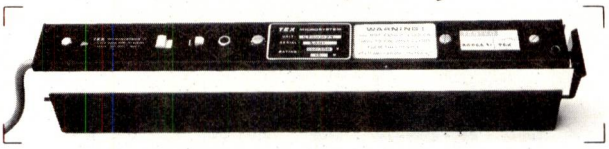
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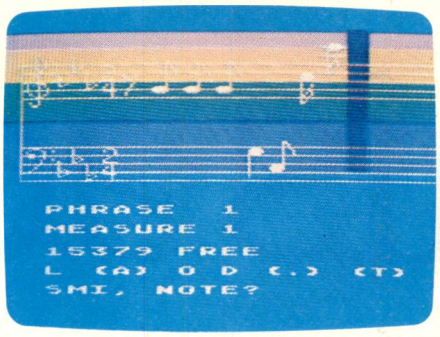
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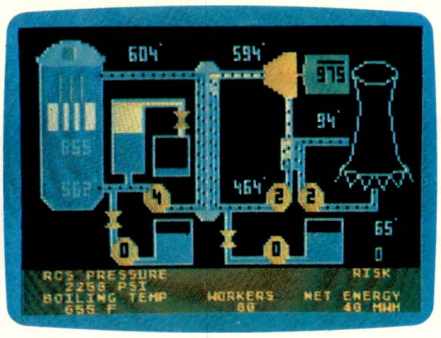
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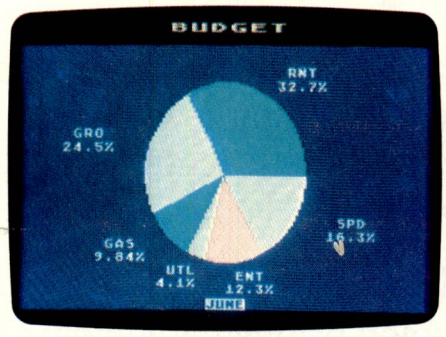
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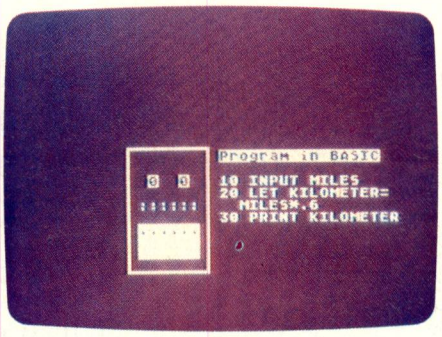
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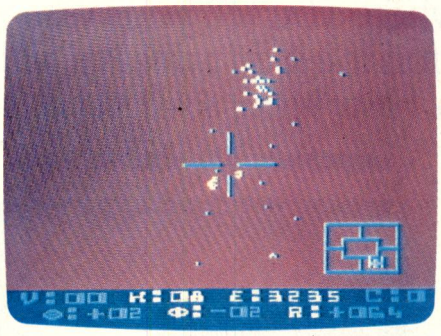
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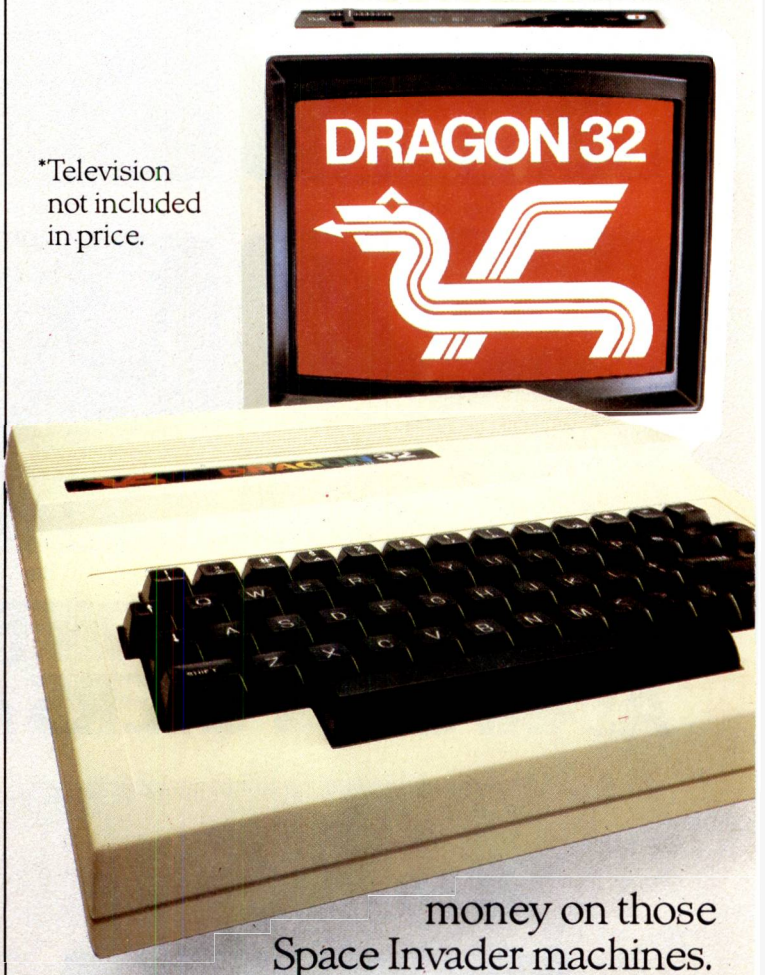
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with 5 octaves of music. How it will engross your children in mind-boggling adventures in dungeons and caves without even getting their knees dirty. And the Dragon works with any U.H.F. TV.

THEY'LL LEARN AS THEY PLAY.

And then you can casually point out that although the kids are having fun, they're also learning. And within a very short space of time, the whole family will be completely at home with programming - with computer language - with every aspect of how computers work. Which can't do their future prospects any harm at all.

BRILLIANTLY SIMPLE INSTRUCTION MANUAL.

The Dragon is made in Britain, designed with the help of British Universities. And it's also worth remembering that the Dragon's instruction manual is clearer and easier to understand than any other home computers.

That its top-quality keyboard is as easy to use as a typewriter, and so well made it's guaranteed for twenty million depressions.

TAKE THE FAMILY DOWN THE HIGH STREET.

And if she still wants to know more, take her to see the Dragon 32. It'll soon be available in most good stores - or you can send the coupon for further details.

And if you're one of our many lady readers, please accept our apologies.

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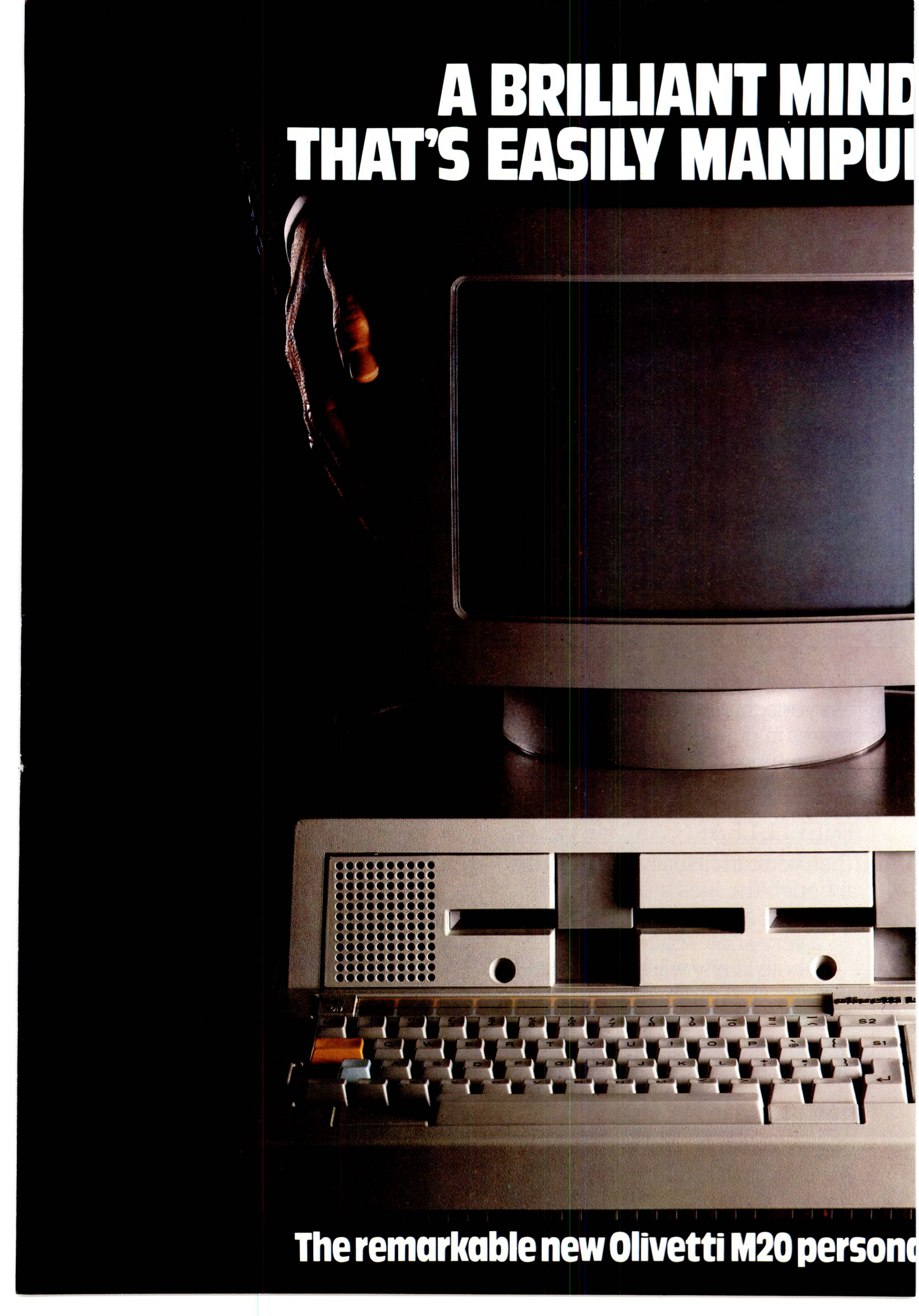
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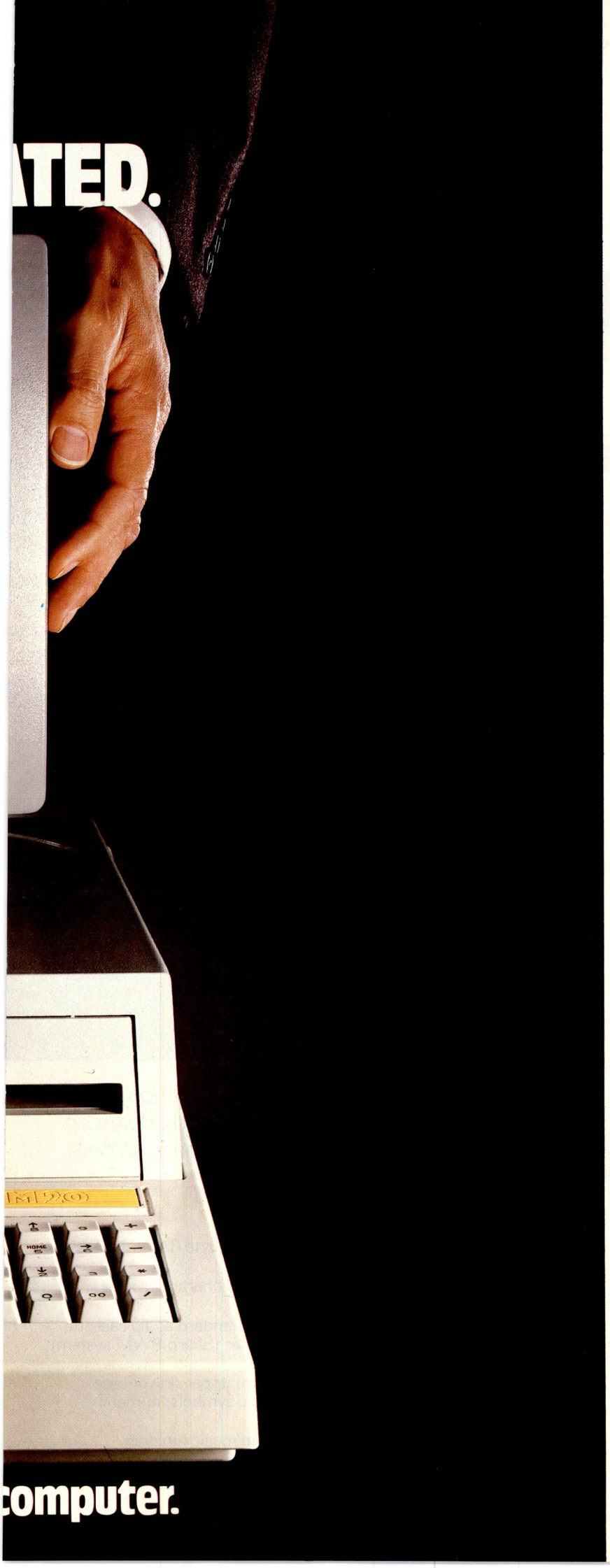
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In fact, the advanced PCOS operating system combined with its programming language make the M20 easier to use than a typewriter.

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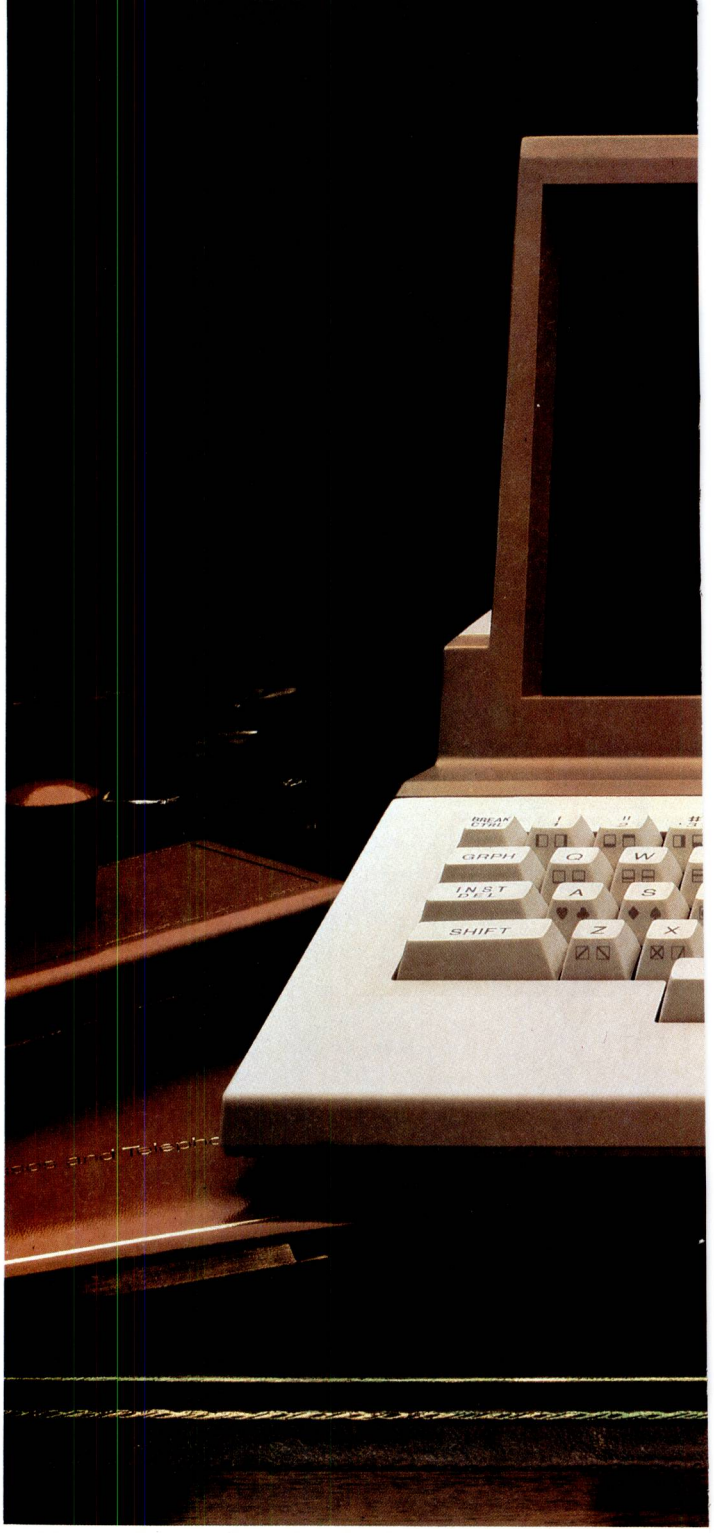


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Specifications MZ 80A

CPU	Z 80
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Display	9 inch (23 cm); 40 characters x 25 lines. Green screen.
Cassette	Manual control; standard audio cassette tape. Data transfer (Sharp PWM system): 1,200 bits/sec.
Keyboard	ASC11 keyboard; upper-/lower-case alphabet; graphic symbols; numeric keypad.
Other features	Built-in clock and music function. Auto repeat on all keys. 2-page video RAM (allows the screen to be scrolled up and down). *CP/M available.



Printer specifications	Optional Printers MZ 80P4	MZ 80P5	MZ 80P6
Printing method	Serial impact dot matrix		
Feed method	Variable sprocket; Friction	Variable sprocket	Variable sprocket; Friction
Kinds of characters	230		
Character make-up	9(W) x 8(H) dot matrix (normal-size characters)		
Number of digits	136/68 per line 160/80 per line	80/40 per line 136/68 per line	
Printing speed	150 cps (normal-size characters)	80 cps (normal-size characters)	
Head sweep direction	Bi-directional		
Other functions	• Software-controlled full graphic function • Programmable number of lines per page • Battery-operated memory of HOME position (MZ 80P4 only) .		

Design and specifications subject to change without notice.

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Because Sirius users have both the latest microcomputer technology and the powerful 16-bit software that takes full advantage of it.

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UP TO 896 KBYTES RAM

128 Kbytes of RAM memory as standard easily upgraded to a massive 896 Kbytes ensures plenty of capacity for fully fledged business software and associated record files.

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As a result, the Sirius is suitable from the start for large record processing applications. And with 5 and 10 Mbyte Winchester disk drives scheduled for early introduction, the Sirius can easily match your own organisation's growth.

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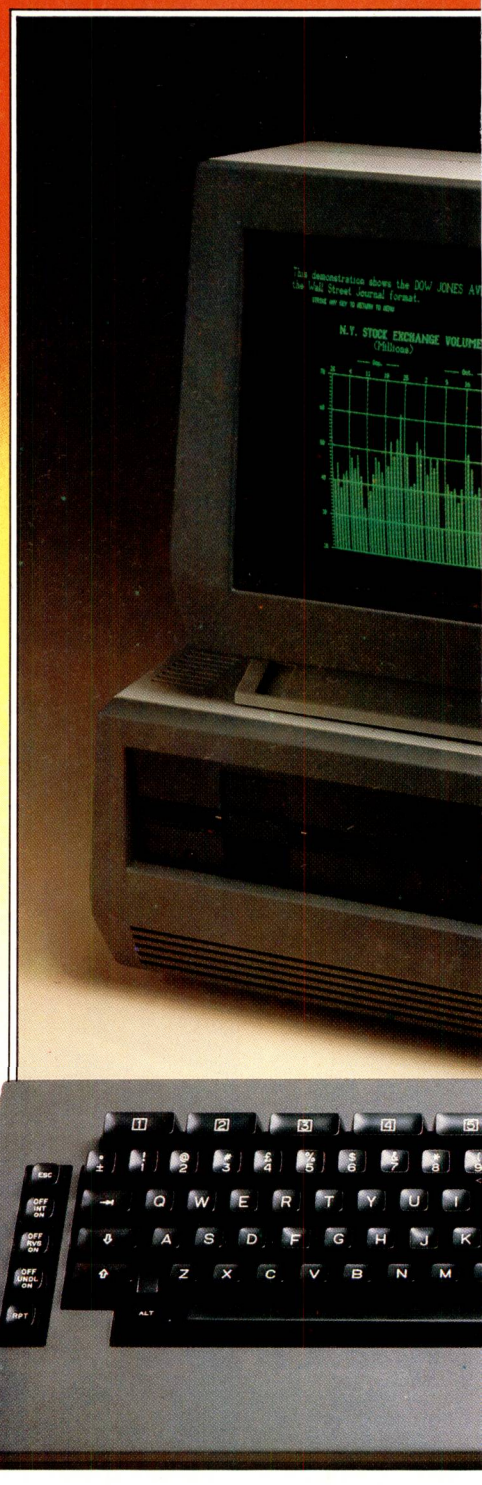
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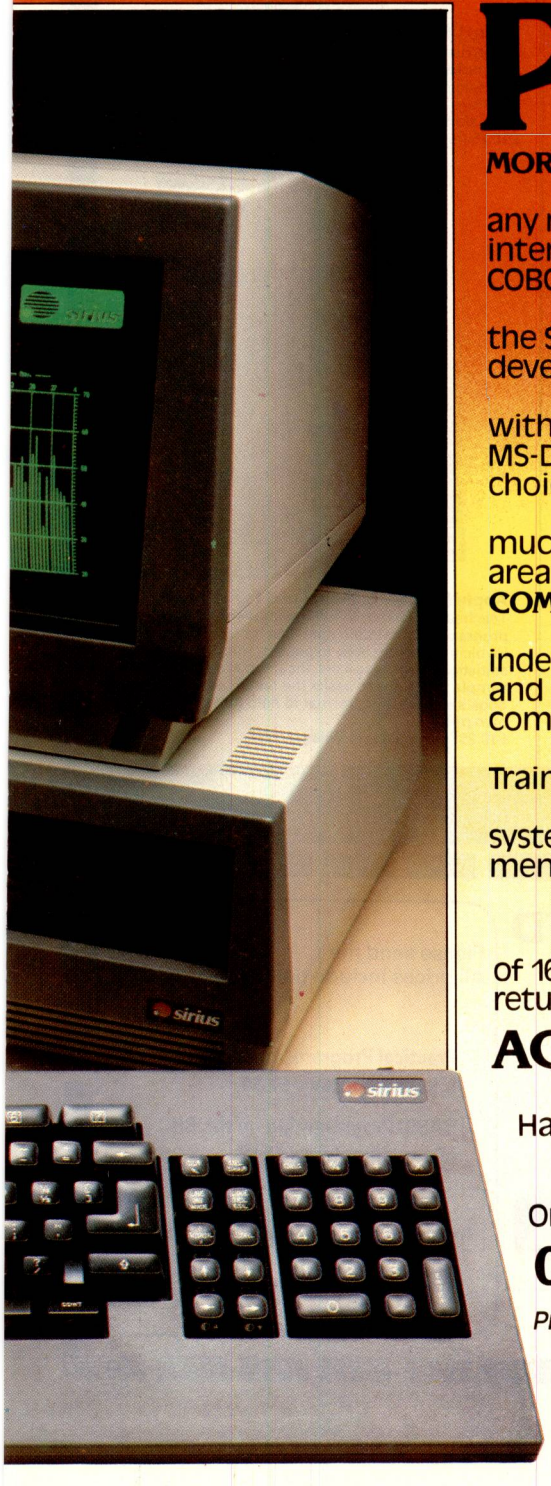
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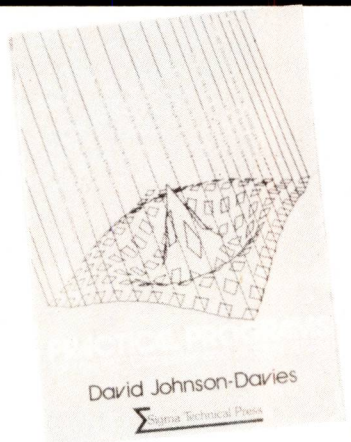
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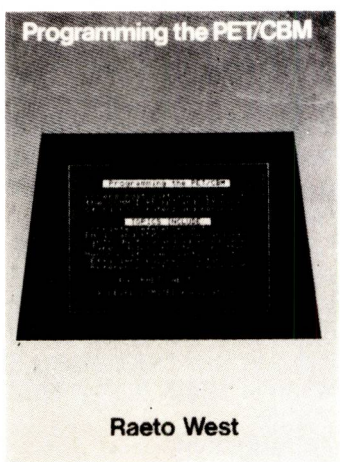
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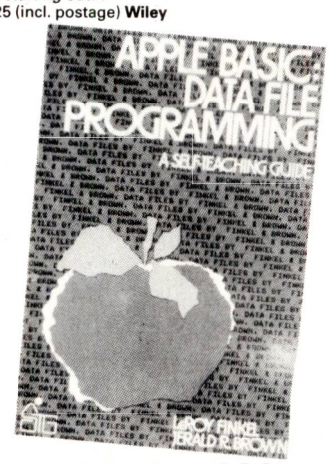
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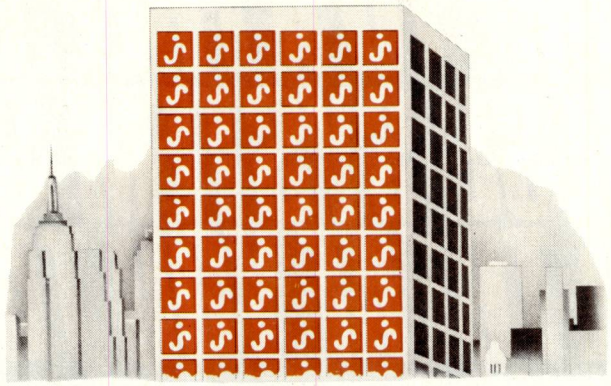
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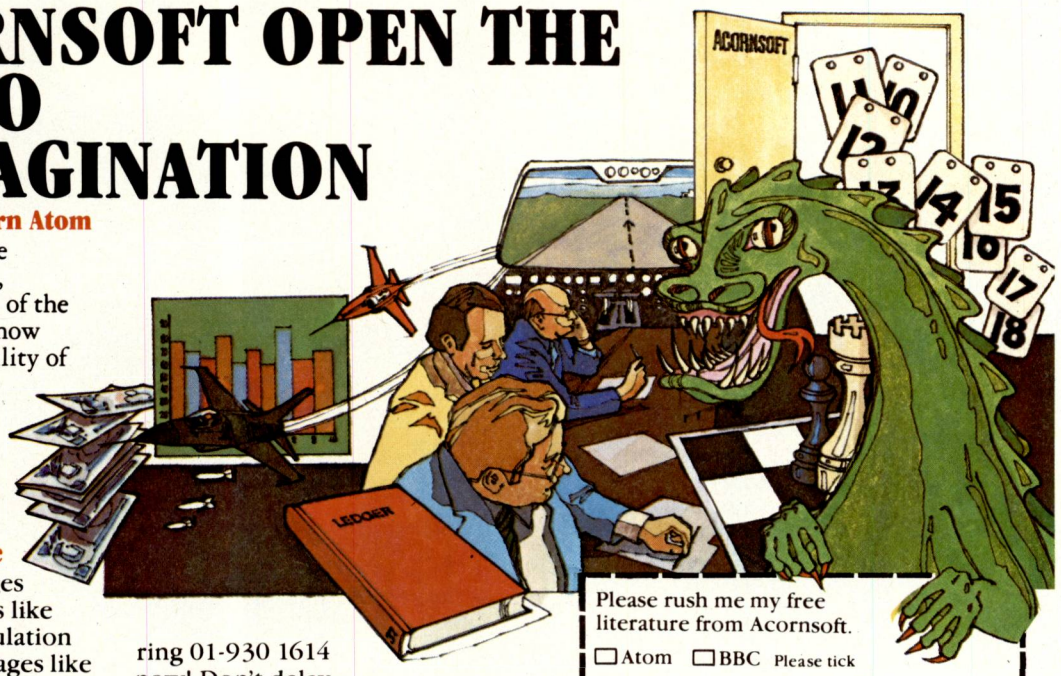
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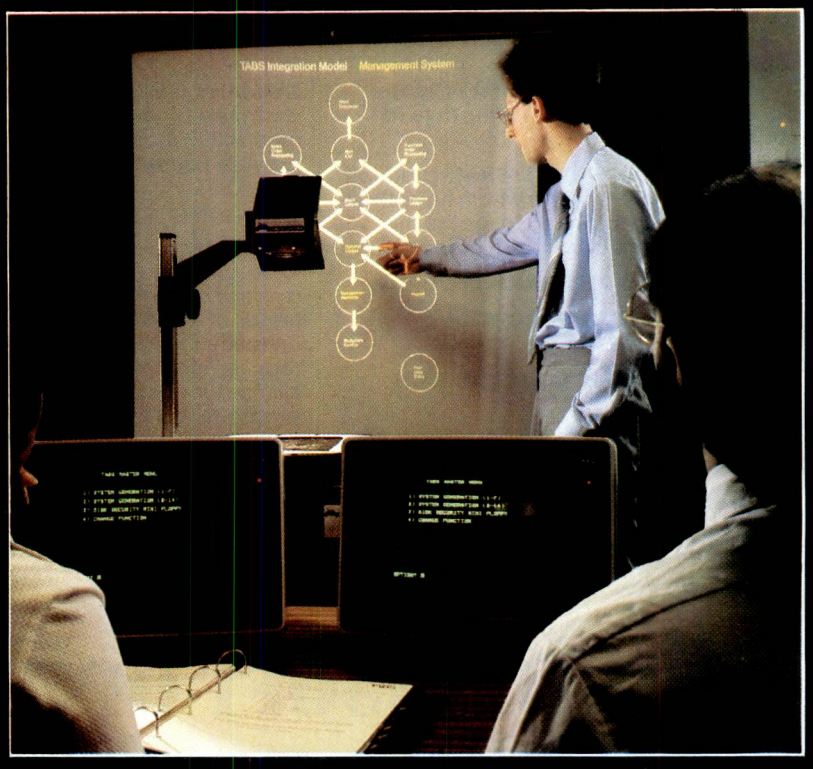
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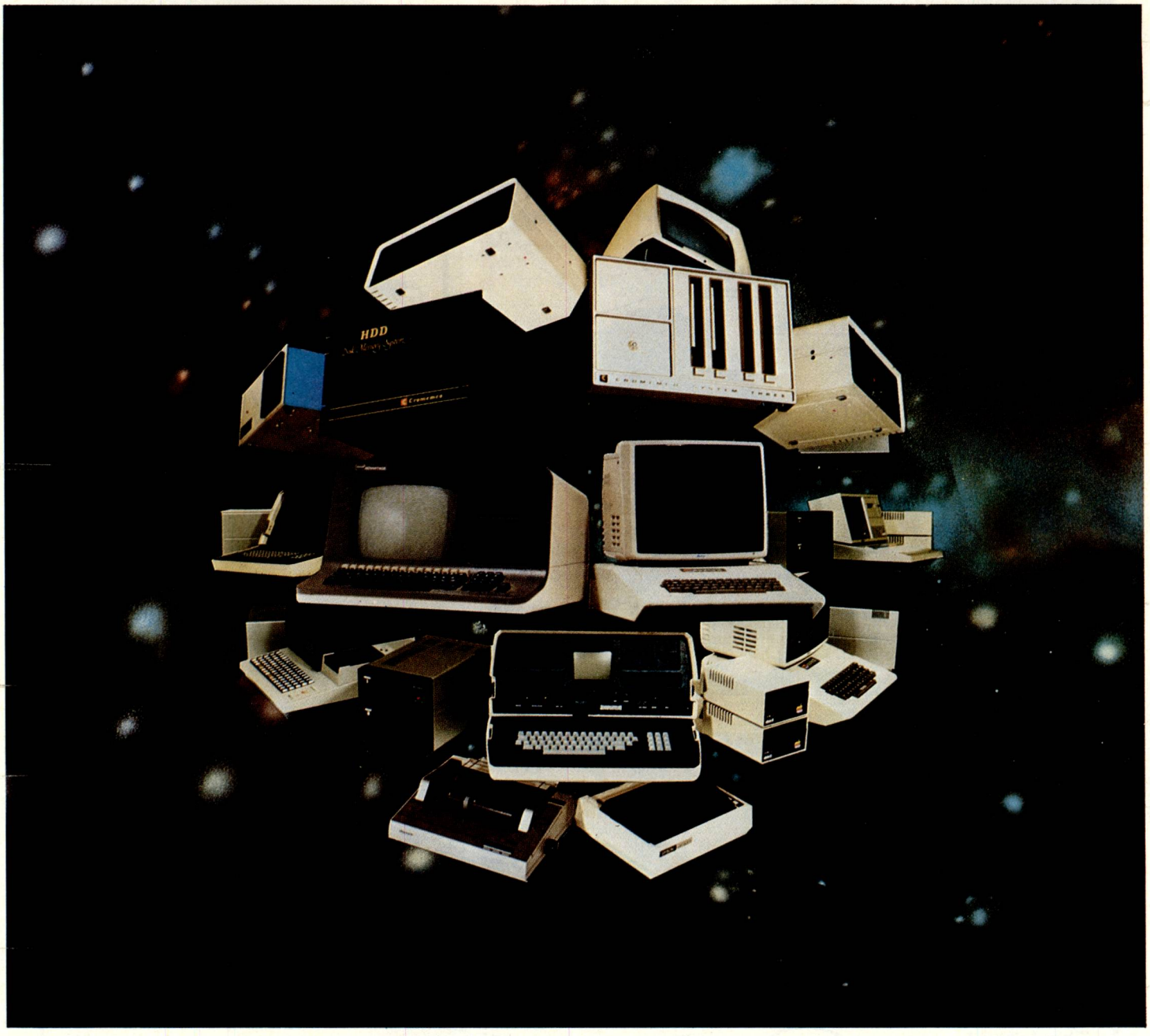
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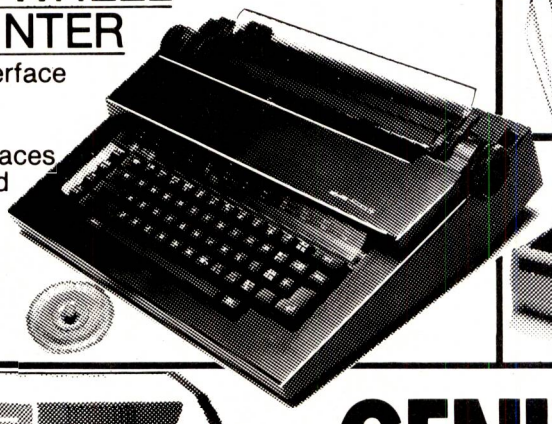
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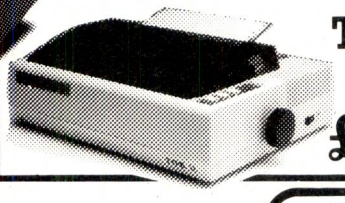


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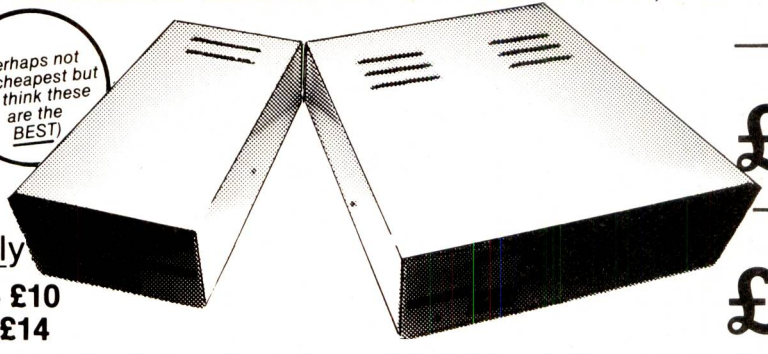
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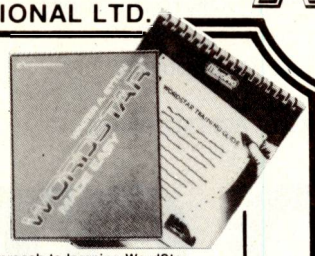
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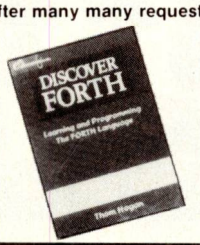
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We've also given you the choice of 256, 320, 512 and 640 x 250 screen resolution, whereas most only offer a maximum of 256 x 192.

Big enough for your business.

Although NewBrain is as easy as ABC to use (and child's-play to learn to use) this doesn't mean it's a toy.

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It comes with ENHANCED ANSI BASIC, which should give you plenty to get your teeth into.

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Although NewBrain, with its optional onboard display, is a truly portable micro, that doesn't stop it becoming the basis of a very powerful system.

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As we said, this isn't a toy.

It doesn't stop here.

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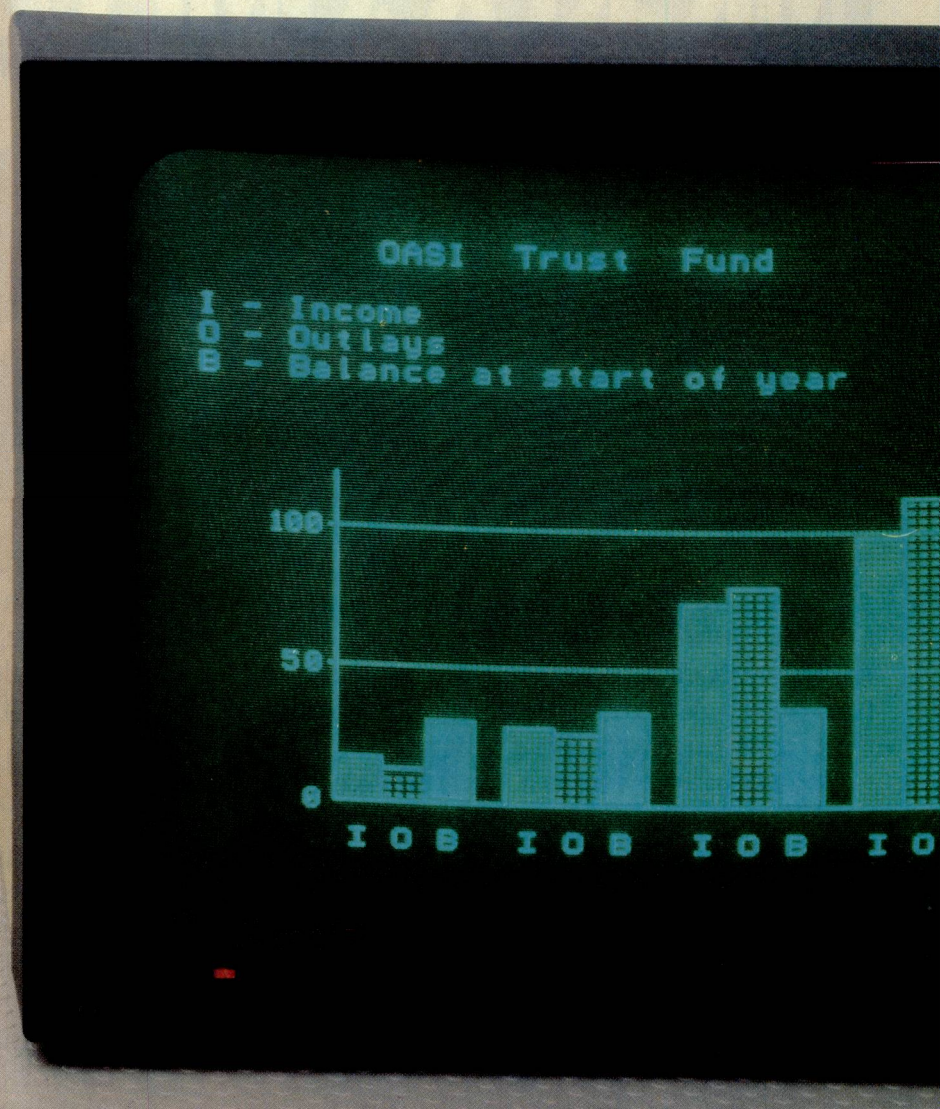
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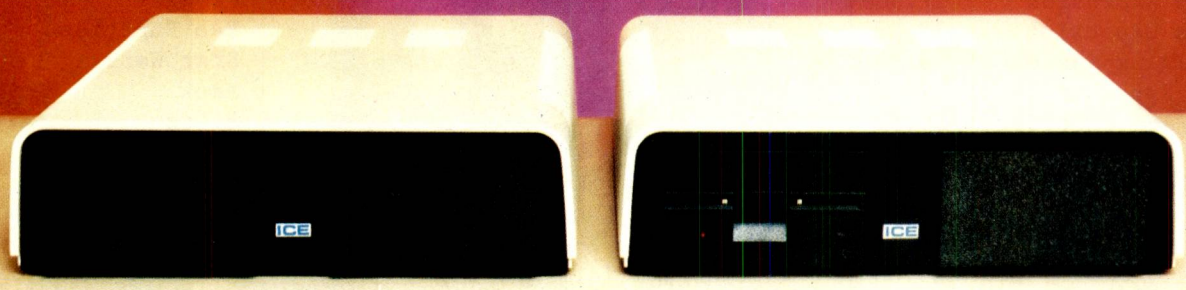
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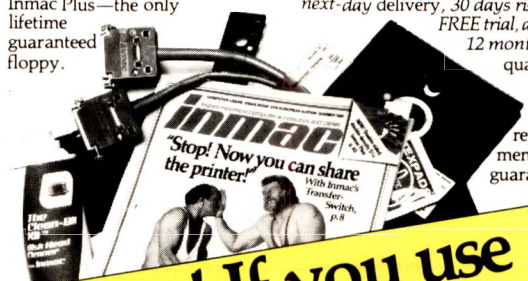
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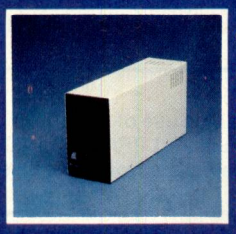
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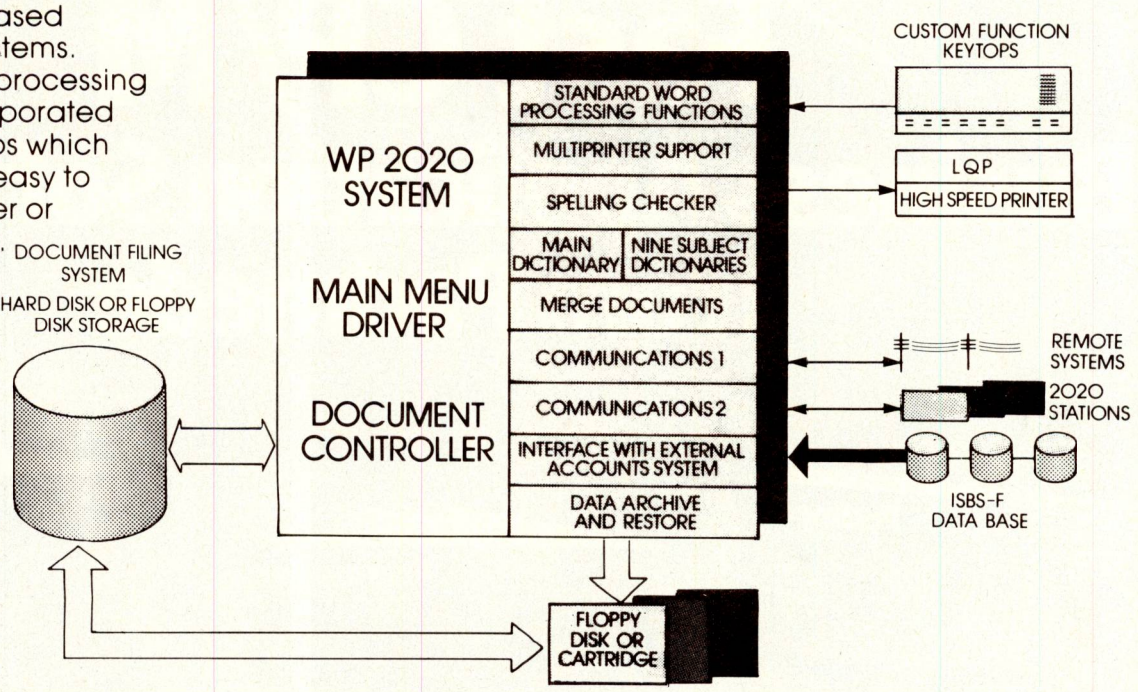
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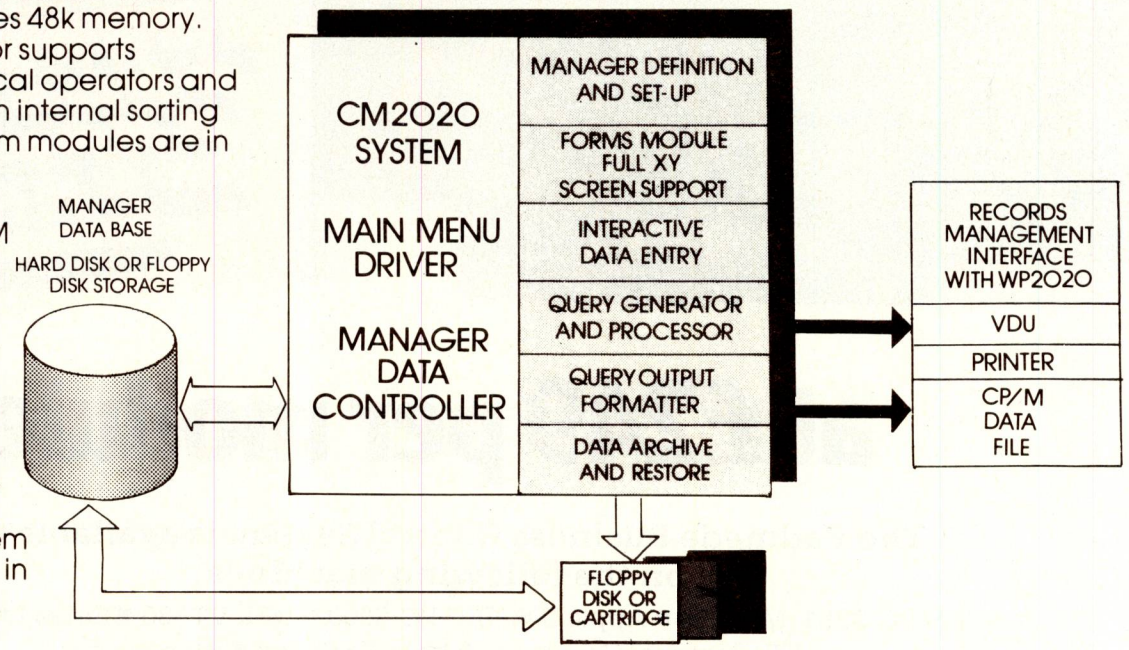
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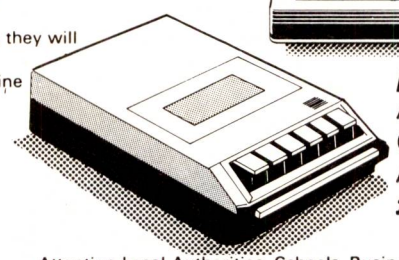
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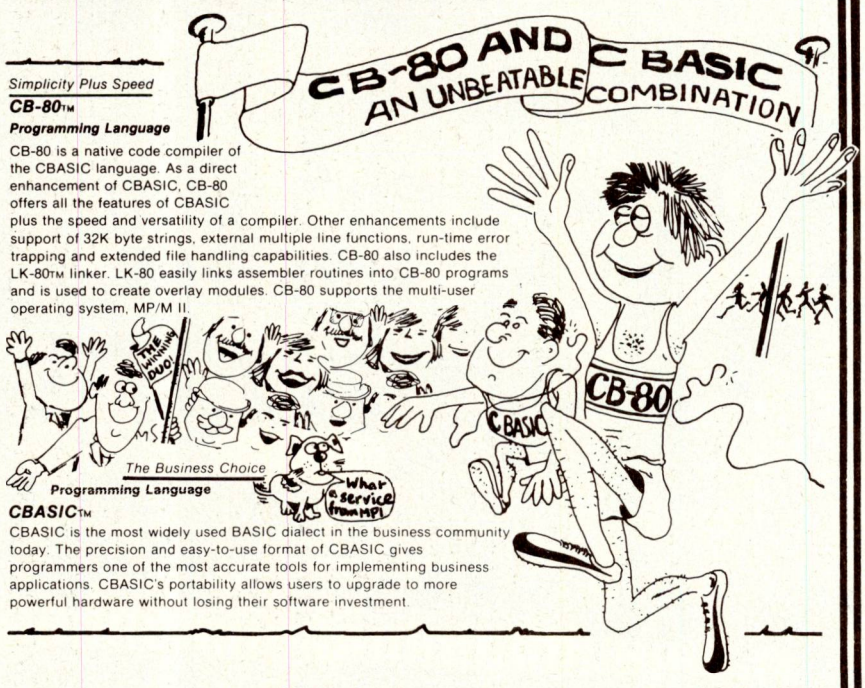
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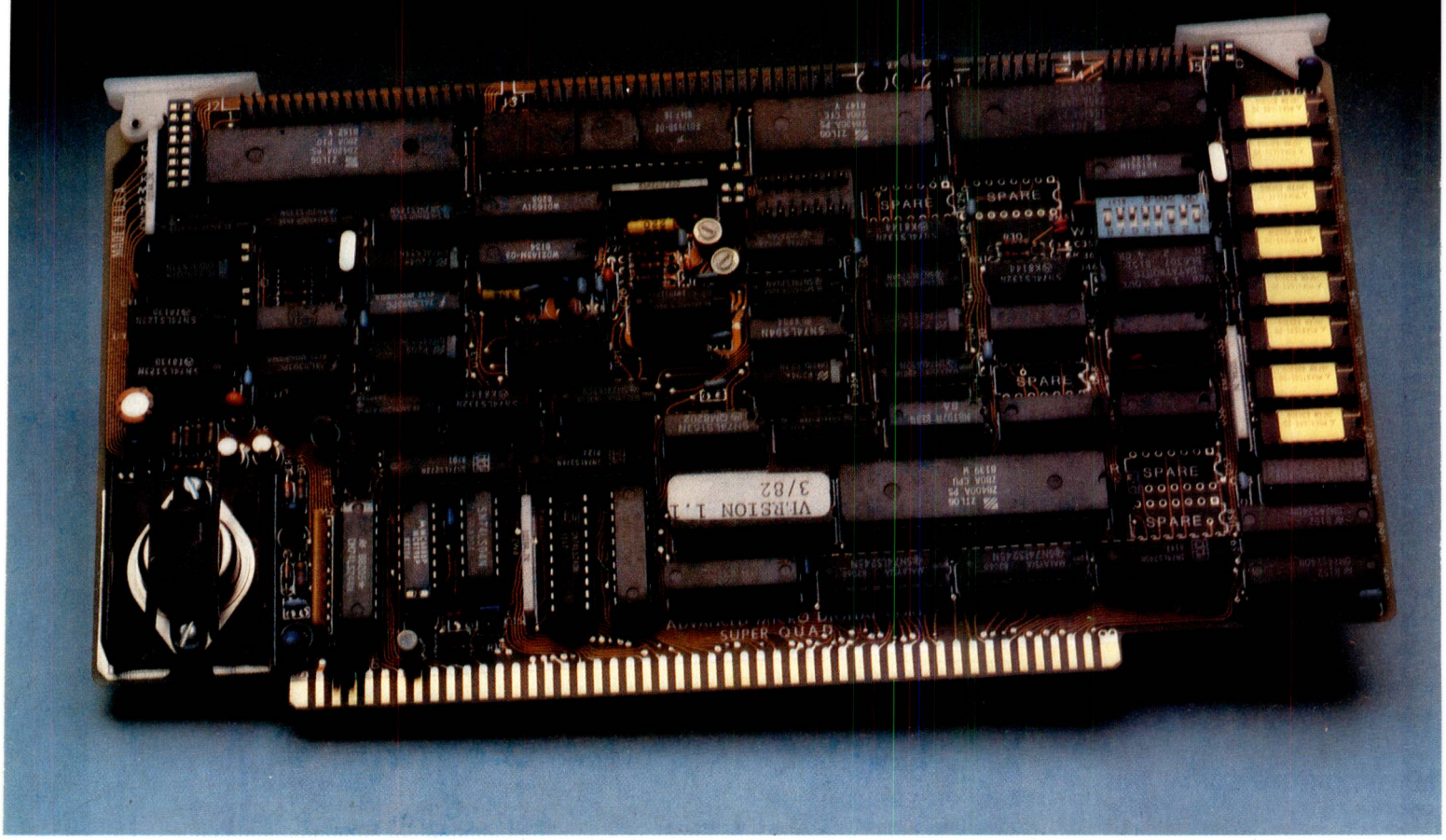
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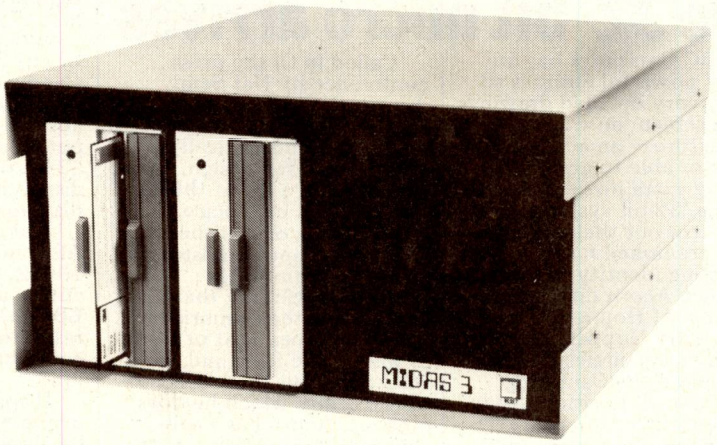
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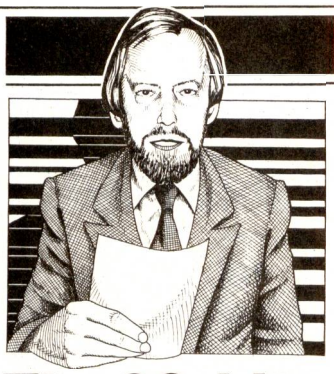
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Guy Kewney delivers his monthly package of micronews.

The 32-bit micro arrives

The BBC Computer has unusually powerful abilities to display very detailed drawings on the screen; now it has a new feature — an add-on processor able to give it amazing extra power, turning it into a '32-bit system'.

It turns out that the two things are linked by the interesting identity of an unknown Acorn director by the name of Hopper.

Dr Andy Hopper is famous in computing circles because he invented the Cambridge Ring from his position inside the Cambridge University computing laboratory, and because his laboratory also helped design the special logic chips that have caused all the trouble inside the BBC microcomputer.

It now turns out that, for the last two years, Hopper has also been a director of Acorn, the company which builds the BBC microcomputer. It wasn't a secret — just nobody knew.

That is, nobody knew until Acorn announced its choice of a 32-bit add-on for the BBC Computer and revealed that the chip chosen was not the expected Motorola 68000, which has some 32-bit characteristics, but the National Semiconductor 16032, which has most of the necessary attributes to be called 32-bit. National Semiconductor officially 'announced' the 16032 chip recently and held a grand London press conference in order to give details.

Called in to the press conference by Nat Semi, Acorn produced as its spokesman Dr Hopper, who went on to speak enthusiastically of computer-aided design. All of a sudden, a lot of things began to fall into place.

Hopper is one of the brighter computer aristocrats inside the Cambridge charmed circle (no, that's not the same as the Cambridge Ring) and does a lot of things as well as the Ring and the BBC chips but those are two of the things which he does most of. Acorn has a subsidiary, Orbis, which was set up to make and market Ring-based systems, and this activity is suddenly explained.

But more significantly, consider the work on the BBC chip. It was built by Ferranti, using the same basic 'uncommitted' logic design that Sinclair used in his ZX81 and later in his Spectrum machines, but with different logic inside it.

At the time, Acorn boasted that the design for the Ferranti circuits had been done in Cambridge, not in Ferranti's own design centres, and had been a lot quicker than would have been possible if designs had been going to and fro between Ferranti and Acorn.

The reason it went quickly, it was said, was not that the job had been botched (that was a miscalculation at the silicon level about how fast signals would propagate across the circuit) but because Cambridge's computing laboratory could actually run programs that would simulate the function of any Ferranti chip which Cambridge could design. This software needs a powerful, normally expensive computer capable of handling 32-bit data items, and of displaying complex circuit diagrams in accurate detail.

Not any more, it doesn't. All it needs is the Nat Semi 16032, plugged onto the end of a Tube chip inside the BBC micro with its ultra high resolution display . . . why, it could have been made for the job!

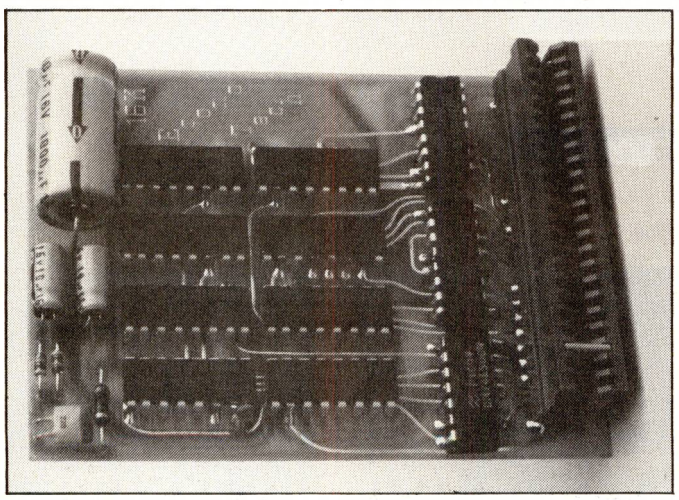
Hopper is already happily occupied in transferring all his design and simulation software onto the BBC micro plus 16032 'Gluon'. Apparently it is very easy to do, which must prove something about the Tube concept.

At the launch, a company called Translation Systems announced a computer called the Plum, based on the new chip, which equally illustrates something of its power. The Plum was introduced as an 'add-on for the Q-bus', and the Q-bus is a rather ordinary method of connecting the smaller computers made by Digital Equipment Corporation to other devices (memory, peripherals and so on).

According to TSI, the add-on will upgrade these low-power minicomputers, the bottom of Digital Equipment's power range, to the point where they outperform the largest machine made by Digital, the VAX 11-750. The upgrade costs $2000.

Did you ever read *Soul of a New Machine*? Tracey Kidder got a Pullitzer prize for it and it dealt with the human drama and conflict involved in the rush of a company called Data General to catch up with Digital Equipment and the VAX by designing and launching a 32-bit minicomputer.

I wonder if it has dawned on either DEC or Data General (or Hewlett Packard) to wonder if the effort was in any way justifiable, with chips like this one coming up. I doubt it — I'll be surprised if they know what's hit them.



Even cheaper than Clive Sinclair's new cut-price 16 kbyte add-on memory for the old faithful ZX81, EconoTech's add-on module costs £19.95 including VAT. It allows you to use the printer, too, just like the official memory. Details on 01-764 8671.

Disk matching

Osborne's UK boss, Mike Healey, predicts that very few people will pay £1250 for their Osborne micros, because 'most sensible users will want to spend the extra needed for having 200 kbyte capacity disk drives.'

In his wake, comes Systems of Tomorrow, a company specialising in adding disks to other people's hardware, which thinks that quite a few people will want to spend £900 extra and get 800 kbyte drives.

Like Osborne, Soft thinks that there is a real need for disk machinery that can understand not only its own disks but those produced by other types of computer.

And Soft also thinks that there is a good market for people with £1300 who want a six megabyte hard disk. Like the big-capacity Osborne disks, Soft's 800 kbyte drive design can read several other disk formats, including Xerox, Superbrain (soon) and Osborne single density disks. Paul Toman at Soft considers that soon this clever trick won't be so unusual that it warrants note. Modern chips used for disk control (particularly the Western Digital 1790 series) make this sort of feature much more manageable.

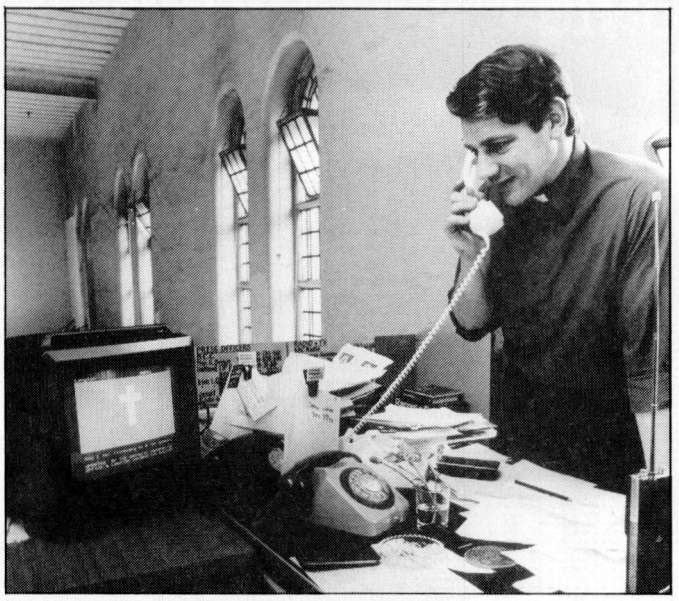
Toland also offers 'full conversion services to allow user software to be transferred' - from other formats to Osborne format, that is. He will take a program disk designed to run on a Superbrain, for instance, and produce one designed to run on the Osborne. Full details on (0494) 786989.

Getting approval

People inside British Telecom would be more (or less) than human if they did not resent the fashion for offering other people the chance to make money by transmitting electronic messages, and they do.

Nonetheless, the process of opening up Telecom to telecompetition (hee, hee) proceeds and John Butcher, Parliament's closest approach to an intelligent MP, has announced from his desk in the Department of Industry, where he's a junior Minister, that a great deal of apparatus which can be connected direct to a phone line, and also direct to a computer can now be 'approved' early.

Full standards for approval should by now be published, showing what needs to be tested and what tests it should be expected to pass before BT will allow it to fasten itself to BT copper wire. It may seem strange, but this information was hard



It would be horrible to think that Pope John Paul II came all the way to the UK without getting involved in micros. Just to prove that he did, here's a picture of a Catholic priest who put the Pope's tour plans on Prestel. Ok, Prestel isn't micros, but it's close . . . and getting closer all the time.

to come by previously.

Now, the information is available direct from the Department of Industry and people wishing to sell extension telephones, automatic call-makers, or any apparatus with a modem in it, should get in touch.

Facsimile machines and Prestel equipment don't need to be approved under this scheme.

It should all speed up the arrival of cheap modems, which is why I'm interested and so will you be, one day.

Conc CP/M

Easily the most annoying feature of most programs written under CP/M is the way they don't let the user get at CP/M. For example, when trying to call up a file, these programs won't let you type DIR to see exactly what the damn thing is called. Easily the most delightful thing about Concurrent CP/M-86 is that you can always do something like this, if you have a machine capable of running it. And of course, if you have Concurrent CP/M-86.

So far, you don't. An encouraging next step in the slow march of this product to market is the release of an 'announcement' of the product by Vector International, Digital Research's European agent. But that's all the good news, so far. Keep patient, or ask for the details on Brussels: phone no 32 2 538 91 14.

Cheap link

To connect an Apple II to a phone line via a modem, or to a serial printer, a serial card is needed. At £55 including VAT, the serial card from PAP Monitoring Systems in Belfast must qualify as one of the cheapest.

There is also a parallel interface card for the same price, and the company has announced a real-time clock board (same price again) for those who can understand enough assembler programming to use it. Details from PAP at 20 Callendeer Street, Belfast BT1 5BQ, or phone (06487) 63920.

'88 board

For those people who want to build their own system based on the Intel 8088 which IBM, Sirius and DEC have now made famous, Intel itself has provided a £534 single board as a flying start. The unit is called the iSBC 88/25, and details are available from distributor Rapid Recall on 0494 26271.

Euro show

Everybody goes to the NCC, the National Computing Conference, in America each year. It is a zoo: in Houston this year a record number of people failed to see the 'new' products which had already appeared at the Hanover Fair.

If you must blow all the company's budget going to look at computing equipment, consider instead Comdex. You've just missed Comdex in Atlantic City but there is now going to be one in Europe, 8-11 November, in Amsterdam. And after that, one in Las Vegas, 29 November to 2 December.

For no good reason, the very new Comdex shows seem to attract the more important microcomputer announcements — the Sirius 1 for instance, was announced at last year's winter Comdex.

Quite what the Amsterdam one will be like, nobody can say, because it is the first but already, says the organising company, Interface Group, companies like Altos, Cii Honeywell Bull, Corvus, DEC, Micom, Onyx, Osborne, Ramtek, Tandon, Televideo, and Universal, Vector Graphic and Zenith, are coming.

Details from Comdex, 160 Speen Street, PO Box 927, Framingham, MA 01701, USA.

Quick fix

Mills Associates is the company which launched a 24-hour fix-it service for PET owners last June (1981), and which now has announced a lower-cost service for 40 percent of the full price, providing a working system within three working days (or better if possible, of course) of failure.

The original service was often described as a rather Rolls-Royce type offering and it is possible that, even at 60 percent off, this new one won't seem any cheaper than the service offered by Commodore dealers. Also, you have to have more than one PET per site, to qualify to use it.

Details from Mills Associates' head office in Monmouth on 4611.

Bananas?

The interesting thing about the new Geest micro is the fact that it uses the Zilog Z80 microprocessor chip.

This chip, apparently obsolete, is now being found even in the new '16-bit' systems from DEC, IBM and Sirius which are supposed to be replacing it — either built in (by DEC, for example) or supplied as add-on options by other people — just to enable people to use CP/M software which still isn't ready for the 16-bit chips.

In Geest's case, the irony is even more marked. It isn't exactly offering the bargain of the year — a bog standard system with screen, printer and processor box will cost £3300. But Geest sells larger minicomputer systems based on Texas Instruments 990 series minicomputer processors. And Texas failed to provide a microcompouter version that could be sold even for this unremarkable price.

It turns out to be easier to buy a system built in California by NNC Electronics of Huntingdon Beach, based on a different processor, than to take TI's 9900 family of processors and build a cheap micro round them. And enough people who know Geest's software like it well enough to want to buy a micro from them. So they'll sell a few.

Details on Spalding (0775) 61111.

Next Microfair

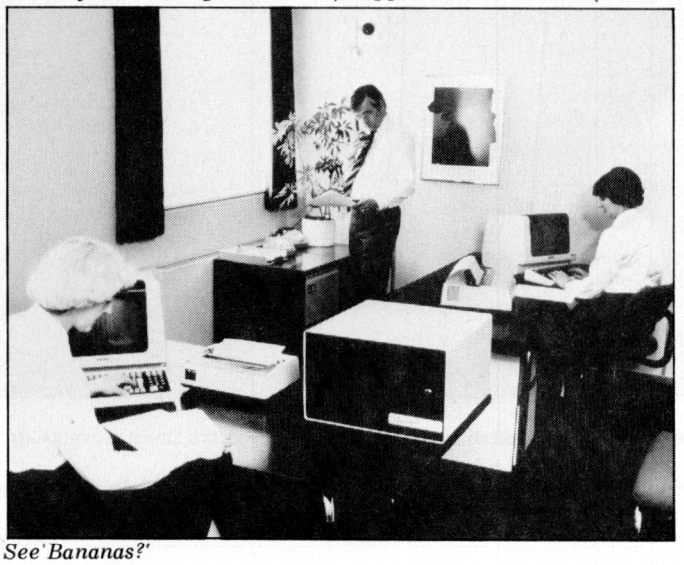
Sinclair fans can see all the latest ZX bric-a-brac at the 4th ZX Microfair on Saturday, 21 August. The venue is to be the Royal Horticultural Society Hall, Greycoat Street, London SW1.

This will be the largest ZX Microfair since the first one in September 1981. All three Sinclair micros will be catered for and the show includes a special area for local user groups.

Opening hours will be 10am to 6pm. Admission is 60p for adults and 40p for children under 14. OAPs and accompanied children under 10 get in free. Details or advance tickets can be obtained from Mike Johnston, 71 Park Lane, London N17 0HG.

Buying on the cheap

It is possible to buy a computer for less than it costs to build the beast if you are a big enough customer. A lot of microcomputer makers were rather hoping that was what happened when Boots (the



See 'Bananas?'

WHEN YOU HAVE 637 PROSPECTS TO REMEMBER YOU NEED OUR ELECTRONIC CARD-INDEXING AND RETRIEVAL SYSTEM



Many people know Henry VIII had six wives. But few are aware of his 637 girlfriends. Poor Henry! Is it any wonder he laid about them with an axe. Just imagine trying to remember all those first names, addresses, birthdays, pigeon hole numbers and personal details.

With CARDBOX, Caxton's new electronic card indexing system, keeping and retrieving information is simplicity itself. Not only could Henry have found his ladies but he could have kept tabs on all those barons, bishops and bowmen. (Rent demands would have gone on time, confiscations would have been orderly and executioners would have been selected to suit every occasion.)

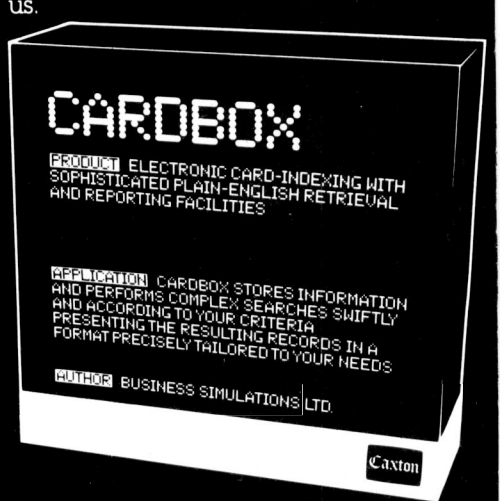
And he wouldn't have had to understand a thing about computers. CARDBOX looks like your favourite card index on the screen. You draw the card yourself. You decide where you want lines. You make up your own headings. And you fill in the details.

At this point CARDBOX stops behaving like a flat inflexible card. It becomes multi-dimensional electronic paper. You can change any information you want. You can retrieve portions of information. You can print out all or selected information from your cards.

You talk to CARDBOX in plain English. You search your records on key words or on selected criteria. CARDBOX acts like a sieve, sifting through the records reducing the number until it finds only those that meet your needs. You display records on your screen or print them out in a format of your own design. Label production for mailing is simple. You can also use CARDBOX with some of your favourite wordprocessing packages, eg Wordstar.

CARDBOX works on most popular CP/M machines including those with special screens, eg Osborne. Use the CARDBOX Tutorial to learn all about this simple, fast aid to better record management. Study the detailed Reference Manual to take full advantage of its sophisticated features.

See CARDBOX at your local computer dealer. Or we'll send it to you with a dealer list. Call or return the coupon to us.



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Name _____ Position _____ Company _____

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Computer _____ Disk Format _____

Caxton

chemist) was quoted a rumoured £500 per computer on a bulk order of 1500 Osborne 1 machines. But no, it wasn't. The price was one on which Osborne makes a useful profit.

The sale still hadn't been tied down when this column was prepared for press but it looked quite probable, given that the price would buy a CP/M machine with two disks, printer and modem interfaces, screen and keyboard plus a lot of useful software (mainly Supercalc and Wordstar) which might be expected to sell for upwards of £2000 in small quantities, judging by competing equipment.

The deal is interesting and will be followed by other deals from other manufacturers. Some of them will not be able to afford it but will go ahead anyway. Why? Because it will enable them to get the price down almost to the point where they cover their costs.

It works like this. My Crows Corporation, the designer of a new system, has a workshop in which it can build 10 Crow 1 micros a month.

But the design turns out to be very much more attractive than first thought and several tens of dealers all follow up their initial purchases with requests for lots more. The managing director realises that he could sell 100 a month if he could make them and so he looks for bigger workshops.

One option is to subcontract all the Crows out to an electronics factory which could put them all together for a lot less (per unit) than his own workshop because it has a fast production line. But it needs to have an order for at least 500 per month to get started up.

While he is doing this, he gets wind of a big conglomerate, which needs a thousand of the machines. Although the price it is prepared to pay is well below the level he needs to charge to make a profit, he follows it up, and eventually finds himself up against just one rival for the contract.

The rival's price turns out to be 10 percent below the price which his subcontractors want to charge him per computer!

So he goes ahead and matches the price, despite the fact that he will be losing 10 percent of his costs on each machine the conglomerate gets. The reason is that once the big order is fulfilled, over six months, he will have also sold (through his normal dealers) several hundred Crows at the normal shop price, at a vastly better profit margin and will end up better off overall. And his machine is established as one of the market leaders: people start writing software for it and offering add-ons and printing adverts mentioning it. You will be able to watch a lot of this happening over the next year.

The ones to watch carefully, however, are the people whose machines are 'over-engineered' to the point where you know that, no matter what they do to subcontract the production, no matter how many they build, the thing still costs damn near £1000 to put together.

Over-engineering involves a lot of giveaway signs, but the most common are: too many circuit boards (one is enough); chips laid out higgledy-piggledy (can't be plugged in automatically by machinery); strong steel cases (hard to work, expensive, heavy to ship); highly complex multi-rail power supplies (a dead giveaway that the machine hasn't been designed as a low-cost unit); ultra-high density disks (generally, only standard drives are cheap); and ultra-advanced new chips (they often aren't available in large quantities, they often make servicing very difficult, and they are a sign that money has been skimped at the design stage in favour of swallowing some silicon salesman's brochure).

Ham and chips

Amateur radio operators who want their own micros to control transmissions quite often have to do all the work of connecting computer to radio: Computer World in Holland has now launched a plug-in unit, complete with software to link the two. The software does all the things a ham would want, none of them intelligible to the rest of us: things like station description, CQ, CW ID, Autostart; it also understands Morse and can interpret it as well as transmit.

Details at Hilvertsweg 99 - 1214 JB, Hilversum, Holland, phone 31-35-12633.

No CP/M-68K this year

Most people seem to be coming round to the idea that the operating system we will all use on machines that have a Motorola 68000 chip inside, will be something called Unix; it is already available on a machine called the Fortune 32, recently announced in the UK by its US parent.

Guess who, then, reckons that 'we feel that the CP/M-68K will become a standard operating system for 68000-based microcomputers and that our working relationship with Hitachi will expedite the availability of CP/M-68K.'?

It's Tom Rolander, Digital Research's vice president in charge of the operating systems division. The reference to Hitachi is because Digital Research will be working with that company in developing the operating software. The two companies also 'expect to develop several application languages' for the chip.

The only deduction that can be made from the announcement is that CP/M-68K will not be available on any 68000 system this year. Tom Rolander can be as optimistic as he is paid to be about making a standard out of it; the rest of us will just have to wait and see.

Brunel forums

Knowledge-based systems, according to somebody called Alex d'Aggapeyeff, are the most important development yet in getting computers that work the way humans might expect them to work, and are able to explain what they do in terms that unskilled users might not only understand, but be able to respond to usefully — what David Tebbutt recently called 'making computers people literate.'

Brunel University is providing a forum for the study of this significant area from 14 to 16 September, on the campus at Runnymede.

Brunel actually wanted to have people submit papers for this conference and the only thing that prevents *PCW* readers from submitting theses is the small detail that the organisers wanted them by 7 June. Ah well. At any rate, I gather the technical conference 'will be heavily subsidised' so it's probably worth contacting Dr T R Addis at the Computer Science Department of Brunel University in Uxbridge, Middx UB8 3PH.

Subsequently, there is going to be a Management Tutorial, introducing expert systems (knowledge-based systems are sometimes called expert systems) on 17 September, and there will be another course on the fundamentals of Knowledge engineering 'for DP professionals' from 20 to 25 September. Details of these two events can be obtained from R C Muller, 12 Oaken Grove, Maidenhead, Berks SL6 6HQ. The University phone number is Uxbridge 37188.

VIC expander

The picture of the Planet Weather, as Earth will one day be known in the Galaxy, is apparently the obvious way of illustrating the little-known fact that Commodore's VIC 20 can become a 'business microcomputer' by the attachment of the large, featureless black box which is eclipsing the polar ice-cap.

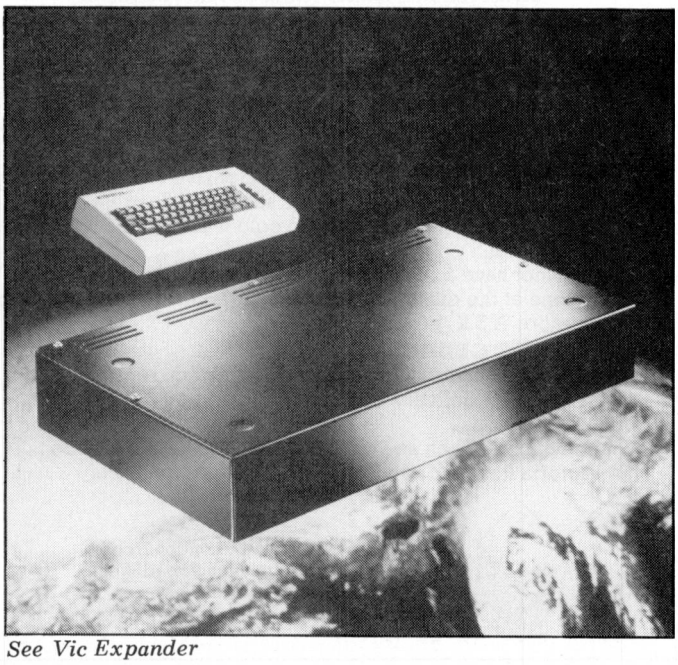
The box is the BeeBox, from Beelines. The firm specialises in Prestel add-ons but this is better than that: it gives the VIC an 80-column display, a lot of extra internal memory (up to 32 kbytes), and a plug to drive a printer or phone connection (modem).

Cost of £650 includes VIC, Beebox 40, modem and RS232, power supply, cassette deck and a carrying case.

Details from John Blackburn of Bolton 385299, and don't ring Blackburn 385299 and ask for Mr Bolton, or you will upset some nice family people . . .

Tangerine's DOS

This is the year of the cheap disk: even the hobbyist machines are getting them. And after the shock announcement by Sinclair of a £50 drive for the end of the year, the release of the first Acorn Atom and BBC Computer devices, there is now another new disk operating system.



See Vic Expander

£8.95 plus 55p p+p

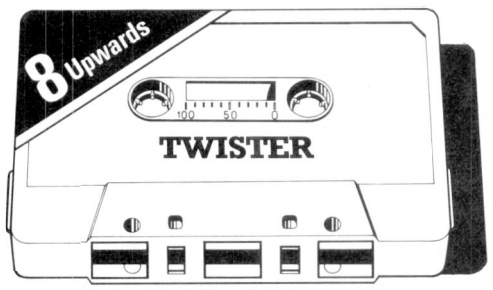
Very Important Educational Cassettes

A.S.K. announce the first four programs in a series of educational cassettes for the VIC 20. These programs have been written by a team of teachers and professionally programmed specifically for use in the home.

They are of proven educational value, complementing work done at school, yet all the programs are designed to be fun to use – not just once, but over and over again. We believe that these programs will give you and your family and friends hours of worthwhile enjoyment. They will help your children to learn at home in a relaxed yet stimulating way.



We Want To Count. A program for young children learning to count which involves the numbers 1 to 5. Children often find it easier to recite numbers than to count things correctly. Four different games give the child a variety of objects to count, and are presented in an exciting and stimulating way. Suitable for children aged 3 and upwards.



Twister. A geometric puzzle that will tie you in knots, testing and improving your thinking skills and powers of concentration. The purpose is to rearrange coloured squares so that no row or column contains a repeated colour. Set your own puzzle and test the whole family. Suitable for children aged 8 and upwards.



Facemaker. This program is designed to help improve spelling, expand vocabulary and sharpen observational skills. There are thousands of characterful faces you can make with the program. Perhaps someone you know? Suitable for children aged 5 to 12.



Number Chaser. A car race provides an opportunity to practice and improve estimating and multiplication skills. You can choose the level of difficulty you want making it different every time you play. Suitable for children aged 5 to 12.

Each cassette comes in an attractively labelled box together with a colour booklet which gives detailed loading instructions and tells you how to use the program.

N.B. Because these programs make extensive use of computer memory and colour graphics, a 16K RAM PACK (or 8K RAM PACK for Numberchaser only) and colour T.V. are essential for their operation.

If you do not have a 16K RAM PACK, we will be pleased to supply one at the discounted price of £67.50 with your order for one or more A.S.K. programs.

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If you are dissatisfied with any A.S.K. program, return it to us within 7 days of delivery and we will give you a full refund without question.

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There is so much rivalry (some of it friendly) between Acorn and Sinclair that it is painfully easy to forget about that other popular low cost micro maker in Britain, Tangerine.

Tangerine has followed tradition in launching its disk operating system: all the popular manufacturers of computers with a 6502 chip inside have invented their own system, and so has Tangerine, following Apple, Commodore, Atari, Acorn and Ohio Scientific.

Tangerine's is about the normal price for these things: two disk drives together with software, cable, power supply and so on, come for £550 plus VAT.

The operating software that comes in this package is called Tandos 65. The Tangerine micro needs at least 8k to run it, 'and Tandos extensively expands Microsoft Basic to allow it to be run virtually as a disk Basic,' says Tangerine.

Tangerine is now in Cambridge itself, at the Science Park (where Grundy lives with its Newbrain) and can be contacted on (0223) 60422.

Visidealer

When two lovers split up, everybody wants to know who done whom wrong. In the case of the ending of smooth relations between Visicorp (producer of the famous Visicalc program) and its last UK distributor ACT, both Visicorp and ACT insist that they were the injured party and that they booted the other out.

What matters, however, is that there is a new agent: Rapid Recall's Rapid Terminals subsidiary has taken over Visicalc and all its Visibrothers and Visisisters. Details from Rod Smallwood, Rapid Terminals; phone (0494) 38525.

Apple DB

At a price of £200 including VAT, Access may not be the cheapest ever database management package for Apple II but it is cheaper than many.

It is produced by Spider Software from Croydon, and while we wait for Kathy Lang to get round to reviewing it, I can at least pass on the bare bones of what Spider claims for the software.

It is able to accept a list of commands which are executed one after the other. It has a screen editor to allow changes to be made to records in the database, as though editing with a word processor. It has 'hidden' fields on records, and it can also have data fields on the screen which are computed from other data in the record automatically.
Retrieval times, says Spider, 'are extremely fast — given the primary index, a record will be retrieved and displayed either instantly, or within three seconds'. If a search for multiple criteria is needed, a record could be found instantly, and it could take up to 23 seconds, maximum. Available through Apple dealers, or contact Spider directly at 98 Avondale Road, South Croydon, Surrey.

Business, not blobs

Editors refer to the endless stream of 'action' games which their readers submit for publication as 'blob-chasers' for obvious reasons — and throw them out.

Taking a rather different tack, CCS has produced some 'business' games for the ZX81. 'Market surveys have shown that the majority of users lie in the 13-35 age group,' says CCS, trying not to use the more descriptive phrase 'school-kids' for these people.

Most users are numerate and many have a desire to gain an appreciation of the business world,' the company continues, so 'the games are fun to play and teach the use of histograms and bar charts, and simulate real business problems in the airline and catering industries.' In the one, you have to accumulate enough capital to take over British Airways, and in the other, you have to take over Trust House Forte. Presumably masochism is taught in a separate program.

'Airline' and 'Autochef' cost £4.75 each and details can be obtained from Cases Computer Simulations (which is CCS) at 14 Langton Way, London SE3 7TL.

Net distributor

An area distributor who will supply Sig-Net micros to dealers in the South East has been appointed by the manufacturer, Shelton Instruments. The distributor, DPLC, is on 01-278 6272, and contacts are Frank Yates and Rebecca Hill.

Shrinking disks

When you and I get to buy a disk, it costs twice or three or even four times what it costs to buy it in large batches from the factory but even so, the new factory price of £75 for a two-thirds-height minifloppy from Shugart would mean that microsystems should soon get a bit cheaper as well as a bit smaller.

It will be more impressive when half-height drives come down to this price. Those of us with one disk would then be able to get two instead, and squeeze them both into the same box. And those of us who have two already could of course replace one with a hard disk, and the other with two half-height floppies. Still, it's a start.

Shugart announced this product in May: one can safely predict that some of these will find their way into boxes in the shops before the beginning of next year.

IT's paranoia!

There is probably money in a thriller, a novel about IT Year, and how it really refers to the IlluminaTi and their take-over of microprocessing, in an effort to impose their vision of the golden future.

The first evidence is in already. For a start, Information Technology Year has achieved exactly nothing, which is a dead giveaway, isn't it? I mean, all that activity and money, and nothing to show? Can't be true — it must have been kept secret by the Illuminati, or the Masons.

I note, on this theme, that the National Computing Centre has got embroiled. Very suspicious indeed: the NCC has started setting up 'a number of groups to be known as "Information Technology Circles".'

Circles indeed! I wonder they don't just call them 'covens' and be done with it. Or 'lodges'. All the information about these 'circles' that can be obtained is a highly obscure press release from the NCC's director, David Fairbairn, referring vaguely to 'meeting the need for up-to-date information on current and projected developments in specific areas of information technology.'

The 'primary aim' of these Circles, says Fairbairn, 'is to provide specific knowledge on which informed decisions can be based, and to extend the opportunity to influence the developed work being undertaken.' Influence, eh? I suppose it is 'only coincidence' that Clive Sinclair's July jamboree for British Mensa concentrated on 'Golden Ages' of the past, and Clive's own feeling that we're just about to enter another Golden Age?

Okay, contact the NCC on 061-228 6333 if you want to start pulling strings from behind the throne, and influence the way civilisation is going. But don't say I didn't warn you.

Osborne on ice

All right, men, next stop Antarctica and the frozen South. I want you to check your fur-lined anoraks, quilted picnic baskets, Little Piggy toe-exercisers for cold nights and Osborne computers.

Apparently, yes, the next Scott Polar Institution sponsored expedition to the South Pole from Cambridge, is taking one of these portable micros 'for data logging and processing'. When I find out how they'll keep the disk from freezing, I'll let you know.

Machine code on ZX81

Excellent though the editor on the Sinclair ZX81 may be for entering and altering Basic programs, the machine falls down heavily when you start trying to write machine code. You can only run Z80 instructions if you can get the code in and if you can find out what went wrong and can change it.

So to make all this



Way back in April we ran a silly competition, where you may have found a box at your newsagent into which you could place your entry. It got us a lot of shelf space, and made it easier to give you a copy, so maybe you will have thought it was a harmless enough idea even if you didn't win. As to whether you won or not, we'll let you have details of the winners shortly. Meanwhile, here is a silly picture of one of the promotional areas — at London Bridge station.

possible for just £7, Artic Computing has released a machine code monitor and debugger with a full Z80 disassembler to find out what is actually in the machine at any stage.

ZXBUG is not just a loader, it's also an editor. It takes up the top four kbytes of a 16kbyte system and works with the ZX81 tape system. Details from Artic at 396 James Reckitt Avenue, Hull, North Humberside.

Hear it on the Grapevine

Local area networks allow a lot of micro users to share disks, printers and so on but almost inevitably involve miles and miles of connecting wire. As anybody who has ever re-wired a house will tell you, getting the wire into an office is expensive, time-consuming and disruptive.

However 'Grapevine' described as a 'local data network' and produced by a company called Case, has found a neat way round this problem, by using the internal telephone system wire.

Case is a company which specialises in phone links, selling modems and also selling the very sophisticated (and pricey) local area net called Net One.

The trouble with selling any local area net today, as Case points out, is the fact that they are all potentially obsolete. Nobody knows which local net will turn out to be the one to have bought in ten years' time.

Grapevine certainly doesn't do all the things that a local network will one day do but it does enough to be worth using while waiting. Don't, however, expect the price to be pitched at the sort of level that amateurs would find interesting.

Paper push

The most costly part of any big computer system is not, as you can read in some adverts, the memory but the paper. That obviously doesn't apply to most personal microsystems, since not even a majority of those have printers, but it certainly does apply to the average business system.

Which is why you should take seriously a big marketing push by Moore Paragon, a company which supplies computer forms. The company aims to have 400 to 500 micro dealers, high street shops, office equipment dealers and so on selling pre-printed stationery for you to print invoices, letters, labels, stock lists, and other office documents on.

One day, no doubt, everybody will have so much storage of their own that there will be no need to print copies on paper. And everybody else will have computers too, so they won't have to print paper copies to send through the post — you will transmit information down the phone line.

But that isn't for at least 15 years. So watch out for those circular red and blue window stickers.

Into type

Most typewriters and computers print in columns, with the letter 'i' taking up the same sort of space as the capital 'M', something which one look at this printed paragraph will show is not true of typesetting.

It is very clever, therefore, of Tom Graves of Wordsmiths and of Galley Typesetting separately to interface typesetting equipment to CP/M computers using word processing software.

Tom Graves is famous for it: he is on 0458 45359. Galley is a more recent recruit and can be contacted through its microcomputer specialist partners, Digitus, on 01-379 6968.

Impressive

Any number of people are now offering software which 'can write programs', and will offer to demonstrate how easy it is to write a program at the drop of a hat.

The really impressive demonstration of such a product, however, is not the conjuring trick of sitting down and leading some sucker through the demo. It is showing them somebody actually using a program which was written by the product. For that reason alone I'm impressed by a 'programming system' called Trojan, demonstrated at British Micros on the latest model Mimi, a British-built CP/M system.

Trojan is a system which appears, in the cursory evaluation I've been able to give it, to be a blend of CP/M system commands, database management commands, Forth language structure, and Cobol readability.

The program demonstrated to me was a forecasting program and it was demonstrated by the managing director of British Micros, Manas Hegoyan, who is not a programmer. He assures me he didn't write the program but he can use it fluently, it was simple to understand and it was the sort of program I'd like to sell if I was on commission.

Apparently it was written in two or three days by the inventor of Trojan, at Scifax Computer Systems in Basingstoke. I'm sufficiently impressed to pass on Scifax's phone number (0256) 24018.

Details of the Mimi 801 and forthcoming expansion products are now available on Watford 48222, from Hegoyan or Gerald Roll.

Serious games

The fact of the matter is that people can sell very ropey old computer games for a lot of money if they describe them as 'educational', a fact which must make it very difficult for people with serious educational uses of micros.

One group with *very* serious uses for micros in education is the Mayfield Dyslexia Computer Group and while they have 'games' on their list of software, these are definitely games with a difference. They are designed to help diagnose dyslexia, to help exercise the minds of dyslexic children and to help spastic children.

The programs are available for the cost of sending the Group a disk suitable for use on Commodore or RML 380Z machines, and include diagnosis programs, exercise programs, and test programs, most of which are disguised as games to encourage the 'patients'.

A list of the games is available for 40p from Brother Henry, CFX, the team leader at Bradley House, Little Trodgers Lane, Mayfield, East Sussex TN20 6PW.

Money back offer

Guaranteed fault-proof disk! The company which has decided to stick its neck out with this claim is Media Technology of London, which reckons the Dennison disk 'will eliminate formatting or read errors' and is prepared to refund money if it doesn't.

More impressive, as far as I'm concerned, is the production of 'official' flippy disks — double-sided disks that are fitted with read slots on both sides, so you can flip them over in systems like Apple, Superbrain, Osborne and so on, which only read single-sided disks.

When Media Technology offers to refund the value of any lost information on the disk, I'll know they really mean it. Details: 01-278 7465.

Stability call

Last year's 'cowboy' computer shops, having sold a few hundred Apples at rock-bottom prices, are suddenly this year's staunch recruits of the Computer Retailers Association, loudly calling for a 'stable market'.

In the circumstances, it is easy to understand why the outgoing head of the CRA, Ian Dunkley, spoke wryly of 'a constant area of dispute inside the CRA' as being 'discounting'.

'What we and the manufacturers should do,' Dunkley noted in his farewell message as chairman, 'is to ensure that the end-user is aware that there is, or should be, a direct relationship between price and the total service available to support the sale.' In other words, what you don't pay for you don't get; service is one of those things you need and it doesn't come free.

Dunkley has his head screwed on tight enough to know that a lot of people neither sell at a discount, nor provide service. Quite how they attract customers is something of a mystery until you note the things that they 'give away' free with computers. And one of my oldest hobby-horses has been the scandal of retailers literally stealing software, copying it, and supplying it 'free' with a micro.

Lots of people think that software should be free, and we should all write our own and pass it round. This attitude is common in computer clubs, and in universities and colleges, and there may be some element of truth in it.

For instance, if I write an accounts receivable package, and use a mathematical routine inside it, I think that the mathematical routine should be useable by any other programmer, even though I think the package as a whole should not be sold by anybody who doesn't pay me a royalty. But it is a strange attitude for a commercial retailer to take, and, I think a dishonest one.

Hence my extreme surprise to find reports from a Northern branch of one well-known chain of micro stores, where schoolboys are to be seen 'trying out' games with a special program designed to make copies of 'protected' disks.

My informant (a software producer) complained to the manager. 'Oh, I'm sure they wouldn't do anything like that!' said this gormless twit, while the lads made off with a few hundred pounds worth of games software.

It may be, of course, that the kids were from the local club, and didn't have enough money to buy one program among the lot of them. And it may be that somebody, somewhere, will see the game, want one and go and buy it.

But while that may happen somewhere, sometimes, it would be very foolish of the retailers to condone it. And I think this is definitely an area where CRA policing could do some good.

Gee-whizz graphics

The star of the Apple show, without any doubt, was Robocom's software and bit stick, which draws plans for circuits, gardens, houses, dresses, people, offices — or anything you like.

Describing it in operation is futile — you might as well try to describe the game of cricket to a blind American. Watching it in action is magic.

I watched the inventor of this £185 system (including software and precision joystick) draw a transistor on the screen.

He then enlarged the transistor until it filled a quarter of the screen and then, inside the circle of the transistor symbol, he wrote a typed description of what it did.

Then he shrank the transistor, text and all, to the size of the letter 'W'. When the whole screen was covered with a maze of little transistors, resistors, diodes, etc, he was able to 'focus' on any detail and blow it up big enough to fill the screen. And then he could focus on any detail of that detail. It was uncanny.

I think the bit that blew my mind was not when he drew a whole lot of little men and painted their clothes on in different colours, but when he enlarged the text he had typed in on that transistor.

When the transistor was the size of the full Apple II screen, the text still looked like Apple text but had letters an inch high.

And it all fits onto a standard Apple with 64 kbytes of memory and disks.

For those who want everything from computer, disks, graphics tablet, interfaces, plotters, installation and instruction and a proper power supply (and a lot more), the price is less than £4000. Details on 01-263 3388.

From the horse's mouth

For those who like to indulge in 'bit snobbery', I can confirm that Commodore, the maker of the PET, is working on a 32-bit processor chip and expects to be able to demonstrate samples of a 16-bit version before Christmas.

That comes from the horse's mouth.

The main benefit of visiting the Commodore show last May was the chance to meet the company founder, boss and controller, Jack Tramiel.

Tramiel believes that the best chip available today is the Motorola 68000, a 16-bit chip with some of the more powerful features for 32-bit processing. His plans are for a similar sort of design but the other way round — a 32-bit design with some of the restrictions of 16-bit data buses.

'The difference between us and other semiconductor companies,' said Tramiel, 'is that they want general-purpose chips but we just want them for use in microcomputers.'

That makes it more important to know what sort of computer Tramiel believes will be selling than to discover what the chip will do.

'By 1984, the market will be for hand-held computers, with big displays, working off batteries and plugging into the telephone system.' Such a machine, said Tramiel, will cost around £500, will have 16 to 128 kbytes of RAM, and will have a new type of liquid crystal display, one measuring around seven inches square, capable of displaying 12 to 16 lines of 40 characters per line.

'If we built a display like that today, it would have a factory cost of $100, but by 1985 that will be down to $20,' he said.

That display will not just be two bits of glass with a jelly squeezed between them, as with today's LCD modules. A lot of silicon will be stuck to the back to decode the incoming messages and display characters nearby — several driver chips will be needed for each display.

The cost of software for such a machine 'will be dramatically lower than today — the PET user group provides a good example,' Tramiel said.

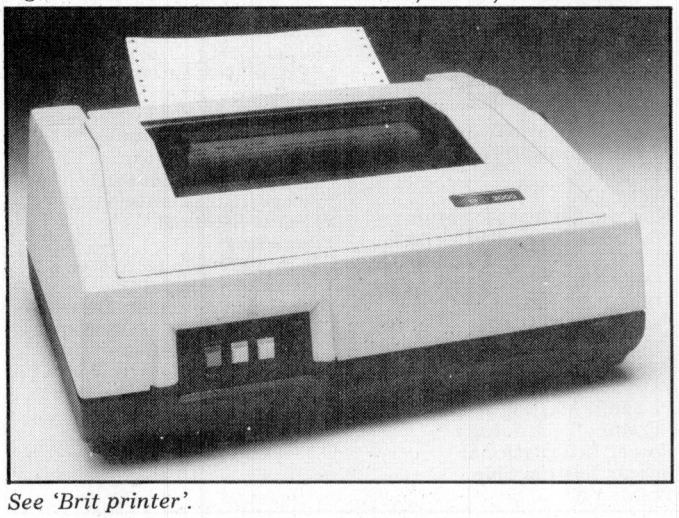
He was referring to the ICPUG processor, Superscript, which appears to do everything that something like Wordpro or Wordstar can do (and a lot more), but costs £30 (details from Tom Cranstoun, Flat 7, 10 Lancaster Road, London SE25 4AQ).

And, by the end of 1985, 'only 20 percent of microcomputers will be for business use, but that will be 10 times the total market for micros of all types for 1982,' he predicted.

A fascinating glimpse of the future, I thought. It was only slightly marred by Tramiel's rather edited version of the past.

Commodore's failure to sell to the US market in the same way it has dominated the European scene is something which I had always supposed to have been a source of irritation to Tramiel.

On the contrary, he said. 'I'm very grateful we've had the patience and restraint to stay out of the games market and build up a solid foundation of business software here in Europe, on which to tackle that market worldwide,' was the way he summarised it.



See 'Brit printer'.

Brit printer

If a competition to find the world's most substantial peripheral device were staged, a likely favourite would be the Walters 120 bidirectional dot matrix printer, manufactured by Walters Microsystems of High Wycombe and distributed by Impact Data Ltd.

It's hardy enough, apparently, to be dropped down a flight of stairs without suffering any damage at all. It weighs 10kg, which should give some idea of just how tough it is.

Walters claims it prints at 120 cps, which is slightly faster than the Epson MX-80 range (against which it is, it seems, designed to compete). The Walters 120 comes with pin-addressable graphics (dot matrix 11x9 and 9x9 for the character set), a good choice of line lengths and spacings and a healthy variety of interfaces: RS232C, 22mA current loop, Centronics and IEEE-488.

The character set is the full 96-character ASCII set. Also provided, as already indicated, are 64 pre-programmed graphics characters and 10 user-definable characters. The buffer is a standard 750 characters but this beast comes with an optional extra 1k buffer. The Centronics version is £395 + VAT and with other interfaces the price is slightly higher. Walters, an all-British company, also designed the 120. Could this be the beginning of the introduction of practicality to patriotism?

Details from Impact Data Ltd on 01-952 7956.

Good news, good news

In May's instalment of 'Frames of Reference' (*PCW* Vol 5, No 5) Alan Wood featured a panel of amusing observations on the vagaries of contemporary computing under the caption 'Good News, Bad News'.

One such observation was to the effect that the Corvus Mirror tape backup system could back up their winchester disk, but not reload to the disk. It has since been discovered that this comment was based on an isolated occurence of a fault in the system Alan was using and is not typical of the Corvus Mirror. Both *PCW* and Alan Wood accept the assurances of Keen Computers' Tim Keen that there are hundreds of Mirror systems installed and functioning well both to backup and restore, and we apologise for any wrong impression that may have been given.

Plus ça change...

Those readers with keen eyesight and dedication who read the publishing information on the contents page of this issue will have noticed that the publisher's name has changed. Yes, another chapter in the tempestuous saga of *PCW* has opened (writes our Dramatic Cliche Editor).

The story began in a newsagent's shop in West London in 1978, when one Angelo Zgorelec beat the combined research departments of Britain's largest publishers to the punch and launched the country's first micro mag. Angelo sold *PCW* to Sportscene Publishers in 1979 when it became clear that pro publishing expertise would be required to survive in an increasingly competitive market. In the next three years Sportscene turned *PCW* into the number one micro magazine, despite the huge influx of new titles. Now the beast has outgrown the rather slender resources of Sportscene and it has been taken over by VNU, a large publisher which already has several computing titles on its roster. VNU will be setting up a special microcomputing division called Computing Publications Ltd to handle *PCW* and their existing monthly, *Microdecision*.

What does all of this mean to you, the reader or contributor? Nothing will change in the style or content of the magazine (except for those continual improvements which we try to introduce anyway). The same editorial team will be at the helm, namely, Rodwell, Pountain and Burton, and the same star contributors will be, er, contributing. The principal difference is that they might get paid quicker. . . dig, dig. But eventually we expect the greater resources now available to make possible some exciting and hitherto undreamed-of schemes.

We are now in the middle of July and with the latest batch of new exhibitors we're well on the way to this year's show being three times the size of 1981. The people who have booked this month really do cover a wide cross-section of sizes and types of products.

For the business visitor the National Computer Centre will once again be running its highly successful advice centre inside the Show. With advice from the NCC and the chance to wander down the aisle and actually try out the machines this has to be one of the most cost effective ways of looking at micros for the office. With a good short-list from which to make the final choice the chances of buying the wrong machine are cut right down.

And there won't be any shortage of good British kit for the patriotic (or the companies that are after British Leyeland's business and don't want to offend). On the business side ICL joins Systime as new names to the *PCW* Show. ICL's micro is based on the now well known Rair Black Box but perhaps the more exciting news from them is the rapid expansion of Trader Point retail outlets round the country.

The other big story this month involving a British company is the Corgi manufacturer Mettoy announcing its diversification into the micro market with the Dragon micro. You can read a complete Benchtest of this new machine elsewhere in this issue and see the

The 5th Personal Computer World Show

9–12 September 1982
Barbican Centre, City of London



machines, some add-ons and software at the Show. Machines will be available for sale from the stand.

Finally, with Digico adding another British name to the list that already included Grundy, Transam, Gemini, Lucas Logic and Research Machines, there will be plenty of chances to see where we stand against Japanese and American competition.

One American machine that we see comparatively little of is the Sorcerer. Now with EMG Microcomputers taking over the entire distribution arrangements for the UK they are obviously anxious to change all that. One thing that might surprise a lot of people is just how far up market some of the models now go with disks and printers.

Our Editor swears that Microwriters do work very well and if you've never seen a six key recording 'typewriter' that you can do simple word processing with even on the train, you ought to visit their stand at the show to see if you agree with him.

Last month we had a rush of magazine publishers all anxious not to miss out on the show. This month, Addison Weslay and McGraw Hill, two big names in book publishing join those who have already booked (like John Wiley's).

Finally, this year also saw us set up the biggest stand of the show so far. ACT (Sirius) Ltd is taking over a massive area in Hall B upper to build a Sirius City. As well as a huge amount of new software there will be the new 10Mb winchesters and local area networks. But one of the biggest potential crowd stoppers must be its new voice message systems. Each Sirius has limited voice facilities as standard and one of their new word processing packages (called Pulsar) actually prompts verbally!

As if that wasn't enough it is offering a message system with which the user can record words in his own voice digitally, edit them and then transmit the final version to other Sirii (or is it Siriuses?).

So there are even more reasons for coming to the *PCW* show this year. We mentioned last month the cheap travel packages and if you turn to our ad on pages 86 and 87 you can find out more about the cost of getting in. See you there!

END

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Adda Computers
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Thame Systems
Timedata
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VNU Business Publications
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Wadsworth Electronic Publishing
Westrex
Zenithplan

INADEQUATE EDITORS

Dick Pountain leaps onto his favourite hobby-horse.

I have to confess right away that the headline is a bit misleading. This is not a swingeing expose of the moral, physical and spiritual shortcomings of micro-computer magazine editors (indeed, I live in as much fear of that as anyone).

Anyone who follows *PCW* Benchtests at all regularly will realise that I'm referring to program editors and that, furthermore, I have something of a bee in my bonnet on the subject.

The person most responsible for allowing this metaphorical insect into my headgear is Mr Charles 'Chuck' Peddle, though in a rather roundabout way. Chuck Peddle, as you certainly know, designed the Commodore PET, and it was on an early 8k specimen of this machine that I had my first taste of computing and learned the Basic language. Though for some reason the old PET has never been fashionable in professional circles in the way that Apple II or obscure S100 bus machines have, it had an indelible effect on me for one good reason: it had (and has) a full screen editor.

Having learned Basic from the start using a full screen editor, it came as an unpleasant surprise to gradually learn that such things were (and indeed are still not) by any means universal. I won't take up too much time describing my emotions on first using CP/M's ED or learning that the hallowed Apple has only two cursor keys and all that retyping nonsense.

The microcomputing world is already split between those who have had 'big' computer experience and those who came in wet behind the ears, like myself, through the micro. The former have a high tolerance for various sorts of line-editor because those must have been a gift from the gods compared to no editor at all.

I am still amazed to read occasional reviews in US magazines by veteran authors describing the full screen editor of some Japanese micro as if it were totally new; such is the hold of Apple over there.

But a parvenu like myself regards a full screen editor as the natural right of any micro owner. By now you're probably thinking, 'he's cracked; editors aren't *that* important'. I happen to think they are.

As microcomputing settles into something approaching maturity, more and more attention is being turned to ergonomics; the phrases 'user-friendly' and 'user-interface' are already in line for a cliche-of-the-year award. But this attention is not misplaced. Many of the debates about the desirability of Basic as a first language (and we've run enough of them in these pages) miss the point by focusing only on its data and control structures.

What makes the average micro-computer Basic so easy and friendly to the beginner is its interactivity; but even that is too abstract a statement. It is the particular cycle of activities involved in writing a Basic program, namely Enter a line, List the program, Run the program, Crash the program, List the bloody program again, Correct the program — which makes it so attractive and unthreatening. The beginner gets a mental picture of the reality of his/her program, as something which is there inside the computer and which is controllable and alterable, much like writing on a piece of paper. In other words, to the novice an interpreted Basic *is* nothing more than its editor; you have to get quite a way into computer science before you appreciate how an interpreter works and what other activities are going on behind the editor. The other vital role of a good editor is to minimise the amount of typing required; there's no reason why a programmer should have to be a fast typist as well, but voice recognition and the like are still a very long way off.

'...a parvenu like myself regards a full screen editor as a natural right.'

I've already said in a previous column that I accept all the arguments against the style of programming that currently available Basics encourage but I don't accept that the cure is to in any way reduce their interactivity. It isn't impossible to create languages which combine good data and control structures with editing facilities which preserve this concrete image of the program document; I use a Forth which has a fine screen editor and the UCSD editor is good enough for some people to use it as a word processor. So I won't go on about structured programming again, neither will I get involved with the sort of really advanced user interfaces which are promised by Smalltalk and similar systems. Let's just look at what should be possible now with Basic-like languages.

So what features should a good editor have? Firstly it should be absolutely transparent. That's to say there should be no EDIT mode (or ESCape or whatever other name it hides under) which you have to enter to alter your program. This is only achievable for interpreted languages, but we're really talking about Basic here.

Secondly you should be able to LIST the program and work on the listing by moving the cursor anywhere on the screen. It must be possible to overtype, delete or insert into the text using a single Insert/Delete key. This should work for direct mode commands as well as programs. A carriage return should be the necessary and sufficient signal required to accept an alteration.

The cursor keys must repeat when held down, preferably with a higher speed when shifted as on Apple III so that you can get around the screen fast.

It should be possible to scroll upwards as well as downwards through the listing; of the machines I've used only the Newbrain and Sharp MZ-80A have this feature.

If we're talking about a Basic with line numbers then a RENUMber facility must be provided, as must DELete, and both must work on any subrange of lines. AUTO line numbering can be thrown in for completeness but is far less important. You must of course be able to edit the line numbers to copy lines to other parts of the program. To copy parts of lines there'll be a delete buffer which you can unload in the new location.

It would be nice to have the facility to split a line into two by inserting a line number followed by some control code, and even nicer if, when you extend a line beyond the width of the screen a blank line is inserted below to continue on. If you actually *want* to join this line to the one below, that should be possible too.

Full search and replace facilities must be provided which operate on the whole program or on specified parts and should be able to find whole phrases regardless of spaces (spaces will of course not be significant anyway except in string constants, but will be inserted automatically for neatness).

When a program is listed the editor will right-justify the line numbers (or pack them with leading zeroes as second best) and will automatically indent FOR. . . NEXT loops according to the level of nesting; if this is a structured Basic, which I hope it is, then other structures like DO. . . WHILEs will be indented too. Perhaps all reserved words could be put into lower case to distinguish them from (long) variable names while we're at it.

There should be a mechanism for inserting comments without line numbers between blocks of program code proper and these should be of unlimited length. Shorter comments should be tacked on the ends of (or even within) lines.

This is getting to be a big, hungry editor but life is short and memory is getting cheaper.

I don't know of any editor at present which has all these features but they're almost all cribbed from some existing system. One thing which is certain is that some machines/languages come a lot closer than others and that sales volume is no guarantee. My own least favourite editor (after ED of course) is the Microsoft MBasic one, followed closely by the ZX80/81/Spectrum, the BBC Computer and the Apple II. By and large the Japanese seem to be more conscious of the need than Western manufacturers.

There's a lot more I could rave on about, once I get on to syntax checking, error reporting and debugging aids but they will have to wait for another Dump at another time. Meantime, *death to line editors and their running-dogs, struggle for the liberation of the whole screen!!*

COMMUNICATIONS





PCW welcomes correspondence from its readers but we must warn that it tends to be one way! Please be as brief as possible and add 'not for publication' if your letter is to be kept private. Please note that we are unable to give advice about the purchase of computers or other hardware/software — these questions must be addressed to Sheridan Williams (see 'Computer Answers' page). Address letters to: 'Communications', *Personal Computer World,* 14 Rathbone Place, London W1P 1DE.

Telly communication

I have been reading your articles on microcomputers and peripherals with interest for some time. As yet I have not seen one on the suitability of various TVs and monitors for use with microcomputers.

In my experience effects can vary considerably. Of the three TVs I have used with my Nascom 1, two of them lost two characters off the side of the screen and I have yet to find a TV for sale with a width control.

Many TVs do come with a VCR input these days which should be OK for use as a direct video input but as far as I can tell they are only to be found on the larger models.

Due to bandwidth and UHF demodulator restrictions it is normally reckoned that 48 characters is about the longest line possible using the UHF input of a TV, 64 using a video input and 80 on a cheap monitor. Nevertheless I know someone who gets 80 visible characters on a line using the UHF input of a domestic TV from a BBC micro (not R W Lewis!).

I think an article on TVs used with micros, possibly with details of how to introduce direct video inputs on the particular models, should be of wide interest.

T Boardman, Ditzingen, W. Germany

dBASing

I have been reading your excellent Database Benchtest. However, as a user of dBase II (reviewed in the May issue), I feel that you ought to provide further information since some of the statements made in the article could be misleading.

Could you please state which machine was used for the benchtest and what type of disk drives were fitted. The statement that dBase II takes up most of one disk may well be true of a single sided, single density 5 ¼" disk, but will not be true for a double sided, double density 8" disk. Since many packages are released with the installation programs or demonstration routines it would also be helpful to quote the disk requirement of the installed package once it has been stripped from all the systems. For instance, dBase occupies 55k of disk which, on my system, after allowing for CP/M and utility programs, leaves 150k available for user files.

Your report mentioned that there were some faults in the version. I agree, I also found errors in the package but not in the same area as the reviewer (since I do not use the REPORT feature), but I suspect that the errors were symptoms of a problem elsewhere in the package. It would be useful to quote the release number of the package under test so that new users could ensure the package they have purchased had all the features reviewed.

We have been using dBase since last October and have had no major problems with the restrictions in file sizes etc., any problems have been fairly easily overcome by careful coding of the command files, and of course we are talking of microcomputer packages which cannot be as sophisticated as their mini or main-frame counterparts.

J M Low, Bass Computer Services Ltd, West Bromwich

Beeb toolkit

I am writing a Toolkit type program package for my BBC microcomputer to add extra commands such as TEST, DO, ELSE, ENDTEST, CASE, ENDCASE, APPEND and FIND to the BASIC while maintaining BBC Basic as a subset. I am finding it so useful that I intend to give copies to anybody who wants one, for cost price, in the hope that it may become a standard, allowing program exchange between users. Before I do this, however, I intend to modify it.

I would therefore be grateful to anybody who can make any suggestions either on its implementation or on further features that would be useful to them — either extensions to old commands or totally new ones.

If any readers would be good enough to write to me with their ideas it would be extremely helpful.

N Goodwin, Girton College, Cambridge

More brickbats

I was interested to see the mention of Triumph Adler products in the June issue of *PCW.*

I was pleased that Guy Kewney referred to our Alphatronic microcomputer as the 'Alphachronic', since my Oxford dictionary lists 'chronic' as meaning 'lasting'. This is of course a known fact with our products.

However, those who take 'chronic' in its colloquial sense have not been sure how to take Mr Kewney's comments. Some have found them cynical, all unfounded, and some feel they verge on libel.

Triumph Adler has received angry calls from Alphatronic dealers who are wondering why Mr Kewney is gunning for our company or indeed Baroness International, our PR Agency.

As far as Triumph Adler is concerned, a journalist is a respected member of the business community particularly due to his impartiality. I can only wonder at the extent to which Mr Kewney is allowed to abuse this respect.

Jack Letherbarrow, Triumph Adler, London

VALuable information

Thank you for your informative Benchtest of the Sinclair Spectrum.

In your article you asked about the use of the VAL function. May I offer two applications, the first of which is as a function evaluator, demonstrated in the following simple program:

```
10  DEF FNY(X) = VAL(F$)
.
.
.
100 INPUT"Enter function
      of X" ; F$
110 FOR X = 1 TO 10
120 PRINT FNY (X)
130 NEXT X
```

At the prompt, a function such as X*X + 3.6*SIN(4*X) may be entered and will be evaluated correctly at line 120. Thus this type of construction is very useful in, eg, numerical integration, graph plotting and other programs. However, I think that this full expression evaluator may be restricted to 'Sinclair Basic'.

The second application is rather more specialised. I use a PET (in combination with CIL Microsystems PCI 6300 interface) for direct digital control of laboratory equipment. In the control software, I use a combination of GET and VAL to allow operators to change parameters (eg, controller settings and setpoints) without losing control of the system.

The following sections of code will (I hope) explain how:

```
100 TI$ = "000000.. ; REM
      reset the PET clock
110 (Sample the analog
      inputs)
120 (Calculate the new con-
      troller outputs)
130 (Service the analog
      inputs)
140 IF P = 1 GOTO 1000
150 (Service the main menu.
      A request for a parame-
      ter change sets P = 1.
      GOTO line 100 when
      TI  60*S)
1000 GET A$ : PRINT A$;
1010 IF A$ = CHR$(13)
      THEN X=VAL(B$) :
      P=O:B$="":GOTO 100
1020 B$ = B$ + A$
1030 IF TI  60*S GOTO
      1000
1040 GOTO 100
```

where:

S = sample interval (seconds)
TI = PET system variable incremented 60 times a second
P = Flag to indicate whether a parameter change is required
X = new parameter

In practice, further statements would be added to allow, eg, correction of typing mistakes and 'mugtraps' to prevent alphabetic entry. Line 1030 would also be amended to allow for the time taken to execute lines 1000 - 1030, 'fine tuning' being accomplished by means of a further test of TI and a loop just prior to resetting the clock.

This method may seem longwinded, but when compared to the use of INPUT (which stops program execution) in a control environment, the benefits are obvious.

May I also take this opportunity to thank you for a very readable and professional magazine.

Peter Wilson, Loughborough

Our thanks for your thanks, Peter. By the way the full expression evaluation function isn't quite unique to Sinclair Basic; the BBC and Texas micros have similar functions — Ed.

Beeb Append

Having entered the APPEND program that you published in *PCW* in the June issue the following demonstrates a method of APPENDing using facilities already embedded into the Machine Operating System. Namely, the two following functions:

*SPOOL "String"
*EXEC "STring"

and these are used in the following way:

Firstly, a procedure is typed or loaded into the micro and then *SPOOL "Procedure" is entered. The micro comes up with PRESS RECORD THEN RETURN and the cursor then comes back up. Now enter LIST and the program listing is SPOOLED to the tape.

When the procedure is to be joined to another program

the command *EXEC"Procedure" is entered and pressing play on the tape recorder lists the program on the screen. This is automatically joined to the program already in memory as long as there are no line number overlaps. Note: RENUMBER procedure to be spooled with a high number, eg, RENUMBER 20000,1.

This method of APPENDing seems to be very useful and it does not need complex changes of memory pointers.
Jeremy Riggs, Gosport

Legal matters

Your note in the May issue, on the need for the reform of the Law of Copyright once more highlights the apparent lack of communication between the computer scientist and the lawyer. This seems to stem, at least in part, from the fact that the computer industry is being advised by lawyers who lack specialised knowledge of the complexities of Copyright Law.

Although the Copyright Act 1956 was drafted long before the revolution in micro-technology, and therefore makes no specific reference to software, most authorities on the subject agree that in the main, software is protected. Admittedly, clarification of certain points, such as the protection of programs entered directly from a keyboard, and the ownership of the copyright in computer output, is needed. However, in view of successive governments' indifference to such matters, one would have thought that the computer industry could find the resources to finance litigation in order that issues such as these would be decided by the courts.
Roger Dowling, Milton Keynes

PC or PCC?

I read with interest Dick Pountian's short article on the Sharp PC1500 and would endorse most of what he said. However as regards the Instruction Manual and the Applications Manual they are both so riddled with fundamental errors that I can only hope they are more accurate in the original Japanese! The standard in the English edition is completely unbecoming for a firm of Sharp's standing (there's an error per page), and would do irreparable harm to any sales effort. Pity — because it's a great little machine with immense possibilities for certain applications where portability is essential. Finally it should be called a 'Poacher's Pocket Computer'!
J H Powell, London

	Forloop	Literalassign	Memory Access	Vector	Equalif	Unequalif
Pegasus MT+	4.7	0.8	1.0	6.1	6.7	
Mycro MT+	8.5	?? (misprint)	0.5	6.0	8.0	8.0
Horizon Z	29.3	1.0	2.1	22.3	4.6	4.1
Horizon UCSD	38.5	6.3	6.5	57.9	20.3	19.9
S Brain M	57.3	9.1	13.1	89.9	30.8	29.8
Clenco Pro	2.0	1.1	0.7	3.9	2.2	2.5

Fast v slow

As I am about to purchase a CP/M based computer and Pascal compiler for business use, it was with interest that I read your list of Pascal Benchmarks. However at first sight they left me puzzled in respect of the slowness of Pascal Z in comparison with Pascal MT+. The Ithica Intersystems advertising pamphlet 'The Facts About Pascal', concludes that Z is on average 21% faster than MT+ (except for real arithmetic) whereas your figures indicate that MT+ is between three and ten times faster.

I am unhappy about the validity of your programs using a double loop. The timing of the assignment statement for example, is swamped by the time taken setting up and performing the inner loop. The times quoted include the time taken to set up a loop 10,000 times and perform that loop 100,000 times which far outweighs the time taken to perform 100,000 assignments. However by subtracting the time for the "for loop" program from those quoted for the literal assign, memory access, vector, equalif and unequalif, a more accurate and clearer picture emerges as shown in the table above for the MT+, Z, UCSD, M and Pro Computers.

It now appears that Pascal Z is still slower than MT+ but not by such a vast margin, especially when the likely occurrence of the various operations within a 'typical' program are taken into account — ie, Literalassign and Memory Access occurs far more times in a program than say a procedure call.

The timings quoted in the Ithica's publication are equally as misleading. The timings quoted obviously include the time taken for the loading of the program from disc which in the case of some of the trivial programs used takes considerably longer than the actual program execution; Pascal Z compiles into a more compact code and thus will load more quickly, which accounts for its lower times and apparent faster performance which is not substantiated by your benchmark results.

The above example indicates the misleading results that can occur by using ill-thought-out or badly-controlled benchmark tests.

I would recommend any prospective purchaser of a Pascal Computer to read the article '4 Implementations of Pascal' by T H Woteki and P A Sand in *Byte* (March '82) where not only have they used benchmarks more likely to reflect the execution speed of an application program, but have also compared the facilities and ease of use of the compilers. Buying a compiler solely on its execution speed is analagous to buying a car soley on its quoted 0-60mph time.

Incidentally I shall probably purchase a Pascal MT+ which I believe gives a good compromise between execution speed and ease of use.
Tim Janes, Worcester.

The Benchmarks are of course designed to allow precisely the kind of subtraction to isolate individual operations which Mr Janes uses — Ed.

Presbyopic review

I was delighted to read your review of the Sinclair Spectrum in the June issue.

However regarding David Tebbutt's eyesight comment — red and green characters on a grey background are used to detect visual anomalies. It sounds as if David Tebbutt's either long-sighted or presbyopic.
David Pipe, City and East London College.

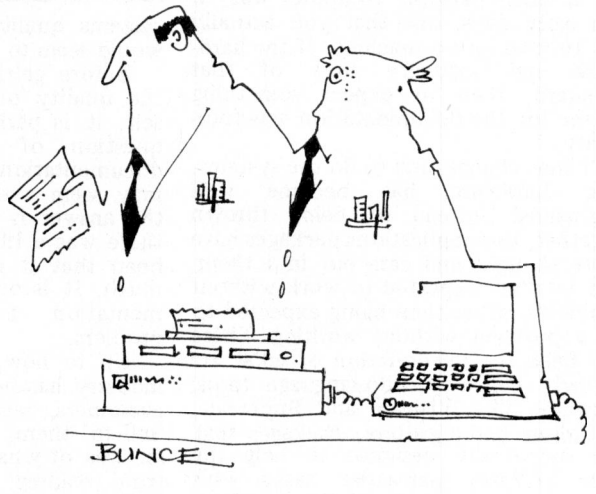
A refreshing change from the normal accusations of myopia — Ed.

Vector addition

I always enjoy reading Guy Kewney's column in *PCW*. With reference to an item entitled 'UK DR Agent' in the May issue, there appears to be a misunderstanding, so I would like to clarify the situation.

Vector International is Digital Research's exclusive representative in Europe. Xitan Systems is a distributor for Vector International of Digital Research products. Two other UK distributors have also been appointed, Tamsys of Windsor and The Legal Connection of Fareham (for Displaywriter products only).

Vector International is now established in the UK as a subsidiary of Vector International NV of Belgium. We look forward to establishing closer contact with our UK customer base and providing more direct service related to OEM and distributor administration, technical support and information on new products. In the coming months we will be placing emphasis on the ISV (Independent Software Vendor) programme, particularly with regard to several important new products to be released soon.
Mike Boothroyd, Vector International, Tunbridge Wells



My God you're right! It's dyslexic!

Banks' Statement

THE BOOK OF THE VIDEO

The dearth of good quality documentation in the micro world is Martin Banks' hobby-horse for this month!

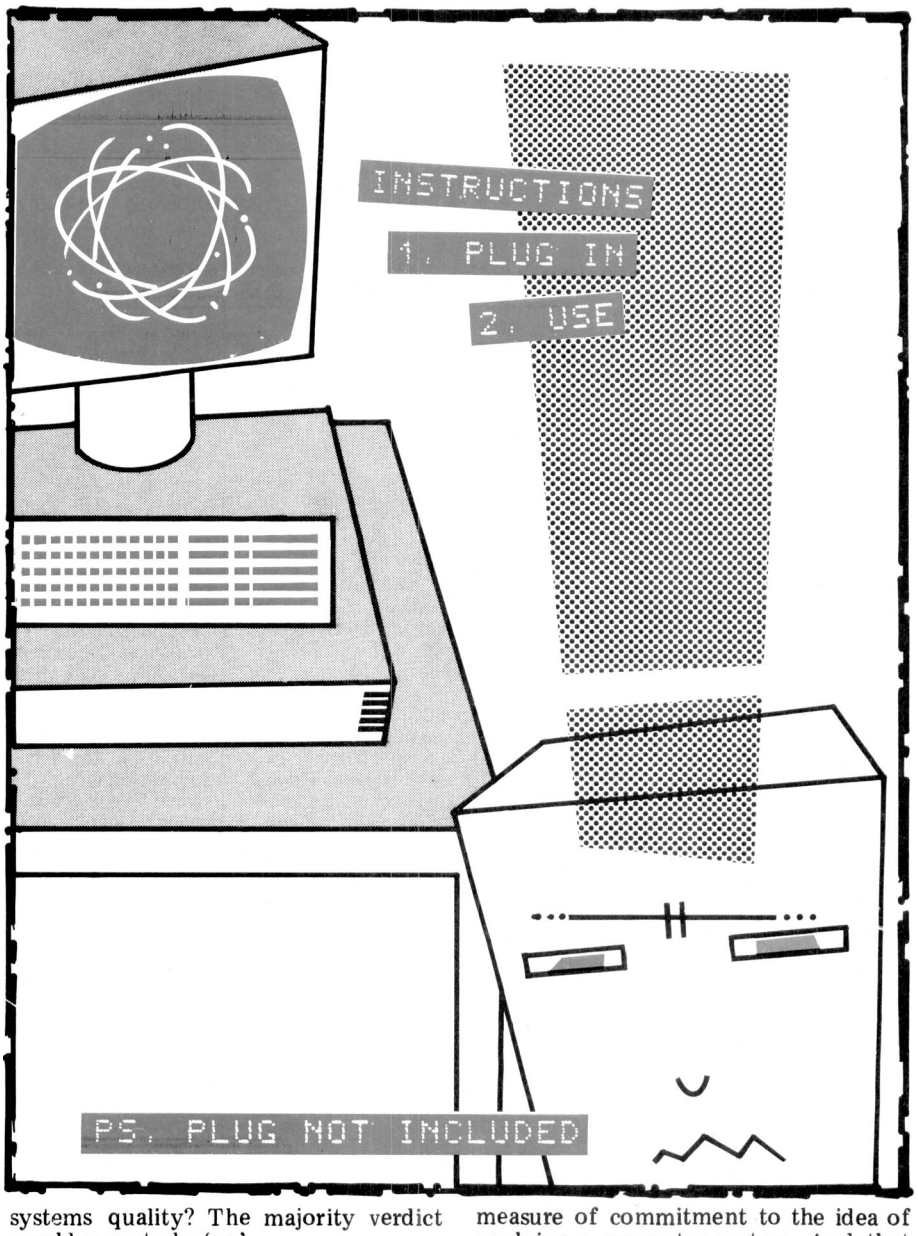


Illustration by Andy Martin/A.D.G.

It's funny what people will put up with, or as Churchill might have said it, up with which they will put. It is maybe not quite so funny how many companies, either by accident or design, take some sort of advantage of that fact.

Not complaining is said to be a peculiarly British failing, us lot being so reserved, and 'nice', and things like that. There are cases, however, that would tend to show this is not always so, and that other tribes from other countries will put up with a considerable amount if they fail to appreciate that things could be better.

In many cases, it is not until someone, or more specifically some company, comes along and rights the 'wrong' — not from any altruistic motive but as part of a conscious attack on its rivals — that anyone really notices that they have been putting up with tat for some time.

This is perhaps the trouble, of course, not knowing what to expect because there has never been any standard against which to check. This is particularly so of the personal computer industry. After all, it is very young, immature even, and despite its phenomenal growth rates and revenues, it has always in practice been horribly underfinanced.

With such thoughts in mind it is perhaps then understandable that one of the fundamental parts of the armoury of successfully selling such equipment — the documentation that tells the user how the various hardware and software bits work and what they are supposed to do — has been of an almost universally poor quality.

Quality is something that the industry has traditionally been somewhat short on in any case, through all aspects of its endeavours. Again, this has been largely due to the fact that it has been a young and under-financed fledgling that has had to find its way in life with few preconceived ideas of where it might be going.

But, in the early days, quality was often assessed on the basis that if a product worked three times on the trot without falling over, it was a 'quality' product.

This was true for hardware, and even more pertinent when it came to software, for a quality application package for a small personal computer was, in the early days, one that you actually got to load into a machine. If the hardware and software were of that standard, then to expect something better for the documentation was foolhardy.

Times change, and so do the systems. The hardware has become well engineered instead of being thrown together, the applications packages have more thought and care put into them, and now are expected to work without problems rather than being expected to be a problem without working. There has been the introduction of what are lovingly called pseudo-language tools; packages like Visicalc and Supercalc, Optimiser and Cardbox. Packages that are specifically designed to help the user perform particular tasks with greater ease, speed, flexibility or whatever.

But, has the documentation improved to match this upsurge in systems quality? The majority verdict would seem to be 'no'.

Before getting on to the subject of the quality of the documentation itself, it is perhaps sensible to ask the question of whether good quality documentation is actually needed. This may seem a simple question to which the answer is obviously yes. However, there was a time when the answer has been that it didn't really matter too much. It is only now that poor documentation is really becoming a problem.

Up to now, the personal computer industry has been 'bought from' by its customers, rather than having had to 'sell to' them. The customers have had an idea of what they wanted, probably from reading magazines such as this august journal, and have set out to buy same. Because they have known what they have been after, no matter how approximately, they have had a measure of commitment to the idea of applying a computer system. And that commitment has usually been enough to overcome the vagaries of the documentation, for both hardware and software, that has been supplied. Indeed, in many cases, the purchasers could be said to fit into the definition of computer techno-freak, and thus would be well qualified to understand the high-powered obfuscation that has passed for a documented explanation of a product.

Now the situation is changing. To continue growing at the rate the industry has done over the last few years, even close to that rate, it is going to have to start selling to the unconvinced. This does not imply that the industry is going to have to start 'conning' people into purchasing (or does it?), but there are still vast armies of potential users out there somewhere that do not know or understand that they could make use

of a personal computer system. This is particularly so in the business area, which is still the biggest applications area for earning revenue. It is also so for the rapidly growing home user market.

One of the key factors in addressing these vast armies of potential users is the need for them to be able to easily understand what it is they are being sold, not only in broad outline and concept, but also in detail. There is a strong tendency towards fear of computers amongst the 'uninitiated' — okay, maybe fear is too strong a word, but it is a feeling not too far from that which prompts the 'I'm bound not to understand how it works' attitude.

This, of course, is where the documentation can be of invaluable assistance. A well-written and easily understood manual, especially on something as strange and incomprehensible to many people as a piece of software, will be one of the greatest sales aids ever developed. It will also be one of the most profitable investments ever made by the producer of the product. No matter how good the product actually is, if the user can't work out how to make it go, and is continually telephoning someone — the dealer, or distributor, or the manufacturer — to ask what are in effect rather banal questions on its operation, then large amounts of time, effort and money can get wasted.

To be fair, there are signs that the documentation side of the business is at last beginning to be better appreciated by the manufacturers and software producers — and not before time. There is little excuse for some of the horrors that have occurred in the production of manuals in the past, or for the fact that many of them seem to have been written by people who fail completely to understand the needs of the end user.

I have mentioned before my own views on one example of this latter problem, in the December issue. This was an extremely useful, if occasionally quirky word processing package. The first time I tried to use the package in earnest, without any prior demonstration of its workings or capabilities, I had considerable difficulties. The manual, the only method available to me on how to find out how to make it go, had been written by someone who understood fully how the package operated. This person was obviously an expert in programming and software. The problem was that the user was assumed to have an equal understanding of these subjects — not so. If the user had such understanding, then he would probably write the damned package himself, without the quirky bits. I eventually found that the best way to read the manual was from the middle outwards.

"The best way to read the manual was from the middle outwards."

This is hardly the way in which to endear hard-pressed users to a company's products.

While fully appreciating that I now lay myself open to accusations of sycophancy to past and current *PCW* scribes, I feel that one of the better examples of how documentation should be approached has come out of Caxton Software Publishing. The documentation that has come with the two products the company has so far released has been not only useful in making the packages go, it has actually been readable.

The presence of *PCW*'s ex-editor David Tebbutt on the payroll of Caxton is probably somewhat less than coincidental in this.

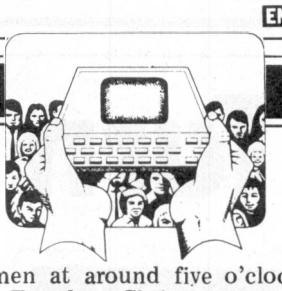
Two innovations that are included as standard in the Caxton documentation are particularly worthy of mention. These are the Tutorial book, which tells you how to make the package go from the 'make sure the computer is plugged in' level; and the Quick Reference card. This is a single card which sets out all the main control keys that the package uses, and their relationship to the operation of the program. This is a little gem of an idea, for there is nothing worse than to have to keep finding a page, often in the middle of a manual, that lists these control characters. And even the most experienced user will forget some of these characters some of the time.

It is to be hoped that other manufacturers and suppliers will follow a similar path — not slavishly, as there must be a million other good ideas on how to produce good manuals, but with a view to making computer systems more accessible and useable to the untapped army of uncommitted potential users. **END**

CTUK!NEWS

A ROYAL VISIT!

By David Tebbutt



Good news this month — ComputerTown has been visited by Royalty, a successful ComputerDay was held and three more 'Towns should have been opened by the time you read this. Sadly, ComputerTown Street has had to close for now.

First, the visit from the Prince and Princess of Wales. Andy Stoneman, who runs the mobile Computer Integration Project (CHiP) for young people, and Kevin Dixon from ComputerTown NE gave a hands-on demonstration to the Royal couple. Prince Charles used the computer to load and run a couple of programs. According to Andy, Princess Diana was very enthusiastic about the potential uses of the microcomputer but disappointed that the demonstration had not included Space Invaders. The visit was covered by the local press, radio and television.

ComputerDay South Ruislip was an unqualified success. The library was given over to a sort of computing exhibition put on by the library staff, ComputerTown Eastcote, Cream Computer Shop, Uxbridge Technical College, Southbourne School, Nick Smith and Sterling Mouse. Metrotech lent one of its Metrotel viewdata systems based on a Dynabyte computer. The 'show' was divided into four sections — business, education, leisure and viewdata services. In this way the public were able to go to the bits that interested them most thus avoiding congestion and time wasting. No one has a precise idea of the number of visitors but it was certainly several hundred.

One of the problems that many ComputerTowns face as they mature is that the same people turn up month after month, turning it into a kind of club. One way of overcoming the problem is to team up with a proper computer club. The other way is to run occasional events such as South Ruislip's ComputerDay which bring in the uninitiated — and that, after all, is the main purpose of running ComputerTowns.

Three more 'Towns are on the verge of starting (in fact, by the time you read this, they should be well under way). Alan Hooley, who lives at 21 Brammay Drive, Tottington, Bury BLB 3HS, is to start his ComputerTown at the premises of his local Arts Association. Alan would welcome more help so, if you live nearby and would like to give a hand, why not ring him on Tottington 2984 or 061-761 7107.

8 June saw the launch of ComputerTown Burton, or at least I hope it did — this is being written in May! Room 2 of the Trent Suite in Burton Library is where you'll find Chris Woodford and his merry men at around five o'clock every other Tuesday. Chris too would welcome help so if you like the idea of joining in, contact him on 0283 32615 or at 31 Hopley Road, Anslow, Burton on Trent, Staffordshire DE13 9PY. Chris will also be publishing a regular Newsletter which he will make available to other ComputerTowns for a small charge. When I've seen a copy I'll let you know more. ComputerTown Burton's sponsors are Peach Data Services, FBC Services, *Burton Daily Mail* and Chris Fox.

Andrew Esmond hopes to have a ComputerTown going by mid-July. He is planning to enlist the aid of his local computer club. If you'd like to give a hand, why not contact Andrew at 34 Albermarle Crescent, Scarborough, North Yorkshire YO11 1XX.

I suspect that Philip Graham of 80 Dallas Road, Lancaster, Lancashire might be interested in getting a local 'Town going. If you live near him and you'd like to help I'm sure he'd welcome a call.

Peter Kiff called me just now with news from Thanet. The bad news is that they are taking a well-deserved summer break. The good news is that they'll be running an open day on 2 October with special emphasis on the educational uses

GOTO page 179

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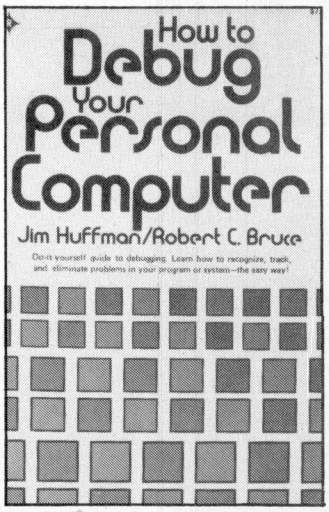
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BOOK FARE

Once more Malcom Peltu courts trouble by reviewing books which suggest that Basic might not be the Perfect Language!

Debuggers strike!



How to Debug Your Personal Computer by Jim Huffman and Robert C Bruce (Prentice-Hall International, £5.55)

There is a widely-held belief that programming is primarily about coding. This mistaken idea is bolstered by the flood of books on programming (particularly in Basic) which are devoted almost exclusively to the writing of code and to functional descriptions of what program commands and statements can do.

Of course, you have to be able to write code in order to produce a program. The process of software development, however, has other key phases: design, test, maintenance and enhancement. In the mid-'70s, the US Department of Defense estimated that it was spending about $6 million on software development. Only about 20 percent of this was going on coding, with about 50 percent being spent on testing and modification.

Cincom, one of the biggest suppliers of mainframe software, estimates that the cost of making enhancements or corrections to software increases exponentially over time. In English, this means that correction costs increase about ten-fold in each programming phase. Say that it costs £1 to find and correct a design bug during the design phase. If the same bug was found during coding, the cost would have become about £10 to correct it. This will rise to about £100 to correct the design glitch during testing. If the dirty bug surfaces after that, the cost could be about £1000 to flush it out.

Some arrogant micro Basicites will argue that figures like these come from mainframe old-hat dinosaurs and that personal computing has revolutionised all that. Now that programming is fun, they might argue, software development has become child's play — just look at all the code being splurged out in computer mags. The personal computer, however, has changed little about the fundamental truths underlying software development. Basic, on the other hand, has changed the computing environment radically. It has opened coding up to the masses. At the same time, it has prompted the benefits of 'quick and dirty' coding which underplays the advantages of good programming and system design practices.

In the first flush of programming excitement, Basicites too frequently closed their minds to appeals to think about what they were doing and to question some of the implicit disadvantages of Basic. Programmers, however, usually fall head over heels in love with their first language. To admit imperfections in their beloved is to question the meaning of life. But, as Groucho Marx once remarked, 'Time wounds all heels.'

The promoters of good programming rather than just any-old-Basic coding are fighting back (see Comal review below). They are winning their argument. In fact, they have won it. Even Basicites are accepting the need for developing 'structured' Basics.

The importance of structured programming and design is central to the question of just how important coding is in software development. The benefits of structured approaches do not come in the actual coding process itself. Structured techniques derived from the experiences of software developers and from theoretical analyses of how to ensure the correctness of programs. This brought about the realisation that the design effort was crucial for all subsequent stages of software creation and that clarity and simplicity of programming structures within a structured design were of paramount importance in producing lightly-bugged, highly reliable, flexible and enhanceable software.

Any book about programming should tackle these broader topics. Otherwise it is like teaching surgery simply by describing instruments without talking about hygiene, anaesthetics and the dangers of bad medical practices. Books about well-structured languages, like Pascal and Comal, usually give reasonable space to questions of design and programming which promote easier debugging, fewer initial bugs and more scope for trouble-free enhancement.

Such considerations arise naturally from structured languages because the languages were designed explicitly to face up to the whole range of problems in the software development process. Basic, however, was designed to be *easy* to learn and use. As such it is superb. But the nature of the language does not naturally lead onto an analysis of *good* systems and programming design.

I was therefore pleased to come across a Basic-oriented book which looked beyond the coding phrase of software. Unfortunately, *How to Debug Your Personal Computer* by Jim Huffman and Robert C Bruce was still a disappointment.

I think the question of avoiding, finding and correcting bugs is of such importance that there should be many more publications aimed at micro freaks focused on this issue. Huffman and Bruce, however, opt for a pragmatic, plodding approach which is typical of so many Basic books. Instead of analysing the general concepts of why errors arise in programming and how to sort them out, they illustrate a few techniques by working through examples. They seem to assume that Basic is the only language around and fail to even hint at its disadvantages. They also seem to be unaware of structured techniques and, of course, avoid whispering the ultimate Micro Heresy: that perhaps the best method of easing debugging is to write your program in a more appropriate (for some applications) language than Basic.

Huffman and Bruce have six chapters. The first goes through an example which illustrates how bugs can be eliminated by drawing flowcharts, even if it means reconstructing flowcharts from existing code. The next chapter works through an example which shows how debugging can be done by a 'desk run', ie, using pen and paper to follow the program through its actions step by step.

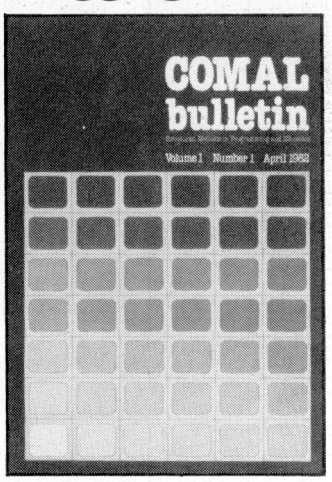
Chapter 3 discusses the virtues of traces. The chapter is called 'Debugging with print statements'. Instead of discussing the philosophy behind having traces to find out what is happening in the machine at various trace points and providing guidelines on the best strategy for implementing traces, they plunge headlong into Basic PRINT statements illustrated by one example.

Chapter 4 shows how, if you cannot find the bug, you can cover it up with a patch which leaves the bug but avoids its impact. They then show how various debugging techniques can be brought together and end up with a useful little look at hardware bugs. The technique of relating a debugging method to a practical example means that the reader becomes bogged down in the example itself. Practical illustrations are very useful but they should be placed within some broader context.

For a book about eliminating errors, I was surprised by the sloppiness of its editing. I did not find any errors in the coding but I cannot claim to have followed each example in inexorable detail. On page 1, however, it does talk about the 'miost' (sic) effective and accurate method of debutging. In Chapter 2, it says the program example is 'much longer than any of the programs we have looked at so far', when there has only been one previous example, and that was about the same length. These are minor quibbles but a book about bugs should be well debugged itself.

Despite the disappointment of this one, I hope that many publishers start churning out books which go beyond the coding phase into the heart of the programming matter.

Plugging Comal

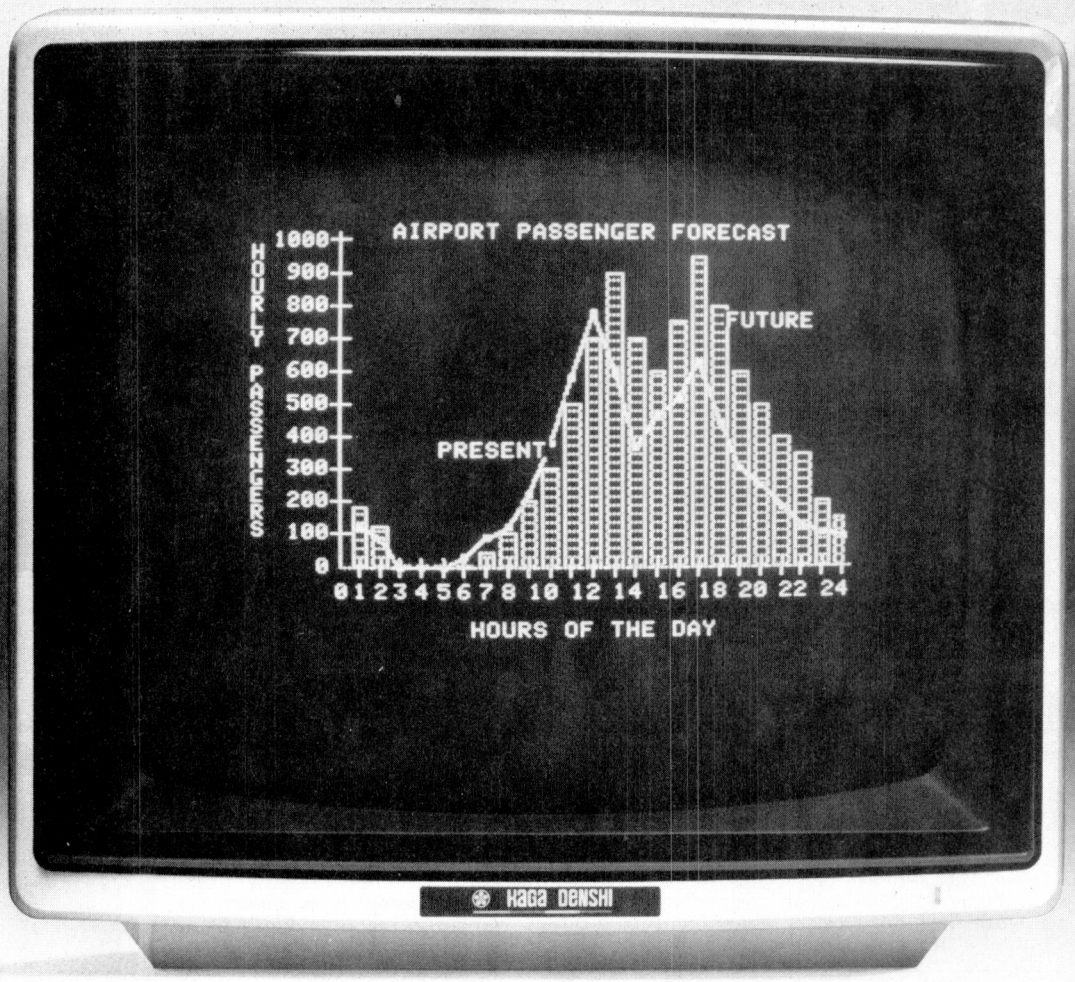


Comal Bulletin — Structured methods in programming and educating edited by Roy Atherton (Ellis Horwood, £10 a year in UK, £13.50 overseas for six issues a year)

For the second month in a row, I would like to give a plug to Comal — the language which combines the best of Basic and Pascal. In particular, publishers Ellis Horwood should be praised for showing faith in Comal beyond just producing books on the subject.

The Comal Bulletin has been started by Ellis Horwood as a forum for educational users of Comal to explore all aspects of the languages and its implications in depth (it will come out six times a year). The subtitle of the *Bulletin* describes what it's really all about: 'Structured Methods in Programming and Education'. At £10 for six issues, the first may seem a

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bit thin (12 pages) but its articles are lively and there is promise of more goodies to come.

In his editorial, Roy Atherton states his case clearly. He is primarily a fanatic for good programming and systems design principles rather than a Comal bigot. He admits that, 'Comal may die, as Pascal or Fortran may die. It seems equally clear that the underlying concepts of repetition, decision making and modularity have an air of permanence.'

Although the bulletin will focus on Comal, Atherton states: 'Structural principles are important; so is the idea of combining them with Basic.' He and the Comalites are not anti-Basic — they are Basic exploiters. 'While Comal is a valid language in its own right, it is also a symbol for the general trend towards structured Basic,' he comments. The bulletin will terefore look at other structured Basics alongside Comal. People who prefer non-Comal structured Basics will be encouraged to write articles. Atherton shows the open-mindedness of a good educator when he says that the Comal Bulletin 'may deplore the over-extended influence of old Basic on the cause of good programming and other aspects of computer education but it will not exclude seriously argued opinions in favour of GOTO statements or flowcharts.'

One of the articles in the first issue by Richard Forsyth, is likely to set off a bitter controversy among *PCW* readers. As 'Brain Dumped' Dick Pountain remarked in June's *PCW*, one way of causing a flood of 'Communications' letters is to attack a personal computing Sacred Cow.

In his short piece, 'Basic versus Comal: The Clash of The Titans', Forsyth manages to slaughter at least three such beasts venerated by the *PCW* punters: Basic, the BBC micro and (Shock! Horror!) even programs printed in *PCW*.

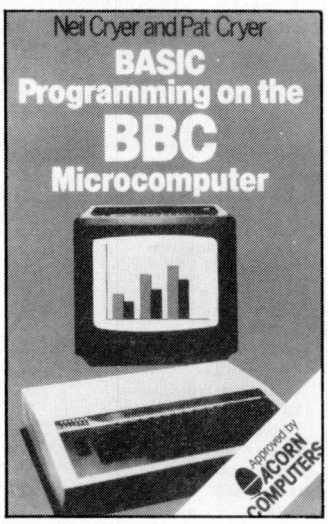
On Basic, Forsyth comments: 'Basic really is easy to learn and it is small enough to burn into the ROM of an inexpensive computer . . . But its dramatic, almost biological growth has also been its undoing. Like Latin, it has diverged and spread. Today . . . no-one speaks Latin except a few dusty cardinals in the Vatican. Likewise, it is true to say that Basic is a dead language. Despite the efforts of the ANSI standardisation committee (too little, too late), there is really no such thing as Basic. There is just a Babel of mutual incomprehension.'

On the BBC computer, he says: 'The BBC fell between two stools. They paid lip service to compatibility (with Minimal Basic), but half-heartedly tacked on a few structuring facilities to BBC Basic which ensured its lack of both structure and compatibility.'

On *PCW* programs, Forsyth observes: 'Let me quote Roy Atherton: "GOSUB 7000 is one of the most dismal statements in computing." If you have not already grasped the necessity of properly insulated named procedures and functions, then you need to do a penance. I suggest trying to read, understand and implement any four programs selected at random from the pages of *Personal Computer World* magazine.' (Get on your 'Bludner' bus and fire back, oh Nubile Prog Ed Burton!)

Future issues of the *Comal Bulletin* promise articles on the history of programming languages and keeping control of long programs, as well as discussion of Comal itself. There will also be regular features on teaching structured programming and examples of programs. Ellis Horwood is also planning to bring out a book by the founder of Comal, Borge Christensen, aimed at microfreak children as well as teachers. This is part of the enterprising publishers continuing commitment to Comal.

Basic for Beebers



Basic Programming on the BBC Microcomputer by Neil and Pat Cryer (Prentice-Hall International, £5.95)

This slim volume by the family Cryer is a reasonable example of a plain vanilla Basic programming book (Neil and Pat wrote it, daughter Wendy did some cartoons). It does everything you would expect it to do, competently and pragmatically. But it keeps its vision within Basic blinkers. It is purely an introduction to good programming principles which uses Basic.

Surely it is about time manufacturers produced their own definitive book on programming in Basic on their machine which is provided with the system, particularly for a machine like the Acorn/BBC computer which is aimed at beginners. I would not expect the manufacturer to produce general books on programming but, equally, I do wish commercial publishers would get their noses out of the Basic grindstone (see my review of the Huffman/Bruce book above).

The Cryers' book is approved by Acorn, makers of the Beeb computer. Why couldn't they have commissioned the Cryers to write one to be provided with the machine? This criticism is directed at many other manufacturers who rush around approving books published commercially instead of ensuring they get their initial documentation so good that further 'approved' publications are unnecessary.

However, given the microworld as it is, the Cryers have done a workmanlike job in achieving their (I think, rather narrow) objectives. The book is designed very much for hands-on use with the Beeb computer and cannot be recommended for users of other computers or people with no computer at all.

The Cryers start with some simple programming examples to give a feel of programming and of the machine. It then goes through a dozen chapters looking at INPUT; branching; loops; program management (saving, restoring, etc); graphics (two chapters seeing it is so important for the Beeb Computer); animation for games; mathematical functions; string handling; user-defined functions; file handling; and programmable characters and sounds. All programs are claimed to have been tested on a production model of the computer. The Cryers write crisply and sparingly. They extend their descriptions by having three sections at the end of each chapter entitled 'Some points to think about'; 'Discussion on the points to think about' and 'Discussion of activities'. These are generally quite brief but enable particular points to be emphasised and some subtleties to be investigated.

For what it aims to do the book is reasonable. My general fear about books like these, however, is that it makes beginners think that there is only one way of programming and that way is Basic. For example, in an early section called 'Why program in Basic?' the Cryers do not even mention other computer languages. When they ask the question, 'What is a program?' they answer, among other things, that 'Each line of a program begins with a line number which indicates the sequence in which the computer should carry out the instruction.' There is no suggestion that other languages do not have line numbers or that line numbers can be a straightjacket. As the Cryers subsequently explain when discussing branching, the line numbers, of course, do *not* necessarily indicate the order in which program instructions are executed. They say that IF . . . THEN . . . ELSE is a 'natural extension of the IF statement.' But they fail to explain how important IF . . . THEN . . . ELSE is in its own right as an important construct for structured programming — it is there for excellent programming reasons and not as a tack-on to IF . . . THEN. The Cryers then go on to explain about the problems of having to contain IF . . . THEN . . . ELSE within a line They say that multistatement lines could be used but they warn that 'we do not in general recommend them as they can make programs difficult to read.' But they do not explain that the whole point of IF . . . THEN . . . ELSE in structured programming is to make programs easy to read.

If all you want is a book on Beeb Basic, this one is more friendly and more tailored to the BBC Computer than the 30-hours NEC/BBC book (Bookfare, April and Communications, June).

From an educational point of view, this type of book is wrong, I believe, because it inculcates a limited Basic perspective of programming. The first language used is so important that something which looks more generally at programming principles is preferable. On the other hand, practical expediency tends to win in the microworld, so the Cryers book will appeal to many Beebers.

Job slaughter

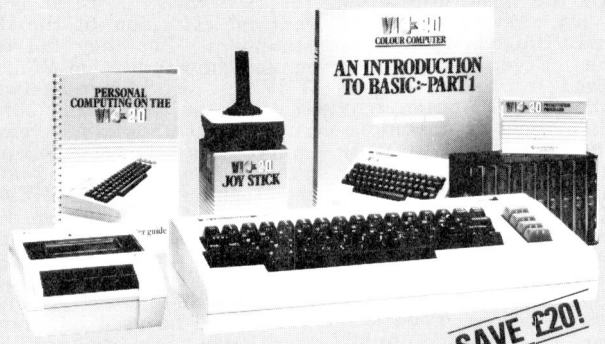


Your Job In The Eighties — A women's guide to new technology by Ursula Huws (Pluto Press, £2.50)

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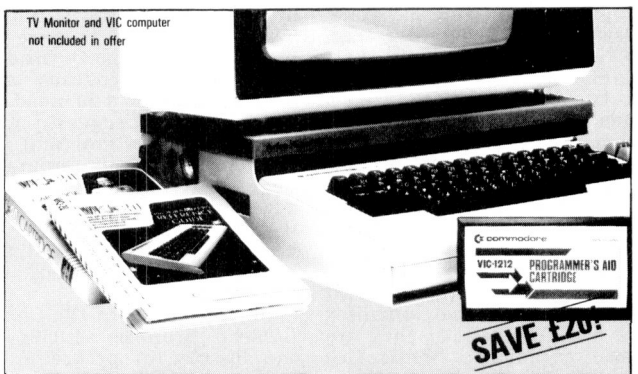
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had some power, not much but some: as long as the employers needed to buy our labour we had something to bargain with. When they did not need it we were powerless. We felt helpless in the face of a development which not only would crush us but also, at the time, seemed to make economic sense.'

These are the words of a convenor at a vehicle component factory. Many other people have felt this type of helplessness in face of the apparent technical and economic inevitability of information technology. Ursula Huws, who quotes the convenor, has written *Your Job in the Eighties* to try to overcome this passive acceptance of technological change.

The convenor quoted by Huws is a woman. Although much of Huws' material is applicable to both sexes, her main purpose is to analyse the impact of technology on women.

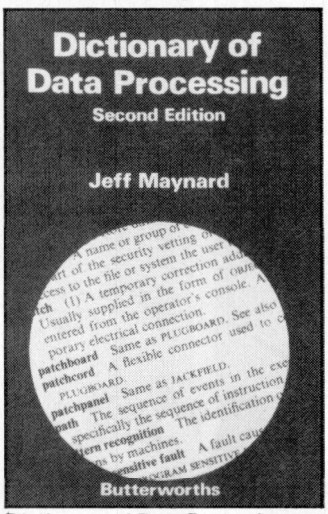
The book is a snappy presentation of a two-year study conducted by Huws for the Leeds Trade Union and Community Resource and Information Centre. It is a didactic book. Huws believes that women's jobs will be cut drastically by new technology and that the way to respond is through collective union action.

She marshalls statistics and experiences to support her argument. She writes clearly and crisply. The text is broken up by photographs, snippets and descriptions of the technology which look like mini-featurettes in pop newspapers. Huws focuses on the five work areas where most women are employed — clerical, semi-skilled factory, housework, the 'caring' professions (nursing, etc) and sales and distribution. She explains where technology is likely to be applied and offers practical guidelines on how to negotiate over new technology.

This is one of the liveliest, most succinct and readable books on the impact of information technology. It gains in strength by focusing on one aspect of that impact, rather than trying to cover the whole waterfront. I agree with her conclusions, particularly in the short-term. As she says, it is difficult to predict what and where new jobs will be created by information technology. They undoubtedly will be generated. It is more predictable, however, that many women will have to face either unemployment or a very different working environment, because of technological change. I know that many people profoundly disagree with this conclusion, although the optimists tend to base their bright outlook on hope and wishful analogies with previous industrial revolutions. They tend to forget, however, that earlier industrial revolutions were pretty painful for some people at the time.

Even those who disagree with Huws should welcome this book which provides much useful information and puts her case so lucidly. It helps to make the debate about new technology sharper and more informed.

Look it up



Dictionary of Data Processing — Second Edition by Jeff Maynard (Butterworths, £12.00)

Jargon is the great mystifier. Every subject, however, must necessarily develop its own terminology, whether the specialisation is computing, nuclear physics or gardening. It is pie-in-the-sky to expect that, with the best will in the world, every computer article or conversation about computers could avoid jargon. What is needed is a good dictionary to find out what some of the mystery words mean.

The problem with computing jargon is that it changes and expands so rapidly that it is difficult to pin down. For example, when Jeff Maynard produced the first edition of his *Dictionary of Data Processing* in 1975, the personal computer world was just about to explode on the information technology galaxy. Mainframe computing was a relatively self-contained subject. Seven years later, not only has computing itself been revolutionised but it overlaps increasingly with areas such as telecommunications, the electronic office, electronics, and so on.

Maynard has made a useful attempt to update his first edition to include new developments. Inevitably, it is still biased towards traditional data processing but it has spread its wings to cover other aspects of computing.

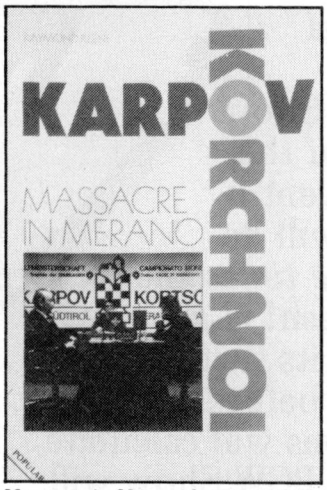
Maynard's descriptions are succinct — generally less than 50 words. It therefore cannot be regarded as an encyclopaedia or as an introduction to computing in alphabetical order.

I found most of the general computing words that I looked up, although it still seems weak on office systems (words like local area network, electronic mail, voice recognition, workstation, and other innovations in the electronic office are omitted).

The traditional DP origins of the dictionary are shown by the inclusion, for example of 'George' (a late '60s ICL operating system) but CP/M is left out.

In such a rapidly changing field, any computing dictionary is likely to be out of date before it is published. I hope Maynard keeps updating his because it is concise and clear and already, with over 4000 terms, has the answers to many questions of jargon.

Board war



Massacre in Merano by Raymond Keene (Batsford Chess Books, £3.95)

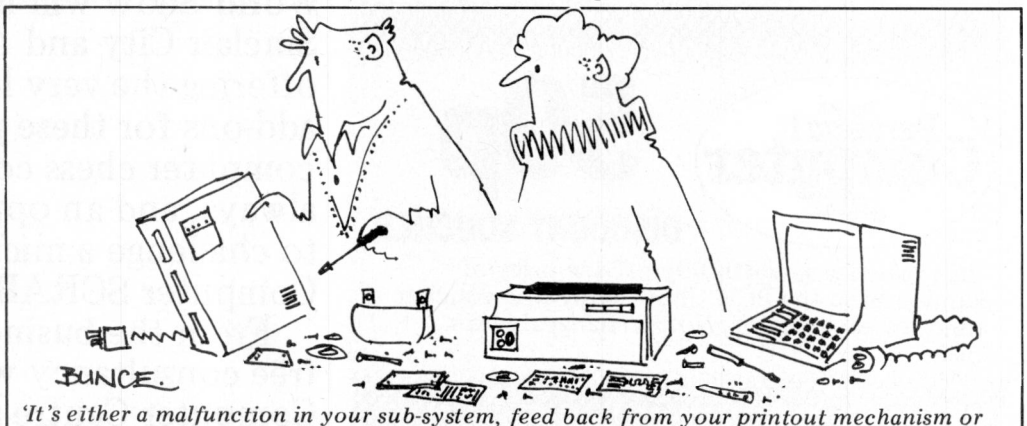
Chess is supposed to be one of the supreme examples of human intellectual achievements. Getting computers to play chess has therefore been one of the touchstones in the progress of 'machine intelligence'. Yet *Massacre in Merano* by Raymond Keene shows just how illogical, nasty and silly chess supremos can be.

The book is basically a description of the 18 games of the 1981 World Chess Championship held in the Italian town of Merano when world champion Anatoly Karpov 'massacred' challenger Viktor Korchnoi by 11-7. The games themselves will be of interest to chess buffs but Keene also provides an insight into the strange behaviour of the contestants particularly Korchnoi.

Grandmaster Keene had been Korchnoi's advisor when he lost an earlier championship. Korchnoi had become involved in parapsychology, accusations that Karpov was cheating and a whole lot of unintelligent behaviour. He ended up by accusing his old friend Keene of being a 'man without moral scruples'. Despite this earlier attack, Keene manages to keep a detached coolness about his reporting. He briefly describes the background to the chess world championship and puts up his defence against Korchnoi's attack.

The only mention of computer chess is a small piece at the end, which describes how the SciSys Chess Champion Mark V performed creditably when it was given the task of scrutinising the Merano game. 'On several occasions, admittedly in more simple, tactical positions, the Mark V was able to improve on the play in the match, and once it succeeded in seeing more than the commentators,' says Keene.

SciSys will welcome the plug but the main reason for reading this book is for what it tells us about people's rather than computer's behaviour when following an apparently rational 'game'. This may be outside the mainstream of computer books which I usually review but so many *PCW* readers are keen on chess that I thought this intriguing book was worth a mention.



'It's either a malfunction in your sub-system, feed back from your printout mechanism or a fault in your fan unit. Either that or you're shorting the National Grid.'

TOMORROW



The 5th Personal Computer Word Show this September will be the largest and most exciting microcomputing exhibition ever held in the UK.

There will be over 25,000 square feet of display space in the newest and most prestigious exhibition venue in the country.

It's the only micro computing show to offer literally hundreds of stands covering micros for home, business and educational uses. Previous visitors to the PCW Show will get some idea of the size of this year's event if we tell you that it will be approximately *three times* the size of last year's bash! (Last year's show was, in its turn, twice the size of the year before. Statistically minded persons will calculate that at this rate the PCW Show will cover the face of the planet by the year 1995.)

The 5th Personal Computer World Show

50p

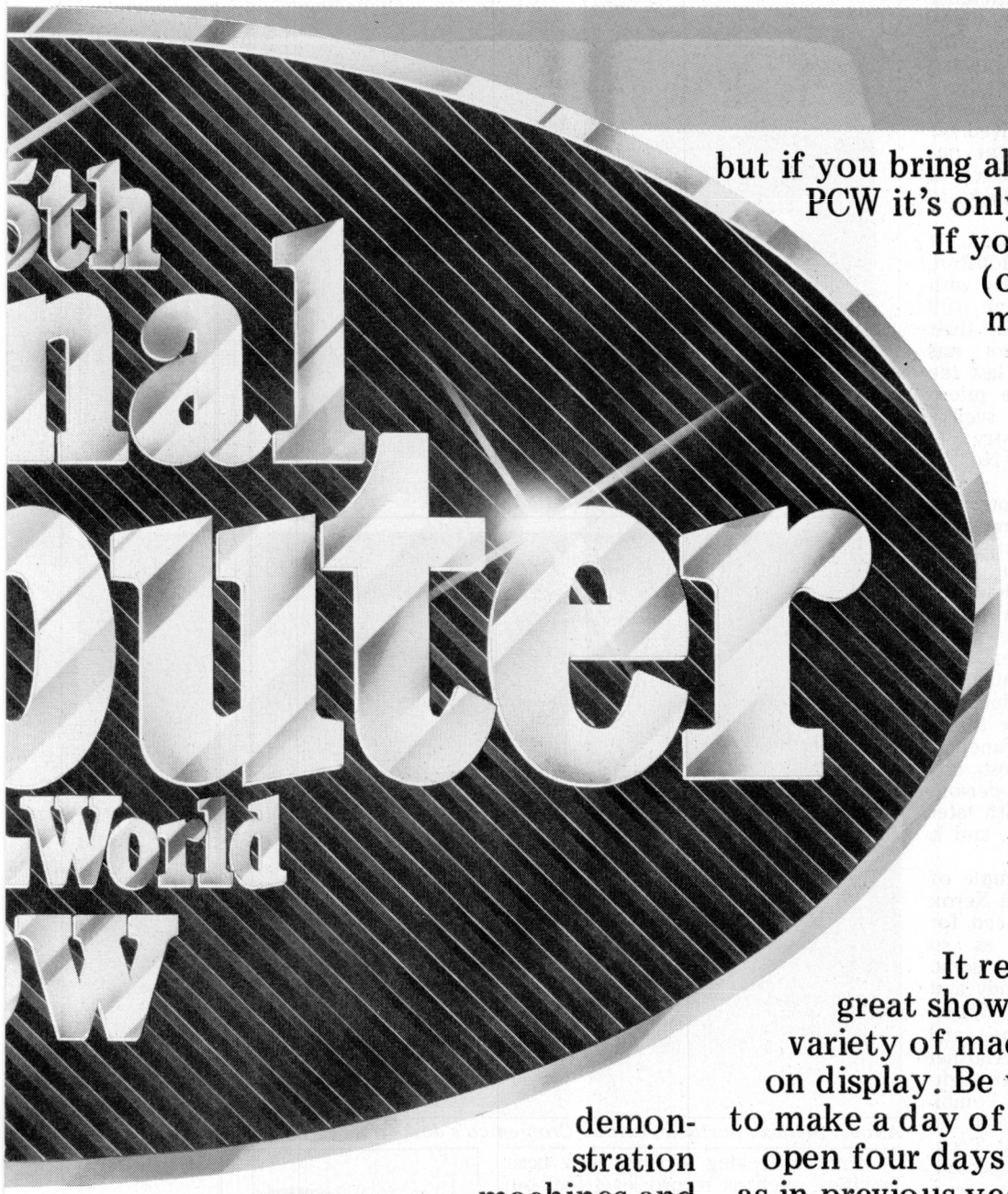
DISCOUNT VOUCHER

This voucher is worth 50p off the price of admission to the PCW Show. Only one voucher valid for each visitor. Not exchangeable for cash.

Features of The 5th Personal Computer World Show will include a Sinclair City and Acorn/BBC Arcade offering the very latest software and add-ons for these popular machines, computer chess competitions as always, and an opportunity for you to challenge a micro to a game of Computer SCRABBLE ®.

From the business angle there's free consultancy with the National Computer Centre and more

THE WORLD!



demonstration machines and business software than you could get to see in a year at your own office. But you needn't risk divorce to evaluate them. . . your wife (or husband!) and the kids can be looking at the vast array of home and educational micros in one of the other halls. It's £2.50 to get in but if you bring along a coupon from PCW it's only £2.00 per person.

If you're a business user (or potential user) of microcomputers just write with your cheque for £2.00 (payable to the Personal Computer World Show) to Tim Collins, PCW Show, 11 Manchester Square, London W1, enclosing your business card. We'll send you a special 'Fast Lane' ticket to save you the trouble of queuing.

It really is going to be a great show with a tremendous variety of machines and software on display. Be warned, you'll need to make a day of it (remember we're open four days this year, not three as in previous years) so give yourself plenty of time and wear comfortable shoes! See you there. . .

BARBICAN CENTRE, CITY OF LONDON

9–12 September 1982

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The show that launched 100 micros

Jane Bird reports on the NCC, the biggest computing bonanza of the year.

The National Computer Conference (NCC) takes place each year somewhere in the US and has traditionally been the platform for the more exciting launches by major manufacturers.

In the past that strange phenomenon the microcomputer has been hived off to some distant hall and sought out only by the more eccentric members of the computer fraternity that flocks to the show.

This year witnessed a revolution. At the 1982 NCC, 7-10 June in Houston, Texas, the main hall was seething with a mass of micros. There were 100 micros launched at the show and their appearance in the mainstream was utterly without precedent. At last the industry had faced up to the micro and, as you would expect of such a dynamic and modern industry, it doesn't do things by halves. Not in terms of quantity at least.

This burgeoning of the personal computer (PC) at the NCC represented the third revolution in the history of the thing, according to micro consultant Bill Meserve from Arthur D Little. 'First there was the birth of the PC in the US in 1975. Then there was the introduction of the IBM Personal Computer, office automation, integrated data communications and the decline of hardware costs. Together, these things spell the birth of the multi-function workstation. Such a product costs less than $6000 and provides one-person-orientated clustered systems with later additions of graphics and voice, and it is the next tangible product.'

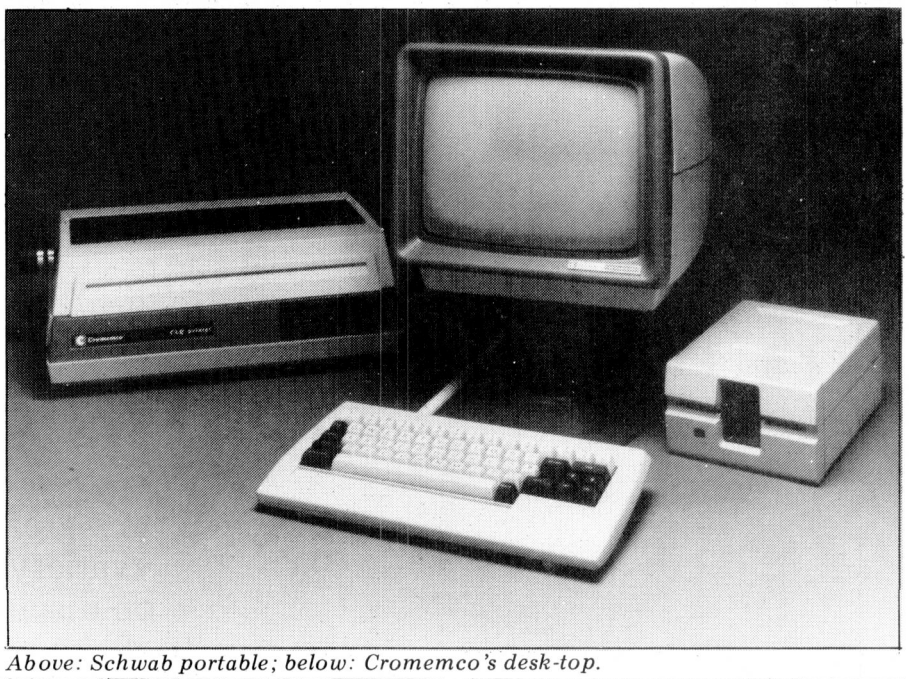
Meserve cited the best example of what he means as evinced in the Xerox Star. He saw the marketing need for these personal workstations as so essential that it will necessitate some curious partnerships such as Tandy and Datapoint, Apple and Univac, Nippon Electric (NEC) and Cullinane, and Motorola and Computer-Land. Another we have recently seen is the Burroughs and Convergent Technologies combination which won mixed approval at the NCC. Although the Convergent Technologies device is much respected, punters thought that Burroughs, as a high-technology corporation, ought to have been able to design a micro of its own. At least Burroughs has added some good business software to the B20.

But despite the abundance of micros at the show and the inevitable emergence of the 16-bit systems, pundits thought the lack of software bound to hold everything up for some time.

'We have seen endless super boxes here with only embryonic software,' said Martin Healey of Future Technology Systems. 'There is no software for the 16-bit systems so that although the death of the 8-bit systems is only just around the corner, it could be a long time before we get there.

'And in the meantime there has been some thoroughly irresponsible pushing of the Unix operating system as viable business software.

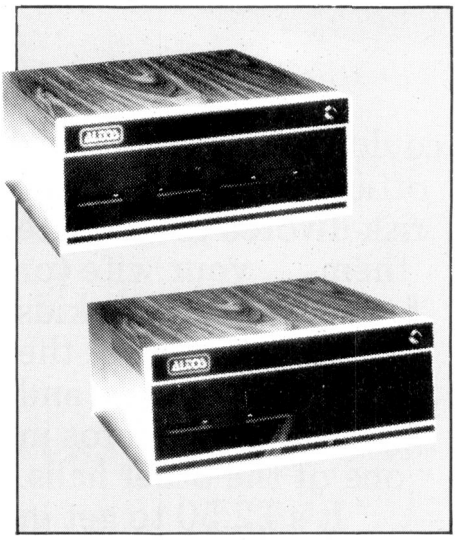




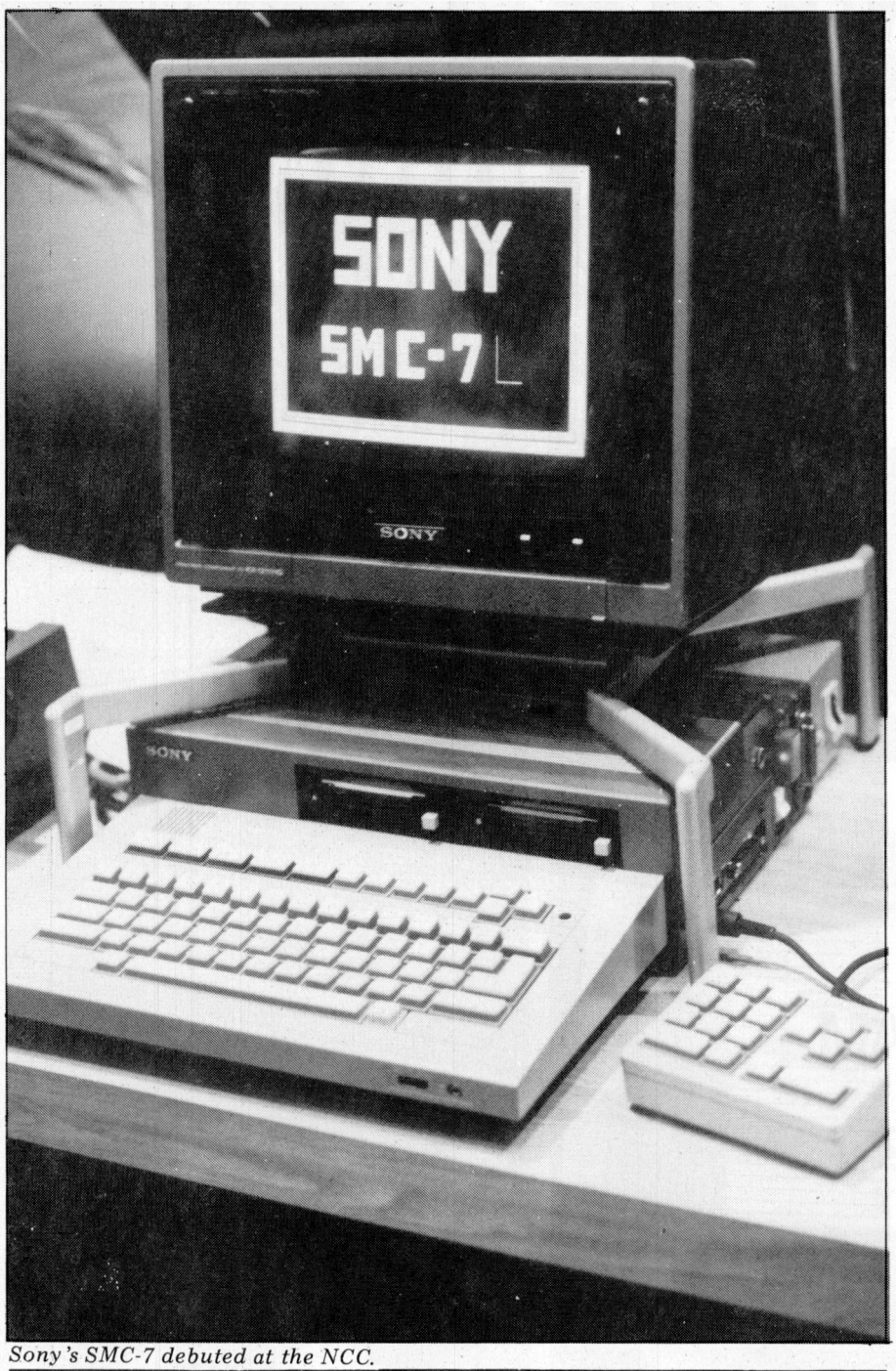
Above: Schwab portable; below: Cromemco's desk-top.

'Unix is lacking in some very basic facilities, such as record level lock-out and if personal computing is to take off then it is essential to have a range of user-friendly interfaces. But Unix is not the only operating system which is providing inadequate facilities for personal computing. Oasis from Phase One Systems is a 16-bit system which provides no memory management,' said Healey. But at least one group of pundits was not so pessimistic for the future of Unix on micros.

Jean Yates, author of *A User Guide to the Unix System* (Osborne/McGraw-Hill, 1982), in which she claimed Unix to be the emerging standard for 'communications, file transfer, software development and transportability in general', claimed to know of 500 Unix products under development and soon to be announced, and saw the market for the coming year as $3 billion



Altos boxes.



Sony's SMC-7 debuted at the NCC.

for Unix software alone and $9 billion for Unix related hardware which is moving in the direction of office automation.

Healey pointed out that it is the need for user-friendly interfaces which tolls the death of the 8-bit systems. 'They have to go because of their lack of address space and not because of their lack of power. It is not a question of needing better performance but of needing space for bigger programs to provide those user-friendly interfaces.'

The Intel 8086 provides 1 Mbyte of RAM and the Motorola 68000 will handle 4 Mbytes for each user. To see the potential success of 16-bit micros you can compare this with a Digital Equipment (DEC) PDP 11 which only gives each user 64 kbytes of RAM.

So what micros were being launched at the NCC? New machines below the $1000 mark came from Morrow Designs, Cromemco and Commodore Business Machines. . . . Toshiba introduced a portable Z80 compatible computer with a standard keyboard, four-line display and modem for $1290. Morrow's briefcase-sized Z80-based Micro-Decision with its integral 5¼in minifloppy of 200 kbytes capacity does not include either a terminal or a printer but does have a range of business software. Initially it will be expandable to two drives with a storage capacity of 1-6 Mbytes and will sell for $1195.

It is notched up against the Cromemco C-10 Z80 machine which is packaged in a CRT but costs extra for the software. Cromemco is calling existing micros 'deskhogs' and claims the C-10 takes up to only 10 sq ins of desk space. Slightly higher priced was Epic Data's Episode C/PM machine starting at $2550 for a system with 400 kbytes of disk storage.

Compatibility with the IBM Personal Computer was predictably a selling point with a lot of the new 16-bit micros. IBM's machine is based on the Intel 8088 processor and North Star Computers unveiled an 8088 version of its Advantage desktop computer, the Advantage 8/16. The standard Advantage is field upgradeable to the new version for a cost of $499. The 8/16 will be able to run MS-DOS, IBM's OS from Microsoft, and eventually CP/M-86 and will read a disk from an IBM Personal Computer. North Star also joined the low-cost networking race with the introduction of NorthNet, a common-bus, one-megabit-per-second local area network with an inexpensive twisted pair cable as the bus.

Hitachi also introduced an IBM Personal Computer compatible 8088-based machine with a colour option and 128k RAM.

NEC made an attempt to go one better than IBM with an advanced Personal Computer (APC) based round an NEC manufactured 16-bit, 8088-compatible processor. MS-DOS is planned for the near future. The APC offers up to 256 kbytes of RAM and a standard 128 kbytes monochrome model with 1 Mbyte, double-sided 8 in floppy disk drive and costs $3298. NEC has contracted with 70 independent software developers to provide packages for the ACP including word-processing and a Cobol compiler.

Software Arts, the creator of VisiCalc, came out with a program generator for engineering and business. Called Tool Kit! (TK!) Solver (the exclamation mark is a reference to the action key (!) the user presses to make a program work), the program performs calculations and can convert units at output point. It can work out compound interest rates or the rate of radioactive decay. Software Arts says the product uses artificial intelligence principles and understands rules and equations so that the user doesn't have to structure his thinking. VisiCorp owns the marketing rights to VisiCalc but will not be involved in the distribution of TK!Solver.

Cognitive Systems claimed to be the only company in the US that is seriously pushing artificial intelligence or knowledge-based user interfaces into the commercial world, including onto micros. It uses Lisp to write specific application interfaces which are intelligible to non-DP personnel and allow machines to appear to think and understand like humans. The programs show linguistic understanding and can function with some degradation on micros.

Ethernet provided a launch novelty for Altos Computer Systems, San Jose, which was claiming to be the first micro with that standard networking interface, on its new 16-bit ACS8600 system. Xerox demonstrated 8081 personal information systems, text-processors, electronic typewriters, laser printers, and electronic files — all operating on Ethernet.

Zilog introduced the MCZ 2/60, a general purpose 8-bit workstation with CP/M. It also showed the high-speed

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as an intelligent 1/0 processor.
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- Compatible with all CP/M software such a wordstar.
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local area network Z-NET II, linking multiple units of Zilog's 16-bit System 8000 'supermicro', which supports Unix.

Zenith, from Glenview, Illinois, launched the Z100 series of combined 8 and 16-bit (8085 and 8088) desktop machines for business and OEM makers. The idea is for users of 8-bit machines to have an upgrade path while making currently available software 2-10 times faster and giving them access to the memory and power of 16-bit machines. Memory is expandable on all models to 768 kbytes and a 5 Mbyte winchester disk will be available early in 1983. Price is about $5000 and Peachtree software and electronic mail is available. A kit version of the computer will be available from Heath in early 1983.

The Charles Schwab Corporation unveiled its Pocketerm One, which it claims is the smallest, lowest cost, self-contained telephone data terminal currently available. It weighs 13 ounces and includes a full alphanumeric keyboard and 16-character display. It will initially be marketed only to corporate purchasers but will be available to individual buyers later this summer for $399.

Meanwhile, UK companies showed a strong presence at the show: Cambridge-based Torch Computers found about 120 dealers for its twin Z80 and 6502 machine which has an optional 68000 plug-in card; Rair, whose Black Box has been adopted as the ICL Personal Computer, had a sneak preview of its 'Cream Box' which, for the time being, is being guarded in-house and not handed over to ICL.

'ICL wants the Cream Box but for the moment we are playing hard to get,' said Mark Potts, president of Rair Microcomputer Corporation. Although the Cream Box uses the 8085 8-bit processor it is capable of addressing up to 1 Mbyte of RAM and supports four workstations with the basic configuration.

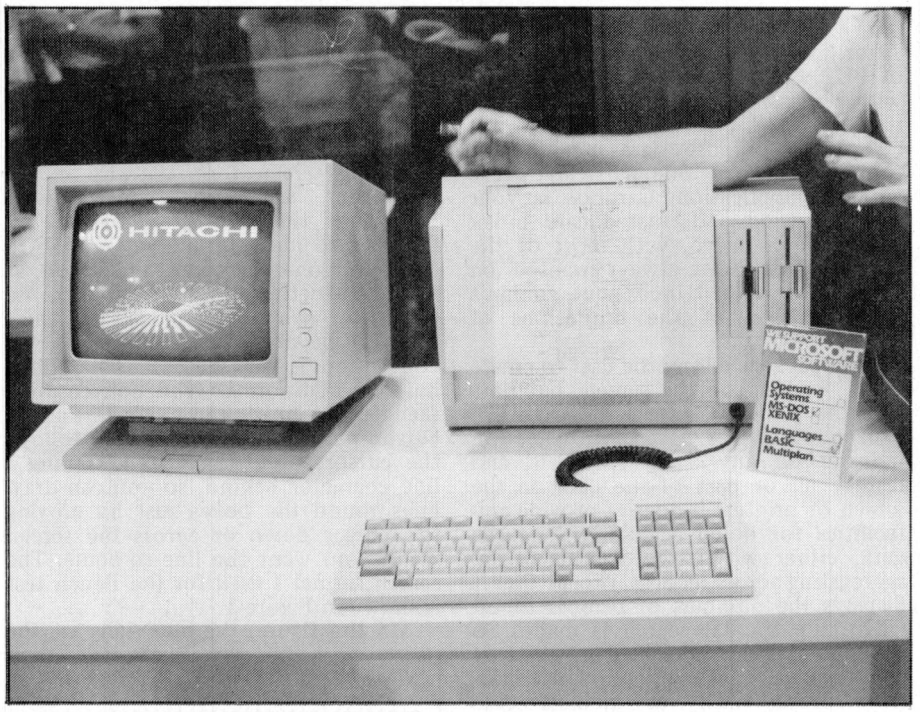
On the subject of the increasingly competitive marketplace for microcomputers, one of the micro session speakers, Ben Rosen, said that the threat to the US from Japan is wildly exaggerated. He cited the example of Oki finally getting its act together by coming into the US under BMC after 18 months of trying to get in directly. He reckoned the PC8000 from NEC is still not selling in the US very well, partly because of the fact that the US market is mainly business while the Japanese market is mainly hobbyist. He put the micro ranking over the next five years as IBM, Apple, Tandy, NEC and Atari, 'although the distribution channels are in total disarray and you often get six separate distribution channels for the same product, all competing for the same customer.' But he reckoned there is 98 percent of the market still untapped — personal computers have only reached 2 percent penetration.

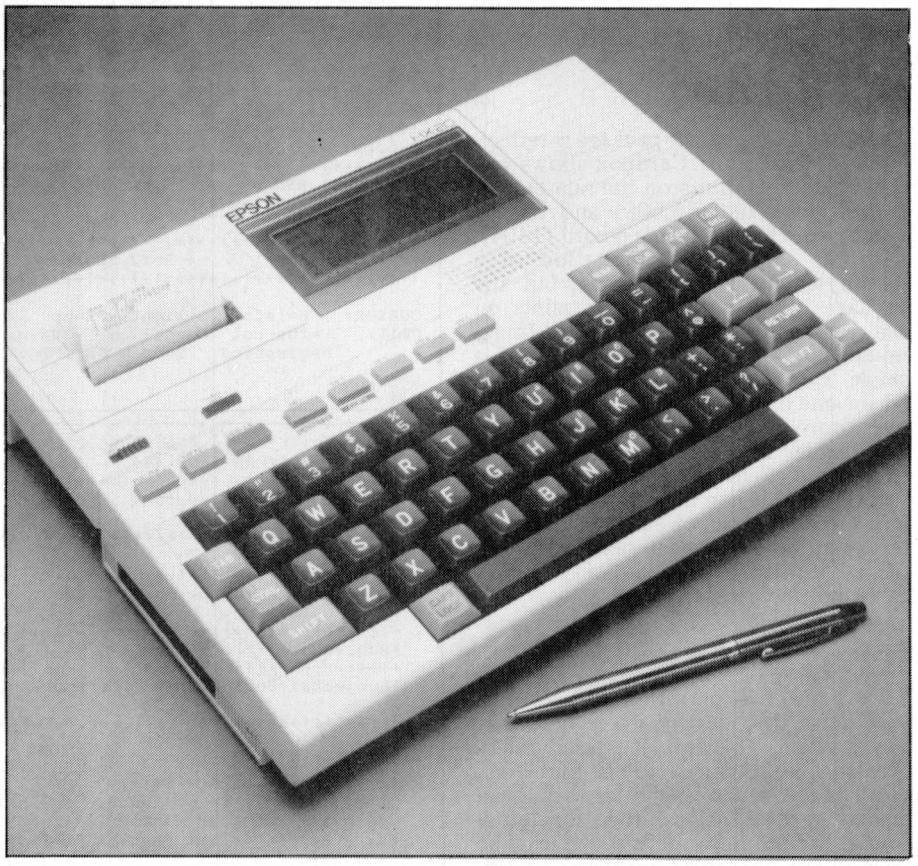
US CP/M software design outfit MicroPro, which wrote Wordstar, announced the establishment of a Tokyo-based Japanese subsidiary to market Japanese translations of the firm's software. 'MicroPro is the first micro-computer software firm outside Japan to translate its products fully into Japanese,' said Frederick Schuchardt, president of MicroPro's World Trade Division. MicroPro also entered into a joint venture with a Japanese micro and software education programme which will take place in schools throughout Japan and pupils will be taught to use MicroPro's products.

So there is no shortage of activity in the micro field and although machines are not necessarily getting any cheaper, you are getting a lot more power for your money.

But the message which came over strongly at this year's NCC was that this power isn't going to help get micros wider usage unless there's a concomitant expansion in software and particularly in user-friendly software.

If a substantial number of those 98 percent of potential micro owners are to be won over, they have to have a micro they can use like a car — without needing to know how it works. END





BENCHTEST SOFTWARE

CARDBOX

Kathy Lang gets to grips with a new British product, an electronic card index system.

After last month's foray into the world of PET with Silicon Office, we're back with micros running CP/M — but this time with software which is aimed, not at general purpose data management problems, but at one particular, very common application. Cardbox is your familiar, tried and trusted card index stored on a micro, with most of the features you have always wanted on your manual card index but couldn't have, because of the limitations of pieces of card.

The package allows the user to create 'card' formats on the screen, put data into the card index from the keyboard or from other files, have the information indexed on any word specified, and display all or part of the data on the screen or printer. It doesn't provide any facilities for doing calculations on the data, either within the records or by aggregating across records, except that it displays the numbers of records found when a particular search is made. So Cardbox is clearly aimed at textual applications — bibliographies, descriptive records such as medical case histories, and so on, rather than at areas where the manipulation of numbers is an essential part of data management.

Constraints

The orientation of the package is reflected in its limitations. Cardbox allows you quite generous limits on the numbers of records in a file (65,500) and on the number of characters in a record (1404), with the usual CP/M limitation of 8 megabytes on total file size, but the package imposes tighter constraints on the number of fields in a record (maximum 26). Although the layout of a single 'card' or record must be described on one display screen, fields may run over more than one line — and indeed the record could consist of just one very large field if you wanted. Any word or phrase can be indexed, but each indexed item may not exceed 32 characters. Cardbox can deal only with one file of information at a time, so you can't link records across files.

Input and updating

To put information into a Cardbox file, you must first design a screen format for the data. This format is used whenever changes are made to the file. When using the search facilities you can display records using either the initial format or other formats which can be created for particular purposes; providing 'overlay' formats to display the information in different ways. Formats both describe the way the data is displayed and define the length of fields for filing the records away. Cardbox provides a screen editor for use in designing screen formats, with cursor movement using the control keys following the Wordstar pattern — CTRL-E to move up a line, CTRL-S to move left one character, and so on. It would be better still to be able to use the cursor arrow keys — but if you can't then to be able to use a well-known convention is very helpful. This editor has, in addition to the conventional facilities for putting in characters at the cursor position, the ability to 'follow' the cursor round the screen, trailing a line character behind, so you can draw lines round the boxes just by moving the cursor down or across the screen where you want the line to come. The screen format I used for the Bench test is shown in Figure 1.

On the figure, the plus signs are the 'draw' characters as they came out on my printer. The items AAAAA, BBB . . . etc, are the data fields. Since Cardbox doesn't have any calculating facilities, it doesn't need to distinguish different data types but it *does* need to know the maximum length of each field. To describe a field, you give it a caption, which is a field label, of up to 16 characters, an abbreviated field name of two letters which you use to describe the field when editing records or searching them, and a single character identifier which is used when 'placing' the field on the screen during the formatting operation. This is the only time the single character description is seen by the user, which is just as well as I found the use of one character for a field when laying out the format, and two characters at other times, very confusing as both are displayed on the screen while you are adjusting screen formats. So in my example the variable System3 has the identifying letter P and occupies three positions at the point on the screen which follows its caption. None of my fields spread over more than one line, but if one does, you just mark the beginning and end of the field, and Cardbox treats those two points as diagonally opposite corners of a box which is to contain the field. So if System3 had needed two 'words' up to three characters long in the same position, Cardbox would have shown that as

PPP
PPP

and I could still have had the field called Rating exactly in the position shown on the figure.

When you set up the screen format, you also say how you want the field indexed. There are four possibilities: the

```
 CARDBOX(F)    File =  PCWBTBOX.FMT        EDIT SCREEN                    PRINT

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+ REFNUM AAAAA       + NAME BBBBBBBBBBBBBBBBBBB                               +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+ Date Cre CCCCCC      Type DDD                                                +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+ Description EEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEE +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+ Supplierl FFFFF    + Pricel GGGGG        + Supplier2 HHHHH  + Price2 IIIIII +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+ Supplier3 JJJJJ    + Price3 KKKKKK       + Supplier4 LLLLL  + Price4 MMMMMM +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+ Systeml NNN        + System2 OOO         + System3 PPP                       +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+ Rating QQ                                                                    +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+ Refl RRRRRR        + Ref2 SSSSSS         + Refl TTTTTT       + Ref4 UUUUUU   +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

CURSOR:  ^S=left  ^D=right  ^E=up  ^X=down                    ROW=03 COL=01
EDIT:  ^V=ins col  ^G=del col  ^N=ins row  ^Y=del row
       ^W=graphics  ^Z=draw ON/OFF  ^P=print  ESC=exit
```

Fig 1

```
 CARDBOX(U)     File = A:BOOKS.FIL      PRINT
Level  0 - RECORD 1 OF 434
  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
  +Author: Mark Girouard                                                     +
  +                                                                          +
  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
  +Illustrator:                                          +Language:          +
  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
  +Title: Life in the English Country House                                  +
  +                                                                          +
  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
  +Publisher: Yale U.P.                                  +Date: 1978         +
  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
  +Subjects: Society, architecture, history, England, country-houses.        +
  +                                                                          +
  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++


Enter command: SELECT SU/
  Enter the word to be found.      (hit RETURN at end)
   "?" will match any letter, "+" any sequence of letters.
LIST:  ^R=1st ^C=last ^A=back ^F=fwd   ENTRY:  ^X=erase ^H=backspace
```

Fig 2

words in a field may always be indexed, or never indexed, or indexed unless the user overturns this decision when the data is input, or indexed only if the user asks for it when the data is input. For either of the optional indexing possibilities, you can choose whether to index or 'unindex' all the words in a field or only some of them. You can also index phrases formed by hyphens — these are indexed both as phrases and under the words which form the component parts of the phrase. All these operations are confirmed when putting the data in with the use of the TAB key, and if you have the right kind of terminal then indexed words and phrases are highlighted on the screen. Cardbox will not allow you to put data in a field beyond the confines which the format allows. If you have records which contain many duplicate fields, you can take a copy of the current record and edit only those fields which have changed, then store it as another record.

In most data management systems, once you have defined the record structure it is hard to change it, and this usually involves copying the whole file out to a new structure. With Cardbox it's very easy; you simply change the main screen format for the data file and Cardbox will show blanks as the value of that field for existing records until you put some data into them. However, if you decide that, while you don't want to change the record structure, you *do* need to index a previously unindexed field, this is much harder, and involves copying the file out in an external format, inserting an index flag before the desired field in each record, and copying the data back into Cardbox. The obvious way round this is to index everything from the start, but this might be expected to slow data entry down; I didn't try it. The same process of flagging index fields and copying the data file into Cardbox can be used to translate any ASCII sequential file into Cardbox format, so it's possible to 'port' data from other programs.

Editing records is achieved by retrieving them using the selection mechanism described later and either modifying or deleting them. During amendment, the cursor can be moved around the record on the screen using control functions much as in the process of formatting the screen, using Wordstar-like control characters.

Displaying data

Records in any file can be displayed using either the screen format employed for data input, or one of any number of different formats set up for particular purposes. These formats do not have to refer to every field in the record; if a field identifier is not used then Cardbox simply ignores the field for display purposes. So, if records consist of a mixture of confidential and 'open' information, then different overlays can be designed so that people with different roles can access only the parts of the record they need for their particular purpose.

Printed reports

Exactly the same mechanism is used for designing printed reports and for screen displays. This has the advantage that you only need one format to get going, and the disadvantage that even if your printer will print more than 80 columns wide, you can't exploit that. (On reflection, as a founder member of the 'A4 is quite big enough for human readers and briefcases' club, maybe that isn't a disadvantage after all.) In addition to the PRINT command, which prints out all the records in the current selection (see below), using a specified format, you can also take a quick copy of the screen at any time with CTRL-P. This could be a very useful feature, not just for data but for taking copies of screen formats and of instruction displays for teaching — I produced all the figures for this article in this way.

```
 CARDBOX(U)    File = A:BOOKS.FIL     PRINT
Level  1 - RECORD 1 OF 25
  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
  +Author: Sacheverell Sitwell                                               +
  +                                                                          +
  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
  +Illustrator:                                        +Language:            +
  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
  +Title: For Want of the Golden City                                        +
  +                                                                          +
  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
  +Publisher: Thames & Hudson                          +Date: 1973           +
  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
  +Subjects: Essays, travel                                                  +
  +                                                                          +
  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++



Enter command:
  MAsk; SElect, INclude, EXclude; HIstory, BAck, CLear; LIstindex;
 ADd, DUplicate, EDit, DElete;  REad, WRite; FOrmat, PRint; SAve, QUit
LIST:  ^R=lst ^C=last ^A=back ^F=fwd   ENTRY:  ^X=erase ^H=backspace
```

Fig 3

```
 CARDBOX(U)    File = A:BOOKS.FIL     PRINT
Now at level  3.  File contains 434 records.

Level  1 - SELECT SU/ESSAYS - 25 RECORDS SELECTED
Level  2 - EXCLUDE SU/TRAVEL - 20 RECORDS SELECTED
Level  3 - SELECT AU/S+ - 3 RECORDS SELECTED
```

Fig 4

Selection

Cardbox has an exceptionally powerful and flexible set of selection facilities, always remembering that we're dealing with textual data. There are two groups of selection commands, one for use on indexed fields and the other which can operate on any field. Selection is by identity only, (with case ignored) but you can use wild characters: '?' to match a single character, '+' to match one or more characters. For instance, if you ask for all records in which a particular field matched the word 'PART', Cardbox would select all those records where the specified field matched the word 'PART' or 'part' (or, for that matter, 'PaRt'). A request to match on 'PART?' would match any five-character word starting with 'PART' or 'part', such as 'parts', 'party', and so on, while a request to match 'PART+' would match all those found by 'PART?' plus words like 'partition', 'particular' and so on. Wild characters can of course be put in the middle of words too, so a request to match 'P??TION' would match words like 'portion', while 'P+TION' would match 'portion' but also 'potion', 'partition', 'parturition', 'petition' . . .

When you request matching of a field, you name the field with the two-character abbreviation specified in the screen format, not the full caption — but Cardbox helps you to remember what fields are called by displaying all the abbreviated field names at the bottom of the screen. It also gives you a reminder of what commands are available at any one time and prompts you for further input when a command is given. Figure 2 shows the screen after specifying the data file to use (a file of bibliographic information which is supplied with Cardbox and is used in the tutorial manual) and requesting the field Subject to be used for a selection.

The next step is to enter the key fields for searching. In my example I chose the subject 'essays'. Cardbox found 25 records that matched the specification and displayed the first on the screen as Figure 3 shows. The main point to note about this figure is that the level number has changed from 0 to 1. Cardbox uses the term 'level' to indicate the depth of search to which the selection has gone, meaning the number of selection, inclusion and exclusion commands that have been given. Selection simply chooses all the records in the current set (available at the current level, in Cardbox terms) which match the field value specified. This process can be further modified in two ways. The INCLUDE command allows you to extract a further set of records from the whole file — so it's really a way of having an OR function at the zero level. I might, for instance, have wanted to select titles covering either travel or biography, and I could have asked Cardbox to SELECT travel and INCLUDE biography. The third command for choosing subsets is EXCLUDE, which removes from the current set any records with a field value matching the specified value. So SELECT and EXCLUDE are the inverse of each other and operate on the current set or level, and INCLUDE always operates at the zero level of all the records in the file.

The possibilities for selection are quite wide, because Cardbox allows you up to 99 levels of selection. This can get pretty complex, and thus the HISTORY command, which spells out how you got to the current level, is an extremely valuable option. I've shown in Figure 4 the history of a search which went on from the SELECT shown before through

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CARDBOX

an EXCLUDE and then another SELECT.

Selection is flexible in some ways and restricting in others; the most noticeable restriction (given that identity is the only comparison possible, because the data is expected to be textual) is that there is no real OR mechanism below the first (zero) level. Having requested travel books, it isn't easy to request all those about Greece and Italy, say without writing out a subset of records to another file and then reading them back. Of course, you could get round that particular example by SELECTing Greece, INCLUDing Italy, and then SELECTing travel — but you have to think about the order and there would be some combinations in which only creating a subset file would give the desired results.

The restriction of matching by identity (albeit with wild codes) might be limiting where an application involved searching date fields, when it can be useful to be able to say 'find all the records where "date of last appointment" is more than six months ago.'

Sorting

Cardbox doesn't have any facilities for sorting, and it keeps the data in an arbitrary order, retrieving it in the order in which it is filed. So if you wanted your books (say) listed in author order, you would have to use another program, such as Supersort, to do it.

Tailoring

Cardbox can be preset for one of quite a number of commonly available terminals. If yours is not one of these, it can still be adapted fairly straightforwardly, though I did have some problems with items to which I did not want to give a value. You can't then tell Cardbox that your terminal has arrow keys for moving the cursor about, or give it information about the terminal's highlighting capability. Apart from adapting it to match your terminal, Cardbox doesn't have any tailoring facilities. The feature that I missed in this area was the lack of any ability to store sets of search and select commands in a file. Often one wants to do quite a complex search regularly as data is updated, and it is tedious to have to retype the instructions every time.

Stability and reliability

Cardbox is the first system I've come across with explicit facilities for repairing a set of data which has become corrupted — either through a system glitch such as power surge, or through mishandling. I didn't need to use these, I'm glad to say, but I suspect they could be very valuable in a real-life application over a period.

Housekeeping

Within Cardbox you can copy and erase files, so the only operating system functions required are disk formatting and directory listing information. Cardbox also provides some analysis facilities to give the user aggregate information about the data, to help in tasks such a file sizing.

User image

Cardbox is a menu-driven package, using two ways of specifying what function to carry out next. At the start, the screen displays a set of options as shown in Figure 5.

To get different options, the arrow pointing to the lines of instructions is moved until the correct pair is identified. Once into the data, permitted commands are shown on the bottom of the screen as shown in Figures 1-3, and two-letter abbreviations (which are filled out by Cardbox) used to give the necessary instructions. I found this approach very helpful, especially the display of what commands were permitted at any one time. My reservations were limited to the facilities for setting up screen formats, which have some good features and some unfortunate drawbacks.

The good features include the use of the cursor to move around the screen, defining starts and ends of fields and elements such as lines around 'boxes' of information simply by 'pointing' through pressing a single key when the cursor is in the desired position. Cardbox also tells you what row and column you're on, so you don't have to do anything primitive like counting the number of times you've pressed the cursor key to get a field the right length.

One drawback of form design I've already mentioned — the confusing use of one-letter symbols for fields whose names are abbreviated to two letters, so each field has three 'names' during format definition. I should have preferred the use of a single field definition character for all fields — the use of a caption makes it quite clear which field is intended. Another silly irritation is that the command to insert a character in a position on the screen actually inserts a column — ie, an extra space in every row on the screen — so to juggle around with the spacing on one row after you've set up the rows below involves adjusting them, too.

But these are minor irritations which do little to detract from a generally well-designed package. The accompanying documentation is also written to a high standard. There is an introductory manual for complete beginners and a reference manual which is actually two documents in one — I suspect that, as they say, the last came first since it is in the usual computing mode with numbered sub-sub-sections and so on. The documenters have done an extremely good job in extracting from it the introductory and main reference manuals, which contain all you need to know in a digestible format. I only found one real howler — both manual and screen tell you that functions marked with a star are not available when displayed, then tell you to go ahead and invoke one that happens to be starred! It only occurs once, though, and otherwise the instructions are clear and well-laid-out.

I do wish, though, that people did not feel it essential to put at the front of the tutorial manual the information about configuring the terminal. Nearly every package manual does it, and it must be very confusing for the first-time user. Even in a package which is sold by mail order, it should be possible to say something like 'If this is the first time Package Z has been used on your system, it must be set up for the purpose — see page xxx in the Reference Manual if you need to do this', to avoid confronting the absolute beginner with hex codes unless they really need them. I expect this aspect of the manuals grated on me more even than usual with Cardbox because the documentation is otherwise so well thought out.

Conclusions

Cardbox is a package designed for a particular purpose, namely the automation of card indexes. Within that aim, it succeeds extremely well. Its facilities for indexing and searching are good and very fast (from my initial tests the fastest of any package I've evaluated so far) and the user image of the screen displays and the documentation are in the main excellent. Users I've spoken to particularly liked the ability to index individual words in prose text, the flexibility of the screen design, and the power of the selection facilities. Set against that are the drawbacks: Cardbox has no sorting facilities of its own, cannot store searches for subsequent re-use and does not let you change an unindexed field into an indexed field easily — and of course it has no numerical facilities at all, nor the ability to test for ranges, in date fields for instance. If these limitations aren't a serious drawback, then for bibliographic applications, records (such as medical case histories) containing continuous prose which need part indexing, and the like, at the asking price of £155 Cardbox would be a very good buy. END

```
  CARDBOX                                          +
                                                   +
PRIMARY FUNCTIONS:                                 +  SECONDARY FUNCTIONS
                                                   +
  ==>  Database                                    +     ==>  Use
       Format definition                           +          Analyse
       Operating system utilities                  +          Create
                                                   +          Repair
                                                   +
                                                   +
                                                   +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

PRIMARY-FUNCTION = [DATABASE]
SECONDARY-FUNCTION = [USE]

FILE =*
CHANGE-DISKS = [NO]

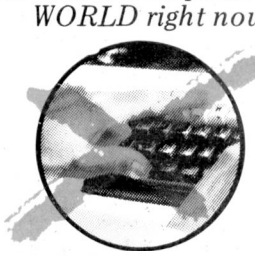
Hit letter for option (P,S,F,C) or hit ESC:
                    (options marked "*" are invalid)
```

Fig 5

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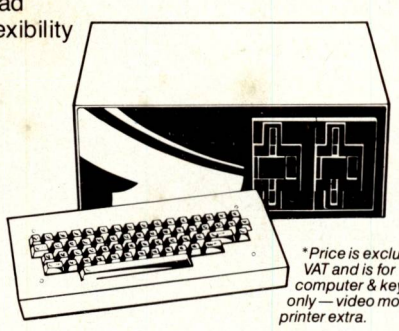
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SONY MICRO HERALDS 'ENCYCLOPAEDIA GALACTICA'

After keeping the industry guessing for months about what it would do in the micro world, Sony has announced the first personal computer with video disc capabilities. B. Harris reports.

One of the most exciting areas of Information Technology — the convergence of computing and telecommunications — is the use of video discs to store information. Although in its infancy as far as the consumer is concerned, video disc technology promises to bring us access to vast amounts of information at remarkably low cost.

As the name hints, the video disc was devised primarily to store images — TV pictures — in a compact, robust and cheap way. This is done by digitising the video signal and storing it as a stream of binary information. There are currently several methods for storing this information in disc form and several manufacturers are currently fighting to establish their particular system as *the* standard.

Because information is stored in binary, it's possible to put other things onto a video disc, specifically computer data. And because the information required to hold even a few seconds of digitised video signals is immense, it's possible to cram a massive amount of data onto one disc: the entire Prestel database would fit onto three video discs, in fact. Using this technology, it is therefore possible to combine computer data and video frames on one disc so that, for example, an entire encyclopedia of text, photographs and even film sequences or animated diagrams could be put onto a video disc. All that's needed then is some method of accessing all this information and presenting it in a structured, easy-to-use way. In fact you need a computer, and that's where Sony comes in.

Sony is quite literally a household name in this country: for years we've been buying its radios, hi-fi sets, TVs and video equipment and the company has built up a formidable reputation for quality and reliability. But the company was noticeably absent from one major and very fast-growing area of electronics — personal computers.

Rumours of a Sony micro have been rife for a while now. Most predicted confidently that it would be something truly fantastic and it was widely predicted that the machine would be a 16-bit micro, probably based around the 8086 processor. A lot of Sony's competitors gave the impression that they were really worried though nobody seemed sure when or if Sony would enter the market.

When Sony did announce its personal computer, the SMC-70, there were not a few surprises. Firstly, it's *not* a 16-bitter but has the industry's 'old faithful', the 8-bit Z80A at its heart. And among the optional plug-in accessories is a video disc interface, making it simultaneously a fairly mundane micro (because everybody else is jumping onto the 16-bit bandwaggon with a vengeance) and one of the most forward-looking personal computers on the market (because nobody else has incorporated such capabilities into a micro). What follows is a detailed look inside the SMC-70. The machine is not on sale in the UK yet and no date had been set for its introduction here at the time we went to press. But a *PCW* mole managed to glean a considerable amount of advance info on a recent visit to the States, where the machine was launched at the NCC in Houston.

Hardware

The basic SMC-70 has clearly been aimed at the Apple market in terms of styling, capabilities and price. Physically, it looks somewhat like a low-profile Apple II with a keyboard, the main PCB and the power supply all housed in a single unit. Monitors, floppy disk drives and other peripherals — including that video disc interface are all options which must be purchased separately.

The basic SMC-70 is certainly going to give the Apple II and similar semi-business micros a tough time, especially as it's price — at least in the States — will be slightly lower than that of the Apple II. In its basic configuration it offers: 102 kbytes of RAM, 32k of ROM, high definition colour graphics, a full-featured Basic, cassette interface, light pen input, a clock calendar and both Centronics and RS232 interfaces.

Inside the SMC-70 is a single large PCB housing almost everything, a keyboard with its associated PCB, another small PCB for the odds and sods which wouldn't fit on the main board and a switching type power supply. The power supply is fitted at the back of the case in a particularly neat arrangement whereby the PSU can be slid back to allow the optional interfaces to be inserted.

There are actually two microprocessors inside the SMC-70: the Z80 running at 4.028 MHz and an 8041 (an 8-bit processor with on-chip ROM and RAM) which looks after the keyboard. The keyboard processor scans the keyboard and interrupts the main CPU when a key is pressed. The CPU can also write to the keyboard processor — using the on-chip RAM — to alter various keyboard parameters under software control, such as the repetition rate of the keys, for example.

Part of the design philosophy which differentiates the Sony machine from other recent designs such as the IBM Personal Computer is the use of custom-made LSI chips. These large (64-pin) devices handle complex tasks that would otherwise require whole bunches of conventional TTL chips and presumably help keep the computer's unit cost down (as well as making it difficult to copy!). One of these special chips takes care of all the timing signals for the entire computer — instead of being generated locally as and where required, they all come from this one chip. The machine has particularly complex timing requirements, due in part to the very sophisticated video and graphics capabilities.

Two more custom chips take care of all the video functions, apart from those handled by the CRT controller, of which more later.

The SMC-70 will be supplied with a full 64k of RAM available to the user, provided by eight 4164 64k chips. The system monitor, Basic, the character set and other system parameters are held in 32k of ROM which occupies the bottom half of the address space. There's also another 32k of video RAM plus 2k of RAM to store the video attributes, another 2k for the character codes and yet another 2k for the programmable character generator (this stores the actual character bit patterns, making the entire character set completely user definable).

All this extensive video memory is addressed by an interesting, ingenious and patented technique. Instead of using the more familiar bank select method of switching in and out blocks of memory too large to be addressed by the number of address lines available (64k in the case of the Z80's 16 address lines), Sony's engineers have taken an entirely new approach to the problem. Although the 32k video RAM is memory-mapped, it is accessed during I/O commands. Not possible, you might reasonably suppose, since as every schoolboy these days knows, the Z80 can address only 256 I/O ports, using the lower eight address lines. Sony's trick depends on the fact that during every I/O operation there is something on the upper eight address lines. Normally that something is the contents of the A register and consequently not very helpful for extending the addressing capabilities. But it is also possible to do I/O reads and writes on the Z80 so that the contents of the C register appear on the lower eight address lines while the contents of the B register appear on the upper eight lines. When the video RAM is accessed, the upper and lower address lines are 'swapped' so that the contents of the

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C register form the upper eight bits. The Z80's B register also has the desirable property of decrementing automatically, partly offsetting the extra time taken for I/O operations compared with normal memory read/writes.

The highest bit of the video memory address bus is used to select (switch) the graphics RAM or normal I/O. Graphics RAM is selected when this line is 1 and ordinary I/O (cassette interface, disk access, etc) when it is 0. This leaves 15 address lines to address 32k of video memory. The advantage of this technique is that it allows virtual memory mapping of the video memory without eating into the main memory in any way. The video attributes, character memory and character set are all held in separate RAM which is addressed as normal I/O.

The CRT controller itself is the very versatile and relatively new HD46505



The naked machine



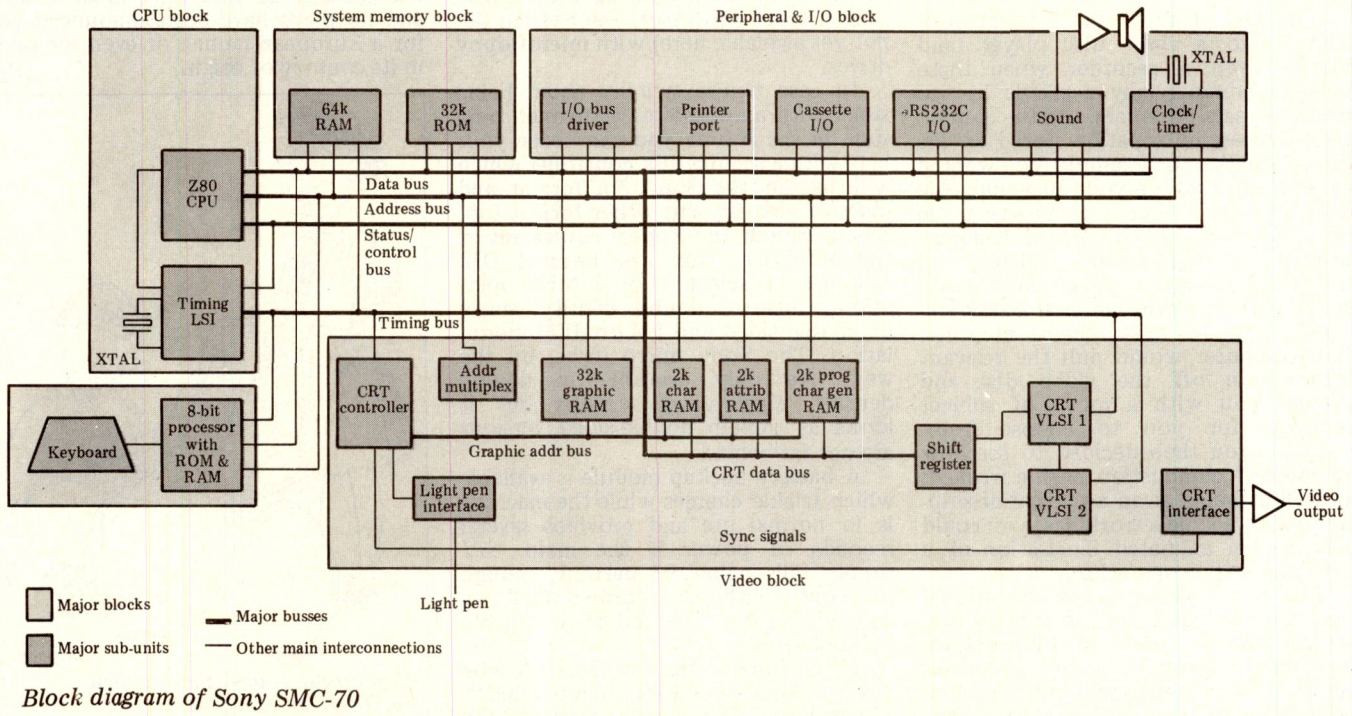
SMC-70 with extra RS232, Cache Disk and floppy controller.

CTRC from Hitachi and handles almost all the display's housekeeping; together with the custom LSIs, it replaces masses of TTL. It includes integral light pen capability and all the interfacing for a light pen is provided in the basic SMC-70, although the light pen itself is an optional extra.

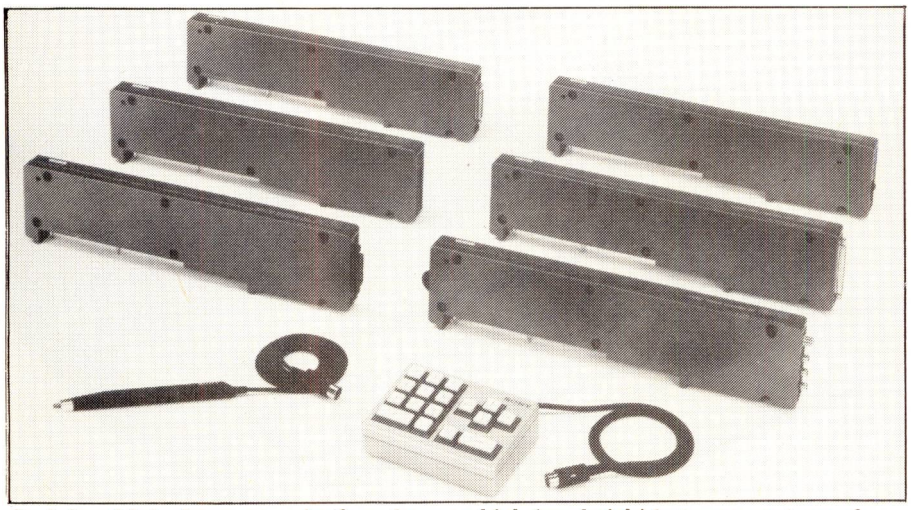
The SMC-70's video capabilities represent very nearly the state of the art in personal computers. There are four levels of resolution available to the user, the maximum being 640x400. This means we can expect to see very sophisticated graphics available on the Sony, though the single Z80 may mean that animations are not as fast as they might have been had Sony opted for a separate processor to handle the display.

Apart from the 64k user memory and 32k video RAM, the SMC-70 doesn't offer so very much on board — most of the really juicy items are options for which you have to part with more money.

Basically, the machine comes with a *monochrome* TV output and an RGB output for a colour monitor — there's



Block diagram of Sony SMC-70



Peripheral interfaces come in these boxes which 'sandwich' between centre and rear sections of computer.

SONY MICRO

no provision for a colour output to a domestic TV.

Other interfaces are for cassette (1500 baud) and RS232, the latter being configured with switches inside the cabinet. Apart from these there's also an internal speaker which can produce 'music' from Sony Basic or from your own machine code programs using the monitor and there's a clock/calendar using the MSM5832 chip.

Optional extras

Rather than launch the basic unit first and leave the add-ons for later, Sony has commendably launched a complete range of optional extras with the SMC-70.

The most exciting and intriguing of these is of course the video disc interface but unfortunately it's also the one of which least information is available. Like all the other peripheral interfaces, the video interface slots in the space created by sliding the power supply back and, of course, is designed to operate Sony's own video disc system.

The idea is that you connect your SMC-70 to a video disc player (and maybe even a recorder when these become commercially available in two or three years' time) and use the computer to access information stored on the disc. Suppose, for example, you wanted to look up 'cars' on your encyclopaedia disc. Obviously there's a massive range of subjects under this broad heading: history of automobiles, history of individual marques, how they work, road safety, environmental considerations, how to drive them, etc, etc. The computer would pull the relevant information off the video disc and present you with a menu of subject headings for you to choose from. Suppose you then decided to see how an internal combustion engine worked; as well as being given a textual description of an engine's workings, you could also see an animated illustration of a cut-away engine operating.

The implications in the educational field are enormous, for, after being presented with a 'unit' of information, you would then be asked questions about it. The computer could analyse your answers and either present the next 'unit' or re-present the old material, depending on whether or not you had absorbed the information correctly.

Sony is certainly not the only company to realise the potential of video discs for this sort of application but it is the first to bring out a microcomputer with direct interfacing capabilities. There are, it is true, a number of add-ons available for other machines, notably the Apple II, but no other micro manufacturer has taken the plunge and done the hard work itself.

Large companies and other organisations are also getting interested in the use of video discs for training and archiving — the Ford Motor Company in the States is a big video disc user, according to Sony.

At a considerably less exotic level, a wide range of other peripherals has been devised for the Sony, of which the most important is the disk drive interface.

This handles Sony's own, unique 3in microfloppies, one of several competing and incompatible microfloppy formats now knocking around. Quite who will come out on top in this particular battle is anyone's guess at the moment but Sony seems to have beaten the rest of the world to producing a computer (and a word processor, the System 35, not yet available here) with microfloppy drives.

In case you're twitchy about being stuck with an obsolete 3in format some time in the future, you can hedge your bets with a second disk controller which will handle the Sony 3in format and disks of virtually any other format too. Based around the Fujitsu equivalent of the WD1791, this has internal DIP switches to select 1 or 2 MHz operation, single or double density, single or double sided and FM or MFM modulation. The Sony micro disks, by the way, are only available in double density, single-sided versions but it looks as though double-sided versions are not far behind.

A battery backup module is available which trickle charges while the machine is in normal use and provides several seconds of power if the main +5V supply falls below 95 percent, enough to cope with the 'brown-outs' so common in the USA and so rare in the UK and Japan.

Then there's the so-called 'cache disk', a solid state 256k memory block which looks like a disk drive to the computer but, of course, is much faster to use. This speeds up file access tremendously by allowing you to read a file into the cache and work on it while it's there, only accessing the disk again at the end of the program when you dump the modified file back to disk. The CPU addresses the cache memory in tracks and sectors, via a special Sony chip which looks like a floppy disk controller as far as the CPU is concerned.

A couple of more mundane interfaces are available: an extra RS232 interface (one is already supplied in the basic unit) and an IEEE-488 interface, handy for linking up to laboratory and other instruments.

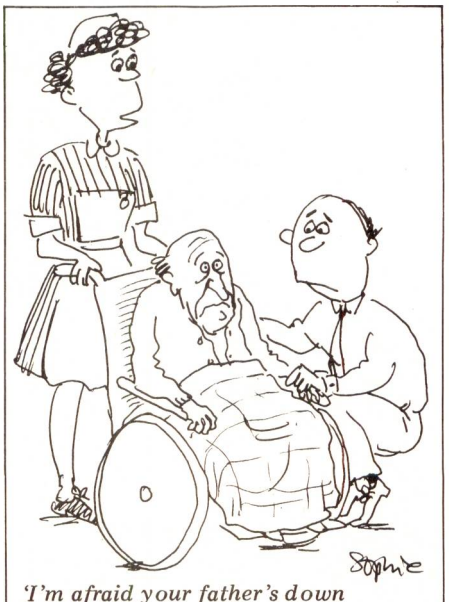
Two other modules are planned but not yet launched, a number cruncher and an add-on 16-bit upgrade using an 8086. Facts about these seem rather difficult to come by, probably signifying development problems. Certainly the 8086 module will run CP/M-86 and will allow instant switching from the keyboard between CP/M on the Z80 and CP/M-86 on the 8086.

Software

As the SMC-70 will run CP/M and (with the 16-bit upgrade) eventually CP/M-86 too, there should be no shortage of software. The only snag will be in trying to find suppliers who sell software on Sony 3in microfloppies, and we can't help thinking than Sony has made life a little bit difficult for itself with this format. Few owners will want to buy a 5¼in drive just to be able to read in the occasional new software package.

Also curious is Sony's decision to develop its own Basic rather than buying Microsoft Basic and bolting on extras such as graphics handling. Just how compatible Sony Basic is with Microsoft remains to be seen but it should be a pretty comprehensive implementation as it probably takes up at least half of that 32k of ROM.

Sony's marketing plans for the SMC-70 are rather uncertain at the moment. Like the very attractive System 35 word processor, the machine will initially be sold only in the States and no plans have been announced yet for a European launch or even for sales in its country of origin. **END**



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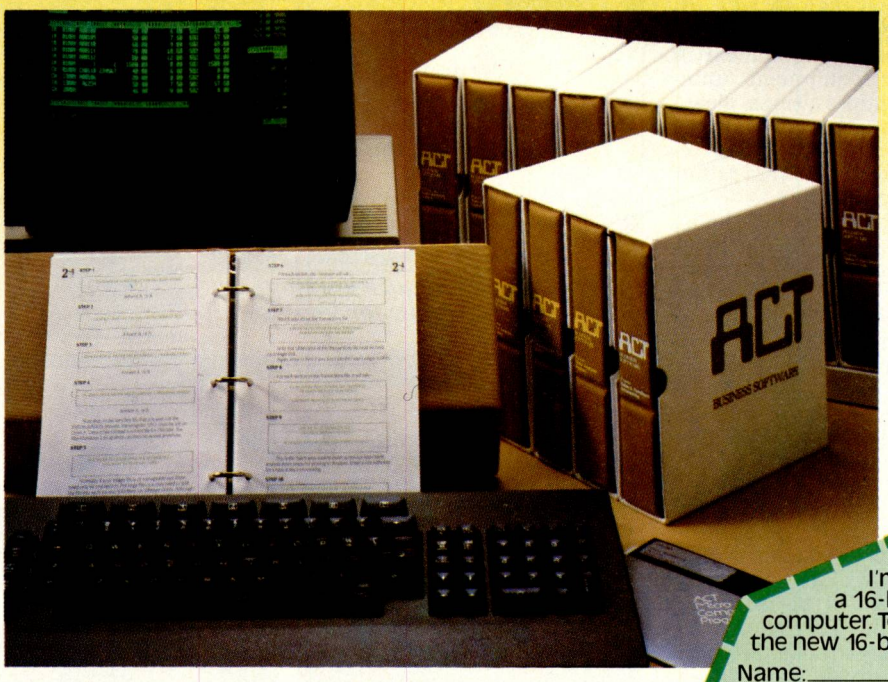
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EXPERT SORDSMANSHIP

BENCHTEST PERSONAL COMPUTER

Andrew Scott gets to grips with the latest Japanese business micro, the Exleigh Expert.



Sord is a Japanese microcomputer manufacturer with a corporate policy — IBM-style — of being the biggest computer maker in the world as quickly as possible.

In line with this objective, Sord has launched a range of businesss-oriented micros, aimed squarely at its number one victim, Apple. In Japan, Sord has pushed aside Hitachi and Fujitsu to take the second biggest-seller slot behind NEC.

Sord's Japanese drive is spearheaded through a chain of shops called PIPS Inns, after PIPS, the main software package which runs on its machines. These are rather more than straightforward computer shops though, as they're set up to allow customers to wander in and play with the equipment uninterrupted (current shop vultures please note!); they also run regular seminars and training courses relating to the practical uses of commercial software rather than the art of programming.

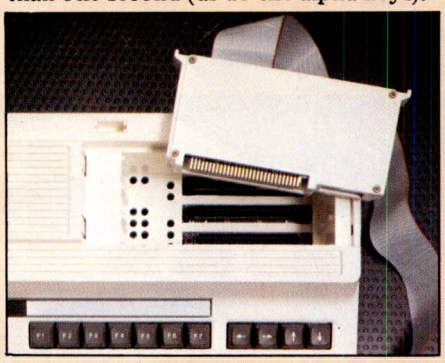
Distribution in this country is being handled by Exleigh Business Machines Ltd of Penzance and the Sord machines — renamed Exleigh — will be retailed through a nationwide chain of 30 dealers. The full Sord range is offered, from the 64k, Z80A-based M203 to the 16-bit (8086), 254k M416. All but two of the range feature colour as standard and disk storage ranges from 290 kbyte floppies to 20 Mbyte hard disks.

Hardware

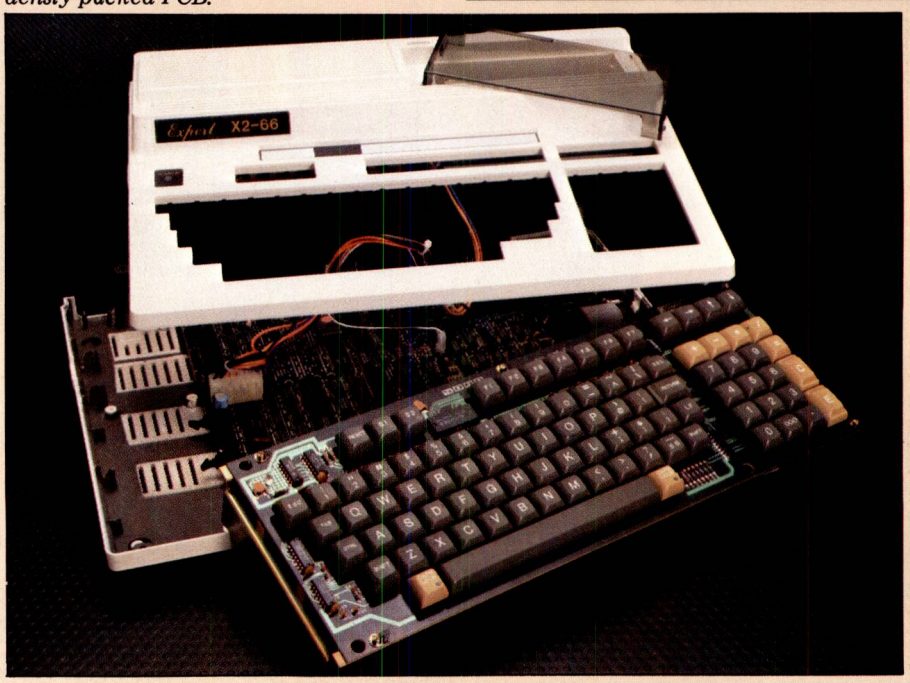
The system evaluated was based around the mid-range M23 Mk III computer/keyboard unit which will be marketed in this country as the Exleigh Expert X2-66. This unit houses the Z80A CPU and an internal memory of 128k which is configured with 4k boot ROM, 64k page 0 memory and 64k page 1 memory, which includes 4k of video RAM.

It is cased in rather cheap-looking cream plastic which gives it a very misleading 'toy' impression at first sight; this impression evaporates as one discovers the succession of high-class features within.

The keyboard is intelligently laid out; on the left the green Power On light glows dimly just in the line of vision, next to which is a group of three keys, the reset key and two 'sense keys' which operate with the PIPs software and have discreet red lamps which illuminate when in the key is functioning. From the centre to the left are grouped seven programmable keys, F1 to F7, which support 21 functions when used with the escape and shift keys and can be defined by up to 31 characters. Continuing left, the remaining four keys on the top line are cursor controls which repeat if depressed for longer than one second (as do the alpha keys).



Above: *machine has three slots for plug-in modules.* Below: *interior features densly-packed PCB.*



Photography by Brent Moore



The keyboard itself is full ASCII with the Caps Lock keys being located either side of the space bar and picked out in orange plastic as opposed to grey. When in use both keys are illuminated and, in common with the sense keys and the power on indicator, are recessed to avoid a blinding display of control information while typing. The keyboard has excellent feel and allows high typing speeds to be achieved, aided by a type-ahead buffer which compensates for the slow screen updating of the word processing package.

To the right the keyboard is a full calculator keypad with the calculator functions picked out in orange and containing a useful thousands key. In addition, the pad contains two keys E (for Execute) and C (for Cancel) which are extensively used in Sord software to move backwards and forwards through the menus, in place of the Return key. Concealed beneath the keypad is a nerve-shattering bleeper which can be programmed to operate more reverently or not at all. Also concealed beneath the skin of the unit is a cooling fan which is thankfully muted in operation and can barely be detected.

On top, beneath a smoked plastic cover, is probably one of the most refreshing innovations of the system — that of plug-in cartridges. There is space for three such devices which can be peripheral controllers, ROM cartridges (including the word processor) or CMOS RAM packs. The test unit came with a disk controller to control the twin disk drive, the word processor being disk-based. These plug-in sockets can also be used to provide an LCD display of eight lines of 80 characters or 640 x 64 dot graphics. This could be very useful as the keyboard unit weighs a mere 8lbs and with the addition of such a feature one would not need a monitor. Therefore, using the LCD and the plug-in word processor cartridge could provide a highly portable facility based on only one unit, copy being generated from the base office.

To the rear of the keyboard unit are two RS232C ports, a parallel printer port (Centronics type) and output ports for colour or black and white monitors.

The demonstration system was equipped with a green screen monitor, of which little need be said other than it presented no problems. It was, however, disappointing to note the absence of descenders on the display, especially given the otherwise advanced spec of the machine. The colour monitor would be preferable for obvious reasons but also because the software provided with the system made extensive use of colour.

A peek inside the case reveals some very high-powered production engineering in the shape of a single, computer designed, four-layer PCB, crowded with components including 64k RAMs.

The dual 5in floppy disk unit has a capacity of 330k per drive, smallish by today's standards but part of a range of compatible drives which include an 8in unit of 1M per drive. The unit is well constructed and the drives have a solid feel. My only criticism is that the drives rotate constantly and produce an irritating whirr. There is the useful facility of being able to lock the drives by use of a small switch on each drive,

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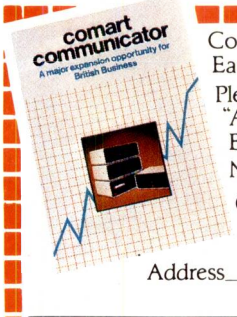
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which illuminates red when activated. This is of particular use if the equipment is left processing data unattended, thus preventing the less informed user from removing disks or powering down. The drives are single sided, double density with the IBM 34 format and utilise DMA; the interface and controller module plugs into one of the expansion slots.

Connecting this system of four units (including an Epson MX-80 matrix printer) was relatively straightforward with idiot-proof connectors. However, once it's all connected, you have a tangled mass of leads with each of the four units having its own power lead, plus all the inter-unit leads converging into one mass of cables that did not enhance the aesthetics of the system.

Software

Two languages were provided with the Expert, Sord's own highly unusual compiling Basic and UCSD Pascal.

Basic uses a separate operating system called Sord FDOS. This supports the handling of sequential data files and also I/O to and from peripheral devices using I/O files and serial or parallel channels. In addition, it contains all the utilities for disk copying and initialisation, directory listing and programming the function keys. The latter operation is menu driven and includes various options which allow writing the key assignments to a disk file and automatic read-in on booting up, so that turn-key applications can be created with very little fuss.

The system has a clock which date and time stamps all files on creation though it must be set on power up. Eighteen commands are recognised by the operating system's Command Line Interpreter and strings of them may be entered simultaneously and executed in order without any special treatment, such as SUBMIT or EXEC; error messages are in plain English, eg, CHANNEL ALREADY IN USE.

One curiosity is that although there is 128k of RAM available, only page 0 (64k) is useable by Basic unless an extra package called SYSCOM is purchased. PIPS and other supplied software use all 128k though. Altogether this is a powerful and friendly operating system.

The Basic itself is loaded from disk using the command 'BASIC'; it is a considerably extended implementation with such niceties as AUTO and RENUM built in. Two precisions of arithmetic are supported, six and 16-digit, arrays are limited to two dimensions and variable names to two characters. An unorthodox feature is the inclusion of UNTIL and WHILE which are used on their own without any DO or BEGIN in multistatement single lines: 100 PRINT "do it again": LET A=A UNTIL A=25. This will loop back to the first statement until the condition is satisfied. A welcome feature for scientists is a comprehensive set of matrix manipulation commands, seldom found in micro Basics. The standard Basic does not support any graphics statements but a separate colour graphics package can be supplied.

Editing is via a separate Edit mode, eg, Edit 100, but mercifully the whole line is displayed for cursor editing. The editor has several nice features: it automatically inserts LET (which is mandatory) into assignment statements, it performs full syntax checking on entry and it automatically indents FOR. . . NEXT loops in listings. The combination of these features allows the writing of better structured programs than the average plain vanilla Basic.

All this refers to ordinary interpreted Basic; the sting in the tail is that having developed your program interpretively you can if, you wish, compile it. The source program is saved as normal, then a COMPILE command is issued from the operating system and the file is read in and compiled to Z80 native code. A variety of compiler directives can be added to print an assembly listing, save the assembler source on disk, save a relocatable code file and link in library routines. Compilation is rather slow but the speed improvement in the resulting code is appreciable (see Benchmarks).

The UCSD Pascal is a standard implementation but time did not allow the Benchmarks to be run. However, with 320k disks and 128k of RAM, this system is serious stuff compared to some other current offerings.

CP/M was not supplied with the Expert, though by the time this review appears it should be available, according to Exleigh.

The software packages provided were PIPS and a word processor. Exleigh is offering a full range of commercial software including payroll and accountancy packages and various special interest packages which include ones for farmers and the video business. As exciting as the range of hardware offered, PIPS software has to be considered as a unique package, and can truly be descibed as a cross between Visicalc and Silicon Office.

PIPS provides the user with the facility for constructing pages of tabulated data. Once constructed, these rows and columns of data can be manipulated in a variety of ways including the linking of files via an automatic program.

PIPS pages can contain up to 50 rows, 42 of which contain data. Each row can contain either 74 or 75 character positions and characters can be grouped into a maximum of 36 columns which are of definable width. Pages can either be formatted to provide tabulated data or unformatted for text storage. PIPS divides the main RAM memory into three 'Buffer' areas, the Master Buffer, the Sub Buffer and the Figure Buffer, each holding one page of data.

The main operator of the system is the Master Buffer where file pages are constructed and examined. It is in this buffer that data can be linked to other files, made part of an automatic program or transferred in to a bar or dot chart. Data from the Master Buffer can be exchanged with that held in the Sub Buffer and when data is presented in graphical form the Sub Buffer holds this data for transfer to file or printer.

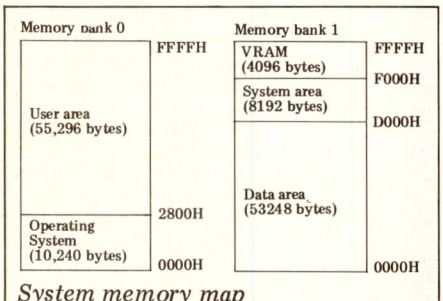
The third buffer is the Figure Buffer and is used when performing calculations, the results of which can be appended to data in the Master Buffer.

Therefore, you could project a sales forecast using the Master Buffer, speculate with a few 'what if?' calculations on the Figure Buffer, transfer the result to the Master Buffer and finally produce a bar chart on the Sub Buffer.

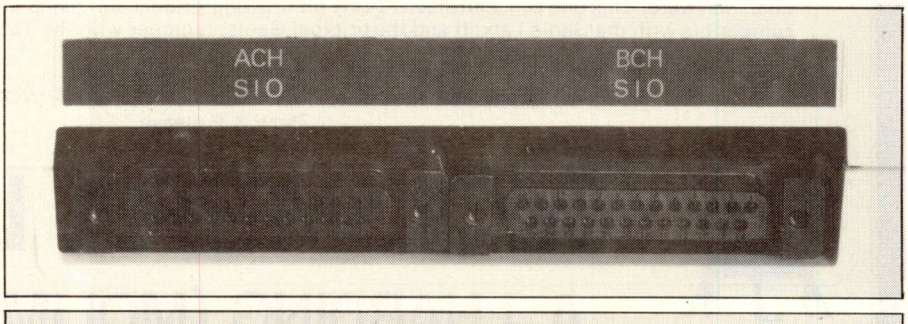
File use by PIPS is almost entirely transparent to the user as pages are simply Put to or Got from disk with a single keystroke command. The system is operated by a series of commands, normally of two characters in length for the basic commands and up to four characters for the more complex search or programming functions.

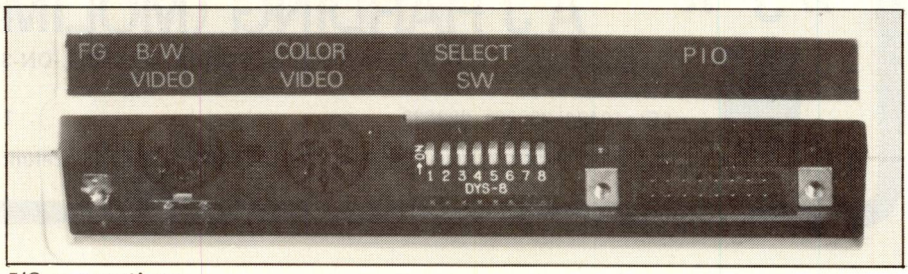
To give the software a practical test, and also to save tiring out my own computer, I attempted to set up files to provide an analysis of company performance for the first two quarters of this year.

The manual instructs one to 'read through briefly' and then enter data



System memory map





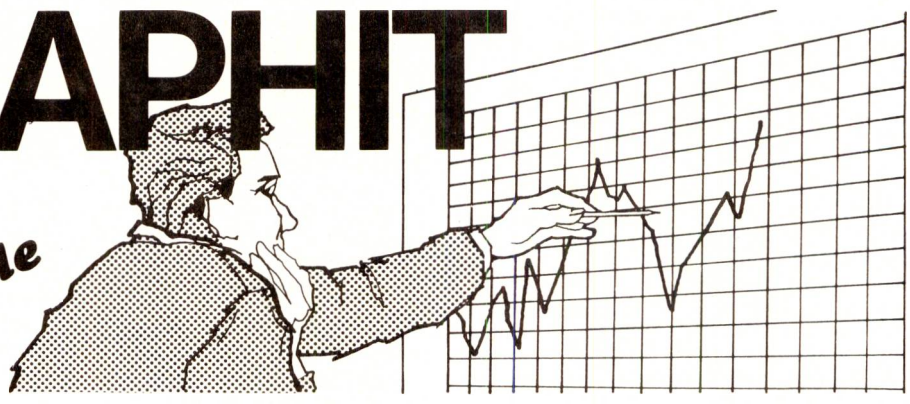
I/O connections

INNOVATIVE

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GRAPHIT



Visicalc compatible

There are a number of programs which will portray graphs on a Microcomputer. Indeed, we stock two already, Graph Plotter and Plotter. Graphit, however, is the ultimate of such programs. It has been written solely for displaying graphs. It is compatible with Visicalc DIF files. Hence such a file constructed with Visicalc can be fed into Graphit and a graph display obtained. Users may also, however, insert data directly from the keyboard into Graphit. This data may then be fed into Visicalc for further processing.

Every function that we can think of that would be of use to a person requiring a graph has been included in Graphit. Labels may of course be used and these may be transposed from the side to the bottom or vice versa at any time. A great deal of work has been put into manipulation of the display in the sense of magnification, or changing the scale. The program will itself first of all calculate an appropriate scale but thereafter this may be altered in almost any way. Thus a small section of the graph may be made to occupy the whole of the screen. Alternatively a large proportion, or all, of the data may be displayed at once. In other words, the program has complete flexibility of display of the graph.

Scrolling is supported in either a latitudinal or longitudinal direction and by one column or by a complete page. If, for instance, the months for one year are set up along the bottom of the screen with sales figures up the side, the user can move along in either direction from month to month or jump six months at a time and show the whole page — the display facilities are almost endless. And display, when you come to think of it, is what a graph is all about.

The graph as shown on the screen may be printed out to a line printer or the raw data on its own can be printed out. The axis can be changed at any time so that if, as in the example mentioned above, we have the months along the bottom of the screen, by one simple keystroke they can be made to go up the side, and the sales figures along the bottom, with the graph changing accordingly of course.

At any time the zig-zag display can be changed for the step and of course vice versa.

Perhaps the most important feature, has been left until last. Graphit was specifically commissioned and the specification called for ease of use, as the prime requirement. Not only, therefore, is a comprehensive manual supplied, but also at almost any time while using the program the H key can be pressed for help, whereupon all of the available commands are displayed. Graph programs in the past have rather suffered from being included in other software. This one concentrates entirely on drawing graphs and gains a lot thereby. Available on disk only, compatible with the Genie I and II and the original Genie, together with the Tandy Models I and III.

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  - > Upward compatible with Microsoft Basic.
  - > High speed **LOAD** and **SAVE**.
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- Print formatter, for control of printer output.
- Built in printer **SPOOLER,** to both disk and ram.
- Joblog to record all system operations with time stamps.
- **UPPER** and *lower* case support, throughout the system.
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with the manual close at hand — sound advice for any application. The manual for PIPS is reasonably clear and deals with the system in a logical manner. However, in common with nearly every software package I have seen, there is no cross-reference index.

This problem aside, information relating to Sales Performance over the last six months and future projections was entered inside three hours and provided the type of analysis that would take forever with a calculator and paper. The unfortunate result was that I became very depressed and contemplated the purchase of a launderette instead of continuing as a consultant. In an attempt to avoid suicide, I quickly charted a breakdown of company expenses at which time my wife (a co-director) entered and, using the Figure Buffer, we able to prove that my car was an egoistical drain on resources!

Progressing to the more complex commands, I found that the screen prompts were adequate and that wrong commands could be quickly terminated using the escape key. I felt that there was a need for a help key which could display all the commands on request as the only place that the commands were presented as a group was in the index. Stick-on labels as used in Wordpro, might be the answer and would again save relentless pursuing of some obscure screen command through the manual.

One *big* problem was discovered at this stage — information from the Master Buffer can be overwritten onto existing files simply by using the same code as that of an existing file. The very least I would expect is a screen prompt informing me that the code is already in use, perhaps in conjunction with an audible warning. Exleigh is aware of this problem and a version with file protection will shortly be issued.

There are approximately 40 main commands in PIPS, of which 10 to 15 should be remembered to facilitate rapid tables generation.

Benchmark timings

	Interpreted	Compiled
BM1	2.5	2.5
BM2	7.2	2.5
BM3	18.5	8.0
BM4	18.5	8.0
BM5	19.3	8.0
BM6	35.0	21.0
BM7	52.0	25.0
BM8	8.5	7.0

All timings in seconds. For an explanation and full listing of the Benchmark programs, see PCW *Vol 4 No 11, November 1981.*

It is possible to reformat a PIPS page, to insert a new column with, say, the results of a calculation, and to print the contents of the page, or plot a bar graph of them. Extracts of a page of information may be produced for reports. The calculation facilities include trig and other maths functions.

A very sophisticated set of search commands allows you to find occurences of a string in formatted and unformatted pages. Complex conditional Searches may be performed, and 'wild cards' are allowed so that you could find every occurence of a whose name contains "Ford" and whose price is less than $100 and stock is less than 20.

Sorting is also provided, on up to five keys and in ascending or descending order, alphabetical or numerical.

Once you have the hang of all these commands and are familiar with using PIPS in manual mode, you can start writing programs of PIPS commands for atuomatic execution. These programs are like a simplified form of Basic and can include looping and tests.

To sum up, PIPS is far more than just another spread sheet program; it is well on the way to being a simple data base management system. It is very easy to use, even without any knowledge of computer programming and can cope with a large part of most small business applications on its own (accounts being the obvious exception).

The word processing package is rather shamelessly inspired by the Wangwriter, which can't be bad as many consider the latter to be some sort of standard to aim for. It is menu driven and makes full use of the function keys for moving pages, inserting, deleting and search/replace. It works very well indeed, the only weaknesses being rather slow screen updating (this needn't slow you down though because of the type-ahead facility) and its annoying insistence that you choose in advance how many pages you wish to create; to get round this you always end up overestimating wildly to be safe, and so risk running out of disk space. On the plus side, it allows you to print multiple copies of a text in one sitting, unlike some well-known WP packages.

Documentation

The documentation accompanying the Expert is prolific but marred by poor English translation in all the original Sord manuals. The operating system and hardware manuals have been redone by Exleigh and read better, though they are poorly-produced Gestetnered folders. The Basic manual is a thick paperback book which is all but incomprehensible in the worst Japanese tradition and the UCSD Pascal manual is a slim volume which is little more than a synopsis of commands and would best be supplemented by a good textbook or the Softech manuals. The PIPS documentation is better than the Basic but was confusingly supplied in three versions, two from Sord and one from Exleigh. Similarly, the word processor manual is for a previous version running on different hardware and comes with a slim pamphlet outlining the differences in use (which include totally different function key assignments). The system deserves much better documentation than this showing.

Expansion and potential use

For heavy-duty number crunching, the Expert/M23 can have an AMD9511 floating point processor bolted on to speed up its arithmetic.

Exleigh can supply six different printers including the Epson MX80 and three daisywheels.

Sord has announced the imminent availability of twin 3in microfloppy drives and ultra thin 8in drives holding 1M per disk. These should be on sale by the time this issue is published. Due later in the year are winchester drives, the LCD display and the CMOS and ROM modules. CP/M is promised by August.

The system as tested makes a highly satisfactory management tool merely using PIPS and the word processor. With the WP in ROM, a CMOS RAM module and the LCD display it would exhibit a degree of portability since the disk drives could be dispensed with when necessary. The excellent Basic, UCSD Pascal, Fortran and Cobol together with the arithmetic chip would make the system suitable for virtually any business, engineering or scientific applications — though software will be in relatively short supply until CP/M is supported.

Prices

Expert X2-66 (Sord M23) with 12" monitor and dual 5in disks, PIPS and Basic	£1950
Word processor	£250
Fortran	£450
UCSD Pascal	£450
Cobol	£600

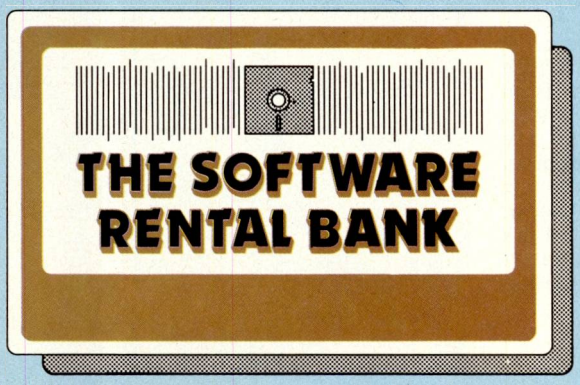
Conclusions

The Sord/Exleigh is a surprising machine. To look at, it is so small and quaint that it looks like a toy. Nothing could be further from the truth; it supports features which shame many more expensive and better known machines. It has in PIPS a piece of software which deserves to become as famous as Visicalc since it is in some ways unrivalled for flexibility and ease of use. Together with a very useful word processor and a proliferation of languages, it represents better than average value at the price. My only worry is that although Exleigh (tel: Penzance [0736] 66577) is highly committed to promoting and supporting the machine, the confusion caused by the different names for the machine may hinder public awareness of its virtues. END

Technical specifications

Processor:	Z80A, 4MHz
Memory:	128k RAM, 4k ROM
Screen:	12in green screen monitor, 80 or 40 column.
Keyboard:	50 key ASCII standard plus numeric pad, 4 cursor and 9 function keys.
Disks:	Twin single side, double density 5¼in 330k per drive.
Ports:	Two RS232 serial plus one Centronics parallel.
Operating System:	Sord FDOS, UCSD, CP/M.
Languages:	Basic, UCSD,Pascal, Fortran, Cobol.

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THE DRAGON

Mike Curtis and Joe Whelan test a new British home computer offering colour and sound for £200.

The Dragon 32 is another British contender for the under-£200 home computer market. With full colour graphics, sound generation, 32k or RAM, 16k Microsoft Basic and a price tag of £199, the Dragon is in direct competition with machines like the new Sinclair Spectrum, VIC 20, Acorn Atom, Tandy TRS-80 Color and, to a lesser extent, with the BBC Model A.

There is clearly a very large market for this type of computer but a new machine will need a good specification and, more importantly, good marketing if it is to make much impact against such well known and well established names. The Dragon 32 is made and marketed by Dragon Data Ltd, a subsidiary of the Mettoy toy company. There should therefore be a well established dealer network already available; it also means that at least one British manufacturer is taking a lead from equivalent American companies and is moving into the electronics field, to save it from the fate of Hornby, Matchbox and the others who have gone to the wall in recent years. I should, however, stress that the Dragon is not a toy, it is a well-made small computer with many interesting facilities and expansion capabilities.

Hardware

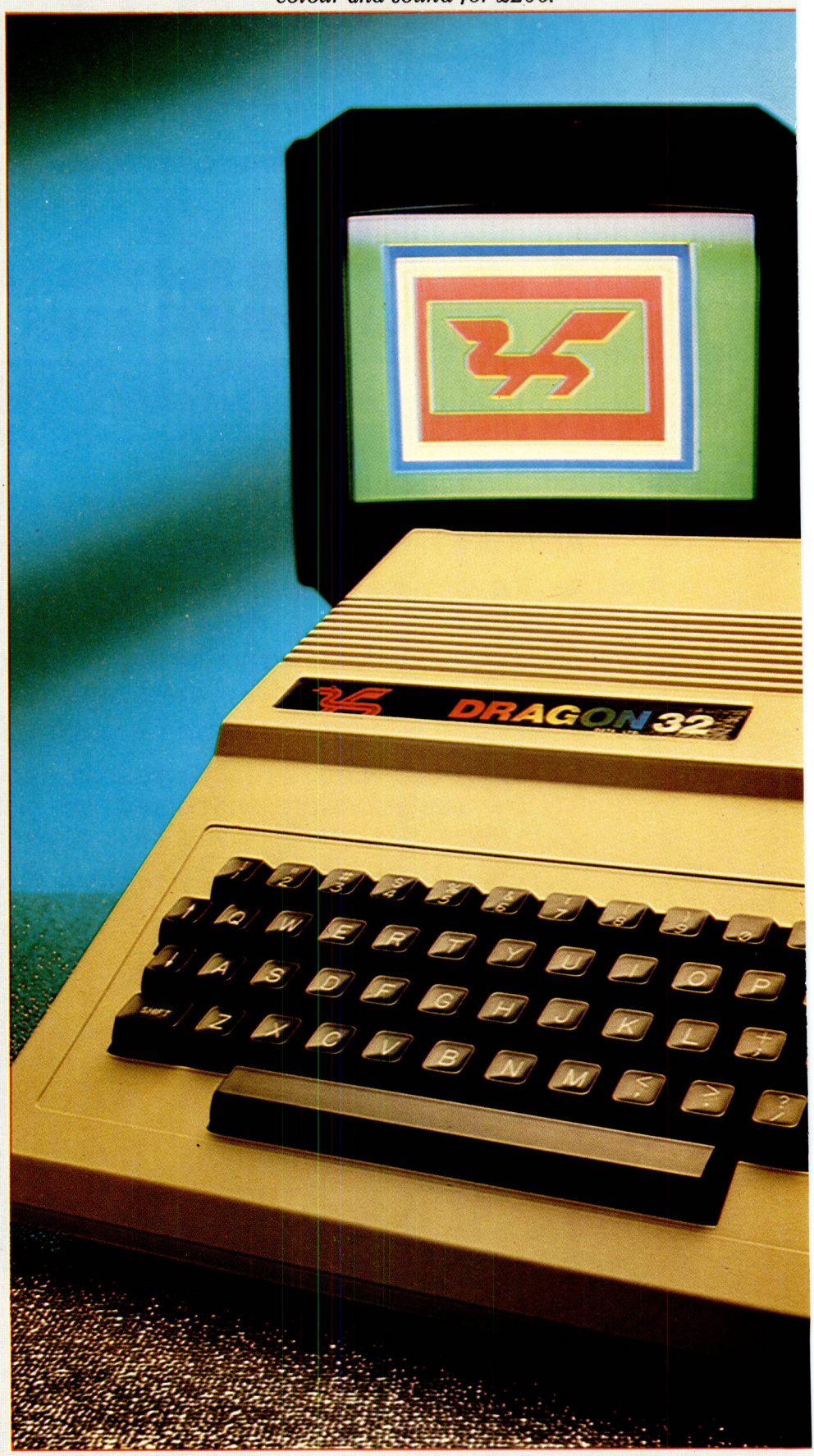
The Dragon comes ready built in a good quality, beige plastic case; it looks strong enough to withstand the sort of punishment that is likely to be meted out to it in a household with young children, where the bulk of sales are probably going to be.

The first impression is that the shape is rather peculiar as, unlike the majority of machines of this type, the Dragon is deeper (38cm) than it is wide (32.5cm); it's a narrow machine, which means it's not possible to stand a monitor on the case, even though it would be strong enough to support it. This will not matter too much in practice as it plugs into the family colour television.

The power supply is separate, a practice of which I heartily approve; many problems can be caused with a hot power supply packed into the same small case as all the other circuitry, although the end result may not be quite so neat and convenient as the all-in-one approach.

The keyboard is of the normal qwerty type, and is kept small by the omission of many of the 'extra' keys found on normal keyboards; there is, for example, no 'control' key, no square or curly brackets; there are in fact only the basic alphanumerics, shift, enter and four cursor control keys. Cursor left is the character delete key and the cursor up doubles as the Basic up-arrow exponentiation symbol. The four cursor keys are not kept together, but are split in pairs to keep the width down.

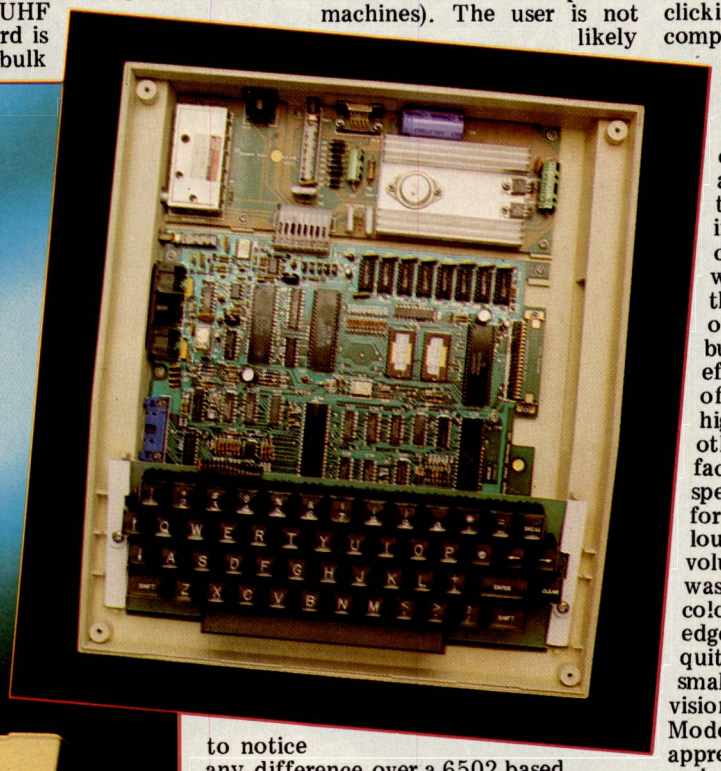
The back of the machine holds the power supply connector (which has nine pins although the power supply does not give anything other than 5 volts), an on/off push switch and a DIN socket for an RGB monitor. The left-hand side of the machine has, from front to back, a standard Centronics parallel printer connector, a group of three 5-pin DIN sockets for right joystick, cassette and left joystick, a reset button and phono socket for UHF TV output. The right-hand side has an opening leading in to

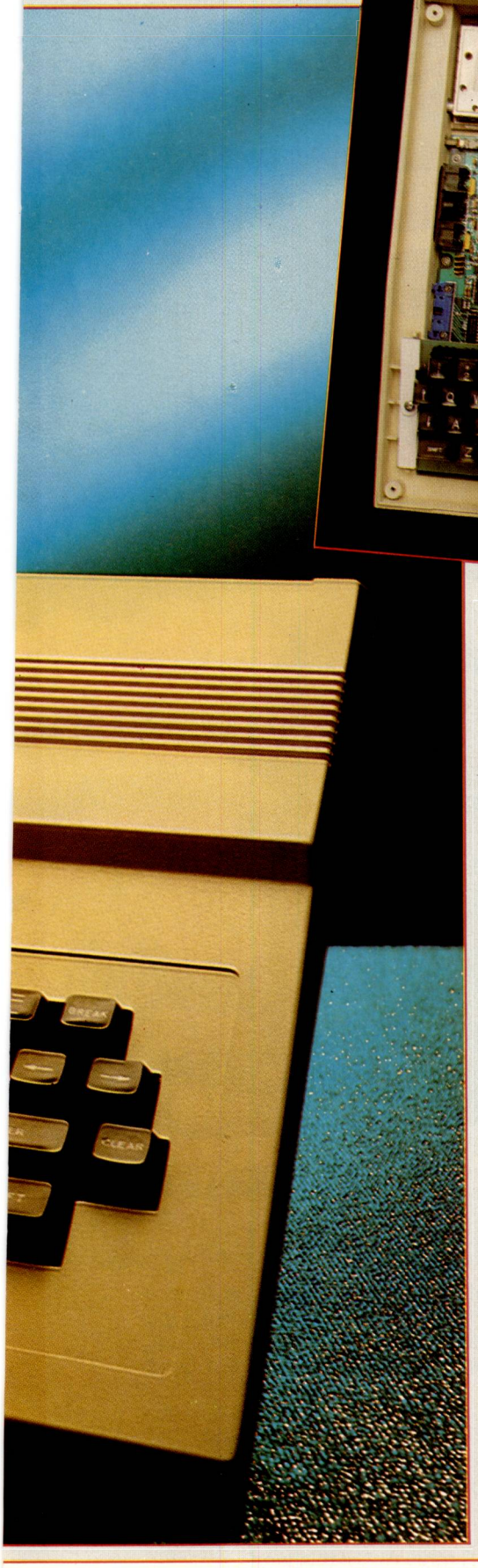


Photography by Kokon Chung

an edge connector, which the manual claims is for program cartridges; presumably many of the bus lines will be brought out here so there's a possibility that other devices may be connected.

Taking apart the case is a simple job: removing four screws on the bottom reveals a neat, compact layout. There are three boards: the rear is taken up by voltage regulators and UHF modulator, the keyboard is a separate unit, and the bulk of the space is taken up by the main processor board. There are a few surprises here; the processor is a Motorola 6809, which is an excellent chip but not very common (the only other popular machine using this chip is the TRS-80 Color computer though it is used in a number of business systems and in some of the new Japanese machines). The user is not likely to notice any difference over a 6502 based machine but the efficient instruction set of the 6809 should help in squeezing as much code as possible into a restricted memory space and should give speed advantages, while being similar enough to the 6502 to make translation of software a reasonably straightforward task.





There are two ROMs containing a 16k Microsoft Basic, and there's a standard 6847 CRT controller. Surprisingly, the memory comes in eight 64k dynamic RAM chips but this is not all available to the user, and indeed the Basic interpreter occupies the memory map from 8000H to BFFFH; since there is no other ROM and the 6809 looks for ROM at the highest memory location on power-up and reset, I assume that the top half of the memory map is not fully decoded so the 16k ROM occupies the top 32k of memory. This means that the 64k memory chips are used for low cost and convenience only and that the 'missing' 32k of RAM cannot ever be used. Input/output is handled by two 6821 PIAs which give four 8-bit parallel ports. There is a surprising number of discrete components on the board, particularly in these days of large ULAs as in the BBC machine and the Sinclairs. However, judging by the difficulties experienced with these chips, perhaps it is not such a bad idea! There's no on-board loudspeaker as the sound generator uses the TV speaker.

The Dragon comes with the power supply and a cable for connection to the aerial socket of a normal TV; when plugged in and switched on the screen clears to a fairly small rectangle inside a large border, with a message to indicate that you are in a 16k Microsoft Basic and the machine is ready to use. The cassette connector gives you on/off motor control if your cassette recorder has that facility. There were two tapes supplied with the review machine, one of which was a demo of the machine's capabilities and the other contained the examples used in the manual. The tapes are blocked, with the motor being switched off and on between each block to the accompaniment of some loud clicking from the reed relay within the computer. The demonstration tape is exactly what it claims to be — a demonstration; it does not contain any usable programs, but draws a few pictures and presents a few examples of possible use, such as an addition sum on the screen with the label 'Education'. These are interspersed with what I suppose can be called the Dragon theme, which seemed remarkably similar to the Apple theme: a simple sequence of a few notes. There were a few bursts of 'Cwm Rhondda' which effectively demonstrates the country of origin. The sound was not of the highest quality, but comparable to other machines of this type, and the fact that it plays through the TV loudspeaker is much more convenient for this machine than an on-board loudspeaker: you can adjust the volume easily for a start! The display was a bit of a disappointment: the colours were not very good and the edges of shapes were fuzzy. It was quite reasonable when used with a small portable black and white television. Quite by chance I had a BBC Model B around at the same time; I appreciate that this is not a fair comparison since the BBC costs twice the price but the difference in the quality of the display was quite incredible. Although I have not had an opportunity to use the new Sinclair yet, I have used a VIC and my impression is that Dragon Data should try and do something to improve the quality of the display as in this respect the competitors have the edge.

The keyboard proved to be quite acceptable; the keys are full-sized with a positive action; while not having a full professional feel, the keys are pleasant to use and give the impression of being able to withstand a fair bashing.

Software

The Basic is everything that you would expect from the Microsoft stable; it's not 'structured', there is an IF . . . THEN . . . ELSE but no DO . . .WHILE. Editing is via the Microsoft line editor and is not screen oriented.

There are OPEN and CLOSE commands for data files on cassette and CLOAD and CLOADM commands for loading Basic and machine-code programs respectively; in addition output can be directed to the printer port using OPEN 'O', -2, filename, and PRINT -2 data items. In other words, the printer is used as an output file.

There is a MOTOR command for turning the cassette motor on and off. There are also some facilities not usually found on machines in this price range such as RENUM to renumber lines, CONT, which enables you to continue with execution of a program after a STOP statement or a BREAK and, particularly useful, TRON and TROFF which turn on and off a trace to help with debugging. The

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THE DRAGON

error messages are not particularly enlightening, eg, 'DD' which means 'Attempt to redimension array'.

Variable names can be of any length but only the first two letters are significant. There are no integer variables. The most important features in the Basic for a machine of this type are the commands which handle graphics and sound generation. These are definitely two of the strong points of this computer.

The graphics on the Dragon are, like those of most home computers, good in some respects but bad in others. The bad points are mainly in the display quality, whereas the good points are to do with thought invested in the commands for the control of the graphics. These commands are very comprehensive and compare more than favourably with the Dragon's competitors. A comparison of some of the graphics commands with those available on the BBC machine and the new Sinclair Spectrum is given in Table 1.

This is meant only as a sample comparison of some of the commands available on each machine and even those commands which are common in name may not be comparable in their versatility.

To demonstrate this, the command 'DRAW' is not a simple statement to draw a line between two points but uses a string for its parameters. This string contains all the necessary instructions for drawing complicated shapes. For instance, the instruction which would draw a square starting at the point on the screen given by X = 100, Y = 110 could be as follows:

```
70 AS ="BM100,110U20R20D20L20"
80 DRAW A$
```

The letters in the string are the instruction set and seem fairly obvious in their usage. The complete set of instructions is given in Table 2.

The commands allow the drawing of quite complicated figures and their immediate rotation. A simple demonstration is given below. This draws a square, rotates it by 180 degrees and then redraws the square:

DRAW A$ + "A2" + A$ gives the result shown in Figure 1.

New strings can be defined which use predefined substrings containing a set of graphics operations. In this way complex operations which would normally require the use of many statements for the drawing of a shape can be executed by one command. Here's a complete program to demonstrate this:

```
10 PMODE 4,1
20 PCLS
30 SCREEN 1,1
40 A$="BM100,100U20L20D20R20"
50 S$="XA$;BM150,50;E40F40L80"
60 F$="XS$;A1;XS$"
70 DRAW F$
80 GOTO 80
```

This gives the display shown in Figure 2.

Some unexpected effects can occur if you try to draw off the screen because any instruction which would cause the overflow of the screen area is automatically corrected so that the point drawn to is just on the screen — this is not as advantageous as it at first seems.

Another extremely useful command is LINE, which allows the drawing of lines, rectangles, squares or blocks (by filling in the rectangle). The main difference between the DRAW and the LINE commands is that DRAW uses strings as parameters while LINE uses numbers or variables. Hence it is only possible to use LINE to draw diagrams which depend on a variable in the program.

One of the most useful commands for animation is the GET command. This is used to copy an area of screen memory. The rectangular area of screen copied is defined by two sets of coordinates and is copied into an array specified with the command. An optional command G can be used after the GET statement, and is called the graphics specifier. An example of this command is shown below.

GET (10,12) - (115,115), R,G

The array R must be dimensioned before using the GET command and so a careful eye must be kept on the amount of memory left. The above example would copy the rectangular area of screen given by the coordinates into the array R. Obviously it is not much use unless you can do something with it, hence the PUT command. This redisplays the array anywhere and to any page or screen desired. The structure of the command is the same as the GET command except that if the array was 'got' using the optional graphics specifier then there are five options which can be used.

PSET: Displays the rectangle as stored

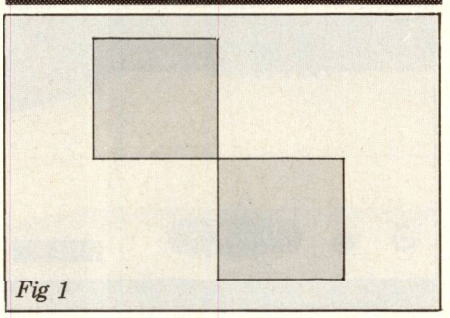


Fig 1

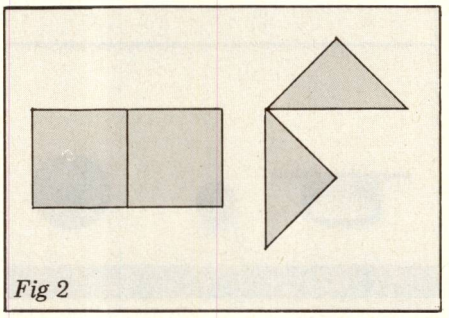


Fig 2

Command	BBC	Spectrum	Dragon
BRIGHT	-	yes	-
CIRCLE	-	yes	yes
DRAW	yes	yes	yes
PLOT	yes	yes	- (1)
INK	- (2)	yes	- (2)
PAPER	- (2)	yes	- (2)
COLOUR	yes	-	yes
GET	-	-	yes
PAINT	-	-	yes
PMODE	-	-	yes
PCOPY	-	-	yes
PUT	-	-	yes
MOVE	yes	-	yes

1 The Dragon has a much more powerful LINE command
2 Both the Dragon and the BBC have the more versatile COLOUR command

Table 1

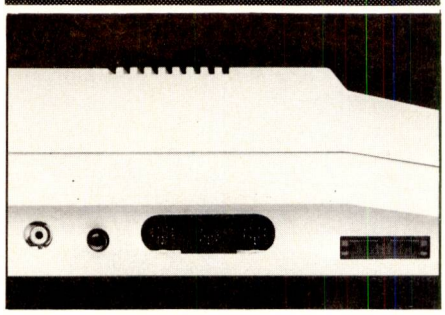
M x,y	= Move to position x,y
U n	= Draw a line up 'n' points
D n	= Draw a line down 'n' points
L n	= Draw a line left 'n' points
R n	= Draw a line right 'n' points
E n	= Draw a line at an angle of 45 degrees for 'n' points
F n	= Draw a line at an angle of 135 degrees for 'n' points
G n	= Draw a line at an angle of 225 degrees for 'n' points
H n	= Draw a line at an angle of 315 degrees for 'n' points
A n	= Rotate the drawing by 'n' multiples of 90 degrees
B	= Blank any of the above instructions so that they act like a move command
X a	= Execute a substring 'a'

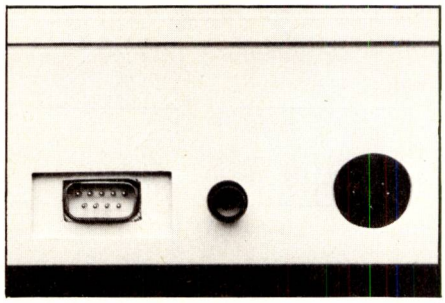
Table 2

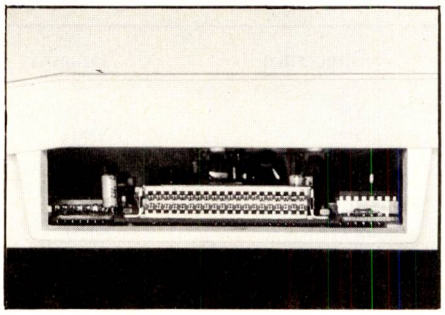
TECHNICAL SPECIFICATIONS

Processor	Motorola 6809
Memory	32k RAM, 16k ROM
Screen	User's colour TV or RGB Monitor, 32x16 characters.
Colour	Up to 9 (including black) depending on mode. Pixels in hi-res graphics.
Keyboard	53 key qwerty type with four cursor keys.
Cassette	User's own with remote control.
Ports	Cassette I/O, Centronics parallel printer, expansion bus, joystick sockets.
Language	Microsoft extended colour Basic.

THE DRAGON







and overwrites any previous information in the display area.

PRESET: Displays the rectangle as above but then inverts the whole area.

AND: Only displays points where the screen area is set and the array element is set.

OR: Displays the array over any previous screen information.

NOT: This inverts the screen area specified in the PUT command. (This seems an extremely unuseful operator and very wasteful of memory because none of the information in the array is displayed.)

These commands are extremely advanced for such a low-priced machine and are found on machines like the IBM machine.

One of the most useful features of the Dragon's graphics is that the screen memory is divided into 'pages'. There is a total of eight individual pages available and each can be accessed; however, as with most of the newer personal computers, there is a variety of screen resolutions available, and the amount of memory used and the usable colours vary. The highest resolution available is 256 x 192, which uses four pages and allows the use of only two colours. This means we have only two screens in the highest resolution but eight in the lowest (64 x 32). The ability to switch between screens is particularly useful in animation. A necessary command to accompany the novel use of screens is PCLEAR. This command clears all the pages in memory and may also be followed by a parameter (in the range 1 - 8) which specifies the number of pages required during the program. If no parameter is specified the default is for four pages to be reserved (ie, one high resolution graphics screen). The PCLEAR command, apart from being useful for saving memory for programs, clears all variables and so must be used at the start of a program. Whole screens can be copied using the PCOPY A TO B command, where A is the number of the source page and B is the number of the destination page.

Swapping between screens (a screen can be made up from a number of pages, depending on the resolution that is chosen) is very simple and very fast. It is accomplished using the SCREEN command, which as well as giving the resolution required also gives one of two colour sets. When swapping between screens or different resolutions, none of the pages are cleared (unless the PCLS command is used) which is very useful as it means you can fill a screen with a complicated diagram while switching between text and graphics modes. It also allows you to draw diagrams on separate pages and then combine these to make a new diagram in the higher resolution modes.

The other special command worthy of note is the CIRCLE command. This allows the drawing of circles, ellipses or arcs in any specified colour. This command is followed by seven parameters: 1 the X coordinate of the centre of the circle; 2 the Y coordinate of the centre; 3 the radius of the circle; 4 the colour it is to be drawn in; 5 the height-to-width ratio used for drawing ellipses; 6 the starting point of the arc; and 7 the finishing point of the arc. This command is very quick and is used to good effect in one of the demonstration programs in the manual.

Overall the instructions set for graphics is very powerful and comprehensive. It allows the rapid production of fairly complicated diagrams with the minimum of effort, using relatively easy-to-follow commands. Animation is also easy to achieve using the pages and produces a good effect. The major drawback is that it is not possible to mix text and high resolution graphics; this can only be done in low resolution.

There are two commands for using the sound generator: SOUND A,B, where the parameter A represents the required frequency as a number between 1 and 225, and B represents the duration (16 representing about 1 sec), and PLAY string, where the string (variable or constant) contains a sequence of musical notes using A-G, # for sharps and – for flats mixed with commands;
O n for a particular octave (n can be 1-5)
L n for length (1-255))
T n for tempo (1-255)
V n for volume (1-31)
P n for a pause (1-255)
X followed by a string variable and a semi-colon for execution of a sub-string.

These commands, which are particularly easy to use, can give some very good sound effects. A further useful facility is the capability of directing sound output from the cassette recorder through the TV speaker using the commands AUDIO ON and AUDIO OFF in conjunction with the MOTOR ON and MOTOR OFF commands; this enables you to add a sound track to your graphics display!

PRICES

Dragon with power supply, leads and manual:	£199.95
Games ROM cartridges	£19.95

(Prices inc VAT)

BENCHMARK TIMINGS

BM1	1.6
BM2	10.2
BM3	19.7
BM4	21.6
BM5	23.3
BM6	34.3
BM7	50.0
BM8	12.9

All timings in seconds. For a full listing and explanation of the Benchmark tests see PCW *Vol 4 No.11, November 1981.*

Documentation

The manual, as usual with this type of machine, combines a proper manual of the Basic commands with a tutorial on how to use them. It is better than most, comprehensive and easy to read without being so large as to be unmanageable but, as usual, it is not really clear for the absolute novice. A particularly useful feature was the inclusion of a reference card of Basic commands and error messages; once one had passed the initial phase of finding out how to use the machine, this would be all that one needs for reference. I wish more manufacturers would follow this example. I couldn't find anything in the manual which was incorrect or misleading so, apart from the qualification as regards absolute beginners, which is the same for every machine that I have ever encountered, this can be counted as another good feature of the Dragon. I am not so sure about the advisability of including a tape with the examples from the manual already written; I would have thought that typing them in was an essential part of getting to know the machine. However, it cannot do any harm and could be useful for people who want to try out all the features without having to go to the effort of actually typing in programs.

The Benchmark timings show the Dragon has a quite reasonable turn of speed – not the quickest perhaps but comparable with the best in its class.

Expansion and potential use

Hardware expansions to the Dragon in the pipeline include disk drives, an RS232 interface, a second processor and Prestel/Teletext but no dates or prices are available on these. Also promised is a 'major operating system' which, given the 6809, will probably be Flex.

ROM software cartridges currently on sale are arcade type games of the Asteroids, Space Invaders and Pac-man genre. Future releases will include an Editor/Assembler, Music Composer and Speech Synthesiser as well as educational and home finance programs.

An interesting move is the promise of

GOTO page 178

SIRIUS GRAPHICS

If you've been trying to get to grips with hi-res graphics on the ACT Sirius 1, then your troubles are over! A D Osborne has done all the hard work for you.

Recently, I bought the ACT Sirius 1 and, in company with other purchasers, found that the documentation provided was pitifully inadequate. It amounted to a CP/M-86 User's Guide (extracted from the dealer by twisting his arm), an Operator's Manual, which had 15 sections, seven of which, including the section entitled 'Attaching a Printer', contained only the words: 'to be developed'! and a Basic-86 manual which contained no information on the high resolution graphics routines.

The demonstration program showed the capabilities of the machine to produce high resolution graphics, mathematical, chemical and electronic notation, superscripting, subscripting as well as various character fonts — but how was I to use them?

Without appropriate documentation, the machine would run only standard Basic programs and I didn't pay £2400 for a micro that would do only that!

Being both curious and impatient, I was unable to leave the thing lying around until documentation arrived and so, using Sherlock Holmes techniques, I started the task of getting into the system unaided. This article reports some of the fruits of my labours, which, I hope, will be of use to other documentationless Sirius owners.

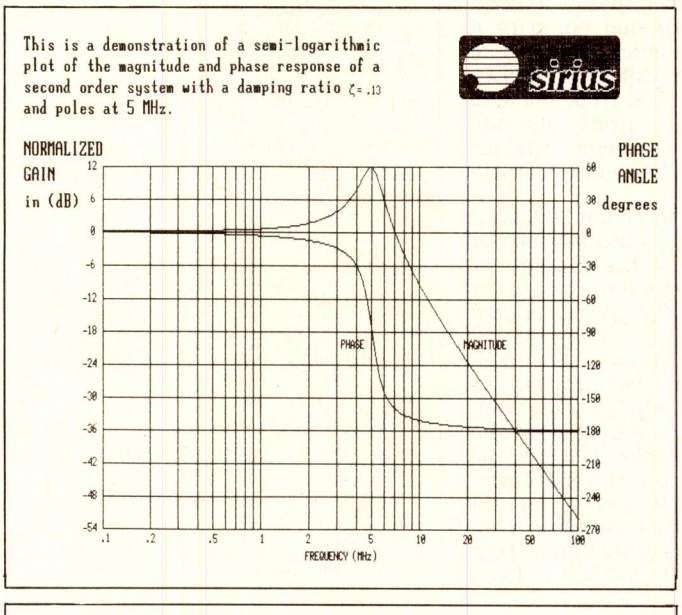
Firstly, I was anxious to know if I could use the Epson dot matrix printer for high resolution graphics since this printer is our college standard, good value for money and of proven reliability. I found that the programs 'GRAFMX80.CMD' and 'GRAFMX8D.CMD' interface with the Epson MX80 Types II & III. The former program produces a sideways print-out of the VDU screen which is somewhat distorted but this distortion is only really noticeable when reproducing circles (such as pie charts). The latter produces an upright print-out. The parallel interface port must be used for printing in graphics mode and the CP/M-86 defaults to the parallel port as the listing device.

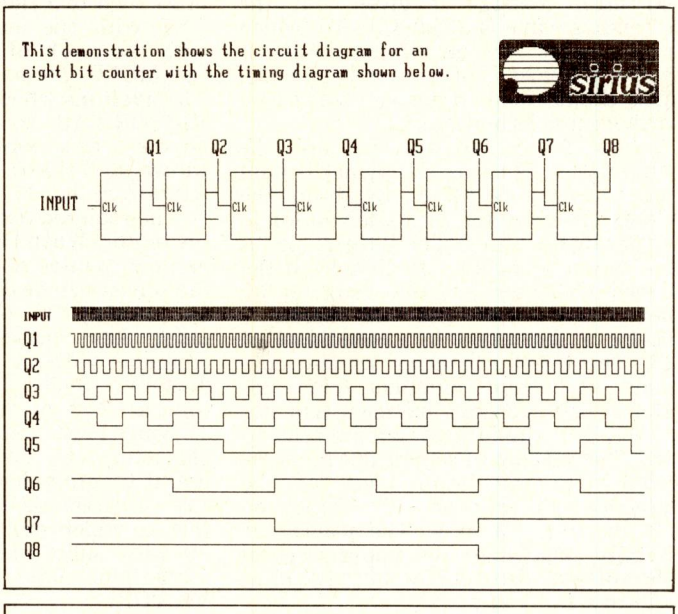
Now for the Basic-86 high resolution subroutines. These are contained in the GRAFMX software, which must be booted up using the BBOOT command immediately after intialising the OS and running that infernal voice program, thus:

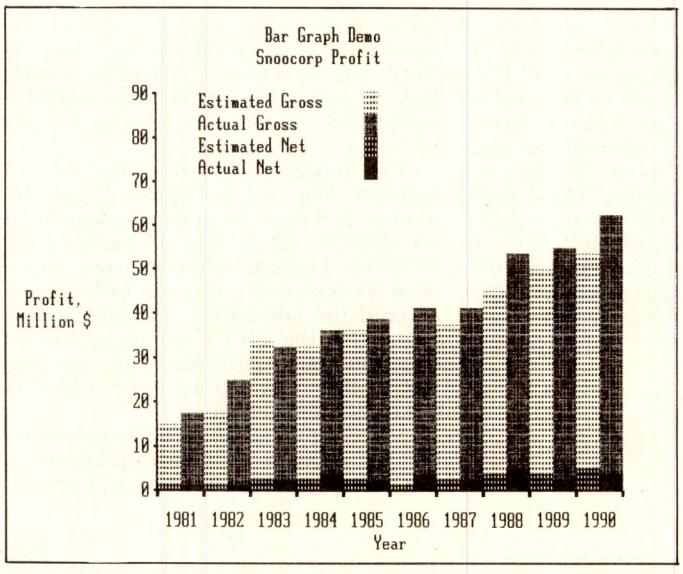
A>VOC
A>BBOOT GRAFMX8D.CMD
A>BASIC86

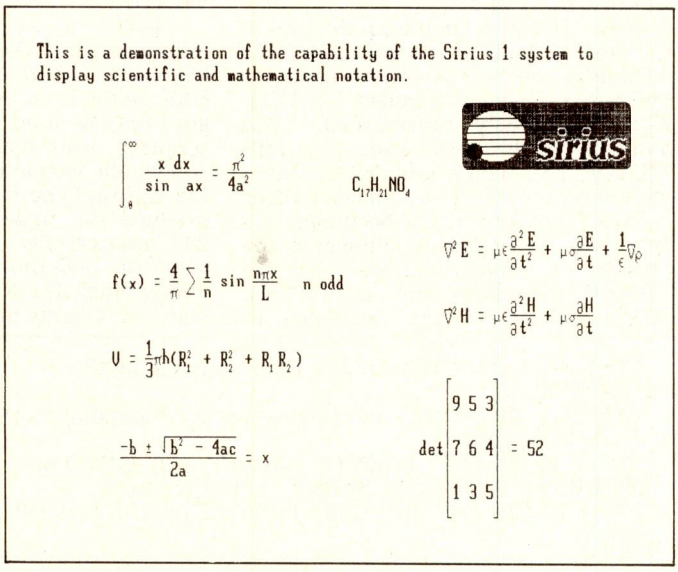
This leaves only 10k of the 128k RAM but it is adequate for most jobs. High resolution mode is toggled on/off by the command ESC E (ie, PRINT CHR$ (27);"E").

The graphics routines are: SETHIRES, which turns on graphics mode: SETTEXT, which turns on high resolution text mode; CLOAD(S%,F$), which loads character sets (the files with extension .CHR) up to a maximum of four (ie, 512 bytes), where F$ contains the name of the character file and S% is the starting address (0,128,256 or 384). CLOAD returns a value of S% of zero when successful loading has been achieved. Subroutine 5000 in the demonstration disk program VICTOR.BAS will load any one of the four character sets in the appropriate place









SIRIUS GRAPHICS

by setting variable CS to 0,1,2 or 3; PDUMP, which prints out a copy of the screen; HPRINT(X%,Y%,M%) prints the character number M% (0 to 511) at X%, Y%. Subroutine 6000 in the program VICTOR.BAS which is on the demonstration disk uses this routine and it is easier to use this than HPRINT directly; CCLR(X%,Y%,M%), is the reverse of HPRINT, that is, it clears characters; HCLR(UX%,UY%,LX%,LY%) clears a rectangular window defined by the coordinates in the subroutine argument; HDRAW(X%,Y%,M%) moves, draws and erases depending upon the value of M%: M%=34 clears the drawing area, use subroutine 7000 in VICTOR, M%=16 moves to X%,Y% without drawing. Use subroutine 7100. M%=129 draws from the previous position to X%,Y%. Use subroutine 7200; FILL (X%.Y%,F$) fills areas with shading from the character set VLOGO (when it is loaded) defined by F$;CLEN & FILARY are routines whose function I have been unable, so far, to ascertain!

The screen area is defined by coordinates x & y in the range: 0<x<800; 0<y<400 with the origin in the top left-hand corner (x increases horizontally to the right and y increases vertically downwards). If x or y go out of range, no error message is given, but the offending value is divided by 10, which can produce very mystifying results, if you are unaware of what is happening. This should help to get you started on drawing graphs and diagrams.

Now for a few further tips: the summation sign (cap Gk sigma) is built using characters 63 & 64 from the Greek character set with a separation in y-coordinate of 22. The integral sign is built using characters 38,39 &40 of the Greek character set, the character 39 being used twice and the characters having a separation in y-coordinate of 16. The Greek character set also contains superscript numbers (chrs nos 42-51) and subscript numbers (chr nos 52-61) and the infinity symbol (chr no 18). The placing of superscript numbers relative to the lower piece of the integral sign (chr no 40) should be +10 in x & +3 in y. The placing of infinity relative to the upper piece of the integral sign (chr no 38) should be +11 in x & −1 in y.

Now let's look at the production of the text in high resolution mode. The demonstration text is written using the program on the disk called VICTOR.BAS, previously mentioned. This program reads text from the file VICTOR.TXT which contains text interspersed with control commands written in square brackets at the beginning of a line. Text and Control commands are written on separate lines and the Control commands are as follows: [TOF], placed at the beginning to initialise the program; [LMxxx], set left margin to x-coordinate xxx; [RMxxx] set right margin to x-coordinate xxx; [C], indicates that the next piece of text is a caption; [B], toggles bold characters on/off; [],new line; [REV], toggle reverse video character mode on/off; [FL], select large font; [FM], select medium font; [FS], select small font; [SC], select user-chosen font (when the changes to VICTOR outlined below are made); [*], write soft key legends; [**], erase soft key legends; [D1], turn on subscripting; [DO], turn off subscripting; [P], new page; [L], print Sirius 1 caption (not available if the changes outlined below are made); [END], always the last command, used to exit from the program.

I decided to sacrifice having the Sirius I caption, which needs the VLOGO character set, in the interests of having a fourth character set of my own choice to supplement the large, medium and small character fonts which are in the files named respectively: LGPROP1, MEDPROP1, SMPROP. If, when running the program, the error message CHR LD PROBLEM appears, this is because the disk in drive A does not contain one of the character sets requested. It is useful, before writing one's own text file, to inspect VICTOR.TXT with the editor and compare it with the result of running option 1 of the MENU program called SYSSPEC. The additons which need to be made to VICTOR.BAS to get print-outs and choose one's own character sets are shown in Table 1. Then erase GOSUB 8100 from line 47.

The required text was compiled using the editor. When [P] is encountered the program pauses so that the contents of the screen can be dumped to the printer by pressing "P" or "p". Pressing any other key causes the program to continue without printing (this, incidentally, applies to the printing of options 2—8 of the MENU program).

While I was experimenting with the character sets, I thought it would be useful to print them out in table form. The program ACHAR below will do this, to which should be added lines 10-39 plus subroutines 5000,6000,7100, 7200 plus lines 10000-10010 from VICTOR.

Finally, a word about the seven 'programmable' keys on the Sirius 1 keyboard. The program called SUPERT.BAS below is an example of how these keys may be used to control the superscripting, subscripting, underlining and condensed character mode facilities of the Epson Type III printer. These keys produce the upper ASCII codes 241-247 respectively. In SUPERT: Key 1 turns on underlining; Key 2 turns off underlining; Key 3 turns on superscripting; Key 4 turns on subscripting; Key 5 turns off super/subscripting; Key 6 turns on condensed character mode; Key 7 turns off condensed character mode; and '@' is used to terminate a line of text.

The program is easily adaptable to activate the other Epson Type III modes. It would be more convenient to use INPUT A$ in line 15 rather than INKEY$ because typing errors could then be seen and corrected before they entered the computer. However, it was found that the INPUT command eliminates the most significant bit, turning ASCII 241 (for example) into ASCII (241-128) which is 'q'.

Let's hope that an official account of the use of high resolution graphics on the Sirius I will appear from ACT soon!

END

```
18 PRINT "Enter name of disk file containing text"
19 INPUT A$
20 PRINT "Enter name of character set corresponding to [SC]"
21 INPUT FILE$
218 IF A$ = "[SC]" THEN CS = 0: LEF = 16: GOTO 60
601 BBB$ = INKEY$: IF BBB$ = " " THEN 601
602 IF BBB$ = "P" OR BBB$ = "p" THEN CALL PDUMP
```

Table 1

```
  5 REM **** PROGRAM "SUPERT" ****
  6 REM Illustrates use of 7 special keys
 10 B$=""
 12 PRINT
 15 A$=INKEY$:IF A$="" THEN 15
 20 RFLAG=0
 22 PRINT A$;
 25 IF ASC(A$)>240 AND ASC(A$)<248 THEN
    GOSUB 100
 30 IF A$="@" THEN 50
 40 B$=B$+A$:GOTO 15
 50 LPRINT B$:GOTO 10
 55 C$=C$+A$
 60 NEXT
 65 LPRINT C$
 70 GOTO 20
100 IF ASC(A$)=241 THEN RFLAG=1
110 IF ASC(A$)=241 THEN A$=CHR$(27)+"-"
    +CHR$(1)
120 IF RFLAG=1 THEN RETURN
130 IF ASC(A$)=242 THEN RFLAG=1
140 IF ASC(A$)=242 THEN A$=CHR$(27)+"-"
    +CHR$(0)
150 IF RFLAG=1 THEN RETURN
160 IF ASC(A$)=243 THEN RFLAG=1
170 IF ASC(A$)=243 THEN A$=CHR$(27)+"S"
    +CHR$(0)
180 IF RFLAG=1 THEN RETURN
190 IF ASC(A$)=244 THEN RFLAG=1
200 IF ASC(A$)=244 THEN A$=CHR$(27)+"S"
    +CHR$(1)
210 IF RFLAG=1 THEN RETURN
220 IF ASC(A$)=245 THEN RFLAG=1
230 IF ASC(A$)=245 THEN A$=CHR$(27)+"T"
235 IF RFLAG=1 THEN RETURN
240 IF ASC(A$)=246 THEN RFLAG=1
250 IF ASC(A$)=246 THEN A$=CHR$(15)
260 IF RFLAG=1 THEN RETURN
270 IF ASC(A$)=247 THEN RFLAG=1
280 IF ASC(A$)=247 THEN A$=CHR$(18)
290 IF RFLAG=1 THEN RETURN
```

```
 40 REM **** PROGRAM "ACHAR" ****
 41 REM Prints a character table
 42 GOSUB 500
 45 CALL SETHIRES:GOSUB 210
 50 X=220:Y=40:GOSUB 7100
 55 Y=Y+320:GOSUB 7200
 58 Y=20
 60 X=X+40:GOSUB 7100
 65 Y=Y+340:GOSUB 7200
 66 IF X>540 THEN 85
 70 X=X+40:GOSUB 7100
 75 Y=Y-340:GOSUB 7200
 80 IF X<550 THEN GOTO 60
 85 X=260:Y=20:GOSUB 7100
 90 X=580:GOSUB 7200
 95 Y=Y+20:GOSUB 7100
100 X=X-360:GOSUB 7200
102 IF Y>355 THEN 120
105 Y=Y+20:GOSUB 7100
110 X=X+360:GOSUB 7200
115 IF Y<355 THEN 95
120 BBB$=INKEY$:IF BBB$="" THEN 120
125 IF BBB$="P" OR BBB$="p" THEN CALL PDUMP
130 GOTO 10000
210 FOR I=1 TO 24
220 READ X%,Y%,C%
225 CALL HPRINT(X%,Y%,C%)
230 NEXT
240 DATA 280, 25,48,320, 25,49,360, 25,50,400
        25,51,440, 25,52,480, 25,53
250 DATA 520, 25,54,560, 25,55,230, 45,48,230
        65,49,230, 85,50,230, 105,51
260 DATA 230,125,52,230,145,53,230,165,54,230,
        185,55,230,205,56,230,225,57
270 DATA 230,245,65,230,265,66,230,285,67,230,
        305,68,230,325,69,230,345,70
275 C=127
276 FOR X=280 TO 560 STEP 40
280 FOR Y=45 TO 345 STEP 20
285 C=C+1
290 X%=X:Y%=Y:C%=C:CALL HPRINT(X%,Y%,C%)
295 NEXT Y
300 NEXT X
310 A$="The   "+FILE$+" character set"
320 CS=0
330 X=280:Y=385:GOSUB 6000
340 RETURN
500 PRINT "Enter character set required:
    ";:INPUT FILE$
510 CS=1:GOSUB 5000
530 RETURN
```



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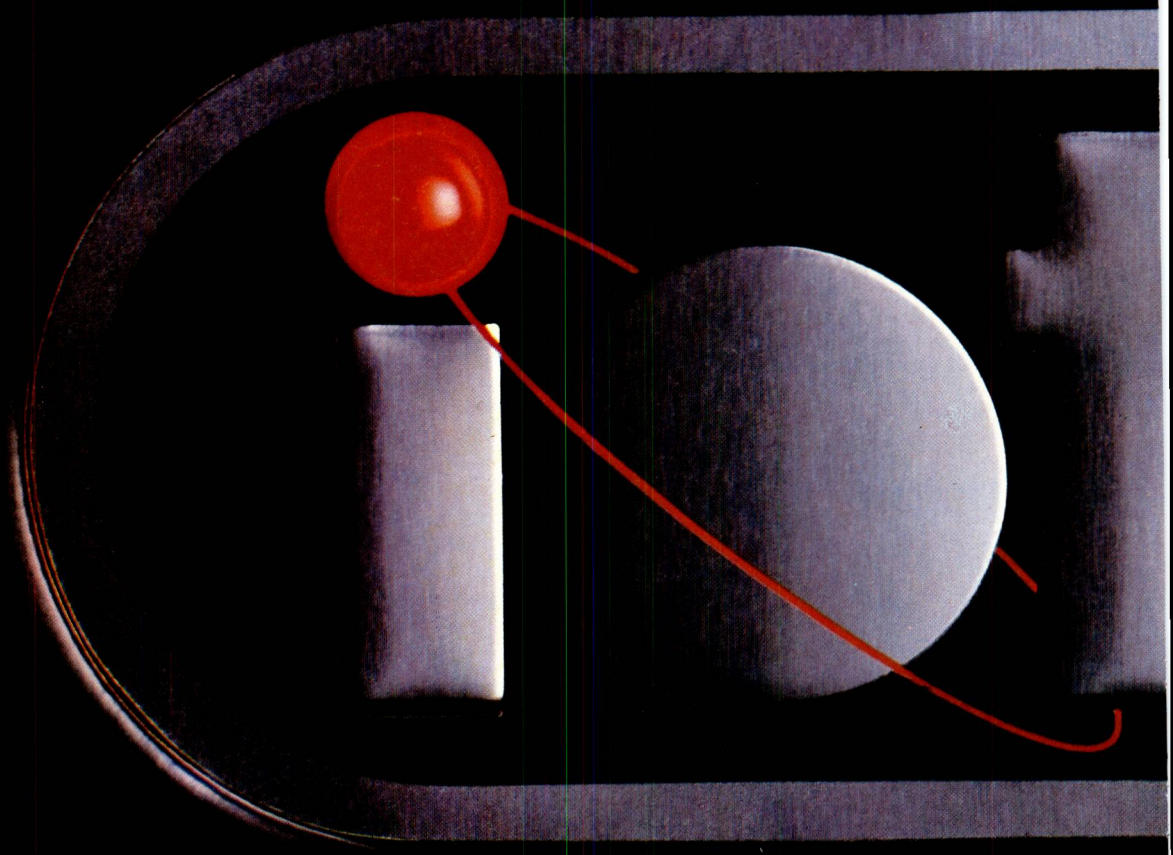
.....

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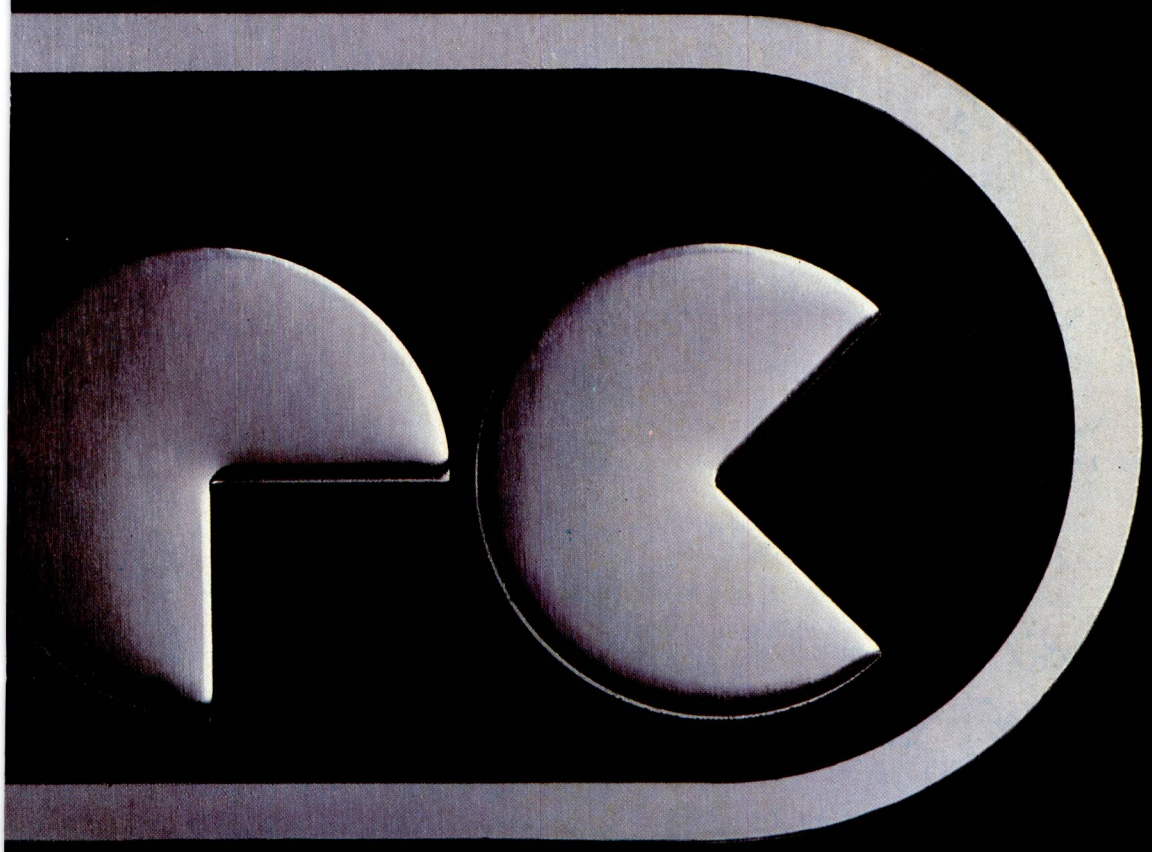
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TJ's WORKSHOP

Our monthly pot-pourri of hardware and software tips for the popular micros. If you have a favourite tip to pass on, send it to: **'TJ's Workshop'**, *PCW*, **14 Rathbone Place, London W1P 1DE.** *Please keep your contributions as concise as possible. We will pay £5-£30 for any tips we publish.*

UNIVERSAL CONNECTOR

In order to avoid making connections directly to the ICs on my computer, I have assembled the following item, (Fig 1). You will need a 14-pin DIL header plug, a 14-pin low profile socket and a piece of veroboard.

Cut a piece of veroboard 8 holes by 7 holes and cut the copper track where shown.

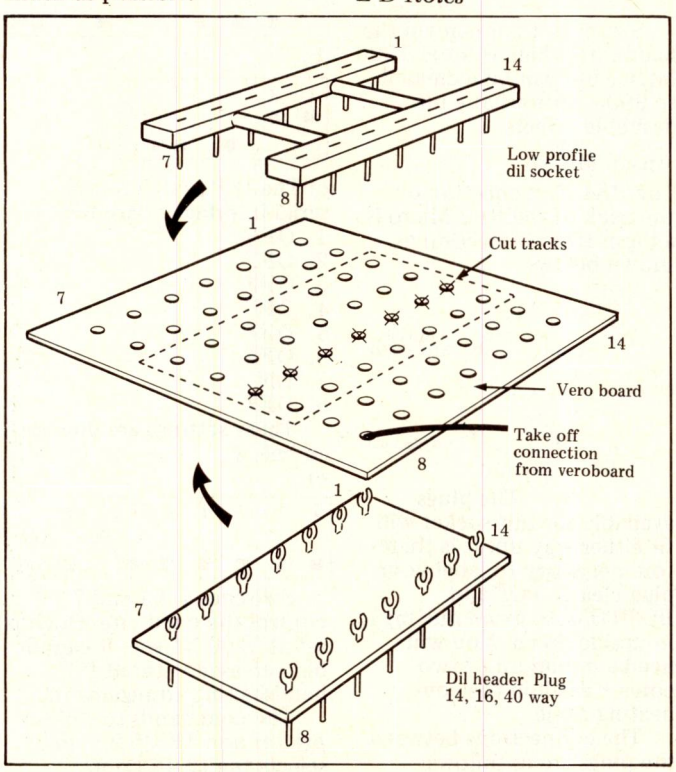
Solder the DIL Socket in position, ensuring that the socket is tight to the veroboard and that the pins protrude through the holes as much as possible.

Carefully align the DIL header plug to mate up with the DIL socket pins and solder in place.

Remove the IC you wish to connect to, insert the device and replace the IC into the top socket. Connections may now be made to the veroboard.

This method enables a neater and tidier way of connecting up without soldering to the tracks or IC legs. It may also be used with 16, 24 or 40 pin sockets.

L D Roles



ZX81 EXTRA LINES

On the ZX81 it is possible to PRINT AT to the bottom two lines normally used for INPUTs. This is done by removing them from the INPUT cursors' use which at the same time frees them for use as lines 22 and 23.

These lines must be made available again if an INPUT is to take place or the program is to finish, otherwise the Interpreter will have nowhere for its cursor to go. POKE 16418,0 allows you to use the lines to PRINT. POKE 16418,2 restores the lines to be used for INPUTing.

A J Alexander

APPLE CONTROLLER CARD PROBLEMS

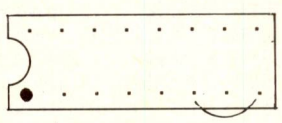
The Apple disk controller card seems fairly vulnerable because of its connections to other cards in the backplane. Whilst pulling the controller card out with the power on is almost certain to damage a chip, interference from other cards can also have a rather nasty effect and you may be greeted with a screen full of question marks, and no other response. If the controller card is removed, the Apple acts normally again.

Unless you have more than two drives, this is not much help, but the chip which has almost certainly blown (the 74LS259 chip) is also present in a not-too-vital place in the Apple main board.

If this chip has blown the 74LS259 in position F14 can be used to replace it. This controls the annunciators and screen soft switches. The annunciators are not particularly important, but the screen switches default to text page two with the chip removed.

The following hardware fix gets you back on the road until you can buy another chip:

1. Remove chip F14 from the Apple main board, and use it to replace the chip marked 9334 on the controller card.
2. Boot DOS to check that this is the chip responsible.
3. If this succeeds, switch off the Apple and jumper the empty F14 socket as below:



Wire pin 8 (ground) to pin 6 (page 1)

If graphics mode required, jumper: pin 8 to pin 4 (Hires) and pin 8 to pin 5 (Nomix) or pin 8 to pin 7 (Lores).

The 74LS259 is marked 9334 on both boards.

P. Reeves

BEEB KEYBOARD CHECK

When I first received my BBC computer, I was impressed with the GET and INKEY functions. But since then, I have discovered that they are more sophisticated (and useful) than I first thought. The computer can usually detect when a certain key is being held down, regardless of other keys being pressed at the same time, using the command:

IF INKEY(-n) THEN . . .

followed by the required operation. n for each particular key *must* be negative, or the computer will wait for n/100 seconds for an input. Figure 1 shows the value of n for each key.

If the particular key is being held down, the statement IF INKEY(-n) will be true and the computer will continue to the stated operation. This function is very useful in real time games, etc.

Note, though, that several keys held down together may, in adverse circumstances 'simulate' another key being held down. This is not frequent but do keep a lookout.

Robert Simpson

A	194	H	213	O	183	V	228	:	201	?	233	1	177	6	181
B	229	I	166	P	184	W	162	;	216	£	169	2	178	7	165
C	211	J	198	Q	145	X	195	,	231	^	153	3	146	8	150
D	179	K	199	R	180	Y	197	.	232	:	249	4	147	9	167
E	163	L	215	S	210	Z	226	[	185	Space	227	5	148	0	168
F	196	M	230	T	164	Tab	225	]	217	=	152				
G	212	N	214	U	182	Delete	218	@	200		(Tab 225)				

TJ's WORKSHOP

A SINCLAIR UTILITY

I'm sure that many Sinclair users have the lines:
200 PRINT 'PRESS ANY KEY TO CONTINUE':
210 IF INKEY$ = " " THEN GOTO 210
or something similar, in many of their programs. However, the words 'ANY KEY' imply that both the shift & break key may be pressed. Anyone who has no ZX programming knowledge and is using such a program could either:
1. press shift — which would result in nothing happening at all, or
2. press break — which would result in the program crashing with report code D.

The latter could be disastrous. I have developed the following machine code routine which will suspend execution until a key is pressed — ANY KEY (literally) — and then will continue with the rest of the program.

```
16514: CALL 02BB   wait for
16517: INC H       key to be
16518: JRZ-6       pressed
16520: CALL 02BB   wait for
16523: INC H       key to be
16524: JR NZ-6     released
16526: RET    return to Basic
```

To load the machine code, enter the following program:

```
1REM 1234567890123
10 POKE 16510,0
20 LET A$= "CDBB02242
8FACDBB022
420FAC9"
30 LET I = 16514
40 LET HI = (CODE A$ —28)
*16
50 LET LOW = (CODE A$(2)
— 28)
60 POKE I, HI + LOW
70 LET A$= A$ (3 TO)
8Ø IF LEN A$= 0 THEN GO
TO 110
90 LET I = I + 1
100 GOTO 40
110 PRINT "DELETE
THESE LINES"
120 PRINT
130 LIST 10
```

Then to use the program enter (for example at lines 200 - 210):

```
200 PRINT "PRESS ANY
KEY TO CONTINUE":
210 LET WAIT = USR 16514
```

instead of the lines shown earlier. The routine is fully relocatable and could be placed above ramtop.

S. Morley

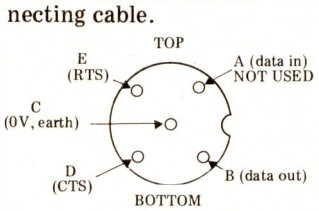
BEEB SERIAL PRINTERS

If you have not yet obtained the necessary connectors to interface your BBC MICRO through the parallel printer port, and you have a serial interface on the Microline or Epson printer, you may be interested in the suggestions for connections which follow.

One problem with the BBC machine seems to be that it only sends a CR (ODH, CR$ (13)) at the end of each line. It is therefore necessary to make the printer perform automatic linefeed. The necessary alterations to the switches are listed. There are still problems in obtaining the different print styles under software control, but the instructions below will at least let you obtain program listings, etc.

OKI Microline

The RS423 connection on the back of the BBC Micro is a 5-pin DIN connection as shown below. The plugs available for this socket will fit either way up. It is therefore necessary to label your plug clearly TOP and BOTTOM, to avoid putting it in upside down. You will need a minimum of three cores + earth in the connecting cable.



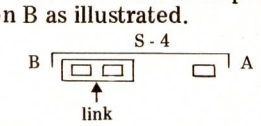
Firstly connect together some of the pins in the plug for the 25 pin connector to the Microline.

Connect insulated wire loops joining:
1. Pins 6, 8 and 20.
2. Pins 4 and 5.

The connections between the plugs are as follows:

BBC MICRO	MICROLINE
Pin B(data out)	to pin 3(received data)
pin D(CTS	to pin 11(SSD)
pin E(RTS)	to pin 2(transmitted data)
pin C(OV)	to pin 7(signal ground)

For automatic linefeed remove the cover of the printer. This is done by undoing the two Phillips screws at the front of the cover and tiliting and lifting the cover. Look at the printed circuit board from the back. At the right-hand side is a link labelled S-4. This must be in position B as illustrated.

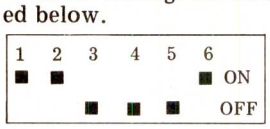


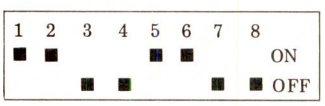
You must now check the DIP switches on the serial interface board in the black box on the back of the printer. The positions of the DIP switches are as follows:

1. ON
2. ON
3. OFF
4. OFF
5. OFF
6. ON

1. ON
2. ON
3. OFF
4. OFF
5. ON
6. ON
7. OFF
8. OFF

These settings are illustrated below.

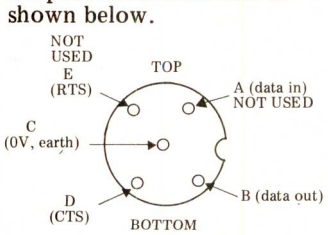




Switches 4,5,6 control the baud rate which is set at 1200 bit/sec but can be increased to 9600 without any undesirable effects.

Epson MX-80

The RS423 connection on the back of the BBC Micro is a 5-pin DIN connection as shown below.



The plugs available for this socket will fit either way up. It is therefore necessary to label your plug clearly TOP and BOTTOM, to avoid putting it in upside down. You will need a minimum of two cores + earth in the connecting cable.

The connections between the plugs are as follows:

BBC MICRO	EPSON
Pin B(data out)	to pin 3(received data)
pin D(CTS)	to pin 20(DTR)
pin C(OV)	to pin 7(signal ground)

For automatic linefeed remove the cover of the printer. This is done by undoing the four Phillips screws on the base, removing the paper feed knob (by pulling hard), and carefully raising and tilting towards the side with the switches. The lid is finally laid, still connected, upside-down by the side of the printer base.

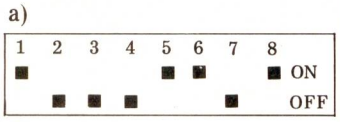
You must now check the DIP switches on the main circuit board by removing the four securing screws and the earth connection, and slowly and carefully lifting the board off the plug which secures it. The position of the DIP switches is as follows:

a) S-1 :8 switch block
1. ON
2. OFF
3. OFF
4. OFF
5. ON
6. ON
7. OFF
8. ON

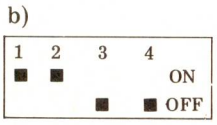
b) S-2 :4 switch block
1. ON
2. ON
3. OFF
4. OFF

These settings are illustrated below:

a)



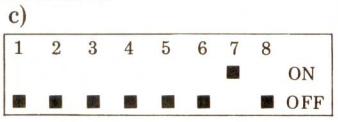
b)



c) The DIP switch on the serial interface board (8141).
1. OFF
2. OFF
3. OFF
4. OFF
5. OFF
6. OFF
7. ON
8. OFF

These settings are illustrated below.

c)



Switches 1,3,4 and 7 control the baud rate which is set at 1200 bit/sec. It cannot be increased without full handshaking arrangements.

The commands to call the printer are: *FX 5,2 — this selects the RS423 port. *FX 8,4 — this selects 1200 baud. VDU 2 or PRINT CHR$(2) or CTRL B will now turn the printer on. VDU 3 or print CHR$(3) or CTRL C will turn it off.

To list the WELCOME programmes it is necessary to BREAK, and then type OLD.

George Hill

TJ's WORKSHOP

ZX81 MAPPED DISPLAY

This routine is for use in ZX81 computers with at least 2k of RAM. It enables the display to be used as though it were memory-mapped, ie, it becomes possible to easily PEEK and POKE onto the screen. This makes programs involving moving graphics to be fast, short and easy to write.

The routine is in two parts, one of which must be executed before you use the moving graphics and the other must be executed when the moving graphics have finished.

Part 1 (at the beginning of program)

```
110 LET A = PEEK
    16396+256*PEEK
    16397
120 CLS
```

If the amount of RAM available, as defined by RAMTOP, is less than 3.25 K then insert the following lines:

```
100 FAST
120 FAST
130 FOR B=1 TO 714
140 PRINT " ";
150 NEXT B
160 SLOW
```

If your RAM is less than 3.25k then do not use CLS — instead use the subroutine from line 120 onwards which will clear the screen.

Part 2 (at end of program)

```
1000 FOR W = 0 TO 696
     STEP 33
1010 POKE A+W,118
1020 NEXT W
```

When you wish to POKE a character on the screen or PEEK at one type either POKE A +C,D or LET Z = PEEK A+C, where C is the number of the location on the screen. C should be an integer between 0 (top left position) and 714 (bottom right position). D is the number of the character to be put on the screen and should be between 0 and 128 inclusive. A is the variable used by the subroutine and should be left alone by the programmer. Z holds the code of the character at location C.

While the subroutine is being used the computer must not stop running due to an error or the break key being pressed, etc. If it is stopped the computer will crash.

While the routine is being used you may use all the other programming commands except SCROLL and, if RAMTOP is less than 3.25k ,CLS.PRINT may be used as long as you do not try to print more than 32 characters on one line. INPUT may also be used providing that no more than 30 characters are typed in.

All the other commands are as normal. If these restrictions are not adhered to, it will almost certainly result in a crash with the loss of the program.

Also note that while this routine is being used a single line on the screen becomes 34 characters long instead of 32.

A G Jones

VIDEO GENIE SOUND

Here is a simple circuit for owners of the old-model, unexpanded Video Genie.

This circuit utilizes the renowned AY-3-8910 Programmable Sound Generator chip and just two, readily available 7400 quad NAND gates. Connection is made to the computer via the 50-way, double-sided edge connector at the rear of the case as indicated in the diagrams.

Connections to the Expander socket are as follows. (Pin numbers in Fig 1):

GND — Pin 1	DO — Pin 15
VCC — Pin 19	D1 — Pin 14
AO — Pin 10	D2 — Pin 12
WR — Pin 40	D3 — Pin 16
RD — Pin 41	D4 — Pin 20
A15 — Pin 21	D5 — Pin 11
RESET — Pin 48	D6 — Pin 18
CLOCK — Pin 30	D7 — Pin 17

The PSG registers are accessed from software by PEEKing and POKEing into any part of the unused RAM area, from location 8000H to OFFFFH. All odd locations access the PSG register latch and all even locations access the PSG data latch.

So, POKE -1,7 : POKE -2, 0 will set the PSG register 7 to zero. And, POKE -1,7 : ? PEEK (-2) will display the contents of PSG register 7.

A word of warning, however. If any other devices linked to the computer use any of the locations from 8000H to FFFFH, then the PSG addressing will have to be decoded further. If more than one device is working from the same address then chips will fry. The solution is to AND line A15 with other address lines before connecting to the circuit.

T. Pothecary

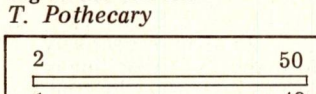


Fig 1 Pin outs from edge connector. (viewed from rear)

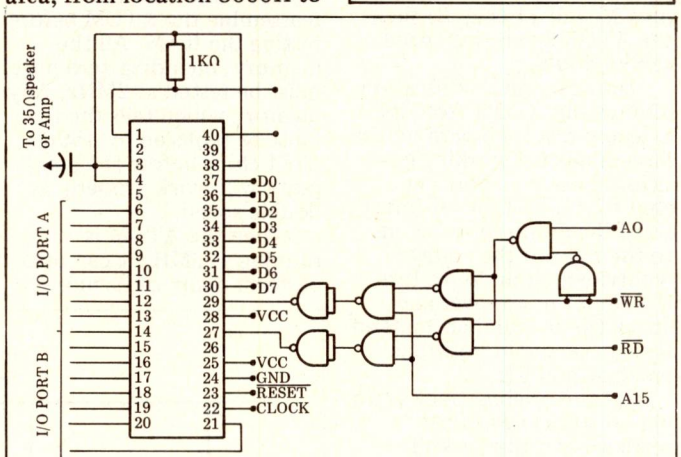


Fig 2 Sound Generator

ATOM SCREEN READ

These routines to read strings and numbers from the screen of the Atom are useful when you wish to alter strings and numbers previously output to the screen and then re-enter them. You can read them from any position on the screen and assign them to the correct variable, by inputting coordinates to give the screen address you require to be read. This address must be the first character of the string or number to be read.

In line 10 of the strings read routine, dimension the string to be read which should also be the same as the shortening of the string in lines 20 *and* 70. The next line sets A to the screen address of the first character you intend to read. A is actually a string, but it is not necessary to dimension this as it is set to an address — the screen address in this case. The FOR loop that follows reads a character in string A into string D correcting in lines 30 and 40 for character codes and converting in line 50 from screen codes to character codes where different. Line 70 shortens string D to A string. Important if the length is to be shorter than A. Finally line 80 prints string.

For numbers, as before A is set to the screen address of the first character of the number to be read. Line 200 converts string A to a floating point variable %B. The following line prints the number.

John Ferguson

```
100 A=8000
200 %B=VALA
210 FPRINT %B
220 END
```

Routine to read floating point number or any number from screen without using input and printing it.

```
 5 DIM D10
10 A=#8000
20 FOR Z=0 TO 9
30 IF A?Z>=128 D?Z=A?Z-32;GOTO 60
40 IF A?Z<=63 AND A?Z>=32 D?Z=A?Z;
   GOTO 60
50 D?Z=A?Z+64
60 NEXT Z
70 $D+10=""
80 P. $D.
90 END
```

Routine to read string from screen without using input and printing it.

TJ's WORKSHOP

2MHZ ATOM

Although ATOM BASIC is fast, the fact that the machine runs on a 1MHz clock (as opposed to the 2 MHz used by PET, BBC . . .) is a great disadvantage. By using this simple hardware modificication to double its speed, the ATOM becomes a much more interesting and competitive computer.

The switch allows you to select a clock frequency of either 1MHz or 2MHz. This is done by taking different outputs from the oscillator divider chain and feeding them to the CPU clock input.

On the circuit diagram (Fig 1) you can see that the 4 MHz signal is fed into the divider chip, IC 44, at pin 13. Pins 11, 10, 9, 8 then carry 2, 1, .5, .25 MHz respectively. Normally the 1MHz line is used to drive the CPU and the .25MHz goes to become the cassette output signal. If however you make the output to the CPU switchable between pins 10 and 11 (Fig. 2) then the ATOM operating speed can be doubled.

To make the modification remove the ATOM from its case and rest the board on the base in normal working position. Locate the divider chip IC 44. It is the left-most IC of the group of three, just to the right of the voltage regulators. (If in doubt turn the circuit board over and check the IC numbers marked there). The main positions are shown in Fig. 3.

Cut the original track from pin 10 to the CPU with a small screwdriver or knife. Pin 10 is the third pin from the right on the bottom row of the chip, pin 11 is immediately to the left of pin 10. To check that the track is cut, switch on the machine. There should be a video output but the BREAK key should not work. If the computer operates then the track still conducts.

Next you must solder the wires from pins 10 and 11 to the place you wish to locate the switch. The third wire for the output from the switch may either be soldered to the plated-through-hole to the left of IC 44, which is part of the original track, or connected directly to the clock input of the 6502, pin 37. The next stage is to connect the switch and test the contacts.

To test the modification set the switch to the 1MHz position and power up the computer. Press the BREAK key and the machine should operate as normal. If not, check your wiring. When the machine is working at 1MHz switch it to 2MHz and press the BREAK key again. If the machine seems to lock up then the wiring from pin 11 to the switch is faulty. If the BREAK key works but the screen displays apparently random characters then the lower video memory is too slow to operate at 2HMz.

When the switch has been installed and checked reassemble the ATOM before testing the RAM. All the memory, including zero page, must be tested at 2MHz. Any memory which fails the test must be replaced by 450nS 2114 chips before the computer will work properly at double speed.

When the ATOM is running at 2MHz it can outperform many of its more expensive counterparts but there are certain drawbacks. The major problem is that unless you make the cassette output frequency switch-selectable you cannot save or load programs at 2MHz. A minor problem is that the timer frequency for the VIA is derived from the CPU clock frequency so that any times obtained whilst running at 2 MHz will be doubled. To avoid this use the 60Hz video sync pulse to check the clock frequency at run-time by executing X=0;WAIT;DO X=X+I;UN? BOO2 128 .X will then contain the clock frequency in MHz.

All software not using the cassette interface will run directly at 2MHz but I found that to use the extra computing power to advantage many programs needed slight alterations. Notably, cutting out many of the "WAIT"s in machine code graphics routines, increasing delay loop times for displays and slowing down many games to make them physically playable.

I should like to know how many micro owners can beat a time of 1 min, 26 secs to sort a thousand random numbers.

A Clements

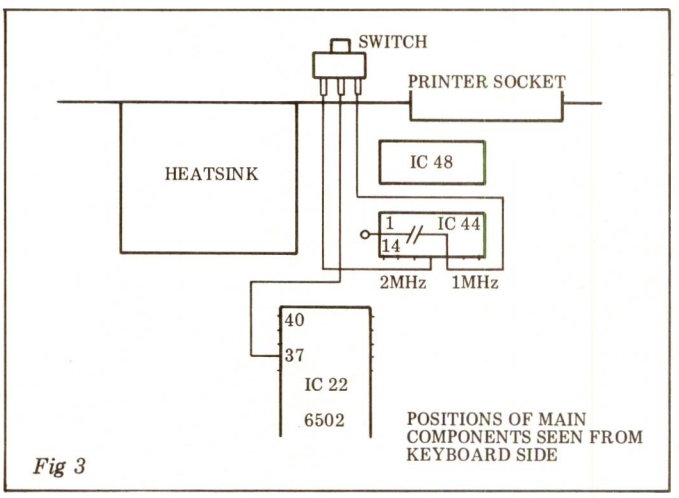


Fig 3

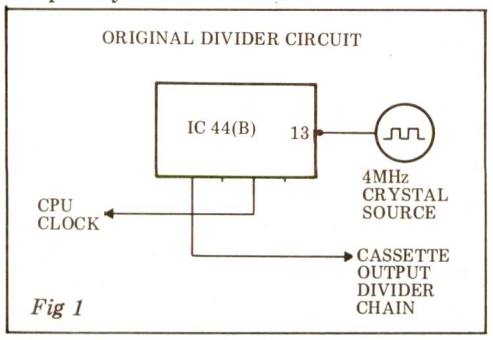


Fig 1

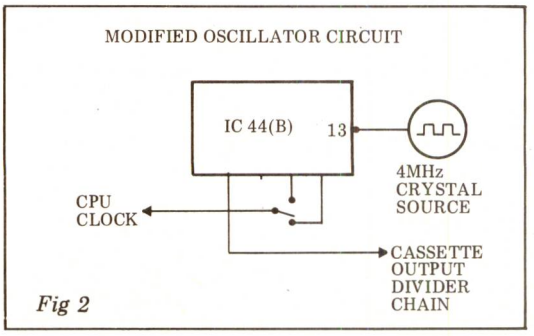


Fig 2

UK101 STOP PRINT

This short program patch for use with the OS1 assembler on a CEGMON-based UK101 should work on any OS1/UK 101 Kit.

```
0235 48          PHA
0236 AD 00 DF LDA $DF00
0239 C9 FC       CMP £$FC
023B 90 F9       BCC -7
023D 68          PLA
023E 4C EE FF JMP $FFEE
0241 A2 00       LDX £$00
0243 2C          BIT $. . .

0782/40 → 41
08FA/33 → 35
08FB/13 → 02
```

This compact little program will suspend the Assembler's 'list' or 'assemble' output from scrolling away madly up the screen before you can read it. You do this by pressing the RETURN key down for as long as you want. (O, L, ↑,. keys also work).

If you want the reverse effect (only printing when RETURN is pressed) then change 1023A,B to FF,FO respectively.

To fit this masterpiece in the small space available one byte had to be stolen from the Assembler proper using the handy "2C" trick — hence the adjustment at 0782 (jump-table).

The actual output vector at $1333 wasn't changed as that tends to screw up echoing input characters as well, hence only $08FA,B is changed to point to the above program. Not bad for only 11 extra bytes, eh?

Dave Woolcock

SHARP MZ-80K QUICKIE

Sharp Basic (SP-5025) will give a Data Error if the following is attempted:
20 PRINT TAB (79); "OK"
(numbers above 78 are disallowed).

However, POKE 10211, 127 will allow numbers up to 254 to be used:
10 PRINT TAB (254); "HOW'S THAT?"

Keith Faulkner

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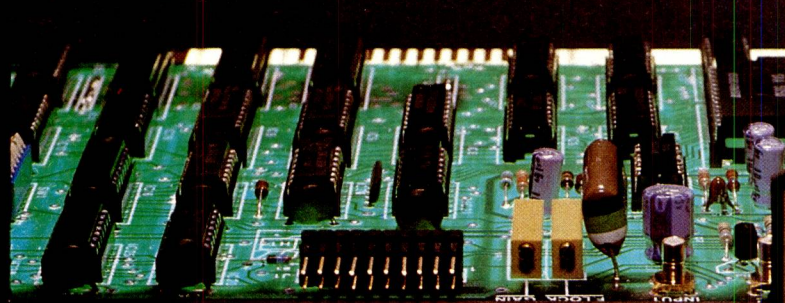
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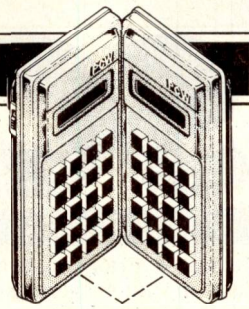
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By Dick Pountain

GOING EQUIPPED...

It isn't too often that I use this column to provoke the committing of felonies, but one must keep an open mind, so here goes. In the May issue we looked at the quirk of the Casio 602p and I promised to reveal at a later date the method for cracking the password protection on this machine. The method, due to Andrew Macleod (sorry about the misspelled name last time) involves getting the 602 in 'quirk mode' to dump the entire contents of memory.

First I'll recap how to get into 'quirk mode' or rather I'll present a much easier method subsequently discovered by Tony Smithurst.

After clearing all memories enter the following program:
P0 HLT " " LBL0 "B" LBL1

This program when run as follows enters the pseudo alpha mode and any program steps placed between the LBL0 and the 'B' will be translated into special characters according to the mapping published in May. To run it press the following key sequence:
P0,FST,INV ALPHA,GOTO0

The function of the "B" LBL1 is as a 'stopper'; since the B translates into GOTO1 it takes the program out into regular mode. Without this stopper the program would run off the end of the rails, which in our current investigation is exactly what we want it to do. So remove the "B" LBL1 and try running:
P0 HLT " " LBL0
using the same sequence as before. You will get a blank display except for the — 'running' symbol but after approximately 41 seconds something will flash onto the display (too quickly to read) and leave the display:
0 ⌐ ⌐ ⌐ ⌐ ⌐ ⌐ ⌐ ⌐ ⌐ ⌐ ⌐

This will remain undisturbed for a further 40 seconds until it is disturbed by the flash again and so *ad infinitum*.

What is happening is that execution has run off the end of the program and is whizzing through the rest of RAM and then cycling round back to the beginning endlessly, taking about 40 seconds per trip (Figure 1). The flash is the program itself in alpha coded form whizzing past. If you halt the process you will get a screen full of the dotty characters which represent the null bytes in empty memory. If you press FST you can now single step through the memory; since there are 2048 bytes of it you run the risk of getting an abnormally developed forefinger if you do it for long. To locate the program it's better to start again with a stopwatch and HLT after 39 seconds; you don't have nearly so far to step then.

Where is this all leading, you may well ask? Patience, we are getting to the point. Now enter any program into P1 and protect it with a password. Upon running P0 as above the password of P1 will be immediately displayed backwards! The display will last for a couple of seconds, long enough to read and to add insult to injury, will be repeated every 40 secs. If you want to freeze it you must either hit HLT very fast indeed or wait for 30 odd secs and then single step. The password is always preceded by a ':' symbol and followed by a '—'. I don't understand quite why it is backwards unless it is stored on a separate stack from the program proper.

Unfortunately this is a somewhat artificial situation we have created in that the protected program was loaded after the 'dumper' program; as you should know by now all the Casio X02s store programs in the order in which they were entered, not in order of program register numbers. In a real life password breaking attempt (to be charitable I will assume that it's your own program whose password you've forgotten) it is certain that the dumper program will be entered after the target program, and possible that other programs may lie in between them.

This creates some difficulties and may even render the cracking impossible. Take the simple case in which the dumper is loaded on top of a single password program. No problem here but you will have to wait almost one memory cycle to see the password (see Figure 2) and some nifty stopwatch work is needed. The time required to cycle from the end of used program memory to the beginning can actually be computed by using MODE 2 to get the number of free steps; then:
Cycle time = (free steps)/ 50 + 30
seconds approx.

However now suppose that another, irrelevant, program sits below the target program in memory (Figure 3). Now the dump must go to the end of memory, return to the beginning and then pass through the irrelevant program before the password is reached. Why is this a problem? Because the irrelevant program will be displayed with its instructions translated into alpha and vice versa. If only the former, it is merely an annoyance having to distinguish between the irrelevant garbage produced and the backwards password you're looking for. But if the irrelevant program contains alpha strings, these will be translated into instructions and executed; it is almost certain that one of them will be illegal and cause an error or otherwise stop the execution of the dump, and so the password will never be reached.

The only solution in this case is to delete all such dangerous alpha strings from the program or even, if convenient, the whole program. But what if the 'irrelevant' program is also password protected, how can you delete the strings (or indeed the whole program)? No sweat because you can see its password as it is first in memory!

As you can see it would be quite a performance to crack the password of a program which sat on top of eight others which had unknown passwords; it could be done with perseverence by cracking each in turn and deleting them.

I hope all this is comprehensible; I equally hope that you will use it only to retrieve your own software and not to filch your neighbours'.

As a sideline this investigation enables us to gain some insight into the 602's memory organisation. The figure of 2048 bytes can be verified experimentally by manually stepping through until a repeat occurs. The fact that a recycle occurs suggests that only 11 bits are decoded for addressing so that 8000H is read as 0000H, ie, memory lies between 0000-07FFH.

By pressing BST when in a single step dump displays of the form
$\overline{x}\,\overline{x}\,\overline{x}$ 7 7 7 7 7 7 4 0
are obtained. By single stepping forward eventually this will change to:
A A A 7 7 7 7 7 4 2.

This AAA code, which only occurs once, marks the partition between program and data memory; it moves when different numbers of registers are assigned, eight steps per register. Following the AAA, the memory code is displayed as ⌐ ⌐ ⌐ . So the $\overline{xxx}$ code shows free program steps. A tentative memory map is shown in Figure 4.

END

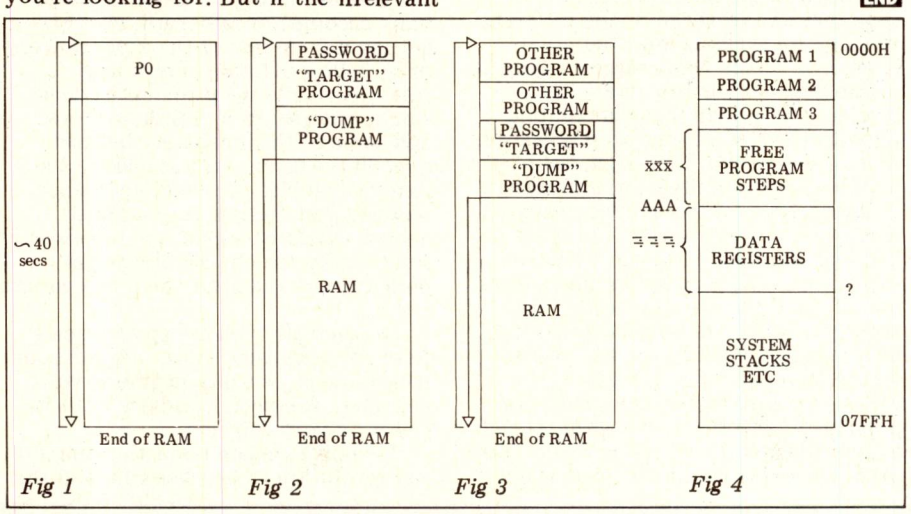


Fig 1 *Fig 2* *Fig 3* *Fig 4*

SCREENPLAY

This month Dick Olney dips a toe into the vast pool of games Software available for the Sinclair ZX81.

It was a dramatic change when, after last month's 'Screenplay', the Apple went out of the door and was replaced with a ZX81. There's not much I need to say about this machine since it's probably the best-known home computer in the country. I had a standard, unadulterated model with a 16k RAM pack which cost respectively £70 and £30, making a round £100. You don't need the extra memory for all the games available for the ZX81, of course, but you will if you want to play anything worthwhile — all the games reviewed here required the RAM pack.

An immediate problem for me was that I didn't actually own a cassette deck so, because I should have anyway, I set about buying one. I'd heard that, although any such device should officially work on the Sinclair, loading programs was not always as straightforward in practice as it might be, so I decided to seek advice. After discussions at Lion House I bought a Panasonic slimline model for just over £20. When I set the system up, however, try as I might I could get nothing loaded. I tried every possible volume setting, poked the leads about and checked all the plugs were in securely — but still no joy. Had I then had the experience I now have of the bizarre screen patterns the ZX81 throws out during loading, I might be better able to assess what went wrong but under the circumstances, I decided to play safe and get another cassette machine.

I tried asking those members of *PCW*s staff who own ZX81s but in all cases, while they could read back their own saved programs, they were all having the same problems as I was with external software.

Finally, I spoke to the Buffer micro shop and was advised to try a Tandy CTR37, an obvious choice where computer compatibility is concerned and only slightly more expensive than the Panasonic. Again, despite the fact that I could see definite changes in the patterns, I failed to load even the tiniest program, so I took the whole set-up down to Buffer's shop in Streatham to seek expert advice.

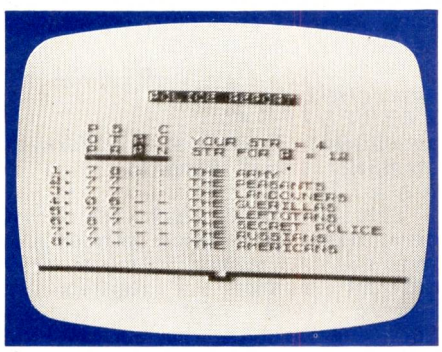
Within moments, Michael Howard, one of the partners of Buffer, discovered the problem: I had been suffering from the dreaded RAM pack jiggling. Whether it had become dislodged in transit or had been the problem all along, I'll never know, but from that point I've had no trouble. Even if the whole episode was due to my own carelessness, there's no doubt that people frequently do have this problem with the ZX81 — while I was in the Buffer shop, a lady came in seeking advice on it. The cure is simply to make sure the RAM pack doesn't jiggle about as you type and that it's always firmly connected up.

I'm sure that many cassette decks will work with a little persuasion, though I can positively recommend the Tandy. If in doubt, consult a local ZX81 software dealer or insist on a sale-or-return basis when you buy a cassette recorder.

Apart from adjusting the volume, positioning the leads and checking that all connections are firm, the following tips may help if you're having tape loading problems. The RAM pack is very low set and there is some give in the footpads — when you're using the keyboard, it tends to knock against the tabletop, making it easy to dislodge. This can be prevented by placing the machine on a book (the Basic manual is almost custom-made for this!) and hanging the RAM pack over the edge. To check the RAM is working, try keying in PRINT POKE 16389, which should come back with 128 if the memory is okay.

Another indication is the time it takes for the cursor to appear after power-on — the RAM pack causes a slight delay.

Everything worked in the end so here's a selection of games currently available for this machine.



Game: Dictator
Supplier: Bug-Byte
Price: £9.00

Although this is the first game of its type that I've reviewed, many different versions are available for a variety of machines. As the name suggests, it's one of those games where you are cast as President of a small 'banana republic' set with the task of staying in power for as long as possible. You begin your term in office with a limited amount in the treasury and a fairly high popularity among all your citizens except the guerillas, who will hate you whatever. Each month begins with a request from one of the three main factions — the army, the landowners or the peasants. You are given advice as to the effects of your response on the strength of the various factions and groups, and your popularity with them. The groups (such as guerillas and the secret police) do not make requests or start revolutions but they may conspire with the factions against you.

Before you decide whether to grant the request, the cost to the treasury (if any) is displayed. After responding, you are shown a treasury report and given the option of a secret police report (for which you will be charged). The latter gives the status of all the groups and factions as well as indicators as to whether any of them are plotting revolution or conspiring to assassinate you. Next you are given the opportunity to make a presidential decision. These may aim to please or strengthen groups, improve your own position (by, for instance, buying a helicopter or transferring money from the treasury into your personal Swiss bank account) or raise cash, either by getting it from one of the super-powers or by selling off the country's art treasures. Only one presidential decision is allowed each month, however, and some of them can only be used once in the game, such as making the Army Chief vice-president and hence pleasing that faction, so you must choose carefully. Again, your decision is followed by the chance of a secret police report and after this a new month begins.

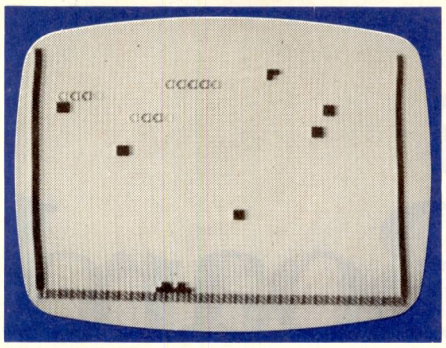
Occasionally you are given a newsflash covering some event beyond your control (such as a plague among your peasants), followed by advice as to its effect on your subjects.

There is a certain strength rating for any revolution to be successful and the trick of the game is to ensure that no factions fall below a critical popularity rating while their strength — either alone or allied with another group — becomes high enough to overthrow you. When some faction does eventually rise against you, you must choose whether to fight them off, in alliance with some group still loyal to you, or to escape. In the former case your success will depend on your combined strength and that of the insurgents, while escape is facilitated by the ownership of a helicopter but is always risky.

The game ends when you successfully flee the country or are killed. Your score will depend on your final popularity, time in office, whether or not you survived and how much money you managed to rip off.

I thought this game had a lot of scope and there is certainly plenty to think about. An added attraction was the program notes section in the documentation. These give you the names of the predefined variables and the line numbers of the various subroutines. You can't apparently make any additions to the program since it takes up the full 16k, but with the information supplied it would be easy to make quite significant changes. Incidentally, this game takes about seven minutes to load so be patient!

Value for money: ▰▰▰▰▰▱▱▱
Presentation: ▰▰▰▰▰▱▱▱
Complexity: ▰▰▰▰▱▱▱▱



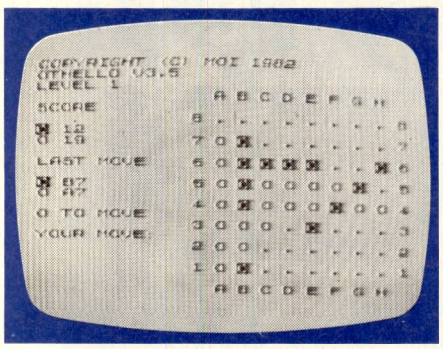
Game: Centipede
Supplier: DK'tronics
Price: £4.95

This is the ZX81 version of the arcade game of the same name. Your part in it is exactly as in classic Space Invaders in that you move a base along the bottom of the screen (keys C and B) and fire upwards (shift). The difference is that the enemy is made up of long, thin beings with eight segments that travel horizontally across the screen, changing direction and moving down one line whenever they encounter one of the randomly-scattered obstacles or the edge.

As might be expected, you lose a base if the enemy hits you with a bomb or reaches the bottom of the screen. If you hit a central segment of the alien, its two halves will split up, until you have lots of single segments roaming around above you. In the first attack wave, only one centipede appears and doesn't drop any bombs, but as the game continues reinforcements are brought on and they start bombing you. There is a choice of speeds and each game can consist of between one and five bases. Although only one player can take part at a time, there is a running table of the top 10 scores with names, so you can have competitions. On mine, all 10 names were initialised to 'Pink Floyd' — presumably the programmer's favourite band.

The responses in this game were pretty good, though the graphics are less than inspired even by ZX standards. None of the strange creatures which appear in the original arcade game seemed to be featured here, which is a pity since the lack of them makes the game repetitive. I also feel there could have been more obstacles so that the creatures make a more interesting descent. This is understandably a poor version of the original but I'm afraid I think it's also a poor substitute.

Value for money: ■■■□□□□□□
Use of graphics: ■■□□□□□□□
Addictive quality: ■■■□□□□□□
Response speed: ■■■■□□□□□



Game: Othello
Supplier: Mine of Information
Price: £6.00

You may remember I reviewed a version of Othello for the Atari in the April issue. It's the board game where you have to position your pieces to enclose those of your opponent, thereby turning them to your colour and 'winning' them. Each time you place a piece on the board you must achieve this or forfeit your move. This particular version has a good selection of special features and playing options. You can play a two-person game or play against the ZX81, with either you or the computer starting. For each of these it's possible to change the initial position of the pieces to solve problems, introduce handicaps or simply make the game more interesting.

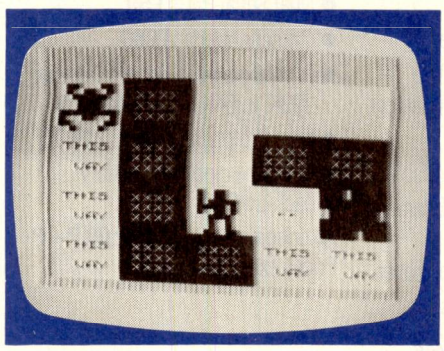
If you choose to play the ZX81, you can at any time change the skill level (1-9), switch sides or replay an unlimited number of previous moves. An interesting feature is the 'sample game' in which the computer will play both sides if you choose and which you can run through in either direction, taking moves whenever you like. This allows you to test out the long-term effects of various moves from the same starting position.

The screen layout is fairly predictable, with an 8x9 matrix of dots for the board and open circles playing against black squares. Information as to the current score (ie, the number of pieces of each colour on the board) and the last move of both players is displayed beside the board above the prompt.

On the package, MoI claims that this program 'puts AI into your ZX81' — quite a promise, though in the accompanying booklet this has been modified to 'embodies concepts from the domain of artificial intelligence'. Although there is a program listing at the back of the booklet, it's in machine code so I wasn't about to unscramble it to investigate these claims.

I'd say that this would be just the job for a present or potential Othello enthusiast. It does play well and the many features give you the chance to really explore the games' possibilities. If you're not into Othello then I presume you wouldn't buy this package — there's nothing special about it apart from its playing skill (unless of course you're wild about machine code and want to study the program!).

Value for money: ■■■■■■■□□
Playing skill: ■■■■■■■■□
Special features: ■■■■■■■□□
Presentation: ■■□□□□□□□



Game: Mazogs
Supplier: Bug-Byte
Price: £10.00

This is a rather interesting graphics-oriented maze game with principles along the lines of a traditional Adventure. You control an impressively animated figure running through a very extensive configuration of corridors. The usual maze procedure operates, whereby you get an aerial view of a very small section during actual movement but there is the possibility of a long-range scan across several tunnels. Scattered throughout the maze are a number of swords and slightly fewer Mazogs, which are decidedly hostile. There are also a few previous Mazog victims walled up in the corridors — they can be recognised by a pair of blinking eyes. The idea is to find the treasure and bring it back to the maze entrance. You can pick up a sword by moving your man against it and with this you will be able to kill one Mazog. If the Mazogs attack when you are empty-handed, there's a 50 percent chance that you'll be killed, which of course ends the game. Pressing the figure against one of the encased prisoners causes a trail to appear briefly, showing the direction of the treasure. Once you've found the treasure you must carry it back with you and, although you can swap it for a sword, you can only carry one thing at a time.

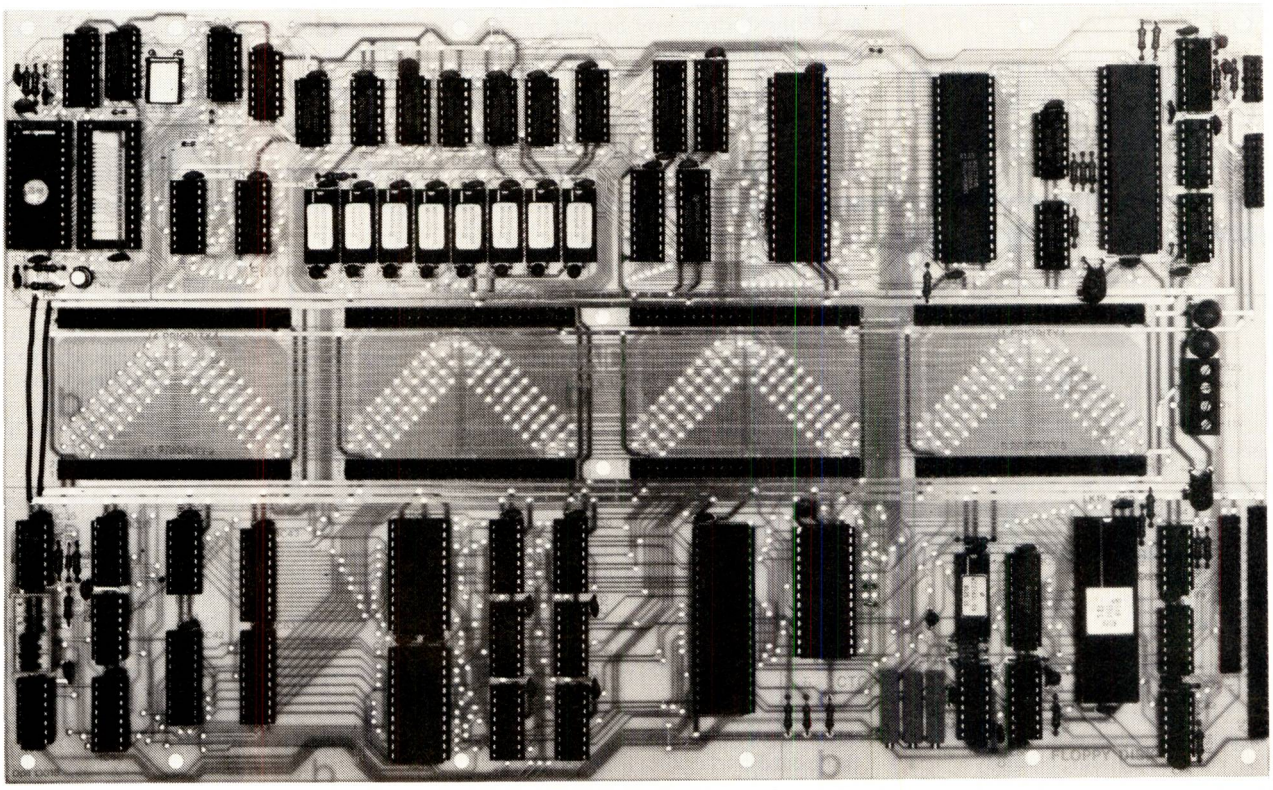
You are given a limited number of moves which can be used up quite quickly and 10 moves are lost with each long-range scan.

There are three possible variations of the basic game. In the first, the Mazogs are completely inert and can only kill you if you run into them. This is fairly easy once you get the hang of it and the option is appropriately called 'trying it out'. The second variation is where the Mazogs will attack you if you move up beside them (they never attack from above or below) but you can gain extra moves if you attack and kill them on a vertical stretch. The most exciting option is called 'manic mobile Mazogs'. In this the nasty creatures move randomly throughout the maze, making life very difficult. Here, the return is the most hazardous part since you are helpless with the treasure and Mazogs will have moved into corridors previously rid of them.

The graphics are used very clearly in this game and the response speed is excellent. The maze itself is fairly extensive and complex, making for an interesting and challenging game, at least at the most difficult level. Keys W and S control vertical movement and H and J horizontal, which works reasonably well. Overall, this is undoubtably one of the best games of its type which I've played on the ZX81.

Value for money: ■■■■□□□□□
Use of graphics: ■■■■■□□□□
Addictive quality: ■■■■■□□□□
Response speed: ■■■■□□□□□

OEM's This is Your Board



The RADER single board computer has been developed in the U.K. and tailormade to offer the user the most up-to-date techniques of microprocessor technology coupled with the built in facilities of ultimate expandability and flexibility.

Based on the popular Z80A Microprocessor running at 4 MHZ, up to 16K of internal ROM may be addressed. 2K of video RAM and 2K of character generator RAM is included (both memory mapped). Decoded bank switching permits the addition of as many boards as may be required, each board containing 3 pages of 64K RAM, giving unlimited capacity. A highly flexible memory capability is achievable by the addition of external pages of ROM.

Floppy Disc interface utilises Western Digital's 1797 Disc Controller allowing interfacing to 5¼" or 8" floppy disc drives, side selection for double sided drives and single or double density recording. All data transfers are accomplished by the on-board DMA controller. Other standard features include: On board keyboard port, composite video output and "disc mains" on/off signals; light pen input; inverse video switch to select normal video display background (white on black/black on white); video enhancements switch; plus choice of invert character or dual intensity enhancements.

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The board is configured to run the latest CPM version 2.2 and ideally suited as the basis for small to medium business machines, games machines, industrial control machines, research and development equipment ● **Board Price £350 plus £4.00 P+P excluding VAT.** (Please state whether 8" or 5¼" board is required.)

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- 64K RAM
- 4 MHZ Z80A CPU
- 5¼" or 8" Disc Interface, single/double/sided density
- Z80A CTC (clock/timer/counter)
- DMA Controller
- Memory Mapped Video Display
- Memory Mapped RAM Character Generator
- Programmable Video Controller
- 8 Expansion Connectors

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Prices exclude VAT.

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Price £100 plus £3.00 P+P. Send for complete technical specification. All prices excluding VAT.

- Full Custom software development support available

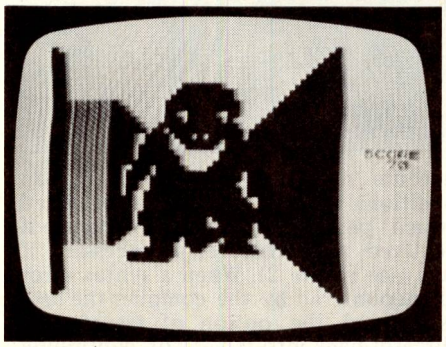
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SCREENPLAY



Game: Monster Maze
Supplier: J K Goreye Software
Price: £5.95

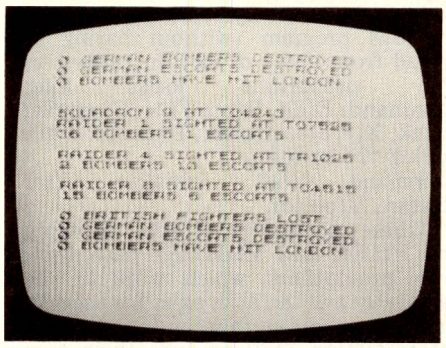
As is frequently the case with 3D mazes (see VIC review in the June issue), the maze in this game is not actually three-dimensional in itself but is graphically represented using perspective, giving a 3D view of the walls and corridors. Unlike other games of its type, however, you are allowed only a limited view in each direction with no short or long range mapping. This makes it incredibly difficult to find your way around and almost impossible to find the exit which is your objective.

The monster in this game is a huge Tyrannosaurus Rex which inhabits the maze, hunting out intruders. He isn't, however, the lumbering old lizard you might expect but is quite agile and seems to hurtle around the corridors at considerable speed. The blurb on the cassette box assures you that it's always possible to outrun him but there were times when I had my doubts. The graphics as the creature rushes towards you with mouth increasingly agape are excellent and almost worth being eaten for.

Luckily Rex does not spend all his time chasing you and spends some periods lying in wait and this is when you do most of your exploring. The problem is remembering where you are when you've just had to run for your life. After you've been devoured, you get another chance at the same maze and it can take many such attempts before you know your way around well enough to find the exit.

I found this game extremely difficult despite the simplicity of its design and I can't help getting the feeling I'd get bored and frustrated long before I got experienced enough to work up any real enthusiasm. It does, however, demonstrate excellent usage of the ZX81's graphics potential.

Value for money:
Use of graphics:
Addictive quality:
Presentation:



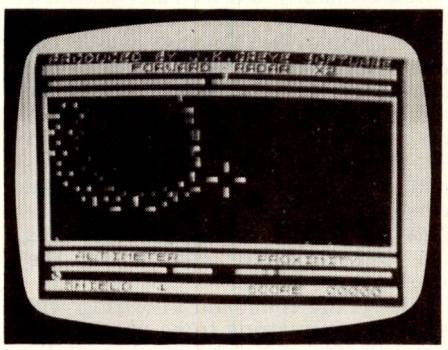
Game: Battle of Britain
Supplier: Microgame Simulations
Price: £4.50

This is a purely textual game in which you direct nine squadrons of aircraft stationed on the south coast during that legendary period of the Second World War. You can give any of five commands to each squadron: scramble, patrol, report, return to base and change course. For the first and last of these you need to enter target co-ordinates which use an Ordnance Survey grid system (two letters followed by four digits). A sketch map is provided, though the game might be made more exciting by using a bigger OS map of the south-east coast. I'd suggest you use coloured counters or something similar to keep track of the position of each squadron.

Throughout the game you are given reports of the strength and position of any approaching enemy bombers and (sporadically) the position of each of your squadron. The enemy planes are of course all heading for London and your job is to intercept and destroy them. Any of your squadrons coming within 5 km of the enemy will attack whether on scramble or patrol. You are heavily outnumbered but to compensate, your fighters have four times the fighting strength of bombers (though not of their escorts).

The strange thing about this game is that you don't have any control over the actual fighting. You just send off the planes and hope for the best, though you can weigh up the relative strengths. I have to say that I won all the games I played with very little problem, though I can't claim to have always kept track with what was going on. Whether this was just luck or that the game really is that simple I'm not entirely sure. It would be a strange concession to the title 'simulation' if you couldn't lose the Battle of Britain! I should add that a note in the instructions mentions a constant you can alter in the program to make the game more difficult. This, however, determines the number of bombers which must reach London before you lose (set at 100) and, since I didn't have a single one ever reach its goal, I can't see that this would have made any difference. Pity — it seemed to have all the makings of a interesting game.

Value for money:
Presentation:
Complexity:



Game: 3D Defender
Supplier: J K Creye Software
Price: £5.95

Firstly dispel any thoughts that this game bears some relationship to the original arcade game. It is, in fact, a rather dull interpretation of the 'forward view with crosshair sights' space battle scenario as seen in Atari's Star Wars and Epoch on the Apple, to name but two.

You start the game by taking off from a landing platform, whereupon you are presented with a three-dimensional view of stars and the odd high-speed alien craft — between one and four, depending on how you're doing. Even though good use is made of the limited graphics, I still found the visuals rather unsurprising. This is perhaps partly because I've been used to playing similar games with full colour graphics (*Techno-snob! — Ed*) but I'm really not sure that the ZX81 is up to this kind of thing.

Movement is controlled by four keys and another is used for firing. To do this, the keyboard is divided into five sections, within which any key gives the same result. The suggested configuration is 'E↖, F↗, H↖, and U↙ with 9 to fire, the idea being to use four fingers like a joystick. This is certainly much easier if you have an extended keyboard (see conclusion) but on the standard touch-pad it is fiddly and irritating. Also, movement is fairly slow considering the speed of the attackers.

It should be clear by now that I was not too impressed by this game, though I should say that it is rated quite highly by some of the ZX enthusiasts I have spoken to. The answer is, I feel, that 3D Defender probably comes out quite well against other space games on this machine but that the ZX81 is simply not very well suited to games of this type.

Value for money:
Use of graphics:
Addictive quality:
Response speed:

Clearly one wouldn't expect the ZX81 with its absence of colour, sound or joysticks and its limited graphics, to compare with some of the other machines I've looked at. The problem with all the non-textual games is having to use the keyboard for movement and other real-time functions. Several companies (including Buffer) make more substantial keyboards for the ZX81. One of these would certainly make life easier but then it could cost you half the price of the machine itself.

On the whole, I was less than impressed by the space battle type games — I

GOTO page 178

P FOR PERFECT?

Sue Eisenbach and Chris Sadler continue their look at the UCSD p-System.

Part 2 The p-System

Programmers and others could be forgiven, after reading last month's article on the UCSD p-System, for believing that there was more to an operating system than the fact that it could run on almost every disk-based microcomputer system commercially available and that it offered a reasonably comprehensive catalogue of applications packages. They would be concerned with the quality (and scope) of the 'program development environment' offered by the system, and it is this which we hope to cover in this article.

On the p-machine, access to the processor and the memory is achieved by submitting p-code programs to the run-time system. A program development environment, however, must provide a means of producing these p-code programs and this is normally done through a language translator which produces the p-code program from a source program written in a high level language. In turn, an editor is required in order to produce the source program.

The elementary building blocks of the p-System program development environment comprise:
SYSTEM.EDITOR — to create source program;
SYSTEM.COMPILER — to create p-code program;
SYSTEM.LINKER — to include any code required from the library;
SYSTEM.INTERPRETER — to execute program.

In addition, a command interpreter (called SYSTEM.PASCAL) is needed to accept the user's commands and initiate the necessary action (as well as providing run-time support). The basic program development sequence is illustrated in Figure 1.

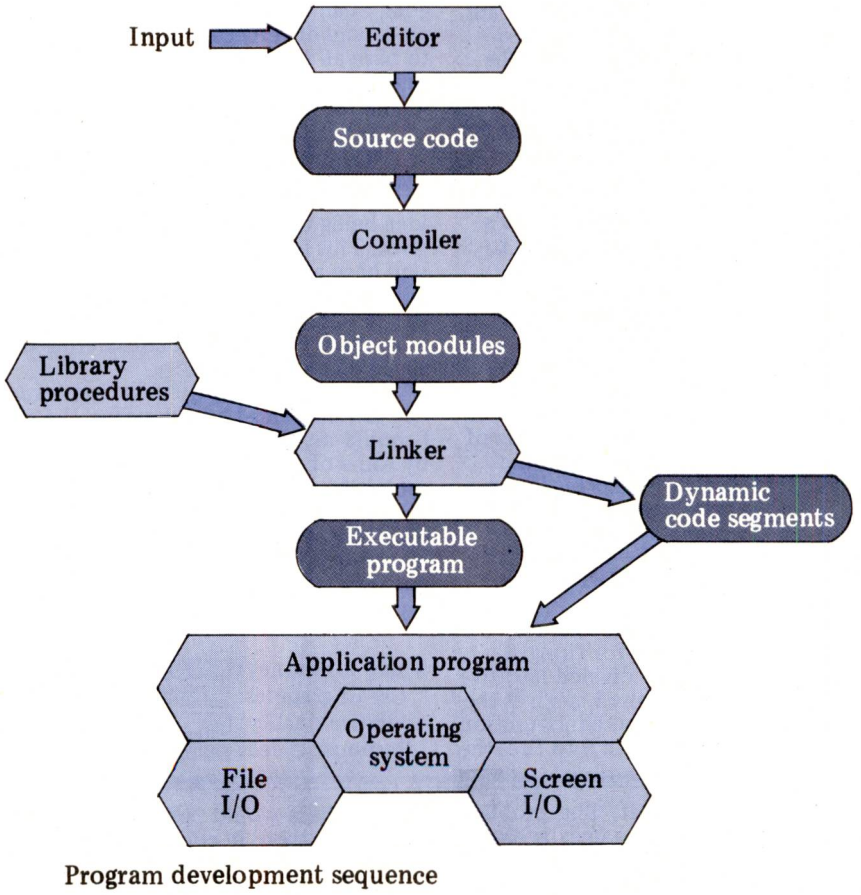
None of this can occur without accessing the backing store (disk subsystem) on which the system programs and the source and code files are stored. In order to make things easy for the user, the concept of a system workfile has been adopted for the p-System. The user nominates a particular source file as the system workfile and thereafter any requirement for access to a file uses the default name SYSTEM.WRK. This minimises the amount of typing required during program development. In fact once the program is entered, the compile-link-execute process is so automatic that an additional command R(un is provided which performs all three in sequence if required and whatever is necessary if not (see Figure 2). When a syntax error is encountered by the compiler the user is offered the option of transferring directly back into the editor, continuing with the compilation or returning to the main command line.

The administration of files on the disks, of the disks themselves and the interchange of files between peripherals, are all handled by a utility called SYSTEM.FILER. Other tools include a native code assembler and a p-code debugging program. Also available at the highest command level are functions which reboot the system, reinitiate the previous program (without having to reload from disk), or halt the processor. The promptline looks like:
Command: E(dit, R(un, F(ile, C(ompile, L(ink, X(ecute, A(ssem, D(ebug ? while typing "?" brings up:
Command: H(alt, I(nitialize, U(ser Restart, M(onitor.

Where necessary, utilities (notably the FILER and EDITOR) have their own promptlines which work in the same way and facilities exist for users to incorporate promptline and command interpretation features into their own application programs.

The Xecute program provides a few shortcuts around the system allowing last-minute changes to the environment before a program is executed. Following the prompt 'Execute what file?' the system will accept a series of different commands in addition to the name of the program to be executed. This is as close as the p-System gets to 'command-line' arguments which are employed in other operating systems. The command P=⟨volumename⟩ allows the prefixed (default) volume name to be set or altered, while L=⟨filename⟩ causes the default library text-file name to be changed. The most powerful commands at this level, however, are those which give control over program and system I/O. Thus PI=⟨filename⟩ directs the program to expect its input from the named file while PO=⟨filename⟩ sends program output to the named file. This is a fairly ordinary facility but the p-System goes further.

Firstly, the command PI=⟨string⟩ will cause the given string to be passed to a scratch buffer from where it will be passed to the program at the appropriate moment. Furthermore the command I=⟨filename⟩ or ⟨string⟩ will cause the string or the contents of the file to be passed direct to the operating system for processing before program execution begins; while O=⟨filename⟩ sends system output (eg, error messages) to the named file. The I=⟨string⟩ command is particularly powerful since it grants access to all the system commands to set up the program's run-time environment. In conjunction with the main-line M(onitor command, however, the I=⟨filename⟩ command is the most useful, since a sequence of commands entered



Program development sequence

Fig 1

under the control of the Monitor will automatically be stored in a filename which can be used subsequently to ensure that the program's environment is consistently set up. This is the p-System equivalent of using SUBMIT under CP/M.

Since the p-System is not tied to any hardware it can be run on almost any disk-based system. This machine independence is achieved by means of three devices: first, there is the p-code interpreter which dynamically translates each p-code instruction into its actual machine equivalent. This program is loaded into the system at bootup time and runs the whole time the system is up except during the execution of machine code segments. Second, there is the Basic Input Output System (BIOS) which connects the p-System's logical devices (the console, disk volumes, printer, modem line) to the corresponding physical devices on the actual system. Finally, there is a file called SYSTEM.MISCINFO which the system refers to when communicating with the user's terminal. The information which it contains is specific to the particular terminal and this file had to be created by executing a program called SETUP. By using this information together with a user-supplied procedure called GOTOXY the editor can offer full screen editing facilities on any cursor-addressable terminal and is thus also device independent.

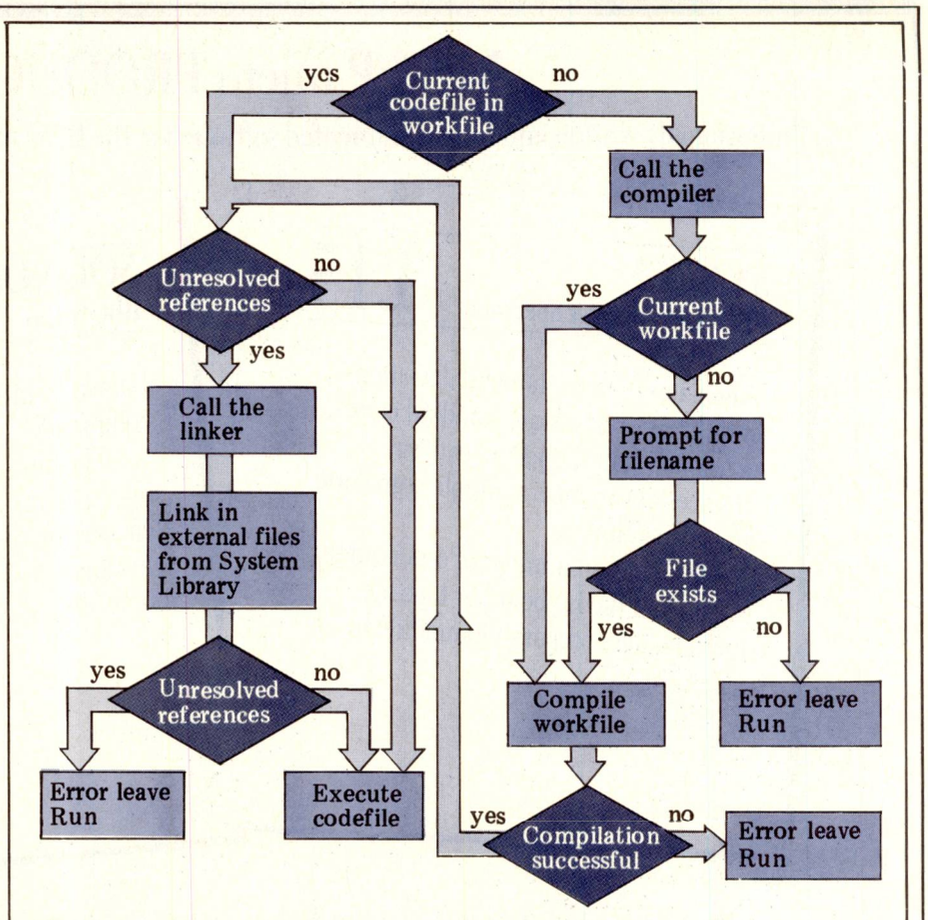


Fig 2

The editor

Typing E to the top level command line invokes the program called SYSTEM.EDITOR. The p-System comes with a choice of two candidates for this position — YALOE (yet another line oriented editor) and the screen editor. Either editor automatically reads in the current work file when entered and will either update the current workfile or any named file upon exiting.

YALOE is a line-oriented editor based on Digital's RT11 editor (ESC ESC is required to get a command accepted). It contains a reasonable number of features (including a macro facility) but is not particularly easy to use (it's similar to CP/M's ED). YALOE was the editor for the first UCSD system and is currently only used when the p-System has not been set up for a specific VDU.

Far more widely used is the screen editor. It is equally easy to use for either program or text files, responding to commands from a prompt line as well as the cursor keys. Unfortunately not all the commands are on the prompt line. (Any file to be edited contains a file header with easily alterable information about the file's environment).

For program files there is an auto-indent mode which, upon pressing carriage return, will put the cursor immediately below the first character on the line above — so that the user has to indent just once while typing in a block (and then backspace when the block is completed) rather than on every line. To aid good layout further there is an Adjust command which allows the user to move whole blocks of text a few spaces left or right very easily.

An impressive feature of the screen editor as an aid to program development must be the tie-in with the compilers. The typical programmer will want to move rapidly between the compiler and the editor while the syntax errors are being ironed out of the source code. On detection of a syntax error, the p-System compiler offers the option of returning directly to the editor, which, if taken, delivers the source code back on the screen with the cursor at the point where the error was detected and the particular error message on the top of the screen.

For text files auto-indent can be turned off and line filling on. Margins can be set as well as tab stops and paragraph margins. K(olumn will shift columns left or right while M(argin will reformat a paragraph between new margins. A text formatter is still required if justification or pagination is required.

Most commands (including I(insert, d(elete and eX(change) can be completed with 'accept' (usually CTRL-C) or 'ignore' (usually ESC). Whether a command is accepted or ignored it fills up a buffer which can be copied out anywhere in the file. Some commands can be undone with Z(ap.

It is easy to move around the file by using the cursor keys (20↑ will move the cursor 20 lines up). Alternatively, one can jump to the beginning of the file, the end of the file or user pre-set markers, or one can page forwards or backwards one screenful at a time.

We have used the screen editor extensively and have found it a major aid in both program and text development. Of course there are some features we would like included that aren't there. One major gripe is that it can only work on files small enough to fit into main memory (about 15k on our LSI II) — which is an irritation for people who regularly produce 4000 (about 25k) word articles. Version II had a version of the screen editor for large files called L2, but this was full of bugs and has been dropped in Version IV. Another company, Volition Systems, sells a large screen editor (the Advanced System Editor) which is upward compatible with the p-System editor. This can cope with large files and also features facilities for macros, nested edits and some extra editing commands.

The filer

The filer is a collection of utilities which deals exclusively with disk housekeeping. Some deal with the disk as a whole, ie, as a volume or peripheral device, while others treat the disks at file level. File names can be up to 15 characters in length including an optional extension separated from the rest of the filename by a '.'. Some standard extensions are:

.TEXT — for a file produced by the editor.
.CODE — for a file produced by a compiler or assembler
.DATA — for a datafile produced by a user's program or by the system
.FOTO — for a disk image of the graphics screen (if available)
.BAD — for a file generated by the disk-scanning utility Examine.

System files are all prefixed by 'SYSTEM'. Filenames should not contain the characters '=', '?', ':', or ',' as these have special meanings during file-handling operations. Unfortunately the rest of the system (eg, the editor and translator) allow the user to create file names containing special characters which are quite difficult for the filer to manipulate.

Although the filename extensions are

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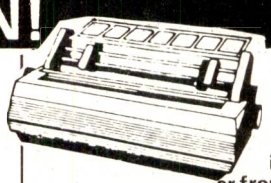
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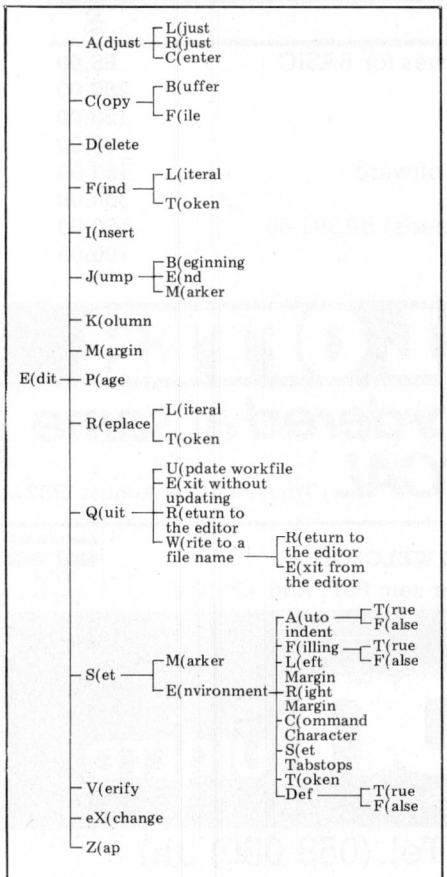
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optional for the user, when generated by the system, as described above, they tend to denote different file attributes. For example TEXT files are equipped with a header which contains information used by the editor. Other utilities cope with this header while manipulating the file — eg, it will be copied from disk to disk but not listed on the lineprinter. Text files generated by user programs on the other hand (ie, DATA files) will be improperly accessed by the editor, although the header can be forced on the file from within the user program by explicitly naming it with the .TEXT extension.

Disk drives have device numbers while the disks themselves have volumes (up to seven characters). This brings disk volumes into line with the other 'volumes' on the system which have both device numbers and symbolic names as shown in Table 1.

The system disk can be referred to by its user name, by its device number (4:) or by the shorthand symbol '*'. Similarly, on bootup, the System disk is also the default disk although it is possible to change this to the other drive. The symbol '=' is used as a wildcard to represent 'all' instances, so = .TEXT means all text files.D = will refer to all files beginning with 'D' and '=' simply means 'all files'. The symbol '?' has the same meaning as '=' except that the system will stop and confirm each operation on each file. It is possible, for example, to pass through a disk directory selectively deleting files. The symbol '$' is a repeater which stands for the current disk or the previously defined file identifier — provided it appears within the same command. Finally the ',' serves to separate a series of named files on which the given function should act.



Screen editor command tree

The filer promptline takes up three lines on the screen (although only one is shown at any time) as follows:
Filer: G(et, S(ave, W(hat, L(dir, R(em, C(hng, T(rans, D(ate?
Filer: Q(uit, B(ad-blks, E(xt-dir, K(runch, M(ake, P(refix, V(ols?
Filer: X(amine, Z(ero

In general the filer expects the user to select one of these options and will then prompt for file names and other information not already given, double-checking before doing anything destructive (like deleting a disk directory). For this reason, the type-ahead buffer is frequently suspended so that the user cannot get too far ahead of the action. This scheme of prompting is doubtless a bit slow for expert users, especially when used on small implementations of the p-System, but it has the great advantage that it is very easy for the beginner or infrequent user and it is almost never necessary to consult a manual to find out how to do something unfamiliar. The versatility of the filer is something of a mixed blessing — because it is so large it cannot fit into memory in its entirety and has to swap parts of itself off the disk. This is a big nuisance especially during disk-to-disk operations when both drives are needed and the system disk must constantly be replaced.

The commands can be divided into four categories — disk operations; file operations: workfile operations and others. Disk operations include: Zero, which initialises a disk, giving it a volume name and allocating space for a directory; Bad-blocks which searches a disk for physically corrupt areas, while eXamine attempts to recover bad blocks or else marks them as .BAD; Prefix which nominates one volume or another as the default disk; and Krunch which moves files across the disk to concentrate all the free space at the end (files are held in consecutive blocks). Finally Ldir will list the directory of a disk while Extdir gives a fuller listing displaying the physical layout of files (and unused areas) on the disk.

General file operations include Change (the name of a file or directory), Make (a file of a certain size), Remove (a file entry from a directory) and Transfer (a file from one volume to another). The Workfile can be manipulated by Get (a named file and nominate it as the workfile); Save (the current workfile under another name); What (file is the current workfile?); and New, which clears the workfile. Finally, Volumes produces a listing of all the devices recognised by the system and Date allows the current date to be set — this is recorded as an attribute in the file directory when a file is saved or created. The last command is Quit which exits from the filer.

Other utilities

The p-System comes with a collection of useful programs which can be executed. These vary slightly from system to system as some are machine dependent. This section describes many of these utilities but does not pretend to be comprehensive.

The Debugger offers full debugging facilities at the p-code level including single-step, breakpoints, the display of memory information in a variety of different formats (global, local, intermediate or procedure) and markstack traversal. The user is expected to possess a fairly sophisticated view of the p-machine, and is offered no promptline as this would, in the words of the User Manual, 'detract from the information displayed by the debugger'. Lines can be altered either in ASCII or hex and symbolic debugging information can be accessed by inserting a compilation option into the source code at compile time. Variables and procedures can then be referenced by name rather than by segment and offset number. Unfortunately, SofTech does not seem to have any plans for providing a source language debugger.

The Compressor was designed to prepare assembler language programs for applications outside of the p-System environment. The code it produces has all the p-System information stripped out and the result is optionally an absolute or a relocatable object module. System specific Adaptable Assembler directives must be omitted if the Compressor is going to be used.

Patch is a Screen-oriented utility which allows the program developer to edit files at the byte level or to extract listings of files (typically p-code files) in a variety of formats. Edit mode allows the user to access named files or numbered blocks within a file. Type mode allows the user to modify characters as displayed on the screen. (This is done simply by positioning the cursor and overtyping). Finally, there is Dump mode which outputs the code file, as stored on disk or as a range of memory addresses in a variety of formats including ASCII, hexadecimal, word-or-byte-octal or word-or-byte-decimal (BCD).

The Decoder is a utility which provides access to information in code files, either in the form of a p-code disassembly or as a series of tables giving segment, unit and linker information.

The Cross-referencer (XREF) is the only avowed 'software tool' among the utilities offered by SofTech and is adapted from a program produced by Professor A Sale (of Tasmania) who, in turn, based his program on another by A J Currie of Southampton University. Once again, the input for this program is a simple working codefile while the output includes: a lexical structure table; a call structure table; a procedure call table; a variable reference table; a variable call table.

Finally, a WARNINGS file can be produced, predicting possible problems. Unfortunately SofTech did not fully customise XREF for UCSD Pascal. All characters in an identifier are taken as significant in XREF whereas UCSD

Device No	Volume Name	
1	CONSOLE:	Standard terminal
2	SYSTEM:	Non-echoing terminal
3	GRAPHIC:	Graphics terminal
4	(username):	System disk
5	(username):	Another disk
6	PRINTER:	Serial or parallel printer
7	REMIN:	Remote serial line (in)
8	REMOUT	Remote serial line (out)
9-12	other disks	

Table 1

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P FOR PERFECT?

Pascal doesn't count '—' as a significant character.

Floppy disk compensation

Several utilities exist to cater for the uncertainties of life as lived with a floppy disk system. These include a utility to enable a duplicate directory system (set up by Zero within the filer the first place) so that every entry into the 'proper' directory is reproduced in the duplicate. This feature is known as MARKDUPDIR and it has a counterpart, COPYDUPDIR for when the regular directory inevitably becomes corrupted and needs 'refreshing' from the duplicate. However these two directory areas are effectively next to each other (or even intermingled, with disk interleaving) rather than at opposite ends of the disk, which offers a speed advantage when updating the directory, but it is of course less secure.

Finally, there is the utility RECOVER which tries to extract information from a disk whose directory has effectively been 'wiped'.

The librarian

Libraries are, explicitly, large-scale UNITS for use within applications programs. When a segment within a particular compilation unit references an external segment, this generates a 'segment reference'. In general this will be resolved by the operating system when it incorporates the necessary UNIT as indicated by a USES statement. However, references to external segments within the system library and other system units are automatically resolved — eg, the segment WRITELN resides in a system unit called PASCAL10 which need not be explicitly declared. The utility LIBRARY is used to insert a UNIT into SYSTEM.LIBRARY or into another library.

Each library contains 16 'slots', each of which can contain a unit, program, segment routine or assembler routine. In fact a new library is created by LIBRARY and entries can be transferred into it from an old library, slot-by-slot, or inserted individually from the disk.

D = list CP/M directory
E = extended listing of CP/M directory
C = transfer CP/M file to p-System file
P = transfer p-System file to CP/M file
H = display Help file
Q = quit utility.

Table 2

12 — return CP/M version
13 — reset disk system
14 — select disk
15 — open file
16 — close file
17 — search directory for first occurence of filespec
18 — search directory for next occurrence
19 — delete file
20 — read file sequentially
21 — write file sequentially
22 — create a new file
23 — rename a file
24 — return logged drives
25 — return currently selected disk
26 — set DMA address
27 — return currently available blocks on disk
28 — write-protect disk
29 — return read-only disks
30 — set file attributes
31 — ⟨not implemented⟩
32 — set or get user code
33 — read random record
34 — write random record
35 — return file size
36 — set random record position pointer

Table 3

Print spooling

The utility SPOOLER.CODE allows the user to create and manipulate a file SYSTEM.SPOOLER which contains a queue of up to 21 filenames. Spooler I/O occurs concurrently with other operations on the system. Interrupts are generated every time a key on the console is struck.

Zenofile

Xenofile is a package which allows access to CP/M formatted files. CPM_CNFIG must first be run to configure the package to the local hardware. Once that is done, CPM_FILER allows for directory access and file-transfer operations between UCSD and CP/M formatted disks. CPM2_UNIT, FCPM and BCPM are units which grant access to CP/M disks from within Pascal, Fortran and Basic programs respectively.

CPM_FILER has six commands as shown in Table 3.

The language-specific units contain a set of functions which operate as shown in Table 3.

Turtle graphics

This is a package of routines which allows for the production of graphical images on a display screen and for the storage and retrieval of those images from disk files (called FOTO files). In general, the user must write some assembler language control routines before Turtlegraphics can work on a particular system.

In Turtlegraphics, the cursor is a 'turtle' which can be faced in a particular direction and moved from point to point, drawing a line of a given colour or simply moving without drawing. More than one turtle is associated with a 'figure' which may or may not be displayed on the screen (active) at any given time. Commands sent to 'the turtle' will affect the turtle currently on the screen and all inactive figures are stored in memory. The package supports scaling and windowing. Specific procedures and functions defined within Turtlegraphics are shown in Table 4.

Procedure
Move: move turtle a specified distance
Moveto: move turtle to a specified location
Turn: rotate turtle by a specified angle
Turnto: rotate turtle to a specific direction
Pen-Color: select a specified colour
Pen-Mode: draw a line of no colour (ie, no line); of the current colour or of the colour opposite (ie, complementary) to that found on the screen
Function
Turtle-x: return x-coordinate of turtle
Turtle-y: return y-coordinate of turtle
Turtle-angle: return direction of turtle
Procedure
Activate-Turtle: direct commands to a specified turtle
Fillscreen: fill figure with specified colour
Background: define background colour for figure
Wchar: write a character at the turtle position
Wstring: write a string at the turtle position
Display-scale: define coordinate limits to be mapped onto the screen
Function
Aspect-ratio: returns height/width/ ratio of screen
Create-figure: returns a number which references a new figure. When the number is passed to Activate-Turtle, drawing will commence
Procedure
Delete-figure: discards previously created figure
Getfigure: transfer a figure from memory onto the screen
Putfigure: transfer a figure from the screen to memory
Viewpoint: define a window on the screen
Function
Read-pixel: return the value of the colour at an individual point
Procedure
Set-Pixel: sets individual point to a specified colour
Function
Read-figure-file: open FOTO file of figures on the disk for reading
Write-figure-file: open FOTO file for writing
Load-figure: read figure from FOTO file
Store-figure: write figure to FOTO file.

Table 4

Implementation-specific routines which have to be supplied by the user deal with screen and character resolution; colour range; aspect ratio; amount of memory required to store a figure; pixel and background colouring mechanisms; and a line-drawing primitive.

Documentation

All manuals from SofTech Microsytems have a professional appearance. They have white softcovers with orange, red and purple hexagons. Internally they are all paginated, have detailed tables of contents and appear to have been produced by a daisywheel typewriter.

The User Manual contains chapters on: system commands, file handling, both editors, the UCSD Pascal language, the adaptable assembler (a bit sparse for easy use), memory management, concurrent processors and utilities. In several of these chapters each command or function is given a page to itself with both description and examples.

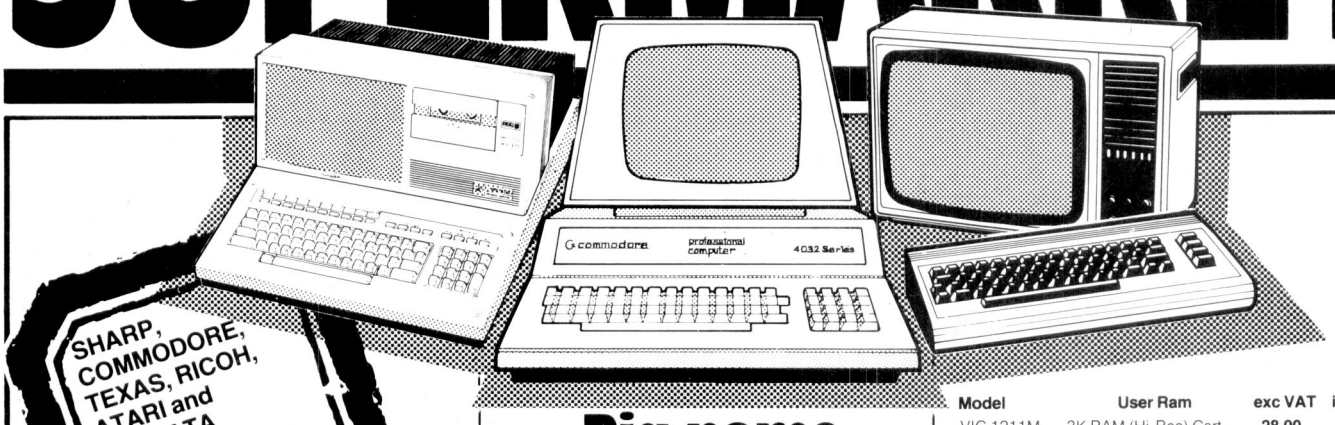
The other manuals that come with the system are a 'User Manual Supplement'. 'Installation Guide', and 'Internal Architecture Guide'. None of these have either index or 'thumb marks'. The Supplement contains chapters on the latest releases — including the Symbolic Debugger, extended memory, native code generation, print spooling, interrupt handling, file transfers to CP/M and Turtle graphics.

Basic and Fortran each come with their own slim reference manual. Users of these languages are expected to read the User Manual for information about the system. The language manuals assume (including those for Pascal and Assembler) that the user is thoroughly familiar with the language and needs details of this particular implementation. For this purpose the manuals are quite adequate although it would have been useful if someone had gone through the Fortran manual and made sure that the page numbers matched the stated page numbers in the contents.

The language translators on the p-System will be discussed in full in our next article.

END

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CHECKOUT

DCP SPEECH PACK

Steve Mann gets his ZX81 to answer back. . .

'Soon your computer will be talking to you like an old friend.' So runs the advertising copy for DCP Microdevelopments' new Speech Pack for the ZX81 — and if your friends have minuscule vocabularies and American accents, then I suppose that's true.

One of a new range of ZX81 hardware add-ons, the Speech Pack enables you to add words, phrases and simple sentences to your programs. As such it could prove a useful adjunct to games and a whole host of more serious applications.

Construction

The Speech Pack is housed in a neat plastic case, measuring 125x80x42mm, which plugs directly into the ZX expansion port. Other peripherals such as RAM pack, printer, etc, then connect to the rear of the Speech Pack. I experienced no stability problems with this arrangement — DCP has thoughtfully provided a couple of foam strips to anchore the pack — but the arrangement looks a trifle odd, with the computer perched like the blade of a shovel on the end of a long line of add-ons.

Speech is supplied by the National Semiconductor Digitalker chip and an 8k ROM. Three further 8k ROMs can be added to bring the total vocabulary up to 275 words. A very small internal loudspeaker provides the sound, though there is a facility for connecting a more powerful external speaker or headphone.

Operation

Table 1 shows the words that can be spoken by the Speech Pack, together with their codes. Speech occurs when the relevant code is POKEd to addresses 49149 (Word Packs 1 and 2) and 49148 (WP 3 and 4). DCP recommends setting a variable to the relevant address and then using PAUSE to separate the words produced, thus:

```
10 LET S=49149
20 FOR A=0 TO 143
30 POKE S,A
40 PAUSE 50
50 NEXT A
```

will cause the entire vocabulary of Word Packs 1 and 2 to be uttered at one-second intervals. Omitting the PAUSE means that the entire set of words is pronounced at once — interesting, but not very useful. Judicious juggling of the PAUSE command allows you to build up extra words by extracting syllables from the supplied vocabulary but this can only be done from the beginning of words. The 'This is' from 'This is Digitalker' can be extracted by POKEing 0, then PAUSE 18, then POKE, say, 71 for period of silence — another PAUSE and another POKE and you've got a sentence, albeit a very simple one.

Similarly, plurals can be constructed by using the 'ss' sound. Unfortunately there's no way to extract, say, the last syllable from a word, as the Speech Pack begins each word as its code is POKEd; there's no way of getting it to drop the first syllable and then pronounce the second.

So, what of the speech quality? Well, inevitably, there's no way the Speech Pack is ever going to be mistaken for a human voice; each word is pronounced clearly and distinctly as a separate entity — even when run together in a sentence, there's none of the natural inflection of human speech. But, of course, the Speech Pack is not designed for talking about the weather. What it can do — and do well — is produce single words, phrases and sentences on demand. In games, for example, the Speech Pack could be programmed to say 'Warning — increase speed' at a critical point, saving the user from having to keep his eyes glued to the screen display.

The volume of the internal loudspeaker can be adjusted by inserting a very fine screwdriver into a hole in the side of the case but in practice I found that at full volume the sound was only just about adequate. Anything less than full volume left me straining to hear it. A 3.5mm jack socket enables an extension speaker to be connected; this must have an 8ohm impedance.

Conclusion

The DCP Speech Pack is a well-designed and easy-to-use speech synthesiser. The use of the POKE command makes it simple to insert sound into any program and the quality is clear and unambiguous. A certain degree of ingenuity and experimentation is needed to get the PAUSEs exactly right when making compound words, but this only adds to the fun. And it *is* a lot of fun. But it is an embellishment; it'll give your programs a certain novelty value, but it doesn't give your computer more power. And, as such, I can't help wondering who is going to buy it.

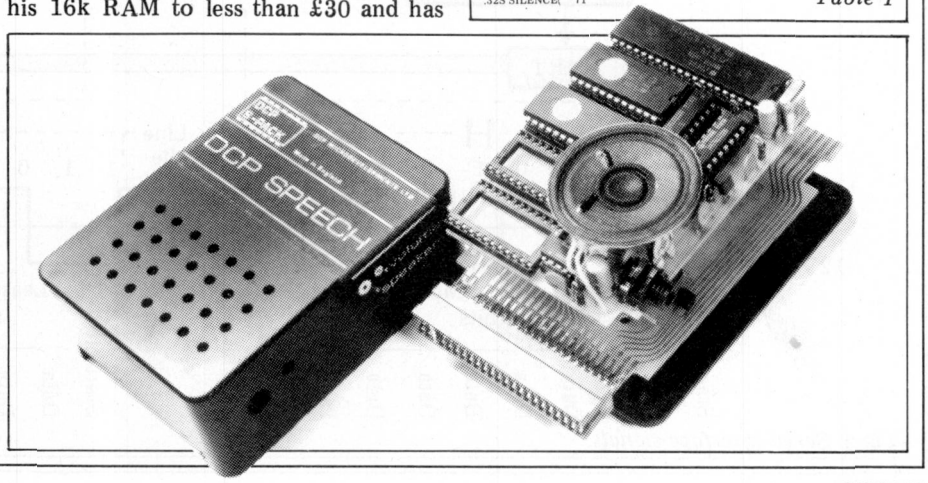
With the advent of the Spectrum, ZX81 add-on prices are inevitably going to look less of a bargain. Sinclair has recognised this by slashing the price of his 16k RAM to less than £30 and has left many hardware firms' goods looking distinctly overpriced in comparison. At just five pence less than fifty quid for the Speech Pack (Word Pack 1 is supplied with it) and with at least one more Word Pack realistically needed to utilise the device fully, you'd be left with very little change from £65. And are people really going to pay almost as much as a factory-built ZX81 for a device which, at the moment anyway, is more novelty than necessity? I have my doubts.

SPEECH PACK (with Word Pack 1) £49.95
Word Packs 2,3 and 4 £14.95 each

Obtainable from DCP Microdevelopments Ltd, 2 Station Close, Lingwood, Norwich NR13 4AX.

Word Pack ROM 1 (supplied)		Word Pack ROM 2		Word Pack ROM 3		Word Pack ROM 4 (must be used with WP3)	
WORD	CODE	WORD	CODE	WORD	CODE	WORD	CODE
THIS IS		CENTI	72	ABORT	0	LOAD	67
DIGITALKER*	0	CHECK	73	ADD	1	LOCK	68
ONE	1	COMMA	74	ADJUST	2	MEG	69
TWO	2	CONTROL	75	ALARM	3	MEGA	70
THREE	3	DANGER	76	ALERT	4	MICRO	71
FOUR	4	DEGREE	77	ALL	5	MORE	72
FIVE	5	DOLLAR	78	ASK	6	MOVE	73
SIX	6	DOWN	79	ASSISTANCE	7	NANO	74
SEVEN	7	EQUAL	80	ATTENTION	8	NEED	75
EIGHT	8	ERROR	81	BRAKE	9	NEXT	76
NINE	9	FEET	82	BUTTON	10	NO	77
TEN	10	FLOW	83	BUY	11	NORMAL	78
ELEVEN	11	FUEL	84	CALL	12	NORTH	79
TWELVE	12	GALLON	85	CAUTION	13	NOT	80
THIRTEEN	13	GO	86	CHANGE	14	NOTICE	81
FOURTEEN	14	GRAM	87	CIRCUIT	15	OHMS	82
FIFTEEN	15	GREAT	88	CLEAR	16	ONWARD	83
SIXTEEN	16	GREATER	89	CLOSE	17	OPEN	84
SEVENTEEN	17	HAVE	90	COMPLETE	18	OPERATOR	85
EIGHTEEN	18	HIGH	91	CONNECT	19	OR	86
NINETEEN	19	HIGHER	92	CONTINUE	20	PASS	87
TWENTY	20	HOUR	93	COPY	21	PER	88
THIRTY	21	IN	94	CORRECT	22	PICO	89
FORTY	22	INCHES	95	DATE	23	PLACE	90
FIFTY	23	IS	96	DAY	24	PRESS	91
SIXTY	24	IT	97	DECREASE	25	PRESSURE	92
SEVENTY	25	KILO	98	DEPOSIT	26	QUARTER	93
EIGHTY	26	LEFT	99	DIAL	27	RANGE	94
NINETY	27	LESS	100	DIVIDE	28	REACH	95
HUNDRED	28	LESSER	101	DOOR	29	RECEIVE	96
THOUSAND	29	LIMIT	102	EAST	30	RECORD	97
MILLION	30	LOW	103	ED	31	REPLACE	98
ZERO	31	LOWER	104	ED	32	REERSE	99
A	32	MARK	105	ED	33	ROOM	100
B	33	METER	106	ED	34	SAFE	101
C	34	MILE	107	EMERGENCY	35	SECURE	102
D	35	MILLI	108	END	36	SELECT	103
E	36	MINUS	109	ENTER	37	SEND	104
F	37	MINUTE	110	ENTRY	38	SERVICE	105
G	38	NEAR	111	ER(b)	39	SIDE	106
H	39	NUMBER	112	EVACUATE	40	SLOW	107
I	40	OF	113	EXIT	41	SLOWER	108
J	41	OFF	114	FAIL	42	SMOKE	109
K	42	ON	115	FAILURE	43	SOUTH	110
L	43	OUT	116	FARAD	44	STATION	111
M	44	OVER	117	FAST	45	SWITCH	112
N	45	PARENTHESIS	118	FASTER	46	SYSTEM	113
O	46	PERCENT	119	FIFTH	47	TEST	114
P	47	PLEASE	120	FIRE	48	TH	115
Q	48	PLUS	121	FIRST	49	THNAK	116
R	49	POINT	122	FLOOR	50	THIRD	117
S	50	POUND	123	FORWARD	51	THIS	118
T	51	PULSES	124	FROM	52	TOTAL	119
U	52	RATE	125	GAS	53	TURN	120
V	53	RE	126	GET	54	USE	121
W	54	READY	127	GOING	55	UTH	122
X	55	RIGHT	128	HALF	56	WAITING	123
Y	56	SS	129	HELLO	57	WARNING	124
Z	57	SECOND	130	HELP	58	WATER	125
AGAIN	58	SET	131	HERTZ	59	WEST	126
AMPERE	59	SPACE	132	HOLD	60	SWITCH	127
AND	60	SPEED	133	INCORRECT	61	WINDOW	128
AT	61	STAR	134	INCREASE	62	YES	129
CANCEL	62	START	135	INTRUDER	63	ZONE	130
CASE	63	STOP	136	JUST	64		
CENT	64	THAN	137	KEY	65		
HIGH TONE	65	THE	138	LEVEL	66		
LOW TONE	66	TIME	139				
.02S SILENCE	67	TRY	140				
.04S SILENCE	68	UP	141				
.08S SILENCE	69	VOLT	142				
.16S SILENCE	70	WEIGHT	143				
.32S SILENCE	71						

Table 1



Photography by Karin Craddock

ONE BIT AT A TIME

Mark Gonzales and David Sinclair begin a two-part, er, serial, describing the ins and outs of the RS232 interface.

The last few years have seen the ever-increasing use of microprocessor based controllers, peripherals and scientific instrumentation in the office, laboratory, factory, car and home. An 8-bit microprocessor chip such as the Z80A, bought in quantity, today costs less than £1. Add a few support chips and you have a sophisticated computer system for a few tens of pounds. Microprocessors already appear around the home in washing machines, hi-fi equipment, telephone answering machines, video recorders, Prestel terminals, TV games and microwave cookers. In the near future we can expect to see energy saving central heating controllers, security and surveillance systems, personal databases and perhaps even school lessons distributed by computer.

How will all these computer systems communicate with another? Some form of communication will be desirable for many reasons. For example, users might want to interrogate and update a central database from their home VDU (eg, borrowing a book from the local library by calling up the particular file off disk). Also, since most peripheral devices (eg, plotters, printers, etc) use relatively slow and expensive electromechanical machinery, it is cost effective to share peripherals between several microprocessor systems.

One popular interface, the RS232 standard (also known as the V24 interface), is widely used for slow to medium (up to 1000 characters/second) data communication between devices. Despite its widespread use, the RS232 interface is often poorly understood — particularly its various handshake protocols. This problem is aggravated by the fact that, although the RS232 standard was originally intended for specifying connections between telecommunication equipment, it is now applied to many situations outside its original brief. Here we'll explain why you need an interface standard, how serial interfaces work and the connections required to implement an RS232 interface. In addition, we will describe the problems we encountered in setting up RS232 links between a Research Machines 380Z microcomputer and a large Prime mainframe computer — with the intention of using the RM 380Z as an intelligent terminal for data collection and input to the Prime.

The RS232 interface

Suppose, back in the 1960s when computers were necessarily large, non-portable, expensive mainframe devices, you wanted to access your company computer from a remote location — say your office in a different building on the other side of town. The cheapest solution would be to connect a terminal in your office to the main computer via the local telephone lines. To do this you would require some special equipment, the basic component of which would be a modem. One would be required at each end of the telephone line as shown in Figure 1. Modem stands for 'MODulator-DEModulator'; It's a device which converts the computer's binary on-off signals into audible tones and back again so that digital information can be sent over phone lines.

In its original form the RS232 standard specified the connections that should be made between the modem and the computer or terminal. Before we look at this standard in detail we must first examine the basic elements of a serial communication link and these are illustrated for the case of a VDU connected to a printer, Figure 2. Most of the hardware required for this interconnection is available in an LSI chip called a UART (Universal Asynchrous Receiver Transmitter) and will be built into the printer and terminal by the equipment manufacturer. The UART in the terminal receives signals from the terminal keyboard which indicate which character is to be transmitted and outputs the appropriate voltage pulses to the printer as described below. The UART in the printer examines these voltage pulses and tells the print mechanism which character to print. It can generally detect errors in transmission or interconnection and provides most of the simple control functions in the interface. All the user has to do is to provide a cable connecting the RS232 port of the terminal to that of the printer.

Suppose the user wishes to send the characters 'HI' to the printer. Each character on the keyboard of the VDU is assigned a 7-bit code — normally ASCII code. The codes for H and I are 1001000 and 1001001. An eighth bit, called the parity bit, is added to this code in the most significant (leftmost) digit. If even parity is used the parity bit is chosen so that the total number of 1s in the 8-bit code is an even number.

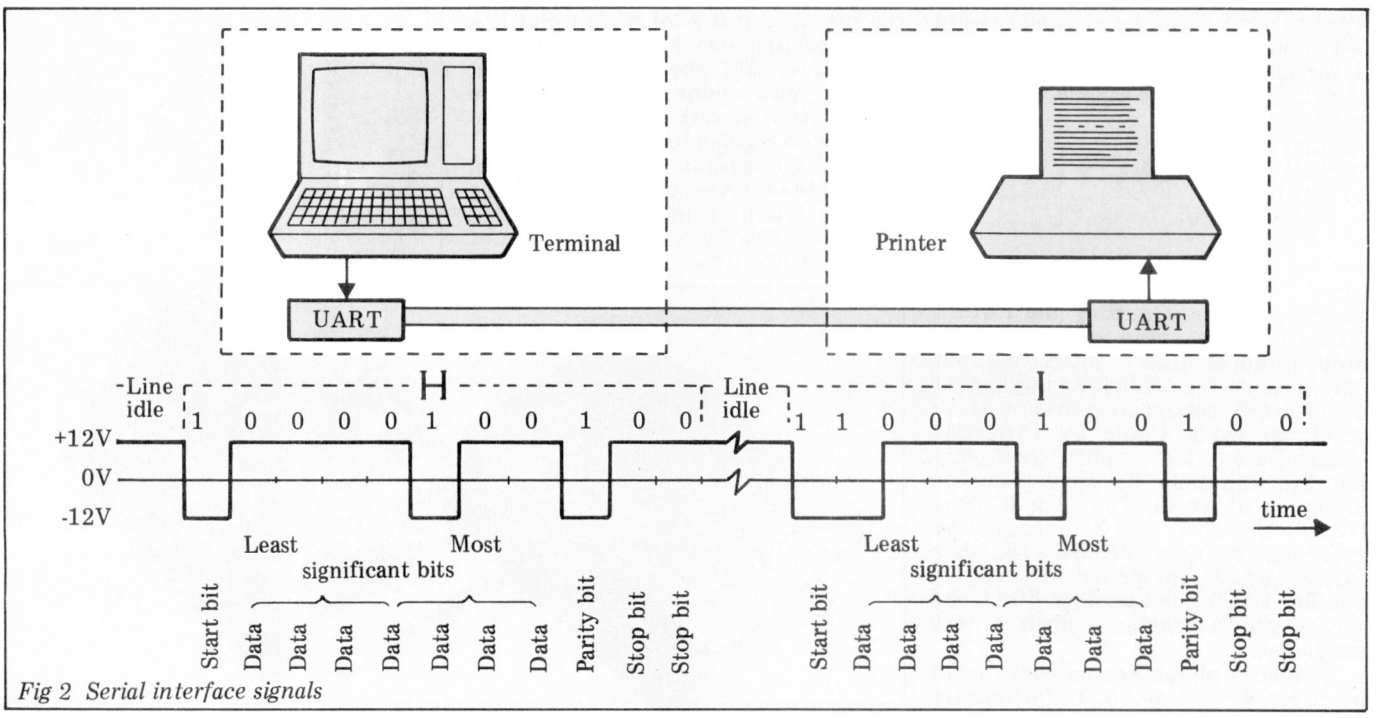


Fig 2 Serial interface signals

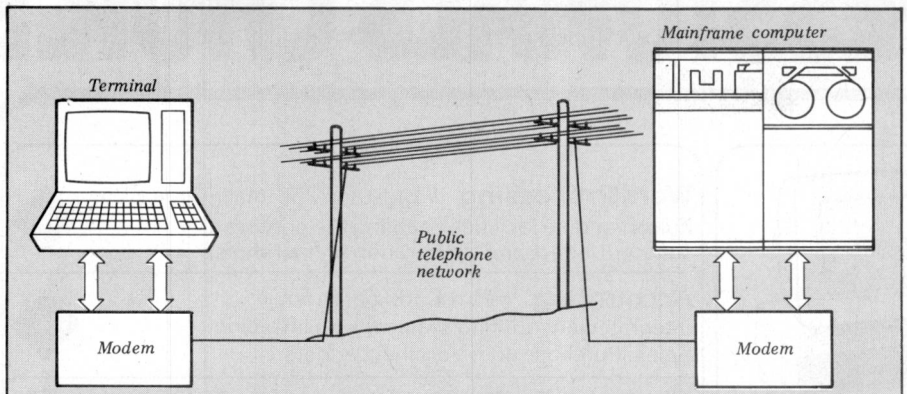


Fig 1 Terminal to computer communication using a modem

If odd parity is used, the total number of 1s must be odd. If the printer has no parity circuit, or it is disabled, it does not matter whether the parity bit is 0 or 1. The purpose of the parity bit is to allow the detection of any scrambling of the character code that might occur during transmission. For instance, the code for H with odd parity is 11001000 and if the printer received 11001001 due, say, to a noisy line, it would know this data was invalid. (It would not think it was an I since the code for I with odd parity is 01001001). Of course this simple parity arrangement can only detect an odd number of wrong bits but it's usually sufficient for most routine applications.

The character code is transmitted from the VDU to the printer as a series of voltage pulses: 1s are transmitted as negative pulses whose amplitude must be between -3 and -15 V and 0s are transmitted as positive pulses in the range +3 to +15 V. When no characters are being sent, the data line has a continuous series of 0s on it so that it is held at a constant, positive potential.

Both the VDU and printer must know and agree on the width of the voltage pulses to be used. The pulse width is set by specifying a particular baud rate as described below. Each character code is preceded by a start bit (set equal to 1). This bit allows the printer to synchronise its clock to the following data bits. The code is then sent as a sequence of pulses (least significant bit first) on the data line. One, or more commonly two, stop bits (set equal to zero) follow the character code — these were originally necessary to allow time for the mechanical printing process in a teletype to be completed, If there is a gap between characters, extra stop bits are sent to fill the gap — equivalent to holding the line in an idle condition. (see fig 2)

The use of start and stop bits means that, although the VDU and printer clocks have to be almost exactly the same frequency they do not have to be locked together in phase and consequently no direct connection is required between them. This reduces the number of interface connections and the transmission is classed as asynchronous. When long bursts of characters are being sent, the stop bits enable errors in detecting the beginning and end of each character to be detected: nine bit times after the start bit, two stop bits should be received to indicate the end of the character. If they are not, the logic in the UART in the interface is designed to indicate an error condition to the controlling computer.

There are thus 10 or 11 bits per character transfer. The baud rate is defined to the the number of bits per character multiplied by the number of characters transmitted per second. Standard baud rates are 75, 110 (for mechanical teletypes, eg, ASR33), 300, 1200, 2400, 4800 and 9600. If the VDU and printer interfaces are set to 1200 baud with 11 bits per character the maximum number of characters transferred per second would be 1200/11 = 109 char/sec. All teletypes and daisywheel printers and a lot of needle impact printers cannot print this fast. It would therefore seem to be necessary to use a lower baud rate, ie 300, corresponding to 27 char/sec. This will probably not be an optimum solution however — for instance, the Diablo 1640 daisywheel printer can print at up to 45 char/sec and therefore if it was interfaced at only 300 baud it would only print at about half its maximum speed.

A better solution is to run the VDU and printer at 1200 baud and provide a control signal from the printer to the VDU that indicates when the printer is ready to receive the next character. As soon as this control signal indicates the printer is ready, the VDU can send the next character. This is known as handshaking. In actual fact, like many other printers, the Diablo incorporates a character buffer. This is used as a temporary store when characters are received faster than they can be printed. This buffer can be filled at 1200 baud and when it is nearly full a control signal indicates that the sending device must pause until the buffer contents have been nearly all printed out. The control signal is then reset and further characters may then be received and processed by the printer. This method of buffering reduces the amount of handshaking required and the use of large blocks results in a more efficient transfer of characters.

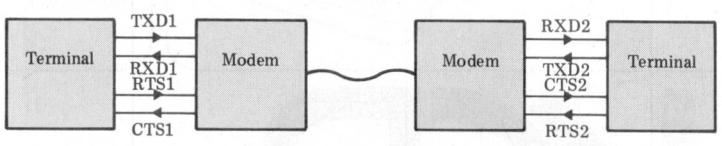
Table 1 shows the main modes of transmission. In a simplex channel the message flow is always in one direction only. In a half duplex channel messages can travel in either direction but not simultaneously. In full duplex mode this restriction does not apply and both ends of the channel can transmit and receive concurrently. This usually means that when using a terminal in half duplex mode, characters appear on the terminal screen directly they are typed, while in full duplex mode they only appear after they have been echoed back from the far end of the line. Unfortunately, as shown in the table, there is some disagreement between the computer and telecommunication industries over what exactly half duplex/simplex means and some care should be exercised when interpreting these terms. We will use the 'computer industry' terms in this article.

Major RS232 signals

In its original form, the RS232 standard was intended to describe how units of 'Data Terminal Equipment' (DTE, eg, computers and terminals) were to be connected over phone lines by 'Data Communication Equipment' (DCE, eg, modems). However, the RS232 inter-

Information Transfer	Computer Industry	Telecommunications Industry
Both ways at same time	Duplex	Duplex
Both ways but not at the same time	Half Duplex	Simplex
One way only	Simplex	Channel

Table 1 Nomenclature for various types of information exchange

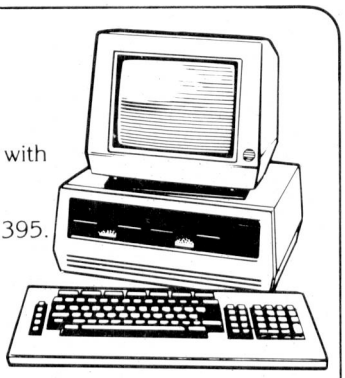


Transmission	RTS1	CTS1	RTS2	CTS2
Idle	0	1	0	1
1 ⟶ 2	1	1	0	0
2 ⟶ 1	0	0	1	1

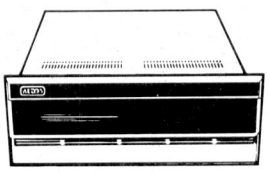
Fig 3 CTS/RTS handshaking for terminal to terminal communication via a modem/telephone link

THE PROFESSIONAL'S CHOICE

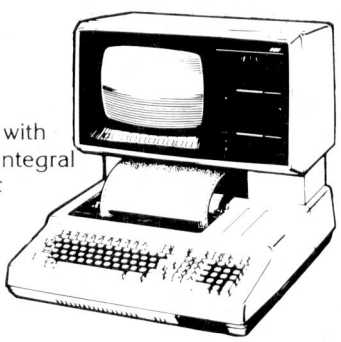
Act Sirius 1
16 Bit Stand Alone micro with superb features.
128K, 1.2MB Floppies,
CPM86 as standard – £2395.



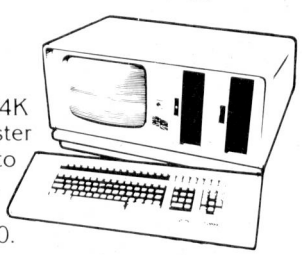
Altos
Up to 4 terminals and 40MB of Winchester Disc.
One of the biggest selling small business systems starting at £2350.
16 Bit system with 8 terminals available soon.



OKI 1F800
Quality graphics micro with full colour screen and integral printer. 64K and Basic are standard – £4750.
Wide range of peripherals available.



LSI M3
High specification Stand Alone micro. CPM, 64K and up to 10MB of Winchester in one package. Very easy to use. Detachable keyboard. User programmable function keys. From £2250.



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Full on-screen facilities enabling the printing of standard letters and preparation of mail shots.

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Communications - Liberator £250.
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Most major computer languages are available: Basic, Cobol, Fortran, Pascal and Assembler.

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Solicitors accounting, client accounting and time recording.

Multi-terminals - MP/M and Oasis from £350.
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Protective ground:	tied to the instrument power grounds and if connected to both the DTE and the DCE, they should both have the same power line ground reference.
Signal ground:	the ground reference for interface signals.
Transmitted data:	used to send serial data from the DTE to the DCE.
Received data:	used to send serial data from the DCE to the DTE.
Clear to send:	a control signal that indicates that the DCE is ready to receive data on the TXD line.
Data set ready:	a control signal that indicates the DCE is connected and prepared to receive/transmit data.
Data terminal ready:	a control signal that indicates the DTE is connected and prepared to receive/transmit data.
Request to send:	a control signal sent from the DTE to the DCE that indicates the DTE wishes to send something to the DCE.
Carrier detect:	a control signal in a modem system that indicates to the DTE that a data carrier is being received from the distant modem.
Ring indicator:	a control signal in a modem system that indicates to the DTE that a ringing signal has been received by the modem.

Signal name		Pin number
Protective ground		1
Signal ground		7
Transmitted data	TXD	2
Received data	RXD	3
Request to send	RTS	4
Clear to send	CTS	5
Data set ready	DSR	6
Data terminal ready	DTR	20
Carrier detect		8
Ring indicator		22

Table 2

ONE BIT AT A TIME

face is now widely used in serial data links of all sorts, over special networks, or even from unit to unit in the same room, as in the VDU printer example above. Due to the change in its usage, some of the original terminology is not entirely self-explanatory. In particular, since telephone companies tend to call modems 'data sets' this can introduce a certain amount of confusion into signal naming. The RS232 definition provides two unidirectional data lines and about 20 control lines. Since this standard was originally specified for modem communication over telephone lines, many of the signals (such as those concerned with autodialling etc.) are of a rather specialised nature.

Here we will only describe the major data and control lines and the minimum requirements for modem operation. Table 2 summarises these major signals. The standard also specifies that 25-way 'D' type connectors should be used to interconnect DTE (male plug) to DCE (female socket). Since the standard is often used today to connect computers and terminals together without intervening modems or telephone lines, this convention can break down. Terminals are always DTE and have male plugs. Generally speaking, the computer or microprocessor system is also regarded as DTE and similarly has a male plug plug. Printers are DCE and have a female socket. The problem comes when you want to connect two computers together directly without using intervening modems. One computer must then assume the role of a DCE and in that case you either have to rewire the plug on one computer to become a female DCE socket or else a special cable must be made up which crosses over the connections between pins 2 and 3 (and possibly some of the control signals as well, depending on the application).

The TXD and RXD circuits are used for the actual serial data transfer and the control circuits are used for various handshaking and interface management functions. Less than -3 volts indicates an OFF state or a 0 and greater than +3 volts indicates an ON state or a 1 for the control lines. Note that signal polarities other way around for the data lines; less than -3 V indicates a 1 and greater than a +3 V indicates a 0. The circuitry is usually designed so that if a unit is disconnected and its control lines are therefore at zero volts, this is taken to be an off condition as well — providing a measure of failsafe operation.

Generally speaking it's up to the various equipment manufacturers how they actually use these signals. Often CTS/RTS or DSR/DTR are used as handshake pairs, as we shall see later.

Handshaking

One of the simplest examples of handshaking is a computer transmitting at 1200 baud (109 cps) to a 40 cps printer with some buffer memory. The printer needs a means of telling the computer to stop transmission when its buffer is full and to restart transmission when the buffer is nearly empty. Assume the printer is a DTE and the computer is a DCE. Then when the buffer is full the printer lowers DTR (data terminal ready) to the off state. The computer notices this and waits until it sees DTR going to a high voltage (ie, the on state) before it transmits more data.

Strictly speaking, this is incorrect, as the V24 standard says DTR being low means the DTE is switched off. Thus, some DCEs may shut down if DTR goes low rather than handshaking properly. However the standard provides no other means for the DTE to tell the DCE that it is not ready to receive, so DTR does seem to be frequently used for this purpose.

Alternatively the CTS/RTS lines can be used as a handshake pair and this is illustrated for transmission between two terminals via a half duplex modem link in Figure 3. Note this arrangement applies only to links between modems. When neither terminal is transmitting, the control lines are as shown in the table in Figure 3. When terminal 1 transmits data it sets the RTS 1 line to 1 (ie, to the ON or greater than +3 volts state). This results in modem 2 setting the CTS2 line to a 0, indicating to terminal 2 that it is to receive data and preventing terminals 2 from trying to transmit data down the line to terminal 1. Only when terminal 1 sets RTS1 to 0 (thereby resetting CTS2 to 1) can terminal 2 transmit back to terminal 1 and when it does it must set RTS2 to 0 (thereby setting CTS1 to 0).

As we said above the RS232 standard is now applied to many situations outside its original brief. This means that the control signals in the system are often used in a non-standard way and it is up to the user to beware of unusual and unexpected implementations.

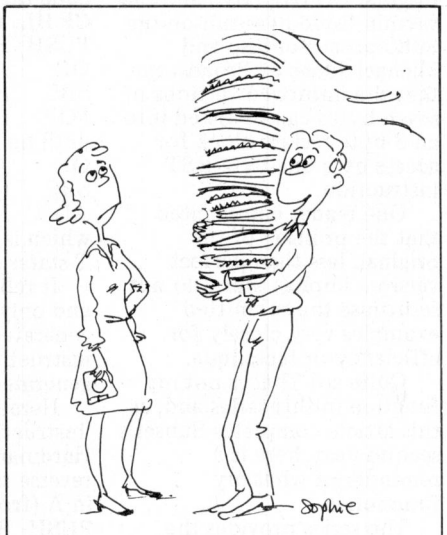
More complicated handshake sequences, sometimes grandiosely called 'communication protocols', involve sending characters in both directions. For example, when using a daisywheel printer (which contains a character buffer as described above) with Wordstar, either ETX/ACK or XON/XOFF protocols can be used:

ETX/ACK: When Wordstar wants to write something to the printer it sends a 'message' consisting of a specified maximum number of characters, followed by an ETX character (ASCII 03). After printing all the characters up to but not including the ETX, the printer transmits an ACK character (ASCII 06) back to the computer, thus telling Wordstar that another message can be transmitted.

XON/XOFF: The printer transmits an XOFF character (ASCII DC3 = hex 13) to the computer when the printer buffer is nearly full. When the buffer is nearly empty the printer transmits XON (ASCII DC1 = hex 11) to the computer to indicate that Wordstar may restart transmitting characters to the printer.

Generally the ETX/ACK protocol is implemented since this does not require the computer to continually monitor the printer for an XOFF character. Each of these protocols require printers that can both transmit and receive characters. In addition the printer must be connected to a bidirectional input/output port on the computer.

Next month we will explain how the RS232 interface can be used to turn a microprocessor system into a dumb or intelligent terminal and describe some of the pitfalls we encountered when we used the RS232 standard to link a Research Machines RM380Z to a Prime minicomputer. **END**



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PCW SUBSET

Alan Tootill presents more useful assembler-language subroutines. This is your *chance to help build a library of general-purpose routines, documented to the standards we have developed together in this series. You can contribute a Datasheet, improve or develop one already printed or translate the implementation of a good idea from one processor to another.* PCW *will pay for those contributions that achieve Datasheet status. Contributions (for any of the popular processors) should be sent to : Sub Set,* PCW, *14 Rathbone Place, London W1P 1DE*

LD HL,(HL)

The code, printed in April, to implement this function provoked a healthy response. All improvements cut the length of the routine to seven bytes and were on the lines of Roger Hargrave's improvement printed in June but more commonly using A in AF instead of E in DE as a temporary store for the lowest addressed byte of (HL). The other common improvement used the EX DE, HL instruction thus:

```
PUSH  DE
LD    E, (HL)
INC   HL
LD    D, (HL)
EX    DE, HL
POP   DE
RET
```

Chris Hall of Chiswick makes the interesting observation that this latter version can be modified by removing the PUSH POP pair and adding DEC HL before the EX DE, HL. This now returns the original HL in DE, which is useful when chain hopping.

Robin Fleet of Cowplain (Hants, if you don't believe it) points out that both the original LD HL, (HL) and the version listed here run on the 8080 processor also and Michael Jones of Broadstone that the improved versions in seven bytes can be fitted into an 8-byte restart block for access by a one-byte RST instruction.

One reader commented that the printing of the original, less than perfect version, implies that I do not scrutinise the submitted examples very closely for efficiency or technique.

Quite so! That is not my function in this series and, as this article completes Subset's second year, here is a reminder of what my function is.

The series provides the means by which you can share your work with others. I look for interesting ideas, test that the code we print works and bring Datasheet documentation and explanation, where necessary, up to a standard that makes the code we print clear and visible to all. I am not unmindful of efficiency and technique and sometimes highlight that which pleases me. But the best ideas do not always come well coded and it is useful to put them out to interested coders with the time to work on them.

Instead of simply swallowing what is dished out, you scrutinise the code for efficiency and technique, improve it and spark off new ideas. It is because machine coders are a cut above ordinary mortals and involve themselves in this way, giving and taking some devastating criticism in pursuits of perfection, that we have this series.

More Z80 extras

It was seeing the April version of LD HL, (HL) that reminded David Broughton of Northwood how he used to code the 'instruction' CP HL, DE:

```
PUSH  HL        ; E5
OR    A         ; B7
SBC   HL, DE    ; ED 52
POP   HL        ; E1
```

until he hit on this version:

```
OR    A         ; B7
SBC   HL, DE    ; ED 52
ADD   HL, DE    ; 19
```

which is one byte and 10 T-states shorter.

It relies on the fact that if, and only if, a carry is generated from the SBC instruction will a carry be generated from the ADD.

Here is an extra 'instruction' from John Hardman of Welling to reverse the order of the bits in A (from 0-7 to 7-0):

```
PUSH  BC        ; C5
LD    B, + 8    ; 06 08
L1:   BRA       ; 1F
RL    C         ; CB 11
DJNZ  L1        ; 10 FB
LD    A, C      ; 79
POP   BC        ; C1
RET             ; C9
```

The routine produces interesting effects when reversing the memory map of a high resolution graphics board, allowing pictures to be rotated.

Ian Law of Bristol also sent a routine to reverse the order of the bits in A, which he used when he was designing software routines to adapt an existing disk controller to read another disk format.

6502 universal delay

Last month we printed Dave Barrow's URDZ, universal delay routine for the Z80. Our first Datasheet this month is his universal delay routine for the 6502, URDS.

For the benefit of anyone who hasn't last month's *PCW* handy, there are two factors governing the length of the delay: the input value in X the numerator, and the value named FRACS, located at FRACHI and FRACLO. FRACS is determined by dividing the system clock hertz by a denominator. To produce a FRACS delay of 1/50th of a second, the denominator is 50 and, with a 2 Mhz clock, the FRACS value is 40,000 or 9C40H. The FRACS delay is multiplied by the value input in X to give the total delay.

Datasheet

```
;=UDRS- Universal Delay Routine 6502
;/CLASS: 1
;/TIME CRITICAL?  yes
;/DESCRIPTION: Accurate delay of 1-256 times assembled
;/             fraction of system clock hertz.
;/ACTION: REPEAT UNTIL X=0
;/        AY← FRACS - UDRS operating time (first
;/        iteration
;/                        (NUMLPS operating time
;/                        (subsequent iterations))
;/        repeat until AY<0
;/        AY← AY-18
;/        REPEAT 17 TIMES TO USE REMAINING TIME STATES
;/        Y←Y+1
;/        IF Y=0 THEN Y←Y-1
;/SUBr DEPENDANCE: none
;/INTERFACES: none
;/INPUT: X= Numerator ($00=256)
;/OUTPUT: Delay of X/ Denominator seconds
;/        X=0
;/REGs USED: X
;/STACK USE: 4
;/LENGTH: 45
;/TIME STATES: FRACS*X (including JSR UDRS)
;/             (inaccurate if branches cross page
;/             boundary)
;/PROCESSOR: 6502
FRACS= system clock hertz / denominator (245≤FRACS<65536)
FRACHI= INT(FRACS / 256)
FRACLO= FRACS-(FRACHI*256)
UDRS:   PHP          ;save flags, A & Y            T states= 3  08
        PHA          ;                                      3  48
        TYA          ;                                      2  98
        PHA          ;                                      3  48
        CLD          ;clear for binary arith                2  D8
        LDA #$0B     ;lo-byte negated routine T states      2  A9 OB
NUMLPS: CLC          ;using 2s complement addition with     2  18
        ADC #FRACLO  ;subtrahend being first in accumulator 2  60 XX
        TAY          ;subtract UDRS optime (1st iteration) or2  A8
        LDA #$FF     ;NUMLPS optime (subsequent iterations) 2  A9 FF
        ADC #FRACHI  ;from FRACS giving result in A,Y       2  69 XX
DIVLPS: PHA          ;use 18 T states per loop              3  48
        TYA          ;of repeated subtraction               2  98
        SBC #$12     ;until A,Y<0                           2  E9 12
        TAY          ;                                      2  A8
        PLA          ;                                      4  68
        SBC #0       ;                                      2  E9 00
        BCS DIVLPS   ;Cy reset on exit                      2/3B0 F6
        LDA #$EF     ;so count up T state remainder         2  A9 EF
REMLPS: INY          ;repeat 17 times using 10 T states     2  C8
        BNE REMCTS   ;per iteration normally                2/3D0 01
        DEY          ;but 11 for each remainder             2  88
REMCTS  ADC #+1      ;                                      2  69 01
```

```
        BNE REMLPS  ;                                 2/3D0 F8
        LDA #$33    ;lo-byte negated subseq iter T states  2  A9 33
        DEX         ;decrement Numerator              2  CA
        BNE NUMLPS  ;and repeat until done            2/3D0 DF
        PLA         ;restore                          4  68
        TAY         ;Y                                2  A8
        PLA         ;A                                4  68
        PLP         ;and flags, esp decimal mode      4  28
        RTS         ;                                 6  60
```

TIMING EFFECTS.

Operating time T states in:	NUMLPS	UDRS
(JSR UDRS)		6
sequence (bytes 1 to 7)		15
sequence (bytes 8 to 15)	10	10
DIVLPS (bytes 16 to 25)	17	17
instruction (bytes 26 & 27)	2	2
REMLPS(bytes 28 to 35)	169	169
NUMLPS Test (bytes 36 to 40)	7	6
sequence (bytes 41 to 45)		20
	205	245
converted to Hexadecimal	$CD	$F5
Negated for complement addition lo-byte	$33	$0B

Z80 square roots

Steven Weller of Southampton contributes Datasheets SROOT and DSROOT for extracting square roots from 16-bit and 32-bit positive binary numbers respectively. But first he goes into the theory of finding square roots with Figure 1, in decimal, of how to find the square root of 2840.

Thus, in the example shown, the answer is 53 and the remainder 31. The same method works in binary, as is shown in the Datasheets, which Steven reckons are very fast. Will anyone accept the challenge?

```
1.      28  40    Split the number into pairs of digits from
                  the decimal point.

2.       5        Find the largest square that can be subtr-
        28  40    acted from the first pair of digits. Write
        25        it below the first pair, with the root
         3        above the line. subtract the square from
                  the first pair.

3.       5        double the number on the top line and write
        28  40    it on the left, level with the difference
        25        found previously. Bring down the next two
    10   3  40    digits.

4.       5        Find a digit, 0-9, which, when added to the
        28  40    right hand end of the number (10) on the
        25        left and multiplied by that digit, produces
    10? 3  40    the highest result that is less than the
     ?x           right (340). ie, since 101 x 1 = 101, 102
                  x 2 = 204, 103 x 3 = 309, 104 x 4 = 416. the
                  digit we want is 3.

5.       5   3    Write the digit so found (3) on the next
        28  40    position on the top line and subtract the
        25        product (309) from the last number (340)
   103   3  40
     3   3  09
   309      31
```

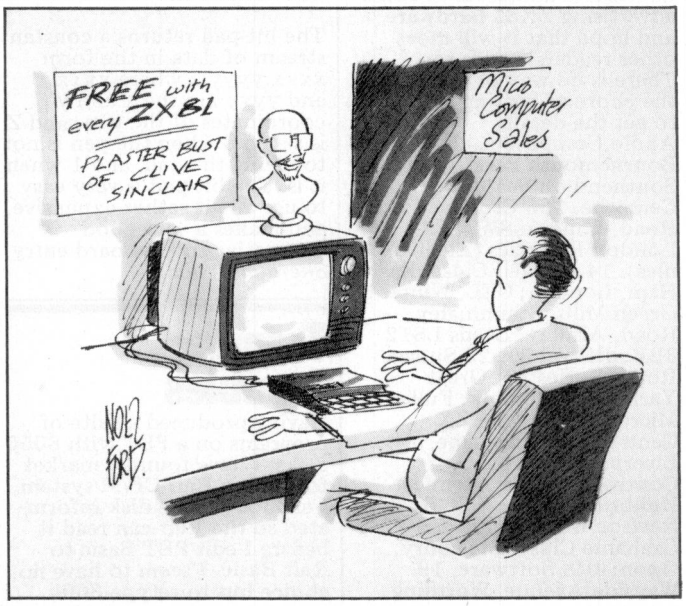
Fig 1

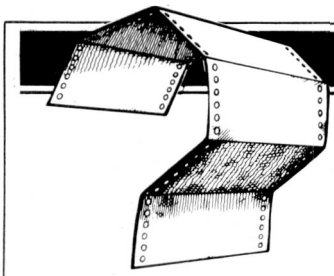
Datasheet

```
;=SROOT- 16-bit square root
;/CLASS: 2
;/TIME CRITICAL? no
;/DESCRIPTION: Calculates the square root of a positive 2's
;/              complement binary number.
;/ACTION: Shifts pairs of binary digits in LA left through HLA;
;/         subtracts 1 from a pair >1;
;/         shifts into the least significant end of answer D 1
;/         if there has been a subtraction, otherwise 0.
;/SUBr DEPENDANCE: none
;/INTERFACES: none
;/INPUT: HL contains a positive binary number for which the
;/        square root is required.
;/OUTPUT: HL contains the square root, DE the remainder. The Z
;/         flag is set if the input was negative.
;/REGs USED: B,AF,DE,HL
;/STACK USE: nil
;/LENGTH: 37
;/PROCESSOR: Z80
SROOT:  XOR  A       ;clear carry                    AF
        DEC  A       ;set A to -1                    3D
        BIT  7,H     ;test sign of input             CB 7C
        JR   NZ,SR30 ;if -ve, exit setting Z         20 1D
        LD   A,L     ;set up                         7D
        LD   L,H     ;24-bit working                 6C
        LD   H,+0    ;accumulator                    26 00
        LD   DE,40H  ;and subtrahend                 11 40 00
        LD   B,+8    ;load loop counter              06 08
SR10:   SBC  HL,DE   ;try subtraction                ED 52
        JR   NC,SR20 ;                               30 01
        ADD  HL,DE   ;if unsuccessful, re-add        19
SR20    CCF          ;carry set if successful        3F
        RL   D       ;shift carry state to answer    CB 12
        ADD  A,A     ;shift working accumulator      87
        ADC  HL,HL   ;1 bit left                     ED 6A
        ADD  A,A     ;shift working accumulator      87
        ADC  HL,HL   ;1 bit left                     ED 6A
        DJNZ SR10    ;do 8 times                     10 F0
        LD   E,H     ;get remainder                  5C
        LD   L,D     ;and result                     6A
        LD   H,A     ;set top 8 bits of              67
        LD   D,A     ;each to 0 (A is 0)             57
SR30:   INC  A       ;reset Z for a valid result     3C
        RET          ;return                         C9
```

Datasheet

```
;=DSROOT - 32-bit square root
;/CLASS: 2
;/TIME CRITICAL? no
;/DESCRIPTION: calculates the square root of a positive 2's
;/              complement binary number
;/ACTION: shifts pairs of binary digits in (SP), IX left through
;/         HL,(SP),IX;
;/         subtracts 1 from a pair >1
;/         shifts 1 if there has been a subtraction, otherwise 0,
;/         into the least significant end of answer DE
;/SUBr DEPENDANCE: none
;/INTERFACES: none
;/INPUT: BC,DE contains a positive binary number for which the
;/        square root is required
;/OUTPUT: BC,DE contains the square root, IY the remainder. The Z
;/         flag is set if the input was negative.
;/REGs USED: AF,BC,DE,IX,IY
;/STACK USE: 4
;/LENGTH: 62
;/PROCESSOR: Z80
DSROOT: LD   A,+16   ;load counter                   3E 10
        BIT  7,B     ;test sign of input             CB 78
        JR   NZ,DSR30;if -ve, exit setting Z         20 35
        PUSH HL      ;save HL                        E5
        PUSH DE      ;put low half of                D5
        POP  IX      ;number in IX                   DD E1
        PUSH BC      ;top half to (SP)               C5
        OR   A       ;reset carry                    B7
        SBC  HL,HL   ;zeroise HL                     ED 62
        LD   BC,4000H;set subtrahend                 01 00 40
        LD   D,H     ;    "                          54
        LD   E,L     ;    "                          5D
        EX   (SP),HL ;top part to HL,0 to (SP)       E3
DSR10:  SBC  HL,BC   ;try                            ED 42
        EX   (SP),HL ;                               E3
        SBC  HL,DE   ;                               ED 52
        EX   (SP),HL ;subtraction                    E3
        JR   NC,DSR20;jump if successful             30 05
        ADD  HL,BC   ;add                            09
        EX   (SP),HL ;back                           E3
        ADC  HL,DE   ;if                             ED 5A
        EX   (SP),HL ;not.                           E3
DSR20:  CCF          ;carry set if successful        3F
        RL   E       ;shift carry state              CB 13
        RL   D       ;to answer                      CB 12
        LD   C,+2    ;load counter                   0E 02
DSR22   ADD  IX,IX   ;shift                          DD 29
        ADC  HL,HL   ;                               ED 6A
        EX   (SP),HL ;working                        E3
        ADC  HL,HL   ;                               ED 6A
        EX   (SP),HL ;accumulator                    E3
        DEC  C       ;                               0D
        JR   NZ,DSR22;and again                      20 F5
        DEC  A       ;                               3D
        JR   NZ,DSR10;do 16 times                    20 DE
        RES  6,B     ;set BC=0                       CB B0
        POP  IY      ;get remainder                  FD E1
        POP  HL      ;restore HL                     E1
DSR30:  ADD  A,-16   ;reset Z for a valid result     C6 F0
        RET          return                          C9
```





COMPUTER ANSWERS

Send your queries to: Sheridan Williams, 35 St Julian's Road, St Albans, Herts. Please note that Sheridan can no longer answer questions on an individual basis, so please don't send an SAE with your query.



Better RAM

I was on the point of ordering the Sinclair plug-in 16k RAM when a friend loaned me the October 81 issue of *PCW*. This contained an advert from Audio Computers for RAMs suitable for adding under the keyboard of the ZX81. A solidly-connected RAM would be my preferred option because it would leave me a port free and be more reliable. Which do you recommend that I go for?
A Jenkinson, Edinburgh

I am unable to recommend any of the ZX81 add-on equipment, not because it isn't good but because I have no personal experience of it. The firm you mention is still advertising in *PCW* and I list the name and address below. There are obvious advantages in having any add-ons securely fixed so that during keyboard operation there is no danger of flexing the connexion and thus losing the contents of the memory. This is a problem with the standard and the look-alike RAM packs. Some of my acquaintances have adopted various stratagems to avoid the problem (metal clamps, rubber bands and hardboard etc) and they all seem to me rather inelegant even if they manage to be reliable.

However there are various ways to add memory and some of them manage to provide a port free as well. I have collected a list of the names and addresses of firms advertising ZX81 hardware and hope that it will meet other readers' needs too. There is no way of avoiding the chore of writing to them to get the details: Audio Computers, 87 Bournemouth Park Road, Southend on Sea, Essex; Cemeche, 136 Cromwell Road, London SW7; East London Robotics (Electronics), 14 Darwell Close, East Ham, London; CEL, Winter Green Mills, Stanningley Road, Armley, Leeds LS12 3BB; dK'tronics, 23 Sussex Road, Gorleston, Great Yarmouth, Norfolk; Fuller Microsystems, The ZX Centre, Sweeting Lane, Liverpool 2; Ground Control, Alfreda Avenue, Hullbridge, Essex SS5 6LT; Hewson Consultants, 7 Grahame Close, Blewbury, Oxon; JRS Software, 19 Wayside Avenue, Worthing, Sussex BN13 3JU; Macronics, 26 Spiers Close, Knowle, Solihull, West Midlands B93 9ES; Quicksilva, 95 Upper Brownhill Road, Maybush, Southampton, Hants; Thurnall (Electronics) Eng, Dept P95, Liverpool Road, Cadishead, Manchester M30 5BG. I hope any suppliers who have been left out will forgive me.
Anthony Camacho

Bit Bug

In an earlier issue you stated that the Summagraphics Bit-pad could be connected to the RML 380Z via the RS232 serial port, but I am unable to get data from the pad into my machine. How do I do it, preferably in Basic?
J Miles, Luton

Assuming that the bit-pad is equipped with a serial interface, you'll need to alter CP/M so that you can read data in from the SI0-4 port via the OPEN file statement. You will have to follow the bit-pad manual to decide on which baud rate to use, but 9600 should be OK. Here are two subroutines, the first to set up the input from the port and the second to decode the data coming from the bit pad:

```
1000 POKE &DF13, &30
1010 OPEN£10, "RDR:"
1020 PRINTER 4,6
1030 RETURN
```

Change line 1020 according to the baud rate selected.

```
2000 INPUT LINE£10,Q$
2010 X=VAL(MID$(Q$,1,4))
2020 Y=VAL (MID$(Q$,6,4))
2030 Z=VAL(MID$(Q$11))
2040 RETURN
```

The bit-pad returns a constant stream of data in the form xxxx,yyyy,z where xxxx and yyyy are the x and y coordinates of the pen, and Z is set to 0 when the pen is not touching the pad, and 1 when it is. The bit-pad is very easy to use albeit rather expensive, and makes a very good alternative to keyboard entry.
Sheridan Williams

Transfer troubles

Having produced a suite of programs on a PET with 8050 disks, I have found a market for it on a Rair CP/M system. I cannot get the disk reformated so the Rair can read it before I edit PET Basic to Rair Basic. I seem to have no choice but to retype 300k worth of software — have you any ideas?
S Skinner, London

The answer involves spending some money rather than time. What you will need to do is to save your programs on the PET disks in ASCII rather than compacted form, like a data file. Next you will need an IEEE to serial interface; these cost about £25 upwards. Using CP/M's PIP program you can get data in using PIP INP: = filename provided your CP/M has been configured to do that (it should have been). Depending on the handshaking capability and the baud rate chosen, you may lose a small amount of data every time the input buffer fills, but you can enter the corrections manually at the end.

If this all sound a bit complicated then I would advise that you find a dealer who will let you (for a fee of course) undergo the transfer using equipment at his premises. Such a dealer in London might be Sumlock Bondain Ltd at 263-269 City Rd (01-250 0505). Expect to pay anywhere from £30 to £100 for the service, as he will have to provide people and equipment with no prospect of making any sales. You may find a local dealer who is prepared to do it for nothing though!
Sheridan Williams

New career?

I have acquired quite a knowledge of computers through having a PET at home. I also use an Apple and occasionally a BBC micro. My present job is as a draughtsman but I am getting a little bored by it. I have always wanted to teach; should I consider teaching computing? Your advice would be much appreciated a as I believe that you are a lecturer in computing.
(Name and address withheld by request)

Yes, of course you should consider it. If you don't, then in 20 years' time you will kick yourself for not trying. You will need to do considerable research first, because there are many areas to consider — for instance, at what level do you want to teach: primary, secondary, further education, polytechnic or university? What area do you want to teach in: systems methodology, programming, computer operations, computer architecture, business data processing, numerical analysis . . . the list goes on. Would you leave your present job in order to take a relevant degree, and/or teaching qualification? How do you know that you *can* teach? What do your friends, wife, etc think of your capabilities as a teacher?

Next, consider your knowledge of computers in totality. Your only practical experience is in programming in Basic and 6502 machine code. There is far more to teaching about computers than just programming and this applies at all levels from primary education upwards. Could you give a class/lecture two hours a day for five days on, say, 'error correction techniques' or 'file design'? Approach schools, colleges, libraries, examining bodies for as many syllabi as you can find. Study them at the level that you are interested in and see if you could cope. I have seen many teachers in particular subject areas told that they must teach computing, and even though they try their best the results are often very disappointing. Suppose you taught history and someone said to you, 'take the physics classes next year'. The analogy is fair and indicates the stupidity of the request.

You say in your letter that you have acquired quite a knowledge of computers. This is probably not true — you have acquired quite a knowledge of *micro*computers and even then you have only used a few. There is a considerable difference when moving to a mini or mainframe, especially as they will operate in the multi-programming code, hence requiring a rather more sophisticated operating system than the PET.

I hope that I haven't squashed you, but it is best to be honest.
Sheridan Williams

Too costly!

Would you be willing to forecast whether the price of the least expensive daisywheel printers will go down much? I am sure there is a mass market for letter-quality printers for people who have a cheap micro, want to do some word processing, but cannot spend the better part of £1000 for the printer.
R P Phillips, Milton Keynes

I don't need to forecast! The new Smith-Corona TP-1 is now on the market in this country at £485 (plus VAT) and the TEC Starwriter sells at £799. As an alternative,

there are a number of dot matrix printers which generate letter-quality print by multiple passes over the line.

These can cost from £400 approx.

What you lose by choosing a cheaper daisywheel printer, or a letter-quality dot-matrix, is mostly speed. The typical expensive daisywheel printers used with commercial WP systems print at from 45 to 60 characters per second. The cheaper daisywheels now coming on the market are often derived from electronic typewriters and print at electric typewriter speeds — 15 to 25 cps. Also, cheaper machines may not always be built for continuous operation, but then you wouldn't need that.

As regards the future, it has been claimed in some quarters that electronic daisywheel typewriters actually cost less to make than conventional typebar electric machines. As the cheapest of these sell for about £150, the implication is clearly that daisywheel printers should eventually fall to that level (ignoring inflation). How long this could take is another matter. I would think that three to five years might be a reasonable guess.
P L McIlmoyle

Better graphics

Could you give me any information on how to improve the graphics on my UK101?
P Pedro, London

This is an example of a letter that doesn't give me enough to go on. It doesn't say whether there is a fault with the graphics or whether the display needs improving. It is even possible that the writer might expect to be told how to add programmable characters or colour or high resolution draw and plot facilities such as the BBC Computer has. In general, to get the best display possible you need a high quality television, or even better, a monitor. Mine was second-hand and quite cheap. If your computer's graphics don't please you there is nothing else you can do except go back to the manufacturer or supplier (or if it is a popular machine there may be other suppliers of add-ons) and ask what can be added or changed.
Anthony Camacho

What is it?

With reference to the word processing supplement to the May issue of *PCW*, could you please tell me what is an OEM?
D Irvine, Hamilton

These initials stand for 'Original Equipment Manufacturer'. This phrase comes from outside the computer industry, and initially referred to, for example, a car manufacturer. Thus, if a tyre company supplied tyres to an 'OEM' it meant to a car, truck or tractor manufacturer, as compared to supply to a tyre distributor or wholesaler, or to a garage.

Most OEMs in the computer computer industry are equipment assemblers, rather than manufacturers — thus the typical computer OEM is a systems house putting together complete computer systems, usually hardware, peripherals, and software. The most common use of the phrase is with reference to the discounted prices at which equipment such as peripherals (printers, VDUs, etc) is supplied to OEMs. Some of these items, and often the actual computers, are supplied in a 'stripped-down' form that the OEMs fit into their own cases.
P L McIlmoyle

Which micro?

I wish to spend around £450 on a microcomputer complete with a cassette recorder, suitable for engineering design problems as well as general home use. It would not be needed for use with games programs and colour is not required.

I have looked at VIC-20, Tandy TRS-80 Model I Level 2, Atari 400, Tandy Colour Computer and the Sharp MZ-80K among others. I tend to prefer the last, as it is self-contained and has been much reduced in price. I would appreciate your advice on these, or on other computers in the same price range.
S A Chapman, Sutton Coldfield, West Midlands.

My approach to such selection problems is to first make a 'shopping list' of those features which are essential for the application and then of those which are desirable. Thus in your area of structural engineering I would think that high precision arithmetic, speed of processing, trig and log functions, and at least two-dimensional numeric arrays would be on the essential list, with a graphics capability, and the potential to run Fortran being desirable.

High precision arithmetic is essential, bearing in mind that many micros calculate only to six significant figures in their standard mode. Speed is also important as many engineering calculations are of an iterative nature and thus processor speed becomes significant, rather than the commoner limiting factor of I/O speed.

If you apply these criteria to the machines you mention I would expect you to end up choosing between the TRS-80 and the MZ-80A, the replacement for the now-defunct MZ-80K. The Tandy Colour Computer meets most of the essentials, but is less than half as fast as the TRS-80. This (and the MZ-80A) only runs at 2 MHz, compared with the 4 MHz of many other Z80-based machines. Other computers you should consider are the Video Genie I, which is very similar to the Tandy TRS-80 Model I but has a built-in cassette recorder, the Tandy TRS-80 Model III (but probably out on price) which is the most successful successor to the Model I, and has a built-in screen and (if you're not in a hurry!) the BBC model B.

Another factor to take into account is whether you wish to allow for upwards growth to a system that can run CP/M. While this involves the expense of disks, it offers the availability of a wide range of commercially available powerful software, including Fortran. The Sharp MZ-80K has this capability, but if you do think seriously of this machine, make sure you will be quite happy with the somewhat unusual layout of the keys.
P L McIlmoyle.

Disk info sought

I am interested in the hardware of computers but find it difficult to obtain books concerning disk controllers and disk drive systems. Could you recommend any?
P Lee, London.

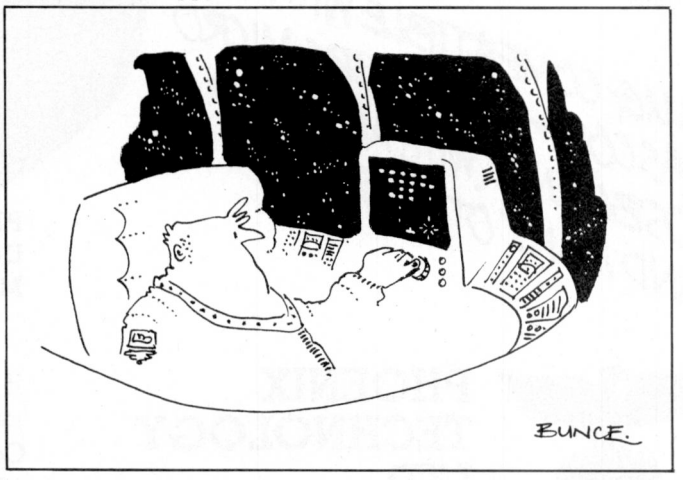
Disk controller and disk drives are rather hard for an amateur to deal with, so it's not worth publishing do-it-yourself guides; at any rate I don't know of any. There is a series of articles in *Wireless World* that began in the March 1982 issue and is still continuing (expect the third part in the May number) but this seems to be more about hard disks than floppies. However, the principles are the same. The only place that I've been able to get details about floppy drives and their controllers is directly from the manufacturers or their agents, who will sometimes supply the engineering manuals at rather high prices.
Anthony Camacho

Distorted view

I have been experiencing problems keeping my Binatone 12 in TV tuned when using it with my UK101. After about five minutes the picture distorts and becomes unreadable. This does not arise when using the TV as a TV. Will my TV suffer?
M Leslie, Welwyn Garden City

In my experience it is common for people to have trouble with the tuning of television sets in use as displays. Sharpness (focus), picture size (I bought a portable that puts the first character of every line off the screen to the left!) and waviness (some micros are only approximately synchronised with the frame rate and produce a picture that gently sways about like seaweed under water) — are the common troubles with ordinary TV sets. Your problem sounds like a fault on the micro or the TV. Don't worry about damaging the television — it's very unlikely that you will do that. Have you tried the micro on another telly? You may see the same effect, in which case you should take your UK 101 back to the supplier to get it fixed. If, on the other hand, it's the telly, the remedy is obvious.
Anthony Camacho

In the May issue of PCW *in Computer Answers I mentioned the Independent BBC Microcomputer User Group — BEEBUG. There are one or two corrections to the text as published. Firstly, BEEBUG was established and run as a joint venture by myself and David Graham. Secondly, the number of members has soared beyond the 4000 mark and thirdly, the address to write to for enquiries or subscriptions is: BEEBUG, Dept 6, 374 Wandsworth Rd, London, SW8 4TE.*



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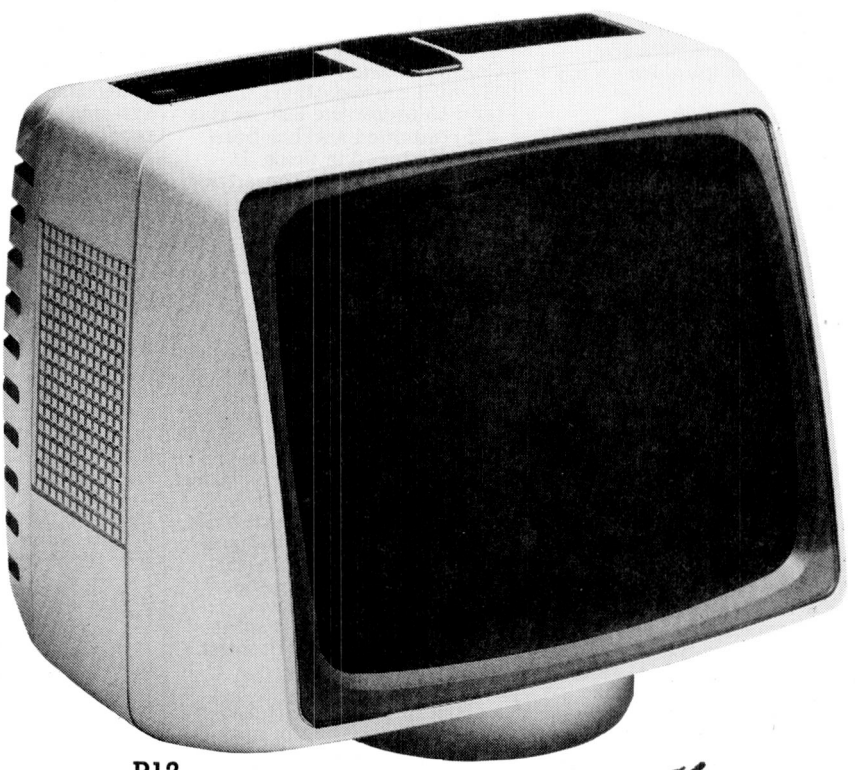
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NEWCOMERS START HERE



This is our unique quick-reference guide, reprinted every month to help our readers pick their way through the most important pieces of (necessary) jargon found in PCW. *While it's in no way totally comprehensive, we trust you'll find it a useful introduction. Happy microcomputing!*

Welcome to the confusing world of the microcomputer. First of all, don't be fooled; there's nothing complicated about this business, it's just that we're surrounded by an immense amount of necessary jargon. Imagine if we had to continually say 'numbering system with a radix of 16 in which the letters A to F represent the values ten to 15' when instead we can simply say 'hex'. No doubt soon many of the words and phrases we are about to explain will eventually fall into common English usage. Until that time, **PCW** will be publishing this guide — every month.

We'll start by considering a microcomputer's functions and then examine the physical components necessary to implement these functions.

The microcomputer is capable of receiving information, **processing** it, storing the results or sending them somewhere else. All this information is called **data** and it comprises numbers, letters and special symbols which can be read by humans. Although the data is accepted and output by the computer in 'human' form, inside it's a different story — it must be held in the form of an electronic code. This code is called **binary** — a system of numbering which uses only 0s and 1s. Thus in most micros each character, number or symbol is represented by eight binary digits or **bits** as they are called, ranging from 00000000 to 11111111.

To simplify communication between computers, several standard coding systems exist, the most common being **ASCII** (American Standard Code for Information Interchange). As an example of this standard, the number five is represented as 00110101 — complicated for humans, but easy for the computer! This collection of eight bits is called a **byte** and computer freaks who spend a lot of time messing around with bits and bytes use a half-way human representation called **hex.** The hex equivalent of a byte is obtained by giving each half a single character code (0—9, A—F): 0 = 0000, 1 = 0001, 2 = 0010, 3 = 0011, 4 = 0100, 5 = 0101 .... E = 1110 and F = 1111. Our example of 5 is therefore 35 in hex. This makes it easier for humans to handle complicated collections of 0s and 1s. The machine detects these 0s and 1s by recognising different voltage levels.

The computer processes data by reshuffling, performing arithmetic on, or by comparing it with other data. It's the latter function that gives a computer its apparent 'intelligence' — the ability to make decisions and to act upon them. It has to be given a set of rules in order to do this and, once again, these rules are stored in **memory** as bytes. The rules are called **programs** and while they can be input in binary or hex **(machine code** programming), the usual method is to have a special program which translates English or near-English into machine code. This speeds programming considerably; the nearer the **programming language** is to English, the faster the programming time. On the other hand, program execution speed tends to be slower.

The most common microcomputer language is **Basic**. Program instructions are typed in at the keyboard, to be coded and stored in the computer's memory. To **run** such a program the computer uses an **interpreter** which picks up each English-type **instruction**, translates it into machine code and then feeds it into the **processor** for execution. It has to do this each time the same instruction has to be executed.

Two strange words you will hear in connection with Basic are **PEEK** and **POKE**. They give the programmer access to the memory of the machine. It's possible to read (PEEK) the contents of a byte in the computer and to modify a byte (POKE).

Moving on to **hardware**, this means the physical components of a computer system as opposed to **software** — the programs needed to make the system work.

At the heart of a microcomputer system is the central processing unit **(CPU)**, a single microprocessor chip with supporting devices such as **buffers**, which 'amplify' the CPU's signals for use by other components in the system. The packaged chips are either soldered directly to a printed circuit board **(PCB)** or are mounted in sockets.

In some microcomputers, the entire system is mounted on a single, large, PCB; in others a **bus system** is used, comprising a long PCB holding a number of interconnected sockets. Plugged into these are several smaller PCBs, each with a specific function — for instance, one card would hold the CPU and its support chips. The most widely-used bus system is called the **S100**.

The CPU needs memory in which to keep programs and data. Microcomputers generally have two types of memory, **RAM** (Random Access Memory) and **ROM** (Read Only Memory). The CPU can read information stored in RAM — and also put information into RAM. Two types of RAM exist — **static** and **dynamic;** all you really need know is that dynamic RAM uses less power and is less expensive than static, but it requires additional, complex, circuitry to make it work. Both types of RAM lose their contents when power is switched off, whereas ROM retains its contents permanently. Not surprisingly, manufacturers often store interpreters and the like in ROM. The CPU can only read the ROM's contents and cannot alter them in any way. You can buy special ROMs called **PROMs** (Programmable ROMs) and **EPROMs** (Eraseable PROMs) which can be programmed using a special device; EPROMs can be erased using ultra-violet light.

Because RAM loses its contents when power is switched off, **cassettes** and **floppy disks** are used to save programs and data for later use. Audio-type tape recorders are often used by converting data to a series of audio tones and recording them; later the computer can listen to these same tones and re-convert them into data. Various methods are used for this, so a cassette recorded by one make of computer won't necessarily work on another make. It takes a long time to record and play back information and it's difficult to locate one specific item among a whole mass of information on a cassette; therefore, to overcome these problems, **floppy disks** are used on more sophisticated systems.

A floppy disk is made of thin plastic, coated with a magnetic recording surface rather like that used on tape. The disk, in its protective envelope, is placed in a disk drive which rotates it and moves a **read/write head** across the disk's surface. The disk is divided into concentric rings called **tracks**, each of which is in turn subdivided into **sectors**. Using a program called a **disk operating system**, the computer keeps track of exactly where information is on the disk and it can get to any item of data by moving the head to the appropriate track and then waiting for the right sector to come round. Two methods are used to tell the computer where on a track each sector starts: **soft sectoring** where special signals are recorded on the surface and **hard sectoring** where holes are punched through the disk around the central hole, one per sector.

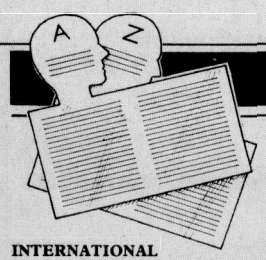
Half-way between cassettes and disks is the **stringy floppy** — a miniature continuous loop tape cartridge, faster than a cassette but cheaper than a disk system. **Hard disk** systems are also available for micro-computers; they store more information than floppy disks, are more reliable and information can be transferred to and from them much more quickly.

You, the user, must be able to communicate with the computer and the generally accepted minimum for this is the visual display unit **(VDU)**, which looks like a TV screen with a typewriter-style **keyboard**; sometimes these are built into the system, sometimes they're separate. If you want a written record **(hard copy)** of the computer's output, you'll need a **printer**.

The computer can send out and receive information in two forms — **parallel** and **serial**. Parallel input/output **(I/O)** requires a series of wires to connect the computer to another device, such as a printer, and it sends out data a byte at a time, with a separate wire carrying each bit. Serial I/O involves sending data one bit at a time along a single piece of wire, with extra bits added to tell the receiving device when a byte is about to start and when it has finished. The speed that data is transmitted is referred to as the **baud rate** and, very roughly, the baud rate divided by ten equals the number of bytes being sent per second.

To ensure that both receiver and transmitter link up without any electrical horrors, standards exist for serial interfaces; the most common is **RS232** (or **V24)** while, for parallel interfaces to printers, the **Centronics** standard is popular.

Finally, a **modem** connects a computer, via a serial interface, to the telephone sytem allowing two computers with modems to exchange information. A modem must be wired into the telephone system and you need British Telecom's permission; instead you could use an **acoustic coupler**, which has two obscene-looking rubber cups into which the handset fits, and which has no electrical connection with the phone system — British Telecom isn't so uppity about the use of these.



USER GROUPS INDEX

Here's a full listing of all the User Groups we know of in the UK and abroad. The next one will be in February '83 with updates in each month between. Send corrections/ updates to: **User Group index, PCW, 14, Rathbone Place, London W1P 1DE.**

INTERNATIONAL

Apple Users' Group Europe.
President: K Giese, Hackstucker
11, D-4320 Hattingen 15, West Germany.
Tel 02324 52240.

Central Program Exchange. Full membership (£25 Europe, £40 overseas) provides 30 free programs pa. Small user service (£10 Europe, £20 overseas) provides 10 free programs pa. Contact: Mrs Judith Brown,The Polytechnic, Wulfruma St, Wolverhampton WV1 1LY.

Comp 80 User Group. Monthly newsletter. Annual subscription £6.50 UK, £8.00 overseas. Contact: Philip Probetts, 50 Cromwell Road, Wimbledon, London SW19 8LZ.

GP/M. IRL. Irish CP/M Users' Group. Meets monthly in Dublin area, membership IR £5 pa. Newsletter: CP/M.MAG. Contact: Doug Notley, Gardner House, Ballsbridge, Dublin 4. Tel: 01-686411.

DENSPET: group specifically for exchange or original programs for MTU 200 x 320 dot matrix hi-res PET add-on. Send sample of your work or £2.50 ($2.50) & receive sample in return plus newsletter sub & lists of available programs. Contact: DENSPET, Rock House, Ballycroy, Westport, Co Mayo, Eire.

DA Inamic: European DAI personal computer users' club. Has over 500 members, publishes a bi-monthly newsletter with most articles in English. Contact: DA Inamic, Heide 98, 3171 Westmeerbeek, Belgium.

European Sorcerer Club. For sample newsletter contact Colin Morle at 32 Watchyard Lane, Formby, Nr Liverpool L37 3JU. Annual sub UK £5, Overseas £12.00.

Group/380. Recently established for information interchange on microsystems equivalent to IBM 360/370 main frames, newsletter, access to a computerised database listing relevant software. Annual sub: $10 for individuals, $25 for organisations. Contact: Mokurai Cherlin, PO Box 111, Mokurai Cherlin, PO Box 1131, Mount Shasta. CA96067. USA.

International Sharp User Group. 1400 members in 31 countries £3 sub includes MZ-80K Internaional Sharp User Group. 1400 members in 31 countries £3 sub includes MZ-80K Space Invaders cassette and newsletters. Contact: Graham Knight, 108 Rosemount Place, Aberdeen. Tel: 0224 630526.

Irish ZX80/81 Users' Club, the first club in Ireland. Open for all owners of Sinclairs. For info send two 22p stamps (six counties 40p). Users Club, c/o M Cronsten, 73, Cnoc Crionain, Baile Atha, Cliath 1.

Ithaca Intersystems and S100 Bus Users' Club. Formed to 'organise the construction and design of software and hardware based on Ithaca or other S100 systems.' Contact: George Brooke, Sebastian Baverstrasse 20c, 8000 Munich 83, W Germany.

KAOS — the official 6502 Users' Group of Australia. Has a range of projects within special interest groups: hardware, software, amatuer radio, Pascal, education, Publishes monthly newsletter. Contact: Mr Ian Eyles, 10 Forbes St, Essondon, Victoria, Australia 3040.

Microcomputer Users' Club. Recently establishd for program writing and exchange, emphasis on 6502/Z80 users. Contact: c/o Synthetronics Microcomputers PO Box 151, 1322 Hoevik Norway.

Norsk Data Samfunn — User Groups for HP41C and ZX81. Both groups publish bimonthly magazines, offer techincal services and arrange meetings and courses. Contact: Christopher Solheim, Norsk Data Samfunn, Tuengen Alle 11, Oslo 3, Norway.
Tel: (02) 147110.

Pascal Z User Group (Europe) Affiliated with Pascal Z USA. 12 user disks available plus newsletter. Contact: George Brooke, Sebattian Bauerstrasse 20c, 8000 Munich 83, West Germany.

Post Sharp: International exchange and contact club on the Sharp MZ-80K. Has over 100 members. Contact: Mr Daniel Joly, 207, Rue sur les Thiers, B-4400 Herstal, Belgium.
Powertran Users' Club. Annual subscription £6.50 UK membership, £8.00 for members abroad, which includes a monthly newsletter. Contact Philip Probetts, 50 Cromwell Road, Wimbledon, London SW19 8LZ.
Tel: 01-540 3713.

Powertran Users' Club. Annual sub. £6.50 UK, £8.00 overseas which includes monthly newsletter. Contact: Philip Probetts, 50 Cromwell Road, Wimbledon, London SW19 8LZ. Tel: 01-540 3713.

Spanish ZX81 User Group. Quarterly magazine/newsletter, hardware and software advice, program library & exchange, courses. Contact: Josep-Oriol Tomas Jr, Club Nacional Usarios Del ZX81, Avda de Madrid, No. 203-207, 10, 3a, esc. A, Barcelona-14, Spain.

Tangerine Users' Group (International), recently formed for users of the Microtan 65, the TUG will act as a central information clearing house, including exchange of programs, etc. Annual membership £5.00. Details from TUG at 16 Iddesleigh Rd, Charminster, Bournemouth, Dorset BH3 7JR.

USCD System User Society. Existing special interest groups include industrial application, word processing, real time, business applications and forward planning. UK contact: John Ash, Dicoll Data Systems Ltd, Bond Close, Kingsland Estate, Basingstoke, Hants RG24 0QB.

ZX80/81 Users' Club. Low cost software. Technical support, newsletter. Subscription £6.00 UK, £10.00 overseas. Contact: D Blagen, PO Box 159, Kingston-Upon-Thames, Surrey KT2 5UQ (sae for further information).

The 1800 Users' Group of Finland. Est. 1978, about 500 members. Software & hardware projects, competitions, meetings, newsletters, magazines. Some programs adaptable to Elf and other 1802 micros. Contact: Richard Eller. foreign correspondence, 1800 Users' Club, P.O. Box 559, SF 00101, Helsinki 10, Finland.

NATIONAL

6502 Users' Club. Holds regular meetings and welcomes new members. Contact: Walter Wallenborn,21 Argyll Avenue, Luton, Beds or Joe Manifold, 16 Bunyan Close, Pirton, Hitchin, Herts.

80 UK — User group for all TRS-80 owners, including VG/Colour/Level 1. Bi-monthly magazine. Write for details to: N Rushton (ref 80 UK), 123 Roughwood Drive, Northwood, Kirkby, Merseyside L33 9UG.

9900 Users'Group. Contact: Chris Cadogan, Dept. Computer Science, University of Manchester, Manchester M13 9PL.
11s Users' Group. A sort of help service only. No meetings, no newsletter. Contact: Pete Harris, 119 Carpenter Way, Potters Bar, Herts, EN6 5QB. Tel: 0707 52091 or 01-248 8000 ext 7065.

11's User Group. A sort of help service only. No meetings, no newsletter. Contact: Pete Harris, 119 Carpenter Way, Potters Bar, Herts EN6 5QB. Tel: (0707) 52091 or 01-248 8000 ext 7065.

77/68 Users' Group. Quarterly Newsletter. Free membership for 1st year if you buy the 77/68 instruction manual, £1.50 thereafter. Contact: Newbury Computing Store, 40 Bartholomew St, Newbury, Berkshire.

Amateur Computer Club. National organisation with seminars, local group meetings. Bi-monthly newsletter 'ACCUMU LATOR'. 6800, Z-80, and 2650 libraries. Founded 1972. Fee £4.50 sae Jim McDonald, 1 Carlton Court, Studley Grange Road, London, W7 2LU.

Amateur Computer Club, 2650 Library. 2650 related data and technical assistance only. No meetings, no newsletter. Contact: Roger A Munt, 51 Beechwood Drive, Feniscowles, Blackburn, Lancs. BB2 5AT.
Tel: (0254) 22341.

Apple Music Synthesis Group. Interested in ALF, Mountain Hardware, Alpha Syntauri and Soundchaser systems. Contact: Dr David Ellis, 22 Lennox Gardens, London SW1 enclosing an SAE.

Atom User Group. Quarterly newsletter, software library, technical help when possible. Some local groups. Membership £4.00 pa including newsletter. Contact: Richard Meredith, Sheerwater, Yealm View Road, Newton Ferrers, S Devon, PL18 1AN.

BEEBUG — BBC Micro Independent National User Group. Regular magazine with programs feature in each issue, hardware tips, software library, advice clinic and reviews. Membership £4.50 (6 months) £8.50 (full year) all inclusive. SAE for further details. Contact: Sheridan Williams/D E Graham, 35 St. Julian's Road, St. Albans, Herts AL1 2AZ.

British Apple Systems User Group For Apple II and ITT 2020 users. Meets 1st Tues eve & 3rd Sun afternoons monthly at The Old School, Branch Rd, Park St, St. Albans (on A5 about 2 miles south of city centre). Contact: John Sharp, Garston. Tel: (09273) 75093; or David Bolton, Park Street. Tel:(0727) 72917.

Casio fx702 User Group. Newsletter includes: Reviews, puzzles, programs, raffles etc. Membership £6.50 pa for 6 issues. Contact: R Cooper, 11 Baintree Rd, Dunmow, Essex.

Commodore Pet Users' Group publishes a monthly magazine — the official voice of Commodore. For membership details contact: Margaret Gulliford. Tel: (Slouth) 74111.

Compucolor II User Group (UK). Quarterly newsletter: Hardware and software advice: Program library and exchange; links with other CCII national groups. Contact: Bill Donkin, 19 Harwood Avenue, Bromley, Kent. Tel: 01-460 2626 (evenings).

Compukit User Club. Details, contact: P. Crabb Esq., 21 Jones Close, Yatton, Avon. Tel: (0934) 834808.

Compukit User Club. Details contact S H Grisvenor Esq., 11 Bernard Rd, Oldbury, Warley, West Midlands. Tel: 021-422 3298.

Compukit User Club. Contact: P Crabb, 21 Jones Close, Yatton, Avon.
Tel: (0934) 834808.

Computers in Genealogy — a quarterly newsletter starting September on the application of computers in family history. Sub £3.00 pa or sae for more details to Anthony J Camp, Society of Genealogists, 37 Harrington Gardens, London SW7 4JX.

Cosmac Users' Club (proposed). For people using the RCA 1802, Cosmac ELF, ELFII, Super ELF etc. Those interested contact James Cunningham at 7 Harrowden Court, Harrowden Road, Luton LU2 0SR (enclosed sae, please).

CP/M Users' Group (UK). Annual sub £6.00. S/ware library, newsletters, meetings, 'help' service. Contact: 11 Sun Street, Finsbury Square, London EC2M 2PS. Tel: 01-247 0691.

Educational Users' Group for TRS-80 & Video Genie. Offshoot of Nat TRS-80 UG, other TRS-80/Vid Genie users welcome. Contact: D J Fatcher, Head Teacher Beaconsfield First & Middle School, Beaconsfield Rd, Southall, Middx.

EZUG: Educational ZX80/1 Users' Group. Annual sub £2.50 (UK), £3.00 (rest of Europe), £6/$12 elsewhere Bi-monthly newsletter Large SAE for sample newsletter (UK & Eire only). Contact: Eric Deeson, Highgate School, Balsall Heath Rd, Highgate, Birmingham B12 9DS.

FX500-P Users' Association. for Casio FX501-P & FX502-P users to communicate with each other and to work together. SAE to Max Francis, 38 Grymsdyke, Gt. Missenden, Bucks HP16 0LP.

The Home Computing Special Interest Group of British Mensa Ltd. Six eight-page newsletters pa. Sub £2.00. Circulation restricted to Mensa members. Details from: Gordon Grant, 305 Stand Lane, Radcliffe, Manchester M26 9JA. Please send sae.

Independent PET Users' Group. Contact: IPUG, 57 Clough Hall Rd, Kidsgrove, Stoke-on-Trent. Staffs.

Ithaca Audio S-100 bus UK User Group. Contact: Dave Weaver, 16 Etive Place, Bumbernauld, Glasgow G67 4JE.
Tel: (02867) 36570.

Mk 14 Club. Bi-monthly magazine called 'Complement and Add'. Contact: Geoff Phillips, 8 Podsford Rd, London NW9 6HP.

MUSE is an organisation for co-ordinating activity in schools and colleges. Meetings are held regionally and nationally. Full details from Muse, Freepost, Bromsgrove, Worcs B61 0JT.

MZ-80K National Software Exchange/Library Assoc. All kinds of cassette software, newsletter, advice, regular catalogue updates etc available. Membership £6.00 pa. Contact: Greenlands, Heathton, Nr Claverley, Wolverhampton.

National Acorn Atom User Group. Publishes monthly program magazine. For free copy and club details send large SAE (15½p) to Alan Carr, 105 Fairhole Avenue, Gidea Park, Romford, Essex.

National Personal Computer Users Association. Cassette/SAEs supplied for continuous program exchange. ALL PERSONAL COMPUTERS. Subscriptions £12.00 (£15.00 overseas) with computer details to NPUCA 11 Spratling Street, Manston, Ramsgate, Kent.

National RML User Group, c/o RML Ltd., PO Box 75, Oxford.

National TRS-80 Users' Group. Activities include a computerised bulletin board service (see 'Network News'). Contact: Brian Pain, National TRS-80 UG, 40A High Street, Stony Stratford, Milton Keynes. Tel: (0908) 566660 (office) 564271 (home).

National T158/9 Club: bi-monthly newsletter, program exchange etc. Annual sub £5.50 or, if you include a program with your cheque then it's £3.50. Contact: R M Murphy, Dept. of Electronic Engineering, University College Swansea, S. Wales.

National ZX80 and ZX81 Users' Club. Publishes monthly magazine *Interface.* For free copy and club details send a large SAE (15½p) to 44-46 Earls Court Road, London W8 6EJ.

Ohio Scientific UK User Group. Independent of OSI, an important role will be the disentangling of poor documentation. There will be regular newsletters and membership is at present £5.00 per year. The group will initially be concerned with the practical aspects and applications of OSI systems — rather than with games. Contact: Tom Graves, 19a West End, Somerset, BA16 0LQ.

Sharp MZ-80k User Group. Contact: Joe LP Seet, 16 Elmhurst Drive, Hornchurch, Essex RM11 1PE. Tel: 04024 42905.

Sharp MZ-80K User Group (and shortly PC3201/00 and 80B) £3.00 per annum for three newsletters. Send cheque/POs tips, articles and sales to Mr R Erdine, 271 Meadow Rd, Sheffield S8 7UN.

Sharp MZ-80 Users Club. Free membership: Extensive library and facilities. Details on meetings & Newsletters (SAE please) from: Paul Chappell, Computer Centre, Yeovil College, Yeovil, Somerset. BA21 4AE.

Sharp PC-1211 Users' Club for all PC-1211/TRS-80 Pocket Computer users. Membership of £5.00 p.a. includes newsletter containing programs etc. Contact: Johnathan Dakeyne, 281 Lidgett Lane, Leeds LS17 6PD.

TI 99/4 Users' Group — TIHOME offers access to a software library and sends out a monthly newsletter. Contact: P M Dicks, 157 Bishopsford Road, Morden, Surrey.

Transducer. The club for those interested in robotics, micro's and micro hardware. Send 25p to D Stockqueler 66 Waterloo Rd, Penylan, Cardiff for sample newsletter and details.

TRS-80 National User Group, 40a High Street, Stony Stratford, Milton Keynes. Tel: 0908-566660 (day) or 564271. Secretary: Brian Palin. Monthly Newsletter, free software library, special interest groups, workshops arranged for 1982. All Tandy systems and compatible micros welcome.

TRS-80 Educational User Group for TRS-80 I,II,III. Color and Video Genie users. Contact: Dave Futcher, Beaconsfield School, Beaconsfield Rd, Southall, Middx. Extensive educational software library and facilities of National TRS-80 User Group available to members.

Tangerine Users' Group (TUG), 16 Iddesleigh Rd, Charminstre, Bournemouth, Dorset BH3 7JR. Tel: (0202) 294393.

TRS-80 Level 1 User Group. Software library and quality newsletter (write for details and free copy). £5.00 p.a. N Rushton (LIUG), 123 Roughwood Drive, Northwood, Kirkby, Merseyside L33 9UG.

TRS-80 Medical & Laboratory Users Newsletter. Free quarterly newsletter detailing interests, programs & applications. Send SAE & details of interests to: Dr N Robinson, The Residency, Northwick Park Hospital, Harrow, Middx.

UK Apple Users' Group. Contact: (Keen Computers) 5 The Poultry, Nottingham.
Tel: 0602 583254/5/6.

UK Comal User Group, under the aegis of the North London Hobby Computer Club. Meetings 1st & 3rd Wednesdays monthly at 7pm. Venue: Community Computer Centre, Polytechnic of North London. Comal available on several machines, incl. PET and CP/M. Newsletter to be published. Contact: Sandy Anderson c/o NCHCC, Polytechnic of North London, Holloway Rd, London N7 8DB.

UK101/Superboard User Group (Computer User Aids). Newsletter, software library and technical service. Membership £4.60 inc VAT

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per 6 months — £5.00 overseas. Apply to Adrian Waters, 9 Moss Lane, Romford, Essex Tel: (Romford) 64954.

UK Intel MDS Users' Group. Contact: Lewis Hard, Space Intelligence, The Old Coach House, Court Row, Upton-Upon-Severn, Worcestershire WR8 0NS.

UK Pilot Users' Group — SAE for fact sheet on Pilot versions available Common Pilot Reference Manual £5.00. Contact: Alec Wood, Wirral Grammar School for boys, Cross Lane, Bebington, Wirral, Merseyside L63 8AQ.

USUS (UK) — British arm of the UCSD p-system Users Society. An international organisation created to promote the UCSD p-system (which includes Apple Pascal) and other machine independant software systems. Contact: Malcolm Harper, PRG, 45 Banbury Road, Oxford OX2.

ZX80/81 National Software Association. Annual sub £6.00, incs cassette of software. Bi-monthly newsletter, software available on cassette. Send SAE for details. Contact: 15 Woodlands Rd, Wombourne, Staffs WV5 OJZ.

REGIONAL

ACC (Merseyside 380Z Users Group). Contact: Alan Pope, Paal Enterprise, 37 Stuart Road, Crosby, Liverpool L23 0QE.

Anglia Computer User Group. Contact: Jan Rejzl, 128 Templemere, Sprowston Road, Norwich NR3 4EQ.

Birmingham/West Midlands area TRS-80 User Group. Sub group of National TRS-80 User Group. Meetings Monthly, newsletter available to non-members. Contact: Michael Gibbons, 1, New Street, Castle Bromwich, Birmingham 36, Warks.
Tel: 021-747 2260.

Central Scotland Computer Club. Meets the first and third Thursdays each month in Falkirk College of Technology, Grangemouth Road, Falkirk. Secretary, J Lyon, 78 Slamannan Road, Falkirk, FK1 5NF.
Tel: 22430.

Computer Education Society of Ireland. A voluntary organisation that consists of a national body and an expanding number of local branches. Their brief is to monitor computer education in Ireland. *National CESI* (£3.00 p.a.). Contact: Dairmuid McCarthy, 7 St Kevin's Park.

East Anglian Computer Users' Group. Meets: Crane Community Centre, Telegraph Lane East, Norwich. Contact: Gill Rijzl, 88 St Benedict's Street, Norwich NR2 4AB.
Tel: (0603) 29652.

Grampian Amateur Computer Society. Meets 2nd Monday every month. New pemises are in Thistle Lane, Aberdeen. Contact: Alan Hird, 20 Harcourt Road, Aberdeen.
Tel: (90224) 33102.

Humberside Sharp User Group and Microcomputer Society. Regular meetings, new members welcome — whether or not they own a computer. Courses arranged, membership £5.00 pa. Contact: N J Bennington, 39 Humberville Road, Immingham, South Humberside DN40 1AX.

IPUG South East. Meet 7.30 3rd and 4th Thursday. Charles Darwin School, Jail Lane, Biggin Hill. Bi-monthly newsletter. Contact: M Ryan, 164 Chesterfield Drive, Sevenoaks.
Tel: (0732) 53530.

Kimalcud, Blackrock, Co. Dublin. *Cork branch* (£1.00 extra) — Michael Moynihan, Colaiste an Spioraid Naomh, Bishopstown, Cork. *Dublin branch* (£1.50 extra) — Jim Walsh, CBS Naas, Co Kildare. *Limmerick branch* (£1.00 extra) — Sr Lourda Keane, Conent FCJ, Laurel Hill, Limerick. *Waterford branch* (£1.00 extra) — Mr Hugh Dobbs, Newtown School, Waterford. *Kilkenny branch* (£1.00 extra) — Sr Helen Lenehan, Presentation Secondary School, Kilkenny.

MACC (Midlands Amateur Computer Club) meets every Friday evening 7.00 p.m. onwards — no sub, no magazine. Contact: John or Roy Diamond. Tel: Coventry (0203) 454061.

Manchester Computer Club (formerly the Amateur Computer Club (Northwest Group). Meets 1st and 3rd Thursdays monthly at St Peter's Chaplaincy, Precinct Centre, Oxford Road, Manchester. Contact: David Wade, 28 Hazel Road, Altrincham, Cheshire WA14 1JL.
Tel: 061-941 2486.

Merseyside Nascom Users' Group. Now independent, with 150 members. Meets 1st Monday monthly, 7.30 p.m. at Mona Hotel, James Street, Liverpool. Contact: T Searle, 14 Hawkeshead Close, Maghull, Liverpool L31 9BT.

Merseyside TRS-80/Video Genie Users' Group. Contact: Peter Tootill, 101 Swanside Road, Liverpool L14 7NL.
Tel: 051-220 9733.

Mersyside Microcomputer Group. Special interest groups: PET, Apple, 380Z, SC/MP, education (Mr M Trotter, 051-652 1596) Contact: Fred Shaw, 14 Albany Ave, Eccleston Park, Prescot.
Tel: 051-426 5536.

Northeast PETs. Contact: Jim Cocallis, 20 Worcester Road, Newton Hall Estate, Durham. They meet the 2nd Monday of each month for software tuition and the 3rd Monday for hardware tuition (both in addition to normal activities). They start at 7.00 p.m. and meet in the PET Lab, Newcastle Polytechnic, Ellison Building, Newcastle upon Tyne.

North-East RML 380Z Users' Group. Meets monthly at Micro-Electronics Education Centre, The Polytechnic, Newcastle upon Tyne. Contact: M Hatfield or R Reed, Computer Unit, Northumberland Building, The Polytechnic, Newcastle-upon-Tyne NE1 8ST. Tel: 26002 ext. 268 office hours.

North East TRS-80 User Group. Meetings 3rd Wednesday monthly room 2, School of Physics, Newcastle-upon-Tyne University. Contact: S Tetlow, 3 Highbury Close, Springwell, Gateshead, Tyne & Wear.

Northwest Computer Club. Fortnightly meetings 25p attendance fee. No subscriptions. Contact: John Lightfoot, 135 Ashton Drive, Frodsham, Warrington, Cheshire WA6 7PU.
Tel: (0928) 31519.

Pennine & District Computer Club. Open at both 26 and 51 Mill Hey, Haworth, W. Yorks. each Saturday and Sunday 10 a.m. to 10 p.m. Systems books, magazines, members' shop. Contact: club at weekends on Haworth 43007 or chairman, Douglas Bryant, on Bradford 569660.

A PET group is being formed on the Sussex/Surrey border, presently centred on Crawley & Horsham. Aims to meet monthly and produce a monthly newsletter. Contact: Richard Dyer, 33 Parham Road, Ilfield, Crawley RH11 0ET.

Scottish Amateur Computer Society. Meetings 1st Wednesdays monthly, Claremont Hotel, Claremont Crescent, Edinburgh from 7.30 onwards. Meetings include talks and demonstrations. Contact: P Lindsay, (Top Right Flat), 1, Lower Gilmore Place, Edinburgh. Tel: 031-229 6841.

Scottish TRS-80 Users' Group. Meetings on 2nd Thursdays monthly at 7.30 p.m., normally in the Mansion House Hotel, West Milton Road. Software library and monthly newsletter. Contact: Dick Mackie on 031-229 6032 or at 3 Warrender Park Crescent, Edinburgh EH9 1DX.

Southern Users of PETs Association, free membership, meet first Wednesday each month. £1.50 for monthly newsletter. Contact 42 Compton Road, Brighton BN1 5AN.

Surrey Microprocessor Society. (SUMPS) Coventry Surrey plus bits of South London and other adjacent countries. Anyone interested in joining, call Mike on 01-642 8362.

Thames Valley Computer Club. Meets 1st Tuesday monthly at the Griffin, Caversham, Reading (just NW of Caversham bridge). Start 7.30. Contact: Roger Bird, Newbury 43855 or Phil Warn Reading 594874.

Thames Valley Nascom User Group. Newsletter to be published for novice and expert alike. Regular meetings in Slough/Staines/Windsor planned and we need support! Interested? Contact: Mike Rothery, 37 Eton Wick Road, Windsor, Berks, and enclose SAE. Tel: Windsor 56106.

TRS-80 — North West Group, (for 6 issues). Meetings last Wednesday monthly (not December). Contact: Melvyn D Franklin, 40 Cowlees, Westhoughton, Bolton BL5 3EG.
Tel: (0942) 812843.

West Sussex — Rustington, Littlehampton. Is anyone interested in starting a computer club in this area? Contact: Chris Evans, 115 Worthing Road, Rustington, W Sussex.
Tel: Rustington 74998.

West Yorkshire Microcomputer Group. Holds monthly meetings in Leeds. Contact: Philip Clark, Care Computer Services, Suite 204, Crown House, Armley Road, Leeds LS12 2EJ.
Tel: (0532) 450667.

Wirral Microcomputer Users' Group. Meets at Mons at Birkenhead Technical College. Contact: J Phillips, 14 Helton Close, Nocturum, Birkenhead, Merseyside L43 9HP.
Tel: 051-652 0268.

Worcester & District Computer Club. New address for organiser (DJ Stanton): 73 St. George's Lane North, Barbourne, Worcester WR1 1QX. Tel: Worcester 22704.

380Z User Group Northern Home Counties: inc Herts, Cambs, Oxon. Contact: Sheridan Williams, 35 St Julian's Road, St Albans, Herts AL1 2AZ.

6502 User's Club (Southern Region). Welcomes all 6502 Users — Acorn, Aim, Apple, Atari, Atom, Kim, Microtan, PET, SYM, Superboard, UK101, etc. Regular Newsletter. Contact: Steve Cole, 70 Sydney Road, Gosport, Hants.

COUNTY

Would anyone interested in setting up an Apple Users' Group in the Bucks/Berks area contact: Steve Proffitt. Tel:01-759 5511 ext 7298 day, or Marlow 73074 evenings or weekends.

Cornish Radio Amateur Club — Computer section meets on the second Monday of every month at the SWEB Social clubroom, Pool, Redruth. New members welcome. Contact: Bob Reason, 24 Mitchell Road, Camborne, Cornwall TR14 7JH.

South East Essex Computer Society, holds monthly informal computer evenings plus lectures. Open to anyone over 14. Contact: R Knight at Southend-on-Sea. Tel: 218456.

Gwent Amateur Computer Club. Covering the Gwent and Cardiff areas, the club has its own computer room and technical library. Meetings are held once a week on Wednesdays at 10 Park Place, Newport. Contact: Ian Hazell. Tel: (0633) 277711 office hours.

N Herts area CBM/PET/VIC Users' Group. Regular meetings, talks, affiliated to IPUG. Contact: P Mortiboy, 2 Spurr's Close, Hitchin, Herts SG4 9OE. Tel: Hitchin (0462) 54435.

West Herts 80 User Group. Membership not restricted to Herts residents — many members are also in National TRS-80 User Group. Meetings fortnightly at St Stephens Parish Centre, Station Road, Bricket Wood, North of Watford. Contact: Terry Bradbury, 20 Spruce Way, St Albans. Tel: Park Street 73633. Or Reg Smith, 24 Sempill Road, Hemel Hempstead. Tel: Hemel Hempstead 60085.

Mid-Cheshire Computer Club: Meetings 2nd Friday monthly in the main Winsford library (town centre precinct). Contact: David Clare, Providence House, 222 Townsfield Road, Winsford, Cheshire.
Tel: Winsford 51374.

Mid Kent TRS-80 User Group. Users and potential users of TRS-80 and Video Genie welcome. Meetings fortnightly at Kent Micro Services, 53 High Street, Maidstone, Kent. Contact: Mike Mariott also John Rayfield, 22 Beaconsfield Road, Sittingbourne, Kent.

North Herts Computer Club. Meetings 1st and 3rd Fridays monthly at: The Settlement, Nevells Road, Letchworth. Contact: R Crutchfield, 2 Durham Road, Stevenage, Herts.

North Kent Amateur Computer Club. Meetings first Thursday of each month, usually in Biggin Hill. New members and visitors always welcome. Contact: Barry Biddles (sec). Tel: Biggin Hill 71742.

North Lancs User Group. Contact: John Robinson, 12 Harold Avenue, Blackpool, Lancashire.

North Wilts Computer Club. Meetings at Holt Village Hall 2nd & 4th Wednesdays monthly. Entrance fee 50p to non-members. Speakers welcome. Contact: Matthew Jones, Pinhills, Bowood, Calne, Wilts SN11 0LY or Gary Hawkins, 198 The Common, Holt, Trowbridge.

Norwich & District BBC Micro User Group: Membership £2.00 pa (£1 for OAPs & Students). Regular meetings and workshops with various speakers. Contact: Paul Beverley, Room B12a, Norwich City College.
Tel: 0603-60011 ext. 233.

PET Users' in West Lancashire. Meetings on the third Thursday of each month at Arnold School, Blackpool. Contact: David W Jowett, 197 Victoria Road East, Thornton, Blackpool FY5 3ST. Tel: Cleveleys 869108.

The Leicestershire Personal Computer Club. Meetings held the 2nd Monday in each month, at Leicester University and Loughborough University alternately. They start 7 p.m. Membership is £2.00 p.a. £1.00 for under 16s. Contact: Ms Jill Olorenshaw (Club Secretary) c/o Arden Data Processing, Municipal Buildings, Charles Street, Leicester. Tel: (0533) 22255. Or Mr Dick Foden (Club Chairman) at 11 Gaddesby Lane, Rearsby, Leicester.

Lincolnshire Microprocessor Society. Various meeting places. For up-to-date information contact: Hon. Sec. Mr Eric Booth, Senior Common Room, Bishop Grosseteste College, Newport, Lincoln.

LPRINT is the newsletter of the East Midlands TRS-80/VG User Group. For a FREE sample copy send large SAE to: Mike Costello, 17 Langbank Avenue, Rise Park, Nottingham NG5 5BH.

MACRO (Medway Amateur Computer & Robotics Organisation). Meets monthly, sub £3.00. Contact: Ms Christine Webster, 13 Ladywood Road, Cuxton, Rochester, Kent.
Tel: (0634) 78517.

ACC (Merseyside 380Z and BBC Atom Users Group). Contact: Alan Pope, Paal Enterprise, 37 Stuart Road, Crosby, Liverpool L23 0QE.

Manchester area TRS-80 Users' Group. Contact: Francis Glenister, 13 Pridmouth Road, Withington, Manchester M20 9GN.
Tel: 061-445 7191.

West Midlands Amateur CC. meet 2nd and 4th Tuesdays each month at Elmfield School, Love Lane, Stourbridge. Further details contact: John Tracey, 100 Booth Close, Brierley Hill, West Mid. Tel: (0384) 70097.

West Midlands RML User Group, c/o BECC, The Bordesley Centre, Camp Hill, Stratford Road, Birmingham B11 1AR.

NE RML 380Z Users' Group. Meets monthly at MEC, Newcastle-upon-Tyne Polytechnic, Coach Lane Campus. Contact: M Hatfield or R Reed. Tel: 26002 ext 268 (office hours).

Oxford Microcomputer Club. £5.00 p.a. Contact: S C Bird, 139 The Moors, Kidlington, Oxford OX5 2AF.
Tel: Kidlington (08675) 6703.

South Shropshire: Ludlow & Dist Microcomputer Club. Meets 7.30 p.m. 2nd Monday monthly at Diocesan Education Centre, Lower Galdeford, Ludlow. Contact: David Pauli, 32 High Street, Leintwardine, Craven Arms, Shropshire.
Tel: 05473 287.

Amateur Computer Club of North Staffordshire. Call or write to Mr M Turner (chairman) ACCNS, 542 Lightwood Road, Lightwood, Stoke-on-Trent ST3 7EH.
Tel: (0782) 324639 evenings.

Suffolk Microcomputer Club. Meets monthly, produces newsletter, sub £5.00 p.a. Contact: Mr S Pratt, c/o Microtek, 15 Lower Brook Street, Ipswich, Suffolk IP4 1AQ.
Tel: (0473) 50152.

Anyone interested in forming a Suffolk Computer Users' Club should contact Ian on Ipswich 831353 evenings/weekends.

South Yorkshire Personal Computing Group. Meets 7.30 p.m., second Wednesday each month. St George's Building, Mappin Street, Sheffield. Visitors always welcome. Contact: Paul Sanderson, 8 Vernon Road, Totley Sheffield. Tel: (0742) 351895.

West Surrey Computer Club. Monthly meetings — members range from professional to hobbyist. Contact: Howard Webb, 101 Park Barn Drive, Park Barn, Guildford, Surrey. GU2 6ER.

TOWNS

Arun Microcomputer Club. Caters for a wide range of micros. Meetings usually fortnightly — Sundays and Mondays. Contact: Mr P Cherriman, Littlehampton 7607.

Aylesbury ZX Computer Club. Regular meetings at Aylesbury College 1st Tuesday monthly 7.30 p.m. – 9.30 p.m. Contact: D P Nowotnik (secretary). Tel: Aylesbury 630867.

Ashfield Computer Club. Meets 1st and 3rd Thursdays each month at Carsic Junior School, membership £3.00 p.a. Contact: Deric Ellerby. Tel: (0380) 75376. Or Derrick Daines.
Tel: (0380) 56198.

BAUD (Bristol Apple Users and Dabblers). Contact: Geoff Smythe, Datalink Microcomputer Systems Ltd., 10 Waring House, Redcliffe Hill, Bristol BS1 6TB.
Tel: (0272) 213427.

Bedford Amateur Computer Club. Recently started, no further details as yet. Contact: Mr R Bird, 7a High Street, Great Barford, Bedford MK44 3LB.
Tel: (0234) 870763.

Bournemouth Area Computer Club. Meets monthly at the Kinson Community Centre. Contact: Peter Hills, 54 Runnymede Avenue, Bournemouth, Dorset BH11 9SE.
Tel: Northbourne 6547.

Bristol Computing Club. £4.00 p.a. Meetings 3rd Wednesday monthly. Contact: Leo Wallis, 6 Kilbirnie Road, Bristol BS14 0HY.
Tel: Bristol 832453.

Brunel Computer Club. Meets alternate Wednesdays, 1900 – 2200 hours at St Werburgh's Community Centre. Contact: Mr R Sampson, 4 The Coots, Stockwood.

Brunel Technical College Computing Club. The Club divides into two sections — the "skilled" and the "not skilled". They share alternate Wednesdays at the College. Contact: S W Rabona at 18 Castle Road, Worle, Weston-Super-Mare, Avon BS22 9JW.
Tel: (0934) 513068.

USER GROUPS INDEX

Birmingham Computer Club. To be formed shortly, catering for all micro users. Fortnightly meetings planned but venue not yet fixed. Contact: Dr M Bayliss. Tel: 021-743 7197.

Brighton, Hove & District Computer Club. First meeting held on Friday 31st October. We are interested in corresponding with other societies, exchanging software and attracting new members. Many existing members have access to hardware. Contact: Rod Phillippe at Hobbyist, 3 The Broadway, Southwick, Brighton BN4 4ND.

Cambridge Microcomputer Club. Meets 3rd Wednesday monthly at Portland Arms, Cambridge. Contact: Duncan Mackay, 4 High Street, Waterbeach. Tel: 63137 (day).

Cheltenham Amateur Computer Club. Meetings 4th Wednesday monthly. 7.30 p.m. start. Contact: Mr M Pullin, 45 Merestone Drive, The Park, Cheltenham GL50 2SU. Tel: (Cheltenham) 25617.

RAF Coltishall Computer Club meets at the Motor Club Social Centre, Coltishall, Nr Norwich, Norfolk on 1st & 3rd Thursdays monthly at 7.30. Contact: Chf. Tech. D McCandless, Sgts Mess, RAF Coltishall, Nr Norwich, Norfolk.

Anyone interested in forming a computer club in Cornwall, catering mainly for PET, ZX80 and UK 101 computers should contact: M F Grove, 35 Causeway Head, Penzance, Cornwall.

A Crawley computer club has recently been formed, open to anyone interested in personal computing, with or without computing facilities. Contact: Mr J Fieldhouse, 18 Seaford Road, Broadfield, Crawley, West Sussex. Tel: Crawley 542509. Or, Mr J M Clarke, 31 Hyde Heath Court, Pound Hill, Crawley, West Sussex. Tel: Crawley 884207.

Crewe Computer Users' Group. Meetings monthly (Thursdays) at Crewe Library. Details of meetings in local press. Contact: Bram Knight. Tel: Nantwich 623375.

Croydon micro/small computer group. Contact: Vernon Gifford, 111 Selhurst Road, London SE25 6LH.

The Colchester Microprocessor Group. Meetings held at the University of Essex on the second and fourth Wednesdays of each month — 7.30 p.m. start. Membership is open to all, on payment of £5.00 annual sub (£1.00 for full-time students). Contact: The Information Centre at the University on the evening of the meeting.

TRS80 User Group (Chelmsford). Now part of the National TRS80 User Club. Contact: Michael Dean, 22 Roughtons, Galleywood, Chelmsford, Essex.

Computer Club. Business & Word Processor section meets Fridays 7.30 p.m.; Scientific & Recreational Saturdays 10.00 a.m. Contact: L Boxell, 8 Vane Terrace, Darlington. Tel: (0325) 67766.

Dalton-In-Furness Computer Club. Recently formed. Contact: A H Gay, 24 Rusland Crescent, Ulverston, Cumbria LA12 9LX. Tel: (0229) 52854.

Derby & District Branch of IPUG meets monthly in Derby. For details contact: Raymond Davies, 105 Normanton Road, Derby DE1 2GG. Tel: 41025 (day) 514016 (evening).

Derby Microcomputer Society. Meets fortnightly at Derby Lonsdale College, Uttoxeter Road, Derby. Contact: Mike Riordan, 172 Blagreaves Lane, Littleover, Derby. Tel: (0332) 769440.

Edinburgh ZX User Group. Meetings 2nd Wednesday monthly, Claremont Hotel, Claremont Crescent, Edinburgh, from 7.30 pm. Also Saturday workshops & outings arranged. Newsletter, software library. Membership £3.00 for children, students, OAP and unemployed. £5.00 otherwise. Contact: Keith Mitchell, 19 Meadowplace Road, Edinburgh EH12 7UJ (031-334 8483) or John Palmer 031-661 3183.

Exeter & District Amateur Computer Club. General meetings 2nd Tuesday monthly, specialist meetings 3rd or 4th Tuesday. £7.50 adults p.a. Contact: Ian Hodgson, 21 Dean Street, Exeter EX2 4HH. Tel: Exeter 50812.

Folkestone needs a computer club. I am willing to start one but I need some help. Please write or call any evening. Contact: Ray Milton, 94 Linden Crescent, Folkestone, Kent.

Grimsby Computer Club. Meets fortnightly on Mondays at 7.30 p.m. Contact: Jenson Lee, 29 Park View, Cleethorpes. Tel: 32559.

Glasgow area ZX80/81 User Group, presently being formed. Main aim is to promote computer literacy. Will eventually include BBC Micro. Contact: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW. Tel: 041-638 1241.

Glossop (Derbyshire) — is anyone interested in forming a computer club in this area? If so, please contact: Neil Jenkinson. Tel: (Glossop) 66027.

Harpenden Microcomputer Group. Informal meetings are held on alternative Monday evenings. Contact: David James, 5 Ox Lane, Harpenden, Herts AL5 4HH. Tel: (05827) 5366 (evenings).

Harrow Computer Group meets on alternative Wednesdays at 7 p.m. in room G43 of Harrow College of Higher Education. Summer meetings in the 'Plough', Kenton. Contact: B Butcher. Tel: 01-950 7068.

Hartlepool, Cleveland. Is anyone interested in starting a TRS-80 Users' Group in this area? If so, please contact: Ian Nicholson, 3 Thirsk Grove, Hartlepool, Cleveland TS25 1LT.

IOW TRS-80 Users' Club. Meets last Friday in every month at 7.30 p.m. at the London Hotel, Ryde. Contact: Mr M Collins, 11 Star Street, Ryde, Isle of Wight. Tel: (Ryde) 614589.

Leeds Microcomputer Users Group. Meets fortnightly on Thursday evenings in Leeds, new members welcome. Contact: Paul O'Higgins, 20 Brudenell Mt, Leeds 6. Tel: (0532) 742347 (after 6).

Leicester Apple User Group for Help & Support (Laughs) — affiliated to BASUG. Meetings now at the Winstanley Arms, The Glade, Narborough Road, Leicester. Contact: Hazel Brown, 7 Bude Drive, Glenfield, Leicester LE3 8BA (0533 875 253).

The SOBAT Computer Club (Leyton). Membership free for 1st two months and thereafter £1.50 pa. inc. Newsletter, software exchange. Contact: Mr T Kayani, 12 Calderon Road, London E11 4EU. Tel: 01-556 5423.

East London Amateur Computer Club. Meets 7 – 10 p.m. on 2nd & 4th Tuesdays monthly at Harrow Green Library, Leytonstone, London E11. Contact: Fred Linger. Tel: 01-554 3288.

East London Computer Club. Meets every Friday at 7.30 p.m. in term at North East London Polytechnic, Romford Road Precinct, Stratford E15. Contact: John Grieve. Tel: 01-553 4761.

North London Hobby Computer Club. Workshops four evenings a week during term time. General meetings open to all last Wednesday of each month. Contact: Secretary DELE, Polytechnic of North London, Holloway Road, London N7 8DB. Communications Group — interfacing personal computers with Prestel/teletext and Networks like PC Net and The Source. Every Thursday 6.30 – 9 p.m. Room 2/5, Tower Block, Holloway Road. ZX81 User Group every Monday during term-time 6 – 9 p.m. Room 3/4, Tower Block, Holloway Road.

North London VIC-20 Users' Group to be formed. People interested please contact: Jim Chambers. Tel: 01-387 7050 (day).

North London BBC Micro Users Group. Provides aid for beginners and tuition for enthusiasts. Newsletter coming soon. Contact: Jeremy San, 73 Uphill Road, Mill Hill, London NW7 4PT. Tel: 01-959 0114.

SELMIC (South East London Microcomputer Club). Meets fortnightly at Thames Polytechnic, Woolwich. Contact: Peter Phillipps, 61 Craigerne Road, London SE3. Tel: 01-853 5829.

London-based Atom/Proton User Group. Regular newsletter including software and hardware tips, listings, reviews. Problems answered when possible. Meetings arranged. Membership £3.50 p.a. Details from M Jaffer, 71, Mill Farm Close, Pinner, Middx. Tel: 01-429 8042 or C Holt 01-427 6088.

Local IPUG Group meet other PET users and make friends. Contact: G Squibb initially. 108 Teddington Park Road, Teddington, Middx.

Manchester Atom Users' Group. Meets last Tuesday monthly during school terms at Abraham Moss Centre, Crescent Road, Manchester 8. Contact: John Ashurst. Tel: 061-370 5121 ext 27 (day), 061-681 4962 (evenings).

Manchester Computer Club. Meetings 1st and 3rd Thursday monthly in the Computer Science Building, Manchester University, Oxford Road. Contact: D Wade, 28 Hazel Road, Altrincham, Cheshire WA14 1JL. Tel: 061-941 2486.

North Manchester. Anyone interested in a ZX81 Users' Group? Contact: Jon Harvey, 93 Glebelands Road, Prestwich, Manchester M25 5WF.

MKMUG-Milton Keynes Microcomputer Users' Group. Weekly meetings Tuesdays 7.30 – 10.00 p.m. Lectures, etc, frequently arranged. For further information contact: Brian Pain, 40a High Street, Stony Stratford, Milton Keynes. Tel: (0908) 566660 (w) or 564271 (h).

Medway Atom Users' Group. Meets last Tuesday monthly during school terms at St John Fisher School, Ordnance Street, Chatham. Contact: Clem Rutter. Tel: (0634) 42811 (day).

Newcastle-upon-Tyne Personal Computer Society. Meets first Tuesday each month in Room D103, Newcastle Polytechnic. Over 60 members sub £5.00. Several sub-groups inc. PET, TRS-80 and S100 (last one meets weekly). Contact: Pete Scargill, Secretary. Tel: (0632) 573905.

Nottingham Microcomputer Club. Lectures arranged by visiting speakers. Meetings 1st Tuesday monthly at the Friends Meeting House, Clarendon Street, Nottingham. Subs £5.00 p.a., reduced for students and OAPs. Non-members pay 50p entrance fee to meetings. Contact: Geoffrey Jago. Tel: Nottingham (0602) 621453.

Orpington ZX80 & 81 Computer Club. Meeting each Friday. Contact: R A Pyatt, 23 Arundel Drive, Orpington, Kent BR6 9JF. Tel: 66 20281.

Microsoc the Oxford University micro group holds shared meetings with the Oxford Microcomputer Club. Contact: M Bourla, St. John's College, Oxford.

Oxford University Microcomputer Society. Meets weekly in Clarendon laboratory, Oxford, visiting speakers, micros available for programming. Contact: Richard Ash, Christchurch, Oxford.

Southampton Amateur Computer Club meets at 7.30 2nd Wednesdays monthly at the Medical Sciences Building, Bassett Crescent East, Southampton. Membership £5.00 pa. (£3.50 students & OAPs) inc. newsletter. Newly formed junior section (with own regular meetings). Contact: Paul Blitz, Gardenways, Chilworth Tower, Chilworth, Southampton. Tel: 0703 766161.

South Oxford Computer Club. Covers Wantage, Abingdon, Didcot, Wallingford and Newbury. Meets 1st Tuesday monthly at The Star, East Ilsley. Contacts: Mike — Tel: (0235) 834402; Malcolm — Tel: (0235) 816949; Paul — Tel: (0235) 815305; Rocky — Tel: (0635) 34456.

Peterborough Computer Club. Recently formed, meets on first and third Mondays each month at Adult Education Centre, Brook Street, Peterborough. Contact: T Marchant. Tel: (Peterborough) 76681 after 8 weekdays, anytime weekends.

Plymouth and District Amateur Computing Club. Subscription £5.00 p.a. Meetings last Wednesday monthly. Contact: Mr S A Bell, Secretary, Plymouth and District Amateur Computing Club, 31 Victoria Place, Stoke, Plymouth, Devon.

Would anyone interested in forming a computer club in the Portsmouth area please contact: Dave Cocker. Tel: (Portsmouth) 751156.

Richmond Computer Club. Meets 8.00 p.m. 2nd Monday monthly, Richmond Community Centre. Contact: Bob Forster. Tel: 01-892 1873 (evenings).

TRS-80 Independent User Group. Recently formed in Birmingham. Contact: Mike Bayliss, Tel: 021-743 7197.

Salisbury. Is anyone interested in forming a microprocessor and computer society in this area? SAE to David Bone, Flat 2, 24 St. Mark's Road, Salisbury, Wilts.

Shipley College Computer Group (Sorcerer/6800). They meet Tuesdays (software) and Wednesdays (hardware/advanced) between 7.00 & 9.00 p.m. Contact: Paul Channell. Tel: (Shipley) 595731.

Sunbury Amateur Computer Club. Meets 1st Friday monthly whenever possible, 20p per meeting. Contact: S Taylor, 8 Priory Close, Sunbury-on-Thames TW16 5AB. Tel: (Sunbury) 86649.

Scunthorpe & District Microprocessor Society. Contact: G Hinch, 21 Old Crosby, Scunthorpe, S Humberside DN15 8PU.

Southgate Computer Club. The club recently held its AGM and adopted a formal constitution. Annual subscription will be £2.50 from January 1981, including a club newsletter; full-time students under 18 pay half-cost. The club now has 83 members. Contact: Panos Koumi, Southgate Computer Club, 33 Chandos Avenue, London N14.

Southampton Amateur Computer Club. Meets 8 p.m. 2nd Wednesday each month (not July – September) at Medical Science Building, Bassett Cres. East, Southampton. £3.00 p.a., OAPs & students £2.00. Newsletter and special int. groups; 2 years old, 80 members soon setting up another club in Portsmouth area. Contact: P G Dorey, Dept. Physiology, The University, Southampton SO9 3TU, or Andy Low. Tel: (0703) 555 605 ext 34.

Springfield Computer Club. Special interest in Sorcerer but beginners and others welcome. Meetings 1st Friday monthly. Contact: Stephen Cousins, 1 Aldeburgh Way, Springfield, Chelmsford, Essex CM1 5PB. Tel: (0245) 50155.

Taunton Computer Club. Meets weekly at Somerset College of Art & Technology (Tuesdays 18.00 p.m., term time). Other occasional general meetings outside, eg, visits, demonstrations. Beginners welcome. Contact: Mrs D Walker, Glenleigh, Whiteball, Sampford Arundel, Wellington, Somerset.

Anybody interested in forming a microcomputer users' club in the Towcester (S. Northants) area, please contact: R J Wellsted, 20 Hampton Court Close, Abbey Chase, Towcester. Tel: (Towcester) 51354 (eve (evenings).

TRS-80 User Club (Chelmsford). Now part of the National TRS-80 User Club. Contact: Michael Dean, 22 Roughtons, Galleywood, Chelmsford, Essex.

Would anyone interested in joining an informal Computer Club in the Tonbridge or Tunbridge Wells area please contact: Chris Wallwork. Tel: (Tunbridge Wells) 37682; or, Ray Szatkowski. Tel: (Tonbridge) 355960.

Worle Computer Club. Meets alternate Mondays 19.00 – 22.30 p.m. at Woodsprings Inn Function Rooms. Contact: S Rabone, 18 Castle Road, Worle, Weston-Super-Mare, Avon. Tel: (0934) 513068.

Worcester & District Computer Club. Meets 2nd Monday monthly at 8 p.m., Old Pheasant Inn, New Street, Worcester. Contact: D Stanton, 55 Vauxhall Street, Rainbow Hill, Worcester WR3 8PA.

West London Personal Computer Club. Meets first Tuesday each month at Willesden Technical College. Also visits, special int. groups, demos, problems surgeries. Contact: Graham Brain, 81 Rydal Cres., Perivale Middx. Tel: 01-997 8986.

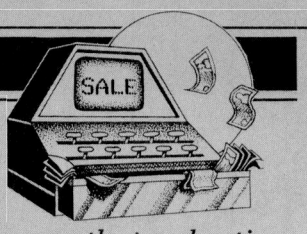
York Computer Club. Meetings 8 p.m. Mondays at Holgate WMC New Lane, Acomb, York. Contact: K Thomas. Tel: (York) 38239.

Anyone interested in forming a micro group in the Doncaster area, contact: Mr P Flinders. Tel: (Doncaster) 78954 or (Doncaster) 868 379, (6 – 9 p.m.).



'I'm sorry Gerald, I can't see you anymore, the computer at work thinks you're pathetic.'

TRANSACTION FILE



Things have been getting very crowded recently in this part of the magazine, so this month we've put our heads together and come up with a new format for the 'Transaction File' which means we can now cram many more ads onto a page. The queue which was once longer than those for season tickets on a Monday morning is now up-to-date. We apologise profusely to all those readers who've been waiting for months to advertise their micros. As always, ads are accepted on the form (or a photo-copy) printed below. We cannot guarantee to place an ad in a particular issue or to repeat one unless a separate form is supplied. Please mark envelopes very clearly: 'Transaction File' (PCW), 14, Rathbone Place, London W1P 1DE. Thank you for your co-operation and we hope things will run smoothly in future.

✱ Video Genie 16k (Level II BASIC). Extra keys + VU Meter. Various M/C progs. inc Arcade Scramble, Missile Command, Flight Simulator. Excellent condition £350 o.n.o. Tel. Chi. 783278 6 p.m.+/or weekends.

✱ Creed 7B Teleprinter (excellent condition) with Acorn atom interface and software driver. Hardly used. Buyer collects, price just £35. D. Booth, collects Greenfield Street, Nottingham.

✱ Hewlett-Packard — HP41CV (incorporating Quadram) together with card reader & printer. All complete — as new condition — bargain £500 — phone 01-727 9657.

✱ HP41C with 3 memory modules & card reader perfect condition. £200 Gilbert, Stourton Cottage, Trench, Ellesmere, Salop, (061 3322 evenings.

✱ Commodore Vic — 20 with C2N cassette & 8k expansion pack 3 months old. Manual. Cost £275 will accept £235 ono. Tel. 01-890 1262 anytime.

✱ Apple bargains! Original packages with makers manuals. Used for demo only. Alf 9 voice music-card £55 write-on word processor £25 filemaster II (database) £25 Apshai £12 Stellar Trek £7 Portsmouth 820663

✱ Superboard II. 300/600 Baud, 2MHz, cased, psu, modulator, 48x32, Cegmon, 16k Ram. Software inc Assembler, Extended Monitor, M/code Othello. Three Adventures 16k Star Trek. Very good condition. £240. Tel Tottingham 5338.

✱ Microtan 65 (plus graphics), HE X keypad, leads, psu, system file and 82 key ASC II coded keyboard. £75 ono. Phone Nick Fox 01-656 2633 eve/w/ends.

✱ Texas TI 5a magnetic card programmable calculator, up to 960 program steps, complete with master module, magnetic recording cards, 3 manuals, coding sheets, case, charger, boxed as new £70. Phone 07744 34660.

✱ Sorcerer 32k, Basic Rompac, all manuals, vhf modulator, all copies ESC, £350, no offers, bought Superbrain, tel Slough 36864 day 41536 eve.

✱ Acorn Atom 12k RAM, Integer basic, wordpack ROM, printer Interface, via buffers, expansion connector, leads & connectors, psu, magic book, manuals, £175. Telephone 0204 694265 (Bolton).

✱ Nascom 2 — 16k, graphics, psu, software. Perfect condition. Cased with full documentation — a bargain at £300. 'Phone Jonathan on (0530-5) 3824 after six.

✱ Acorn Atom. Fully expanded colour with more than £40 worth software chess invaders etc & books. Also Seikosha GP80 graphics printer offers will separate — Tel. 021 747 5084 evenings.

✱ Tandy model 1 level 2 six months old green screen plus £100 of very good quality software quick sale £400 o.n.o. Tel 0752 663219 anytime.

✱ Sharp MZ80k 48k as new inc manuals books software etc. £375 phone Hartlepool 74085.

✱ Acorn Atom 38k Ram 16k Rom, inc W.P.Rom, via, printer drive, plus extension, power supplies, £80+ software, forth, all leaas, documentation. New keyboard fitted. Offers around £250 to Cambridge 553005.

✱ Sharp M2-80k the Golden Pearl. Fantasy adventure game. Explore up to 2,400 rooms inc graphics needs 48k. £10. David Cheeseman 66 Totterdown Lane Oldmixon Weston-super-Mare. Avon BS24 8NJ.

✱ PET 2001 32k, green screen, little used, external cassette, large keyboard, manual, several games, Tel John on Stevenage 55421 early evenings.

✱ ZX81 Sinc built with 16k Ram, manual, psu. £40 worth games on tape, including defender, asteroids, invaders, adventures, ICL. Audio course with manuals. All in perfect condition £135 Maidenhead 25198.

✱ ZX81, 16k, printer with manuals, Sinc built 2 Sinc tapes plus program listings 3 months old cost £160 accept £150 ring Sean 0947 (Whitby) 605812.

✱ PET 2001 8k new Rom green screen sound box + manuals + over 50 programs £350 (0424) 752736 anytime view Hampshire.

✱ MZ-80k — 48k excellent condition, 5 months old. Small amount of software, monitor listing, basic manual, program listings, original packaging. Owner upgrading. £300 for quick sale. Teesdale (0833) 37961. Buyer collects.

✱ ZX80 — Sinc built, both Roms (8k fitted), both manuals. Linsac companion, psu & leads all for £40 — phone Salter on 0865 55414.

✱ Nascom 2 32k Verorack, fan, psu, separate keyboard enclosure, 4MHz, 2400 band cassette interface, Nasera, Nassys 1 or 3, toolkit in Eprom, Pascal, Zeap2, V&T assembler, NasDis, NasDebug, £375 o.n.o. 0632 844902 or 01 01-589 9608 Room 58.

✱ ZX81 — 16k Sinc built with full size fuller keyboard, psu, manual, £80 of software inc Hires graphics, chess, machine code assembler & compiler & many arcade games. £125. Tel: 01-657 4878,

✱ PET 32k with cassette unit & manual. Toolkit & other Roms. Software inc games. £475 require software for 80 — column. Have 40 — column software for sale. Blackpool (0253) 869108.

✱ Unwanted xmas gift boxed ZX81 manual leads etc, programmer course plus tapes, games etc, 16k Ram pack cost approx. £170. Accept £120 o.n.o. Phone: Hastings 423739 anytime.

✱ PET 2001 8k new Rom, built-in cassette, small keyboard, approx. £200 software, £350 01-947 2325 evenings.

✱ ZX81 as new. Sinc built, complete with leads, mains adaptor, & 16k Ram. £105 o.n.o. Games cassette inc. Tel: 0206 74961 (eve and w/ends).

✱ ITT2020 48k 3 months old, with disk drive & controller. VHF colour output, lower—case chip, paddles, cover, carrying case. 9 months guarantee: £785 o.n.o. Ring Bracknell (0344) 84995 eve and w/ends.

✱ TRS-80 Mod III 32k. Genuine Tandy UK. Epson MX80. Printer. Scripsit etc. Cass. Very little used as new. Will split. Value £1200 + sell £875 o.n.o. Rickmansworth 79767.

✱ Acorn Atom 12k + 12k Acorn built 6 months old psu leads books games software worth £60 inc asteroids 747 adventure space fighter Alan Spellman 0642 211573 after 6 pm

✱ ZX81 — 16k Ram, leads, mains adaptor, & manual; plus four games, 30 programs book & machine code book; £100. Tel: (01) 992 8141.

✱ Acorn Atom 12k Ram, 8k Rom, £190. Inc manual, leads, psu, atom magic book, invaders & lots of other progs. Phone: Grimsby (0472) 824615 after.

✱ Acorn Atom. 8k Rom + 12k Ram. Acorn built, only a few hours use. Superb B condition, inc:— manual book of programs, psu/leads £190. Tel: Wrington 862231 (after 7 p.m. (Std:— 0934.)

✱ ZX81 — 16k Ram, — Sinc. built with space intruders & Sinc cassette. Also, understanding ZX81 Rom, 50 rip — roaring games. £125 o.n.o. inc p+p! Phone: (0232) 626714 after 6 pm.

✱ Exchange Computing from No 1 6 numbers missing for small computer like ZX81 01-731 1509.

✱ Atari vcs + 6 cartridges — missile command, invaders, adventure, basketball, outlaw & combat £140 o.n.o. Tel: Mark Lissak (01) 485 8393 after 5.

✱ Microtan 65 — plus lower case, power supply & ASC II keyboard unused £90 o.n.o. Tel: 01-660 4872.

✱ Aculab floppy tape TRS-80 2 drives inc extended basic & manuals. Selling because am upgrading to disks. £300. Phone: 0272 552440 10 am to 5 pm.

✱ Acorn Atom 12k Rom 32k Ram. Seikosha GP80A printer. All leads & power supplies plus manuals & extra software. £475 o.n.o. Tel: Swindon (0793) 812207.

✱ TRS-80 16k L2 all leads plus manual, numeric keypad & twelve games cassettes inc invaders, Pacman scramble, galaxians defend etc. £340 o.n.o. Tel: Charlton on Otmoor (086-733) 360.

✱ VIC-20 with cassette cartridge game magazines all for £175. Tel: 01-251 3769 after 5.30.

✱ Nascom 2 32k Ram, Vero rack, cased keyboard, V+T ½ meg software controlled cassette drive with operating system (fast!) 12 in monitor, basic, Pascal, assembler, various games £500 o.n.o. Tel: 01-263 6736 anytime.

✱ ZX81 Sinc. built with 16k, psu, guarantee, leads, manual etc. Over 60 programs inc chess, backgammon, draughts, Othello, poker, pontoon, assembler & 3 books. £95. Phone: (0366) 500466.

✱ Atari TV game, inc asteroids, air sea battle, street racer, casino, space invaders, pinball, missile command, extra paddles. cost £270., ask for £220. Tel. 01-452 3963. Tony Chan, evening Still guaranteed.

✱ ZX81 16k Sinc built. Everything complete. Excellent condition. Only 2 months old. plus large amount of software & machine code manual. Only £95 o.n.o. Tel: Downham Market (0366) 38 2488.

✱ PET 8k-2001 — Basic 2.0, large keyboard, green screw, external cassette deck, user manual, reset switch, cover & many programs. All excellent condition. £400 Tel: Norwich (0603) 49599.

✱ VIC-20 + CN2 cassette deck, all leads, mint condition, also 3 books and many mags. Bargain at only £199. Tel: (021) 354 7104 evenings.

✱ ZX81 16k — Smith's purchase — 6 months old but only 4 months use. In perfect order. Replaced by MZ-80k. With some books & cassettes. £90 Huntingdon 59693 or 01-430 5660.

✱ ZX81, 16k, factory built, almost new, full size keyboard, QS + bug-byte software manual, leads, adaptor, plus interface magazines £120 o.n.o. Tel: (01) 353 8807 (day) (01) 946 5161 (night).

✱ 16k ZX 80: Sinc built, psu, leads, manual, perfect working order, first £100 secures HP325 advanced scientific calculator includes 15 storage registers, hyperbolics & normal distribution, first £35 secures. 01-892 9444.

✱ Apple II Europlus 10 inc monitor, colour card, disk II, DOS 3.3, all manuals, software worth at least £150. Bill Budge 3D graphics package. 8 months old. A bargain at £850. Tel: 0902 337586 5-8 pm.

✱ TRS-80 pocket computer + printer cassette interface + separate cassette interface + CTR manual leads games programs £100 for quick sale. Tel: Worksop 476306 anytime.

✱ Texas Instrument TI 99/4A. 16k Ram as new. Features include hires graphics. With cassette lead (3 mm jack). Tel: Northampton (0604) 585184 £260. A Harrison 14 Firsview Drive, Northampton.

✱ ZX81 16k Sinc built, leads, manuals, adaptor. 3-D monster maze, poker, spelling test, alien search. 3 cassettes. 30 programs for the ZX81. All only 2 months old. £115 o.n.o. Etwall 2081.

✱ Casio FA-1 cassette recorder/ 501P/502P/601P/602P interface plus carry case and music overlay. Must sell. £12 o.n.o. Ring Glenn

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Please find enclosed my cheque/PO for £2.50 for the following Transaction File ad.

TRANSACTION FILE

Major, weekdays London 274 6222 ext 2654/2653.

✱ TRS-80 16k L2 excellent condition. Boxed. Inc new (debounced) Rom. manuals, keypad, CTR, monitor, power supply, leads & software. £325 o.n.o. Tel: Porthtowan (Cornwall) 890753 day.

✱ 48k Sorcerer £450 o.n.o., manuals, all back copies of ESC, cables, tapes (inc word processor, toolkit, machine code tutorial, galaxians, cadas, ESC games tape) Taylor 01-272 5896 after 6.

✱ Acorn Atom, 12k Ram + 8k Rom Acorn built & tested. All leads and manuals. 6 months old. With games pack £230. Tel: J. Stone on 0652 648074.

✱ ZX81 16k Sinc built brand new — boxed. Inc all leads, mains adaptor, manual. £110. Tel: Kevin Norton, Grays Thurrock (0375) 30785.

✱ ZX80 8k Rom + 16k Ram Sinc built, recently checked inc psu, ZX-80/81 manuals. 3 books of programs, tape. £90 o.n.o. Phone: 01-657 4198.

✱ ZX81 16k Ram Sinc built almost new still in box with all leads and manual. 9CL cassettes 5 & 6. £110 o.n.o. Ring Heywood 60230.

✱ Atari software. Mainly games inc Atari, EMI & independant. Prices from £5. Games include missile command, ghost hunter, eastern front & many others. Phone: 01-642 6553 for list

✱ zx81 16k Ram Sinc. Built leads manual adaptor & three Sinc cassettes £100. Tel: Chalfont-St-Giles 2307.

✱ Acorn Atom 12k + 12k, F.P. Rom, printer interface, wordpack Rom, psu, via some games, as new £195 o.n.o. Tel: 01-882 3422 eves.

✱ ZX81 16k Ram Sinc built leads, mains adaptor, manual & a selection of other books. Hardly used £90. Phone: 0634 362077.

✱ Ohio Superboard, 8k Ram, Wemon, in custom-built case with built-in video monitor. Manuals cassettes etc. separate 5A psu cased. £220 o.n.o. Tel: Burgh Heath 60439.

✱ Atari 400 16k, complete home computer, system with program recorder, basic, pilot, assembler, editor, star raiders, invitation to programming, manuals & books, as new. Cost over £550 sell for £400. Phone: 01-642 6553.

✱ ZX81 — with 16k Ram Sinc built. Hardly used with manual leads & psu. Also Sinc magazines & course to basic programming bargain £95. Ring Mario 01-235 5400 (eve).

✱ ZX81 16k Ram Sinc built with software inc space invaders 2 books + manual. All leads & adaptor. Excellent condition, hardly used. £120. Tel: 01-527 8596 after 6.

✱ Video Genie 16k perfect condition. Complete with leads, manuals (inc service manual) editor assembler + lots of software, books and magazines £395 o.n.o. Tel: (01) 950 3158.

✱ Acorn Atom — 12k + 12k. psu, m/c code. Toolkit. Debug, dis-assembler. Manual & Atom Magic Book. £160. 66 High Street East, Glossop, Derbyshire.

✱ HP-41C — calculator as new, complete with box & manuals. Must sell, hence prince £100 o.n.o. Phone John Westhrop after 6 Oxford (0865) 69623.

✱ TRS-80 16k C2 inc. micro chess, backgammon blackjack editor/assembler tapes & learning level 2 book o.n.o. £280. Must sell. Tel: 01-346 7289.

✱ DAI personal computer 48k, in as new condition to include games tapes, assembler package, manuals & 8080a assembly language programming book. £525 o.n.o. Phone: 0632 843030.

✱ UK 101 cased 8k Ram, new monitor, Assem' edit, one or two MHz clock. Various cassettes inc space invaders. £170 for quick sale. Tel: 0922 414927 after 6pm or w/ends.

✱ ZX81 — 16k Ram, Sinc built, two months use, with mains adaptor, leads, manual, cassette player & tapes, all mounted on board £98. Tel: Gloucester 29574.

✱ 77-68 perfect working full boards: 32k dynamic £25; 6800 cpu £20; 4k static £20; Mon 2 with T-bug £20; vdu £15. Please write Mr Long, 27 Princes Avenue, Liverpool L8 2UP.

✱ PET 3022 printer with new head installed — £249. Frank Chambers, Rock House, Ballycroy, Westport, Co. Mayo, Ireland. Phone: Ballycroy 7 anytime.

✱ Data Dynamics Teletype KSR 33. RS232 interface. Good condition. Can be seen working on a Nascom II. £95. Tel: Crowthorne 6894.

✱ Computer keyboard. 80 keys plus case. Good quality keys. £12. Tel: Crowthorne 6894.

✱ PET 2001 8k. Hardly used. As good as new. Unwanted purchase. Ideal to learn. Expansion possible. Collect from Croydon. £250. Tel: 01-651 2637 after 6.30.

✱ Algol 60 the language Pascal is based on. Mac an 8080/Z80 Macro assembler language. Both run under CP/M. £50 each. Alan on 062983 4426 after 5 p.

✱ PET 3032, PET 3040 dual disk drive, cassette drive, toolkit, super-chip, music generator, light-pen, lots of software & books. £1000 the lot. Tel: Ralph Pruitt, Dunstable 872575 eve/w/ends. 01-9512469 day.

✱ UK101 8k Ram, cased, new monitor, RS232 output, 2MHz clock, regulator on heat sink, leads & manual. £160. Tel: Cambridge (0223) 350718.

✱ Sharp PC-1211 plus printer cassette interface. Offers over £70. Contact Rowley. Tel: 061 061-941 2082 evenings.

✱ ZX81 — 16k Ram pack, printer / paper, manual, leads etc. Sinclair cassette psu other software £140 Tel: Accrington (0254) 384737 (Lancs).

✱ Power supply 5v & 24v supplied by Pelco for AIM 65. Offers. Tel: Swansea (0792) 74147.

✱ TI58 prog. Calculator + modules £70. PC 100 C printer with program trace. £150. Both brand new. Cost £100 & £200. Phone John (031) 668 2804 e/w.ends. Must sell quickly!

✱ UK101 cased, 24k Ram, Eprom board with toolkit & extended monitor. Cegmon. 300/600/4800 Baud. 32 & 48 screen. Loads of software and user group notes. £300 01-450 6936 eve.

✱ Video Genie, 16k, cassette level meter & full cursor keys, as new, dust cover various books, several games, editor assembler £230. Phone: Leics (0533) 414437.

✱ ZX81 16k Ram, psu. Reset switch, & tape controller. Also many 16k programs. £100 o.n.o. Phone: David Scott, Hartlepool 68943 after 6.30 any day.

✱ Atari 400 16k computer with 410 recorder plus five games inc star raiders & asteroids three months old as new. £325. Phone: 01-857 8088 after 5.

✱ Mz-80k — Sharp Pascal interpreter inc tapes & manual only 3 weeks old. Cost £51, accept £35 o.n.o. Available after 4 p.m. at 58/20 Castle Irwell Student Village, Salford 6, Manchester.

✱ TI 59 & PC100C print cradle. Complete with manuals, spare rolls of print paper, power supply etc. Little used £120. Tel: Dotton 261094 after 6.

✱ ZX80 new 8k Rom + 16k Ram leads manuals games cassette £70 Tel: South Molton 3341.

✱ Commodore PET Fat 40 12 in screen model 4032 32k plus cassette 8 months old little used. All manuals PET/CBM guide £500. Tel: 01-692 4450 01-852 9742.

✱ PET 2001 — 8k, new Rom. Games cassettes, manuals, program books. £420 o.n.o. Phone: Malvern (06845) 5704.

✱ Tandy pocket computer with cassette interface identical to Sharp PC-1211, only 6 months old; £65. Tel: 01-732 3053.

✱ PET 3016 16k computer immaculate £350 o.n.o. inc cassette. Soundbox £10. Software i.e. halls of death, super glooper, nuclear etc. Cost £225 will accept good offer or may split. Tel: 01-9540529 Harrow.

✱ VIC-20 Commodore about four months old plus space invaders Rom cartridge Commodore cassette deck & Commodore joystick plus about fifteen programs £240. Phone: Ruislip 35173.

✱ Tandy Quick Printer (Centronics Microprinter P1) 120 mms Web. 3 reels paper. £100. o.n.o. Thanet 28019 anytime.

✱ Acorn Atom 12k + 12k 10 months old inc manuals leads games software printer drive etc. Worth £400 + selling £280 o.n.o. Phone: Mark 051 6388504. Still in perfect condition.

✱ Sinc ZX81 + 16k Ram + input I/D/output board worth £140 must sell so £100 inc leads books power supply etc — Tel. 0652 34162 & ask for Richard.

✱ Atari 800 16k cassette deck star raiders tape pair of joysticks graph-it cassette all books £600 o.n.o. Contact: Paul Oldland 35 Rosewood Ave, Elm Park, Hornchurch. Phone: Romford 60712 after 5.

✱ PET 2001, 8k (old Rom), £150 worth of programs, manual, PET revealed, PET graphics, sound box, & more books. All for £350. Tel: 01-790 6368.

✱ ZX81 + 16k Ram inc leads adaptor etc. Also s/ware by Sinc. & inc with M/C asteroids & invaders. Sinc built, altogether worth £150. Yours for only £100 (faultless). Telephone: 01-942 8101.

✱ Apple II 48k Europlus, DOS 3.3 disk, Hitachi monitor, many good games + special manuals (Apple Atlas etc.) Mint condition. Delivered insured to you, complete, £950. Write Mark Radcliffe, 38 Silverburn Drive, Ballasalla, Isle of Man.

✱ Atari 400 (16k). Basic cart. 410 recorder, p/supply leads, manuals boxed as new £350 also Joysticks £10 & star raiders cart. £22. Ring 01-461 1604 (after 7. p.m.)

✱ PET 8k/32k 2001 series both excellent condition & working order. Capable of expansion. Prices £250 (8k) £350 (32k) o.n.o. Telephone: Mr. Caplan (01) 493 5015 during weekdays 9 9-5.30 or (01) 953 6369 eve or w/ends.

✱ ITT 2020 48k, floating point basic in Rom. Disk drive with controller & Dos, paddle controls in as new condition £640. Tel: 01-527 2350 ext 54 office hours.

✱ Casio FX502P &FA-1 with master pack cassette. Exchange for PC1211 or sell. Phone: Tunbridge Wells 44607 eve except Fridays.

✱ HP-41C printer complete with recharger & handbook £180. Tel: Chris Farnborough (Kent) 51468.

✱ Printer for only £90 — KSR33 Teletype recently serviced, 20mA current loop, with manuals. Easily interfaced (circuit diagrams included). Write P. Freeman, 325 King's College, Cambridge CB2 1ST.

✱ Apple II +. One disc DOS (3.3). 5 manuals, £250 software immac. 8 months old. Extras £1000. Tel: Mario 01-567 5359 after 7.

✱ PET 2001 32k in excellent condition. Over 20 assorted programs 2nd cassette deck. £260 Phone: Cosham (0705) 373666 day.

✱ TRS-80 L II, 16k, numpad, CTR80A, vdu, Tandy Quick-printer, Aculab stringy, all cables & magazines. Best offer over £430 secures! (Might split) Tel: Bicester 44827.

✱ PET 32k, basic 4.0. 1 year old, excellent condition. with over 200 programs, Hi-res graphics board, soundbox & reset button. Only £500 o.n.o. Tel: Wokingham 788024.

✱ Acorn Atom 24k, as new, boxed, two Joystick ports, cassette recorder plus software, psu, leads, related manuals etc. £195. Phone: Peter 01-460 6356 eve.

✱ Cromemco System 3 64k, structured basic, assembler, CP/M, CDOS, packages, extras, £3500. Cifer vdu, multitudinous functions, RS232, £400. Terminet 1200, 120cps, letter quality printer with keyboard, RS232. £450. Tel. (0279) 724211.

✱ TI59 programmable calculator & 100B printer complete. Also master, maths & leisure modules. All manuals, source & other boxes. All at £150 will haggle. Ring Evenings 0480 55701.

✱ Two Shugart 8 in floppy disk drives model 800-2. Ex equipment, as new but untested £120 each. Also 5 volt 10 amp stabilised power unit £25. Tel: 01-366 8926 after 6.

✱ Sharp PC1211 plus printer, Akai cassette & interface. All in briefcase little used. Priest Tel: 01-505 5313 (Buckhurst Hill Essex) £120 o.n.o.

✱ Video Genie 16k, sound box, Vu-meter, tab keys, manuals, games, football program, previous years results on tape £230. Tel: 01-950 1124.

✱ VIC-20 plus Arfon expansion unit, 3k & 16k Rams cassette & software £450. Tel: Nigel Clemons 0203- 442979.

✱ PET 16k model 3016 complete with commodore cassette deck, user manuals. All in original packing cases. £375 o.n.o. Tel: Chesterfield 812849.

✱ TI59 with printer and some cards. All manuals, excellent condition. £120 o.n.o. Tel: 0632 818383 (day).

✱ UK101 8k. Price includes a large number of software tapes such as: space invaders, assembler, le passe temps, startrek etc. All for £90. Tel: 051 228 7971.

✱ Nascom 2 . 32k Ram, Nas-Sys 3, runs 4 MHz, 2400 baud, cased with 3A psu, grahics, Rom, Naspen in Eprom, assembler on tape, games. £320 o.n.o. Ring 061 653 5791 (eve).

✱ Acorn Atom, 8k Rom, 2k Ram, inc power supply & manuals. Acorn built. Only 4 months old, excellent condition. Only £150. Telephone: anytime after 4 pm. 01-736 5608.

✱ 1 Sinc built ZX81 with 16k Ram, software, leads, manual & transformer. Used once, £100. Tel: 01-602 2244.

✱ ZX81, Sinclair built, 16k Ram, printer. Keyboard & case, key repeat. Some games plus ZX assembler. All manuals, plus under standing your Rom. Psu's included. Selling for £199: Tel: Middlesbrough 824725.

✱ "ZX81 + 16k both Sinc built, plus professional keyboard with repeat key - full working order plus extensive software, £110. Tel: Bolton (0292) 44547.

✱ Acorn Atom 12k + 12k inc psu, manuals, leads, games, flight simulation printer drive. Worth £400 ÷ asking £280 o.n.o. 13 months old, Seikosha GP80a printer 6 months old £185 o.n.o. Tel: 051 638 8504.

✱ ZX81 with Sinclair 16k Ram pack, all leads, psu, manual etc. with Microgen chess program. Cost new £137, accept offers around £80. Phone: (01) 397 3821.

✱ Tandy colour computer . . 16k extended colour Basic. 5 months old, space assault program pak, joysticks and colour manuals inc £375. o.n.o. Ring Mold 58417 after 5 pm.

✱ "Texas TI99/4A: Colour graphics, sound (9900 16 bit cpu), unwanted competition prize, £300 new) accept £235 o.n.o. Also ZX81 1k £40 cassette deck £20 Tel: Copthorne (0342) 712220 weekends"

✱ BBC Microcomputer model A unused (but checked). Just started Open University studies, and now short of hands-on time. Immediately available (3 month BBC delivery). £299, full guarantee. Woking 70860.

✱ ZX81/81 — Sinc built, with 8k Rom upgrade, 16k Ram pack, as new, with games tapes and books L 79. Tel: 01-245 9513 or 0926-624688.

✱ Sharp MZ-80k, 48k, 6 months old, remainder of 2 year warranty applicable hardly used, in excellent condition, £300 o.n.o. Phone Edinburgh (031) 553 2602 after 6 pm.

✱ 16k ZX81 4 months old, perfect condition,inc leads, 50 programs (games, educational etc). on cassette (startrek, equations etc), psu, manual, boxed, £110. Tel: (0324) 20275 after 5pm.

✱ ZX81 Sinc built with 16k and full size real keyboard, inc leads, manual, psu all for only £100 o.n.o. Tel: Blackmore (0277) 821266 after 4 p m.

✱ 3032 PET, with fixed green screen and cassette drive. Perfect condition. Several games programs thrown in, please call Adrian Berry at (01) 353 3491 on weekdays after 10.30 a.m.

✱ ZX81 with 16k Ram and push button cased keyboard, manual all leads, 4 cassettes, excl condition 3 months old. Only £105. Phone: Caterham 49664 eve.

✱ Sinc built ZX81 + 16k psu, leads, manual etc, all boxed £100 o.n.o. Also over £50 worth of good software tapes and books, £25 o.n.o. Tel: Ilchester 840320 eve.

✱ Video Genie 48k with expansion box disk drives, colour, sound, lower case, many programs on 20 disks & manuals & books. All cables leads etc. £1280 o.n.o. Tel: 01-643 6896.

✱ ZX81 Sinc built hardly used, with all leads, manual, mains adaptor and tape recorder, all perfect condition only £65. Tel: 061 973 4817.

✱ ZX81 16k Ram, boxed, all leads, machine code box + a lot of software eg 12k chess, 16k startrek, East London delivery £100. Tel: Stuart (0277) 217150 weekdays after 6 pm.

✱ Superboard 2 16k Ram switchable cegmon/wemon basics toolkit 48 x 32 display psu cased plus manuals etc. Will split £199 o.n.o. Phone: Sunbury, Middx 88762.

✱ ZX81 16k + extension keyboard/motherboard/psu manual and leads. Over £60 of software. Worth more than £250. Asking £130 o.n.o. Excellent condition. Ring 0632 732749 eve and w/ends.

✱ ZX81 with 16k Ram, four game cassettes, manual, one game book for the ZX81, leads & psu. In mint condition, all for only £85.75. Tel: (01) 722 7846.

✱ Microtran 65 with keypad & power supply. As new £90. Tel: Berkswell (0676) 34332.

✱ ZX81 1k machine, nearly new. All leads and psu in working order. Together with over 40 programs. No expansion, must go quickly, bargain price only £79. Tel: Preston 52473.

✱ HP-41C, printer and games module, good condition worth £520 only £270 o.n.o. Sale due to upgrading. Tel: Wokingham (0734) 784322.

✱ Sharp MZ80 twin floppy disk drive £500 o.n.o. + MZ80k expansion unit £75 o.n.o. Both 6 months old and under guarantee. Also Sharp PC1211 + interface £60 o.n.o. — Brighton 423021.

✱ Apple II plus 48k 9in monitor, as new condition, complete with a all manuals, books, some software, £650. D Girdler, Chesham 785428 eves.

✱ Acorn Atom 12k + 12k inc many games, (chess [1000 levels], galaxian, space invaders, defender etc.) £220 o.n.o. Tel: Collingham Bridge 72826 after 6 pm.

✱ Sinclair ZX81 + 16k Ram + all leads etc. + over £35 of software inc astroids! & invaders + M/C made simple & ZX81 pocket books. Worth over £170. Sell for £90. Tel: Whitby (0947) 604125.

✱ ZX80 (1k) 4k + 8k Roms. Sinc built. Games book (4k Rom) manuals, tape of games inc "Space invaders" (4k Rom). Adaptor, leads, all for £50. Phone: 01-959 0394 evenings.

✱ Acorn Atom 8k Rom + 12k Ram Acorn magic book leads + psu £175. Brentford 224540.

Hewlett Packard HP41C plus full range of software & manuals — would consider splitting — offers? (Paul: 01-809 2551 after 7.30 Mon-Fri).

✱ Texas TI59 + printer 100b perfect working order. Still in original box. Master, maths utilities & structural eng. modules. 100 + magnetic cards + various software. £220 o.n.o. Tel: E. Horsley Sy. 04865 4239.

✱ Sharp MZ-80k memory as new, with dust cover, and £100 worth of software, £350 will separate phone Dave (0702) 612921 after 6 pm.

✱ VIC-20, excellent condition, little used, unexpanded with cassette deck, "introduction to basic", cartridge & long video connector cable. Costs £280 new. Sell for £190. Tel: 947 2886 after 6 pm.

✱ ZX81 — Sinc built, 16k Ram, printer, paper, 80/81 psus, leads, games cassette. Books, manuals, ZX81 companion, getting acquainted with — hardly used, worth over £200. £175. Tel: Hatfield Broad Oak 284.

✱ PET 32k (upgraded 3008), new Rom, large keyboard, cassette deck, manuals, dust-cover, various games, blank cassettes, as new, £400 o.n.o. Phone Terry Ridge, Haywards Heath 459188 ext. 23 office hours

✱ TRS 80 — L2 16k, boxed Numpad, CTR 80A cassette, 8 in vdu, transformer & tv connector. Level 1 + 2 manuals, games, editor assembler, basic + assembler prog. books, leads, perfect cond. Nearly new £390 o.n.o. Tel: Potters Bar 59659.

✱ Video Genie — 16k manuals, books & invaders, flight simulation, chess, labyrinth, all leads. £250 no offers. Phone after 5 pm. Tel: Surlingham 283

✱ Apple II + 48k 1 yr old 2 disk drives, monitor, printer-card, many games, visicals inform, master org. over £1800) yours for £1450 o.n.o. Tel: John 0622 63192, Maidstone, Kent.

✱ Apple II + 48k 1 yr old 2disk drives, monitor printer — card, many games, visicals, inform, master (org. over £1800) yours for £1450 o.n.o. Tel: John 0622 63192 Maidstone Kent.

✱ Video Genie 16k 5 mths. old Arrow keys plus Aculab floppy tape complete with usual bumph worth over £200 best offer to £450 secures no splits. Simon Tel: (01) 886 5907 (eves).

✱ 16k video Genie: very good condition with games, leads & manuals; only one year old: £245. Tel: Oursley 3883 after 4 p.m.

✱ ITT 2020 48k with Apple Dos 3.3 disk drive £475: Hitachi 9 in Hi-Res monitor £50: Epson MX-80 printer with interface £250: original packing, manuals,

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software, utilities: owner emigrating: Tel: 09594 75784 eve.

✱ZX81 16k Ram Sinc built manual, adaptor, s/ware & books worth £25, four months old £110 o.n.o. optional extra tape recorder £10. Tel: 01-540 6641 Wimbledon.

✱Sinc Built ZX81 — 16k, 5 months old, as new, manual + all leads, 2 psus, compatible crown cassette recorder, £25! software, inc toolkit, plotter pad + film. £150 o.n.o. Ring 0924 371135.

✱Acorn Atom, 12k Ram, 12k Rom, Acron built, psu, manuals, 13 in tv & recorder, will separate. All in exc. condition. Must sell, £245 o.n.o. Tel: Shoeburyness (Essex) 6863.

✱Sharp MZ-80k 48k, as new, still in original packing. Reset switch fitted, Sharp's dust cover & £200 worth of software inc M/C manual. £450 o.n.o. Tel: 01-555 0089.

✱ZX81 — real snip at £40 complete with leads, mains adaptor & manual. Postage paid in original box. Phone: 061439 2633. Barward 36, Moss Lane Bramhall Stockport.

✱Casio fx702P pocket computer + microc professional programme pack unwanted gift. Fast basic expandable Ram/Rom cost £120 will sell for £95 o.n.o. Phone Mike 061-792 2871 eve.

✱Acorn Atom — 32k dynamic Ram kit, partly built. No longer wanted. Cost £60. £40 for quick sale. Phone: Peterboro' (0733) 52665.

✱ZX81 16k Ram as new games books £100. Sharp MZ80k 48k games utilities manuals as new £340. Versa graphics tablet for Apple £150. Ring 01-399 0963 after 6 pm.

✱Video Genie 16k with sound little used £225. Tel: 0590 22744.

✱32k Sorcerer. Amazing asteroids & space invaders programs, all manuals/leads. Also high-res plotting & 3-D graphics routines. All vgc. Bargain £395 o.n.o. Tel: (0734) 340366.

✱MZ-80k (48k) extended basic £345. M/C space invaders, chess, £8 each. Startrek, mizmaze, monstermaze, gamespack, £5 each. Basic extended £10. Will separate. Phone: 01-505 4470 eve. Buckhurst Hill, Essex. Delivery arranged.

✱PET 4016 16k, new Rom, green screen, large keyboard. Instruction & graphic manuals. Cost £550 will accept £345 o.n.o. Phone: Crawley 513207 day or eve.

✱Pet 2001 16k. New Roms. Large keyboard. Commodore cassette. Phillips mini digital cassette. Assembler, toolkit, superchip Roms. Printer interface. Software. £600. P. Novis 108A milton Road, Clapham, Bedford MK41 6AS.

✱ZX81 16k complete with mains adaptor, leads, manual, games & tape deck. Only few months old in original packing. Quick sale £95. Phone: Paul 01-434 2989 11 am to 1 pm daily.

✱Acorn atom 12k + 12k power supply leads, over £150 worth of best software available, full documentation inc magic book for quick sale £250. Tel: Godalming 6410.

✱ZX81 Sinc built + 16k Ram adaptor. All leads & manual also ZX81 books. Accept £80 or near offer for quick sale. Tel: 01-800 8398 anytime.
time.

✱ZX81 + 16k Ram, Sinc built, manual, leads, 5 months old, perfect condition, psu, 8 cassettes, Damsel + beast, 3D monster maze, defender. Sinclair magazines worth £155. Offers £120 welcome. 01-997 3870.

✱Digital PDP8A, twin 8 in disks 16k core, LA36 teletype & card reader, professional standard equipment, good condition (service contract) £2000 contact computing Dept. Cranleigh School, Surrey 04866 3666.

✱Expanded ZX81, custom built console housing Redditch keyboard, D'ktronics graphics Rom, Ferguson tape deck, plenty software inc ZX Chess II, invaders, adventures, monster maze, startrek, all 6 months old, more details phone: 01-311 5591.

✱Sharp MZ80k 48k, as new, hi — resolution graphics, (320 x 200) dots. Zaks Z80 assembler programming. Assembler tape, many games, manuals. £400. o.n.o. G. Byram, 30 Empress Road, Derby. Phone: 0332 763353 (eve).

✱ZX80 8k Rom 4kRam with leads & manual but without power supply unit. £30. Phone Nick Draper on Blackburn (0254) 886523. Also inc compshop's "slow" add-on, tested but not fitted.

✱Acorn Atom, 21k Ram, 12k Rom, via, joystick, 5A fan cooled psu, cassette recorder, magic book, programs including pontoon, fruit machine othello. Cost £320, £320, £250 for quick sale. 01-504 9834 8—10 pm.

✱Acorn Atom games packs nos 1, 8 6 & utility pack cost £44 all in good condition £7 each phone Godalming 6410.

✱UK101 8k Ram, 2MHz, 32x48 display, Cegmon, 300 to 2400 baud tape. Games inc space attack. Disassembles. Single key basic. £150 o.n.o. Also Monukoz £3. PHone Sheffield 383532.

✱Acorn Atom 8k Rom, 8k Ram, Acorn tested, via fitted, 3a psu, manuals & leads. Programmable sound generator connected on board. £120. Liverpool 051 638 2446.

✱BBC micro for sale. Brand new model-A works perfectly. Regret selling due to open university studies & time factor. Serious offers only (£299 new). Phone Woking 70860 after 6 p.m.

✱ITT 2020 48k in excellent condition with games paddles & all manuals. £400 o.n.o. Tel: 01-660 0750.

✱Sinc built ZX81 plus 16k Ram still under guarantee power supply manual & all leads included some software including galaxians galaxy warrior & catacombs bargain £75 o.n.o. Telephone: Caterham, Surrey 46840.

✱Apple II 32 line parallel interface card for input or output complete with timers shift registers & handshake similar D109 with optional power-up status new guaranteed £170 Bryant Camberley 28366 after 6.

✱Sharp MZ-80k (48k) with quantum high-res/user definable graphics board, speed/high-res basics, forth, forth editor/assembler, subscription to user notes, still under guarantee, plus games. £450 Tel: 01-898 4803 (evenings).

✱UK 101 8k exc. cond. with power supply. New monitor & invader tape only £80 Tel: 01-462 8687.

✱ZX81 Sinc. As new, still under guarantee. Factory made, in original packing, leads, manuals, adaptor, etc. £53 Tel: 01-736 3268.

✱TRS-80 16k L2 with numeric keypad & B/W tv. Also several computing books & editor assembler. £200 o.n.o. must sell soon. Mike Hadlow, Tel Sevenoaks 458261.

✱Pet 2001 8k with manuals & £200 worth of cassettes immaculate £500 Tel East End 698 Puddefoot 'Norleys' Norley Wood, Nr. Lymington Hampshire 504 8RR

✱ITT 2020 . . 48k with manuals, games controllers & some software Runs Apple II programs. £ 350 Tel Shoeburyness (03708) 5409.

✱ZX81 Sinc built, with leads & mains adaptor, manual & games cassette, £55. Phone 01-543 4104 (Merton Park, London SW19 3DX). David Archer.

✱'PCW', 'CI', 'PC', back issues for sale, total-51 issues. Also Elektor, 'ETI', 'HE', magazines, total-64 issues, all 80-82', excellent condition £2300 & £27. Tel Leicester (0533) 730653, after 5 pm.

✱Pet 4032 32k with 4040 dual disk & 4022 printer. Has command-o & pronto-pet extras. Cost £1866, sell for £1243. Phone Mike Rebay at London 01-928 3821 office hours.

✱ZX81, + 16k Ram, Sinc built, leads, psu, manual Sinclair games cassette four, two books inc m/c, + some magazines. Sell £90 o.n.o. Kaz 01-444 5499.

✱Video Genie EG 303 . . 16k Ram new model keyboard, integrated cassette & vu meter in good condition complete with leads & extra manuals. Now upgrading. Would PX anything Apple. £240. Tel: 01-680 2775 (Croydon).

✱Nascom-1 cased 32k-Ram 8k-Basic graphics, sound, many extras, tapes. Full documentation £250 o.n.o. printer. Tandy — Thermal £75 o.n.o. both — £300 o.n.o. must be seen. 'Phone Southend (0702) 76205 — Dave.

✱TRS-80 Level II 16k + vdu, numeric keypad, cassette recorder, leads, manuals, Edtasm, buyer collects, £200, plus ZX81, Sinc built, 1k, £45 Tel: Great Eccleston (Lancs) 70835 anytime.

✱TRS 80 LII 16k, new Rom numeric keypad, CTR80 cassette recorder, leads, manuals, books, arcade & other software. Plus system's desk. Worth £750. Only £490 o.n.o. Phone Doncaster 538987 eve — Tony.

✱Pet 32k old Rom built-in cassette tv, small keyboard sound-box books 100 programs value £150 Wymark new printers with interface & paper bargain price £759 eve Essex (0702) 66373.

✱ZX81, psu & cables. Perfect condition hardly used. Purchased February 13 1982 Tel: Cheltenham Glos, (0242) 20908. Will send c.o.d. anywhere on UK mainland price £45.

✱Acorn Atom software inc invaders asteroids, 3D colour adventure, breakout, othello, acornsoft pack one, hangman, lander, 60 programs on 13 cassettes cost £45 sell £23 Tel: 0494-39283 after 5.

✱Nascom in frame. 64k board with 16k. NasSys 1 & T4 8k tape basic. Econographics, control keypad. With usual modifications. Cost over £500; yours for half that price. Tel: 01-592 1874.

✱Video genie 16k — sound, lowercase (with driver in Rom) fitted. Joystick, lightpen, dust-cover & box. Many programs. £350. Tel: 01-979 5816 after 6 or w/ends.

✱MZ-80k. . 48k 6 months old (18 months guarantee still remaining). Sharpsoft user notes, assorted good games £350 Tel: 021 430 2631.

✱ZX81 + 16k Ram, Sinc built, 1 software tape, all leads, manual, original boxes, 2 months use, guarantee still valid. £95. Telephone (Woking) 04862) 63397 eve.

✱VIC-20 cassette recorder, joystick, books, loads of software Vicmen, Amok, asteroids. Cost £280 three months ago. Perfect condition. Boxed etc. £217 Tele: Wolverhampton (0902) 757872.

✱Pet 2001 old Roms integral cassette 24k Ram + second cassette + software + books mags £300 CBM 3022 printer £250 Tel Leicester 886437.

✱ZX81 16k Sinc Built, psu, manual, 3 cassettes, users magazines; good cond. £95. Write n.l.h. Cresdee 14 Arminers Close, Clayhall, Gosport, Hants.

✱Don't buy a toy. You can have my TRS-80 16k LI (boxed) for £175 (inc over £100 software/ books CG Edtasm, FS1, T Bug, scramble, etc.) with cassette. Phone Cris (0387) 68696.

✱ZX81 Sinc built 3 months old perfect working order with manual leads, 30 progs, boxed as new. £52. Phone 78007 Milton Keynes.

✱Vic-20, Vic cassette, basic course, tapes. (3 months old) £200. Video Genie, books, tapes, leads etc. £240 Tel: Ipswich (0473) 210028.

✱Apple II Europlus 64k, disk drive Silentype 80-col printer, Hitachi 9-inch monitor, dust coers, with leads, manuals & software, £1100 o.n.o. Tel: Steve Griffiths 01-250 3000 ext 175 day.

✱ZX81 16k Ram, manual, all leads, psu cassette £30. Software, numerous programs, magazines, spare tv. Want £85 buyer collects. Cash. 11 Holly Grove, Parkinson Lane, Halifax, W. Yorks.

✱Vic-20 brand new! Over £30 of new software inc super lander space defence phone 01-777 1678 for details.

✱TRS-80 16k L II all leads manuals plus many programs inc invaders & scramble faultless workings order in original packing £250. Ring P. Drubra 01-427 3651 after 6 pm.

✱Video Genie EG 3003 L II 16k all leads, manuals. 11 months old, excellent condition. £210 o.n.o. Buyer collects. Tel: (0902) 758582.

✱Sharp MZ-80K 48k with xtal basic knight commander big basic probe assembler disassembler pascal & many more programs £360 Les Stubbs 96 Coleridge Way, Crewe, Cheshire Tel: 0270 581657.

✱Texas PC 100C printer for TI 58/58C/59 calculators boxed & in immaculate condition with extra roll of thermal paper. price, £95 not negotiable. Tel 061-794 7465 (Manchester) after 6 pm.

✱ZX81 Sinc built with 16k Ram, fuller FD full size keyboard various software. All in good condition. Total price £145 o.n.o. Tel Loxwood 752639 (evenings only).

✱ZX81 Sinc built, 16k Ram, ICI training manual & tape. Five software tapes. £100 inc manual, psu & leads. Matthew Cockerill tel: York (0904) 489275.

✱ZX81..Sinc built. Boxed as new with psu cassette & tv leads, manual, various program listings, articles, hardware projects etc., owner upgrading. £45 o.n.o. Phone Barnsley (0226) 41753 after 4pm.

✱ZX81 Sinc built 16k. New psu, full size keyboard, large collection of magazines. Loads of software centipede invaders defender etc £120 o.n.o. Tel: Yeovil 26434 after 6 pm.

✱Sorcerer development pack, modular assembler for Z80 processor, full instructions & manuals inc, £70, phone Wolverhampton (0902) 894477.

✱Pet 24k integral cassette, old/ new Roms, Arrow programme auto fastfinder, many more, Pet revealed Mos 6502 etc. Soundbox, anti crash buttons £350. LIttle-hampton 7607 W. Sussex.

✱TRS-80 L2-16k. Good condition & with numerous software, inc games etc. selling to upgrade! First offer off £260 secures. Contact Satnam. Telephone: (0922) 30283. Walsall between 3pm — 7 pm eve buyer collects.

✱Apple II plus 48k. Single disk/ controller. 12in B/W tv/monitor £1500 new). £950. Tel: Kings Langley (09277) 63612. After 7.30 pm.

✱Superboard 610 exapansion board, 32k Ram, 4800-300 baud, 3 channel music, own character generator making high resolution graphics, 32 x 48 mutek converted screen, professional box egmon Cooling fan, over £600 spent, £320 o.n.o. immigrating. Tel: Allen 01-542 7593.

✱Nascom 2 smart Wooden case 32k Ram switched mode power supply graphics Rom perfect condition £250, also Nascom 1 unexpanded in metal case £100 also ZX81 £50 9in monitor £50 Phone 0892 41396.

✱16k ZX-81 psu, expandable to 32k continues memory-insert 8 4l16's (7.50). Factory built. Software (cassettes, 218 ZX programs in magazines + book.) £95 o.n.o. II Clifton Place, Wakefield, WFI 3JH.

✱Vic-20 4m-old. Datacassette both boxed with 3k Ram, programmers reference guide, joystick, super lander (Rom Cartridge), software inc space invaders, robot attack. Cost £326.29, accept £225 o.n.o. Tel: 0532 643991.

✱Microtan 65 graphics, Tanex, 8k Ram, XBug, psu £200 o.n.o. 71 key keyboard, data 2716 Eprom for encoding to ASCII £30 o.n.o. Tel Kenilworth (0926) 58384 eve.

✱TI59 calculator PC100b printer/security cradle magnetic cards & several accessories all for £200 only, 4 months old. Contact James Segawa, Rush Common House, Dorchester, Crescent Abingdon Oxon OX14 2AJ.

✱Commodore 4040 dual 5¼in disk drive with DOS 2.1 excellent condition complete with IEEE cable manual & diagnostic disks. £385. Ring 01-650 8839 after 6 pm. Also 3032 32k logic board complete £75.

✱ZX81 16k psu & loads manual Sinclair cassettes & several books £75 for quick sale as upgraded. 01-656 7498.

✱ZX81...32k Ram, 1.2 Amp, psu manual, leads, etc. + magic gook. 5 cassettes software inc music, invaders, Hi-Res, Sinclair games & valley adventure (28k) £90 inc p+p. Phone Langport 251080 eve.

✱Apple bits . . doublevision 80 column card — £90. Software controlled video switch for showing graphics or output from any 80 column card — £15. Symtec professional fight pen — £60. All o.n.o. Slough 41092.

✱Acorn Atom 12k Rom + 12k Ram. psu, manual inc software inc chess, invaders, 747, Acornsoft No.9. £180. Ring Ruislip (71) 38204.

✱TRS-80 LII 16k + Edtasm + Sargon etc £260 01-388 6859 (eves).

✱Vic-20 as new with data-cassette, Lunar lander Rom. Cartridge & assorted software cassettes, £200 o.n.o. Tel: A White London 01-579 5720 after 9.30 pm.

✱TRS-80 Model 1 L2 16k, 3 months old. Selling to go to university approx 50 games. Invaders, invasion force, spare computer tapes all manuals new plus ctr tape recorder £350 Tel: Wrexham (0978 756246.

✱ZX-81 16k manual, leads, adaptor. Some software & book. Perfect condition with original box. Worth £120 asking only £95 phone Brighton 33958 after 6 pm.

✱ZX81 Sinc built with 16k Ram & full size protos keyboard. All leads, manual, etc. plus books & many programs on cassette. Just £130 Tel John 01-673 6563 eve.

✱ZX80 8k Rom 16k Ram psu & leads manual £60 for quick sale as upgraded 01-656 7498.

✱Video Genie EG 3003 complete w/sound, arrow keys, level meter, EG 3016 printer interface, kansas assembler & basic software 1 games. Manuals, leads etc. cost £425 yours for £300 phone 041-339 4840 eve.

✱Nascom 1 Nas-Sys 3, 32k Ram, graphics, cuts cassette interface, Eprom board with toolkit Nas-Dis/ Debug Zeap 8k basic. All in veroframe. Television, keyboard, psu, sound in vdu. Much software. £450 o.n.o. Tel: Leeds (0532) 789920.

✱Dai 48k L.C. 24k basic + M/C utility Rom, Hi-res 16 colour graphics, stereo sound, RS232, analogue & floppy disk interfaces, software. £475. 16in Sony trinitron with R/C. £225. Tel, Dave 0235-21900 ext 6345 (work 9-5) or 03677-273 (home week/eve only).

✱32k Pet 3032, 3040 disk drive, 3023 printer, cassette, purchase & sales. Ledger packages £1100 o.n.o. Tel: Tamworth 61369 eve.

✱TRS-80 .. L I 4k, very good cond. leads & manual inc only £150. Tel: 061 643 4643.

✱ZX81 1k, one month old, mint condition, in original packaging, Sinc built, inc mains adaptor, all leads, ZX81 basic manual. £65 o.n.o. Tel: Wigan (0942) 493107 after 6 p.m. on weekdays.

✱Sharp MZ80k . . (36k) with dust cover, basic/A, knight commander games, Sharp assembler, byte searcher, memory dumper, disassembler, hex poker, manuals bargain £385 o.n.o. Ring Steve on Redditch 24406 will deliver??

✱Acorn Atom (new keyboard) 12k + 12k, psu leads, business software & books 2 months old (owner upgrading) £250 Tel 0473 53161 eve (will deliver) also 6k spare Ram.

✱TRS-80 16k L II cpu only plus CTR-80 cassette recorder with various games & books. £200 o.n.o. Write D Climie, 91 Moss-park Avenue, Glasgow G52 1LQ.

ZX81 with 16k Ram Sinc built, leads, manual etc. in original boxes. Lots of software inc asteroids & chess. Only £100 o.n.o. Phone: 01-688 2351.

✱ZX81 16k full size keyboard & £40 of software, worth £200, yours for only £110. Newquay 06373 4292.

✱MZ-80K 48k Ram (green screen) vgc user enhanced Xtal/ Sharp/integer basics Xtal bug monitor, invaders, asteroids & other games progs. £350. Tel: Southend (0702) 352439.

✱ZX81 with 16k Ram & full size case & keyboard, plus software worth £50 inc adventure & invaders etc. cost £190 for only £120 o.n.o. Phone East Kilbridge 27265.

✱TRS-80 model 1 L 2 32k, twin .isks. RS232 interface. Tandy vdu all manuals, twelve floppies containing personnel statistics, games, graphics, scientific & other programs £950 o.n.o. 01-594 5500 ext 49 (office hours).

✱UK101 8k Ram, new monitor, programmable sound generator, joysticks, software inc space invaders, startrek, toolkit, 300/600 baud, assembler, mini Eprom board, manual, bargain £260. Tel: Bradford 27635 after 28/6/1982.

✱Microtan Tanex 7k, Basic, X-bug, system motherboard S.mode power-pack in smart case. Cost £300. Offers around £180. Also spare microtan 65 £60 o.n.o. Tel: E. Grinstead 25952 after 6 pm.

✱Sharp MZ-80k, 48k, Ram mint condition. Six different basics, many languages & utilities over 100 games, manuals & user notes. Box & cable. £350. Tel: Derby (0332) 74927.

✱Microtan 65 Tanex, 5k, motherboard, lower case, chunky graphics, psu, keypad, manuals some games programs inc invaders, as new. £125 o.n.o. Tel: Jim 01-788 4864. anytime.

✱ZX-81 16k, leads, psu, cassettes, manual, machine code book. All in excellent working order. Bargain at £90. The old Guildhall, Monks Eleigh, near Ipswich. Tel: Bildeston (0449) 740 399.

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✱ ZX81 + 16k complete, Sinc built. Books: ZX81 companion & mastering M/C on ZX81. Programs; assembler, games, home & business £85. contact David on Cheltenham 36461 eve.

✱ ZX81.. Sinc built with 16k Ram, psu, leads & manual, & four books, two software cassettes. £110 o.n.o. Telephone 0202 698325 or write Titchmarsh 300 West Way, Broadstone, Dorset.

✱ Seikosha GP80A printer as new, boxed complete with handbook, cost £228 new 4 weeks ago selling for £190. Tel: Sunderland (0783) 229602.

✱ Acorn Atom . . 12k Rom + 12k Ram. Acorn built. 4k toolbox Rom. 1200 baud cos. psu, leads, manual, magic & getting acquainted books. Software inc invaders, 747 & galaxians. £210. Winchester 883235 eve.

✱ Acorn Atom 12k + 12k, F.P. Rom psu & leads. Many many games & books inc invaders, Acornsoft 1,3,4. Atom magic getting acquainted with Atom £195. Telephone Hoddesdon (09924) 61342.

✱ ZX81 + 16k Ram, Sinc built, adaptor, leads, manual, three Sinc cassettes & books, £85 o.n.o. Lewes (07916) 5513.

✱ Pet owners, Mikro assembler for sale, £30. 3000 series only. Fits into spare Rom socket, comes complete with manual & fitting instructions. Works with toolkit. Phone Leicester 704859 Rich Downs.

✱ UK101 cased 8k Ram 1/2MHz conversion leads, external cooling, manual etc. Bargain price £130. Ring Dave Dorking 885922 ext 328 day or Redhill 60513 eves.

✱ Apple II Europlus 48k + Hitachi 9in monitor + software all mint condition. £700 phone Jo John Morgan 01-994 8541 ext 292. 8 am to 4 pm.

✱ TRS-80 16k L 2, vdu, cassette, Tandy line printer VII, cables, manuals, books, software (over £100 incl asteroids, invaders, word processor) £550 o.n.o. (may split). Steve 01-651 4249 (Croydon).

✱ ZX81 Sinc built, under guarantee. 16k Ram, manual, psu, leads. £100 of software inc line renumber, Hi-Res graphics, chess, many arcade games, machine code assembler & compiler. £120 complete Tel: 01-657 6754.

✱ Oki Microline 80 printer with Epson/Apple interface. One year old. £225. Ring Ted Sloan Belfast (0232) 661748 (eve or 666926/ 662058 (day).

✱ Sharp MZ-80k 48k six months old with eighteen months warranty plus many programs on cassette adventures etc. All as new £285 o.n.o. Phone: 01-330 3379 office hours. Can deliver.

✱ Casio fx501p non-volatile programmable calculator. Also FA-1 cassette adaptor. £35 for both or will split. Will also take offers from students (I know what its like1) Phone Worksop 771526.

✱ Pet 32k — large keyboard Basic 4.0 & 3.0 with cassette toolkit, sound plus various books, good condition. £450. o.n.o. Tel: Ipswich (0473) 461791. Anytime.

✱ Nascom 2, 10k Ram, 10k Rom, Microcase, music, sound, graphics Rom. All shop built. Invaders, toolkit, chess & many other games. Cost £430. Offers around £250. Tel: Newcastle (0632) 870440. after 6 pm.

✱ 16k ZX81 almost new 512 programmed graphics + 512 user. Keyboard, tapes, chess, machine code assembler, disassemblers games. Books basic machine code value £250, selling £170. Dave Noonan Tel: 01-272 5674.

✱ 32k colour Pet B/lines colour writer, graphics chip. N/R.O.M. two cassette decks, sound box, digitizer, power, arrow, laster basic, Roms £300 approx games, books etc £675. Tel: Southend 712289 (eve).

✱ Pet 32k new Rom large keyboard toolkit rabbit latest cassette with counter soundbox lots programs inc petchess magazines books blank tapes dustcover all for £400 o.n.o. Tel: Hitchin (0462) 54435.

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✱ ZX81 16k Ram Sinc built as new + software tapes (inc Star trek) also as new . . . £110 o.n.o. Phone: 01-441 4541.

✱ UK101 8k Prof-built, sound generator, Cegmon, over 100 games inc M/C invaders full documents wooden case with fan only £160 or offer for quick sale Tel: Ipswich (0473) 685341.

✱ Vic-20 boxed as new. Very little use, with transformer, modulator, datassette, 3k Ram expansion, assorted cassettes. Worth well over £260. May deliver offers £200 plus. Phone 01-204 1261.

✱ Sharp MZ-80k 48k Ram 4 months old excellent condition with MZ80 10 still boxed & knights commander & many other software tapes will split £420 o.n.o. Tel: Steve on 01-668 8342.

✱ Printer Tandy quick printer II, connects to cpu or E/I. All leads & paper £80 o.n.o. Tel: Bolton (0204) 27249.

✱ Acorn system one (6502) 8 months old. Extra I/O port + Ram, cassette interface. As new, all manuals, some software, £60. Phone: (01) 668 2779 eve or w/ends.

✱ ZX81 Sinc built, 16k Ram with mains adaptor, leads, manual & 2 tapes plus 4k graphics Rom giving 1064 graphics. £110. Tel: Crucorney (982) 528 after 5 pm.

✱ Nascom 2 32k Ram, graphics Rom, toolkit, cased with fan, mains, filter, documentation & software £280 also 12in vdu £40. 01-642 7778 after 6. Sutton, Surrey.

✱ TRS-80 32k, vdu, cass with aculab drive. Epson MX-80F2 printer £850 o.n.o. Consider splitting & can deliver. Sargon, Bomber & other software manuals & books inc. Phone (0509) 39098.

✱ Pet 4032 mint condition. Save over £250 on list price. Bargain at £545. Tel: 061-904 9901

✱ Atari 800 software, ghost hunter, space invaders, scram, caverns of mars, £44 o.n.o. or exchange, also Sharp music centre, worth £300, exchange for Vic-20 computer. Tel: Basildon (0268) 284771.

✱ ZX81 16k Ram & manual, leads, adaptor + software. All Sinc built & in perfect condition. All for only £85. Phone: 01-229 0814.

✱ TRS-80 LII 16k numeric keypad inverse video vdu joystick £300 + of software plus books etc. £550 o.n.o. 01-387 9538 & ask for Martin Wright.

✱ Intellivision 1 month old. Perfect condition with space battle + soccer cartridges will swap for good condition Vic-20 or sell for £200 write to P. Carter, 1 Harington Road, Formby, Merseyside L37 1NS.

✱ Apple II Europlus .. 48k Eurocolour card, modulator disk drive, controller (Dos 3.5) Epson printer, + interface, Assembler, toolkit, software, books, magazines .. £1800 o.n.o. Tel: P. Hobbs (01) 226 8624 after 5 pm.

✱ UK101 built, 4k Ram, Hardly used. only three months old. Will include psg, pcb & working Sinclair ZX80 for price of £110 o.n.o. Tel: Abingdon 29106 (eve).

✱ Texas PC100-C print cradle for TI58/59. New boxed only printed dozen lines. Must sell as grant running out hence low low price of £80 o.n.o. Phone Ian after 6 pm 0909 771526.

✱ Sharp MZ80k, 36k Ram, as new Basic language tape, manual & numerous progs/games £275 o.n.o. Tel: Erith 40643 anytime.

✱ ZX81 bargain + 16k Ram pack Sinc built plus six tapes of programs & compatible cassette recorder. All leads, psu & manual inc. First offer over £75 accepted. Tel: Epsom 40210.

✱ Video Genie EG3003 sound with over £200 worth of software, books, manuals excellent condition, invaders, adventure etc. £300 ring 01-806 7546.

✱ ZX81 + 16k Ram. 6 months old. Mint condition. Inc compatible prinz sound TR 195 cassette recorder, software listings, psu, manual, leads etc. Only £90 Tel: 061 736 4050 after 6.

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✱ Acorn Atom 12k + 12k + 32k board (16k fitted), colour board, all buffers, connectors via etc. 3 Amp 5v power supply, software, books, user club news etc. £320 o.n.o. Tel: Stroud (045-36) 6143.

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✱ ZX81 Sinc built 3 months old with leads, psu manual & thirty program books value £77 will take £60 o.n.o. Tel: Cardiff 568020.

✱ Sharp MZ-80k 48k 3 months old mint condition with manual, notes & software. Selling due to unemployment. £300 o.n.o. for details, phone Bournemouth (0202) 671410.

✱ ZX81 . . Sinc built, 16k Ram, manual, leads, etc. Sinc tape one, ZX81 pocket book & input output board unused. £95 for quick sale. Tel: 051 625 7477.

✱ Sharp MZ-80k 48k Ram, 4 MHz board, Knight commander, Pascal, Forth, Fortran, systems programs macine codes & disassemblers plus over 100 other programs. Would cost over £700, £485 09956 327 (Lancs) after 5:30 pm.

✱ Apple II plus inc 2 disk drives, Ramcard, Pascal, Visicalc, many games & other software. £1200 o.n.o. Tel: 04203 2764 (Bordon Hampshire).

✱ Apple II + twin disks colour monitor language card MX80FT2 interface Z80 softcard Romplus toolkit l/case generator games h/duty paddles ex/port cost £3300 accept £2650 o.n.o. will split High Wycombe (0494) 23786.

✱ ZX81. 16k. VGC inc psu, Techomatic user port. Software: chess, high resolution graphics, space intruders, breakout, cesil compiler, much more. £90. Keyboard kit (54 keys) £15. Tel: Ledbury (0531) 3545.

✱ 19k Atom with Shughart disk drive, parallel printer output, RS232 output, colour monitor output, Wordpack, Database, Peeko, utilities, games, packs, invaders. Highly "customised", needs attention but only £399. Norwich 610622.

✱ ZX81 16k, new keyboard + all leads, psu, etc. also lots of software: defender, startrek, assembler, invaders, adventure etc £110 o.n.o. to P. Goodjohn Beaujolais, Water Lane, Castle Bytham, Grantham. Lincs.

✱ ZX81 Ram, psu, power switch & tape controller. Also Sinclair game tapes plus others. £90 o.n.o. Tel: David, Hartlepool (0429) 68943, after 6.30.

✱ Vic-20 + manual, modulator & psu little used & under guarantee cost £190 sell for £155 o.n.o. Tel: (01) 952 1628.

✱ Pet 4032, latest 9in model. Invaders, acrobat, plus cassette games & books. £520 o.n.o. Tel: 04302 2060. North Humberside.

✱ Atari 400 16k brand new in box. With cassette recorder, star-raiders, asteroids, & missile command Rompacks plus scram cassette. Cost £500. Tel: Madinglby 210472 after 6 pm. £400 o.n.o.

✱ ZX81 . 32k Sinc built, 4k graphics Rom, tapes inc startrek, defender, 3d maze real invaders & centipede. Still under guarantee. Cheap at £150. Ring Erith 33784 after 6 or w/ends.

✱ Video Genie EG3003 16k less than year old. Excellent condition with some software (eg. Invaders, u-boat strike) £250 o.n.o. Tel Reading (0734) 52132.

✱ ZX81 . . Sinc built, with 16k Ram, adaptor, leads & manual. As new. £75 personal callers, or add £2 p&p. Write to: W. Ditch, 16 Frome Square, Ford Estate, Sunderland.

✱ Casio FX702P— new, boxed, still under guarantee with manuals, £70. Write to M. Armstrong, 5 Wyndham House, Slaone Square, London S.W.1. Also Pet 2001-8 at £110 with lots of programs.

✱ FX-502 with FA-1 adaptor, inc master pack with over 100 programs on tape & all instruction manuals. £70. Tel: Diwyang 01-805 4146, after 6 pm.

✱ 16k Video Genie I with bionic Ram. 3 months old with printer adapter & software worth hundreds of pounds inc Edtasm Accel 2 etc £250 phone 092 82 5112 eve.

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✱ CBM 3032 cassette, reset, switch, toolkit, "repeating keys, fast Load Save" Rom. Programs include microchess, hellfire, warrior, extramon, cursor magazines, arcades 1-8. All for £500, o.n.o. Phone: 021 360 8395.

✱ Nascom 2 32k Ram case. Psu, all usual software inc 3 monitors & many games. Eprom programmer proto board with graphics, sockets for sound chips & clock. £500. Tel: 01-470 2787.

✱ ZX81 + 16k Ram with manual leads, psu & box. Sinc built. Only 6 months old .Mint cond. only £90. Tel: (061) if outside Manchester 344 5962, after 5 pm.

✱ Superboard, psu 8k Ram 8k Rom, perspex top case 300/600 baud tape interface, circuit drawings, manuals user group mags £110, Peter Rogers 051-526 8762.

✱ Video Genie EG3003. 16k as new, personal circumstances, force sale. Soundbox, space invaders, T-bug monitor included. Complete with manuals, leads, etc. £205. Tel: Cranleigh 6851 (E/W.ends).

✱ Video Genie EG3003 as new, hardly used, original box & leads etc. Also various software inc £260 Tel: Mike 021 444 3169.

✱ ZX81 .. + 16k Ram. Sinc built (9 months old), manual, leads, psu, plus two machine code books. Cost £140, accept £95 o.n.o. Phone Newcastle (0632) 629357 after 5 pm.

✱ Hewlett Packard HP41CV system. Comprising of calculator, cardreader, printer, two application packs & a solution book. Cost over £650 four months ago. Accept £440 o.n.o. Tel: 01-5938960.

✱ Vic-20 + 16k Ram pack. Cassette recorders, manual, programmer's reference guide, introduction to Basic part 1, alien cartridge & many programs. Worth £340+, will accept £250 o.n.o. Tel: M.W. 28470.

✱ Pet 32k, Basic 4, 8050 disk drives, MX80FT/1 printer cassette deck. Lots of software. Would suit small business or serious hobbyist. Complete system £1700. Tel: Milton Keynes (0908) 670630 H. Melton.

✱ Texas TI59 & PC100B printer master library, manuals, magnetic cards, spare rolls printer paper, hardly used mint condition. £150. Tel: 01-504 6737.

✱ ZX81 plus 16k Ram plus 1.2A psu Sinc built, MC book, manuals, interface magazines, cassette recorder, leads, software on tapes. Trouble-free machine. Owner upgrading £100. Kirkcaldy (0592) 202408.

✱ 16k ZX81 in fuller extended case with 42 real typewriter keys. Excellent condition. Still under guarantee. ZX81 manual + 3 other books + software. Bargain at £150. Tel: (0993) 850961 after 6pm.

✱ Sharp MZ-80k. Machine code, Editor/assembler, debugger, reloca table loader tapes & manuals. New, unused. £50. Phone: 042121 2445.

✱ Vic-20 4m-old, plus datacassette (C2N). Vic revealed book. Games plus manuals & leads. Worth £240, sell for £215. Tel: 01-267 0908 after 5 pm.

✱ Video Genie 16k inc manuals (Tandy) plus books & progs. Genuine reason for sale. 11 months old. Stanford-le-Hope (03756) 79533 evening 01-592 3000 ext 2165 Knowles day.

✱ Sharp MZ-80k 48k only five months old. inc Knights Pascal, Fortran & Forth. Also £100 + of games & utilities programs. £450 o.n.o. 041 959 6727 after 5 pm. A. McDonald.

✱ ZX81 16k printer complete, two psus boxed excellent condition plus 'Hints + Tips', 'Mastering Machine Code' books, ZX Chess II only £155 post paid Tel: 0501 43283.

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✱ ZX81 16k Ram with printer special custom built typewriter keyboard various software printer paper cassette tape recorder all mounted as one unit for quick sale. Price £150 01-804 2145.

✱ As new - TRS-80 16k L2 vdu manuals CTR-80 cassette recorder leads books software must sell £400 o.n.o. Phone Brownhills 4104.

✱ ZX81 16k Sinc built, all leads, psu, manual & £20 of software. Boxed £130 o.n.o. Also ZX81 without psu but all leads, box etc. £45. Tel: Mogador 833205 after 7 pm.

✱ ZX81 Sinc built with 16k Ram only four months old plus manual, leads psu, machine code instruction book & book of 30 programs £90 tel Maidstone (0622) 679526 eve.

✱ Mattel Intellivision Soccer, Gold, sea battle, space battle, skiing, armor, battle, checkers, car, race, cost, over £300, will sell for £250. Phone: Camrose 408 eve.

✱ Sharp MZ-80k 48k Ram Basic system software package all manuals one year old £325 sale due to upgrade. Tel: Harrogate (0423) 500108.

✱ Sharp MZ80k 48k mint condition complete with manuals & some software 18 months guarantee will deliver any reasonable distance £350 o.n.o. Tel: Barnsley (0226) 293729 after 6 pm.

✱ Vic-20 expanded on Arfon motherboard to 20k tape cassette. Superlander Rom cartridge, basic introduction part 1 mint condition cost £430. Sell £330 prepared to bargain. Tel: Coventry 81770 after 5 pm.

✱ ZX81..16k Ram. Sinc built, 3 months old, as new. All leads, manual & psu. Six diff Sinc S/W tapes. £110 o.n.o. Phone Newmarket 741031 eve.

✱ Video Genie 16k L II & monitor with Aculab floppy tape system & centronics PI printer. Complete with manuals, editor/assembler etc £450. Will consider selling separately. Tel: 0773 (Ripley Derbys) 872244.

✱ Pet 4040 disk drive + basic 4 Roms £500. Pet 3016 + cassette + toolkit £425. 2022 printer £250. All 3 £1100 (could deliver in West Midlands/North West). Tel: Penrith (0768) 62621 eve only.

✱ ZX81 16k Sinc built exc. cond. psu manual, all leads, two books, lots of progs inc S/inv. cube & many more. Only £95 Tel: Porthcawl (065671) 4123 (Richard).

✱ TRS-80 Model I L2-16k 2 months old & green screen monitor one month old also cassettes leads manuals & tv modular only £425, but price negotiable optional cassette player - £20. Phone: 01-952 4860 eve.

✱ Sharp MZ-80k 48k exc. cond. 4 months old. Under 2 year guarantee. Over £20 software original box & packing. Manual. £330 o.n.o. Phone: Southport (0704) 28233 after 6 pm.

✱ ZX81 Sinc built, 16k Ram, large range of books, software inc chess worth £130. £97 o.n.o. Tel: Birmingham (021) 4755329.

✱ ZX81 Sinc built 16k Ram, manual leads, psu vgc. Cheap at £70 o.n.o. Ring 01-942 2793.

✱ ZX80 + 8k Rom + 16k Ram all as new includes leads psu + both manuals many professional tapes & programs £90 o.n.o. or will split. Tel: Telford (0952) 603351 will deliver in West Midlands.

✱ ZX81 + stable 16k Ram, Sinc built + manual, leads, etc. Excellent condition. With over 20 16k taped programs + many listings + books, mags — £105 o.n.o. Phone Capel Bangor (097084) 411 anytime.

✱ Processor technology Sol S100 bus, 8080 based, 48k, Ram, dual double density North Star disks, CP/M, Wordstar, Mailmerge, original adventure, extended basic, etc. £2900 o.n.o. Tel: (eve) Birmingham (021) 329 2987.

✱ ZX81 16k Ram Sinc built with manual, leads, adaptor & a dozen tapes inc Micro-Gen Chess, three Sinclair & a Rose Educational. £88. Tel: Neil 01-478 3604 (Ilford) after 5 pm.

TRANSACTION FILE

✱ Vic-20 + cassette + £18 worth of books cost nearly £270 best offer secures. Wants a Sinclair Spectrum like his Dad. Phone Bill 01-794 4436.

✱ Acorn Atom 12k Rom, 28k Ram, (4k toolbox Rom). Psu 'Interface' & 'Atom' magazines, printer interface. Lots of software inc galaxian & fruit machine, two books. £200. Wellington (Somerset) 082347/2095 (any time).

✱ Casio Fx 601P calculator brand new boxed. 11 months guarantee £49 also TI-57 £9.00 colour card for Apple £35, all o.n.o. Phone Ian 0909 771526 after 6 pm.

✱ TRS-80 48k (model 1), two discs, cassette, vdu line printer II. Visicalc. Excellent condition, manuals, packaging as new, £990. Telephone: 0632 818383 (day).

✱ Vic-20 colour & sound 5k computer hardly used inc Vic cassette player bought in March, absolutely mint condition, £199. No offers. Buyer collects or pays postage. Phone Tamworth 67888.

✱ TRS-80 16k K.I. inc cassette, leads etc. over £120 worth of software & books (inc Edtasm, T-bug, FS-1, games) £280 or nearest or exchange for guitar/amp. Tel: Cris (0387) 68696.

✱ ZX81 factory built, 16k Ram leads, psu manual & full size fuller Keyboard. All excellent condition, only 4 monts old; £125. 3 cassettes software, M/C + Basic — £10. Tel: (0204) 68952) eve.

✱ Tuscan Z80, 8k, Ram, 8k Basic, mint condition, fully working, 12in green screen monitor various programs in basic on tapes. £470. Ring Dave on 226 1432 (daytime) 808 8121 (evenings).

✱ Seikosha GP80A dot matrix printer, £130 o.n.o. 30 cps, UC/LC characters, Dot addressable graphics, tractor feed, centronics type parallel interface, Ruislip 38733 after 6 pm.

✱ Bargain vdu terminal 12in green screen keyboard, 80CX25L, screen edit, full cursor control V24 as RS232, option 20mA printer outport, 300-1200 baud, plus spare case, C.R.T., electronic circuit, data, working. £70. Cossor vdu 9in green screen keyboard, 80CX13L full cursor control, serial I/O, data, unkown working, it worth more just key/switch alone, + 1000 components £25. Clive Midsomer, Norton (0761) 412237.

✱ MZ-80k 3 months old plus dust cover and cartridges (21 months guarantee). Unwanted gift in superb condition. Sell for £400. Phone Harlow 24609 or write 1 Swallows Old Harlow, Essex. Ask for Richard.

✱ Acorn Atom . . 12k Ram, 8k Rom, psu, all leads, 2 books, 3 game tapes inc asteroids + invaders etc. fully working. £160. Tel: 01-504 8496 eve. Chris, 14 The Meadway, Buckhurst Hill, Essex.

✱ Large selection business & games on tape for MZ-80k no longer required changed to disk. Eight business would cost £352 & 36 different games cost £264. (The lot £324) ring 051-326-5070.

✱ ZX81 with 16k Ram, professional keyboard, power supply & all in an attractive case with leads, manual & Sinclair cassettes. Current cost £175 but accept £130. Tel: 01-542 3218.

✱ Casio FX-702P pocket computer-Basic programming. Hardly used, no longer required. £75 o.n.o. Tel: Pill (027581) 2029 or write Hopkins, 56 Stoneyfields, Easton-in-Cordaus, Bristol BS20 0LL.

✱ IBM Golfball printer complete with Aculab interface to link with Pet Computer, with three golfballs, ribbons and leads. High quality printing at low cost £400. Derrick Watts, 85 Grange Road, Alvaston, Derby DE2 0JY. Tel: 0332 363947.

✱ ZX81 16k built £20s worth of software inc defender. Only 8 months old perfect condition. No bug in the Rom. For only £85 inc postage, Tel: Frinton 2451 after 6.

✱ Exchange Renault 4 van with Mot but in need of some attention to floor. For ZX81 or better with cost adjustment. Tel: 01-660 7907.

✱ Atari 400 16k, plus programme recorder, joysticks, various software games, manuals & still under guarantee. £300. Please phone: 01-851 5942 after 7 pm.

✱ TRS-80 16k Level II, green screen, cassette player, Editor/assembler, T-bug, sargon chess, adventure plus many others — £350. Tel: 01-876 7278.

✱ Commodore Pet 2001 8k new Rom Int. cassette deck, small keyboard 17 game programs (inc and £315 o.n.o. Phone: Knowle 77539.

✱ Pet/CBM 3016 16k Ram Cassette, soundbox, over £100 of software inc most arcade. Pet revealed, programming 6302, Basic compiler, assembler, microchess. All for £500. David Gee, phone: 01-624 6407.

✱ Wanted Pet computer, new Rom, interested; disk drive/printer. (With manuals). Exchange for Yamaha organ (B-35N). Bought in error. 6 months old, vgc. Will deliver/collect within South-East. Tel: Hastings 430236

✱ Wanted: TRS-80 48k with vdu & recorder (but might consider floppy tape). Must be as new. Detail & price to: R. Nubley, 66 Alderside Crescent, Lanchester, Co. Durham.

✱ Wanted computer pen — friend. Commodore Pet 3016 requests corresponding with other addicts. Ideas inc software exchange hints & tips for programming games/business. Write J.W.D., 5 Harding Close, Kettering, Northants

✱ Wanted: Sinclair ZX81 (Sinc. built) with accessories. Tele: Bolton (0204) 51973, after 6 pm.

✱ Apple, Video-Genie, Pet, Vic, ZX81. Tired of that programme? Not what you wanted? Cash to 50% of current list for cassette, disc, Rampack, immaculate condition with full documentation Tel: 0424 220188.

✱ Wanted: ZX81, home built or factory built + games. Svein Utne Kringsjaav. 51, N-7000 Trondheim, Norway.

✱ Acorn Atom — 12k + 12k Psu Magic and Atom books. Acornsoft gamespacks 2, 3 and adventure. Bugbyte galaxion and humor hander. £250. Tel. Bath (0225) 311165.

✱ Pet 32k new ROM. External large keyboard. Also Qume sprint 55, interface and word processing software (fixed proportional spacing). Qume and Pet manuals. £1,250. Tel Chippenham (0249) 75222.

✱ Pet 8032 with 8050 disk drive. 1 year old. Under warranty from Curry's Micro-C. Unfortunate reasons for sale. Offers? Tel: 01-390 4739. Must sell. First sensible offer accepted. Buyer collects.

✱ ZX 81 — 16k Sinc built perfect condition, original box. Leads, manual, adaptor inc plus ZX 81 boot. Software: Trumps (cards) grand prix, music, renumben, breakout, alien etc. £100. Tel: Burnley (0282) 29161 (eve)

✱ Going abroad to work. Must sell my disk based Exidy word processor. Cost over £3,000 new. Full system inc daisy wheel printer. Giveaway price for quick sale £1,500. No VAT. Phone 01-979 4370.

✱ VIC 20 memory expansion 24k + 3k CMOS as new from STACK in January this year, used only six times. £150 (current list price £184), seller buying VIC printer instead. Phone Runcorn (0928) 713401.

✱ Teletype 33 ASR in working order with stand, leads & paper. Fitted tape punch/reader. Internal UCC for 2-way transfer. £30. Phone: 01-998 9257.

✱ Apple II 48k — Autostart & lower case adaptor for Apple writer etc. Complete with many games and useful programs. £460. Phone Keynsham (02756) 3312

✱ Apple Integer Basic Romcard for sale complete with programmer's aid ROM (Graphics and music routines etc.) and manuals much faster than Applesoft. £65 o.n.o. Phone Peter Blair 0969 23462.

✱ Sharp PC1211 computer with CE-122 printer two months old with all documentation £100 o.n.o. Tel Walton 26915 eves.

✱ Sharp MZ-80k manuals etc., excellent condition, £195. 01-868 9709

✱ Brand new Sinc-built ZX81 & character board, slight used 16k RAM, motherboard, keyboard. Books, software, assembler tool-kit-types, (good games, chess for char/brd. Value £315+ sell £225. Turner 01-724 1435.

✱ Acorn Atop. Fully expanded colour, floating point. Software inc astrobirds, invaders, two games packs and utility pack. Manual. Total cost over £400 will sell for £300 o.n.o. Canterbury Telephone (0304) 812857.

✱ Sinclair ZX printer. Completely unused. Unwanted gift. Tel: Sutton Elms 282308 (after 6 weekends)

✱ ZX81 — Sinc built, plus 16k RAM pack, perfect condition, only £120, complete with all leads, manual, mains adaptor, cassette player if required (extra £10) phone Chris, Sevenoaks 55540 between 6-8 pm.

✱ TRS80 — LII 48k vdu, line printer, 2 disk drives, 2 tape recorders, disks tapes, RS232 Newdos 80, worth £2000, offers around £1200. Phone Jackson 0272 676465 eve.

✱ ZX Printer — inc mains adaptor, manual £40. Also Redditch keyboard for ZX81 unused £20. Also assorted s/ware tapes £1.50 each. Tel: Bradford 43973 after 6. Ask for Jonathan.

✱ ZX81 — Sinc built, inc leads, manual + packaging, as new, + Hitachi recorder and many great progs, will deliver London area, worth £90, only £60 ono. Phone Robert 607 2597 after 5.

✱ Texas TI99/4A — three ROM modules, Texas recommended recorder, ten C12 tapes, all five months old. vgc. worth over £400 new. Sensible offers: Mr Beaver, 16 Poulton St, Ashton, Prestonl Lancs.

✱ Microtan 65 — + Tanex, with 10k Basic, new Tanbug, XBug, Toolkit Chip, 8k RAM, ASCII keyboard, HEX keypad, etc. All encased, worth £400 will accept £250 ono. Tel: St Austell 850725.

✱ Unbuilt — 6ft wingspan radio controlled power assisted glider with engine extras. Exchange for ZX80/81 or with cash for Atom. UK101 Atari console or similar 27 Keresforth Hall Rd, Bransley, S Yorks.

✱ VIC-20 computer + Alien cartridge+ some cassettes for £180. Atari game computer + 9 cartridges inc the game Pac-man for £220. Phone John (Cosham) 375681 on Mon-Thur only. From 4-7 cash only.

✱ Video Genie — + s/ware, 1yr old, £220 ono. Atari Video game plus 10 games inc Space Invaders £170 ono.

ZX81 — 16k, Sinc built, plus £20 of s/ware, all leads, power pack etc. Only £85. Tel: Marc 021 378 1551 after 7.

✱ MZ80B — Text Editor prog. A word processor with 18 editor commands and format, £10. W E Witeke, 45 Pound Meadow, Fornham. All Saints, Bury St, Edmunds, Suffolk. Tel: Bury St Edmunds 67297.

✱ TRS80LII — kpad, perfect, nearest £300. s/ware Corplan £15. Best Trek anywhere £10. Pigskin £7 plus other s/ware and books worth £100. At £350, everything. Twyford (Reading) Berks 345723.

✱ Sharp MZ80K — 48k exc cond. 23 Sharp games + Space Invaders and Star Trek. Only 2 months old with original packing. Unwanted gift, £325 ono. Tel: 01-402 8394.

✱ Superboard III — 8k RAM, PSU, modulator, Cegmon fitted plus Wemon, Chess, adventure and Demo cassettes, with manuals and leads £75. Maidenhead 31633 eve and W/ends.

✱ 32k Exidy Sorcerer — with vdu and cassette player, £250 ono. 48k Exidy Sorcerer with S200 bus and micropolis two disc drive and VDU, £650 ono. Tel: Norwich 56161 ext 2696.

✱ Hewlett Packard — HP41CV, hardly used, as new. All manuals + games pac £200, ono. Write: Mick Kelly, Westfield College, Kidderpore Avenue, Hampstead, London NW3 7ST.

✱ Nascom 2 — 48k RAM, Graphics, 3A PSU, Castle high speed cassette, interface, Vero-rack, keyboard case, s/ware on cassette, £425 ono. Kettering (0536) 85087.

✱ ZX81 — Sinc built, 16k RAM, full size moving -key kboard, all leads plus manual and several books and s/ware, exc cond £150. 0263 511497 6-7pm.

✱ TRS80 — LII, 16k, keypad, monitor, 32k interface, percom, data separator, sound, lower case, Epson printer, Shugart disk drive. %0 + disks inc: Newdos, scripsit etc. Many games. Offers? Peter 0277 220456.

✱ Star DP8480 printer — 80 columns, 80cps, bidirectional, logic seeking, tractor and friction feed, centronics interface, only three months old, per cond. Free delivery, £230, Tel: Leeds (0532) 456146.

✱ Microtan System — inc case, hi-res graphics, 48k RAM, 10k Basic, power supply, keyboard, 32k ROM board, inc manuals £590. Tel: Aberdeen (0224) 894452.

✱ TI59 + PC100 printer — master and maths utilities modules, power/charger unit, cover, paper, over 80 magnetic cards, complete with books + source-book, s/ware. Cash: £250. ono. Tel: Munir 636 0893.

✱ PET — 4032, cassette, dust covers, etc. under 1 yr old, owner changed to 8032. £500. Tel: AJ Boyle 01-802 9658.

✱ BBC — micro offers invited for unused model B with disk interface have given up waiting delivery, advised July 1982 D. Rowse Ramsdell, Basingstoke, Hants RG26 5QH. Tel: Basingstoke 850021.

✱ ZX81 — 16k, all leads, manual etc, 4 cassettes of s/ware, chess, Gold etc, plus assembler, disassembler and machine code book — £95. Tel: 769 2115 (eve).

✱ UK101 built, 8k RAM, leads, psu, manual, several games, £128 ono, only 8 weeks old, April, per cond. Quick sale, CT Mountier, 84 Yeldham Rd, Hammersmith, London W6.

✱ ZX81 — Sinc built, 16k RAM, Quicksilva mother board, Asteroids, Defender, ZXDB Debugger, Sinc cassettes 1+4 and other s/ware £100 ono. William Stuart sound board £15. Tel: Ruislip 73686.

✱ Genie I — 16k RAM complete with sound, cassette recorder, manuals, leads, display and games tapes. Bought in March 82. £200 ono. Tel: Sheffield 872434 after 5.

✱ Sharp MZ-80K — nearly new. Extra languages Forth, Pascal, Fortran, machine code. Also Knight commander, Star trek, all manuals etc. All for only £420. Phone (0634) 46874, can deliver in Kent or surrounds.

✱ PET 4032 — 32k, external cassette deck, manuals and 6502 programming book. Under 1yr old and per cond. £500. Tel: Kim Swain 01-366 8395 home, 01-407 8989 x3097 office.

✱ Casio fx601 — programmable calculator (as new, inc all manuals) £30. Also FA1 adaptor (cassette interface) £10, FX702p wanted at a reasonable price. Tel: Blidworth 3959 eve.

✱ UK101 — 8k RAM, new monitor, with case, 300/600 baud. Under 1 yr old, inc many progs. Tel: 01-529 5325.

✱ Acorn Atom — 12k+12k + 4k utility ROM inc 1200 baud cassette interface; psu, centronics electrostatic printer, with all leads, 9in tv. £350 the lot, will split. Tel: 01-500 8070 after 5.

✱ Video Genie — 16k internal cassette interface; psu, Centronics manuals, over 50 s/ware progs, inc Big Five Software, chess etc, £250, phone Bridgend Mid Glam 50919.

✱ UK101 — 8k RAM 10k Basic assembler ROM 2MHz 300/600 baud, £50 s/ware plus 16k DRAM board and hs cassette interface, not installed £120. Tel: 01-660 6393.

✱ Texas TI99 — home computer c/w taperecorder plus modules and cassette games, exc cond. £200. Tel: Kettering 518440 after 6.30pm. 3 Thames Rise, Kettering. Northamptonshire.

✱ TRS80 — LII, 16k, new ROM, numeric keypad, manuals, dedicated books, magazines, Tbug, Editasm, Dancing, Demon, Micromusic, other purchased s/ware, faultless, original packing. First offer over £320. 01-643 4823 Monday eve. Michael.

✱ MZ-80K — 48k RAM, exc cond, 8 months old, extended Basic + various prgs, eg Cosmiad sphere etc, approx s/ware value £50, green screen supplied, lowest accepted £300 black cassettes supplied. Roy Biddle, Denyshome, Chilworth Village, Southampton SO1 7JP.

✱ Video Genie — 16k RAM, sound unit, new keys + VU meter, programs inc Galaxy invasion and animated graphics generator, with manuals, extra books and TRS-80 Basic manual. Delivery inc, price £235. Tel: 077 87 246.

✱ Star DP-8480 printer — Centronics interface, friction and tractor feed, 80 columns, 80 CPS, Bi-directional logic seeking, only 3 months old, per cond, free delivery. £230. Tel: Leeds (0532) 456146.

✱ Microtan 65 — uncased, fully expanded Tanex and Tanram, full ASCII keyboard, keypad, Basic, XBug, Tanbug V2.3, SI, MPS2, chunky graphics, lower case, £700 new. £500 ono. Phone (0926) 613534 Midlands.

✱ Ohio Superboard III — in Mahogany Aluminium case 8k RAM power supply, RS232 — TTY sockets, sound cassette, tv, 110/300 baud, phone 0276 20993 £140 ono.

✱ Acorn System — (not Atom): 6502, cpu, cassette interface, colour VDU, interface, memory expansion board, cased Hex keypad/display & 5V/3A psu, buffered backplane, connectors, manuals & s/ware, only £100. Tel: 051 426 6997 eve.

✱ HP41C — complete with re-chargeable battery pack HP82120A, three memory modules HP82106A + HP 82143A printer, current value £560 for £400 ono. Tel: Ponteland (0661) 23135 eve.

✱ Acorn Atom — 23k RAM, 12k ROM, two external memory cards, VIA, psu, s/ware inc Chess, Space Invaders, Asteroids, Galaxians, books, etc, hardly used £220 ono. Tel: Potters Bar 59542.

✱ ZX81 — complete plus programs. £50. 180 PET programs exchange, Speech Unit for VIC20. Your programs listed free, cassette based VIC20 only. Phone 01-840 3610 after 3.

✱ TRS80 — 16k L2, hardly used 2months old, £300 ono. Buyer inspects and collects. Paul Helliwell, 3 Longfield Way, Todmorden, Lancs.

✱ VIC-20 — + cassette, boxed as new. Also £20 of books, 4 months old, worth £270 will accept £220. Paul Harrison, 33 Lady Bay Rd, West Bridgford, Nottingham.

✱ ZX81 — + 16k, Sinc built, manual, psu, leads, 4 books, 4 cassettes s/ware £75. 113 Leigham Vale, London SW2 3JH. Buyer collect or add postage.

✱ PCW — back copies. Full set of 50 to June 1982! £25 or split, No 1 1978 to Dec 1979 £15, Jan 1979 to June 1982 £15. Tel: 0905 (Droitwich) 773327.

✱ Sharp PC-1211 — pocket computer, still boxed with 3 manuals, spare set of batteries, hard carrying case and CE-121 cassette interface, plus many programs. All for £85 ono. Tel: PC Lee after 4. 01-977 6389.

✱ Microtan 65 — Tanex, 8k RAM, Basic, XBug, Invaders, ROM, Star Devices, Mk 3 keyboard, hex keyboard, 19in rack, two 7k m/c games, tapes etc, cost £420+, accept £250 ono. Tel: 0908 604743.

✱ Superboard 3 — 8k RAM cased, tapes and magazines £130. Also ZX80, 4k RAM tapes and magazines £40. Tel: Tamworth (0827) 62714.

✱ ZX80 — 1k, both ROMs + manuals, psu, leads, moving graphics, modification. Hi-res Space Invaders ROM, book, articles (reviews) + plenty of programs cost £180. Bargain at £120. Tel: David, Maidstone 26861.

✱ 6802 single board computer — 15k RAM, 10k Basic cassette, tv, interface complete h/ware documentation and monitor disassembled listing, 3amp power supply, requires ASCII keyboard £50. Phone Hamilton 426973.

✱ Acorn Atom — 12k + 12k all leads, manuals, psu, Acorn built, games tapes: Startrek, 747, £200. 5V 5A psu, sturdy case with room for extra boards (new), £50. Tel: 02404 3071 eve.

✱ ZX81 — 16k boxed and guaranteed. RAM clamp, switchbox, £80 s/ware on 13 tapes inc Galaxians, defender, centipede, chess. adventure, Startrek etc. Altogether worth £210 will accept £100. Tel: Swindon 852678.

✱ TRS-80 — 48k level II, VDU, two disk drives, printer, extensive s/ware inc, latest LDOS, NewDOS 80, Cobal, Edtasm, word processor and games, s/ware worth £800, will accept £1100. Tel: Telford 583403 eve.

✱ ZX81 complete, — 16k Sinc built, graphics ROM un'keyboard, 5 15k tape games, 2 manuals 4M/C books (over £200 new), exc cond £130 ono. Tel: (0322) 862303 after 6, Eynsford, Kent.

✱ Acorn Atom — 12k + 12k, (fp ROM), 6522 via; psu, etc, Magic Book, copies of the Atom, s/ware inc Invaders and Asteroids £199. Tel: Billericay 57527.

✱ ZX81 — with Sinc 16k RAM, psu, two games cassettes, books, £80. No offers. Blackledge, 6 Ramsey Grove, Burnley BB10 2NR.

TRANSACTION FILE

✱ ZX81 — 16k, RAM, leads, manual compatible cassette player — recorder, graphics pad, film, all as new, 7 cassettes inc. toolkit, adventures, golf etc. Ring 0924 371135. The lot £115 ono.

✱ Acorn Atom — 12k + 16k ROM, teleprinter cassette player, 5A psu £70 worth s/ware + misc items. Going to university need funds. Total value £550 accept £375 ono. Malvern (068 45) 62259 eve and w/ends.

✱ ZX80 — Sinc built, 16k RAM, pack exc cond. All leads and manual inc only £50. Andrew Platt, 20 Longfield Rd, Shaw, Oldham OL2 7HD.

✱ ZX81 — Sinc built 16k RAM, psu, all leads, manual, perfect cond, Sinc cassettes Nos. 1,3,4 £90. Tel Denbigh (074-571) 2147.

✱ Microtan 65 — psu, hex keyboard, leads, manual, Tanex manual, Space Invaders, ROM, £100, phone 505 2131.

✱ Atari Video Computer — 5 cartridges: Pele Soccer, Space Invaders, Dragster, Laser Blast, Combat; only £130, worth £200. Tel: (0524) 415318.

✱ PET/CBM 3008 — large keyboard, new ROM, two data-cassettes, toolkit, various software inc. Invaders, chess, manuals, dustcover. ex cond. £385. Tel: Didcot 812905.

✱ Acorn Atom — 12k RAM +8k ROM, Acorn built, exc cond. Power supply, leads, manuals inc. Also Astrobirds, Space Invaders, Pinball programmes, £165 the lot. Phone Kevin 051 334 6704.

✱ ZX81 — +16k RAM, Sinc built, leads, psu manual, little used, mint cond. £85. Ring Preston 744680 STD code 0772.

✱ ZX80 — 16k Sinc built, 8k ROM, ZX printer in orig. box. Manuals, many games and business programs on cassette, several books and interface/sync magazines. £150. Tel: 041-644 2450.

✱ Acorn Atom — 12k ROM, 12k RAM, tape, leads, manual, power supply, s/ware inc Atom Invaders, Othello etc. 6months old. £200. Owner purchasing bigger machine. 01-686 9780 any time.

✱ MZ-80K — 48k, VGC, boxed, Basic, Fortran, Systems program, ZEN, dissassem, Chess, Invader, Monaco-GP, monitor list, manuals, Sargon list, Manchester delivery, Quick sale only, £299. Tel: Glossop 3019.

✱ TI59 + PC100C Printer — exc cond. Boxed with master, maths utilities, RPN, Sim modules, also lab chem printer utilities packets + mag cards. £210. Tel: Maurice, Wantage 2929 x2426 9—5pm.

✱ Atari 800 — 32k RAM with program recorder, Joysticks, Star Raiders, 3 adventures and Galactic Empire, only 6months old, £600. Ruislip 72696.

✱ Video Genie — 16k complete with sound, arrow keys, VU meter and leads etc, in orig box + books and cassettes (M/L utilities + games). £240. Tel: 0530 413974.

✱ Atom — Acorn built, 12k + 12k + 4k. ROM floating point, + VIA + PSU + leads, manual, s/ware + Getting Acquainted, worth £55, only 2 months old. Worth £300, sell for £235 ono. Job lot. Tel: 01-607 9778 after 6.30.

✱ Superboard II — £110 ono, psu, programmable sound generator, new metal case, all manuals, exc cond. Ring 04946 5311 after 6.

✱ ZX81 — Sinc built, + 16k RAM s/ware cassettes 1,3,4,5. Full guarantee £75 ono. Cutting, Leicester (0533) 394171. psu, books, leads, all included.

✱ Video Genie — 16k TAB keys, vu meter. 12 months old, s/ware inc. Sargon, Ghost Town, Invaders, books etc. Bargain for quick sale £230. Phone Juan, Weybridge 53851 eve.

✱ UK101 — cased, 16k, 9amp supply. All monitors 300/600 baud, ½MHz, 16/32 screen colour graphics, Basics 1,3,4, masses of s/ware, Space Invaders, Forth assembler, extra RAMs, £220 ono. Phone Hamilton 426973.

✱ Atari 400 — 16k, 410 program recorder, 2 Joysticks, 2 psu's and manuals, 4 months old, £380. Tel: (0443) 450840

✱ ZX81 — 16k RAM, exc cond, little use. All leads, manual power supply, packaging, inc. best games tapes, Asteroids, caterpillar, 3D Maze etc. £85. Tel: Lewis Pullen, Reigate 42321 after 6.

✱ PET 3016 — 16k, new ROM, large keyboard cassette, 18 months old. Exc cond. Small selection of programs and books. £350. ono. Tel, Pill 2029 after 6.30pm or w/ends.

✱ ZX81 — +16k, Sinc built + adaptor, leads, tape recorder, games tapes. Guaranteed. 3 months old. Bargain £99. Tel: 0385 734045. The Cottage, Flass Hall near Esh Winning, Durham City.

✱ UK101 — 8k, cased with cegmon. 10k Basic, new Basics 3,4,5. 300/600/1200 Baud, 1-2MHz. Games inc Invaders £280. Ikegami 9in b/w monitor £80. Whole lot inc cassette recorder £360. Tel: Erith 33906.

✱ VIC-20 — datasette plus 3k RAM, prog ref guide intro to Basic two learning cassettes revealed, £285 ono. Tel: Basingstoke 0256 62142 eve.

✱ Nascom 2 — 3A psu, 32k, RAM 'A' board, Fully cased, 8k Basic, toolkit, Nas-Sys 1, graphics ROM, 2400 Baud cassette. All connection leads supplies, comprehensive documentation & lots of s/ware. £399 ono. Tel: Northampton 28556 eve.

✱ Video Genie — 16k, leads and manual, Old style, will accept any offer over £150. Buyer to collect if possible. Contact Mr L Jackson, 26 Norman Avenue, Nuneaton CV11 5NX.

✱ Video Genie plus TRS-80 — green screen monitor, assembler, tiny Pascal and books on same. Reasonable offers around £300. Tel: 01-743 7629.

✱ ZX81 — Sinc built, reliable 16k, 3 months old, leads + manual, useful book & at least 20 programs, Adventure, Invaders and Others. Exc cond. Only £90. Tel: Eve Reigate (Surrey) 43850.

✱ PET 4008 — new ROM separate cassette recorder lots of manuals, books, games and progs £390 ono. Buyer collects unless in area. Tel: 0203 416158 after 4.30 w/days, w/ends, anytime.

✱ AIM 65 — 16k RAM assembler, Basic 30 printer, rolls cased £350 ono. paper punch and reader £150 ono Darlington (0325) 64477 DL38JP Appleton, buyer collects.

✱ 48k Apple II — + 2 disk drives with controller board, good colour board, paddles, lots of s/ware manuals, vgc only £875. Tel: Harlow (0279) 30544.

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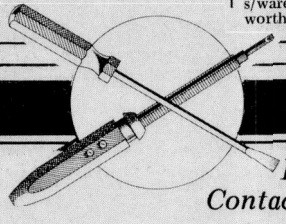
✱ ZX81 — 16k RAM, Sinc built, PSU + all leads, manual. Exc cond. machine code, prog book, star trek tape. Sinc tape, owner upgrading £80. Tel: 041 942 2028.

✱ ZX81 — with 16k RAM, Sinc built, boxes & leads, five cassettes of s/ware inc chess, games, business, £100 ono. Tel: 01-723 0808 eve. Ask for Jon.

✱ Acorn Atom — 12k+12k with word pack ROM, two psus, leads, manual, extra books + utilities, soft vdu and business s/ware. Collect for £190. Tel: 01-349 3263.

✱ TRS80 — LII, 16k, complete with monitor and covers, CTR80, tape recorder, inc £100 worth of s/ware £425 ono. Also Tandy Parallel printer interface £30 ono. Tel: Winfield, Row 3105.

✱ VIC20 — C2N cassette unit + 3k high res cartridge, Avenger, Super Lander also Pacman, Breakout, Joystick, 4months old exc cond. Worth £325, sell for £275. Phone Gareth after 6pm.



ACC NEWS

Rupert Steele of the Amateur Computer Club reports the latest Club news. Contact him at St. John's College, Oxford. Enclose large SAE for sample newsletter.

The comms hacks are at it again. All sorts of people are doing all sorts of things in order to set computers to talk to each other down the phone system.

OEL has announced two cheap acoustic couplers, one of which is Prestel compatible (ie, receives at 1200 baud, transmits at 75 baud), and the other is V21 spec (300 baud both ways). So computer shall speak unto computer. . . and BT shall collect the pennies, even unto the end of the call.

Talking of expensive phone calls, a group of gentlemen wearing smart dark suits and carrying violin cases approached ACC Chairman Peter Whittle at a recent exhibition. They wanted to set up inter-computer communications between England and their Godfathers in Rome. On Tuesday May 25, initial experiments were carried out between Oxford (RML 380Z) and Rome (Apple) via CCITT V21 modems and most of Europe's PTTs. As soon as Peter manages to extract himself from his concrete wellington boots, he'll be able to report on this experiment in international personal computing.

Continuing in an international vein, OPeCC (that's Oxford Personal Computer Club), is holding a talk on 'Hobbyist Remote Networks and Bulletin Boards' at 7.30pm on 22 July in the Old Fire Station, George Street, Oxford. Contact Tim Fowler at 39 Charles Street, Oxford, OX4 3AU for more info.

Should you be as ignorant of comms as I am, I can thoroughly recommend the ACC's Newsletter 'ACCumulator' for refreshment; write to me for details of ACC membership if you're not already 'in the club'. The newsletter contains quite a bit of technical background to comms, as discussed in 'Your Computer and the Telephone', the ACC symposium that we reported last month.

And now, the rest of the news. . .

Vernon Gifford is back on the android trail again. Last November, he organised the ACC National Conference on Personal Micro-Robotics (half micro-mouse, half other applications), and so he's now following it up by starting an ACC study group on the subject. At the intial meeting on 24 April this year it was decided to study micro-robotic applications that could be realised for less than a thousand pounds. The group is planning to meet approximately monthly, so write to Vernon Gifford, 111 Selhurst Road, London SE25 6LH for more details.

Also setting up ACC special interest groups is Jim Turner. This time it's the 68XX(X) SIG, which is a national group looking at the 6800, 6809 and 68000 processors. The inaugural meeting of the steering committee on 17 April led to a decision to concentrate on promoting interchange of hardware and software 'experience' between members. So anybody wishing to tell/hear of any 68XX experiences should contact Jim Turner at 63 Millais Road, London E11 4HB (01-558 3681).

While you are setting up your new group (no doubt assisted by what you read in this column), *please* don't restrict it to a single machine if you're locally based. There is nothing more annoying to a Spectrum user than to find that his local club is really 'The East Grinstead BBC Users' Group' (or TEGBUG if you like), and caters only for that one machine. General local clubs have a wider appeal, and prevent the members becoming stale for want of variety of machines.

SOS... SOS... SOS... two areas appeared notably short of computer clubs at the recent exhibitions, namely Wiltshire and the Slough area. Please can somebody out there either tell the ACC about their wonderful (but secret) club, or else start one. Please write to me if anything happens or is about to.

The DACS (Doncaster Amateur Computer Society) has now been going for over a year and recently held its first AGM. Meetings are held on the first Wednesday of the month at the NCB Lodge, Bennethorpe, Doncaster. Annual membership fees are a fiver and half that if you're unemployed. Secretary: Mr D M Kiss, Flat 7, 99 Thorne Road, Town Moor, Doncaster, DN1 2JT. But where does the analogue work come into their Society?

There is also a new club in Walsall. They don't seem to have a catchy name, but they intend to meet on the second and fourth of the month (Bank Holidays excepted) at 6:45pm. The convenor is Mrs Alison Hunt, of 'Lael', 58 Princes Avenue, Walsall, West Midlands, and she has already been busy arranging discounts on software and computer insurance. They are starting a computer books library, while holding informal meetings.

The Bournemouth Computer Club also wrote to the ACC recently. They are getting involved in writing game programs, in order to learn how to write winning algorithms. Their latest project is called 'EXPLODE' — and may the Force be with them. Contact Peter Hibbs, Secretary, Bournemouth Computer Club, 54 Runnymede Avenue, Bournemouth, Dorset, BH11 9SE.

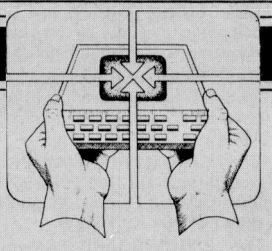
There seems to be a growing feeling that the ACC should act as a kind of national coordinating body of computer clubs (hence the suggested new title 'Association of Computer Clubs'), but there are also views that the ACC should maintain its present status and high quality newsletter. In fact, the two roles, while distinct, complement each other quite well. An organisation that claims to represent the hobbyist nationally in a field as technical as this one naturally needs to have

ACC NEWS

members with strong technical backgrounds. That is what the newsletter 'ACCumulator' does; it biases the membership of the ACC towards the technically more advanced.

This helps create a body of people to represent and co-ordinate hobbyist interests in the micro scene. In my view, this double role is one of the stengths of the ACC (if a bit of a strain on the committee), and this is symbolised by the fact that the initials ACC stand both for Amateur Computer Club and Association of Computer Clubs.

CTUK! CONTACTS



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Headmaster,
Shawfield Norden
Community Middle School,
Shawfield Lane,
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Rochdale
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Alan S Waring,
Palmers Green & Guildhall,
Winchmore Hill,
London N21 2NS

NETWORK NEWS

These are all the European networks of which we're aware. Most are free — but phone them for details.

Forum-80 Hull. . . (Forum-80 H,Q) Tel: 0482 859169, System operator Frederick Brown. International electronic mail, library for up/down loading software. Forum-80 Users Group, Pet Users section shopping list system hours, 7 days a week midnight to 8.00am, Tues/Thurs 7.00pm to 10,00pm Sat/Sun 1.00pm to 10.00pm.

Forum-80 London. . . Tel: 01-747 3191. System operator Leon Jay. Electric mail, library for downloading. System hours: Tues/Fri/Sun 7.00pm to 11.00 pm.

Forum-80 Milton. . . (TRS-80 Users Group 80-Net) Tel: 0908 566660. System Operators: Leon Heller and Brian Pain. Electronic mail, library, newsletter, TRS-80 information system hours: 7 days a week 7.00pm to 10.00 pm.

Forum-80 Holland. . . Operator: Nico Karssemeyer, tel 01 313 512 533. Facilities: electronic mail, program up/downloading, shopping list. Hours: Tues-Sat 1800-0700 nightly, continuous from 1800 Sat — 0700 Tues.

CBBS London. . . Operator: Peter Goldman, tel 01-399 2136. Facilities: electronic mail, program downloading. Hours: Wed 0700-0930 & 1900-2200, Fri 1900-2200, Sun 1600-2200.

Mailbox-80 Liverpool. . . 051-220 9733, System Operator: Peter Tootill, Electronic mail, downloading TRS-80 information.

ACC. . . members bulletin board, Peter Whittle (0908 44262)

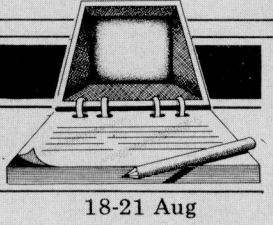
ABC-80. . . Stockholm, Sweden) Tel: 010 468 190522.

University Research Computer. . . Sweden. Tel: 010-468 23660, guests use password "66,66" for access.

Elfa. . . Sweden 010 468 7300 706

Tree Tradet. . . Sweden 010-468 190522.

DIARY DATA



Readers are strongly advised to check details with exhibition organisers before making arrangements to avoid wasted journeys due to cancellations, printer's errors, etc.

Hong-Kong	Combex-Business Equip. & Computer Exbn. Contact: Cahners Exbn Group, Guildford (0843) 38085	18-21 Aug
London	(Royal Horticultural Hall) ZX Microfair.	21 Aug
Glasgow	Compec Scotland. Contact: IPC Exbns Ltd, 01-643 8040	7-9 Sept
London	(Barbican Centre) PCW Show. Contact: Interbuild Exbns Ltd, 01-486 1951	9-12 Sept
Bristol	West of England Electronics Exbn. Contact: Exbns For Industry Ltd, Oxted (08833) 4371	14-16 Sept
London	Computer Choice '82. Contact: James Brewster Assoc, 01-486 8686	20-22 Sept
USA	(Atlanta Georgia) Computerised Office Equip Exbn. Contact: Cahners Exbn Group, Guildford (0483) 38085	21-23 Sept

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LEISURE LINES

by JJ Clessa

There was a good response — about 250 entries — to May's puzzle. In addition, we received about 15 entries for the April competition which had been posted second class on various dates on or after 22 April and which, obviously, didn't arrive in time to be eligible for the April prize. Let that be a warning — the old PO ain't what it used to be.

Most of the entries were correct and offered both solutions: 109989 which, when multiplied by 9, gives 989901; and 219978 which, when multiplied by 4, gives 879912.

The winner, selected by random number, was Mr (or Mrs) A Marshall of Huddersfield. Well done, Mr Marshall — your prize will probably be with you by the time you read this.

Quickie

No answers, no prizes. A new-laid egg drops six feet directly above a concrete floor without breaking. How it is done? (And it's not hard-boiled!)

Prize puzzle

It is easily shown that the sum of any number of consecutive cubes, starting at 1^3, is always a perfect square. Thus $1^3 + 2^3 = 9 = 3^2$; $1^3 + 2^3 + 3^3 = 36 = 6^2$; $1^3 + 2^3 + 3^3 + 4^3 = 100 = 10^2$ etc. But in this month's puzzle, starting at 1^3 is not permitted. We want you to find the smallest perfect square that is the sum of at least four consecutive cubes (excluding unity). That should make the micros whirr!

Answers on postcards please to: August Prize Puzzle, *PCW*, 14 Rathbone Place, London W1P 1DE, to arrive not later than 31 August 1982.

PROGRAMS

PCW is interested in Basic or Pascal Programs for any popular micro — please tell us which one you wrote your program on and how much memory it uses. Make sure your programs are fully debugged before you send them in on cassette (although we will accept disks) with a clear listing on plain paper. Documentation would be welcome, and if you want it returned please label everything with your name and address and include an SAE. Send contributions to Maggie Burton, *PCW* Programs, 14 Rathbone Place, London W1P IDE

TRS-80 Quadrangle

by Stephen Fawthrop and Eileen Baghoomians

This game is somewhat in the Othello style but is rather more difficult. Playing can be either against the computer or against another player. The object of the game is to place four pieces at the corners of a square of any size. Full instructions are included and Quadrangle will run on a TRS-80 Level 2 in 9k.

```
100 CLEAR500:DEFSTRA-E:DEFINTF-Z:POKE16396,165
110 DIMA(1),D(1),S(1),F(70,2),G(12),M(6,6,2)
120 CLS:PRINT@529,CHR$(23)"QUADRANGLE";
130 PRINT@960,"BY S G FAWTHROP & E BAGHOOMIANS";
140 FORK=1TO37:READL,M:D(0)=D(0)+CHR$(L):D(1)=D(1)+CHR$(M):NEXT
150 FORK=1TO37:READL:C=C+CHR$(L):NEXT
160 FORK=1TO70:READF(K,0):NEXT:FORK=0TO11:G(K)=2[K:NEXT:G(12)=4096
170 GOSUB1170
180 CLS:PRINT"ONE OR TWO PLAYERS?"
190 B=INKEY$:IFB<"1"ORB>"2"THEN190:ELSEP=VAL(B)
```

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PROGRAMS

```
200 CLS:IFP=1THENINPUT"YOUR NAME PLEASE";A(0):A(1)="COMPUTER":PRINT@512,
    "YOUR PIECES WILL BE",CHR$(27);D(0);:PRINT@704,"THE COMPUTER'S
    WILL BE",CHR$(27);D(1);
210 IFP=2THENINPUT"FIRST PLAYER'S NAME";A(0):PRINT@128,"YOUR PIECES
    ARE",,CHR$(27);D(0);:PRINT@512,;:INPUT"SECOND PLAYER'S NAME";
    A(1):PRINT@640,"YOUR PIECES ARE",,CHR$(27);D(1);:P=0
220 IFP=1THENPRINT@960,"LEVEL OF PLAY (1-3)";:E=INKEY$:ELSEFORK=1TO1000:
    NEXT:E="0":GOTO240
230 E=INKEY$:IFE<"1"ORE>"3"THEN230
240 T=VAL(E):TS=T:S(0)=0:S(1)=0
250 RP!=RND(0)*2.5+3.5:RN!=RND(0)*2.5+2.5:RM=50:ZX=0:CLS
260 IFA(1)<>"COMPUTER"THEN310
270 IFT<3THENP=1:GOTO310
280 PRINT"DO YOU WANT TO GO FIRST?":B=INKEY$
290 B=INKEY$:IFB=""THEN290ELSEIFB="Y"THENP=0:ELSEIFB="N"THENP=1:ELSE290
300 CLS:IFB="Y"THENZX=1
310 FORK=0TO6:FORL=1TO6:M(K,L,0)=-1:NEXT:M(K,0,0)=0:FORM=1TO2:FORL=0TO6:
    M(K,L,M)=0:NEXT:NEXT:NEXT:GOSUB1050
320 PRINT@896,CHR$(250);:PRINT@896,A(P)"'S MOVE";:B=INKEY$:RM=RM+1
330 IFP=1ANDA(P)="COMPUTER"THENIFZX=1THENQ=P:GOTO780:ELSEZX=1:G=RND(4)+2
    :IFG<6THEN350:ELSEG=4+(RND(2)+1)*SGN(RND(0)-.5):GOTO350
340 B=INKEY$:IFB=""THEN340ELSEG=VAL(B)
350 IFB="0"THENGOSUB1010:GOTO320ELSEIFB="H"THENQ=0:T=3:GOTO780
360 IFG<1ORG>7THENPRINT@896,"YOU HAVE MADE AN UNACCEPTABLE MOVE,
    ";:PRINT"PLEASE TRY AGAIN";:FORK=1TO750:NEXT:GOTO320
370 G=G-1:IFM(G,0,0)=6THENPRINT@896,"THE COLUMN CHOSEN IS OCCUPIED,
    ";:PRINT"PLEASE TRY AGAIN";:FORK=1TO750:NEXT:GOTO320
380 T=TS:IFB="H"THENPRINT@896,"I RECOMMEND";G+1;".  "A$(0)"'S MOVE";
    :GOTO340
390 M(G,0,0)=M(G,0,0)+1:M(G,M(G,0,0),0)=P:GOSUB400:GOSUB420:IFE<>"Y"THEN
    GOSUB520:GOTO660:ELSEGOTO660
400 IFP=1ANDA(P)="COMPUTER"THENPP=835+8*G-128*M(G,0,0):FORK=1TO9:
    PRINT@PP,D(P);:FORL=0TO50:NEXT:PRINT@PP,C;:FORL=0TO50:NEXT:NEXT
410 PRINT@835+G*8-128*M(G,0,0),D(P);:RETURN
420 Q=P:X=G:Y=M(G,0,0)
430 ONERRORGOTO490:E="N"
440 FORK3=1TO6:IFK3=YTHEN470
450 IFM(X,K3,0)=QANDM(X+Y-K3,Y,0)=QANDM(X+Y-K3,K3,0)=QTHENE="Y":Y8=1:
    GOTO480
460 IF M(X,K3,0)=Q AND M(X-Y+K3,Y,0)=Q AND M(X-Y+K3,K3,0)=Q THENE="Y":
    Y8=-1:GOTO480
470 NEXT
480 ONERRORGOTO0:RETURN
490 IF(ERR=8ORERR=16)ANDERL=450THENRESUME460
500 IF(ERR=8ORERR=16)ANDERL=460THENRESUME470
510 END
520 VL=(2(X)OR2((Y+6):FORK4=1TO70:VM=VLANDF(K4,0):IFVM=VLTHENGOSUB540
530 NEXT:RETURN
540 IFP=1THEN600ELSEIFABS(F(K4,1))>5THENRETURNELSEIFF(K4,1)<0THEN620ELSE
    F(K4,1)=F(K4,1)+1:IFF(K4,1)=1THENF0=1ELSEIFF(K4,1)=2THENF0=2ELSEF0=
    7
550 U5=1
560 FORU=0TO12:VX=F(K4,0)ANDG(U):IFVX=0THEN580
570 IFU<7ANDU<>XTHENU1=UELSEIFU>6ANDU<>YTHENU2=U-6
580 NEXT:M(X,U2,U5)=M(X,U2,U5)+F0:M(U1,Y,U5)=M(U1,Y,U5)+F0:M(U1,U2,
    U5)=M(U1,U2,U5)+F0
590 RETURN
600 IFABS(F(K4,1))>5THENRETURNELSEIFF(K4,1)>0THEN640ELSEF(K4,1)=F(K4,
    1)-1:IFF(K4,1)=-1THENF0=1ELSEIFF(K4,1)=-2THENF0=2ELSEF0=7
610 U5=2:GOTO560
620 IFF(K4,1)=-1THENF0=-1ELSEIFF(K4,1)=-2THENF0=-2ELSEF0=-7
630 GOSUB610:F(K4,1)=10:RETURN
640 IFF(K4,1)=1THENF0=-1ELSEIFF(K4,1)=2THENF0=-2ELSEF0=-7
650 GOSUB550:F(K4,1)=-10:RETURN
660 FORG=0TO6:IFM(G,0,0)=6THENNEXT:ELSE680
670 IFE<>"Y"THENPRINT@896,"THE GAME IS A DRAW";:GOTO750
680 IFE<>"Y"THENP=(P+1)AND1:GOTO320:ELSES(P)=S(P)+1:PRINT@896,CHR$(250):
    PRINT@896,A(P)" WINS          ";:PRINT@4+31*P,A(P)S(P);
690 FORL=1TO9:PRINT@835+8*X-128*Y,C;:PRINT@835+8*X-128*K3,C;:PRINT@835+8
    *(X+Y8*(Y-K3))-128*Y,C;:PRINT@835+8*(X+(Y-K3)*Y8)-128*K3,C;
700 FORM=1TO50:NEXT
710 PRINT@835+8*X-128*Y,D(P);:PRINT@835+8*X-128*K3,D(P);:PRINT@835+8*(X+
    Y8*(Y-K3))-128*Y,D(P);:PRINT@835+8*(X+(Y-K3)*Y8)-128*K3,D(P);

720 FORM=1TO50:NEXT
730 NEXT
740 GOSUB1020
750 PRINT@920,"DO YOU WISH TO PLAY ANOTHER GAME?":E=INKEY$
760 E=INKEY$:IFE=""THEN760ELSEIFE<>"Y"THENENDELSEPRINT"ARE THE PLAYERS
    THE SAME?":E=INKEY$
770 E=INKEY$:IFE=""THEN770ELSEIFE<>"Y"THEN180ELSE250
780 PRINT" -- THINKING";:FORK=0TO6:PRINT".";
790 IFM(K,0,0)=6THENM(K,0,1)=-1000:GOTO810
800 R=K:S=M(K,0,0)+1:GOSUB1090:M(K,0,1)=VX
810 NEXT:GOSUB990:IFM(G,0,1)>998THEN380
```


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PROGRAMS

```
820 FORK=0TO6:IFM(K,0,0)<5THENQ=(P+1)ANDI:R=K:S=M(K,0,0)+2:GOSUB1090:
    IFVX=1000THENM(K,0,1)=-999
830 IFM(K,0,1)>-999THENPRINT".";:Q=P:R=K:S=M(K,0,0)+1:GOSUB1100:M(K,
    0,1)=VX
840 NEXT
850 IFT=1THEN960ELSEIFT=2THENGOSUB1120:GOTO960
860 FORK=0TO6:IFM(K,0,1)<-997THEN950:ELSEM(K,M(K,0,0)+1,0)=P:M(K,
    0,0)=M(K,0,0)+1
870 FORM=0TO6:IFM(M,0,0)=6THENM(M,0,2)=-1000:GOTO880ELSEQ=(P+1)AND1:
    R=M:S=M(M,0,0)+1:GOSUB1100:M(M,0,2)=VX
880 NEXT:PRINT".";
890 FORLP=1TO4:L=-100:FORM=0TO6:IFM(M,0,2)>LTHENL=M(M,0,2):LQ=M
900 NEXT:M(LQ,0,2)=-1000:M(K,0,1)=M(K,0,1)-L*RN!
910 NEXT
920 Q=P:R=K:S=M(K,0,0)+1:GOSUB1090:IFVX=1000THENM(K,0,1)=M(K,0,1)-RN!*RM

930 M(K,0,0)=M(K,0,0)-1:M(K,M(K,0,0)+1,0)=-1
940 PRINT".";
950 NEXT:Q=P
960 PRINT@896,CHR$(254);
970 GOSUB990
980 GOTO380
990 G=-1:L=-1000:FORK=0TO6:IFM(K,0,1)>LTHENL=M(K,0,1):G=K:ELSEIFM(K,
    0,1)=LTHENIFABS(3-K)<ABS(3-G)THENL=M(K,0,1):G=K
1000 NEXT:RETURN
1010 CLS:GOSUB1050
1020 FORK=0TO6:FORL=1TO6
1030 IFM(K,L,0)<>-1THENPRINT@835+8*K-128*L,D(M(K,L,0));
1040 NEXT:NEXT:RETURN
1050 M=59:E=CHR$(46):FORL=1TO7:FORK=1TO8:M=M+8:PRINT@M,E;:NEXT:M=M+64:
     NEXT
1060 PRINT@4,A(0)S(0);:PRINT@35,A(1)S(1);
1070 M=125:FORK=1TO7:M=M+8:PRINT@M,K;:NEXT
1080 RETURN
1090 VX=0:X=R:Y=S:GOSUB430:IFE="Y"THENVX=1000:RETURN:ELSEQ=(Q+1)AND1:
     X=R:Y=S:GOSUB430:Q=(Q+1)AND1:IFE="Y"THENVX=999:RETURN:ELSERETURN
1100 IFP=0THENVX=M(K,M(K,0,0)+1,1)ELSEVX=M(K,M(K,0,0)+1,2)
1110 RETURN
1120 FORK=0TO6:IFM(K,0,1)<-997THEN1160:ELSEM(K,M(K,0,0)+1,0)=1:M(K,
     0,0)=M(K,0,0)+1
1130 IFM(K,0,0)<6THENQ=(P+1)AND1:R=K:S=M(K,0,0)+1:GOSUB1100:M(K,0,
     1)=M(K,0,1)-RP!*VX
1140 M(K,0,0)=M(K,0,0)-1:M(K,M(K,0,0)+1,0)=-1
1150 Q=(P+1)+1:R=K:S=M(K,0,0)+1:GOSUB1100:M(K,0,1)=M(K,0,1)+RP!*VX:
     M(K,0,1)=M(K,0,1)*5+RND(4)
1160 PRINT".";:NEXT:Q=P:RETURN
1170 CLS:PRINT"
                    INSTRUCTIONS

AT THE  BEGINNING OF THE GAME YOU WILL BE GIVEN THE OPTION OF
EITHER PLAYING AGAINST THE COMPUTER OR AGAINST ANOTHER PLAYER.

THE OBJECT OF THE GAME IS TO PLACE FOUR OF YOUR PIECES AT THE
CORNERS OF A ";
1180 PRINT"SQUARE.  THE FIRST TO DO SO IS THE WINNER.
EACH COLUMN IS FILLED FROM THE BOTTOM UP.

THE COLUMNS ARE INDICATED BY NUMBERS FROM  ONE TO SEVEN.  IN
ORDER TO MAKE A MOVE SIMPLY PRESS THE NUMBER CORRESPONDING TO
THE COLUMN IN WHICH YOU WISH TO PLAY.
"
1190 PRINT"
HIT ANY KEY TO CONTINUE.";
1200 IFINKEY$=""THEN1200
1210 CLS:PRINT"IF YOU CHOOSE TO PLAY AGAINST THE COMPUTER YOU WILL
     BE
GIVEN THE CHOICE OF THREE LEVELS OF DIFFICULTY.

AT ANY POINT YOU CAN SEEK ADVICE FROM THE COMPUTER.  TYPE 'H'
(FOR HELP) AND THE COMPUTER WILL SUGGEST A MOVE.  THIS OPTION"
1220 PRINT"IS AVAILABLE EVEN WHEN NOT PLAYING  AGAINST THE COMPUTER.

IF YOU NEED TO RECONSTRUCT THE BOARD (AFTER ACCIDENTALLY HITTINGTHE
     BREAK KEY!) HIT '0' WHEN IT IS YOUR MOVE.

WHEN TWO PEOPLE ARE PLAYING, THE GAME CAN BE SPEEDED UP EDITING
LINE 390.  ";
1225 PRINT"JUST DELETE 'GOSUB520:'  HOWEVER YOU WILL NOT GET ANYMEANINGF
     UL HELP IF YOU THEN TYPE 'H'.

HIT ANY KEY TO CONTINUE."
1230 IFINKEY$=""THEN1230
1240 RETURN
1250 DATA 176,176,176,176,176,176,176,176,176,176
1260 DATA 176,176,176,176, 26, 26, 24, 24, 24, 24
1270 DATA  24, 24, 24, 24, 24, 24, 24, 24, 24, 24
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1290 DATA 191,128,191,191, 26, 26, 24, 24, 24, 24
1300 DATA  24, 24, 24, 24, 24, 24, 24, 24, 24, 24
1310 DATA 179,179,179,179,179,179,179,179,179,179
1320 DATA 179,179,179,179,128,128,128,128,128,128
1330 DATA 128, 26, 24, 24, 24, 24, £4, 24, 24,128
1340 DATA 128,128,128,128,128,128, 26, 24, 24, 24
1350 DATA  24, 24, 24, 24,176,176,176,176,176,176
1360 DATA 176
1370 DATA 387, 390, 396, 408, 432, 480, 771
1380 DATA 774, 780, 792, 816, 864,1539,1542
1390 DATA1548,1560,1584,1632,3075,3078,3084
1400 DATA3096,3120,3168,6147,6150,6156,6168
1410 DATA6192,6240, 645, 650, 660, 680, 720
1420 DATA1285,1290,1300,1320,1360,2565,2570
1430 DATA2580,2600,2640,5125,5130,5140,5160
1440 DATA5200,1161,1170,1188,1224,2313,2322
1450 DATA2340,2376,4617,4626,4644,4680,2193
1460 DATA2210,2244,4369,4386,4420,4257,4290
```

UK101 Conversion of units

by I H & O M Ashton

Those readers involved in scientific areas of work or play may well find this program a useful aid — especially if, as many people do, they still think in imperial units. A menu of 9 types of conversion tables is presented, eg, weight or mass, pressure, volume, length, area and velocity. A single (relevant) keystroke will give a menu related to the table required. Conversion is controlled by numeric input from the user to a limit of 13 conversions. Conversions may be chained together to allow for relations of units which are not available directly from the program and in the case of an incorrect selection the menu is again offered to the user.

The program will run as listed on a UK101 with CE1 monitor, using 5k in memory. As CE1 is rather less common than Cegmon, modifications for use under the latter are as follows:
Line 80 should read: FOR A=570 TO 584: READ B: POKE A,B: NEXT Line 180: NEXT: POKE 538,58: POKE 539, 2 Line 990: DATA 104,76,155, 255 and line 12000: POKE 11,236: POKE 12,251: X=USR (X): PRINT CHR$ (26): RETURN

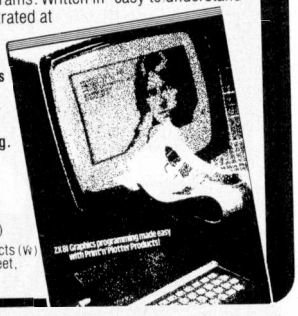
```
10 REM£CONVERSION OF UNITS£
80 FORA=560TO574:READB:POKEA,B:NEXT
100 GOSUB12000:PRINTTAB(15)"CONVERSION TABLES":PRINT
110 FORN=1TO9:READA$:PRINTTAB(3)NTAB(10)A$:NEXT:PRINT
120 PRINT"WHICH TYPE OF CONVERSION (1 to";N-1;")?"
130 GOSUB12010:B=E:IFB<49ORB>57GOTO130
135 RESTORE:FORN=0TO14:READA$:NEXT
140 GOSUB12000:FORN=0TOB-49:READA$:NEXT
145 PRINTTAB(10)A$;" Conversion"
150 FORN=1TO38*B-1854:READC$:NEXT
160 FORM=NTON+12:READC$,A,B$
165 IFC$="0"THENPRINT:GOTO180
167 D=(M-N+1)*2
170 PRINT(M-N)*2+1TAB(4)"➔"C$TAB(20)"TO "B$TAB(39)"←"D
180 NEXT:POKE538,48:POKE539,2
190 INPUT"Type selected number then press 'RETURN'";C
195 IFDGOTO200
197 GOSUB12000:PRINT" There are no ";A$;" conversions!"
198 PRINT:PRINT:PRINT" Press any key to continue":GOSUB12010:RUN
200 IFC=0ORC>DGOTO190
210 RESTORE:FORM=1TON+B-34:READC$:NEXT
220 FORP=1TOINT((C+1)/2):READC$,A,B$:NEXT
230 IFC/2=INT(C/2)THEND$=B$:B$=C$:C$=D$:A=1/A
240 GOSUB12000:PRINTTAB(10)A$:FORO=1TOLEN(A$):PRINTTAB(10)"=";:NEXT
250 PRINT:PRINT"You wish to convert:-"
260 PRINT:PRINTTAB(3)C$TAB(20)"TO "B$
270 PRINT"The conversion factor is";A
273 IFFGOTO310
275 IFE=89GOTO300
280 PRINT:PRINT:PRINT" Is this the required conversion (Y or N)?";
290 GOSUB12010:IFE=78THENGOSUB12000:PRINT:GOTO135
295 PRINT:GOTO240
300 PRINT:PRINT:PRINT"Type your number of ";C$
302 PRINT"then press 'RETURN";:INPUTF
305 PRINT:GOTO240
310 G=F*A:PRINT:PRINTF;C$
320 PRINTTAB(10)"is equivalent to"
```


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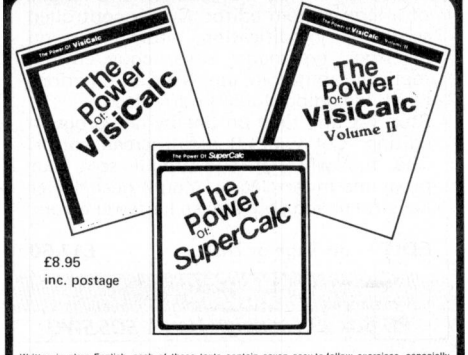
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PROGRAMS

```
330 PRINTTAB(20)G;B$:PRINT
340 PRINT"To continue this conversion (Press A)"
350 PRINT"For a NEW conversion (Press N)
355 PRINT" If you have finished (Press F)";
360 GOSUB12010:IFE=78THENPRINT:RUN
370 IFE=65THENPRINT:F=G:GOTO135
380 IFE=70THENEND
400 PRINT:GOTO240
980 DATA72,165,19,208,6,133,20,169,48,133,19
990 DATA104,76,105,255
1000 DATALength,Area,Volume and Capacity
1010 DATAPower Energy & Force,Pressure,Acceleration
1020 DATAVelocity,Weight or Mass,Miscellaneous
2000 DATAInches,25.4,Millimetres
2010 DATAFeet,.3048,Metres
2020 DATAYards,.9144,Metres
2030 DATAMiles,1.6093,Kilometres
2040 DATANautical Miles,1.852,Kilometres
2050 DATAPence/Yard,1.0936,Pence/Metre
2060 DATAMillimetres,1000,Microns
2070 DATAMicrons,1000,Milli-microns
2080 DATAMilli-microns,10,Angstrom units
2090 DATA1/8th Inches,3.175,Millimetres
2100 DATA1/16th Inches,1.5875,Millimetres
2110 DATA1/32nd Inches,.79375,Millimetres
2120 DATA0,0,0
3000 DATASq.Inches,6.4516,Sq.cm
3010 DATASq.Feet,.0929,Sq.Metres
3020 DATASq.Miles,2.59,Sq.Kilometres
3030 DATAPence/Sq.Foot,10.7639,Pence/Sq.Metre
3040 DATAPence/Sq.Yard,1.196,Pence/Sq.Metre
3050 DATASq.Yards,.83613,Sq.Metres
3060 DATAHectares,2.4711,Acres
3070 DATAPence/Hectare,.40468,Pence/Acre
3080 DATA0,0,0
3090 DATA0,0,0
3100 DATA0,0,0
3110 DATA0,0,0
3120 DATA0,0,0
4000 DATACubic Inches,16.387,Millilitres(cm3)
4010 DATACubic Feet,.02832,Cubic Metres
4020 DATACubic Yards,.76455,Cubic Metres
4030 DATAGallons,4.5459,Litres
4040 DATAFluid Oz,28.412,Millilitres(cm3)
4050 DATACubic Feet,28.316,Litres
4060 DATAPints,0.56824,Litres
4070 DATAPence/Foot3,35.315,Pence/Metre3
4080 DATAPence/Yard3,1.308,Pence/Metre3
4090 DATACubic Metres,219.97,Gallons
4100 DATAPence/Litre,4.546,Pence/Gallon
4110 DATA0,0,0
4120 DATA0,0,0
5000 DATAHorsepower,0.7457,Kilowatts
5010 DATABtu,1.05505,Kilojoules
5020 DATATherms,105.51,Megajoules
5030 DATAFt Lbs,1.3558,Newton Metres
5040 DATAKW Hours,3.6,Megajoules
5050 DATACalories,4.1868,Joules
5060 DATAHP Hours,2.685,Megajoules
5070 DATALbf,4.4482,Newtons
5080 DATAFt Lbs,.13826,Kilogram Metres
5090 DATA0,0,0
5100 DATA0,0,0
5110 DATA0,0,0
5120 DATA0,0,0
6000 DATABars,14.504,Lb/Sq.inch
6010 DATALb/Sq.inch,0.07031,Kg/Sq.cm
6020 DATALb/Sq.inch,6.8948,KN/Sq.Metre
6030 DATAInches (Hg),33.864,Millibars
6040 DATAFeet (Water),0.03048,Kg/Sq.cm
6050 DATAInches (Water),249.09,N/Sq.Metre
6060 DATAFeet (Water),29.891,Millibars
6070 DATALb/Sq.Foot,47.88,N/Sq.Metre
6080 DATALb/Sq.Foot,4.8824,Kg/Sq.Metre
6090 DATAAtmospheres,101.325,KN/Sq.Metre
6100 DATAAtmospheres,1.0332,Kg/Sq.cm
6110 DATAMillimetres(Hg),.01933,Lb/Sq.in
```


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PROGRAMS

```
6120 DATA0,0,0
7000 DATAMetre/sec/sec,2.237,Miles/hour/sec
7010 DATAMetre/sec/sec,3.2808,Feet/sec/sec
7020 DATAMetre/sec/sec,3.6,Kmetres/hour/sec
7030 DATA0,0,0
7040 DATA0,0,0
7050 DATA0,0,0
7060 DATA0,0,0
7070 DATA0,0,0
7080 DATA0,0,0
7090 DATA0,0,0
7100 DATA0,0,0
7110 DATA0,0,0
7120 DATA0,0,0
8000 DATAFt/minute,0.00508,Metres/Second
8010 DATAFt/Second,1.0973,Kilometres/Hour
8020 DATAMiles/Hour,0.4470,Metres/Second
8030 DATAKilometres/Hour,54.681,Ft/minute
8040 DATAKnot,1.1516,Miles/Hour
8050 DATAKnot,1.689,Ft/Second
8060 DATAKnot,51.48,Cm/Second
8070 DATAKnot,6080.2,Ft/Hour
8080 DATAKnot,.0309,Km/minute
8090 DATA0,0,0
8100 DATA0,0,0
8110 DATA0,0,0
8120 DATA0,0,0
9000 DATAOunces,28.35,Grammes
9010 DATALbs,0.45359,Kilograms
9020 DATAPence/Lb,2.2046,Pence/Kilogram
9030 DATATons,1.0161,Tonnes
9040 DATAPence/Ton,1.0161,Pence/Tonne
9050 DATA0,0,0
9060 DATA0,0,0
9070 DATA0,0,0
9080 DATA0,0,0
9090 DATA0,0,0
9100 DATA0,0,0
9110 DATA0,0,0
9120 DATA0,0,0
10000 DATADegrees C,1.8,+ 32 Degrees F
10010 DATA0,0,0
10020 DATA0,0,0
10030 DATA0,0,0
10040 DATA0,0,0
10050 DATA0,0,0
10060 DATA0,0,0
10070 DATA0,0,0
10080 DATA0,0,0
10090 DATA0,0,0
10100 DATA0,0,0
10110 DATA0,0,0
10120 DATA0,0,0
12000 POKE11,236:POKE12,251:X=USR(X):RETURN
12010 POKE11,0:POKE12,253:X=USR(X):E=PEEK(531):RETURN
```

PET Mopup

by Roger Ash

Mopup is a frustrating, effective, but simple game to run on any 'old ROM' PET. The idea is to 'mop up' blobs which appear randomly on the screen by colliding with them using the numeric keypad as a control panel. Each time you catch a blob another one appears. Your target is to beat the fastest time recorded on the computer. If you do this you start another game with extra blobs.

Full instructions are included in the program.

```
170 RS=65:N=10:M=42:SP=32:GOTO290
175 REM**** CHECK TIME ****
180 T=INT(TI/100):IF T<=TR THEN RETURN
190 TR=T:PRINT"■■"TAB(5)TR:IF TF=10000 THEN210
200 PRINT"■■■"TAB(10)TF
210 IF INT(T/2)<>T/2 THEN RETURN
215 REM**** POKE IN EXTRA BLOB ****
220 Q=INT(RND(TI)*878)+Z:IF PEEK(Q)<>SP THEN RETURN
230 POKE Q,81:F=F-1
240 RETURN
```


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PROGRAMS

```
250 PRINT"■■■
```

PROGRAMS

```
1010 PRINT:T$="(WHO LOOKS LIKE THIS)":GOSUB280
1020 PRINT:T$="*":GOSUB280:GOSUB250
1030 PRINT"■■■■"
1040 T$="TAKING 5 AS YOUR CURRENT POSITION
1050 GOSUB280:PRINT:T$="THE OTHER KEYS REPRESENT"
1060 GOSUB280:PRINT:T$="THE POINTS OF THE COMPASS"
1070 GOSUB280:PRINT:T$="THUS:-":GOSUB280:PRINT:PRINT
1080 T$="\   8   /":GOSUB280
1090 T$= "7  |  9":GOSUB280
1100 T$=  "\ | /":GOSUB280
1110 T$="4—  5  —6":GOSUB280
1120 T$=  "/ | \":GOSUB280
1130 T$= "1  |  3":GOSUB280
1140 T$="/   2   \":GOSUB280
1150 GOSUB250:PRINT"■■■■■"
1160 T$="EACH TIME YOU COLLIDE WITH A BLOB"
1170 GOSUB280:PRINT:T$="IT GETS 'MOPPED UP'"
1180 GOSUB280:PRINT:T$="THE CATCH IS..."
1190 GOSUB280:PRINT:T$="EVERY 2 SECONDS,OR SO"
1200 GOSUB280:PRINT:T$="A NEW BLOB IS BORN!!"
1210 GOSUB280:GOSUB250:PRINT"■■■■■"
1220 T$="IF YOU SUCCEED IN BEATING":GOSUB280:PRINT
1230 T$="THE FASTEST TIME, YOU START THE":GOSUB280
1240 PRINT:T$="NEXT GAME WITH 2 EXTRA!":GOSUB280
1250 PRINT:T$="**********":GOSUB280:PRINT
1260 T$="BE CAREFUL..":GOSUB280:PRINT
1270 T$="OR THE BLOBS WILL GET YOU FIRST!"
1280 GOSUB280:FORA=0TO4:PRINT:NEXT
1290 T$="■ PRESS ANY KEY TO PLAY ■":GOSUB280
1300 GETX$:IFX$=""THEN1300
1310 GOTO410
```

Apple Lifespan

by Frank Laughton

This well-presented program will give you a projected lifespan — ie, it'll tell you how much longer you're likely to be alive. From using it I don't think the PCW editors will be around much longer and apparently I'll only be around for another 29 years or so which I wouldn't exactly call a generous estimate for one of my tender years. . .

The program asks you several questions about whether or not you smoke, how much if you do, how much exercise you take, what type of work you do, how much alcohol you drink and the like. It also asks questions about the history of illness in your family and one or two on your own state of health — past and present.

You can reply in the same way any number of times and the program will still come up with the same estimate which says something for its accuracy. It will run on any Apple II.

Use of the program is as simple as it can be — user prompts consist entirely of statements and questions and, as with any question-and-answer type exercise, its accuracy relies on the honesty of the user.

```
30  REM
INTRO

40  GOSUB 1390
50  REM
SET TOP MARGIN

60  POKE 34,3: CALL  - 990
70  REM
SET DATUM LIFESPAN

80  CLEAR :TT = 72
90  REM
PERSONAL DATA

100  CALL  - 198
110  VTAB 2: CALL  - 958: HTAB 13
     : SPEED= 100: INVERSE : PRINT
     "PERSONAL DATA";: NORMAL
120  CALL  - 868: SPEED= 255
130  REM
AGE?

140  GOSUB 450: GOTO 270
150  REM
MAIN LOOP

160  HTAB 1: PRINT A$;"? ";
170  FOR DOT =  PEEK (36) TO 35: PRINT
     ".";: NEXT
180  HTAB 36: CALL  - 868: PRINT
     " ";: GET R$
190  ON R$ = "Y" GOTO 200: ON R$ =
     "N" GOTO 210: GOTO 180
200 Y% = 1:T = Y: GOTO 220
210 Y% = 0:T = N
220  PRINT R$:TT = TT + T: PRINT
     : RETURN
230  REM
READ DATA

240  READ A$,Y,N:ND = ND + 1
250  RETURN
260  REM
AND ASK THE QUESTION

270  GOSUB 240: GOSUB 150
280  REM
LOGIC

290  IF ND = 1 AND  NOT Y% THEN E
     M% = 1
300  IF ND = 2 THEN SX% = Y%
310  ON (ND = 3) * Y% GOSUB 240
320  ON (ND = 8) * EM% GOSUB 240
330  ON (ND = 10) *  NOT Y% GOSUB
     240
340  ON (ND = 12) GOSUB 690
350  ON (ND = 14) * Y% GOSUB 240
360  ON (ND = 17) * Y% GOSUB 240
```


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PROGRAMS

```
370  ON (ND = 21) * Y% GOSUB 240
380  ON (ND = 21) * Y% GOSUB 240
390  ON (ND = 22) * Y% GOSUB 240
400  ON (ND = 25) * Y% GOSUB 240
410  ON (ND = 25) * Y% GOSUB 240
420  ON (ND = 26) * Y% GOSUB 240
425  ON (ND = 29) GOTO 860
430  GOTO 270
440  REM
GET AGE GROUP

450  HOME : PRINT "1)  UNDER THIR
     TY"
460  PRINT "2)  BETWEEN 30 AND 40
     "
470  PRINT "3)  BETWEEN 40 AND 50
     "
480  PRINT "4)  BETWEEN 50 AND 60
     "
490  PRINT "5)  BETWEEN 60 AND 70
     "
500  PRINT "6)  OVER 70"
510  PRINT : PRINT "WHICH AGE GRO
     UP ARE YOU? ..... ";
520  GET R$
530 R =  VAL (R$): IF R < 1 OR R >
     6 THEN 520
540  IF R < 5 THEN  GOSUB 240
550  PRINT R: IF R = 1 THEN 570
560 AG% = 1:TT = TT + R
570  PRINT
580  REM
LOCATION

590  PRINT "1)  ENGLAND"
600  PRINT "2)  WALES"
610  PRINT "3)  SCOTLAND"
620  PRINT "4)  N.IRELAND"
630  PRINT "5)  ELSEWHERE IN THE
     U.K"
640  PRINT : PRINT "WHERE DO YOU
     LIVE? ..... ";
650  GET R$:R =  VAL (R$): IF R <
     1 OR R > 5 THEN 650
660  IF R <  = 2 THEN TT = TT + 1

670  PRINT R: PRINT : RETURN
680  REM
LIFESTYLE DATA

690  CALL  - 198
700  HOME : VTAB 2: CALL  - 868:
     INVERSE : HTAB 13: SPEED= 100:
     PRINT "LIFESTYLE DATA":
     NORMAL : SPEED= 255: PRINT
710  REM
ANY EXERCISE?

720  PRINT "STRENUOUS EXERCISE FO
     R AT LEAST HALFHOUR"
730  PRINT "1)  NONE
740  PRINT "2)  TWO OR THREE TIME
     S/WEEK
750  PRINT "3)  FIVE TIMES/WEEK
760  PRINT
770  PRINT "WHICH OF THE ABOVE? .
     ..... ";
780  GET R$:R =  VAL (R$): IF R <
     1 OR R > 3 THEN 780
790  IF R = 1 THEN T = 0
800  IF R = 2 THEN T = 2
810  IF R = 3 THEN T = 4
820  PRINT R: PRINT :TT = TT + T:
     ND = ND + 1
830  IF EM% THEN  GOSUB 240: GOSUB
     240
840  RETURN
850  REM
CHECK ON SEX & AGE

860  GOSUB 240: IF  NOT SX% THEN
      GOSUB 240
870  IF SX% AND  NOT AG% THEN 900

880  GOSUB 160
890  REM
THIS IS IT ..

900  POKE 34,0: VTAB 2: CALL  - 9
     58: CALL  - 198
910  INVERSE : HTAB 13: PRINT "FR
     ANK LAUGHTON": NORMAL

920  VTAB 10
930  PRINT "  ********************
     ****************"
940  SPEED= 50
950  VTAB 12: HTAB 3: PRINT "YOUR
      PROJECTED LIFESPAN IS ";TT;
     " YRS."
960  SPEED= 255
970  PRINT : PRINT "  ************
     ************************"
980  REM
DIRE WARNING DEPT.

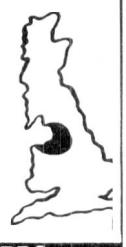
990  IF TT < 45 THEN  PRINT : FLASH
     : HTAB 17: PRINT "URGENT": PRINT
     "SWIFT CHANGE IN LIFESTYLE R
     ECOMMENDED!": NORMAL
1000  REM
DO IT AGAIN?

1010  POKE  - 16368,0
1020  VTAB 19: HTAB 5: PRINT "ANO
     THER LIFESPAN PROJECTION? ";

1030  GET R$: IF R$ = "Y" THEN
      RESTORE : GOTO 60
1040  HTAB 2: VTAB 19: PRINT "I W
     ISH YOU A LONG AND HAPPY LIF
     E ...": VTAB 23
1050  END
1060  REM
DATA STATEMENTS & VALUE
     S

1070  DATA ARE YOU STILL IN EMPLO
     YMENT,3,0
1080  DATA  ARE YOU MALE,-3,4
1090  DATA     DO YOU LIVE IN AN U
     RBAN AREA              WITH A
      HALF MILLION+ POPULATION,-2,
     0
1100  DATA DO YOU LIVE IN A TOWN
     WITH A              POPULATION
      OF UNDER 10000,2,0
1110  DATA  DID ANY GRANDPARENT L
     IVE TO 85,2,0
1120  DATA DID ALL FOUR LIVE TO F
     IGHTY,6,0
1130  DATA DID EITHER PARENT DIE
     (NATURALLY)         BEFORE THE
      AGE OF FIFTY,-4,0
1140  DATA   HAS ANY PARENT/BROTH
     ER/SISTER UNDER      FIFTY GO
     T CANCER OR HEART TROUBLE
         OR HAD DIABETES SINCE CH
     ILDHOOD,-3,0
1150  DATA   DO YOU EARN MORE THA
     N £25000 P.A,-2,0
1160  DATA  DID YOU ENTER/FINISH
     UNIVERSITY,1,0
1170  DATA WITH A GRAD.OR PROFESS
     IONAL DEGREE,2,0
1180  DATA DO YOU LIVE WITH SOMEO
     NE,5,-1
1190  DATA DO YOU WORK BEHIND A D
     ESK,-3,0
1200  DATA   DOES YOUR WORK REQUI
     RE PHYSICAL            LABOUR,3
     ,0
1210  DATA DO YOU SLEEP 10 HOURS+
      PER NIGHT,-4,0
1220  DATA ARE YOU INTENSE OR AGG
     RESSIVE,-3,0
1230  DATA ARE YOU EASY-GOING AND
      RELAXED,3,0
1240  DATA WOULD YOU SAY YOU WERE
      HAPPY,1,-2
1250  DATA HAVE YOU BEEN BOOKED F
     OR SPEEDING         IN THE LAS
     T YEAR,-1,0
1260  DATA DO YOU SMOKE MORE THAN
      TWO PACKS          OF CIGARET
     TES A DAY,-8,0
1270  DATA DO YOU SMOKE ONE TO TW
     O PACKS            OF CIGARET
     TES A DAY,-6,0
1280  DATA DO YOU SMOKE HALF TO O
     NE PACK            OF CIGARET
     TES A DAY,-3,0
1290  DATA DO YOU DRINK THE EQUIV
     ALENT              OF THREE W
     HISKIES A DAY,-1,0
```


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```
1300  DATA ARE YOU OVERWEIGHT BY
      50LBS OR MORE,-8,0
1310  DATA ARE YOU OVERWEIGHT BY
      30-50LBS,-4,0
1320  DATA ARE YOU OVERWEIGHT BY
      10-30LBS,-2,0
1330  DATA DO YOU HAVE DANGEROUS
      PASTIMES,-5,0
1340  DATA DO YOU ENJOY REGULAR B
      RISK WALKS,2,0
1360  DATA DO YOU HAVE ANNUAL CHE
      CK-UPS,2,0
1370  DATA DO YOU SEE A GYNAECOLO
      GIST ANNUALLY,2,0
1380  REM
INTRO

1390  TEXT : HOME : INVERSE : PRINT
      "          LIFESPAN PREDICTIO
      N          "
1400  HTAB 13: PRINT "FRANK LAUGH
      TON
1410  NORMAL : PRINT
1420  PRINT "WE'RE ALL GOING TO L
      IVE LONGER. OR SO   THE EXPE
      RTS TELL US. IN FACT, EVERYB
      ODY HAS THE BIOLOGICAL CAPAC
      ITY TO LIVE     UNTIL THEY A
      RE 100 AND COLLECT THAT
      TELEGRAM FROM THE MONARCH.
1430  PRINT
1440  PRINT "BUT WHETHER WE MAKE
      THE CENTURY DEPENDS NOT ONLY
       ON HOW WE TREAT OUR BODIES
      BUT HOW WE LIVE, LOVE, EAT &
       EARN.
1450  PRINT : PRINT "THE AVERAGE
      LIFESPAN IN ENGLAND AND
      WALES IS 69.9 FOR MEN, AND 7
      6 FOR WOMEN.AND JUST SLIGHTL
      Y LOWER IN SCOTLAND AND NORT
      HERN IRELAND.
1460  PRINT : PRINT "THIS PROGRAM
       WAS DEVISED TO ASK THE
      CORRECT QUESTIONS TO ENABLE
      YOUR LIFE   EXPECTANCY TO BE
       CALCULATED.
1470  PRINT : PRINT : INVERSE : PRINT
      "       PRESS SPACE BAR WHEN
      READY      ";: CALL  - 756
1480  RETURN
```

Apple Trees

by P Nowosad

Although this program has no use for an applications freak, it does draw some very pretty pictures. To run, it needs Apple Pascal and the Apple Turtle Graphics package.

Trees takes about a minute to run and will produce an accurate picture of a tree — accurate, that is, as far as branch formation is concerned. Each tree is different as random number routines are employed, so the possibilities are almost infinite.

The basic theory of the program is fairly simple: a trunk is drawn, and from that branches of a reduced length which split into still smaller branches, which in turn end in small clumps of 'leaves' (green squares).

All this program requires, apart from the specified software, is to be typed in and run.

```
PROGRAM TREE;

USES TURTLEGRAPHICS,APPLESTUFF;          (*Include APPLE libraries*)

CONST   XMAX=279;                        (*X max. on screen*)
        YMAX=191;                        (*Y max. on screen*)

VAR OFFSET:INTEGER;                      (*Base offset angle of branches*)
    FACTOR:REAL;                         (*Base ratio of branch sizes*)

PROCEDURE BRANCH (LENGTH:REAL);          (*Draw branch of given length*)

LABEL 1;                                 (*Branch termination label*)
VAR X,Y,ANGLE,Z,I:INTEGER;               (*Variables on stack for recursion*)

BEGIN
        (*Save end postion and orientation of parent branch*)

        X:=TURTLEX;Y:=TURTLEY;ANGLE:=TURTLEANG;

        (*Calculate length of new branch*)

        LENGTH:=LENGTH*(FACTOR*(85+(RANDOM MOD 31))/100);

        IF LENGTH<4
        THEN
                (*Length below low limit so end with green leaves*)

                BEGIN
                VIEWPORT (X-1,X+2,Y,Y+3);        (*Leafy square*)
                FILLSCREEN(GREEN);
                VIEWPORT (0,XMAX,0,YMAX);        (*Restore full screen*)
                GOTO 1;
                END;
```


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PROGRAMS

```
        (*Set Z to branching factor for end of this branch*)
        (*Note that branching decreases further out*)

        Z:=3;
        IF LENGTH<35 THEN Z:=2;
        IF LENGTH<25 THEN Z:=1;
        IF LENGTH<17 THEN Z:=0;
        Z:=Z+RANDOM MOD 2;

        FOR I:=0 TO Z DO

                (*For each branch*)

                BEGIN

                (*Turn turtle to new branch vector*)

                TURNTO (TRUNC (ANGLE+OFFSET*(I-Z/2)) + (RANDOM MOD 19) - 9);

                (*Branches are brown*)

                PENCOLOR(ORANGE);

                (*Unless out on a limb when leaf covered*)

                IF LENGTH<19 THEN PENCOLOR(GREEN);

                (*Draw branch*)

                MOVE (ROUND(LENGTH*FACTOR*(90+(RANDOM MOD 21))/100));

                (*Recursive call for branches at end of current branch*)

                BRANCH (LENGTH);

                (*Back to end of parent branch*)

                MOVETO (X,Y);
                END;

1:      PENCOLOR (NONE);        (*Done so no pen colour*)
        MOVETO (X,Y);           (*Back to end of parent branch*)
        TURNTO (ANGLE);         (*Restore orientation*)

END;

(*Main program*)

BEGIN
        INITTURTLE;                     (*Initialise graphics*)
        RANDOMIZE;                      (*Random start position*)
        PENCOLOR (ORANGE);              (*Draw tree trunk*)
        OFFSET:=30;                     (*Base for branch join angles*)
        FACTOR:=0.72;                   (*Base factor for branch length*)
        VIEWPORT (137,144,0,50);        (*Define trunk window*)
        FILLSCREEN (ORANGE);            (*Fill trunk*)
        PENCOLOR (NONE);                (*Switch of pen colour*)
        VIEWPORT (0,XMAX,0,YMAX);       (*Reset window to full screen*)
        MOVETO (140,45);                (*Move to trunk top*)
        TURNTO (90);                    (*Point vertically up*)
        BRANCH (55);                    (*Draw branches*)

END.
```

Nascom Snail Racing

by Quentin King

Rather than spending your money on an expensive hat to wear at Ascot, key in this program and spend a free Saturday snail racing! This program will take bets, work out odds and keep track of who is betting on which snail.

A Nascom 2 with graphics ROM and at least 16K of RAM is the necessary hardware. The program has been extensively 'user-proofed' against invalid data input and its only failing as far as I can see is that is uses the '&' sign for

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snails — although this is likely to be a computer-imposed limitation rather than a programming short-cut. You can tell the difference between snails by the track they race in (the course is divided into two lanes). Two to eight people can play and full instructions are within the program. Finally, the author has used '#' instead of '£' in this listing.

```
100 CLEAR1000:GOSUB2600:GOSUB1060:GOSUB200
110 GOSUB1050:GOSUB2100:GOSUB1050:GOSUB300
120 GOSUB1050:GOSUB500:GOSUB600:GOSUB1050
130 GOSUB1700:GOSUB400:GOSUB1050:GOSUB500
140 GOSUB1020:GOSUB1050:GOSUB1800:GOSUB1020
150 GOSUB2000:REM * Optional cheat routine *
160 GOSUB1050:GOSUB800:GOSUB1000:GOSUB1100
170 GOSUB1300:GOSUB1500:GOTO120
197 REM ******************************
198 REM *** Initialise variables ***
199 REM ******************************
200 CLS:A$="Snail Racing":FORJ=1TO12
210 POKE3034+J,ASC(MID$(A$,J,1)):NEXT
220 DIMP(6,1),C(6,3):WIDTH255
230 D(1)=1:D(2)=64:D(3)=-1:FORJ=1TO6:PRINT
240 C(J,1)=2098+64*J+J:C(J,2)=2994-64*J+J
250 C(J,3)=2957-64*J:C(J,0)=2061+64*J:NEXT
260 D$="0000.....................#"
270 PRINT"Press 'ENTER' to cont..."
280 S=RND(S):IFINP(0)<>253THEN280
290 RETURN
297 REM ******************
298 REM *** Get names ***
299 REM ******************
300 SCREEN3,2:PRINT"How many people wish to";
310 INPUT" play. (2-8) ";A$:N=INT(VAL(A$))
320 IFN<2ORN>8THENGOSUB1050:GOTO300
330 DIMZ$(N),B(N,1):GOSUB1050
340 FORI=1TON:M(I)=100:PRINT"Enter name"I;
350 INPUT"please ";Z$(I):Z$(I)=LEFT$(Z$(I),18)
360 NEXT:RETURN
397 REM ******************
398 REM *** Get bets ***
399 REM ******************
400 FORI=1TON:SCREEN1,11:PRINTZ$(I)", you ";
410 PRINT"have #"M(I)SPC(47)
420 SCREEN1,12:PRINTSPC(190):SCREEN1,11
430 PRINT:PRINT"Enter bet (> #9),";
440 PRINT"snail (1-6)";:INPUTA$,B$
450 IFVAL(B$)<1ORVAL(B$)>6THEN420
460 IFVAL(A$)>M(I)ORVAL(A$)<1OTHEN420
470 B(I,0)=INT(VAL(A$)):M(I)=INT(M(I)-B(I,0))
480 B(I,1)=VAL(LEFT$(B$,1)):NEXT:RETURN
497 REM **********************
498 REM *** Display Money ***
499 REM **********************
500 POKE2067,144:POKE2094,145:POKE2131+64*N,146
510 POKE2158+64*N,147:A$=CHR$(152):B$=CHR$(148)
520 SCREEN11,1:FORI=1TO26:PRINTA$;:NEXT
530 FORI=1TON:SCREEN10,1+I
540 PRINTB$" "Z$(I)RIGHT$(D$,20-LEN(Z$(I)));
550 C$=MID$(STR$(M(I)),2)
```


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PROGRAMS

```
560 PRINTLEFT$(D$,4-LEN(C$))C$" "B$:NEXT
570 SCREEN11,I+1:FORI=1TO26:PRINTA$;:NEXT
580 RETURN
597 REM ********************************
598 REM *** Terminate game option ***
599 REM ********************************
600 SCREEN1,12:PRINT:IFX=0THENGOSUB1020:RETURN
610 PRINTTAB(8)"Press 'ENTER' for another race"
620 PRINTTAB(8)"Press 'SHIFT' to end the game"
630 IFINP(0)<>253ANDINP(0)<>239THEN630
640 IFINP(0)=253THENRETURN
650 FORI=N-1TO1STEP-1:FORJ=1TOI
660 IFM(J)>M(J+1)THENNEXTJ,I:GOTO2400
670 M=M(J):M(J)=M(J+1):M(J+1)=M:Z$=Z$(J)
680 Z$(J)=Z$(J+1):Z$(J+1)=Z$:NEXTJ,I:GOTO2400
797 REM ******************
798 REM *** Draw track ***
799 REM ******************
800 FORI=1TO6:A$=MID$(STR$(I),2):SCREEN1,1+I
810 PRINTA$:SCREEN1,15-I:PRINTA$:NEXT
820 FORI=0TO40STEP2:DOKE2058+I,-11566
830 DOKE2506+I,-9253:DOKE2954+I,-11566:NEXT
840 FORI=2489TO2617STEP64:POKEI,255:NEXT
850 POKE2100,246:POKE2996,219:POKE2547,32
860 FORI=2TO42:SET(3,I):NEXT:FORI=1TO5
870 DOKE2099+64*I+I,-31100
880 DOKE2995-64*I+I,-31353:NEXT
890 T=0:FORI=2125TO2445STEP64:POKEI,64
900 T=T+1:P(T,0)=I:P(T,1)=1:NEXT
910 R=INT(RND(S)*4)*20+20:RETURN
997 REM ********************************
998 REM *** Delays / 'ENTER' / CLS ***
999 REM ********************************
1000 FORH=1TO1000:NEXT:RETURN
1010 FORH=1TO2000:NEXT:RETURN
1020 SCREEN2,15:PRINT"Press 'ENTER' to cont..";
1030 IFINP(0)<>253THEN1030
1040 PRINTCHR$(27);:SCREEN1,1:PRINT:RETURN
1050 SCREEN1,15:K=USR(0):SCREEN1,2:RETURN
1060 DOKE3200,3846:DOKE3202,27359:DOKE3204,-1008
1070 DOKE3206,201:DOKE4100,3200:RETURN
1097 REM ****************
1098 REM *** Run race ***
1099 REM ****************
1100 X=INT(RND(S)*6+1):IFRND(S)<N(X)/RTHEN1100
1110 POKEP(X,0),32:P(X,0)=P(X,0)+D(P(X,1))
1120 IFPEEK(P(X,0))=64THEN1180
1130 IFP(X,0)=C(X,P(X,1))THEN1150
1140 POKEP(X,0),64:GOTO1100
1150 P(X,1)=P(X,1)+1:IFP(X,1)<4THEN1140
1160 POKEP(X,0),64:POKEP(X,0)-1,9:GOSUB1010
1170 RETURN
1180 T=64:FORU=P(X,1)TO1STEP-1
1190 IFP(X,0)=C(X,U-1)THENNEXT:GOTO1220
1200 POKEP(X,0),T:P(X,0)=P(X,0)-D(U)
1210 T=PEEK(P(X,0)):POKEP(X,0),64:GOTO1190
1220 P(X,1)=0:P(X,0)=C(X,0):GOTO1100
```


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PROGRAMS

```
1297 REM **********************
1298 REM *** Calculate win ***
1299 REM **********************
1300 V=0:FORI=1TON:IFB(I,1)<>XTHENV=V+1
1310 NEXT:GOSUB1050:IFV=0THEN1370
1320 FORI=1TON:IFB(I,1)<>XTHENNEXT:GOTO1380
1330 PRINT"Well done "Z$(I)" your snail won!"
1340 PRINT"       You have won #"B(I,0)*(O(X)+1)
1350 M(I)=M(I)+B(I,0)*(O(X)+1):GOSUB1020
1360 GOSUB1050:NEXT:RETURN
1370 PRINT" Nobody won I'm afraid.":GOSUB1020
1380 RETURN
1497 REM ************************
1498 REM *** Eliminate losers ***
1499 REM ************************
1500 T=1
1510 FORI=TTON:IFM(I)>9THENNEXT:GOTO1570
1520 PRINTZ$(I)", I'm sorry, but you have less"
1530 PRINT" than #10 and cannot continue."
1540 PRINT"   *** GOOD BYE "Z$(I)" ***"
1550 GOSUB1020:GOSUB1050:N=N-1:T=I:IFI>NTHEN1570
1560 FORJ=ITON:M(J)=M(J+1):Z$(J)=Z$(J+1):NEXTJ
1565 GOTO1510
1570 IFN>1THENRETURN
1577 REM ********************
1578 REM *** End of game ***
1579 REM ********************
1580 GOSUB1050:IFN=0THENSCREEN1,5:GOTO1640
1590 PRINT"*** "Z$(1)", you have WON ! ***"
1600 PRINT"*** You have an incredible ***
1610 PRINT"  *** total of #"M(1)" ***":END
1640 PRINT" *** I'm very sorry, but you are ";
1650 PRINT"all bust. ***":END
1697 REM ************************
1698 REM *** Calculate odds ***
1699 REM ************************
1700 POKE2132,144:POKE2157,145:FORI=11TO34
1710 POKE2122+I,152:POKE2570+I,152:NEXT
1720 POKE2580,146:POKE2605,147:A$=CHR$(148)
1730 FORI=1TO6:O(I)=INT(RND(1)*6+2):N(I)=O(I)
1740 SCREEN11,I+2:PRINTA$" Snail -"I"......";
1750 PRINTO(I)"- 1 "A$:NEXT:RETURN
1797 REM **********************
1798 REM *** Display bets ***
1799 REM **********************
1800 DATA2059,144,2080,154,2086,154,2092,154
1810 DATA2100,145,2228,151,147,2220,150,153
1820 DATA2214,150,153,2208,150,153,2187,149,146
1830 RESTORE1800:FORI=1TO41:POKE2058+I,152
1840 POKE2186+I,152:POKE2250+N*64+I,152:NEXT
1850 FORI=1TO5:READG,L:POKEG,L:NEXT:FORI=1TO5
1860 READG,L,M:POKEG,L:POKEG+64*N+64,M:NEXT
1870 A$=CHR$(148):SCREEN2,2:PRINTA$" Name";
1880 PRINTTAB(21)A$"Snail"A$" Bet "A$" Odds  ";
1890 PRINTA$:PRINT:FORI=1TON
1900 PRINT" "A$" "Z$(I)TAB(22)A$" "B(I,1)" "A$;
1910 PRINT"#"MID$(STR$(B(I,0)),2)TAB(34)A$;
```


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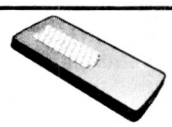
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PROGRAMS

```
1920 PRINTO(B(I,1))"- 1 "A$:NEXT:RETURN
1997 REM **********************************
1998 REM *** Optional cheat routine ***
1999 REM **********************************
2000 T=0:FORU=1TON
2010 IFZ$(U)<>"Your name"THENNEXT:RETURN
2020 V=B(U,1):FORU=1TON:IFB(U,1)=VTHENT=T+1
2030 NEXT:IFT>1THENRETURN
2040 N(V)=2:RETURN
2097 REM ********************
2098 REM *** Instructions ***
2099 REM ********************
2100 FORI=2075TO2085STEP2:DOKEI,-25187:NEXT
2110 PRINT"Instructions : The game of 'Snail ";
2120 PRINT"racing' is a  betting game for 2 ";
2130 PRINT"- 8  people. You each have  #100 ";
2140 PRINT"in the beginning & must bet at lea";
2150 PRINT"st #10  each race on a snail of y";
2160 PRINT"our choice. The odds  will affect";
2170 PRINT" the results of each race by diff-"
2180 PRINT" ering amounts,  but in general, a";
2190 PRINT" 2-1 is more  likely to win than ";
2200 PRINT"a 7-1. In addition, during  the r";
2210 PRINT"ace,  the snails cross paths. If a";
2220 PRINT" snail  tries to push another sna";
2230 PRINT"il out of  the  way,  this qualif";
2240 PRINT"ies as a breach of the rules & it "
2250 PRINT" will be sent back to the start."
2260 PRINT"  If after a race, you have less t";
2270 PRINT"han #10 then  you will be removed";
2280 PRINT" from the game. The winner  is th";
2290 PRINT"e last person left with more than";
2300 PRINT" #10.";:SCREEN1,1:GOSUB1030:RETURN
2397 REM ********************
2398 REM *** Results table ***
2399 REM ********************
2400 GOSUB1050:SCREEN17,2:PRINT"Results Table."
2410 FORI=2202TO2214STEP2:DOKEI,-25187:NEXT
2420 FORI=2257TO2286:POKEI,152:POKEI+128,152
2430 POKEI+192+64*N,152:NEXT:RESTORE2440
2440 DATA2256,144,2279,154,2287,145,2415
2450 DATA151,147,2407,150,153,2384,149,146
2460 FORI=1TO3:READG,L:POKEG,L:NEXT:FORI=1TO3
2470 READG,L,M:POKEG,L:POKEG+64+64*N,M:NEXT
2480 A$=CHR$(148):SCREEN7,5:PRINTA$" Name";
2490 PRINTTAB(23)A$" Money "A$:PRINT:FORI=1TON
2500 PRINTTAB(6)A$MID$(STR$(I),2)"."Z$(I);
2510 PRINTTAB(29)A$" #";:B$=MID$(STR$(M(I)),2)
2520 PRINTLEFT$(D$,4-LEN(B$))B$" "A$:NEXT
2530 SCREEN1,1:END
2597 REM ********************
2598 REM *** Title display ***
2599 REM ********************
2600 DATA-29747,8681,3247,-6887,-7715
2610 DATA6689,1544,-8955,126,4549
2620 DATA64,1798,8206,16331,560
2630 DATA16398,6513,-3056,16657,6654
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PROGRAMS

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2640 DATA9181,4289,-13854,32256,2313
2650 DATA32265,16702,16705,15906,16705
2660 DATA12881,16705,16767,32577,16448
2670 DATA16448,1151,4104,32639,6409
2680 DATA17961,18758,18761,49,35,25,0
2690 DATA15,20,10,25,15,5,0,30:DOKE4100,3200
2700 RESTORE2600:CLS:FORI=3200TO3286STEP2
2710 READG:T=T+G:U=U-G:DOKEI,G:NEXT:DIMH(11)
2720 IFT-U<>771566THENPRINT"Data error":END
2730 FORI=0TO5:H(I)=2062+7*I:NEXT:FORI=6TO11
2740 H(I)=2651-7*I:NEXT:FORI=0TO10:READL(I)
2750 NEXT:T=3211:U=0:V=-1:W=3231:FORI=1TO143
2760 U=U+1+12*(U=11):V=V+1+11*(V=10):DOKET,H(U)
2770 K=USR(L(V)):FORJ=1TO9:NEXTJ,I:FORI=1TO7
2780 SCREEN5,I:PRINT"      ":NEXT:FORI=1TO30
2790 FORJ=0TO10:DOKET,H(J+1):K=USR(L(J))
2800 POKEW,RND(1)*255:NEXTJ,I:GOSUB1010:RETURN
```

UK101 Long Multiplication & Addition

by Chris Clark

Like people, computers almost always seem to have what could be termed 'annoying habits'. The UK101 has a habit of dropping the second decimal place in floating point calculations using figures larger than 10,000. This makes pounds and pence claculations inaccurate.

These two small programs will cope with addition and multiplication of numbers of this size. They are in a very basic form, ie, user inputs whole numbers of up to 71 characters which are handled as a string. This does, however, make the program more widely usable and fairly easy to include as part of a larger program. The main disadvantage is that, as numbers are handled as strings, the decimal point cannot be input. In practical terms all this means, of course, is that the user will have to keep track of where the point should be.

These programs will run on a UK101 with New Mon and 8k of RAM.

Multiplication

```
999 REM   LONG MULTIPLICATION
1000 E=0:Z$=""
1010 INPUT"  First number";A$
1015 PRINT:PRINT
1020 INPUT"  Second number";B$
1025 PRINT:PRINT
1030 A=LEN(A$)
1040 B=LEN(B$)
1050 FORI=ATO(1-B)STEP-1
1060 FORJ=BTO1STEP-1
1070 C=I+B-J
1080 IFC)ATHEN1120
1090 IFC<1THEN1110
1092 X$=MID$(A$,C,1)
1095 Y$=MID$(B$,J,1)
1100 E=E+VAL(X$)*VAL(Y$)
1110 NEXTJ
1120 E$=STR$(E)
1130 Z$=RIGHT$(E$,1)+Z$
1140 IFLEN(E$)<=2THENE=0:GOTO1160
1150 E=VAL(LEFT$(E$,LEN(E$)-1))
1160 NEXTI
1180 IFLEFT$(Z$,1)<>"0"THEN1210
1190 Z$=RIGHT$(Z$,LEN(Z$)-1)
1200 GOTO1180
1210 PRINT"   The answer is ";Z$
```


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PROGRAMS

Addition

```
1999 REM   ADDITION
2000 E=0:Z$=""
2010 INPUT"   First number";A$
2020 PRINT:PRINT
2030 INPUT"   Second number";B$
2040 PRINT:PRINT
2050 A=LEN(A$)
2060 B=LEN(B$)
2070 IFA)BTHENQ=A:GOTO2080
2075 Q=B
2080 FORI=QTO1STEP-1
2085 X$="":Y$=""
2086 C=I-(B-A)
2088 IFQ=ATHENC=I
2089 IFC(1ORC)ATHEN2100
2090 X$=MID$(A$,C,1)
2100 C=I-(A-B)
2105 IFQ=BTHENC=I
2110 IFC(1ORC)BTHEN2130
2120 Y$=MID$(B$,C,1)
2130 E=E+VAL(X$)+VAL(Y$)
2140 E$=STR$(E)
2150 Z$=RIGHT$(E$,1)+Z$
2160 IFLEN(E$)(=2THENE=0:GOTO2180
2170 E=VAL(LEFT$(E$,LEN(E$)-1))
2180 NEXTI
2185 IFE=0THEN2210
2190 E$=STR$(E)
2200 Z$=E$+Z$
2210 IFLEFT$(Z$,1)()"0"THEN2240
2220 Z$=RIGHT$(Z$,LEN(Z$)-1)
2230 GOTO2210
2240 PRINT"   The answer is ";Z$
```

THE DRAGON

Continued from page 116

unprotected games cassettes which can be listed and so provide programming tuition as well as entertainment. A novel and welcome approach in this paranoid business.

The Dragon is quite clearly aimed at the home and educational markets for which it provides a very competitive performance. With its excellent graphics it may find some use at the budget end of the scientific market as well, though more technical information about, eg, the expansion bus would be needed than is contained in the current manual.

Conclusion

The Dragon 32 is without a doubt a worthy rival to its direct competitors. The display quality is a weakness but it is not so bad as to detract from the other qualities of the machine, certainly not to anyone used to a ZX81, for example. The Basic is powerful and fast with a comprehensive set of commands to fully and easily utilise the capabilities of the machine. Whether the Dragon will succeed against strong competition will have less to do with the quality of the machine and more with the exceptionally strong marketing effort which will be needed at this stage against a number of very well known names. Dragon Data has produced a good machine which is well worth the £200 and deserves to succeed. I may be looking for a machine in this category for my children soon and, if I can't afford a BBC Computer, the Dragon would be my choice as the market stands; if something can be done to improve the display then it will outperform its competitors in nearly every respect.

END

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SCREENPLAY

Continued from page 132

think Sinclair enthusiasts will have to wait until they can buy a Spectrum to get anything decent in this line. Nevertheless, many of the other graphics-oriented games made the best of things and could be a lot of fun. Although I haven't reviewed any 'Adventure' games for the ZX (partly due to lack of time and anyway it's difficult to know what to say without giving anything away), there are plenty available and it's these, along with the management games (The Dictator) which probably give best value for money on this machine. On that subject, I should note that, in keeping with the ZX81 tradition, the games are generally quite cheap which must be a point in their favour.

My thanks to Buffer, Bug Byte, MoI and DK'tronics for the loan of the software used in this review. Next month I shall be looking at the games software available for the Acorn Atom.

END

CTUK!NEWS

Continued from Page 79

of microcomputers. Peter also tells me that the local library is now lending computer software as well as books, records and tapes. As a software publisher, I have mixed feelings about this idea. I can see now why authors of books have been trying to obtain some sort of royalty from the library service. It will be interesting to see how this scheme catches on. For those poised to rush round to the library, I should mention that the scheme is starting with ZX81 programs. Your views on the subject would interest me too. What do you think of this idea? Write to me at the address in the box (not to *PCW!).*

Well that, I think, is about it for this month. Don't forget, if you want to give a hand on the ComputerTown stand at the *PCW* show, contact John Bone on 0632 770036. Please write with news about your own ComputerTown activities and plans. Remember the SAE if you need a reply — I look forward to hearing from you.

END

ComputerTown UK! is an ever-growing network of computer literacy centres, where members of the public are given free access to microcomputers, courtesy of those willing to volunteer their time and equipment. ComputerTowns might be found anywhere: in a church hall, a library or maybe in a school after hours. The emphasis is on making computing enjoyable and non-threatening and, because Computer Town is entirely non-commercial, overt axe-grinding of any sort is banned. Guidelines are available for those interested in setting up their own 'Towns: Write to CTUK!, 7 Collins Drive, Eastcote, Middlesex HA4 9EL and remember to enclose a large SAE (A4 would be fine) for your reply. Please don't try to telephone *PCW* for information because this project is entirely a spare-time activity.

BLUDNERS



The gremlins staged a field day on our Master Program Converter given away with the July issue. There isn't enough space to list all the corrections here as most of them are rather verbose to explain, but if we can either bully or bribe our publisher with gifts of alcohol, cigars, chocolates, caviar, etc. he *might* be persuaded to let us reprint it — correctly this time!

Meanwhile, thank you to all those big-hearted readers who've taken the trouble to send in ideas for corrections. They will, hopefully, be put to good use in future.

END

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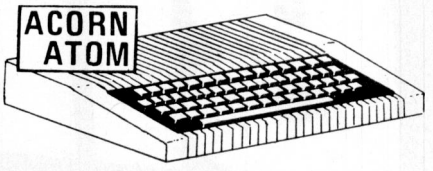
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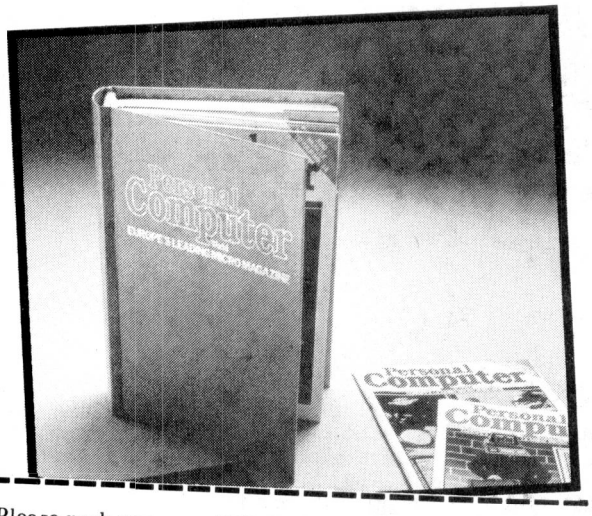
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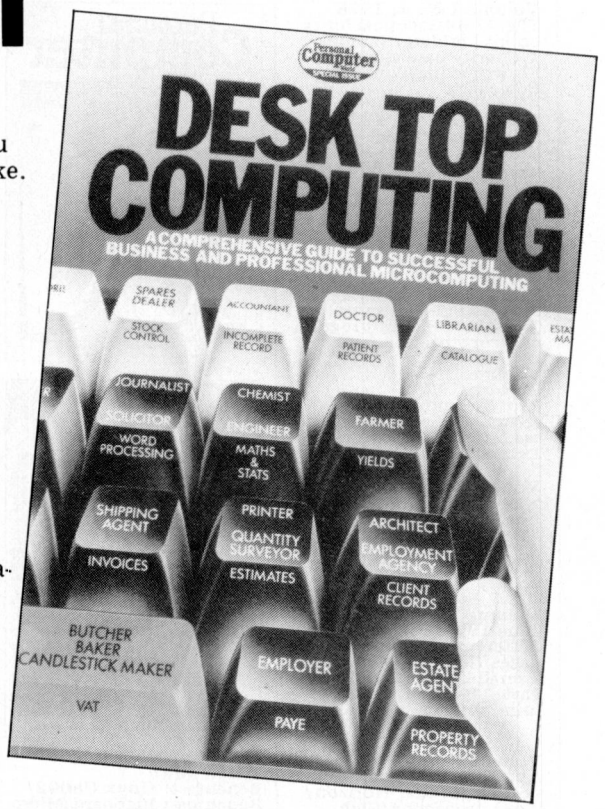
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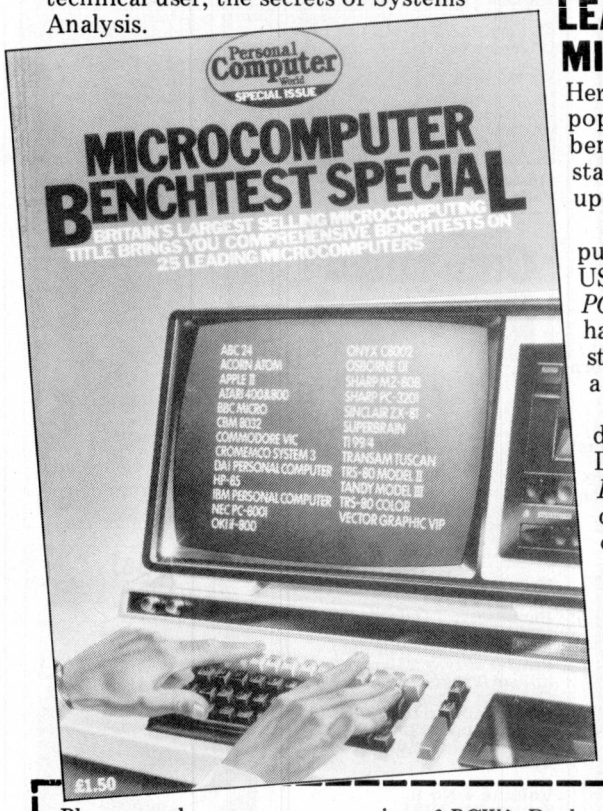


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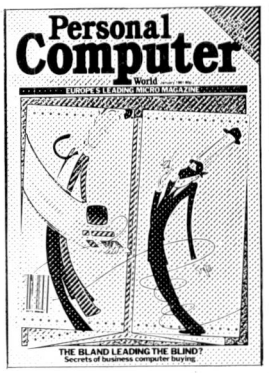
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Volume 4 No 7
July 1981
Benchtest: Sharp PC-3201/Multi-user Benchtest: Acorn Econet/Case study: Accident investigation on TRS-80/Zilog Z8 family/WP Benchtest: Format-80/Pascal Benchmarks: readers' letters/Quicker Casio computations/Programs: ZX80 Sliding Letters, UK101 Car Rally, TRS-80 Calendar, UK101 m/c code to Basic converter, PET Exam Questions, MZ-80K Designer, ZX91 Sketch Pad.



Volume 4 No 8
August 1981
Benchtest: TandyModel III/Viewdata update/WP Benchtest: Spellbinder/Printer survey/Microholism/Programs: ZX80 Othello; Easter Sunday; Apple Mondrian; MZ-80K Duck Shoot; PET Gomoku; MZ-80K Football.





Volume 4 No 9
September 1981
Benchtests: Tandy Color Computer, Commodore VIC/Checkouts: Hi-Tech Speakeasy, Tantel/Multi-user Benchtest: HMSOS/WP Benchtest: Memorite III/Word proc program for PET/Apple dealership run by spastics/Printer facing extra/Calc Corner: Casio fx602p review/Programs: PET Arithmetic test, ZX80 Eldorado, 380Z Memory test.

Volume 4 No 10
October 1981
Benchtest: OKI if-800/Checkouts: Heuristics speech link, Softy 2/Calc Corner: Texas TI51-111/Jeff Taylor on computer literacy projects/Introducing TJ's Workshop/Con-

BENCHTEST GUIDE

Here's a list of all the Benchtests and reviews (and the issues in which they were published) available from the Back Issues Centre

Benchtests

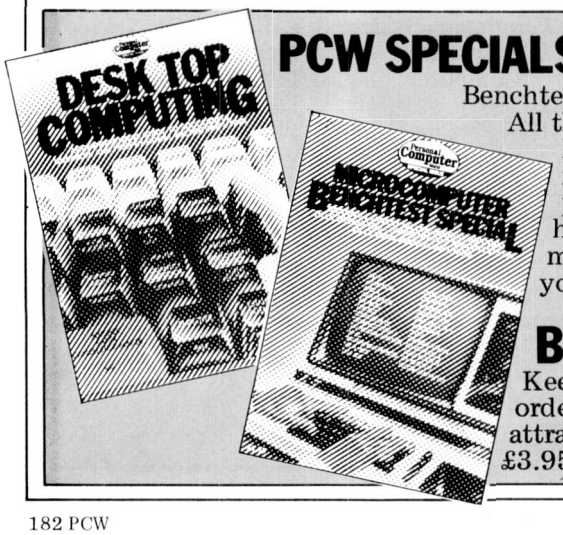
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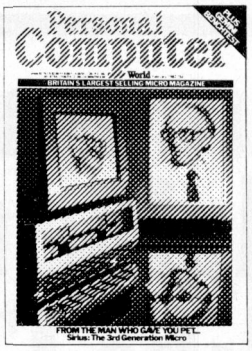
Volume 4 No 11
November 1981
Benchtests: Osborne 01, IBM Personal Computer. Checkout: Sharp IQ3100 Microtranslator. Calc Corner: Casio fx702p. PCW Show report, Benchmark Summary, Euro Micro Chess Championship report. Programs: TRS-80 Sheepdog trial, ZX81 Sun and Planets.



Vol 4 No 12
December 1981
Benchtests: Sharp MZ-80B Philips P2000/School network/ BBC Micro inside story/ 'Turtle' Graphics for Apple/ Forth language/ Curve fitting/ Calc corner: HP14C review/ Programs: PET Fantasy, ZX81 Battleships and cruisers.



Vol 5 No 1 January 1982
Benchtests: BBC Micro, Xerox 820/Frames of Reference (new series)/ ZX81 Printer Checkout/ Digital Drummer for PET/ Calc Corner: Benchmarks/ Programs: MZ-80K Fortune, TRS-80 Reaction Timing, ZX80 Laybrinth, Apple Letters.



Vol 5 No 2 February 1982
Benchtests: Sirius-I, Casio fx-9000p, Gemini Multiboard/Word Processor Benchtest: Scripsit 2.0/ Plotter Checkout: Watanabe/Hardware feature: High Density VDU card project/Music system: FREQOUT/Calc Corner: Aerial Navigation/Programs: Pet Haemophilia, Pet Cheese, TRS-80 Extra, Sharp PC1211 Exam, Personality test.



Vol 5 No 3 March 1982
Benchtests: Texas Instruments 99/4A, Hewlett-Packard 125/Choosing a Database/Compsoft DMS reviewed/Screenplay (new series)/Calc Corner: Hewlett-Packard Interface Loop/Programs: TRS-80 Solitaire, TRS-80 Ducks, Nascom Business Documents, MZ-80K Race Chase, ZX81 Graphplot.



Volume 5 No 4
April 1982
Benchtest: Monroe OC8820/DB Benchtest: FMS-80/Checkout: Sid 1/ Generating screen forms/ Comal/Logo/Brain Dump-New series/Calc Corner: Casio FP-10 printer/ Programs: TRS-80 Maths & Trig, PET Boot the Cat, ZX81 Resistor & Res code.



Vol 5 no 5 — May 1982
Benchtests: Apple III, Hitachi Peach/Database Benchtest: dBase II/3D Graphics Made Easy/ Equation Solving/Calc Corner: fx 602 quirks/ Programs: PET Mini-Animate, MZ-80K Catch, Apple Maze, Atari Sums For Kids, ZX81 Book Index, PET Stockmarket, Microtan 3D Rotation, Extra for MZ-80K, UK101 Crossword Notepad.

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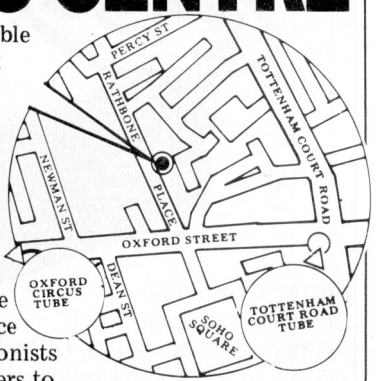
Vol 5 No 6.
June 1982
Benchtests: Sharp MZ-80A/ ZX Spectrum/Database Benchtest: DBMS2/West Coast Faire Report/Lisp/ VIC 20 games/Calc Corner: Sharp PC1500/ Programs: RML Altered Basic/VIC-20 Large Characters/BBC Breakout/ VIC-20 Trailblazer/MZ-80K Next-to-Last-One/MZ-80K Tarot.



Vol 5 No 7
July 1982
Benchtests: Mimi 801/ Newbrain/Database Benchtest: Silicon Office/UCSD p-System/BBC Computer In-Depth/Apple II games/ Calc Corner: TI88/ Programs: ZX81 Hypocycloids/BBC Character Generator/TRS-80 Truth/ PET Doc/TRS-80 Screen Dump/UK101 Screen Converter/PET boxes/Atari Earth.

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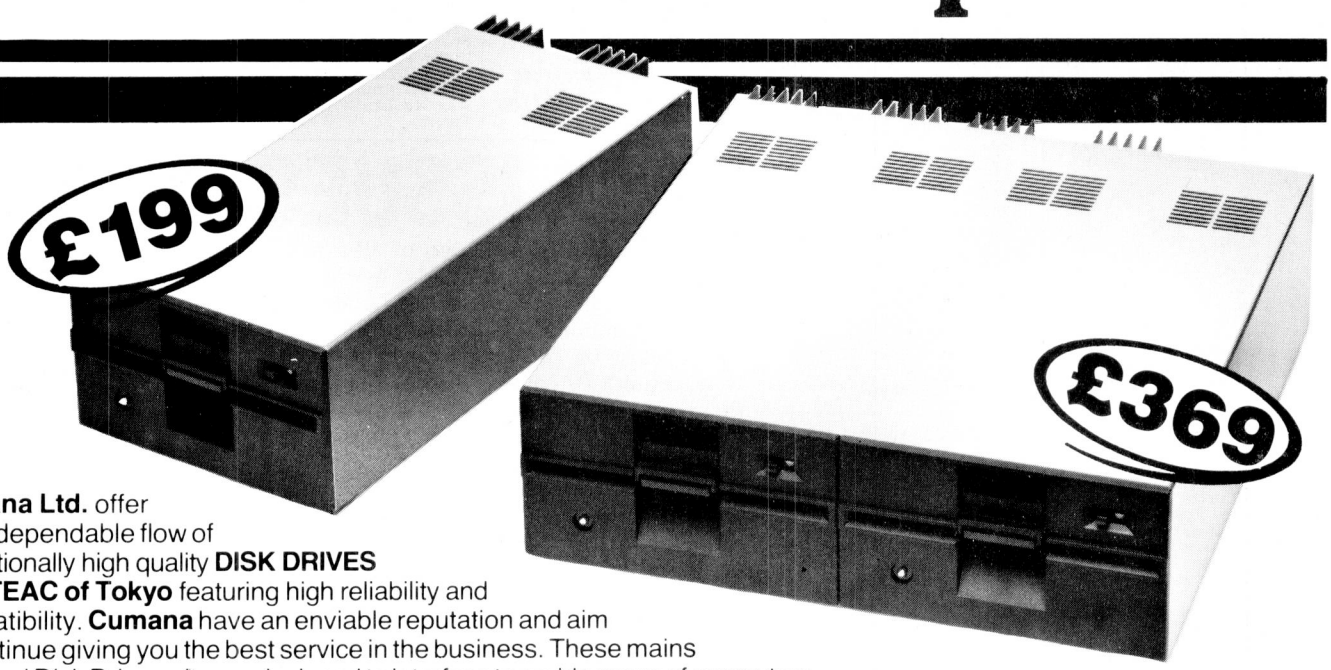
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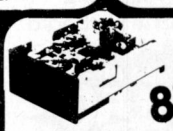
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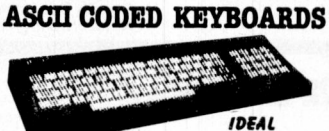
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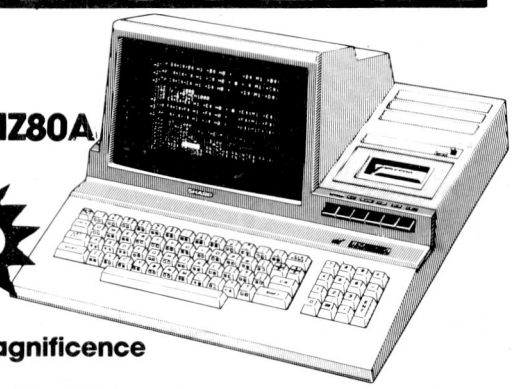
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High resolution plotting on your MZ80K down to a resolution of a single dot within a character cell.

A new BASIC is supplied with the following additional commands: LINE, WIPE, G SET, G RESET



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This combination of hardware & software not only allows printing of the full Sharp character set, but allows a full High Resolution print of the actual screen if used with the Hi-Res graphics option.

Available in 2 versions

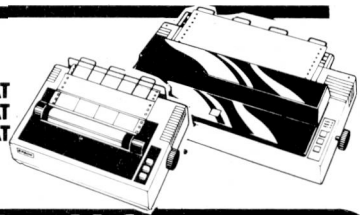
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SEIKOSHA GP100A, Interface, ROMS & screen dump BASIC.
£300.00 + VAT including printer

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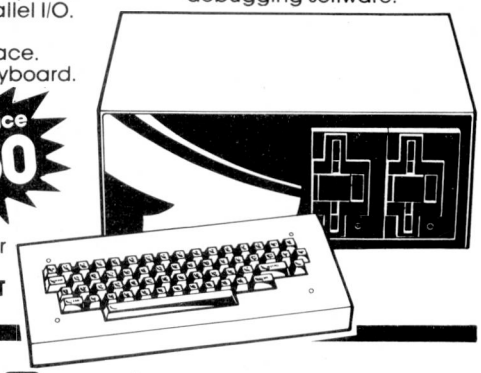
Gemini GALAXY 1 CP/M COMPUTER SYSTEM

A Multiboard based 80-BUS computer

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- ★ Twin Z80A CP/M System.
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- ★ Inverse Video.
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- ★ 160 × 75 Pixel Graphics.
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- ★ RS232 I/O.
- ★ Light pen interface.
- ★ 59-Key ASCII Keyboard.

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- ★ GEM PEN Text Editor.
- ★ GEM DEBUG debugging software.

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Suggested monitor for use with the Galaxy. **£150 + VAT**

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A business accounts package developed for the Galaxy, menu driven.

1. **SALES LEDGER** full VAT reports, statement, credit note + invoice facilities.
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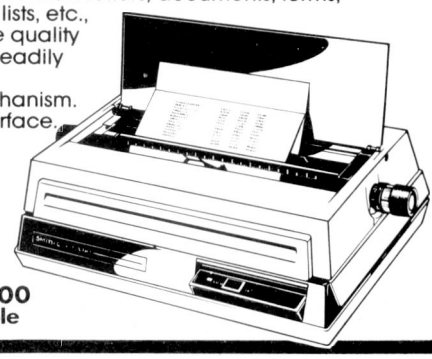
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Tel: (0272) 421196

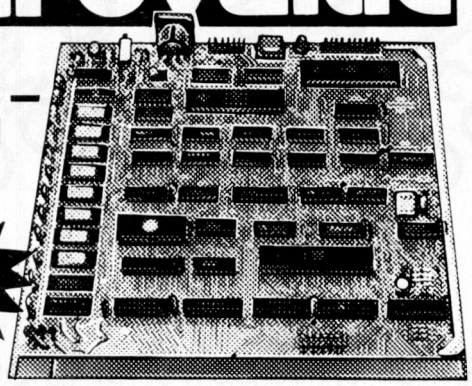
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Tel: (031) 337 5611

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MicroValue

80-BUS PRODUCTS — NEW FROM Gemini

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OTHER 80-BUS PRODUCTS FOR nascom & Gemini SYSTEMS

GM816 GEMINI I/O BOARD

The new GM816 Gemini I/O board takes a unique approach to the problems of interfacing your Nascom or Gemini Multi-board to external devices. This 80 Bus and Nas-Bus compatible card is supplied fully built, populated and tested and includes three Z80 PIOs, a CTC and a Real Time CLock with battery back-up. In addition, a range of 'daughter' boards that attach straight to the I/O board are under development, catering for a wide variety of interfacing requirements.

GM816 Gemini I/O board MicroValue price — £125 + VAT

Prototyping daughter board MicroValue price — £18 + VAT

EV814 EV COMPUTERS IEEE-488 BOARD

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*Available on cassette or disk

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nascom PRODUCTS & PERIPHERALS

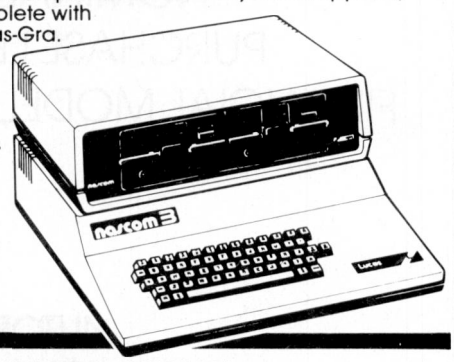
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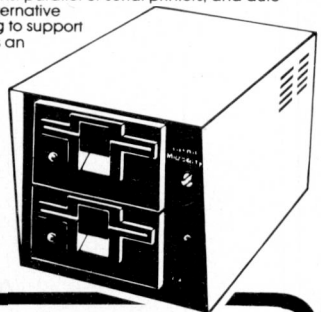
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Nas-Sys 3	**RRP £25 + VAT . MicroValue price £20 + VAT**
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With a thousand in daily use, the Gemini Disk system is now the standard for Nascom and Gemini Multiboard systems. Single or twin drive configurations are available, giving 350K storage per drive. The CP/M 2.2 package available supports on-screen editing with either the normal Nascom or Gemini IVC screens. parallel or serial printers, and auto single-double density selection. An optional alternative to CP/M is available for Nascom owners wishing to support existing software. Called POLYDOS 2, it includes an editor and assembler and extends the Nascom BASIC to include disk commands.



Single drive system (G809, G815/1) £450 + VAT

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NOTTINGHAM Skytronics, 2 North Road, The Park. Tel: (0602) 45053/45215

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LEEDS Leeds Computer Centre, 62 The Balcony, Merrion Centre. Tel: (0532) 458877

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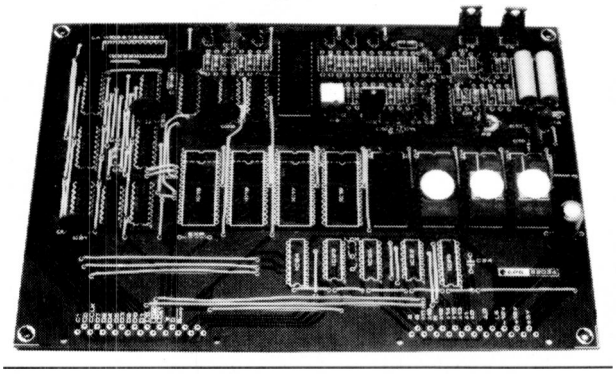
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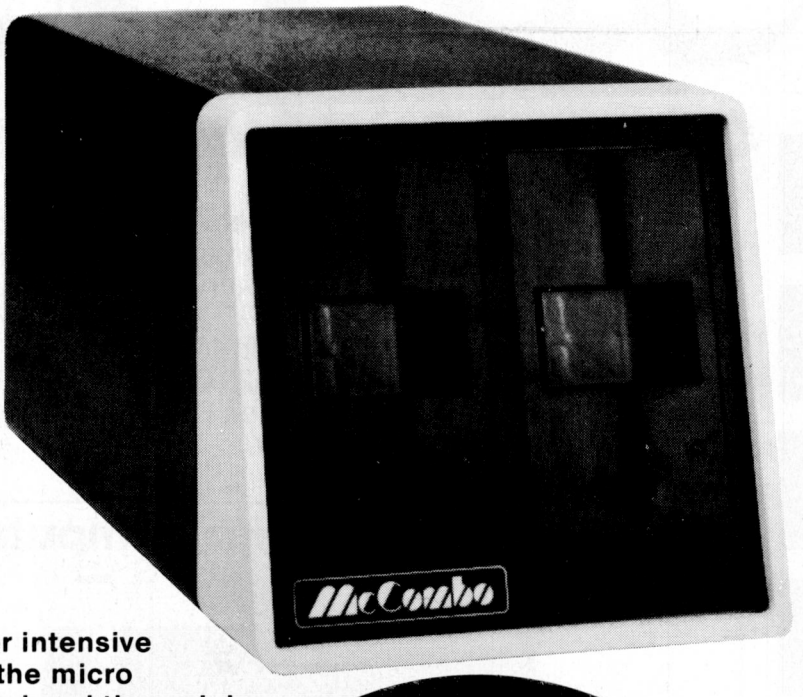
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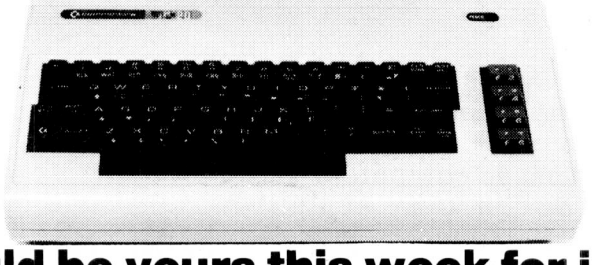
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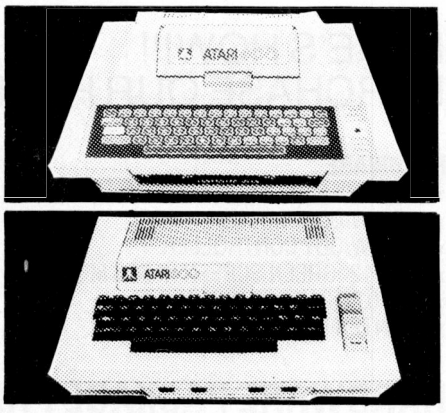
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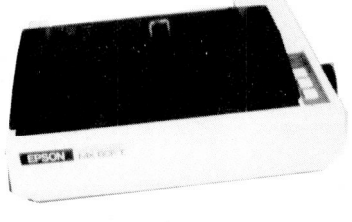
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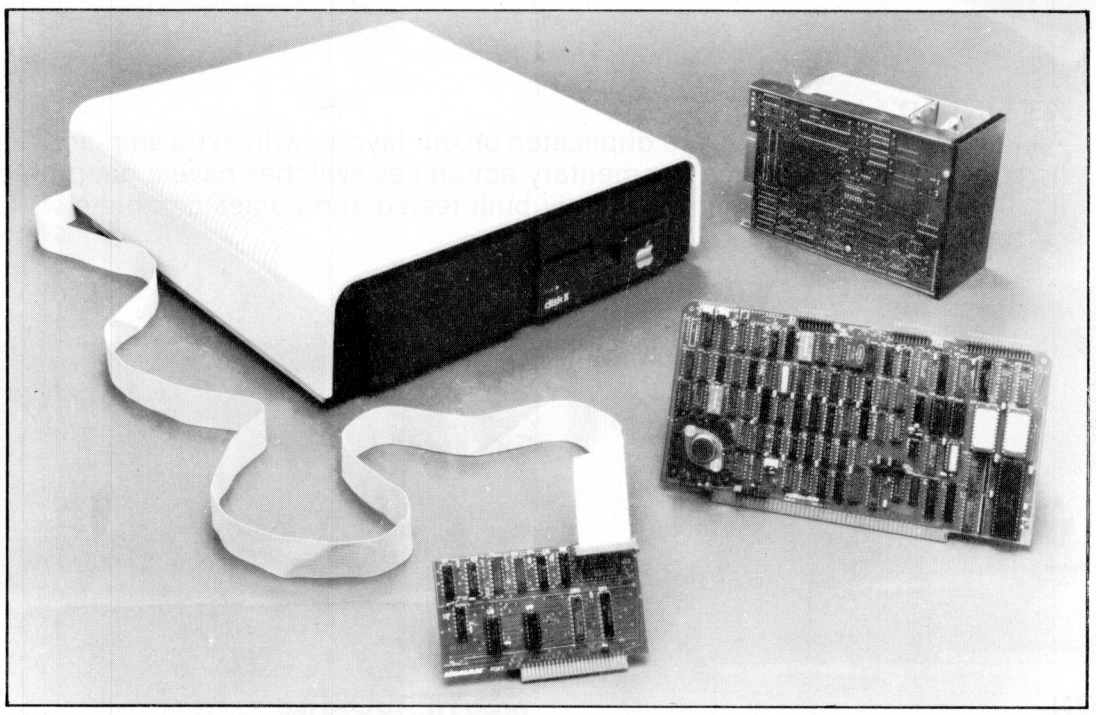
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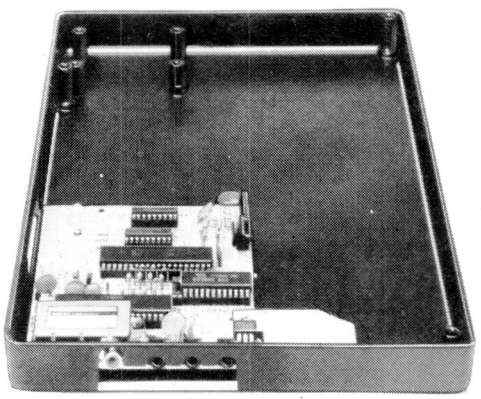
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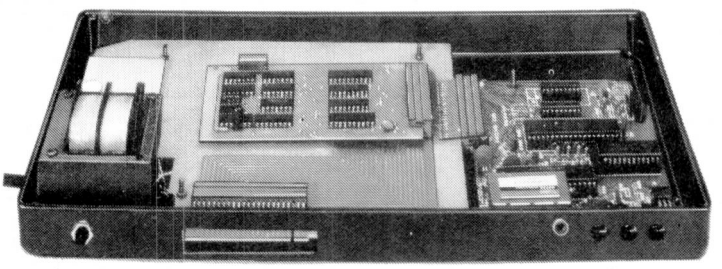


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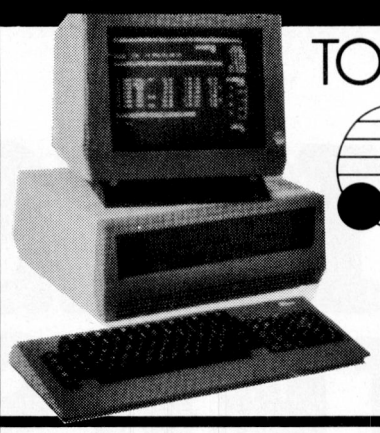
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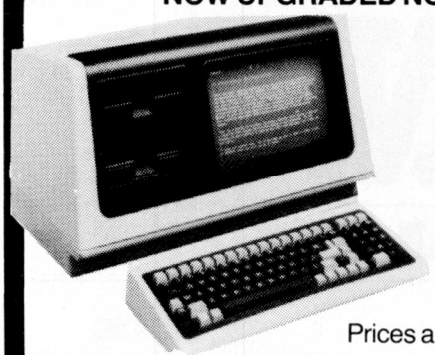
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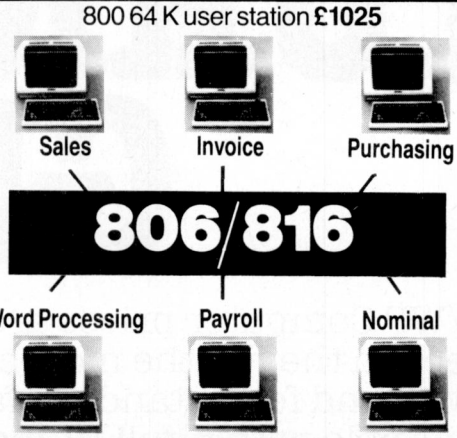
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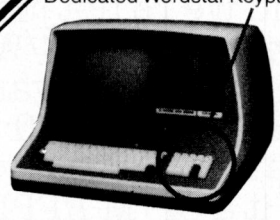
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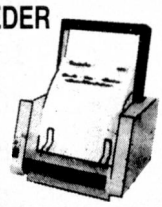
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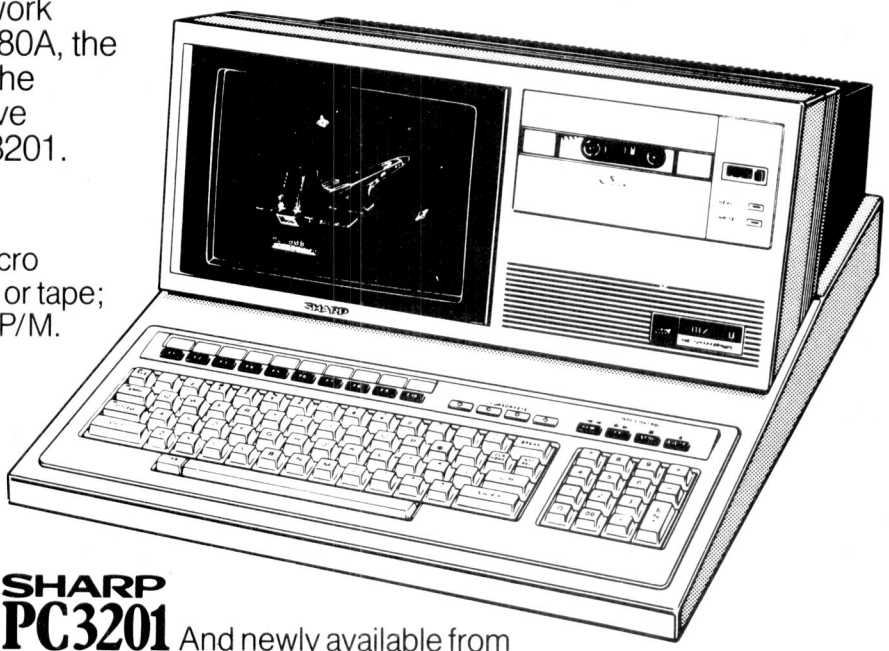
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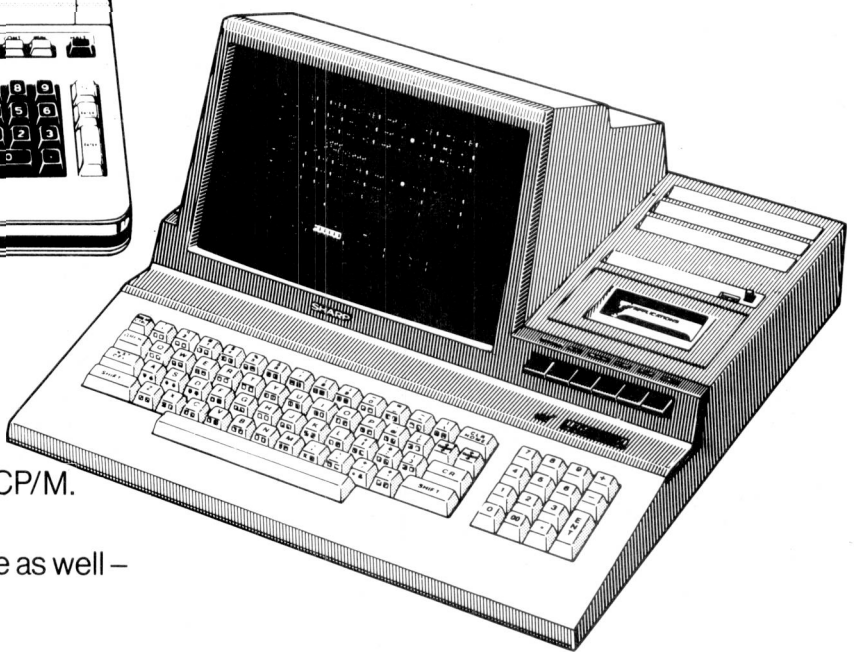
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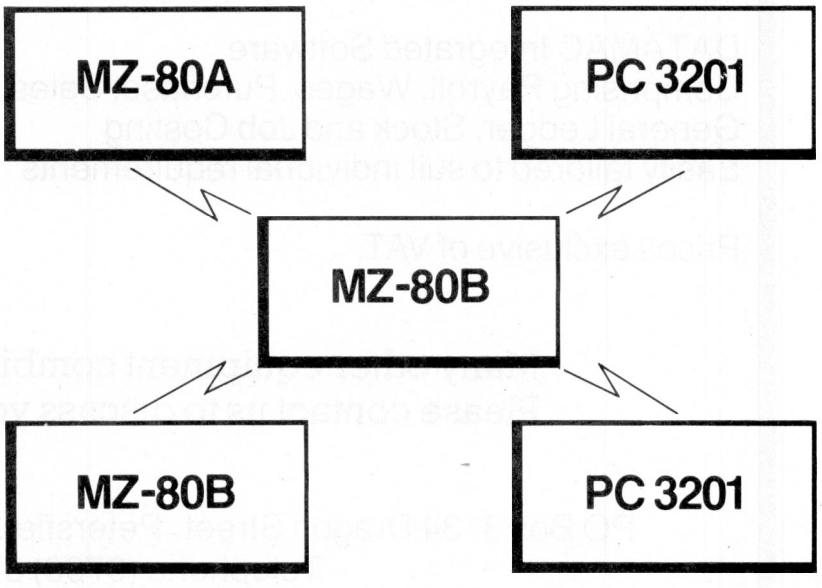
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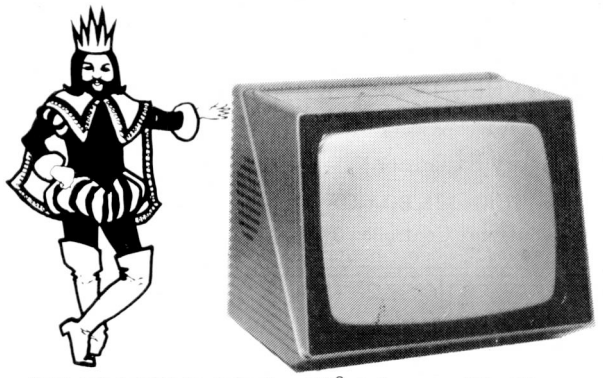
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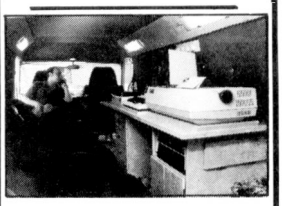
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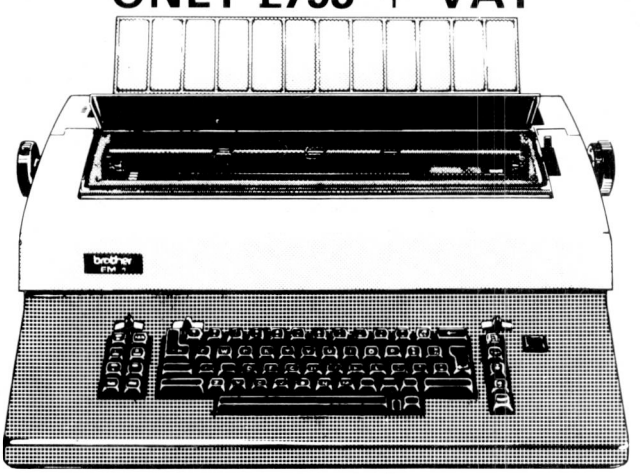


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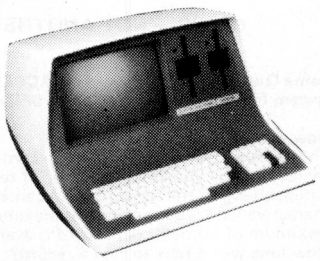
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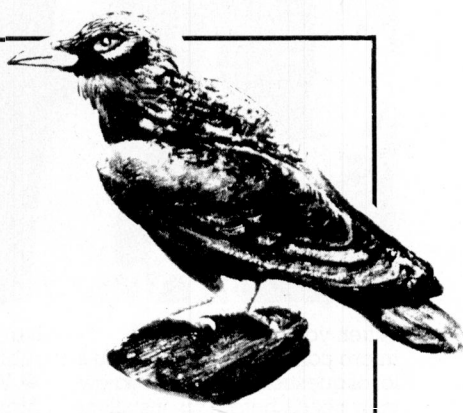
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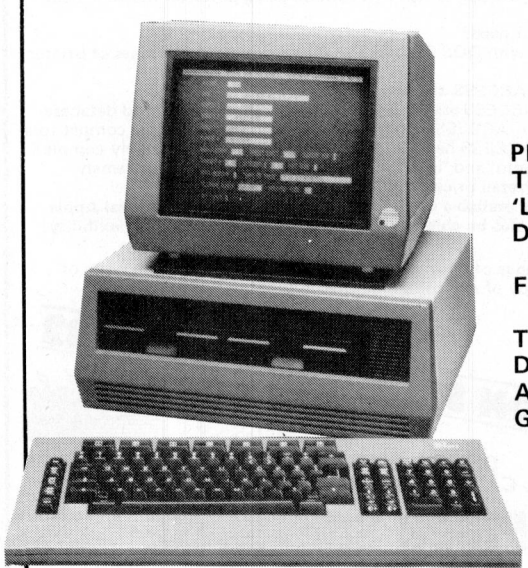
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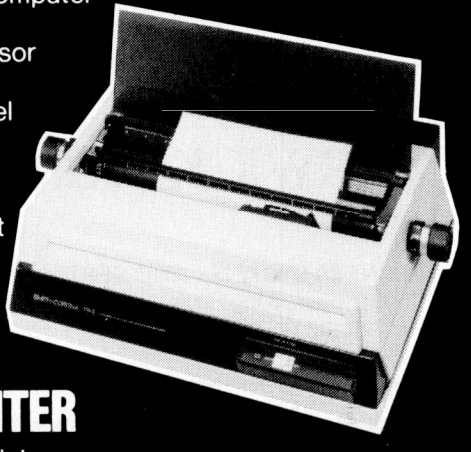
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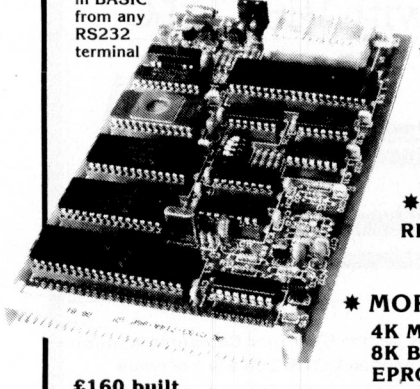
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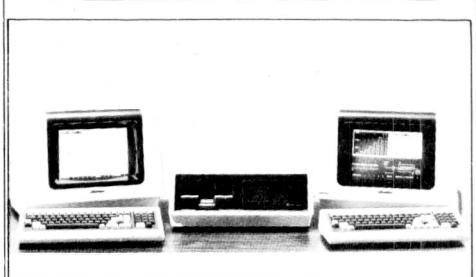
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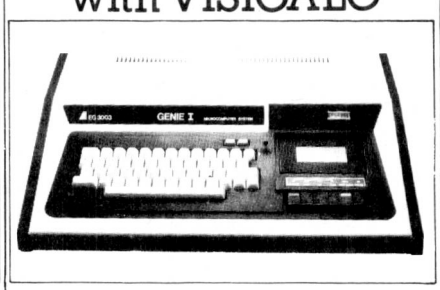
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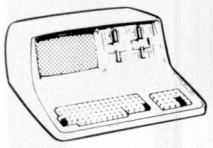
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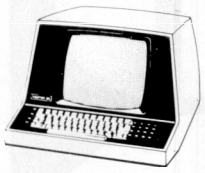


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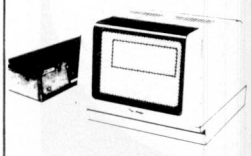
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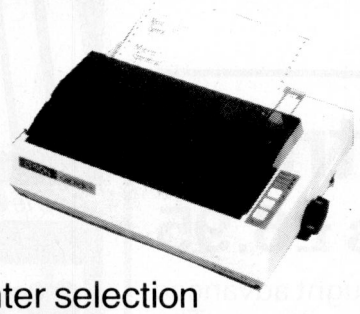
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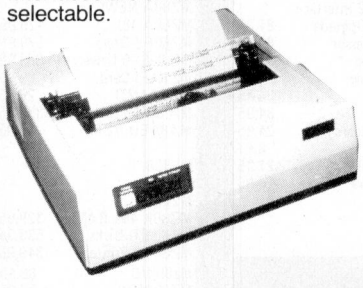
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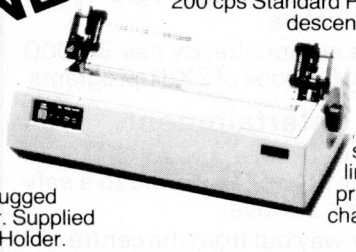
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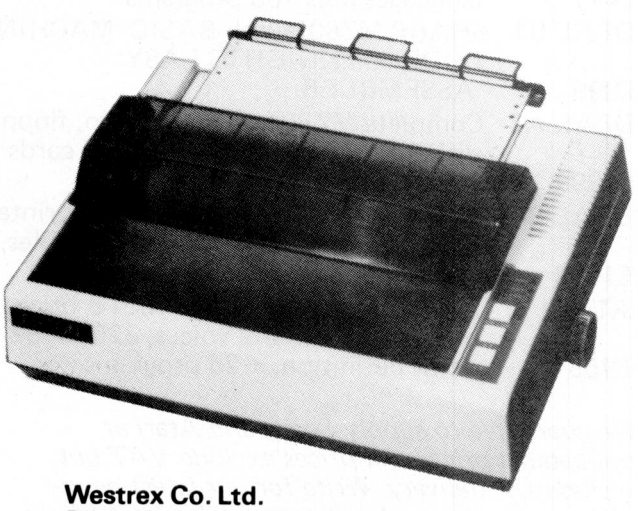
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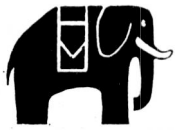
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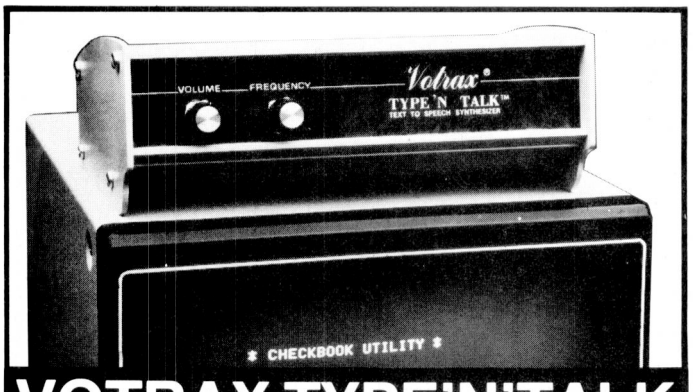
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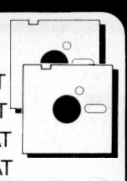
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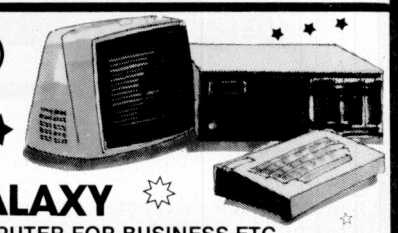


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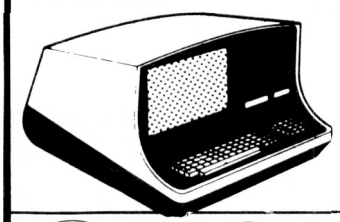
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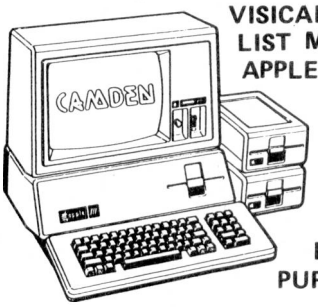


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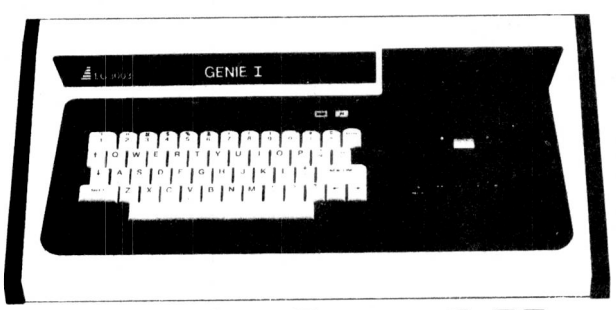
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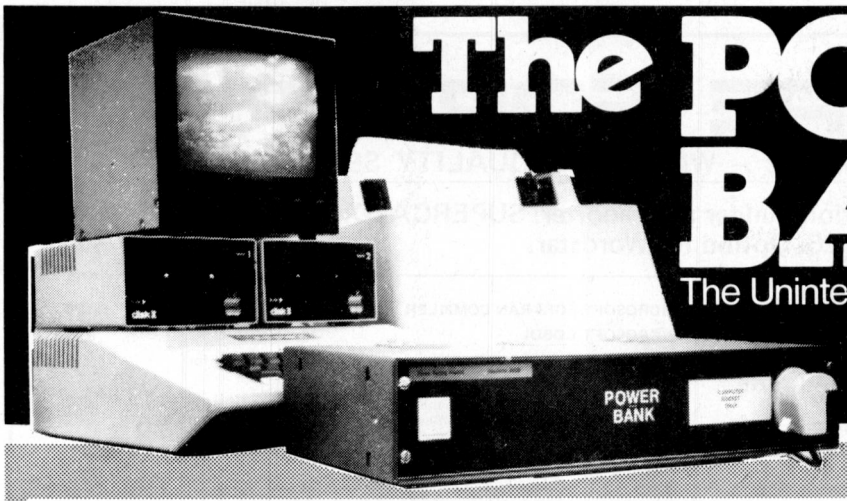
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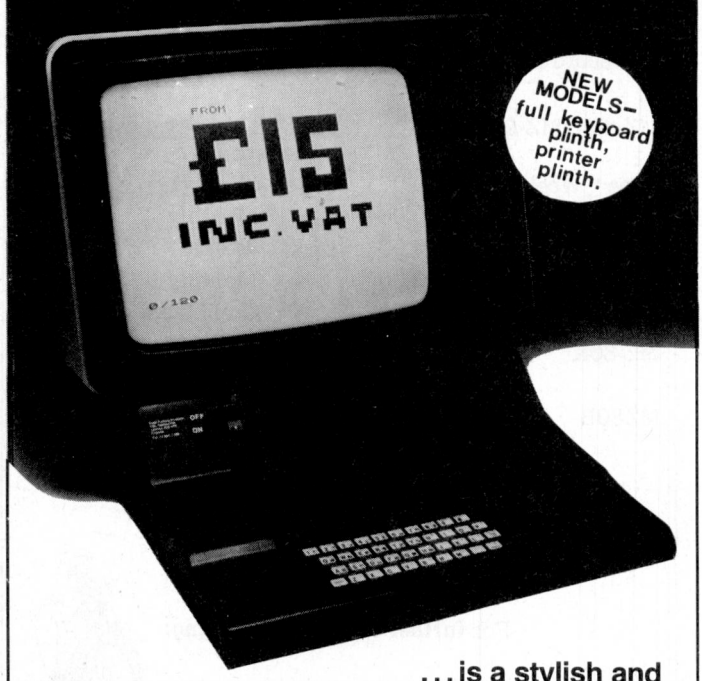


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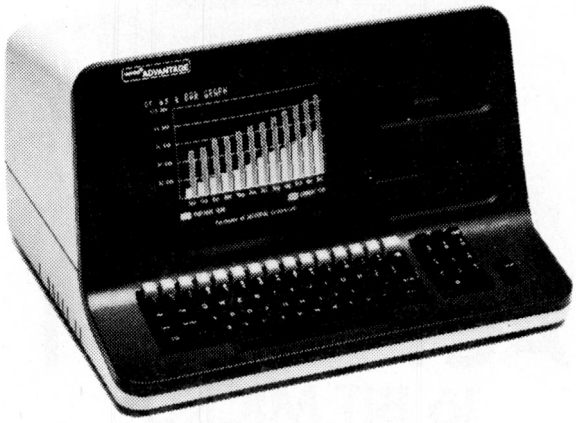
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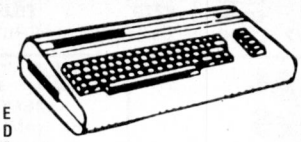
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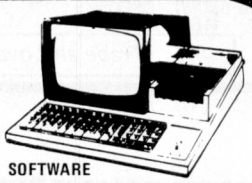
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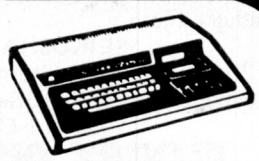


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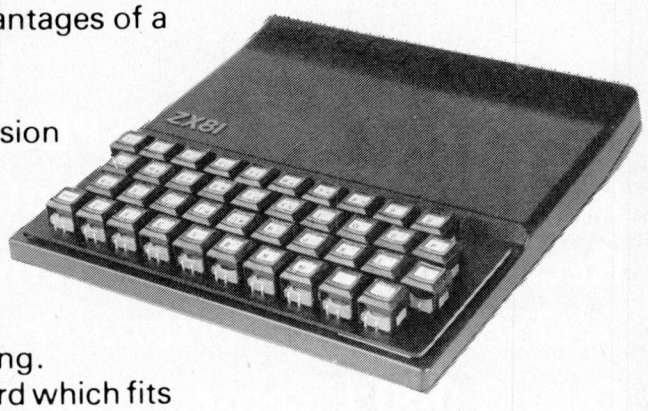
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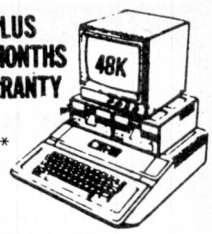
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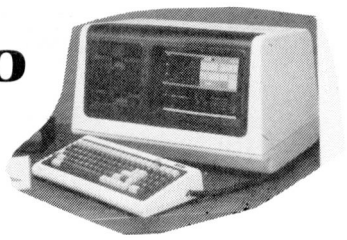
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- *Full-screen attributes, editing, smooth scroll, 25th status line, 11 function keys, numeric key pad*
- *2 RS-232C serial ports. These are jumper selectable for any combination of modems or printers*
- *CP/M 2.2 operating system*
- *Attractive tabletop enclosure, fully integrated with CRT, CPU, RAM and disk drives*
- *1 RS-422 high-spped port*

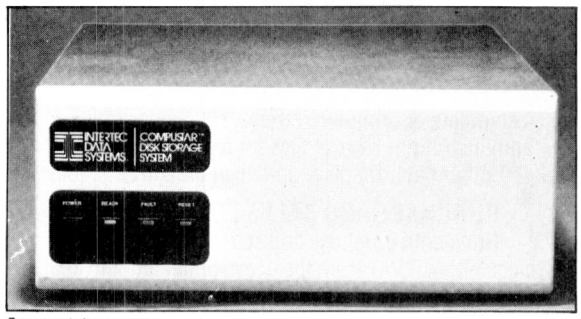
TeleVideo's TS 802 and TS 802H microcomputers are low-cost, powerful single-user integrated computer systems. TeleVideo has combined its top of the line CRT display with an advanced design single board computer (Z80, 64K RAM) with 5¼ floppy disks and Winchester hard disk all in one attractive tabletop enclosure. A detached typewriter-style keyboard is also included. The TS 802 computer features two 5¼-inch Winchester disk drive for 10 Mbytes of data storage, and a single 500 Kbyte minifloppy disk unit.

Both the TS 802 and 802H use the industry standard CP/M 2.2 operating system. This lets the user fulfill a wide variety of information and word processing needs using a multitude of commonly available application programs.

The TS 802 and TS 802H can accommodate serial printers and modems through the RS-232C serial ports.

When it comes time to expand to a multi-user system, you can utilize either your TS 802 or 802H as a satellite user station in the overall system without modification.

Multi-user hard disks



Functional characteristics

The CompuStar 10 megabyte Disk Storage System (DSS) consists of read/write and control electronics, read/write heads, a track positioning mechanism, a spindle drive mechanism, dual disks, an air filtration system, and our exclusive 255 user controller – all packaged in a compact desktop enclosure. Although designed primarily to accommodate multiple CompuStar Video Processing Units (described at left), the unit can easily be connected to a single SuperBrain Video Computer System to facilitate additional disk storage. When used with CompuStar VDUs, however, the integral Z80 based controlle will permit up to 255 users to 'share' the resources of the disk with minimual CPU response degradation.

Read/Write Heads and Disks

The recoding media consists of a lubricated thin magnetic oxide coating on a 200mm diameter aluminium substrate. This coating for mulation, together with the low load force/low mass Winchester type flying heads, permits reliable contact start/stop operation. Data on each disk surface is read by one read/write head, each of which accesses 256 tracks.

G.W. COMPUTERS LTD. 01-636-8210, 01-631-4818, TELEX 892031 TWCG

THE NEW DBMS (DATABASE)*

DBMS2 is a *record relational* as well as a *file relational* database management tool that is capable of being at different times, many different things. **The one core program** can be set up to perform tasks normally associated with the following list.

Accounting	Budgeting	Cashflow
Stock control	Address mailing	Letter writing
Simulations	Time recording	Filing
Calc-type predictions	Hospital indexing	Profit analysis
Bureaux services	General analysis	Mathematics
Answer *what-if's*	Employees records	Tabulate values
Print reports	Sort files	Edit records

Within hours perform all the above in **French** or **German**.

The list is as endless as that which meets the requirements of your own imagination.

Within the appropriate frames of reference you could ask questions like the following.

Find someone whose name begins with W, who is either in London or Birmingham, and available for work at a salary of less than 10,000.00; and is under 40 years of age, not married, of credit worthiness grade 1, with a car, prepared to travel, and who likes horses, does not mind the hours he works, is congenial and has good references. *When you find such persons* produce a printed list of them showing their names, telephone numbers, and what their salaries are as well as their salary *if increased by 10%* and show their availability for work. At the end of the list enumerate the total of such persons.

Find all stock items that are codes *micro-computers* that are either in warehouse 1 or warehouse 2, where the quantity on hand is more than 50 units, the cost is less than 1000.00, the selling price higher than 2000.00; that are not in cartons, bought from supplier 52, allocated more than 20, rated for tax at 15% and weigh less than 50 lbs. *When you find such categories* then print a report showing the description, cost price, quantity on hand, lead time for refills, what the selling price *should be if raised by 12.3%* as well as the profit in either per-cent or round figures of that projected selling price.

Find all patients who suffered from cold, that are either girls or women younger than 23 years old, and who live in London at a socio-economic grade higher than 3, do not smoke, have more than 3 children, are currently at work and where treatment failed to effect a cure in under 6 days. **When you find such persons** then print a list showing their age, marital status, income, and frequency of illness in the past 2 years.

Currently you can ask **5 types** of questions **20 times** for a single selection criterion, and then you can compute **10 mathematical relationships** between the questions for the individual **as well as** for the total number of matches. In all some **60** bits of information relating to **one** record or a **group of records** on simply one permutation of the selection criterion, with a cross referencing facility as well.

Every word in the system, as well as the file architectures, print masks, and field attributes, is capable of alteration by you **without** programming expertise (but with some thought).

ALL IN ONE PROGRAM FROM G. W. COMPUTERS. *THE DBMS2 !!*

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Some of our Special System Deals

*** ALL YOU NEED FROM A COMPUTER SYSTEM ***

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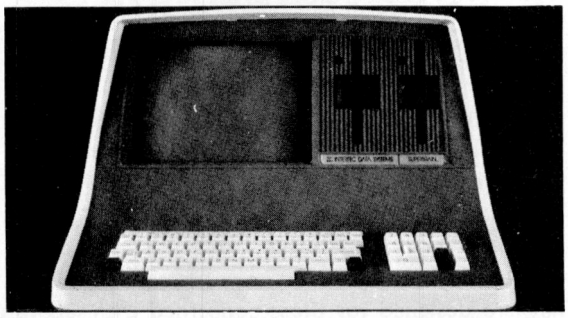
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(Note: The principle of this deal is that you pay (approximately) for hardware, warranty, consumables and 1 program. The rest is ***FREE*** You could make up your own package from our price list similarly.)

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GW Computers Ltd

SUPERBRAIN™

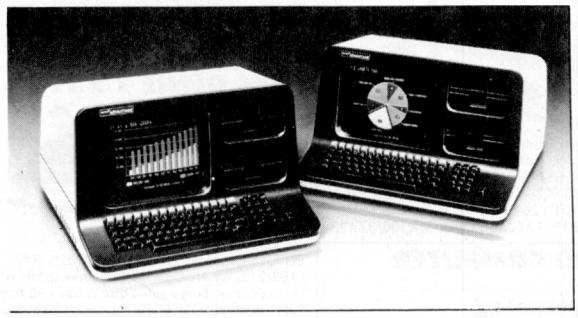


SuperBrain users get exceptional performance for just a fraction of what they'd expect to pay. Standard SuperBrain features include: two double density mini-floppies with 350k bytes of disk storage, 32k of RAM memory (expandable to 64k) to handle even the most sophisticated programs, a CP/M® Disk Operating System with a high powered text editor, assembler, debugger and a disk formator. And, with SuperBrain's S-100 bus adaptor, you can add all the programming power you will ever need. . . almost any type of S-100 compatible bus accessory.

SuperBrain's CP/M operating system boasts an overwhelming amount of available software in BASIC, FORTRAN, COBOL, and APL. Whatever your application. . . General Ledger, Accounts Receivable, Payroll, Inventory of Word Processing, SuperBrain is tops in its class. And th SuperBrain QD boasts the same powerful performance but also features a double-sided drive system to render more than 700k bytes of disk storage and a full 64k of RAM. All standard!

Whatever model you choose, you'll appreciate the careful attention given to every engineering detail. A full ASCII keyboard with numeric pad and user-programmable function keys. A non-glare, specially focused 12-inch CRT for sharp images everywhere on the screen. Twin Z-80 microprocessors to insure efficient data transfer to auxiliary peripheral devices. Dual universal RS-232 communications ports for serial data transmission. And, a single board design to make servicing a snap!

ADVANTAGE



Integrated Desk Top Computer with 12 inch Bit-Mapped Graphics or Character Display, 64Kb RAM, 4 MHz Z80A,® Two Quad Capacity Floppy Disk Drives, Selectric* Style 87 Key Keyboard, Business Graphics Software.

The North Star ADVANTAGE™ is an interactive integrated graphics computer supplying the single user with a balanced set of Business-Data, Word, or Scientific-Data processing capabilities along with both character and graphics output. ADVANTAGE is fully supported by North Star's wide range of System and Application Software.

The ADVANTAGE contains a 4 MHz Z80A® CPU with 64Kb of 200 nsec Dynamic RAM (with parity) for program storage, a separate 20Kb 200 nsec RAM to drive the bit-mapped display, a 2Kb bootstrap PROM and an auxiliary Intel 8035 microprocessor to control the key-board and floppy disks. The display can be operated as a 1920 (24 lines by 80 characters) character display or as a bit-mapped display (240x640 pixels), where each pixel is controlled by one bit in the 20Kb display RAM. The two integrated 5¼inch floppy disks are double-sided, double-density providing storage of 3600Kb per drive for a total of 720Kb. The n-key rollover Selectric style keyboard contains 49 standard typewriter keys, 9 symbol or control keys, a 14 key numeric/cursor control pad and 15 user programmable function keys.

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* * * THE NEW DBMS III (DATABASE) * * *

The DBMS III is an exhanced version of DBMS II with additional facilities that make it (we believe) unsurpassed in overall capability world-wide.

For the first time, it is possible to pre-determine the entire route of this program from its own built in self-drivers. The notion of getting information 'at the touch of a button' is rarely even achieved by other programs whereas in DBMS III it is surpassed.

It will take you tome to master the technique of setting up files that are particular to your activities, but when this is accomplished you will be able to 'clone-copy' the program DBMS III in such a manner that each copy may become dedicated functionaires to specific tasks for as long as you wish.

The end result will be a number of disks whose sole purpose in life will be to perform specific tasks **WITHOUT ever touching a single key.** Say your company is a garage; you want stock-level re-order reports; your stock file contains 20,000 records of parts where among other information you have 'MINIMUMS', MAXIMUMS', 'PRESENT STOCKS' and 'COST'. You design a report so that all records where stock is below minimum, the stock is subtracted from the maximum to produce a re-order report and the cost of such an order. Having set up the files and print report forms, you now enable the **DBMS III SELF-DRIVERS,** to pre-ignition.

Every time you want a stock-re-order-cost-report you simply follow this procedure, with the computer and printer switched on:

Insert the 'STOCK-FILE DISK' and the 'DBMS III FUNCTIONARY DISK', close the drive doors, and walk away. On your return you will find your report ready for action.

Imagine being able to do that for most of the tasks you have about you? Hospital serum analysis reports, Production control process reports, Ledger analysis reports, Clients address reports, Housing management reports, In fact most anything whose nature concerns information.

Additional features include field protection, classified fields, passwords to files, increased number of fields, screen form designing, automatic 10 second screen refresh for network systems, additional search/maths functions.

A leader in database and information processing at this time. The DBMS III (575.00 exc vat and exc mbasic 80). Only from G.W. Computers Ltd.

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FORMATS: (FOR BASIC, DBMS II, = N'STAR & SUPREBRAIN 5").. (FOR SUPER-CALC = 8"; ZENITH; XEROX; APPLE; VECTOR.. (FOR MAGIC WAND/CALC = N'STAR & SUPERBRAIN)

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CONTACT 01-636 8210 OR 01-631 4818 AND IF UNAVAILABLE THEN LEAVE A CALL-BACK MESSAGE (CLEARLY STATING YOUR TELEPHONE NUMBER AND NAME) ON THE 24 HOUR ANSWER-PHONE OR SIMPLY LEAVE YOUR ADDRESS AND WE'LL MAIL YOU A STANDARD INFORMATION PACK. WE REGRET WE DO NOT OPERATE A READER'S REPLY CARD SERVICE. TERMS: C.W.O. OR C.O.D. (PRICES EXCLUDE V.A.T.) SOFTWARE SALES ARE 'MAIL ORDER ONLY'. NO DEALERS.

Due to long term contractual commitments, we are only giving restricted demonstrations by appointment at one of our London offices. We export to all countries. Contact Tony Winter on 01-636 8210 or 01-631 4818 and if unavailable then leave a call-back message (clearly stating your telephone number and name) on the 24 hour answer phone, we call back anywhere in the world.

IMPORTANT!!! NO HARDWARE IS ANY VALUE WITHOUT THE SOFTWARE, AND OUR SOFTWARE IS UNEQUALLED. BUY A COMPLETE SYSTEM AND GET MOST OF THE SOFTWARE FREE

SINCLAIR COMPUTERS

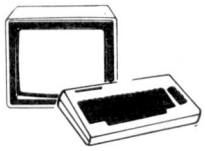
We are the leading world-wide Sinclair export specialist including Norway, Sweden, Finland and Denmark. Write for our surprisingly low prices.

PRINTERS



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VIC 20 COMPUTER



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UK101 AND SUPERBOARD

32x48 display expansion kits UK101 £9, Series 1 Superboard £14. Guard band kit for Superboard only £10. The below accessories suit both the UK101 and Superboard:- Extra RAM £2-10 per K. Cegmon £22-50. Wemon £14-95. Word processor program £10. Centronics interface kit £10. 610 expansion board £179. Cased mini-floppy disc drives with DOS single £275, dual £415.

NEW GENIE 1 £299



EG3014 Expansion box with 16K/32K RAM £199/213. We are Cumana disc drive specialists for the Genie. Single sided disc drives:- 40 track £205, dual 40 track £345, 80 track £269, dual 80 track £469. Double-sided disc drives:- 80 track £399, dual 80 track £699. Double density convertor £72. Parallel printer interface £36.

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We can supply any Epson MX80 printer to run direct from the MZ80K (I/O box not needed) for £39 plus printer price. We also specialise in interfacing printers to the MZ80K, MZ80A and MZ80B both with and without the I/O box.

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Fully stabilised 5V computer and TTL power kits. Short circuit and over-voltage protection 1.5A £7.83, 3A £12.17, 6A £20.

Postage £3.50 on computers, £4.50 on printers and 50p on other orders. Please add VAT to all prices. Official credit and overseas orders welcome.

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Imperial College of Science and Technology

Microcomputers in Chemical Instrumentation

The fourth and fifth of these courses will be held from Monday September 20th to Friday September 24th 1982 and Monday March 28th to Friday April 1st 1983

They are designed for those concerned with laboratory data acquisition, control of instrumentation, analysis and interpretation of results and report generation. Participants gain valuable experience of the revolutionary impact of microcomputers in these fields of laboratory practice. No previous experience of computing is needed.

Most of these intensive five day courses is spent gaining hands-on experience in the college microcomputer laboratory. All instruction is in Basic. In addition to providing a review of the use and economics of microcomputers and subjects covered include the choice of microcomputers, interfacing, the choice of programming languages, text processing and the choice of peripherals.

For further details, please write to :
Dr NJ Goddard, the Chemistry Microprocessor Unit, Department of Chemistry, Imperial College, London SW7 2AY
or Telephone :01-589 5111 extension 1269.

EAST LONDON ROBOTICS

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80K SPECTRUM

now attainable for the price of a 48k model!! with our SP80 low-power Sinclair look-alike.

Functionally identical to the Sinclair 32K internal plug-in expansion but with double the capacity (64k) the SP80 plugs into the sockets provided on the 16k SPECTRUM by Sinclair for his 32k expansion board. Instructions to our usual high standard makes fitting very simple indeed. The SP80 in no way interferes with Sinclair add-ons – ZX Printer, RS232 interface, Microdrive. . .

New low prices on our highly successful internal memories for ZX81

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All prices already include VAT.
Please tick if you require a VAT receipt.
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. . . . . .

STOP PRESS!!! Transfer all your ZX81 BASIC and Machine code programs and data onto your SPECTRUM in minutes with our new SLOWLOADER available soon!!

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THE ROM–VIDEO GENIE & TRS 80 (3 ROM Models)

Are you fed up of loading a lower case drive every time you switch on? — Want your name inside your computer — Better loading (TRS80) — Sick of bouncy keyboards-s!

You need our new ROM–simply remove old–plug in new.

1) Firmware driver for lower case
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FEATURE ROMS £18.95 + VAT + P&P (80p)
A series of ROMS starting with FEATURE 'A'
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NEW

FEATURE 'B'–extended basic
1) Merge–two basic programs to one
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Access and Barclaycard accepted.

Plug on for feature ROMS
Now you can simply plug on the back of your computer, insert ROM and away you go.
VG £29.95 inc. ROM A OR B + **VAT** + **P&P** **TRS80 £34.50 + VAT + P&P (80p)**

48K RAM–internal
TRS80 & VG £43.50 + **VAT** + **P&P (80p)**
Plug in our modules. Connect three wires (VG) or five (TRS80). You are not required to piggyback chips. Keep your old RAM (or sell it!). Compatible with expansion.

LOWER CASE HARDWARE (VG & TRS80)
Unplug two IC's, plug in two modules, connect three wires–EASY! £19.00 + VAT + P&P

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+ Much else in each volume.
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MX80T Type III
£285 + CARR. + VAT (Cash/Chq. only)
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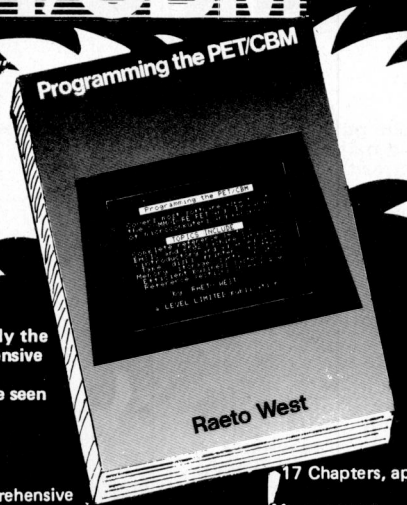
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CHIP CHAT

CHIP CHAT CHIP CHAT CHIP CHAT CHIP CHAT CHIP CHAT

Why has the public relations person of a major micro manufacturer taken to ringing the press and saying that the Sinclair Spectrum has 'gone out of production' due to technical difficulties? And who has started the rumour that Sinclair has run into the same ULA problems which have dogged the BBC Computer? Do we sense dirty deeds afoot? Fact is, there was a technical problem with the Spectrum which involved the first batch of machines being sent back to the Timex factory at Dundee and this, coupled with a short strike there, delayed initial deliveries somewhat. But production is in full swing and was in fact recently witnessed by Editor Rodwell in person when 'Uncle' Clive flew a select group of micro-hacks to Dundee in the Sinclair plane (a twin-engined, turbo-prop Cessna Corsair — nice, but without the gold-plated fittings which Jack Trameil has in his jet). And 'Rodders' has at last received his Spectrum, so they *are* being delivered. And it works, so discount any ULA rumours you might hear . . . Still on Spectrums, hilarious news reaches us that curious Commodore executives, including ex-patriot (?) Kit Spencer (remember him?) were so keen to get their hands on a Spectrum that they persuaded 'Bogey' to lend them his personal machine for an evening. When 'Bogey' tried to contact Kit the following morning to retrieve said micro, he found that Kit was already jetting back across the Atlantic, taking the Spectrum with him . . . Whatever happened to 'Bumper' Harris? Nobody seems to have seen him around for several months . . . We hear that 'Squire' Allason has at last sold his ailing *Sprintout* magazine but our spy refuses to disclose the buyer. Apparently the purchaser upped his bid to a more satisfactory level when the 'Squire' agreed *not* to include Richard 'Paws-on' in the package. Does this mean that Richard will have to hand back Julian's Porsche? . . . Finally, the accompanying photograph shows the effects on the mind of being a software publisher. Well, no, actually it shows 'Tebbo' and partner Bill Barrow (for whom nobody has yet managed to contrive a printable nickname) with their first major order for Cardbox — 300 copies, in fact, which they've sold to Xerox Stores in the States and which are worth a 'street value' of over $70,000. For reasons best known to themselves, David and Bill decided to pile all the Cardboxes into a pyramid and hide behind them, where our roving camera-person found them.



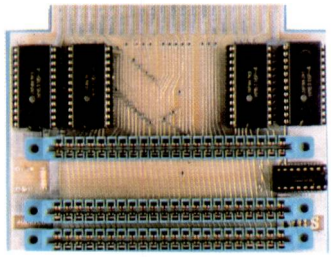
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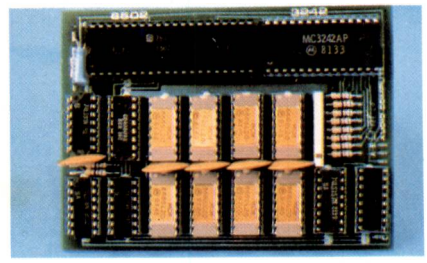
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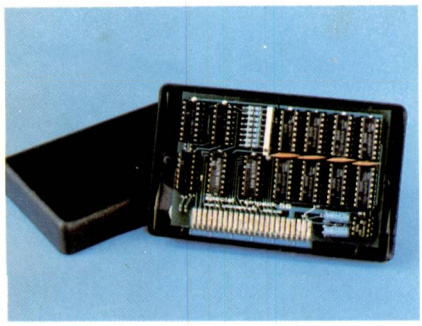
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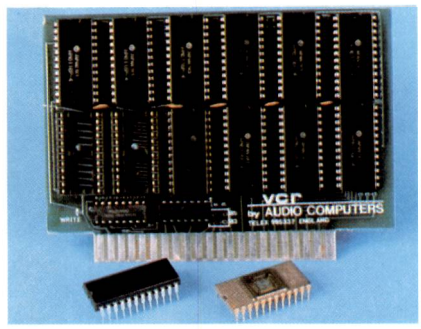
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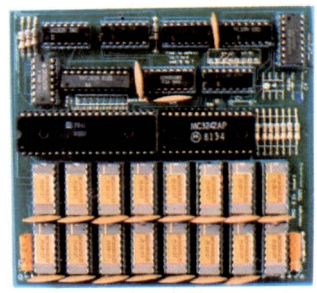
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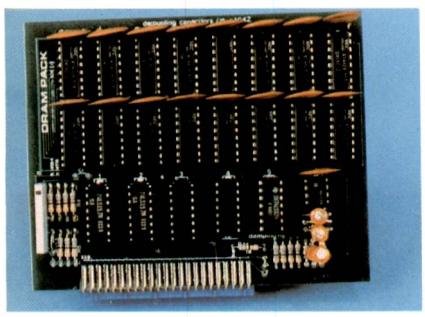
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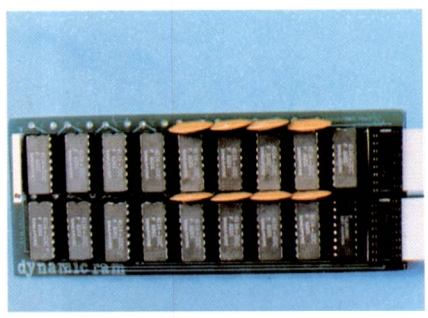


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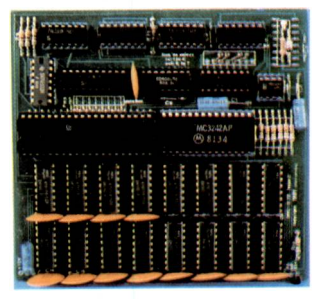


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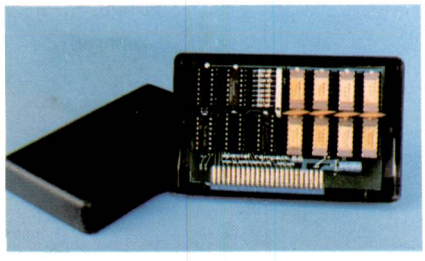
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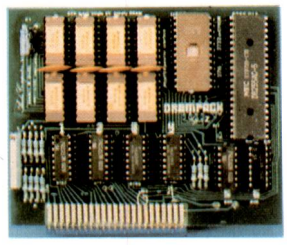
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