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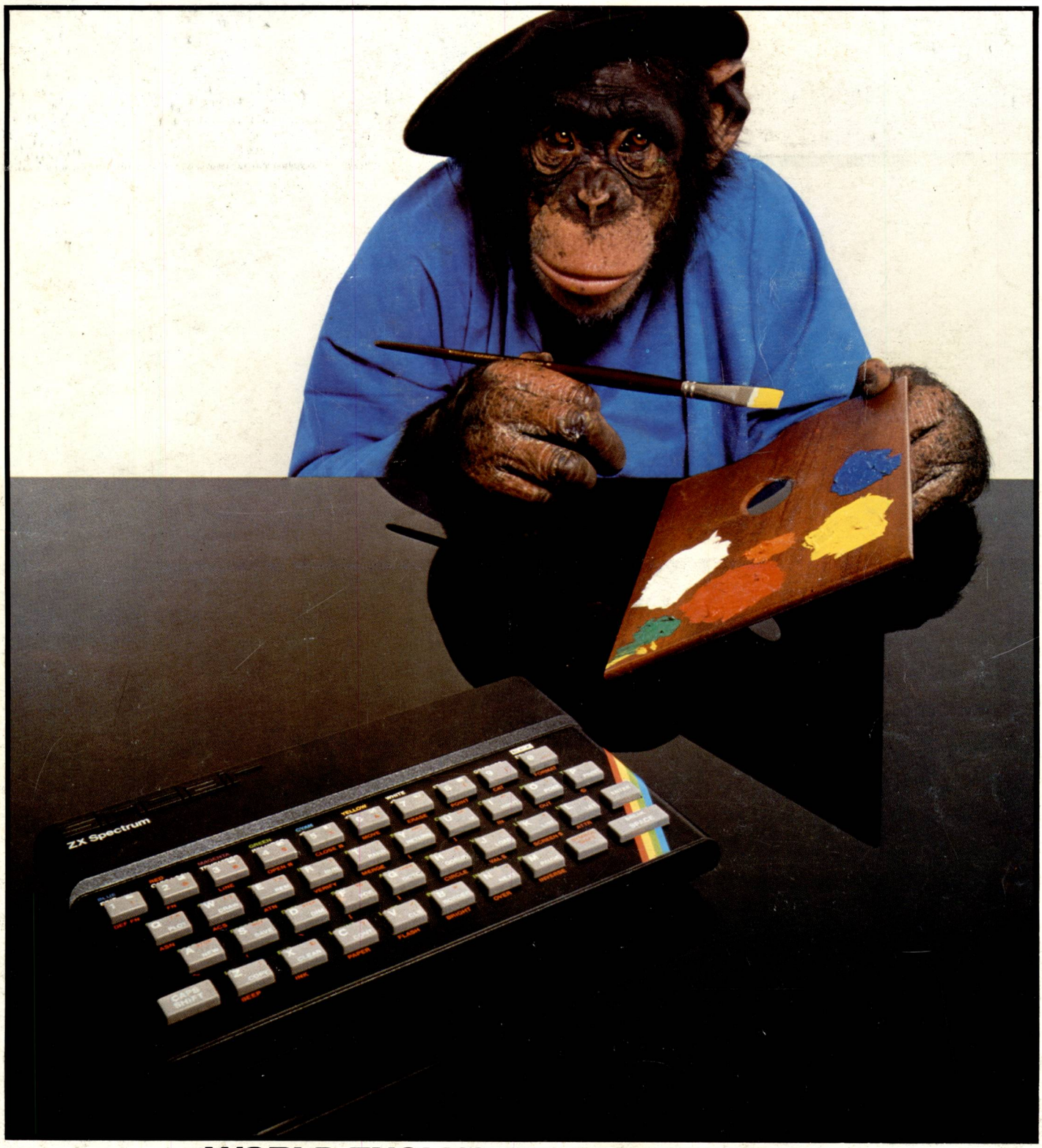
June 1982 75p

BRITAIN'S LARGEST SELLING MICRO MAGAZINE



WORLD EXCLUSIVE: ZX SPECTRUM
We Benchtest Sinclair's new 16k colour micro



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6 Micro courses at Digitus

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A two day course for those who have learned Basic from hands-on experience and want to brush up their BASIC techniques and learn some timesaving software tools.

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DATASTAR INFORMATION MANAGEMENT

The DataStar data entry, retrieval and management system is a powerful aid which enables the educated user and computer professional to build inform ation systems economically and rapidly.

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Course in: Micro Technology for Management • Local Area Networks • Micros for Computer Professionals.
Courses are run at the Workshop or on site. Telephone or write for details.

Micro Technology Workshop Set in 8,500 sq.ft in Central London, the Workshop is a few minutes from Covent Garden, Trafalgar Square, Charing Cross, Embankment and Waterloo stations. Specialist areas include: Personal Computers, Technical Systems, Business Systems, 16 bit and Local Network Systems, Bookstore and Training Rooms.

Booking and Fees The fee for all courses is £80 per day plus VAT, payable 14 days prior to starting date.

All courses provide access to an extensive range of micro hardware, software and expertise.

Note: Wordstar and DataStar are registered trademarks of Micro-Pro Inc.

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Name of delegate ..... Date .....

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Fundamentals of Programming in Basic	☐ June 8/9	☐ Oct 12/13
Improve your Basic	☐ June 10/11	☐ Oct 14/15
Wordstar Wordprocessing	☐ July 6	☐ Nov 9
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PCW/6/82

INSIDE PCW

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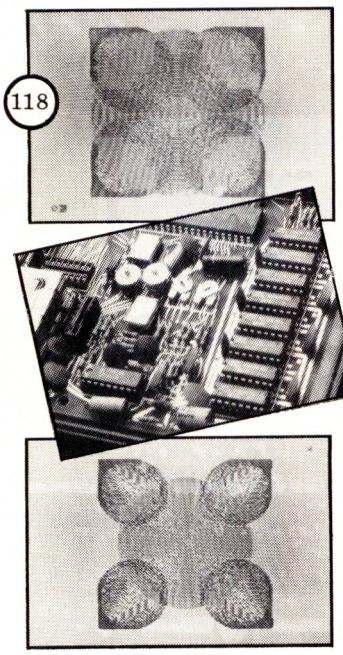





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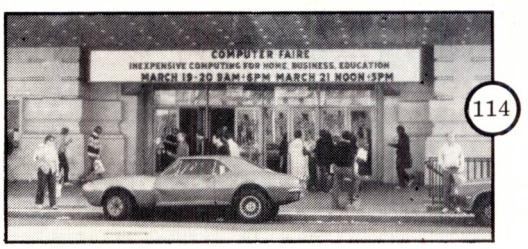

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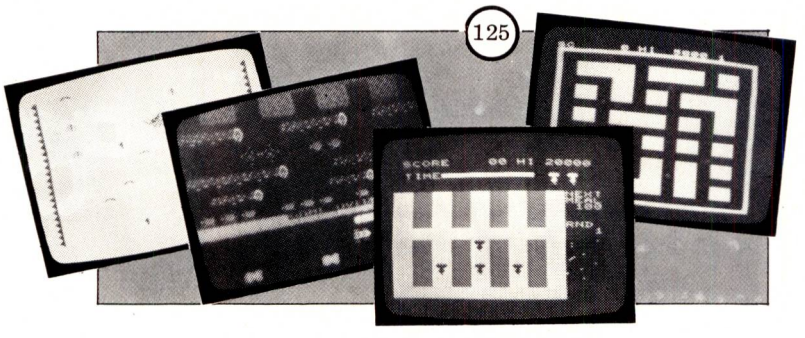

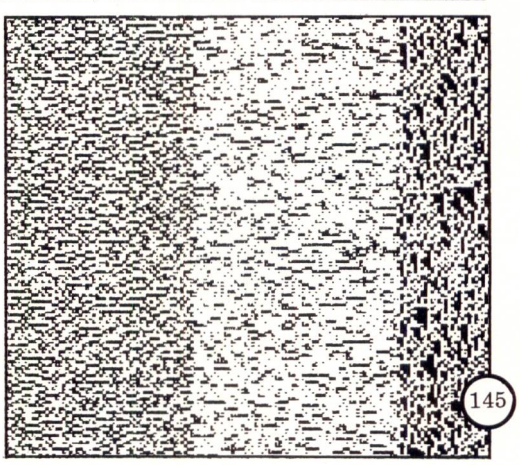

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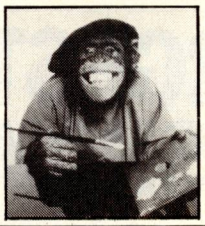

Cover photograph: Chris Stevens
Model: Louis, Twycross Zoo
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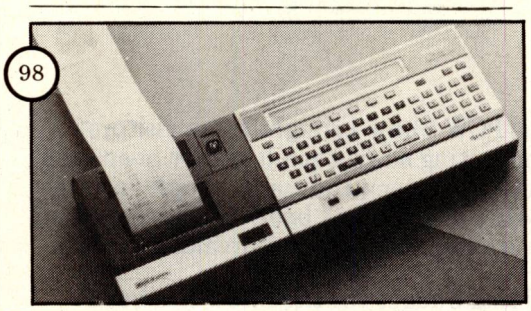

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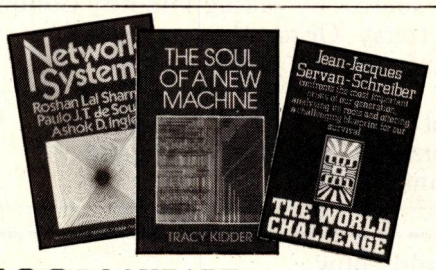

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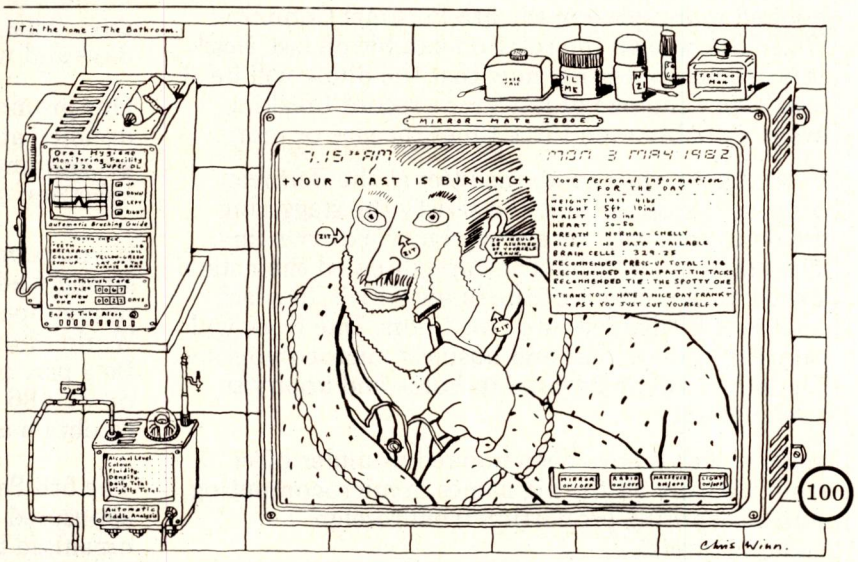

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THE LARGEST MICROCOMPUTING SHOW IN BRITAIN

The 5th Personal Computer World Show

Barbican Centre, City of London
9–12 September 1982

Breaking all records!

By the first week in March, Exhibitors had already booked more space in the 5th Personal Computer World Show than the total on exhibition last year! It is absolutely certain now that the Show will be at least twice the size of last year's record breaking event. Possibly even three times the size or more.

Fortunately, the superb facilities at the Barbican offer us the opportunity to satisfy the staggering demands for space we are currently experiencing. The majority of Exhibitors have doubled their stand size in both sections of the Show which, like last year, will be divided into two floors. One floor will cater for professional and business microcomputing. The other will be devoted to home and hobbyist applications.

Massive stands have been booked or under offer from virtually all the big names in microcomputing. And a surprising proportion from foreign manufacturers!

Last year, the PCW Show brought more visitors to a microcomputing show than had ever been seen in the UK before. Sixteen thousand people in three days. This year the Show has been extended to four days and we are expecting record-breaking crowds.

Our promotional budget for the Show has been doubled and we are arranging the most exciting programme of features to attract the widest possible spectrum of visitors.

If your company is involved in microcomputing we strongly advise you to send off for details and reserve space now. The 5th Personal Computer World Show is already set to be a stunning success. Be a part of that success by calling Timothy Collins on 01-486 1951 today. Or use the coupon below to obtain a full information pack.

The 5th Personal Computer World Show is sponsored by Personal Computer World and organised by Montbuild Ltd.

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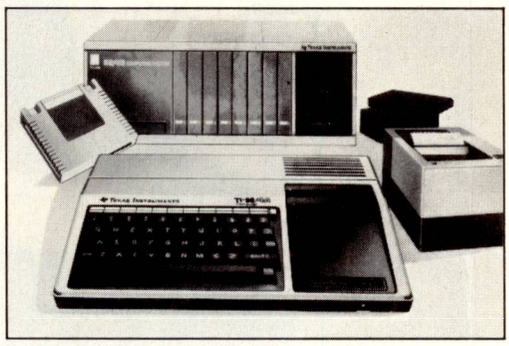
Just compare the versatility of the TI Home Computer with its price – you'll find it real value for money that will prove to be a good long term investment.

The TI-99/4A is a sophisticated computer designed not only for the beginner with its ease of operation, but also for the professional with its vast computing power through a 16 bit microprocessor. And it simply plugs into an ordinary household TV set.



With its high resolution graphics with 32 characters over 24 lines in 16 colours (256 x 192 dots), 3 tones in five octaves plus noise, and BASIC as standard equipment and options such as other programming languages – UCSD-PASCAL, TI-LOGO and ASSEMBLER – and speech synthesis, you'll find that the TI 99/4A more than compares with the competition. Especially when the starting price is £340 or less. When you want to solve problems there are over 600 software programs available worldwide – including more than 40 on easy-to-use Solid State Software® Modules.

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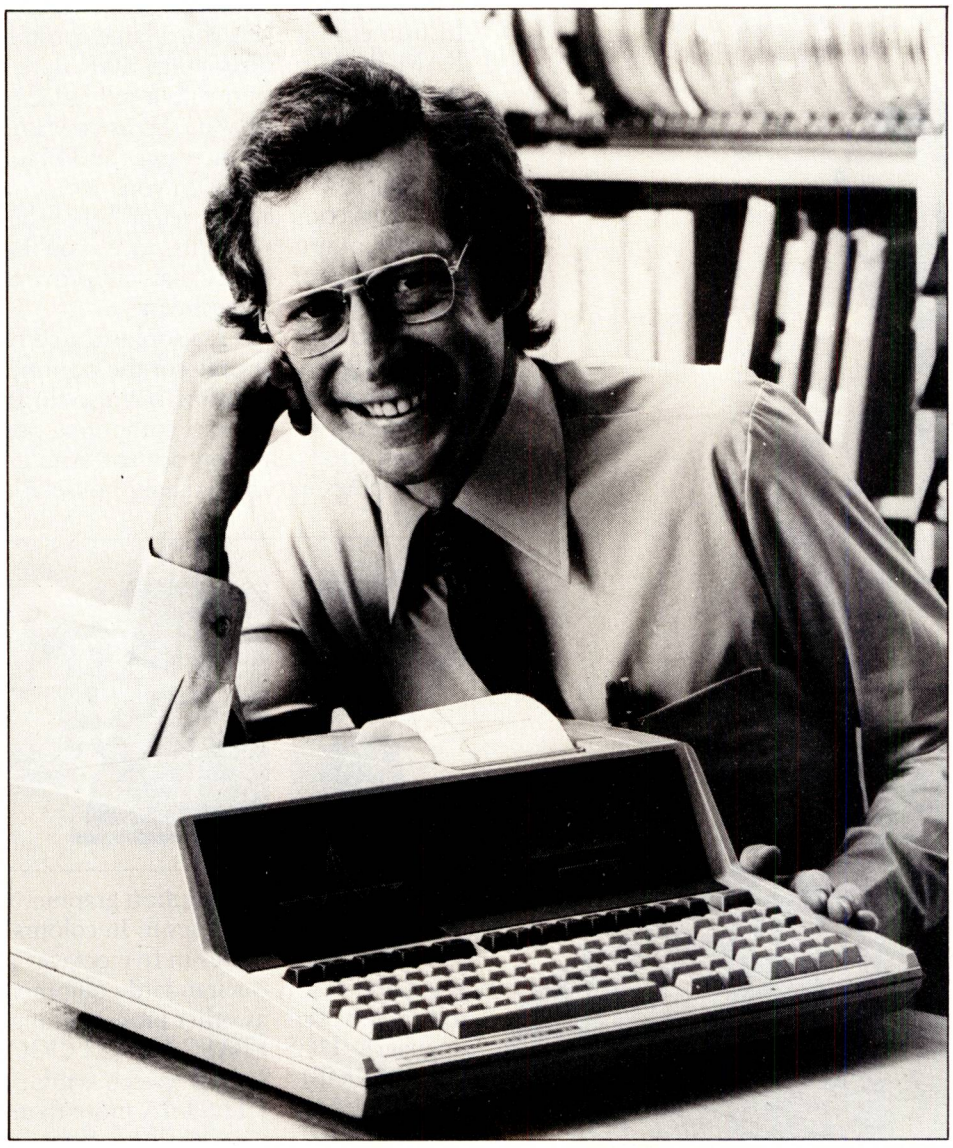


Hewlett-Packard's HP-85 personal computer puts full professional computing power wherever you need it. On your desk, in the lab, at home – anywhere! With all the convenience of an easy-to-use, all-in-one computer system.

Not merely a *portable* computer, but a complete, super-reliable system.

The HP-85 is complete in itself. It incorporates a high-resolution video display with editing capability. A whisper-quiet thermal printer for hard copies of display graphics and alphanumerics. A magnetic tape unit with up to 217k bytes of storage per cartridge. And a QWERTY keyboard, a separate numeric key pad, and eight keys you can define for yourself. Powerful, built-in features – yet HP's extended BASIC language puts them at anybody's fingertips.

Full computing power that tucks under your arm!

The HP-85 weighs only 18 lb (8 kg), and is about the same size as an electric typewriter. Where you go, it goes. When you get there, simply plug in, turn on, and start work.



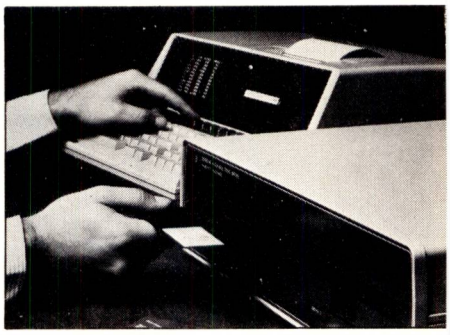
Extend your capability.

The HP-85 is complete – but also expandable.

Extra memory

If you work with lengthy programs, or larg data arrays, simply plug in an optional module to *double* your memory to 32k byte And if that's not enough, there's the HP 82900 series of 5¼" flexible disc drives

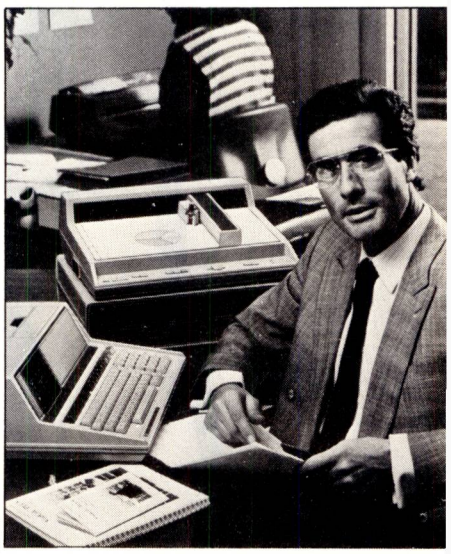
Each with 270k bytes, giving fast, random-access, on-line storage.



Extra facilities

There's no shortage of peripherals to add!

With the range of four plug-in interface modules (HP-IB, RS-232C serial interface, GP-IO and BCD) you can connec your HP-85 to a full line of peripherals. There's a whole range of HP thermal and impact printers, as well as the quality HP 7225 graphics plotter, or the HP 9111A graphics tablet.



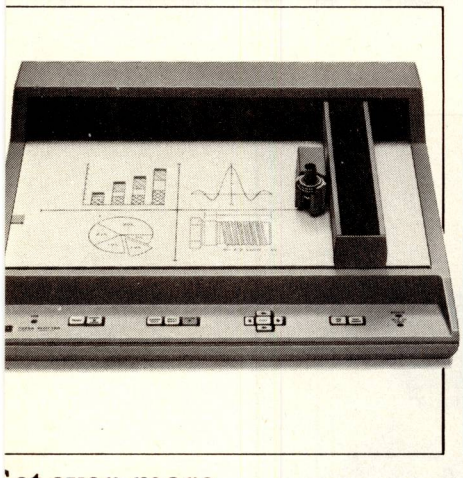
And with the HP-85 peripherals there's no need to write special operating programs – HP's peripheral ROMs do it for you.

Personal Computer The HP-85.

.dvanced graphics – ıe easy way.

The HP-85 can turn the most complex ıta into easy-to-analyse graphs and plots. copies anything from the display to the inter with a single command so you can nerate an unlimited number of lines, ırves, diagrams and designs. From plotting ıta to drawing and labelling graphs with se.

And should you need multi-colour or esentation graphics, simply attach the P 7225 Graphics Plotter to enhance your pability even further.



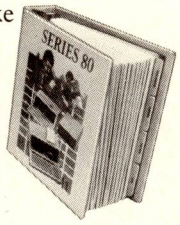
?et even more ut of your HP-85 /ith Hewlett-Packard's nique software support.

As an HP-85 owner, you are provided ith a comprehensive range of software ıpport to make sure you can get the most ıt of your personal computer.

The Optional Application Pacs, for ample, provide a variety of ready-tested rograms. From the disciplines of Statistics BASIC language training...from lathematics and Finance to computer ames. There are even facilities for circuit ıd waveform analysis, and linear rogramming. Another software service vailable to the HP-85 owner is Hewlett-ackard's unique Users Library (covering l Europe). At nominal cost it's designed ecifically to encourage and facilitate the change of user-generated programs. Its sources cover the widest possible range of cientific and professional activity.

xtra user support

he HP-85 comes complete with the)' manual. Its high-quality documentation and easy-to-read style make up 340 comprehensive pages of instructions, programs and examples. Just as simple to follow whether you're the experienced pro. or the first-time user!



Super controller as well

The HP-85 is HP-IB compatible. This industry standard (IEEE-488) allows the connection of up to 14 instruments and peripherals per interface. And not only HP's instruments!

The micro-processor-based interface card handles the complex interfacing task. *So you can concentrate on how to use the instrument, instead of on how to hook it up.* Personal computer one minute – controller the next!



Hewlett-Packard: computers designed for professionals, with professional reliability guaranteed.

Behind the HP-85 computing system is the strength of Hewlett-Packard, one of the world's largest computer manufacturers. This means continuous commitment to quality – and single-source supply, service and support. When you build your personal system around an HP computer, you build in two important extras: first, the legendary Hewlett-Packard long-term reliability; second, the assurance that your entire system can be serviced and cared for on site by the same computer professionals who designed it. Think about a demo – today.

HEWLETT PACKARD

See the HP-85 demonstrated today at

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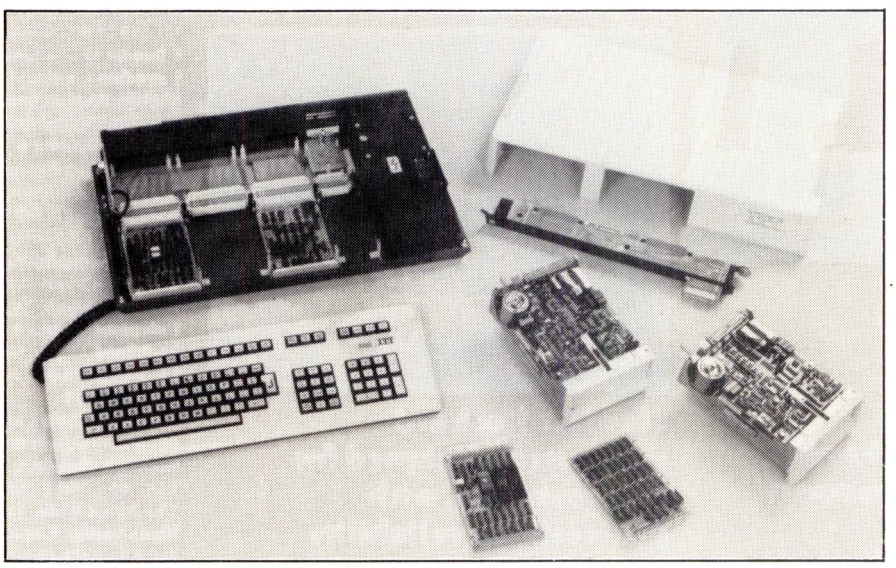

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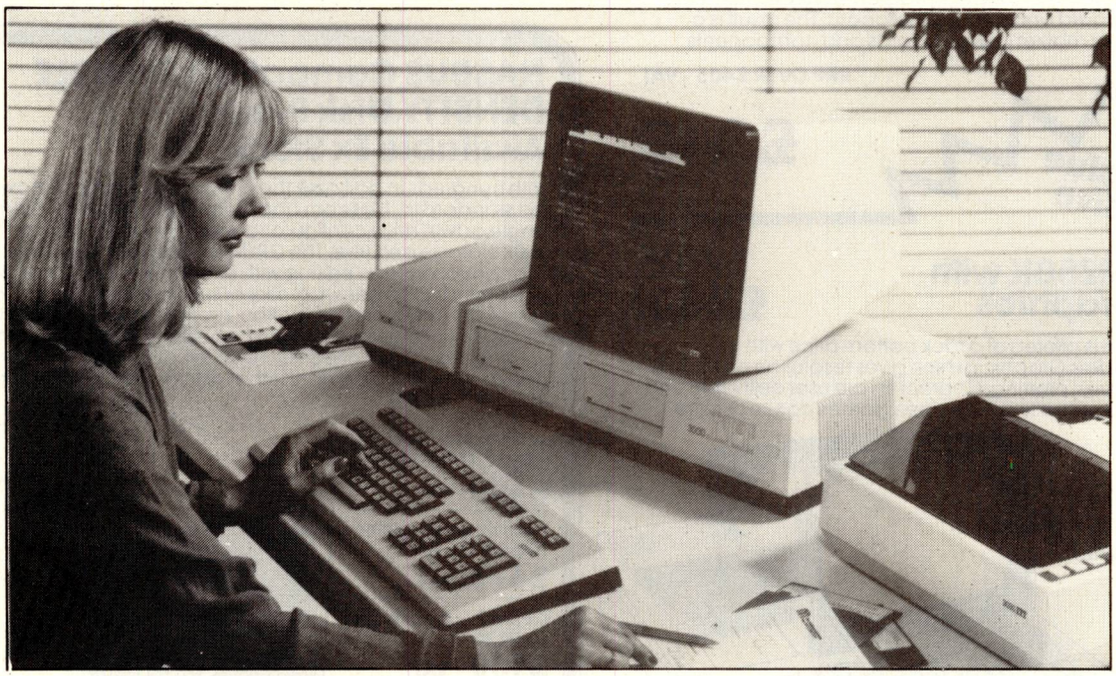

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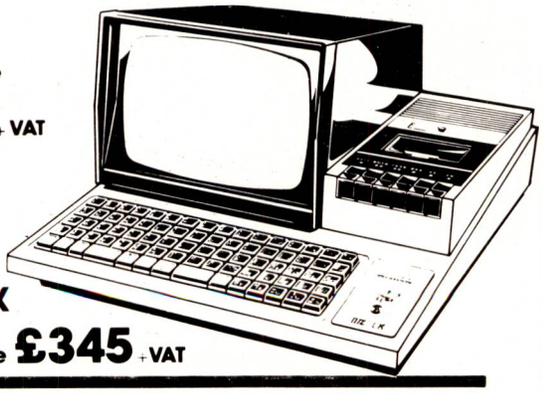

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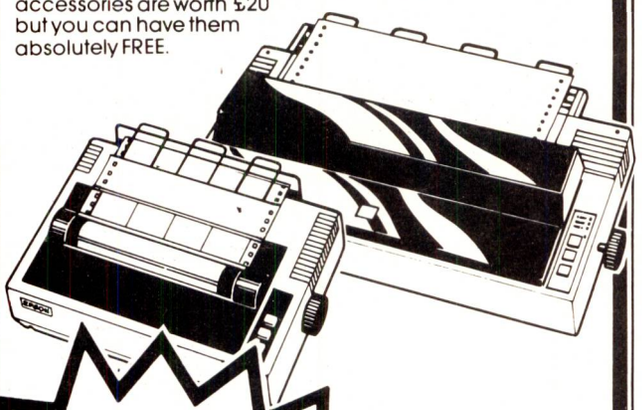

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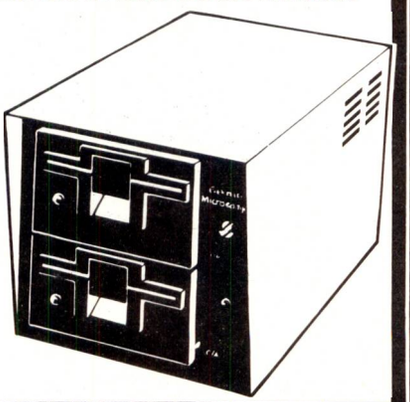

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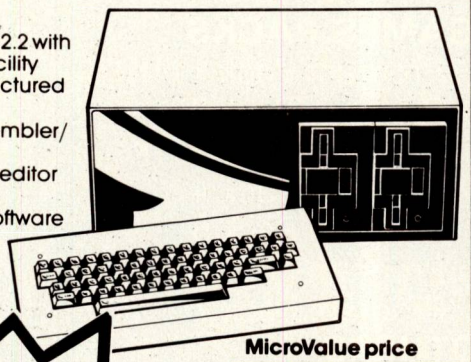

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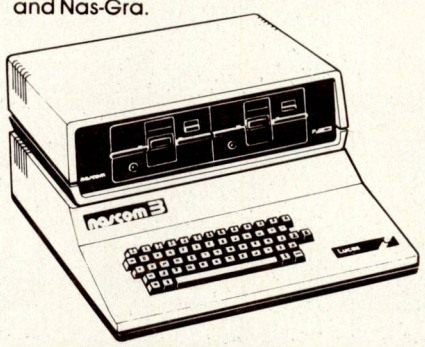

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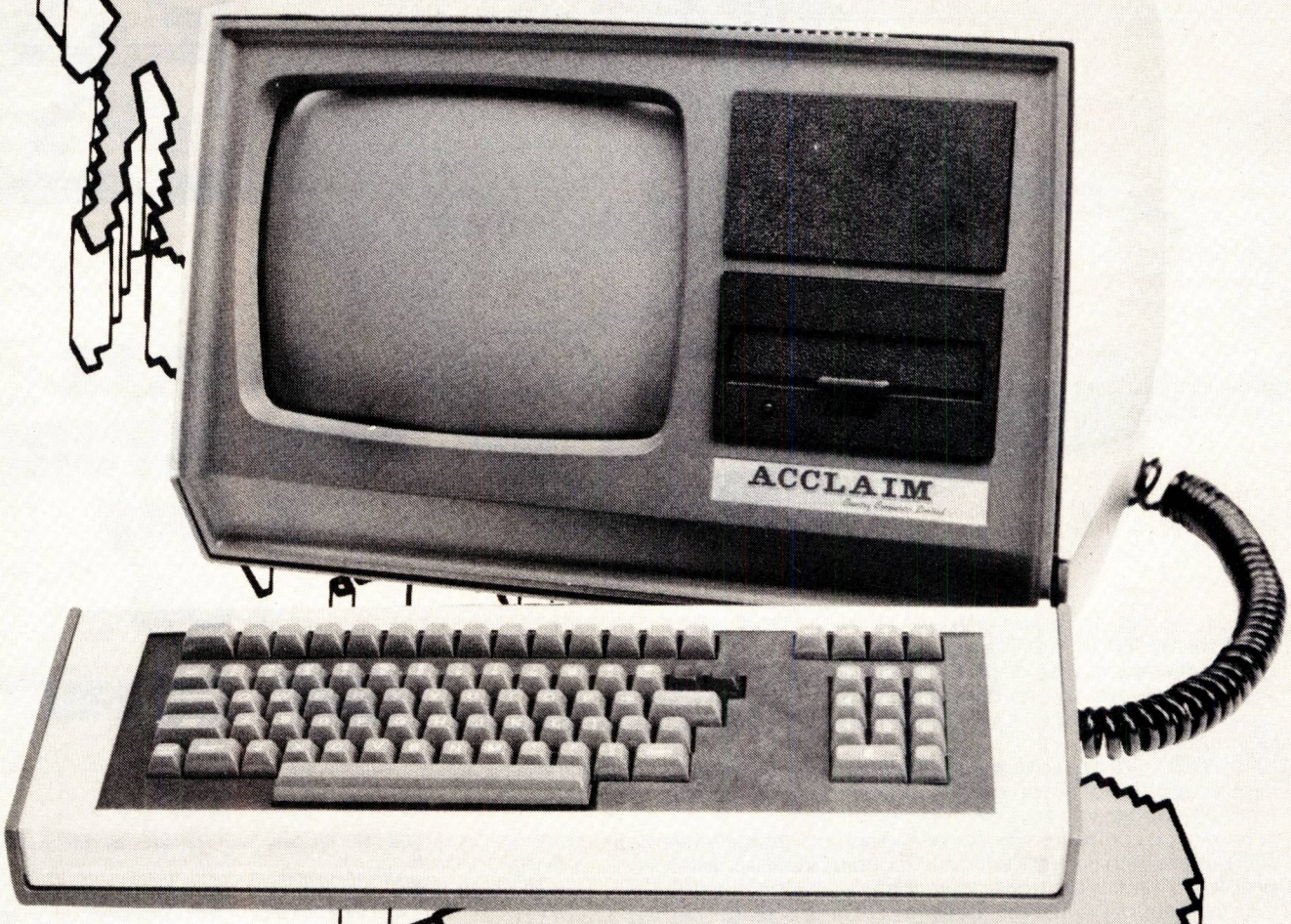

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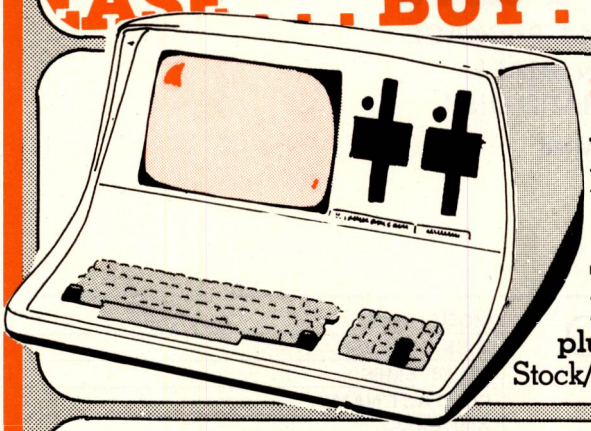

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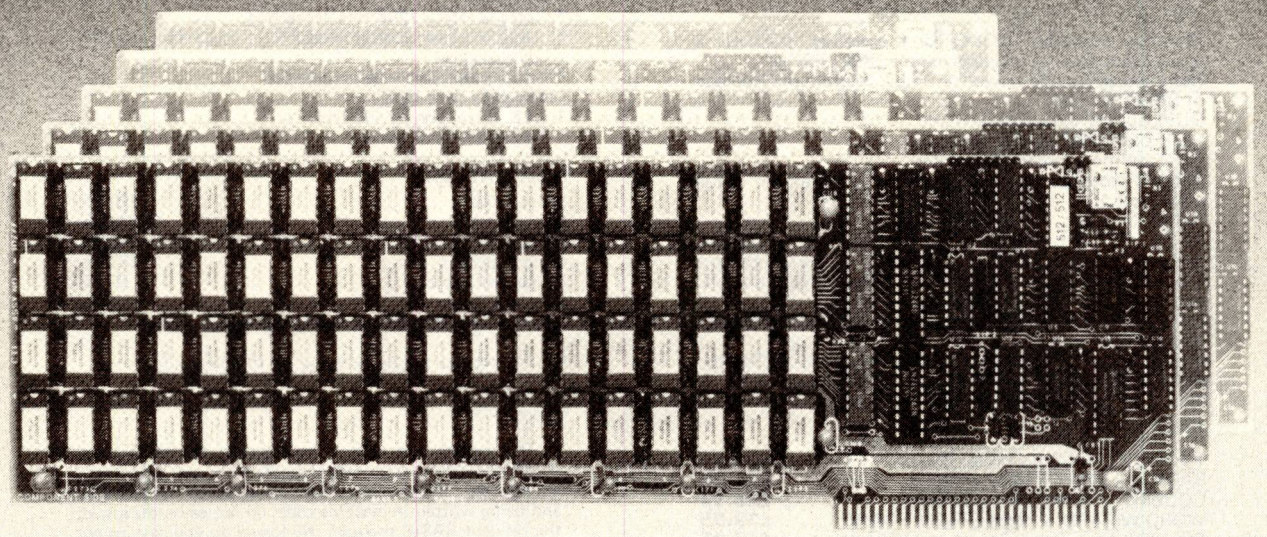

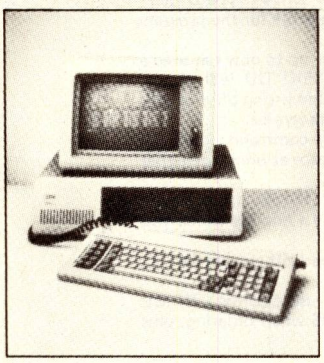

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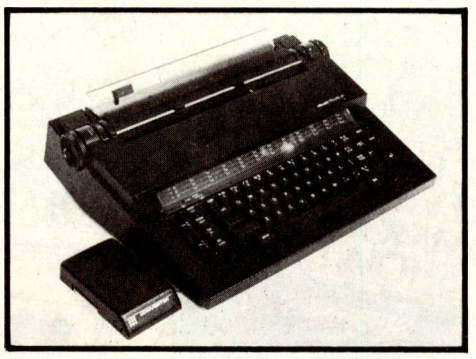

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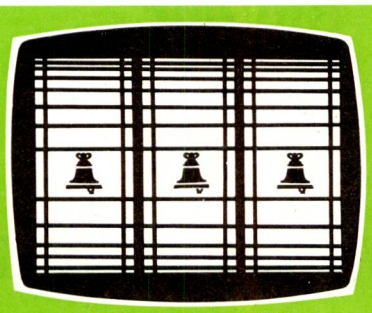
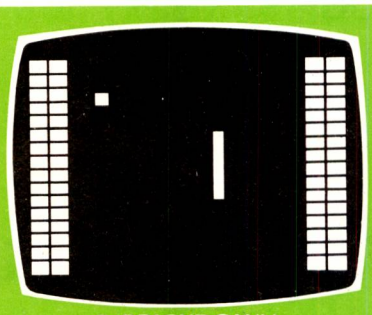


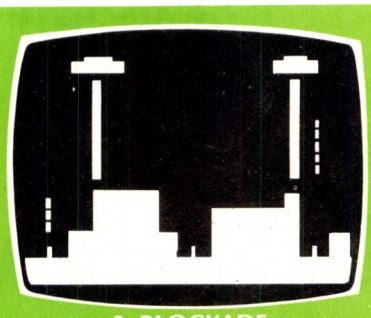
1. FRUIT MACHINE:

This is a computer version of the popular "one armed bandit", with three reels, Nudge reel, and Hold, Nudge and Gamble functions. Incorporating the VIC's normal graphics, colour and sound, it requires an expanded VIC (3/8/16K).



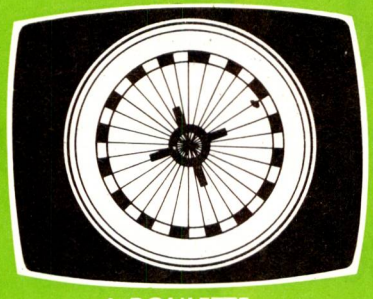
2. BRICKDOWN:

A variation on the game "BREAKOUT"; using the keyboard or a joystick controller manoeuver the bat to try to break through the right hand wall, while protecting the left wall. Requires basic or 8K VIC.



3. BLOCKADE:

Using joystick or keyboard, control your missile base to destroy incoming enemy missiles and protect your fuel dumps. Game ends when you are hit or all fuel dumps destroyed. Uses defined graphics, colour + sound. Runs in basic VIC only.



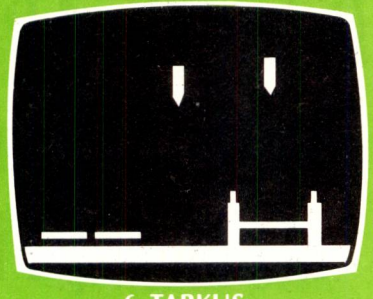
4. ROULETTE:

Complete with accurate full colour "MONTE CARLO" roulette table, you can break the bank without risk of personal loss! Complete with list of odds and allowed bets, you are given £5,000 to play with. Game ends when you lose your shirt. Runs in any VIC, with colour and sound.



5. HANGMAN:

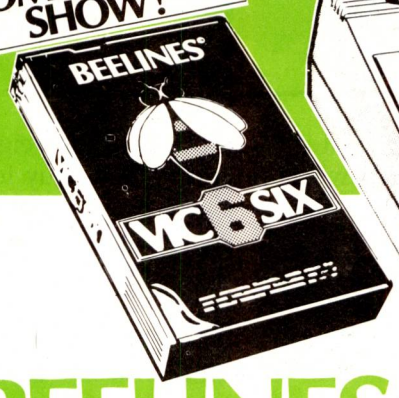
Play the computer at this version of the popular pen + pencil game. The VIC has a built-in vocabulary of 50 words, to which you can Add, Delete or Replace your own words. Addictive, with colour + sound. Runs in any VIC.



6. TARKUS:

With the joystick or keyboard, control the stretcher bearers to pick up the wounded men, and return them safely to the red cross base. If you are hit by an enemy missile, however, you join the wounded, on the field! Challenging and addictive, with defined graphics, colour + sound. Runs in basic VIC only.

'VIC 6' VOL 2. PREVIEW AT COMMODORE SHOW!





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The language provides a basic framework of operations which can be adapted to any application by the declaration of procedures. The simplicity of the underlying structure ensures that BCPL requires little overhead. But in keeping with the practical nature of the language, a range of useful standard routines are defined, in particular for input and output.

BCPL CINTCODE is a new implementation of standard BCPL specifically for Microcomputers. It has been carefully designed to hold the logic of a program in a minimum number of bytes. This releases store and disk for more code and data. Tests show that CINTCODE requires only a third the space of fully compiled code, and that it is significantly more compact than other language systems.

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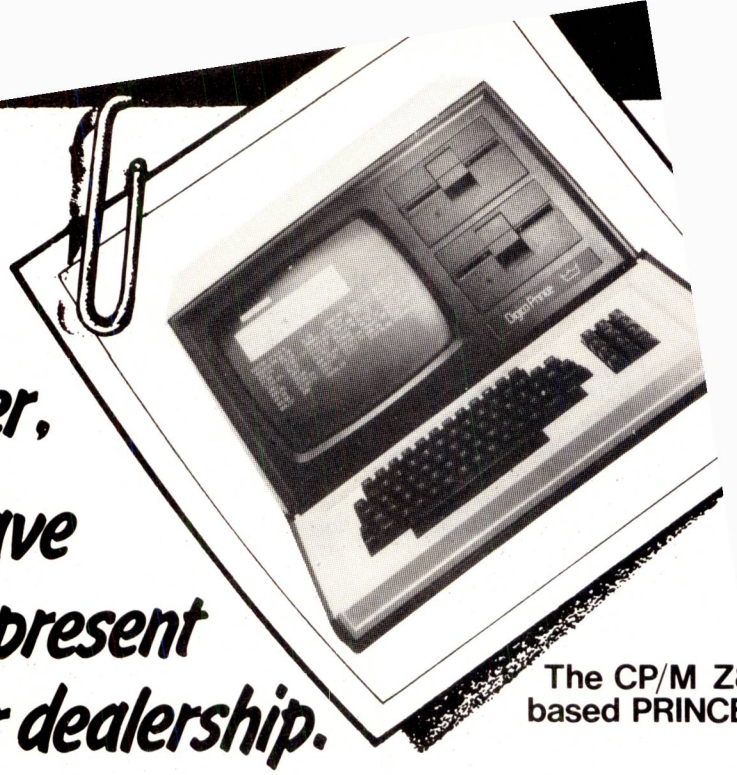

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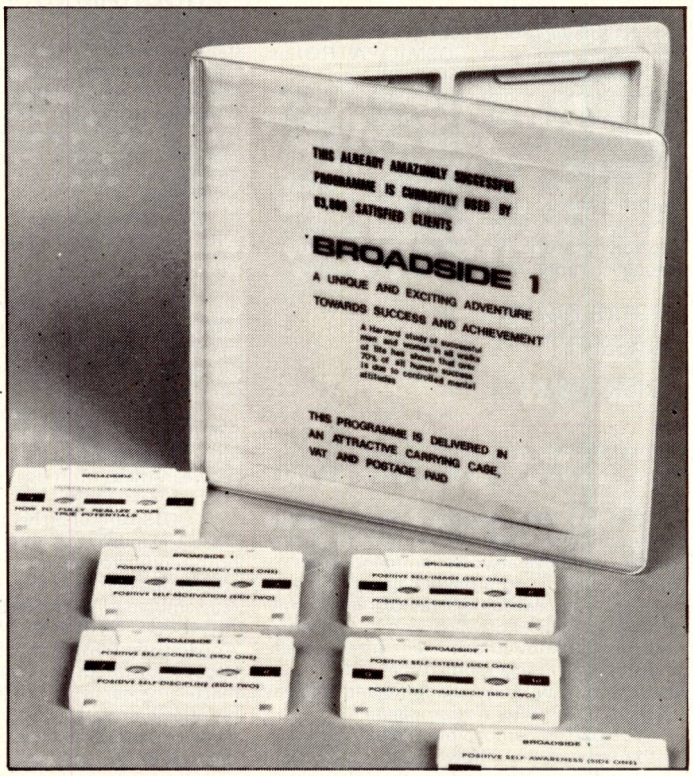

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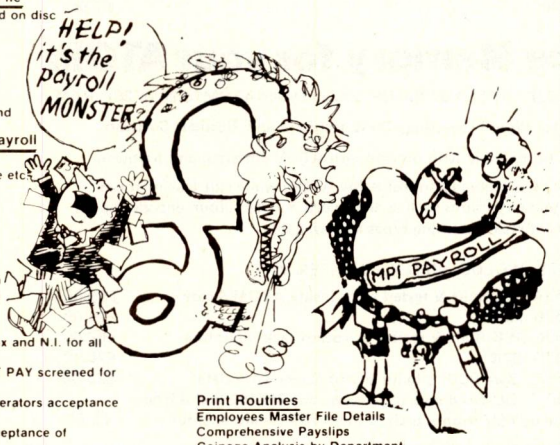

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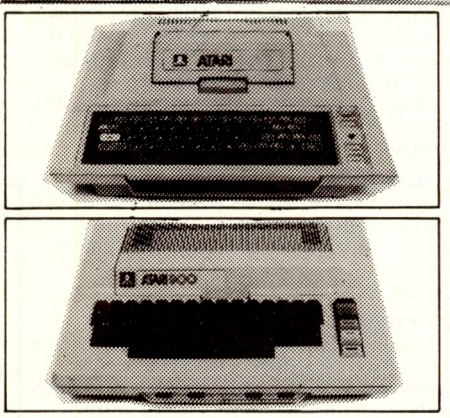

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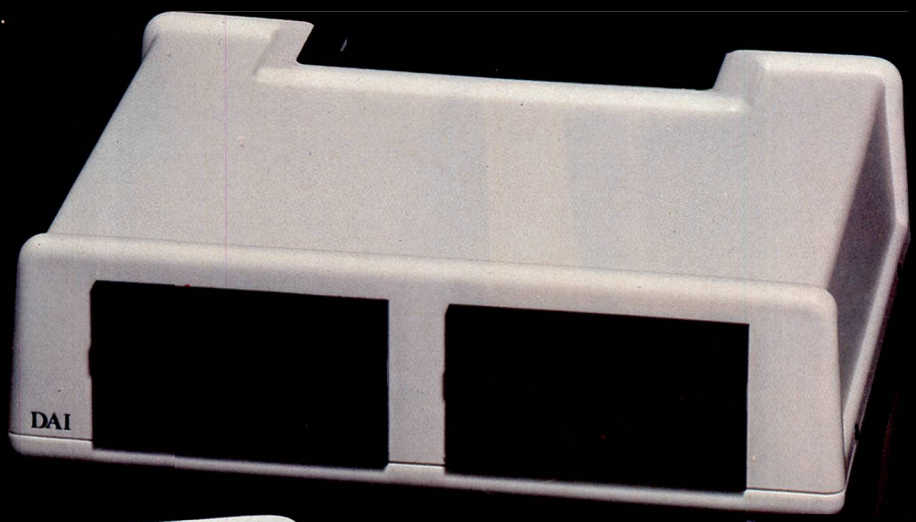



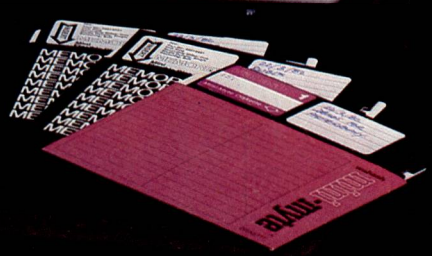

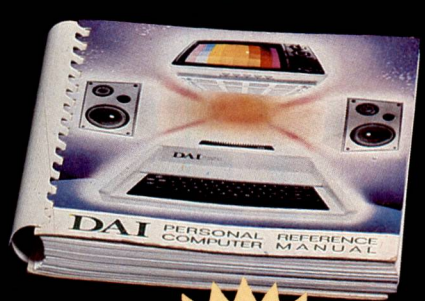

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SEEING IS BELIEVING



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NEW ACT SIRIUS 1
Minicomputer Performance. Personal Computer Price.
16 bit processor: £2,395

The best price/performance ratio you've ever seen on a personal computer.

	ACT Sirius 1	Typical Personal Computers	Typical Business Systems
Memory	**128K-1024K**	32K-64K	48K-256K
Disk Capacity	**1.2Mb-10 Mb**	140K-1Mb	1.2Mb-10 Mb
Processor	**16 bit**	8 bit	8 bit
Operating Systems	**CP/M-86, MSDOS**	CP/M or Machine Specific	Usually Machine Specific
Languages	**Microsoft BASIC Compiled BASIC COBOL PASCAL FORTRAN**	Microsoft BASIC perhaps one or two others, eg PASCAL	BASIC and perhaps one or two others
Price	**£2395**	£1800-£3000	£4500-£8500

ACT Sirius 1 is a new generation personal
ɔmputer. Quite simply, it has no competition at the price.

It's the first personal computer developed from the
ıtset for business and professional use.

It's launched with more software than anything
efore it.

It's supported and distributed solely by ACT—
ıe biggest name in personal computer software.

And it's developed by Chuck Peddle, formerly of
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ɔnal computing.

OFTWARE SPELLS SUCCESS

ACT Sirius 1 has more software than any other
ew personal computer:

A choice of two operating systems — CP/M-86 or
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or Software Houses

The ACT Sirius 1 has a language for you. Microsoft
ASIC 80, two BASIC Compilers, two COBOLS,
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And the ACT Sirius 1 can run any software written
ɔr CP/M — that means hundreds of specialised packages.

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Ergonomics play a vital part in the design of ACT's
irius 1.

The screen tilts and swivels to suit the user and
lare is eliminated.

The display is razor sharp; and the brilliance and
ontrast can be adjusted using keys on the low-profile
etachable keyboard.

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The ACT Sirius 1 is designed to keep you out in front. Winchesters, networks, multi-user facilities and colour graphics are all scheduled during the next twelve months. And all at the same record-breaking price levels of the ACT Sirius 1.

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The ACT Sirius 1 goes through the most exhaustive quality control process of any microcomputer — including the much vaunted Japanese products.

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Up to 5 terminals

The Vector Graphic 5005 & 5032 are ideal for application packages, such as accounts, stock control, payroll, word processing, financial modelling and solicitors packages, all available from Almarc.

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PERSONAL PEARL

PURPOSE
To provide a natural , easy way for people to create custom application programs through an English language interaction with a personal computer.

DESCRIPTION
Personal Pearl is the natural, human way to create new computer solutions. Computers are designed to solve general problems at incredible speeds. Application programs are required to operate the computer in order to quickly solve specific human problems. Personal Pearl unlocks the power of the computer so you can resolve your unique business problems.

Personal Pearl asks you for examples of the results you require from the computer. Personal Pearl then produces the application program. Personal Pearl is for the individual who requires custom computer solutions without the cost and time delay of hiring a programmer.

With Personal Pearl, you can create a library of personal programs, each tailored to your individual requirements. Accounting, mailing lists, data files, data management, calculations and reporting. Personal Programmer builds the program library of your choice, for one price.

Why buy several programs designed for the average computer use? Buy Personal Pearl to create an entire library of the highest quality programs designed by you, for your Personal Pearl leads you through the program design. Your answers are used by Personal Pearl to create the new program.

HIGHLIGHTS

- Interactive English program development. Menu-oriented application description speeds development via formated screens, input error checking.
- Built in HELP facility.
- Display handling is defined by using Personal Pearl convenient full-screen facilities to simply type in the display screens exactly the way they are to appear in the new program.
- Report handling is defined in the same way; by simply formatting the display screen to show the layout of the reports required by the new program.
- The application program display screens or reports may be modified at any time, or new displays or reports may be added.
- Calculation edit: arithmetic operations, editing, translation, table look up, and data validation are included.
- Data routine: display-to-display, display-to-printer, and display-to-file facilities are provided.
- Files may be quickly and easily sorted, printed, searched for selected records, reorganised or analysed.
- Display screens, files or reports may be modified to reflect changing program requirements.
- Display screens may be custom designed in any form.
- Reports may be custom designed in any form. Several report formats may be stored for later use.
- Data may be sent to SuperCalc* or Multiplan* for forecasting.
- No limitation on number of application programs.
- Maximum file sizes determined only by the maximum capacity of the disk storage medium on the computer.
- Records may be up to several thousand characters long, if needed.
- The number of records that may be stored in a file is determined by the total file size. Records are variable length with record packing, eliminating the wasted space incurred by fixed length schemes.
- Data base support is provided by an independent data base manager.
- File support is provided through indexing and sequential data access.
- Security and Integrity of Data:
  - Data input can be validated against previously defined edit criteria before changes are made to data files.
  - Edit criteria can be modified dynamically.
- Automatic Screen Entry Message:
  - Users of Personal Pearl can establish messages to the program operator in order to direct correct data entry.
- Data File Independence:
  - The descriptions of data files are maintained in an independent description file – the dictionary.
- Multiple Program Integration
  - Several generic programs such as word processing and spread sheet analysis may be integrated through Personal Pearl.

PEARL software

Manufacture, OEM and dealer enquiries welcome.
Suggested regail price: under £200* *excluding VAT

PREREQUISITE PRODUCTS

CP/M Operating System
48K RAM Microcomputer.

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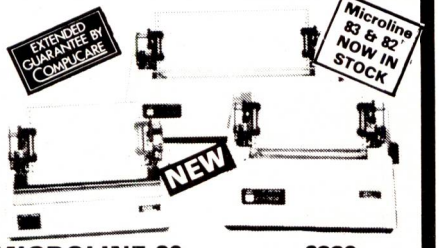

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● 80 cps Uni-directional ● Small size: 342 (W) × 254 (D) × 108 (H) mm. ● 160 Characters, 96 ASCII and 64 graphics ● 3 Character sizes: 40, 80 or 132 chars/line ● Friction and Pin Feed ● Low noise: 65 dB ● Low weight: 6.5 kg

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MICROLINE 83 £649 + VAT

● 120 cps bi-directional logic seeking ● 136 column printing on up to 15in forms ● Small size: 512 (W) × 328 (D) × 130 (H) mm. ● 160 characters, 96 ASCII and 64 graphics with 10 National character-set variants ● 3 Character spacings: 5, 10 and 16.5 Chars/in. ● Built-in parallel and serial Interfaces ● Friction and Pin Feed ● Low noise 65dB ● Low weight: 13 kg

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THE ANADEX DP9500 and DP9501 A PROFESSIONAL PRINTER



● Bi-directional printing ● Up to 220 chars/line with 4 print densities ● 500 char buffer ● RS232C and Centronics Parallel interface built in ● Full software control of matrix needles allowing graphics capability ● 200 chars/sec ● Adjustable width tractor feed.

DP9500 — ONLY **£845** + VAT
DP9501 — ONLY **£895** + VAT

WE ARE NOW STOCKING THE APPLE II AT REDUCED PRICES



AUTOSTART EURO PLUS

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48K **£649** + VAT

Getting Started APPLE II is faster, smaller, and more powerful than its predecessors. And it's more fun to use too because of built-in features like:
● BASIC — The Language that Makes Programming Fun. ● High-Resolution Graphics (in a 54,000-Point Array) for Finely-Detailed Displays. ● Sound Capability that Brings Programs to Life. ● Hand Controls for Games and Other Human-Input Applications. ● Internal Memory Capacity of 48K Bytes of RAM, 12K Bytes of ROM; for Big-System Performance in a Small Package. ● Eight Accessory Expansion Slots to let the System Grow With Your Needs.

You don't need to be an expert to enjoy APPLE II. It is a complete, ready-to-run computer. Just connect it to a video display and start using programs (or writing your own) the first day. You'll find that its tutorial manuals help you make it your own personal problem solver.

APPLE DISC II 3.3 Dos

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THE EPSON MX SERIES



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● Centronics Parallel
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● Upper & lower case
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● 9x9 Dot Matrix
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NEW

CENTRONICS DOT MATRIX PRINTERS



737 £369 + VAT
739 £469 + VAT

Standard Features

● Proportional Spacing ● Right Margin Justification ● 3 way paper handling ● Upper and lower case ● True Descenders ● Bi-directional Paper Mode ● Underlining capability ● Condensed/Expanded Print ● Sub-Scripts and Super Scripts ● Pin and Friction Feed ● 80/132 Column

739 as above with special feature of Dot Resolution Graphics.

NEC SPINWRITER

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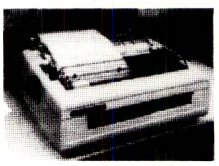
only **£1490** + VAT



NEC's high quality printer uses a print "thimble" that has less diameter and inertia than a daisy wheel, giving a quieter, faster, more reliable printer that can cope with plotting and printing (128 ASCII characters) with up to five copies, friction or tractor fed. The ribbon and thimble can be changed in seconds. 55 characters per second bidirectional printing — with red/black, bold, subscript, superscript, proportional spacing, tabbing, and much, much more.

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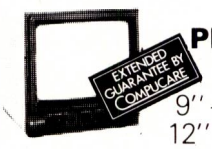

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INTRODUCING THE NEW GENIE

Ideal for small businesses, schools, colleges, homes, etc. Suitable for the experienced, inexperienced, hobbyist, teacher, etc.

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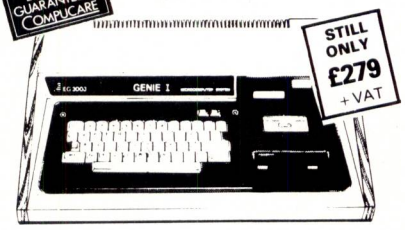
GENIE I



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Self-Contained PSU UHF Modulator Cassette. External Cassette Interface. Simply plugs into TV or Monitor. Complete and Ready to Go. Display is 6 lines by 32 or 64 Characters Switchable. 3 Mannuals included, Users Guide, Beginners Programming and BASIC Reference Mannual. BASIC Program Tape Supplied. Pixel Graphics.

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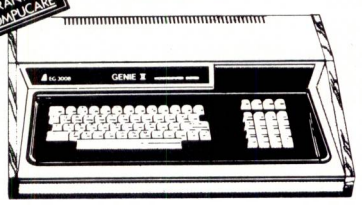

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The **NEW GENIE II** an ideal Business Machine. 13K Microsoft BASIC in ROM. 71 Keyboard. Numeric Keypad. Upper & Lower Case. Standard Flashing Cursor. Cassette Interface 16K RAM Expanded externally to 48K.

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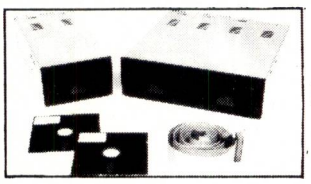

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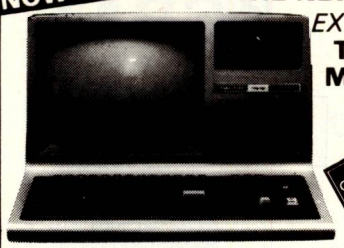

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48K **£599** + VAT

The Radio Shack TRS-80™ Model III is a ROM-based computer system consisting of:
- A 12-inch screen to display results and other information
- A 65-key console keyboard for inputting programs and data to the Computer
- A Z-80 Microprocessor, the "brains" of the system
- A Real-Time Clock
- Read Only Memory (ROM) containing the Model III BASIC Language (fully compatible with most Model I BASIC programs)
- Random Access Memory (RAM) for storage of programs and data while the Computer is on (amount is expandable from "16K" to "48K", optional extra)
- A Cassette Interface for long-term storage of programs and data (requires a separate cassette recorder, optional/extra)
- A Printer Interface for hard-copy output of programs and data (requires a separate line printer, optional/extra)
- Expansion area for upgrading to a disk-based system (optional/extra)
- Expansion area for an RS-232-C serial communications interface (optional/extra)

All these components are contained in a single moulded case, and all are powered via one power cord.

Disc Drives Kit with 2x40 Track Drives — **£599** + VAT
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★ 6502 based system — best value for money on the market. ★ Powerful 8K Basic — Fastest around ★ Full Qwerty Keyboard ★ 1K RAM Expandable to 8K on board. ★ Power supply and RF Modulator on board. ★ No Extras needed — Plug-in and go ★ Kansas City Tape Interface on board. ★ Free Sampler Tape including powerful Dissassembler and Monitor with each Kit. ★ If you want to learn about Micros, but didn't know which machine to buy then this is the machine for you.

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Build, Understand and Program your own Computer for only a small outlay

KIT ONLY **£99.95** + VAT
Fully Assembled — **£149** + VAT
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NEW MONITOR IN ROM — available separately at **£7.90** + VAT.
Improved BASIC 3 ROM — revised GARBAGE routine allows correct use of STRING ARRAYS **£4.90** + VAT
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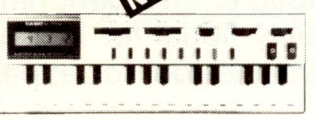

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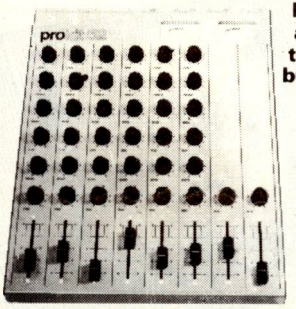

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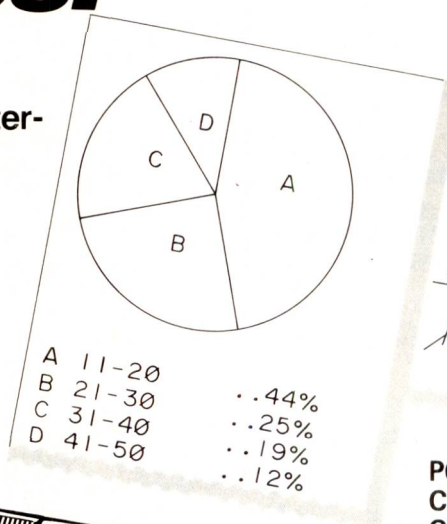

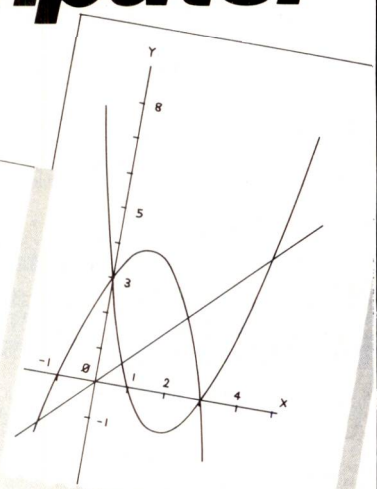

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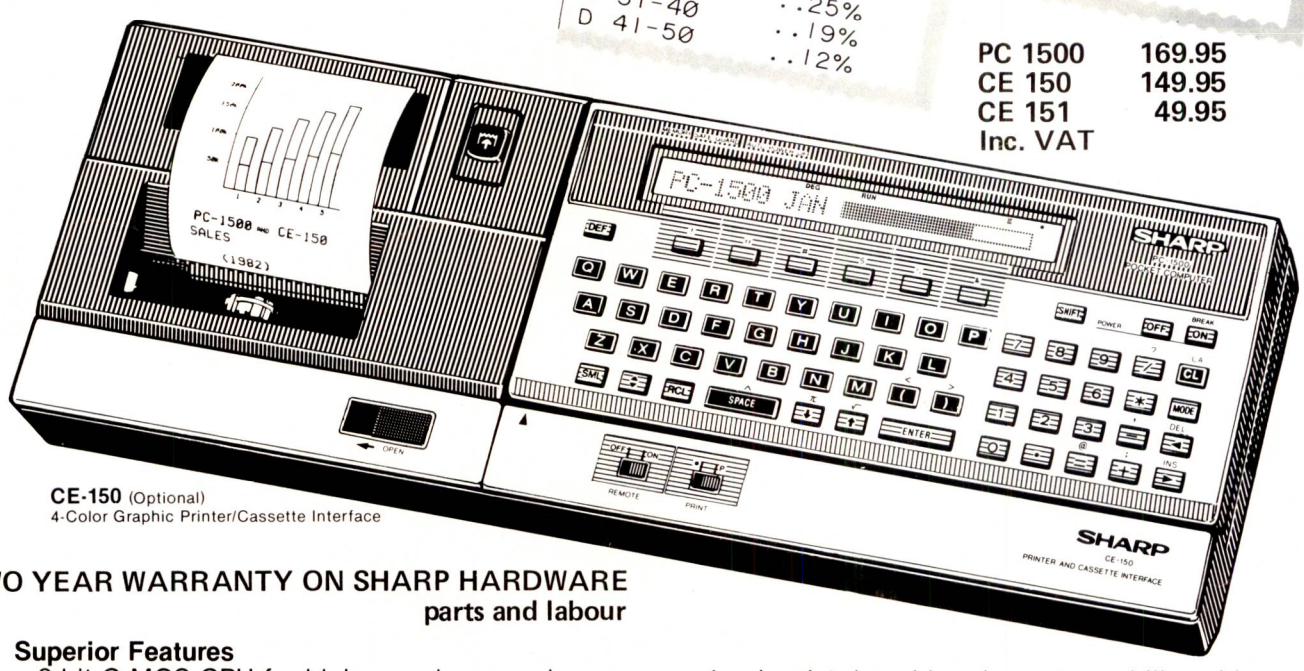

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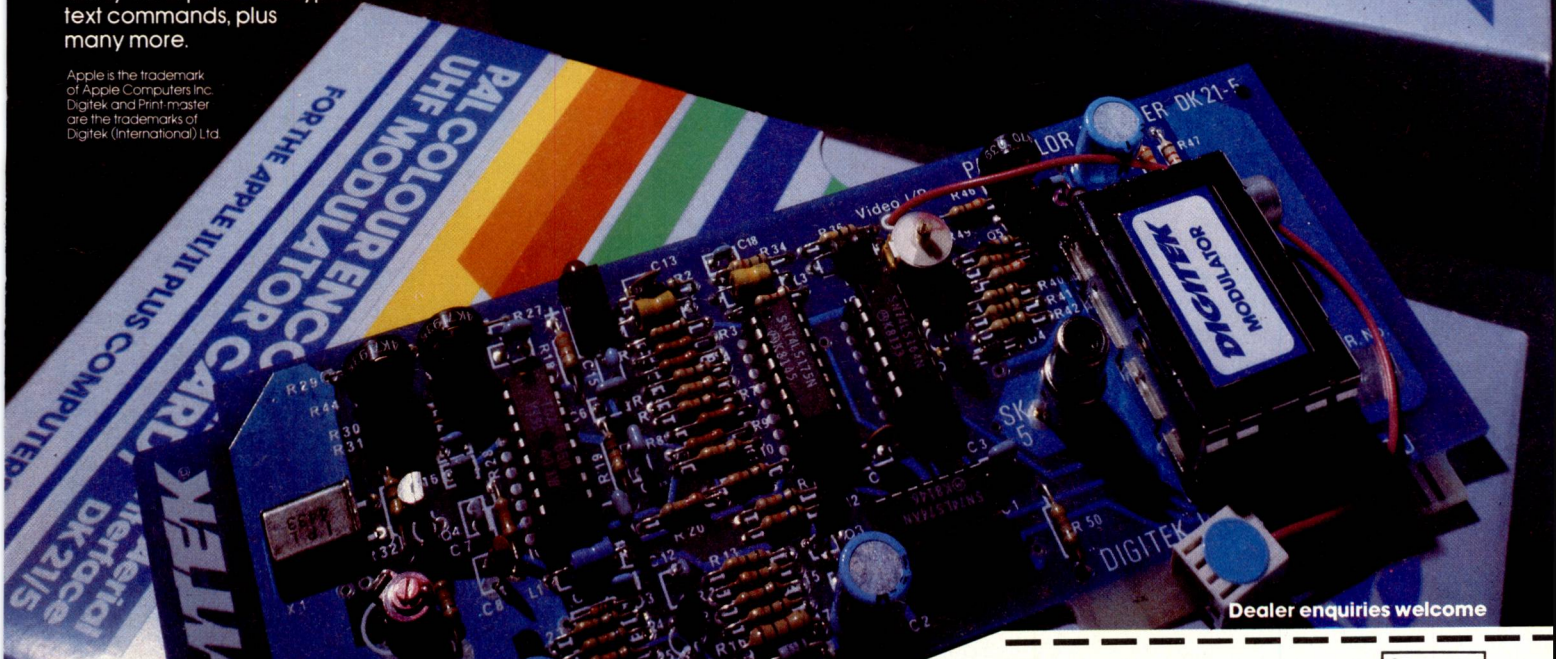

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- *Green phosphor CRT (25 rows by 80 columns)*
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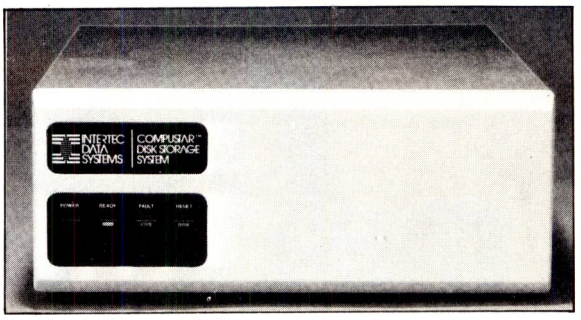

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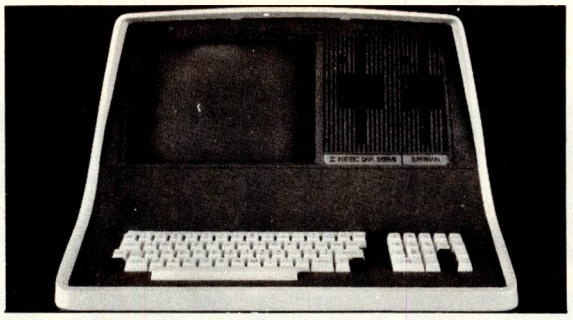

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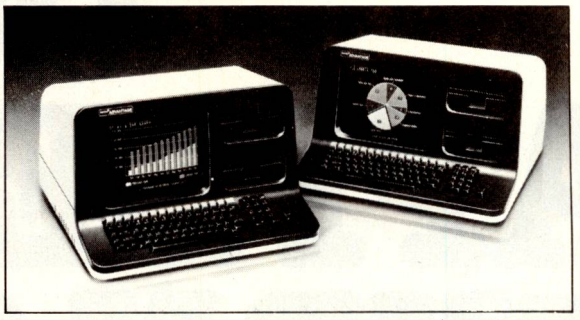

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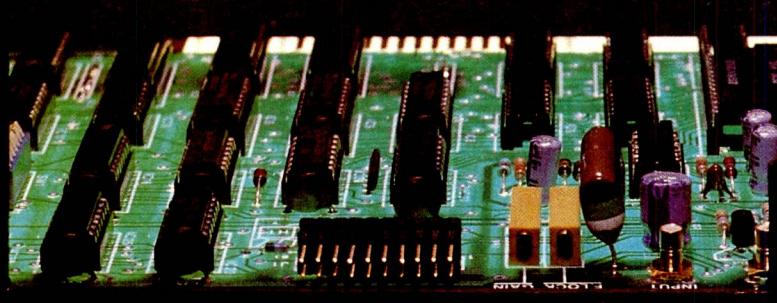

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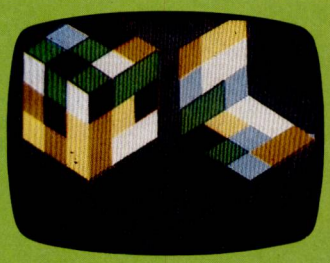



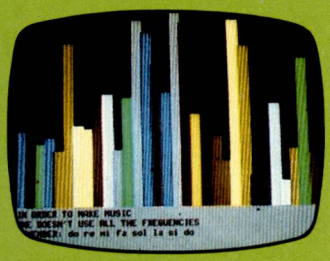

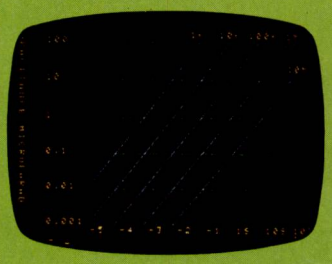

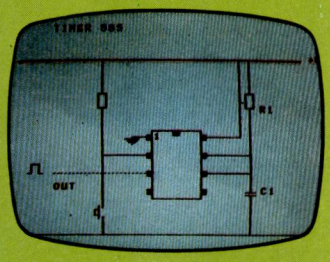

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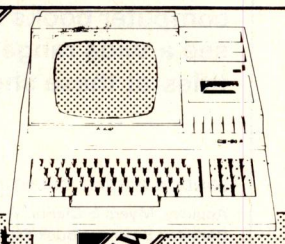

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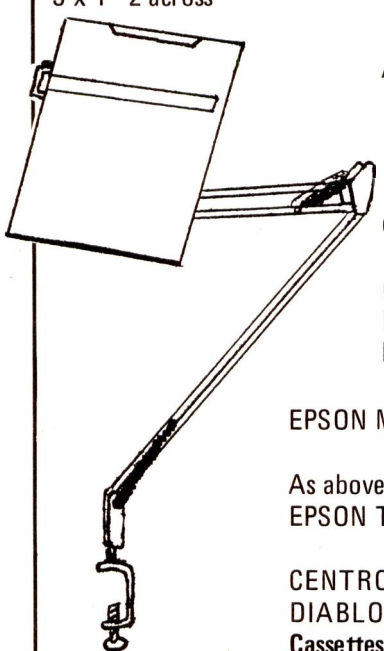

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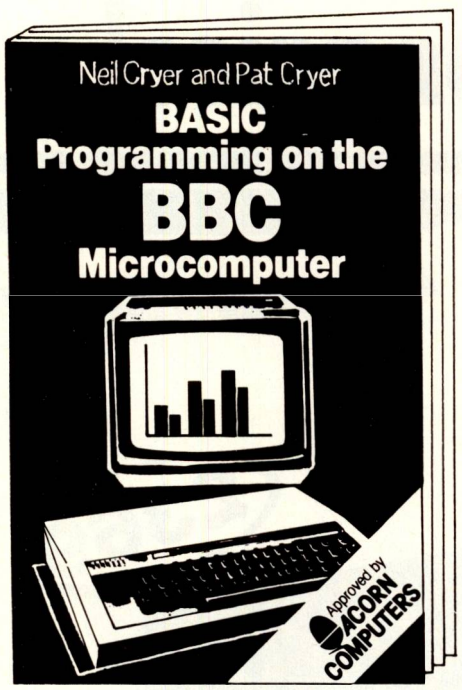

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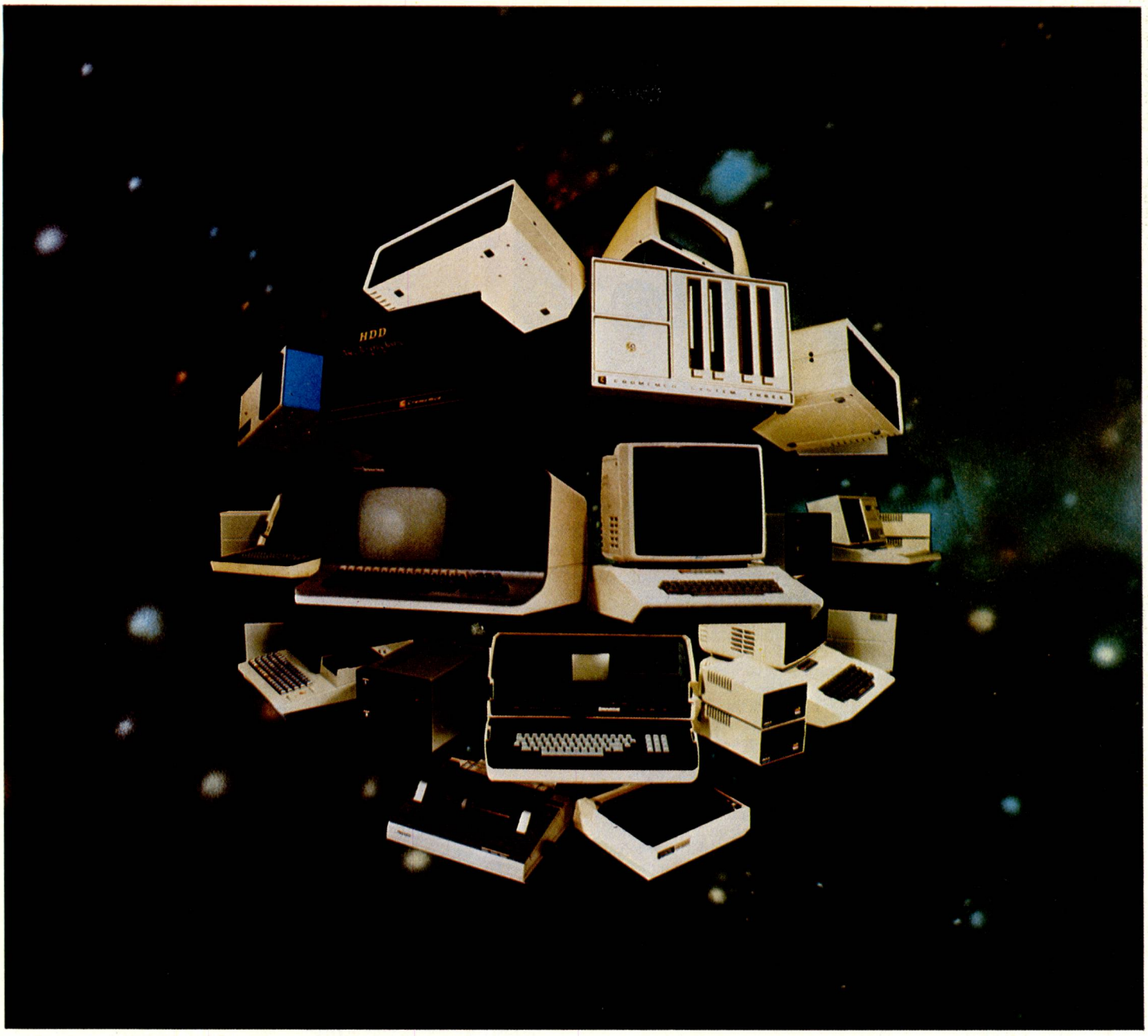

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GOLF – what's your handicap? It's a tricky course but you control the strength of your shots.

Cassette 2 – Junior

For ZX81 with 16K RAM pack

CRASH – simple addition – with the added attraction of a car crash if you get it wrong.

MULTIPLY – long multiplication with five levels of difficulty. If the answer's wrong – the solution is explained.

TRAIN – multiplication tests against the computer. The winner's train reaches the station first.

FRACTIONS – fractions explained at three levels of difficulty. A ten-question test completes the program.

ADDSUB – addition and subtraction with three levels of difficulty. Again, wrong answers are followed by an explanation.

DIVISION – with five levels of difficulty. Mistakes are explained graphically, and a running score is displayed.

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COMBAT – you're on a suicide space mission. You have only 12 missiles but the aliens have unlimited strength. Can you take 12 of them with you?

SUBSTRIKE – on patrol, your frigate detects a pack of 10 enemy subs. Can you depth-charge them before they torpedo you?

CODEBREAKER – the computer thinks of a 4-digit number which you have to guess in up to 10 tries. The logical approach is best!

MAYDAY – in answer to a distress call, you've narrowed down the search area to 343 cubic kilometers of deep space. Can you find the astronaut before his life-support system fails in 10 hours time?

Cassette 5 – Junior Education: 9-11-year-olds

For ZX81 (and ZX80 with 8K BASIC ROM)

MATHS – tests arithmetic with three levels of difficulty, and gives your score out of 10.

BALANCE – tests understanding of levers/fulcrum theory with a series of graphic examples.

VOLUMES – 'yes' or 'no' answers from the computer to a series of cube volume calculations.

AVERAGES – what's the average height of your class? The average shoe size of your family? The average pocket money of your friends? The computer plots a bar chart, and distinguishes MEAN from MEDIAN.

BASES – convert from decimal (base 10) to other bases of your choice in the range 2 to 9.

TEMP – Volumes, temperatures – and their combinations.

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For ZX81 (and ZX80 with 8K BASIC ROM) with 16K RAM pack.

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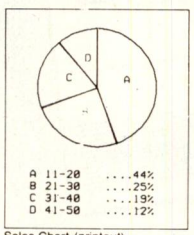

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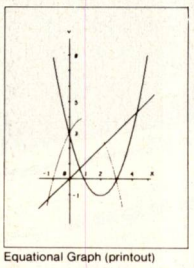
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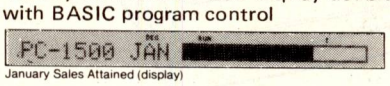

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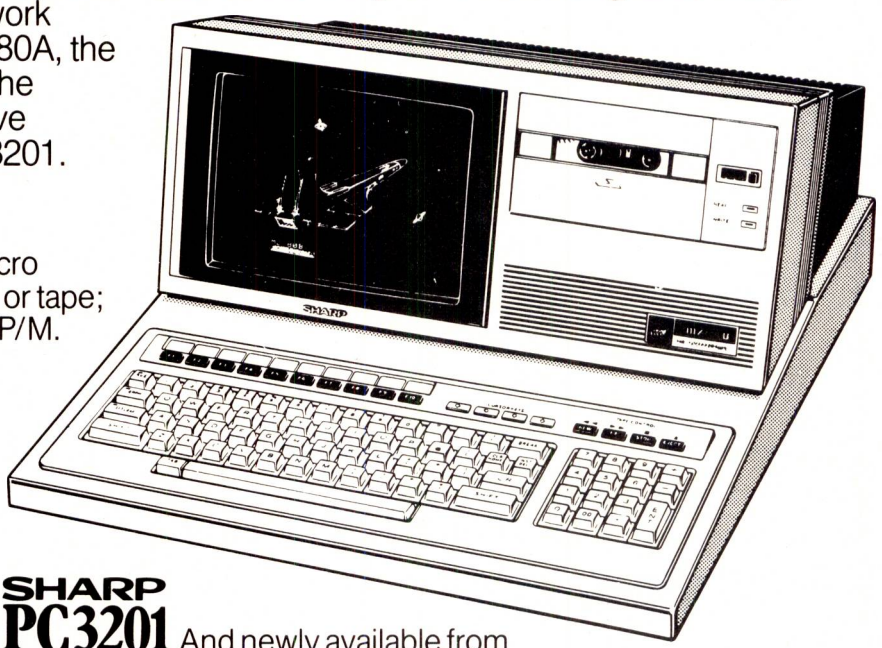

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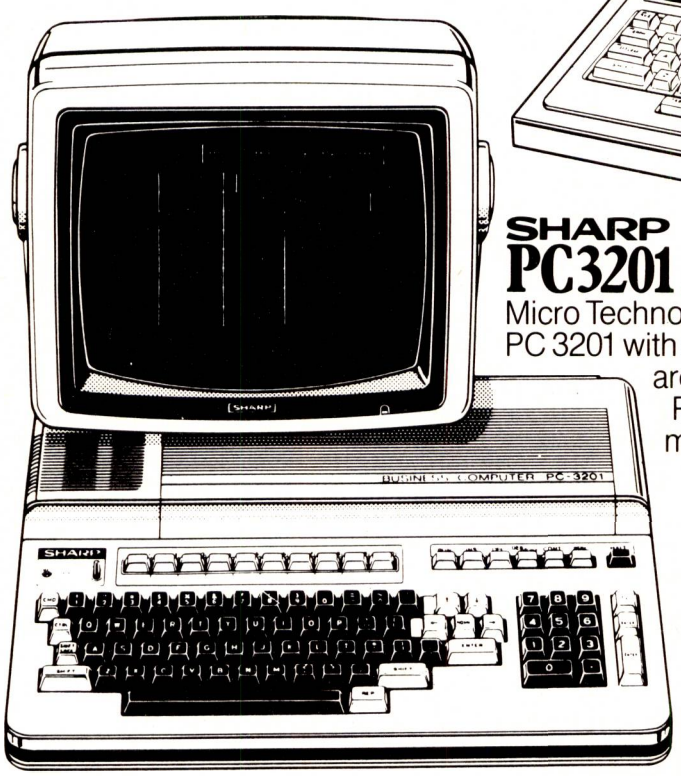

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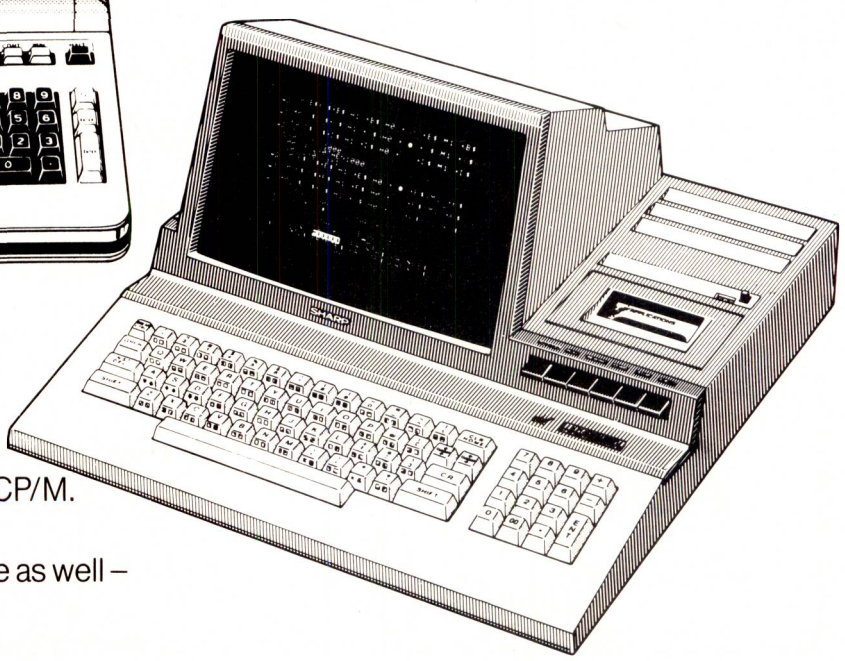

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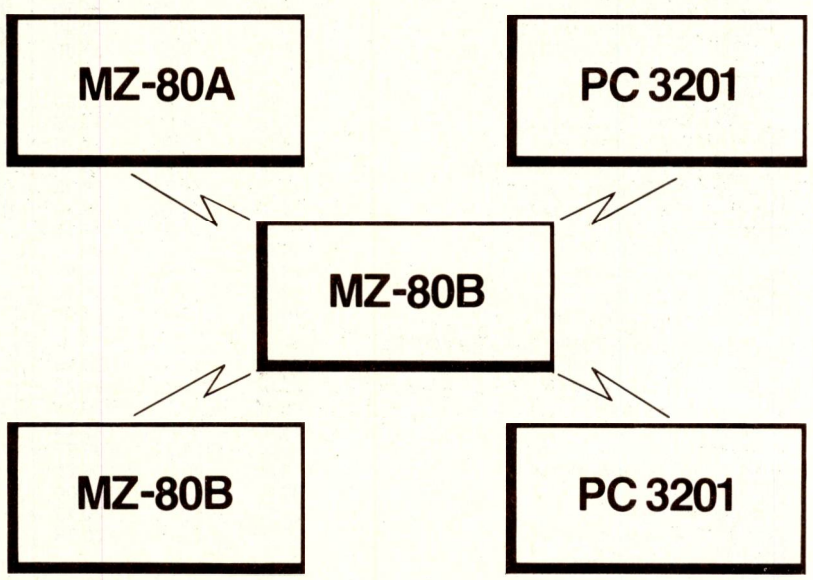

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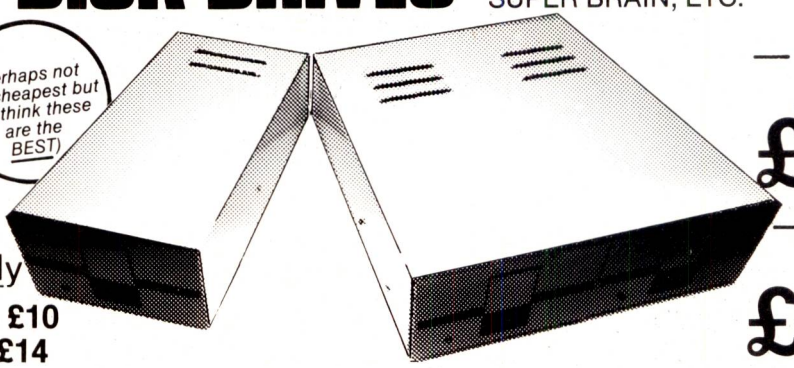

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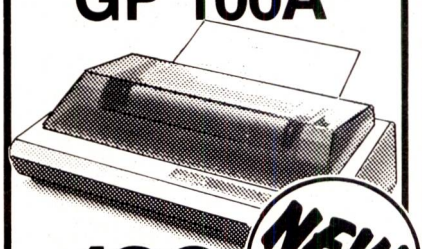

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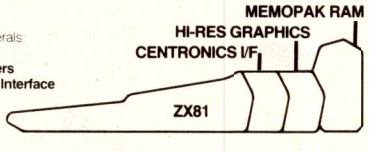

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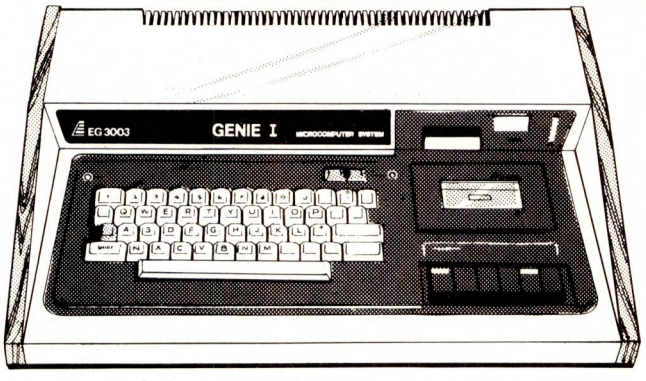



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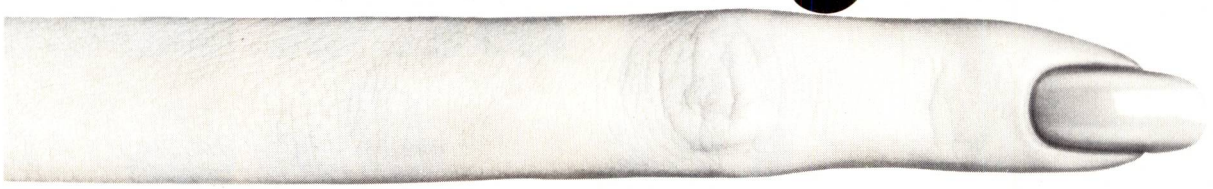

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Silicon Office is the latest microcomputer ftware program from the Bristol Software Factory.

Designed specifically for use with the ɔmmodore PET 8096, it'll help you run your office th the minimum amount of effort and maximum ˈiciency.

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BSF Send to: Bristol Software Factory, PO Box 14, Horley, Surrey.

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Guy Kewney delivers his monthly package of micronews.

Prestel spreads its wings

The time has come to choose a good Prestel computer, or to suffer that 'left out' feeling. In a nutshell, things are starting to happen on Prestel — and the only way to find out what they are is to be plugged in.

A Prestel computer nowadays is one that can connect you to other people with Prestel computers — one of the things that it most conspicuously could not do, originally. More: these days it is getting cheaper to use a Prestel machine for sending messages like this, because the Prestel authorities have reduced the price of doing so.

And, on top of that, there are more and more machines around that can be connected to the Prestel network. Not just expensive TV sets with a funny little pocket calculator but real computer terminals, for rather less money.

Latest of the new machines is one from Tandata Marketing, using the most popular 'Viewdata adaptor' — a device for turning an ordinary TV set into a Prestel terminal — the AlphaTantel. This new machine comes in a briefcase, at just over £500 including VAT.

The unusual thing about the briefcase Viewdata machine is that it doesn't plug into the telephone socket. Normal Prestel receivers do, but the fact of the matter is that most telephones still don't have sockets, and so normal Prestel receivers can't be plugged into any phone. Briefcase Viewdata can, because it can make the necessary Prestel tones audibly and sing them into an ordinary telephone receiver — and can pick up the sound of the returning notes.

'Prestel or private Viewdata users can therefore make use of the system wherever they can find an ordinary telephone and television — for example, in a hotel room,' notes Tandata.

The acoustic coupler is built into the system. The machine otherwise has all the features of the AlphaTantel — it can be connected to a printer with the cheap Centronics interface, and it can store pages on a tape recorder.

To use the 'mailbox' facility on Prestel, you have to belong to a sort of club called a 'closed user group', with your own licensed storage inside the Prestel computer. Until recently, this was a bit of a joke: the cost of belonging was high and the number of closed user groups was restricted to 50 in the UK.

Prestel authorities have now stopped discouraging customers. The cost of setting up a private Prestel group used to be £2500 — it is now a tenth of that at £250. And Prestel can accept 32,000 groups instead of only 50.

Even more significantly, anybody with their own database of information (or group of connected computers) can link it up to Prestel. That is, anybody within easy reach of Croydon phone exchange.

Prestel has set up a 'Gateway' service to connect outside computers to its own storage and switching machines. Instead of dialling into the normal pages of information, you can dial into the gateway. And if the gateway is a computer with a whole new set of Prestel-type pages, somewhere else in the country, this is very useful — or at least it will be.

At the moment, however, it is only very useful to 'nearly one quarter of Britain's telephone users', as Prestel people refer to the people who can dial 01- numbers as a local call. All the rest have to make a trunk call (or STD call, if you like the acronym better).

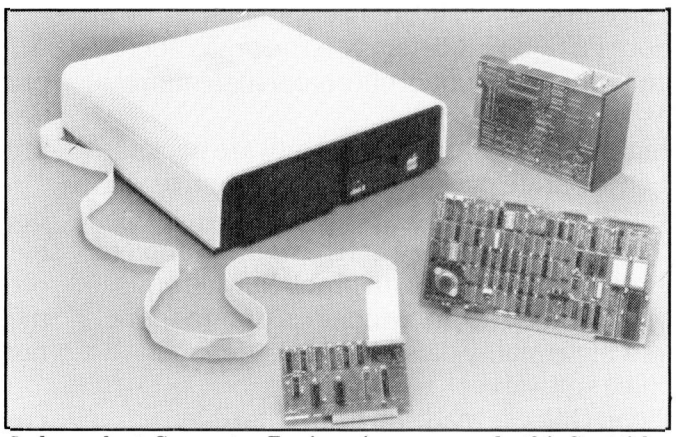
One of the things that can now be dialled into is a newspaper about micros. It's called *Viewfax 258*, which has something of the appeal of a pirate radio station about it.

'Unlike other bulletin boards, *Viewfax 258* is available to the majority of UK telephone subscribers at local call rates, 24 hours a day, seven days a week,' announces the company.

'Another advantage of using Prestel is that information is sent at four times the speed of most bulletin board systems; furthermore, every retrieval computer can handle around 200 simultaneous users. There is even a computer in Boston which can be accessed throughout North America via Telenet,' they add.

The reference to speed has to do with the fact that Prestel transmits 120 (or so) characters per second, while most systems only manage 30 (or so).

This brings one naturally to the only real drawback of Prestel: you still can't transmit faster than seven (or so) characters per second. This may be about as fast as you could hope to type, but with a computer you tend to prepare your message first (while



Independent Computer Engineering can supply this Scottish-built hard disk system for Apple, Superbrain or any S100 bus micro. It provides up to 10 megabytes of storage, and has the advantage of being locally repairable, they say. They don't say it has the advantage of being cheap, however. Details on Ashford (07842) 47271.



Photography by John Mason

This thrilling example of the photographer's art is the PCW *cover that never was. It should have graced this very issue but was displaced by the sudden arrival of Uncle Clive's latest blockbuster, to the eternal chagrin of DP who has fought for years to get a handhold on the cover. Flowers, letters of condolence or small gifts of alcoholic beverages should be sent to the usual editorial address.*

the phone isn't working up a big charge) and then transmit it later as fast as possible.

The reason users are stuck with seven (or so) characters per second is not, however, so that you are forced to run up huge charges on your phone if ever you use the service. Naturally, this consideration doesn't actually bother the people at Telephone House, but it isn't why it happens.

No, the reason is that the modem which Prestel sets use was originally designed to receive data fast but to transmit slowly — because it would be cheap (they said at the time). And when they found that it could work fast in both directions, and still be cheap, they refused to allow people to do it. They refused because the service provided that way would be vastly superior to the antiquated, clumsy service provided by Telecom's Datel modems, which can't even tell if the phone line is working or disconnected.

And we can't have technology putting our valuable antiques onto the scrap-heap, can we?

Anyway, the daily micro magazine is subsidised by advertisers who pay £15 for a page on Viewfax, and it sounds interesting. I shall just have to get a Prestel set and try it — use Prestel mailbox 021-704 115 for information. Or call 021-705 0258.

For details of how to set up a closed user group of your own, contact Prestel HQ on 01-583 9811.

ZX chess

Turn your ZX81 into a nice chess-playing computer with excellent graphics, by getting a £45 ZXChess program plus QS Characters board. This offer from Artic Computing comes as a taster before its rather more important, though more esoteric, announcement of Forth for the Sinclair.

Forth is a programming language where you define what you want to do in terms of instructions which you build up yourself. It may be hell for someone else to find out what you have actually done, but it is very fast as a method of actually doing it in the first place.

Forth from Artic (as in lorry, not as in North Pole) will cost £60 on a ROM. Details from Artic at 396 James Reckitt Avenue, Hull, North Humberside.

Video course

For a fee of £275, you can get into a course on computer-controlled video where you will be able to operate a video disk player by programming an Apple. The course is the first workshop by Roy Goodman's new company, Office Of The Future Ltd. Goodman originally was famous as the founder of Infotech.

The two-day course runs on 18-19 May and 17-18 June, and details are available from 108 Kew Road, Richmond, Surrey TW9 2PD.

Soft rent

On 1 July, the Software Rental Bank will begin a superb notion of renting software to people so that they can see if they like it before buying. If you buy, you get the rent paid deducted from the price.

The idea will terrify many suppliers of software, who are bound to shriek 'but they'll just copy it and keep it'.

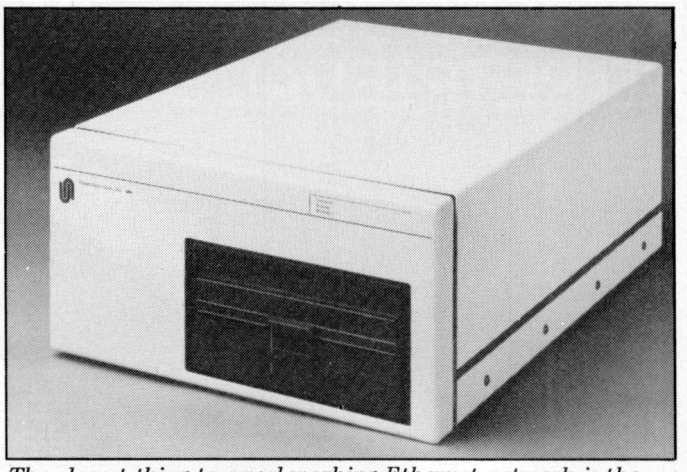
It won't happen like that. Most people copy software either because they just can't afford to buy it, or because they don't know whether it's worth buying or not, so they borrow it first from a friend.

This scheme will let people try software out, legitimately. Do you think that The Last One, for instance, is all razzmatazz and nothing more? Find out if WordStar really is too complicated to use. Find out if you prefer Visicalc to the more costly Micromodeller, or whether you need the extra features. All for the cost of your membership, plus the safeguard of a deposit.

Membership costs £30 for 'associate' status; £70 for 'full' membership, and £500 for 'corporate' membership.

Rental normally costs 20 percent of the list price of a program, down to a minimum of £8.00. Associates get one week's rental and have to pay a deposit of the full value of the program. Full members get two weeks' rental (up to £500 at any one time, they say — so presumably full members can't rent expensive software) while corporate members pay only 10 percent and get up to £1000 worth at any time.

It sounds a bit complex, but apart from that I can't see anything wrong with the scheme. Details from 58 North Street, Leighton Buzzard, Beds LU7 7EN or phone (0908) 53491.



The closest thing to a real working Ethernet network is the Ungermann-Bass system Net One (available exclusively through Case and exclusively through Thame Systems, and exclusively through British Telecom) which now has this little white box. It is a Network Configuration Facility.

That, my children, is something on which you can develop extra software, using a Whitesmith C Compiler, to improve your network. It has a five-megabyte hard disk, a one-megabyte floppy disk and an intelligent controller with a general purpose bus interface (IEEE 488). Details from Thame on (084 421) 5471.

16-bit TABS

Until something new evolves, traditional computerised methods of keeping track of accounts are necessary — and surprisingly few traditional accounting methods have been transferred from old computers to the new micros.

The TABS accounting system has been described as having all the traditional computer accounting virtues, with a few nice trends in working towards tomorrow's systems — and it is possibly this traditional stability that has led Terry Poole to transfer it all to two new machines, the IBM Personal Computer and the similar ACT Sirius 1.

The system 'covers a suite of 14 application program modules, which include sales, purchase and nominal ledgers, stock control, payroll, job costing, word processing management accounting, and so on,' says TABS, announcing the availability of its software on these two machines.

There isn't a lot else to say: contact TABS on Andover (0264) 58933 for more details.

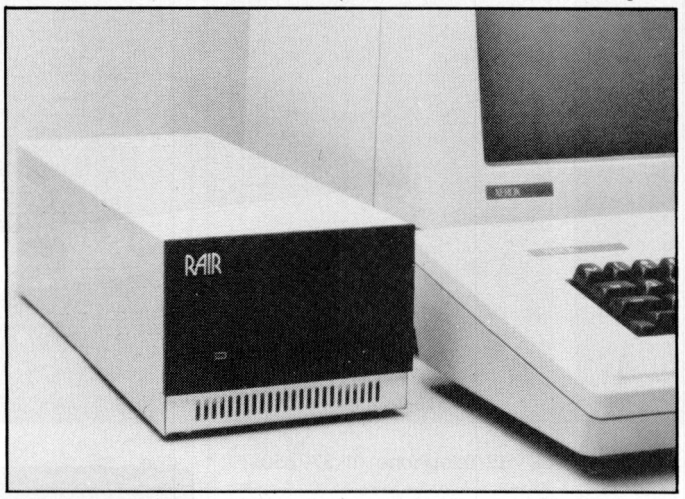
Would you credit it?

Don't use your Access card to buy a BBC Computer for a friend because Access will bounce the payment. Yes, it will, and it won't warn you either — and goodness only knows what happens to your place in the queue.

It turns out that Access credit card holders can order goods to be delivered only to their home addresses. As soon as you buy something for a friend, of course, Access will write to you and tell you they've bounced it, adding a terse note to the effect that they are 'sorry for the inconvenience'.

Inconvenience! You don't know the half of it, Access. The thing is that the BBC micro is supplied under the most honourable terms, whereby Acorn is not allowed to collect the money until it gets word from its mail order subcontractor that the product is in the warehouse, ready to ship.

The way the deliveries have been going, that can be five or six or more months after you placed the order. Your place in the long queue has finally come up . . . and what do you know? Access has bounced the payment. Access expects you to be grateful, because Access has saved you from being ripped off by somebody who knew your Access number. It's a pity you moved house in the meanwhile . . . At that point,



If you buy a Xerox 820 and you want a five-megabyte hard disk drive, Rair will sell you this one for around £2000, including adaptor and software to operate it. Details on 01-836 6921.

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.

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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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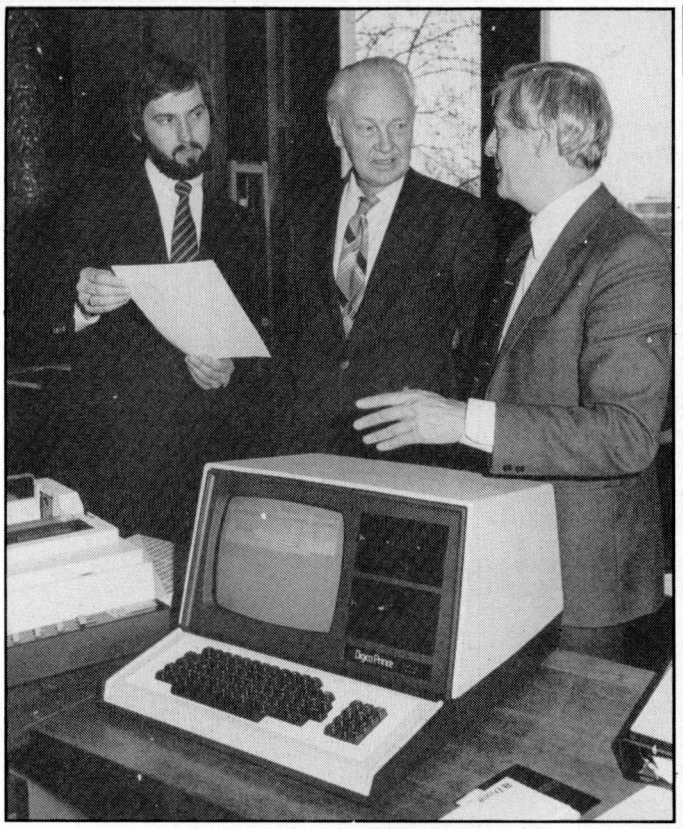

The really interesting thing about this picture of a Digico Prince micro being delivered to the Liberal Party at the National Liberal Club is the question: what is Lord Avebury doing there?

Lord Avebury used to kiss babies (or whatever you do to become Orpington's MP) under the name of Eric Lubbock, and he remains a prominent Liberal. The Liberal Party is going to use two Digico Prince micros — but Eric isn't in the picture because he represents the Liberal Party. That task falls to the Party's Secretary General, Hugh Jones (in the middle).

Digico's announcement mentions that the Liberals will use the micro for 'general accounting, subscriptions for the party's newspaper Liberal News, *and for the large mailing lists of subscribers to fund raising appeals (at present 10,000 names and addresses)'. And it mentions the nice Digico sales director (with the beard), Steve Moyle.*

I imagine it doesn't explain what Avebury is doing there, because the publicists at Digico felt that some of the glory of the announcement would be lost if they pointed out that he was also chairman of Digico.

Oh well, heck: at least it provided seven paragraphs of publicity to lead into the announcement that the Prince can now be bought for £6000 with a daisywheel printer and a big five-megabyte hard disk data storage device built in. Details on (04626) 78172.

you have the choice of starting a long explanation to Acorn and its mail-order group, and hoping they have records which show it all — or of going off and buying Uncle Clive's new Spectrum.

Oh, come on. Surely you're not going to quit now? After waiting so long?

Dr Micro

What is wrong with computers in medicine? Apparently quite a lot, and the British Medical Association (BMA) is out to give the computer people a good push in the right direction, by running a seminar on this subject in the beginning of June.

The seminar, 'What's Wrong With Computers In Medicine', will feature one talk on all the shortcomings, in the hope of encouraging them to be put right. It will be given by Dr John Dawson, the BMA Under-Secretary, 'who will highlight ways of overcoming poor ergonomic design, and encourage doctors and manufacturers to understand how currently inadequate systems could be improved to exploit fully the potential of available computers.'

It looks like a high-power seminar, opened by that ubiquitous MP and Minister. Kenneth Baker (Information Technology chief in the Cabinet) and with a second minister, Kenneth Clark of the Health Department, speaking on the second day. The BMA is organising it jointly with the Institution of Electrical Engineers.

If you feel you need more guarantees of its likely importance, then I can tell you that other speakers include somebody specialising in aids for the disabled, somebody from the Health Department in charge of information handling, somebody from the Royal Free Hospital (Professor Neil McIntyre), and somebody from the Royal College of Surgeons (Professor James Payne).

The only snag: IBM is giving a presentation on its 'Patient Care System'. I'm sure that will be inspiring, but what about micros? A bit beneath our august medical dignity, are they? Not a mention of them in the whole announcement.

I expect if we ignore them, they might still go away.

Details from the BMA at Tavistock Square, London WC1, phone 01-387 4499.

Atom add

There are so many ways of improving the Acorn Atom, mostly by plugging in a ROM chip, that users normally have a terrible time deciding which chip to buy. You can't normally plug them all in.

Aha, you say — 'normally'. That means that something new has arrived doesn't it?

Yes, indeed: a Four Outlet ROM adaptor. You get it from CMT Computer Technology of 6 Turf Park Road, Royton, Oldham, Lancs OL2 6EP, for a mere £22. You can then plug in four different ROM chips — for example, a Word Pack text editor, a Prog Power Tool Box, an Acorn Data Base, and a fast cassette controller from CMT. The only snag is that you have to use a Poke command (a '?' in Atom Basic) to select which ROM you use.

Phones 'freed'

I foresee tears as a result of the Department of Industry's attempt to 'liberalise' the Telecom authority.

The idea is that you and I, should we be brave enough, can now compete with Telecom even if we use its own copper wire, by doing extra clever things to any messages that get transmitted. For example, you can store messages and forward them later when the recipient is there. Or you can change the protocols, so that a message from an IBM computer will make sense to an ICL or Apple computer.

The trouble is that it isn't clear (to me) that you can provide a protocol conversion service. Inevitably, some of your users are going to have the same protocol (they may not know it) and your service is going to output exactly the same thing as it received.

But, according to the Department of Industry, these 'value added' services must first 'process in such a way that when delivered, the messages have been clearly altered as to format, protocol or content'.

And, of course, Telecom would never oppose a licence on such obviously *bona fide* grounds, because Telecom welcomes competition. Doesn't it? And anyway, the message will have been stored and forwarded.

Fortunately, there is an Advisory Panel which can be appealed to if you disagree. It can 'recommend action' to the Secretary of State.

But I still think it'll end in tears.

Run with Clive

Here's your own chance to beat Sinclair on Sunday 18 July. After all the excitement of Clive Sinclair's new machine, get ready for his new marathon. Or, more precisely, his new half-marathon.

The half-marathon is costing Sinclair £5000 as part of his sponsorship of the 1982 Cambridge Festival. But he's going a step further than merely sponsoring it — he's running in it, too.

The race starts near his Kings Parade offices, 'includes a riverside stretch along Chesterton Lane, the "Backs", and finishes in the Market



Costing around £200, this is a Centronics-interface version of the Star printer supplied by Stotron of Hastings. Details on (0424) 442160.

Vic 20	Colour Computer	£199.99*
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8096	96K Computer	£1195
8050	950K Dual Drive Floppy Disk	£895
8023	Tractor Feed Printer	£895
8422	22 Megabyte Winchester Disk	£3495
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I'd like to know more about how Commodore can help me make the right choice.

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NEWSPRINT

Square at the Guildhall Steps', says the announcement. That's very near rival Acorn Computer's original office and where Acornsoft is now based.

Details from the organiser, Brian Allinson of the Amenities and Recreation Department, Cambridge City Council, which is at Kett House, Station Road, Cambridge CB1 2JX.

Moving in...

People describe Japanese machines in Japan as very cheap but lacking software. Over here, they still aren't even cheap — but with Mitsubishi's latest idea, maybe they are starting to get some software, because the thing comes complete with a robot.

The robot is the 'Move Master', a robot arm which can move all over the place, under control of a CP/M microcomputer.

Apart from having the CP/M software, the micro also has to have something called a 'semiCentronics interface' which is a little less than the normal parallel wires that control Centronics-type printers but can be connected to a normal Centronics 'outlet' on a micro. So, to make the robot work you need the half-Centronics software to send the right signals down the right half of the wires.

Cost of Move Master and control processor is $5000. Mitsubishi hopes the thing will be used 'for training operators, as a teaching aid, or as a point of sale display' (a shop window gimmick, I suppose).

With a little luck, it will also prod lethargic UK micro builders into realising what they will be up against in a year or so, when Japanese machines do start spilling over into the West. But I doubt it: they will carry on making 'hand-crafted quality machines' which will go the way of the Norton motorbike and the Dodo.

Details of Move Master from the company's Tokyo offices at 2-3, Marunouchi 2-chome Chiyoda-ku, Tokyo 100, Japan — or wake up in the night and phone (218) 2173.

Auto office

An office automation conference, backed by the Institute of Directors and supposed to be 'part of Information Technology Year', is running from 15-17 June at the Barbican Centre in London. It is organised by the organisers of the *Which Computer?* Show, Clapp and Poliak Europe. That's all the details I have at press time: further information on 01-747 3131.

PET show

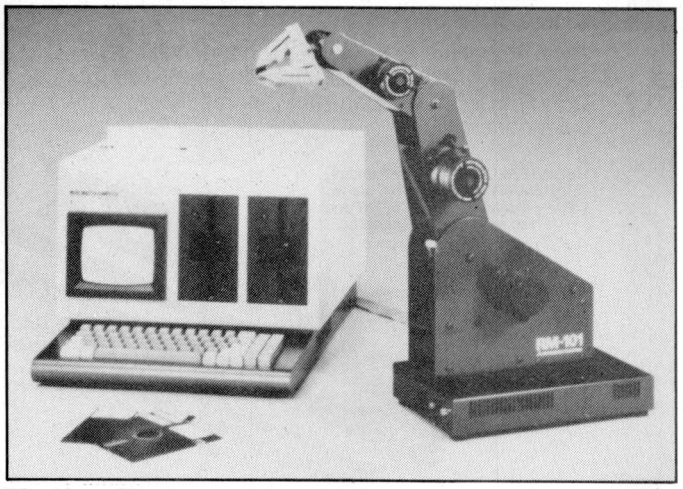
The PET Show, still a bit bigger and more important than any other specialist micro show in Britain, runs from 3 to 5 June at the Cunard Hotel, Hammersmith. Over 100 exhibitors will be there, and while the hardware will be mainly the same from one stand to another, there will be lots of different (and competing) add-ons, software, and other ideas to compare.

If for nothing else, get there to see Jim Butterfield, the world's greatest PET expert. I think he actually knows more about the PET than there is to know. And he will be meeting the worried, curious or otherwise fascinated, courtesy of Commodore. Details on Slough 79292

Apple Logo

Just because a language is easy to learn doesn't make it easy to write programs in that language — as a great many Basic programmers are starting to find out. Which accounts for the number of people who are getting enthusiastic about Logo, a teaching language which actually encourages people to write good programs, and to learn good programming habits.

Latest to get enthusiastic about Logo is Apple itself, which has announced an official Apple Logo. Hope-



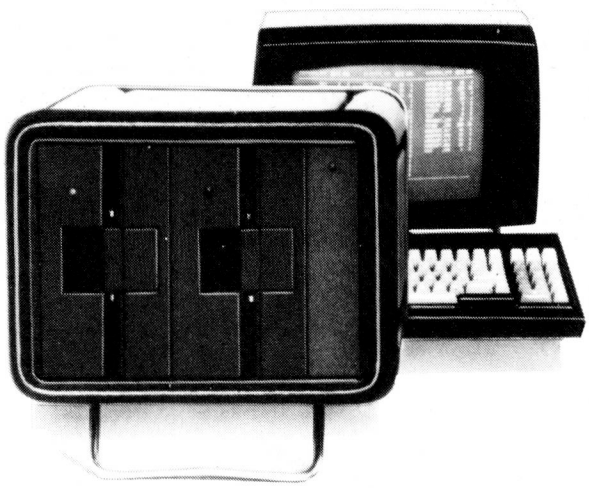
The Move Master — see 'Moving in . . .'

DEALER ENQUIRIES WELCOME

EPISODE

The NEW compact 1.5MB Standalone Computer

£1995 + VAT



EPISODE – A high performance standalone computer at a down to earth price. Capable of sharing data bases.

- FLEXIBLE – COMPACT – ADAPTABLE. The Episode allows user choice of VDU's and printers, takes up the desk space of a legal document and under its CP/M operating system ensures availability of technical and business software for both technical and non-technical user.
- **Word processing/mailing ■ Financial planning**
- **Integrated accounts ■ Stock control**
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- A wide range of languages and utilities is available under CP/M to the technical user. BASIC, FORTRAN, COBOL, PASCAL, etc.
- Can be used with existing mainframe terminals.

Standard features

Z80A Processor, 64K RAM, Diagnostic PROM, Dual 5″ double sided double tracked drives (1.5 MB total), Dual RS232c ports, Centronics parallel port, battery calendar clock.

REGISTERED TRADEMARKS: *CP/M – Digital Research*

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NEWSPRINT

fully it is a good version because there are so many different people around, all offering their own versions, that it is going to be very difficult to know which one to recommend — but the Apple version is almost certain to become the standard. Just because Apple is behind it, probably.

Available from Apple dealers.

Single-handed WP

Our lovable Editor has a thing about a one-handed typing device called a Microwriter, which requires you to press five keys in many different combinations to create the whole printable typewriter character set.

He has learned to type with one hand and therefore wishes everyone to know that you've just missed the chance to see the thing at the Word Processing exhibition on 25-28 May. Oh, maybe you've just got time to see it if you run or the issue got printed early. It's at the Wembley Conference Centre in London.

The company was also planning to launch a new product just before the show but didn't tell us what it was (please see 'The Line Is Dead') in time for this report.

68k chips

Motorola's partner in the development of its giant 16-bit processor, the 68000, is semiconductor firm Mostek — which has now announced a few enormous chips of its own to add to the 68000's potential.

The company has published details of four new chips in the 68000 family, including a 'single-chip computer' with a few extra functions included that would normally require extra chips and complicated interfaces to the central processor.

It isn't meant for computing work but for using as a controller chip inside some automatic machine. That chip won't be available for at least a year, however.

More significantly for us computing types, there is a serial input and output controller, which will make it simple to take the 16-bit parallel codes inside the central processor and queue them up into a serial stream of pulses for transmitting or receiving — in quite complex manners such as ordinary asynchronous communications; or IBM's favourite bisynch (binary synchronous) and even including IBM's complete SDLC (synchronous data link control) protocol. That is all on a chip due to be tried out by the end of this year, and possibly available to builders within 12 months.

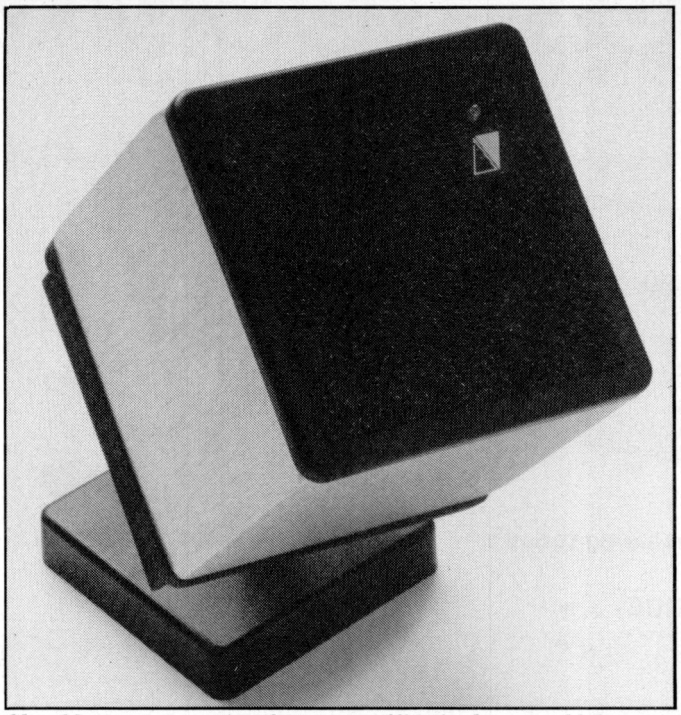
There is also a multi-function peripheral chip, to provide 'the three most popular peripheral functions, of serial input and output, timers, and parallel input and output, into one device,' says Mostek. By input and output, Mostek doesn't just mean a string of serial information but complex tasks such as feeding data streams directly into specified parts of the computer's memory without having to interrupt the processor — direct memory access or DMA. That chip too will appear towards the end of this year and will be available in around 12 months in high volume (perhaps).

Finally, Mostek has decided to follow Intel, Digital



The little white box inset, looking like a one-ring electric cooker on its side, is actually a power supply and fan which can reduce the temperature inside your Apple from 47 deg C to 23 deg C, and can also power the machine, a printer (or hard disk) and the fan, while cutting out several of the electrical interruptions that can come down the mains and screw up your Apple. It costs £150 including VAT, and details are available from Avitek near Reading, on (049 162) 765.

NEWSPRINT



Should you ever notice that your office is always cold for the first five minutes or so that you are in it, look round for one of these little blind TV sets — because what it actually is, is a Sensatemp, which can tell if there's somebody in the room. If there isn't, it can tell the central computer which controls the building's heating and lighting, to save the electricity for the heating (or air conditioning) and lighting in that room. It costs £97. Details from Alternative Marketing Services in Sharpthorne, West Sussex, on (0342) 810771.

Equipment and Xerox by adopting the Ethernet idea for local networks of processors and other equipment.

By putting the whole electronics of Ethernet on one chip, the company will make it possible to have lots of 68000 processors all sharing printers, disks and other expensive items for only a couple of hundred pounds, rather than a few thousand extra. But this chip is really only in the early stages of a long design process: don't expect to see even one sample much before the end of 1983, says Mostek. It's a very big chip.

In the meantime, don't believe anybody who says he has a cheap Ethernet system. Details of the Mostek chip on 01-204 9322.

The line is dead

Deadlines are strange things. A deadline can be 'put back' sometimes, if it has first been 'put forward' to make this possible. A deadline can be 'stretched' if it is broad enough, by taking the four things that have to be done in a different order. A deadline can be rescheduled, sometimes, if you can see the new schedule coming.

The One Thing a Deadline Cannot Do is be revived. Once 'Newsprint' has been written and printed, it is dead and gone. The line is dead; long live next month's deadline.

In this issue are one or two items of some importance, which actually happened in February. The people who made these things (for example, Prestel's new price for closed user groups) happen kept it all secret until they were ready. Then they sent us an announcement which got here just after we put the May issue to bed — so it got printed in the June issue.

For the sake of professional (!) publicists, let me point out that it takes a long time to prepare and print a paper as big as *PCW*.

This item, for instance, was written over the Easter weekend, finishing on Monday 12 April. Just because you did something in March and posted the announcement in the first week of April, don't expect to see it here, because it missed the deadline.

If you want to know why it missed the deadline, think of this: in any week, *PCW* gets between 200 and 300 serious press announcements. Just sorting out this month's 600-plus news possibilities into a rough priority order took me three full days' work.

During those three days, I don't open the post — I don't have time. At the end of those three days, I have to write like hell for the rest of the week, including the weekend.

At that stage, anybody who suggested that I start opening the extra 200-odd announcements that have come in since I started work, and sorted them into some priority, and wrote them up, would get his trousers kicked, even by phone if necessary.

If you want to tell me

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The portable business computer with a difference

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Osborne 1 – The personal business computer for small businesses and busy executives on the move.

- Compact and mobile – The Osborne 1 simply packs into its own carrying case. Take it wherever your work takes you.
- Comes complete – Z80A 64K computer, dual 100KB disc drives, typewriter keyboard with numeric keypad and 5″ screen.
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- CP/M operating system allows user choice from a wide range of existing written programs.
- Connects to a variety of printers.

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MAILMERGE for name/address database.
SUPERCALC for financial planning.
MBASIC & CBASIC for programming.

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WORDSTAR, MAILMERGE: MicroPro International
MBASIC: Microsoft
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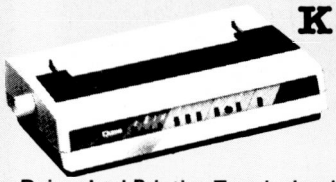

The Daisywheel Printing Terminal series that sets a new standard for print quality, reliability and serviceability. Unbeatable performance at a realistic price.

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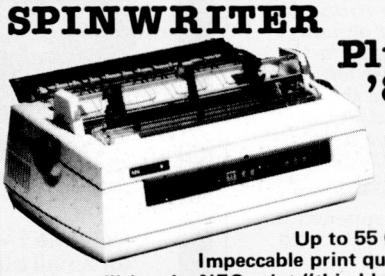
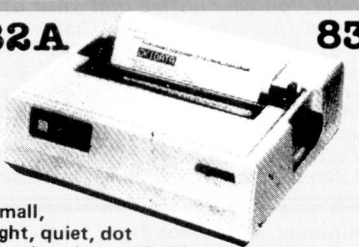


Up to 55 CPS Impeccable print quality printers utilising the NEC print "thimble".

OKI

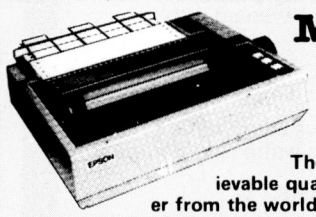
82A 83A



Small, light, quiet, dot matrix printer. 40, 80 or 132 columns, 6 or 8 lines per inch, 96 ASCII characters plus 64 graphics characters, Centronics int.

EPSON

MX80 RANGE



The unbelievable quality printer from the world's largest print head manufacturer. A whole stable of machines to suit a wide variety of applications: MX80, MX82, MX 80FT/1 & MX80 FT/New Type 2. MX100

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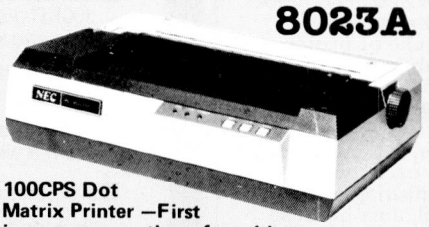
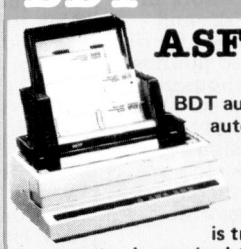
8023A



100CPS Dot Matrix Printer —First in a new generation of machines embodying the quality and features you have come to expect from one of the worlds leading manufacturers.

BDT

ASF 160/560



BDT automatic sheet feeders automate the only thing left in word processing that needs automation. No word processing system is truly automatic if an operator is required to hand feed sheets into the printer, or resort to perforated continuous stock. This handling individual sheets can now be a thing of the past.

TEC

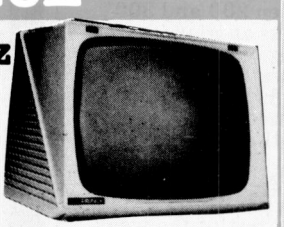
STARWRITER



Low cost, reliable, bidirectional daisy wheel printer—professional quality printout with Diablo or Qume print wheels. Suitable for most micros with RS232C or 8 bit parallel.

PRINCE

24MHz



12" Green Screen, the monitor with features normaly found on screens costing far more. It has a sensitivity adjustment from 0.5V to 4.0V thus allowing ample drive capabilities even with the most meagre of video signals.

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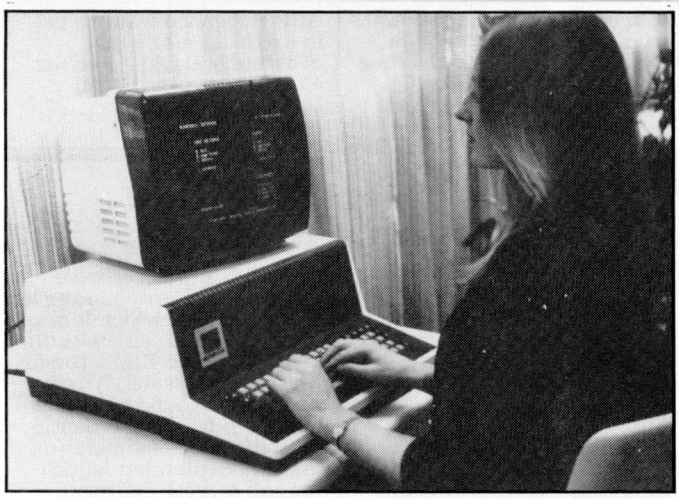




I think the Baroness, a well-known publicity consultant, deserves some kind of extra points for this valiant attempt to take a picture of software.

She did it on behalf of Alphatronic: the picture of the blonde lady is one showing a 'very popular German database program, Minigeni, now translated and adapted for this country by Dantedale Ltd'.

The picture of the dark-haired lady shows a telex pre-preparation system (the black box punches telex paper tape), 'which significantly reduces the bottlenecks that occur at a company's telex machine during preparation and editing of telex messages.' Details of these Alphachronic (as it is affectionately known) systems from Triumph Adler, on 01-734 2907.

something, tell me before the deadline dies. Especially courses. This month, I threw away announcements of 17 different training courses, because they happened before *PCW* could be printed.

What really makes it fun is that, two weeks later, the Editor will get a letter from the outraged course organiser, complaining that 'Guy Kewney never seems interested in our courses.'

Moderate cheers

It is very useful to have computers in schools and providing 100 as prizes should give a lot of people who don't win a powerful incentive to go out and buy one. So two moderate cheers for the Department of Industry, which has awarded the prizes.

Why the restraint (you ask)? Easy: the prizes were Research Machines RML 380Z computers, which no school in my neck of the woods can afford to spread thickly round the pupils. The machine may be lovely but one computer in a school is about as significant a step towards computer literacy as having a woman Prime Minister is a step to female equality — that is to say, almost irrelevant. And more than one 380Z is on its way to being expensive: a classroom full is out of the question.

All of which is not to say that the prizes are a bad idea — far from it. It's just not too hard to think of a better one, even if it does mean casting some slight doubt on the RML range's status as Official Educational Micro. But then, that might do Research Machines a bit of good in the long run (perhaps).

Blatant plug

An exciting plan to publish a book on computer and video games in time for this Xmas rush has just fallen through. A pity: not only would the book have been valuable to the market and the readers, but the two authors (a lady called Elsbeth Joiner and myself) would have made some money out of it. But, apparently, the publishers wouldn't have.

Not to worry: we're going ahead anyway. The result of our efforts will be published — somehow — before the program-buying season in November. All we need is information.

Anybody with game products, please make sure I get details in plenty of time — send information to my own office at 38 Digby Crescent, London N4 2HR.

New Commodores

After sitting quietly letting the world speculate and shake its collective head in wonderment, Commodore has suddenly leapt in with a new range of computers, both up- and down-market from its existing machines.

Most spectacular is the 720, a smart new business machine which not only looks radically different from anything else on the market but has some very exciting features. Like: 256k of RAM (a 128k model is on its way), 20k of ROM, an integral 80 x 25 display, a full qwerty keyboard with 10 programmable function keys, four cursor controls (at last!) and a numeric pad, twin built-in floppy disk drives (also at last), cassette, RS232, IEEE 488 and user ports and — most interesting of all — a slot for a second processor; 8088 and Z80 add-ons are also promised.

Slightly down-range is the 500 series, which looks quite similar except that there's no integral screen or disk drives. The unit plugs into a TV to give a 40 x 25 colour text display or 320 x 200 hi-res colour graphics, there's a music synthesiser with a 9-octave range and three voices, 20k of ROM and 64k RAM (expandable to 256k) and the unit also has a second processor slot.

Both machines come with Basic in ROM and, with the addition of a Z80, both will run CP/M software, with the main processor, a 6509 (a 6502 with memory paging) handling I/O.



Severely disabled people can do amazing things with computers, if they are trained to program them, but severely disabled people often have trouble raising the money needed to get trained.

So lots of marks to Olivetti for donating this P6060 (a sort of costly micro) to Queen Elizabeth's College in Leatherhead, Surrey. Until now, students have had to do their studies without a computer to transfer theory to practice, which is an absolute scandal and every micro supplier who hasn't responded to this sort of problem is not only unaware but thick — because training people on your own machine is very much a two-way benefit. It grows friendly users who are likely to do a lot to enhance the abilities of the machine.

The 5th Personal Computer World Show

By the middle of April we knew that this year's Show would break all records — for number of exhibitors, size of show and attendance. Over 1500 square metres of space are already allocated to the 70-odd companies who have so far returned their contracts. A full list of all the companies that are coming will appear in each issue of *PCW* from now until the preview issue itself comes out in the middle of August. Here's the first list.

If you're looking for business systems the big news is that Digital Equipment (DEC to its friends) has booked a massive 100-square-metre stand. When a big mini manufacturer starts up in the micro market a few sparks should fly. IBM machines will be on show on the Microcomputerland Stand — with a new add-on coming out every twenty minutes for IBM's Personal Computer in the States who knows what will filter through by September? And it's a little more than coincidence that Peachtree (the company IBM picked as official business software suppliers in the US) is also booked into the show. Other news is that the Newbrain (mooted two years ago and now finally being built by Grundy) will be there, as will the entire product range from Sharp Commodore, Tandy and NEC.

Upstairs in the home and hobbyist section we know that if all goes well the colour Genie will be launched at the Show. Commodore, NEC and Acorn will be in both parts of the show this year, which will mean even more demonstration machines for visitors to get their hands on.

There will also be the usual profusion of add-ons, dongles and gizmos from people like Supersoft, Vero and Audio Computers. It is not beyond the bounds of possibility that this will be the first place to see BBC software in decent quantity and variety — from Acorn/Aunty and from independents like Bugbyte.

Our own features will include the World Microcomputer Chess Championship, Computertown, and almost certainly a chance to challenge micros to a very well known board game.

If you are one of the 14 people who haven't already got the *PCW* Show in their diary you should by now have realised the error of your ways. And, if you need more convincing, over the next couple of issues we will be giving details of cheap travel and hotel deals, reduced entry vouchers and more news about the features.

Lower level
Acorn
Adda
AICS
AM Electronics
Apple
Atari
BFI Electronics
Biodata
BMIS
British Computer Society
Caxton Software
Commodore
Community Computers
Computer Bookshop
Data Applications
Digital Equipment (DEC)
Decom Computer Supplies
East Central Business Machines
Electrohome
Electronic Aids
Environmental Equipment
Gemini Microsystems
Grundy (Newbrain)
GW Design
Humac
Intervisual Advertising
IO Systems
Icarus
John Wiley Zenithplan
KGB Micros
Little Genius
Lowe Electronics (Video Genie)
McGraw Hill Book Co
MC Computers
Microcomputerland (IBM)
Molimerx
MPI
NEC
Peachtree Software
Personal Computers
Pete & Pam
Rediffusion
Research Machines
Riva
Roadrunner
Sharp Electronics
Stotron
Systematics
Tandy
Thame Systems
Tomorrow Microsystems
Transam
Vero
VNU Publishing
Wadsworth Electronics

Upper Level
Acorn
Adda
Audio Computers
BugByte
Camtronic Circuits
Chromasonic
Commodore
Computer User Aids
Creative Computing
Elcomp
Ikon
Kansas City Systems
Macronics
Maplin
Microtanic
Mine of Information
MPI
NEC
OK Machine Tool Co
Personal Computers
SBD Software
Southern Software
Supersoft
Sinclair
Time Data

Three new home machines have been announced: the VIC 10, VIC 30 and the long-rumoured Commodore 64.

The two VIC models feature similar basic specs (40 x 25 colour text or 320 x 200 graphics, ROM Basic, and sound), but the Basics differ in that the 10 has a plug-in ROM pack Basic which can be replaced with games or music cartridges while the 30 has an 8k Basic buried in 20k of ROM, which includes the operating system and character generator. They have different RAM sizes, too: 2k for the 10 and 16k for the 30.

The Commodore 64 has the same graphics and sound capabilities of the VICs but has a full 64k of RAM in addition to the 20k Basic and operating system in ROM and also has a second processor slot. In addition, it can be persuaded to run software written for other 40-column Commodore machines.

With the new machines, Commodore now has a very large product range. The 3000 series is dropped but the 4000 and 8000 series remain — for the time being. Although there's no official word from CBM at the moment, it rather looks as though the ageing remnants of the PET line will fade in the near future (ie, as soon as the existing stocks have been sold), to be replaced by the 500 and 700 series.

Prices: VIC 10: £100; VIC 20: £200; VIC 30: £250; 64: £400; 4000 series: £550-£1430; 510: £695; 8000 series: £895-£3500; 710 (like the 720 but without a screen): £995; and 720: £1595. Note that the VIC and 64 prices *include* VAT — the other prices don't.

Peter Rodwell.

Calling all clubs

Once again free stand space is being made available to computer clubs at this year's *PCW* Show (9-12 September at the Barbican in London). Any clubs who want to get in on the scene should contact Dr David Annals at 142 Windermere Road, London SW16 5HE *immediately!*

Three new 16-bitters

Three 16-bit micros were launched in Europe in the last month, one of which looks as though it could ally with the Sirius 1 to give IBM a tough time when the Jolly Giant finally gets round to launching this side of the Atlantic (and the latest estimate for that is a September launch for end-of-year delivery).

Office equipment giant Olivetti finally launched its personal computer, the M20, at a lavish press conference near Turin.

Instead of first testing the water with a conventional 8-bit machine, Olivetti has produced a 16-bit micro with 128k of RAM and its very own operating system. Estimated selling price in the UK is around £2500.

The M20 is virtually unique in the micro world in being based around Zilog's Z8000 processor, a decision made back in the early days of 16-bit chips when the Z8000 was the only real product available and looked all set to win the race.

As well as the Z8000 and the 128k RAM, the M20 has as standard Centronics and RS232 interfaces and an 80x25 display (software switchable to 64x16) with 512x256 graphics, and twin 5¼in floppy drives holding a total of 286k (formatted) each.

Upgrades and expansions include memory expansion to 224k by three plug-in 32k cards, IEEE 488 and twin serial port boards, and very nice colour graphics.

Olivetti's operating system, called PCOS, is a single-task, single-user set-up which, from the documentation, appears rather similar



Commodore's smooth 720

in concept to CP/M but is more flexible and friendlier — it incorporates a 'help' command, for example — and includes password protection facilities for files. The Basic used is more-or-less standard Microsoft, with commands to handle the quite sophisticated display, which includes windows and full graphics control.

A set of diagnostic routines is contained in ROM and is automatically executed on power-up, with any malfunctions being reported on the screen or printer. A disk containing more sophisticated diagnostics is also available.

All this is, of course, useless without some good applications software. The deviation from the now almost-standard CP/M family means that the fast-growing pool of 16-bit software won't run on the M20. Recognising this, Olivetti has produced a number of its own packages, including a word processor called Oliword, a 'data entry, retrieval and update package' called Olientry and a spreadsheet packages called — no, not Olicalc but Multiplan. A number of utilities are also available, including a scientific subroutines library and a system self-instruction guide. A choice of three printers is available, one thermal and two dot matrix, and, of course, you can hook up one of those stylish Olivetti daisywheel units too.

Rather more up-market is the Fortune 32:16. As the name suggests, it's based on the Motorola 68000 chip, which looks like a 16-bit machine on the outside but has 32-bit internal architecture. For £3510 you get 128k internal RAM plus a single 800k floppy and a single-user operating system based on Unix but with a rather neat and considerably more user-friendly shell around it which sensibly keeps the user isolated from the nasties of Unix itself. A twin floppy unit costs £4209 while a machine with a single floppy and an integral hard disk costs £6145 (for a 5 Mbyte disk) or £6848 (10 Mbyte). Upgrade to a multi-user operating system (£348) and you can share the system with other users by adding work stations at £770 apiece.

Surprisingly (especially as the basic machine sells in the US for $4995), no applications software is included in the price. So you'll pay £348 for what looked at the demo to be a rather nice word processing package, £208 for a spreadsheet and £418 for a database system called IDOL.

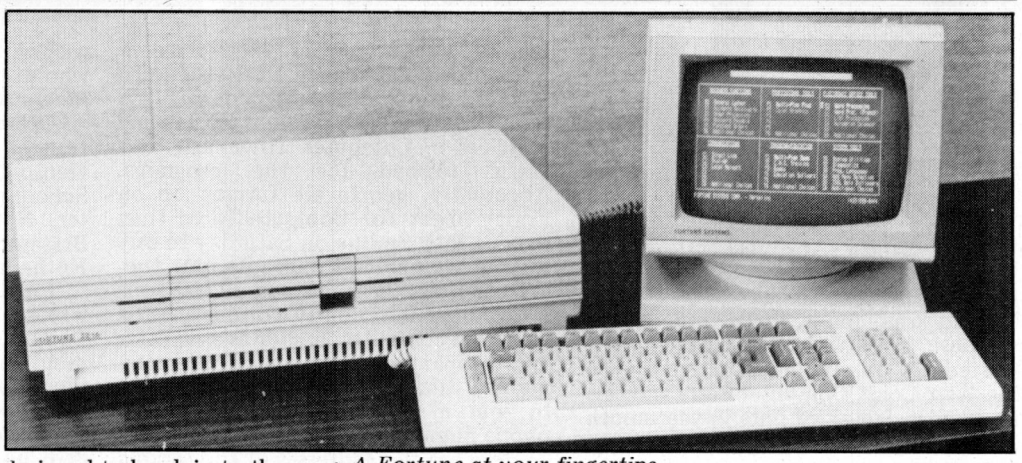
Another 68k-based micro launched recently also caters for more than one user, but does it with a network rather than splitting the CPU between users. The Corvus Concept is in fact a very upmarket workstation designed to hook in to the Corvus Omninet local area networking system, giving communications with other machines and with printers and hard disks. 'Workstation' isn't really doing the machine justice, actually — it's a fully-blown Unix machine just bursting with really interesting features, the most immediately obvious of which is the rotating screen. Well 'rotating' isn't quite the word — it's a two-person job — but in essence, you use the machine with the screen in an upright position (see photo) to give a full A4 display (72 lines of 80 characters) for word processing; if you want to do accounts-type work, for which a very wide display is usually a great help, you simply lift the screen unit up, turn it on its side and put it back after flicking a switch on the back to tell the computer what you've done — the machine then reconfigures itself to the new screen format — 56 lines of 120 chars.

A close look at the photo will show that the Concept has no disk drives. As it's a network-oriented machine, you need to interface it to a Corvus disk drive — £2300 for 6 Mbytes on top of the 'under £4000' for the computer, making it rather expensive for a single-user set-up. Putting more computers onto the network is easy, though, and — impressively — you're not just confined to adding more Concepts; the Apple II can interface to Omninet to give a low-cost terminal where you don't need the full power of the M68000, and Chuck Peddle recently announced that the Sirius 1 will have an Omninet capability soon.

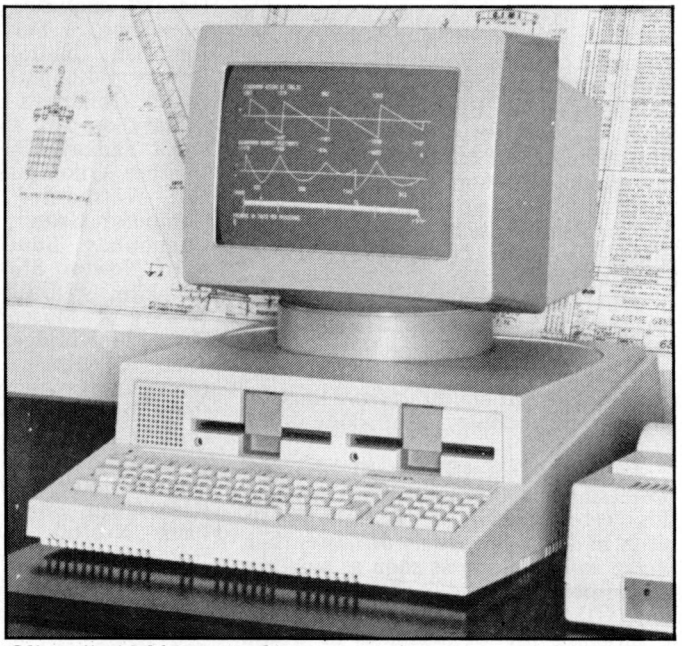
Software for the concept will include Pascal (ISO with full UCSD extensions), Fortran 77, the obligatory word processor and spreadsheet and a CP/M emulator to allow you to run Basic and Cobol.

And there's a *very* interesting hardware feature inside the Concept — a bus into which a large range of Apple II cards can be plugged, although you will have to re-write the ROM drivers on the cards. . .

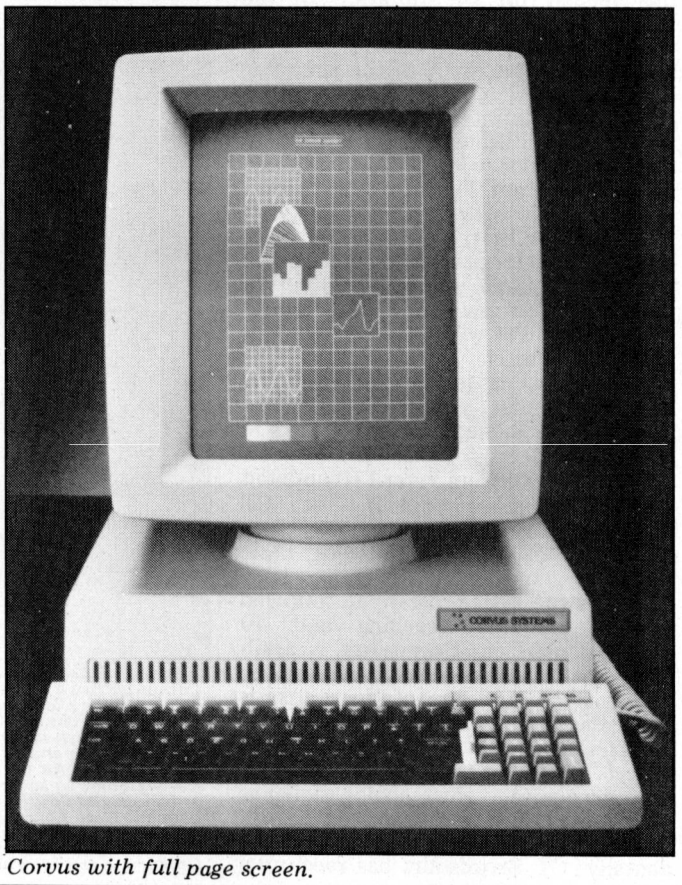
Peter Rodwell



A Fortune at your fingertips



Olivetti's 16-bit contender



Corvus with full page screen.



CTUK!NEWS

by David Tebbutt

Still going strong

First of all my apologies to those who had to wait for a little while for a response to their letters. The fact is I trotted off on my annual pilgrimage to the West Coast Computer Faire and this knocked a fair sized hole in the month of March as far as ComputerTown was concerned.

Let's have a look at this month's mailbag. First of all, a real livewire by the name of Chris Woodford wrote from Burton-on-Trent with a copy of ComputerTown Burton's first newsletter. It made very interesting reading and, although CT Burton is not yet off the ground, I'm sure it will be soon. If you'd like to help Chris start up in Burton please write to him at 31 Hopley Road, Anslow, Burton-on-Trent, Staffordshire.

John Stafford has a lot to answer for: he kindly wrote an article about ComputerTown Worcester in the magazine *Assistant Librarian*. The result has been a deluge of enquiries from libraries all over the country. Well done John, and thanks.

John Bone of CT Gateshead is coordinating the ComputerTown stand at this year's *PCW* Show. If you'd like to pitch in for a few hours or more, then please contact John as soon as possible. His address is at the back of the magazine (CT centres). John has just sent me a 'shopping list' of machines he would like loaned for the duration of the show. If anyone would like to help out, will they once again contact John as soon as possible. Here is the shopping list: two BBC model Bs with disks, Paper Tiger printer and colour televisions; two BBC model As with TVs; two Atari 800s with disk drives, joysticks and colour TVs; two ZX81s with 16k, large keyboard, printer and flat TVs; two ZX82s(!); one 48k Apple with Softcard and printer; a telephone line and modem; and someone willing to telephone the show from a US network. Phew!! If you're willing to help out but you can't reach John, please leave appropriate messages for me with *PCW* unless, of course, you happen to know my own telephone numbers. Thanks in anticipation.

A phone call from Peter Kiff updated me on what's happening at CT Broadstairs. Peter and his merry men have been running a 10 week Basic course very successfully. It starts with a re-run of the BBC programme followed by 20 minutes' teaching and 40 minutes' practice. Homework is available for those who want it. At the moment the structure of the course is fairly flexible but, when the first one is complete and they've had a chance to reflect a little, Peter has promised to send me a note of the teaching sequence which they find works for them. I'll let you know when it's available. Incidentally, CT Broadstairs has received a lot of support from local traders. Rediffusion has loaned a television and video recorder for the course, WH Smith in Ramsgate has lent ZX81s and cassettes — Computer Town acts as a useful testbed for the programs. Apparently, people are turning up on Friday night for ComputerTown then rushing into Smiths on Saturday to buy their own machines! Radio Rentals, too, are offering televisions and a local software house is seriously considering the loan of a computer. It sounds as if Peter and company have got a nice little community thing going there. If you want to join in, help or whatever, Peter's phone number is 0843 67368.

Here are the addresses of the serious looking enquiries this month: Steven Donoghue, Services Development Librarian, Central Library, George IV Bridge, Edinburgh EH1 1EG; Miss P Crabb, Children's Librarian, Warrington Library or 40 Lander Close, Old Hall, Great Sankey, Cheshire WA5 5PJ; Mrs Heather Arnold, 88a Pontway, Warminster, Wiltshire; J Hamilton, Whithorn Computer Group, c/o South Machars Community Education Centre, Whithorn, Newton Stewart DG8 8PN; C W Franklin, Wiltshire County Council, Library & Museum Service, Bythesea Road, Trowbridge, Wiltshire BA14 8BS; John G Batch, Assistant Lending Librarian, Lowestoft, Central Library, Clapham Road, Lowestoft NR32 1DR; Colin Glover, 116 Whitecross, Abingdon, Oxon OX13 6BU; AJ Reese, 94 Coombe Lane, Bristol, BS9 2NP; Frank Richardson, 65 Norwich Road, Fakenham, Norfolk, N21 8BA; Stephen Robinson, Divisional Librarian, Gillingham, Kent; Philip Colner (or is it Colmer?), 43 Victoria Road, Fordingbridge, Hants SP4 1DD; Tricia Raper, 155 Grace Dieu Road, Thringstone, Leicestershire.

I'm sure that all the above are just waiting to hear from like-minded souls who'd like to help them get a local 'Town going.

Other letters this month came from London (SW18 and W1), Bordon, Kenton, Holmfirth, St Louis Grammar School (I didn't note the town), Leicester, Nottingham, Edinburgh, Lympne, Brighton, Paisley, Bootle, Lowestoft, Rotherham, Windlesham.

Finally, my thanks to all of you who wrote and expressed interest in ComputerTown. If you've got half a mind to start one then write for guidelines: appropriate details are in the box somewhere on this page. Thanks too to *Technology Week* magazine who kindly gave us a write-up. Keep those letters rolling in and, if you've a mind to, why not write articles about ComputerTown for your *other* favourite magazines and papers?

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.



ComputerTown Enfield was formed in April 1981 as a result of a meeting between Alan Waring, Dave Clark and Lesley Blundell, the Deputy Borough Librarian. With the help of Southgate Technical College Computer Club CT Enfield swiftly got off the ground. This ComputerTown has attracted a loyal following of some 30 people and it runs at both Palmers Green and Ridge Avenue libraries. A ZX81 has been permanently installed at Ridge Avenue for use by validated users outside normal CT hours. CT Enfield exists mainly for beginners so as people become skilled they are invited to help out with ComputerTown or to join the Southgate club. Here's a quick list of the people who make CT Enfield happen: Dave Clark, Lesley Blundell, Alan Willis, Dave Howell, David Sharp, Piers Bishop, Nigel Craig, Keith Lawrence, Ron Fellows, Brendan Grehan, Sheila Barford, Tony Terry, Anne Sempkins, Andy Scott, Alan Tootill, Terry Gerrish, Max Granger, Andrew Lack, Alan Gregory, Kev Pretorius, Ron Green, Derek Bailey and Alan Waring.

Dick Pountain burrows through the letters in our massive 'in-tray' and gets to grips with digital electronics.

READER'S WRITINGS

Over the last few months it has often fallen to my lot to select the readers' letters which are to be published in 'Communications' and the experience prompts me to offer a few observations gleaned therefrom. Some trends are visible which might shed a little light on the way that the microcomputing scene is developing.

Once upon a time (that is, a year or so ago), the letters *PCW* received fell into four main groups: people reporting tips and discoveries or requesting info from other readers; people making points of general interest about microcomputing, eg, about languages or operating systems; people complaining (usually with justification) about mistakes we had made in the mag or slanders about their product; and gossip and/or in-jokes from pople in the trade. All of which is fine and healthy stuff and the clay from which letters pages are wrought.

In the intervening time two or three new categories have started to be seen, however.

First is the complaint about the trade. We could easily fill a special issue of *PCW* with complaints about the ZX81 RAM pack, the BBC waiting list and various manufacturers' service arrangements or lack thereof (don't worry, we're not going to!). The problem is that we can do very little to help such readers; we can't investigate each case individually, and it is a very dodgy business to make representations to a manufacturer or publicise the complaint without such investigation. We do of course document elsewhere in the magazine the progress on the larger scale bugs delays and foul-ups which beset the industry. But the other problem is that we see both sides of the story from where we're sitting. Without manufacturers there are no computers, hence no *PCW*, hence no *PCW* readers; what's more we have some idea of the immense complexities involved in getting a microcomputer to work at all, let alone into a carnivorously competitive market-place, and we have developed a rather worldweary acceptance of the inevitability of cock-up, catastrophe and crisis (usually followed eventually by triumph). It's a young industry, an immature industry in marketing terms, and also a highly exciting one. One day it may grow up so that you can get the same standard of service as when you buy a toaster. I doubt it myself — there'll always be some crazy who wants to push the technology further than it will stand and three more who want to buy it (he will have budgeted for two).

Never forget that the little box which you paid merely the price of a holiday for (the holiday you now need to get rid of the nervous tension) would once have cost £3,000,000,000 and filled 17 wardrobes, etc, etc.



The next category is altogether more tedious; the diatribes, vitriolic attacks and partisan defences of 'my machine' or 'my language' or whatever. I find it really hard to understand how anyone can get emotionally involved with a computer. To me they are still tools, albeit satisfyingly complex ones. I got interested in them in order to learn things and to do that one must always accept that what you're working with now is not the end of the road; it has imperfections and omissions (regardless of whether or not you can afford to rectify them right now) and that recognising and coping with limitations is as important to learning as bragging about strengths. One subject guaranteed to bring a crop of these letters is structured programming and any article (like Borge Christensen's recent ones) that suggests that Basic is in any way less than the perfect programming language. Within the next year or so I predict that Pascal, Comal, Forth or some such will become cheaply available for every popular micro; then, perhaps, it will be possible to give one of them a try before digging in to entrenched positions.

In general I don't think it's necessary or wise to invest ego in anything to do with computers; so many computer disputes are in the end reducible as much to personal style as to any real superiority of one device or system over another. Save partisanship for the soccer season.

The last new category is that of people who write to say that *PCW* is too difficult and can't we run more stuff for beginners. Apart from the fact that we do run the 'Newcomers' page every month, the point is that beginners don't stay beginners very long in this game and reading articles which go over the same basic ground continually becomes very boring after a while. When you first opened your Basic manual it probably seemed difficult; three months later it's hard to remember what the fuss was about. Now you want to stretch out a little. We can help you there; think of us as a nasty gym teacher or a red-faced sergeant-major or something keeping you on your toes and egging you on to deeds of glory.

The moral of all this is that if you have a burning desire to see your name on *PCW's* letters page, your chances are good if you're saying something of general interest, relevance or importance to the mass of microcomputer users rather than making a narrower point, however justified.

But above all, keep the letters coming.

Digital Didactics

Digital hardware has never been my strong point; Rodwell wields the soldering iron around these offices. My last real involvement in hardware was when, at school in the embarrassingly early 60's, we built an analogue computer out of ex-RAF radar parts. It was, of course, the size of a wardrobe, like everything else in those days (the wardrobes were the size of a house) and could solve a seventh order differential equation while delivering a 9000-volt electric shock — I know because I received one. Anyway, to get to the point, we recently received the Superkit from Cambridge Learning, containing a beginner's course in digital electronics which I decided I was in need of and duly tried out.

The kit, which comes in a neat pocket-sized plastic wallet, consists of a small Eurobreadboard, seven ICs, a four-pole DIL switch and an assortment of discrete components: resistors, capacitors and LEDs. The manual is a 170-page document organised as a graded series of experiments with problems set at the end of each chapter (answers are given). The experiments are extremely well worked out, starting from the use of a single AND gate and ending up some evenings later with shift-registers and twisted-ring counters. The explanations and the system of notation for describing circuits are clear and concise and should not prove frightening to anyone who can wire a plug or change a fuse. Two entry points are provided, one for those totally new to electronics and one for those with experience of non-digital electronics. I found the whole business very rewarding, particularly proving De Morgans Theorems by experiment and finding out how a J—K flipflop works — which made me realise that until then I hadn't really understood what makes RAM remember.

The kit costs £20, which we figured to be good value since there is about £10 of hardware in it, before you consider the manual and the instructional expertise you're getting. Recommended for all budding Tom Wests.

Cambridge Learning is at Rivermill Lodge, St Ives, Huntingdon, Cambs. END



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.**

Soft sell

Why oh why don't you include reviews of the vast number of programs that are available to the micro owner? You review some of the more sophisticated software and under Bookfare give us a round-up of the latest computer books, but in the area of much of the software advertised in your magazine, nothing.

I have bought a number of programs ranging in cost from £5 to £35 and each time have ordered them cold, unseen and untried, as the facilities did not exist to try them out. In most instances I have been satisfied with the product but there have been disappointments and, at a minimum cost of £5, a point of reference such as a software review would have been very useful.

When purchasing a book we not only have, very often, the benefit of a review but we can look at the book in the bookshop. A software review would help to bridge the gap that exists between what the vendor claims and how the software actually performs. The restriction of machine dependability will place a limitation on the number of reviews that can be undertaken but a panel of reviewers operating various machines could provide a very useful service to the micro user through the pages of your excellent magazine.
A R J Stevens, Orpington

We intend to start in-depth software reviews very soon (we already do Databases). Unfortunately the business of testing is even more time-consuming than hardware Benchtests which is why so few periodicals do them properly — Ed

Beebs's boobs

I believe Malcolm Peltu has missed some important points in his review of the NEC *30 Hour Basic* book. I bought the book primarily for my computer-naive wife, but have found a number of errors in the text. While I agree that the book is a reasonable introduction to Basic, I think the errors should be mentioned, especially those directly concerned with the BBC machine.

For example: throughout Unit 3, BBCers are told to omit the semi-colon in INPUT statements — they should, in fact, replace the semi-colon with a comma; some of the alternative PRINT statements for BBCers are incorrect; in Unit 9, IF EOF #B=-1 is used as the BBC equivalent of IF EOF(1), when IF EOF #B works perfectly well.

There are other errors (even in the errata!) not directly concerning BBC Basic and, although anyone familiar with computers will spot them quite easily, some people will be awfully confused — I understand around 50,000 copies have been sold.

For a course that is being sold on the back of the BBC machine, the constant marginal notes for BBCers are a pain. A separate edition should have been produced — and perhaps your review should have been written by a BBC user (I don't charge much!).
David Budd, Manchester

Unfair to expatriate

I recently became rather excited about the BBC microcomputer, having heard a lot in its favour from fellow expatriates here in Stuttgart. And so I dutifully sent off a letter to Aspen House, Kettering requesting a price list for the BBC microsystem along with a query as to whether a system could be sent to me directly in Stuttgart. I was rather surprised at their response. When I opened their letter I found my original letter (very useful!) and a xeroxed reply-sheet obviously used to shake off the more troublesome customers. A small tick in the box against the line saying orders could not be accepted outside the UK was the only information. No price list or other information was sent. I must comment that such an unprofessional response was not expected and does not really enhance the image of British firms here on the continent.

However I would still like to buy a BBC micro, so can anyone tell me what the latest price of a BBC micro model B is and how I can order one from Stuttgart (W. Germany)?
R W Lewis, Ditzingen, Germany

Atomic radiation

I have discovered a useful, and rather unexpected, use for a radio. It may be used to discover whether a computer is processing, without interfering with its operation.

The radio needs simply to be tuned to the FM band (though LW will also work well) and sat on, or near to the machine. Assorted noises will come through the radio loudspeaker, the volume and tone of noise depending on what the machine is doing — eg, if you press a few keys when the machine is inputting something, you will get a different tone for each key (on an Atom at any rate!).

Perhaps a more sensible use is as follows: On the Atom, the cassette operating system messages are decidedly unhelpful in telling one whether the machine is still loading (or saving) a program, or if it has 'crashed'. The only way to find out, without stopping the load, is to sit said radio on the Atom and listen to the sqeaks and gibbers that issue forth. With a little practice, one becomes quite adept at identifying what the machine is doing, just by listening to the radio!
J R Chapman, Dulwich

Thanks for the tip Mr Chapman — I do hope you realise though that the micro industry is spending thousands to eradicate RF emissions! Let's hope the Home Office isn't reading this — Ed.

Apple not outdated

In your March issue Guy Kewney, in his 'Newsprint' compilation, is in many ways inaccurate and in several others at least unfair in what he says about the Apple system.

I would argue strongly that, far from being out-of-date design, this computer has kept abreast of current developments and has in some cases led them. Why does he think it is that there are so many manufacturers who still consider it well worth their while to mount new design and marketing exercises for Apple-compatible products and software if the future of the machine is as short as he thinks? The existing and potential user base for this most versatile of computers is still enormous. The 'competition' comes nowhere near in terms of availability of professional software in almost every major computer language; choice of professional printers, floppy and hard disk systems as well as most other kind of peripheral.

I would feel some sympathy for Guy when he says that the prospect of experimenting with other interfaces gets a bit frightening, if it were not for the excellent quality of the instruction books. The friendly way in which they are written dispels any qualms one may have had. No other computer of any make or size, within my experience, has such helpful and complete manuals. In particular, the tutorial is second to none for the absolute tyro. Every Apple peripheral and interface card has the same standard of helpful instruction book. Many have photographs to assist with installation and they all take you through the relevant instructions for the product.

Does he not know that, in addition to the standard Apple 5¼-inch floppies, there have been several 8-inch floppies and several hard disk systems, including removable platter types for the Apple II, for over 2 years?

It would seem that he has not read his manuals (Tutorial p 52, also see index for editing), or he would know that on-screen editing is available on the Apple II with complete cursor control. Insertion, deletion (character and end of line), and program line copying are all provided in firmware. During program writing, the Apple Toolkit provides many useful programming aids. Since it is RAM-resident it need not occupy run-time memory when it is not needed. A ROM resident toolkit normally occupies valuable address space whether you want it or not.

One final word, the Apple is aimed mainly at the serious commercial user. This being so, it is the Apple dealer, not the user, who sets the equipment up and plugs together the particular configuration for that customer. This major class of user is therefore not involved in the 'nuts and bolts' of installation, nor should he be. This reliance on the Apple dealer is all part of the Apple system and is built into the pricing structure. The cut-price cowboys (and there are unfortunately quite a few in London) cannot provide professional standards of support without charging heavily for it. On the other hand, the properly organised Authorised Apple Dealer/Service Centre provides not only the full installation service, but very often at least a day or two's assistance with the familiarisation, operator training and help with the use of various programs. Such high standards of service are normally required by the non-technical commercial client and are to my knowledge only provided by the serious Apple dealer, not the cheap mail-order operator out for a fast buck.

I hope that the above will assist Guy in coming to terms with a machine which can outshine all others in this field. The longevity of the Apple II as a design concept has enabled it to gather all the accoutrements required of a business-oriented machine. It is worth noting that it is those aspects which have been developed and fine-tuned for this most unforgiving of markets, rather than the more trivial games facilities. It remains to be seen whether Apple can get it as right again with another machine.
Hugh S O'Neill, Selsey

Depreciate, skip on zero

The enclosed cutting from today's *Edinburgh Evening News* causes me to wonder how successful I'd be trying to sell my UK101 complete with numerous modes and add-ons. I can't help but feel that many advertisers in 'Transaction File' are very optimistic! I'd like to sell my machine with colour, sound, etc, but I think I'd be lucky to get a quarter of what I paid for it. (I ordered a BBC computer early in January.)
Dave Henniker, Edinburgh



GOING CHEAP—A COMPUTER WORTH £50,000

A Midlothian college are to get a £50,000 computer — for next to nothing.

Midlothian District Council, trying to dispose of a five-year-old ICL 2903 machine, found there was a lack of interest from the trade.

One offer was free removal, and another was to pay £1 for each disc cartridge.

Yesterday the council's finance committee declared that the computer, worth £50,000 when new, should go to Esk Valley College — on the above terms.

Norse Nascom

I have a complaint. Why haven't you presented the promised test report on Hisoft Pascal-3 for Nascom (now also for MZ-80K)? You said (was it last November?) that you had asked for a tape and the manual. Now, if a rather comprehensive report appears next month I shall forgive you, otherwise not!

Generally you should watch your own ads and give new British firm- and software more and better attention.

Your magazine grows fatter every month, but I wish you would be *slightly* less trendy and keep more to the practical side of personal computing. That is what the common hobbyist has to do. All these shining new computers have just one thing in common; they are not perfect. When the price tag reaches £1000 and over they should be given less than four pages of review. A writer like A F T Winfield gives more of interest in just two pages, but you haven't even looked at his Hullforth.
Olaf Baaken, Norway

I shall be looking at Hullforth as soon as I can get hold of a Nascom. And incidentally PCW is a magazine for all *microcomputer users, not only hobbyists, common or otherwise — DP.*

Agora-phobia

MP Ian Lloyd's concern (Commons Report — *PCW* March 1982) with the imminence of 'electronic democracy' is both understandable and laudable. It would be an absolute disaster! The childish idea that a complicated modern society comprising individuals up to multi-nationals could be managed by millions taking time off from *Coronation Street* or their TV games to press a few buttons is as ludicrous as it is terrifying.

The concept rests upon the assumption of an 'informed community'. This assumption, no doubt expressing the aspirations of the 'informers', is biological rubbish. There has never been an informed community and there never will be. The human mind is like a computer in many respects. It will deal with all data fed to it according to its program. Unfortunately for the 'informers', every human mind has a different program. Information technology can disseminate information but it cannot ensure its absorption. Even if it could, TV-watching pollsters totally isolated from the realities under discussion at best would merely be ineffectual or at worst totally anarchistic.

Electronic AGORA is a juvenile nonsense born of technological enthusiasm rather than political maturity. If it seems to be on its way in the US, we should be warned rather than enthused. Political acumen, except on the part of career politicians, has never been very high over there. But this apart, the whole idea is theoretically indefensible as a democratic mechanism.

The populist view, 'All the people, every issue, every time', is philosophically unsound. Populist democracy, or any other sort, only makes political sense if the communication traffic is in *both* directions. That is, when all who have power to vote also have power to participate in the debate. In the present, and forseeable future state of the art this electronic Tower of Babel is just not on. That being the case, government by electronic referenda, far from being the extension of democracy its proponents claim, would be a move towards totalitarianism with real power resting with those with access to the media. Shades of the EEC debate and 1984!

Information dissemination is not the same as information provision. Information arbitrarily directed at people as envisaged in 'electronic democracy' suffers an altogether different fate to the information consciously sought from such as Prestel, Ceefax and Viewdata. Electronics cannot overcome psychology. Viewers unconsciously regretting missing *Crossroads* offer decidedly less receptivity than conscious applicants to an information service.

And this is the crux of the matter. Democracy, electronic or otherwise, can only be effectively run by those who wish to participate in its running. If this means, in practice, too few people involved or that too many partisan views get expressed, this is a fact of life that has to be faced. The fundamental realities of political parties, trade unions, pressure groups, vested interests and the like will not go away. Neither can they be circumvented by introducing a spurious wider suffrage of relatively disinterested button-bushers. These latter could swamp the political activists and probably would. But what would these traditional elements do? Give up the struggle in the face of an electronic smothering of their hopes and aspirations? Not likely! They would go further underground than they are already and carry on the fight.

Thus more fights, squabbles and eruptions of discontent. More grist to media sensationalism and more and more 'inexplicable' events for our electronic pollsters to pronounce upon. And deeper and deeper into the mire of unresolved conflicts would we sink. No, let us have interactive cable television by all means. All ways in which views may be expressed should be encouraged. But let us treat it as a discussion medium because it can never effectively be more, not as a form of government.
E. A. Hawkins, Ipswich

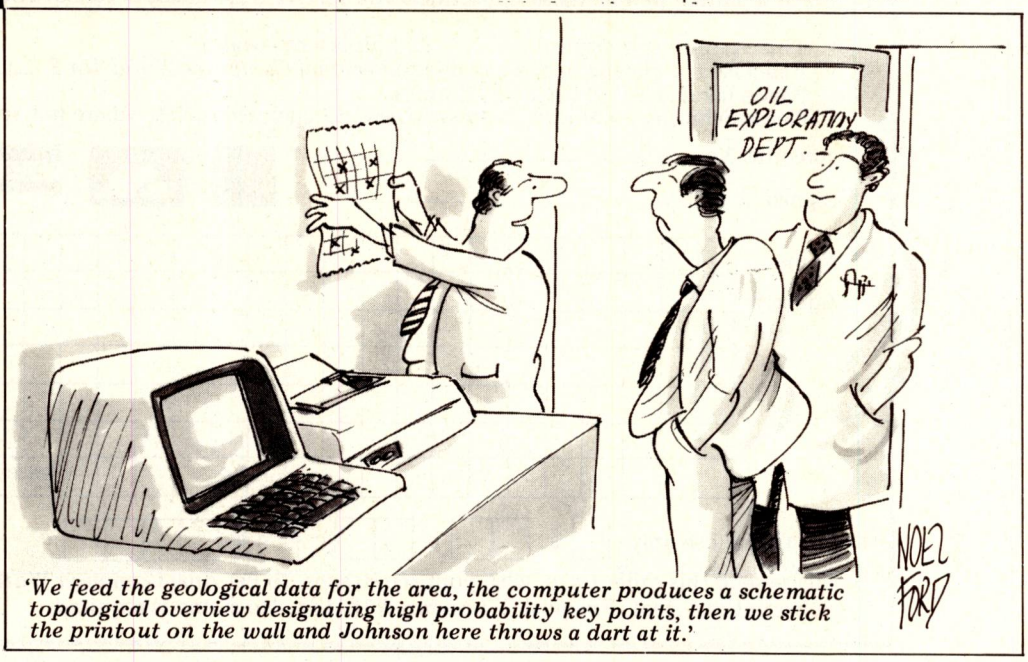
Hey doobrie

This word was in common usage in the Middle East over 30 years ago, I know, I was there. It may be Arabic.

Don't ever be conned into printing zoobrie or similar sounding word which is Arabic!

For an old man of 55 I find *PCW* very helpful and read it cover to cover. The ZX81 tips are interesting but the programs seem a long time coming.
Ray Mullard, Guildford

Thanks for your doobrie, Ray, this whatdoyoucallit is now closed — Ed.



'We feed the geological data for the area, the computer produces a schematic topological overview designating high probability key points, then we stick the printout on the wall and Johnson here throws a dart at it.'

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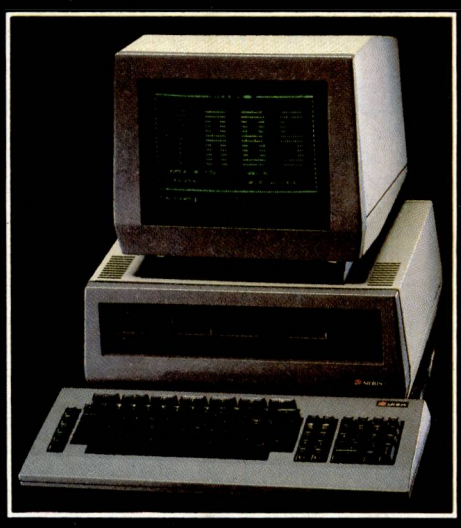

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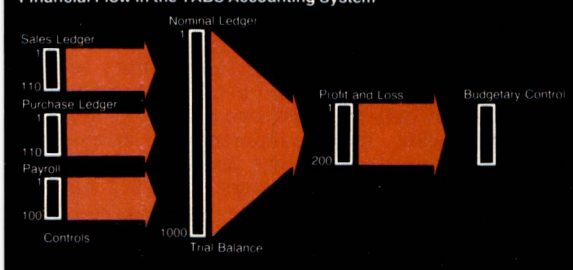

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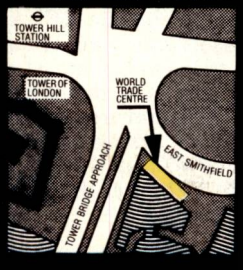

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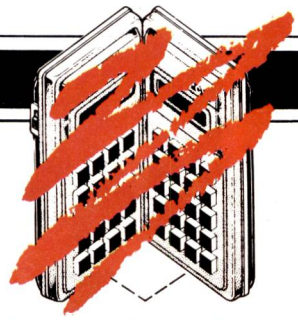
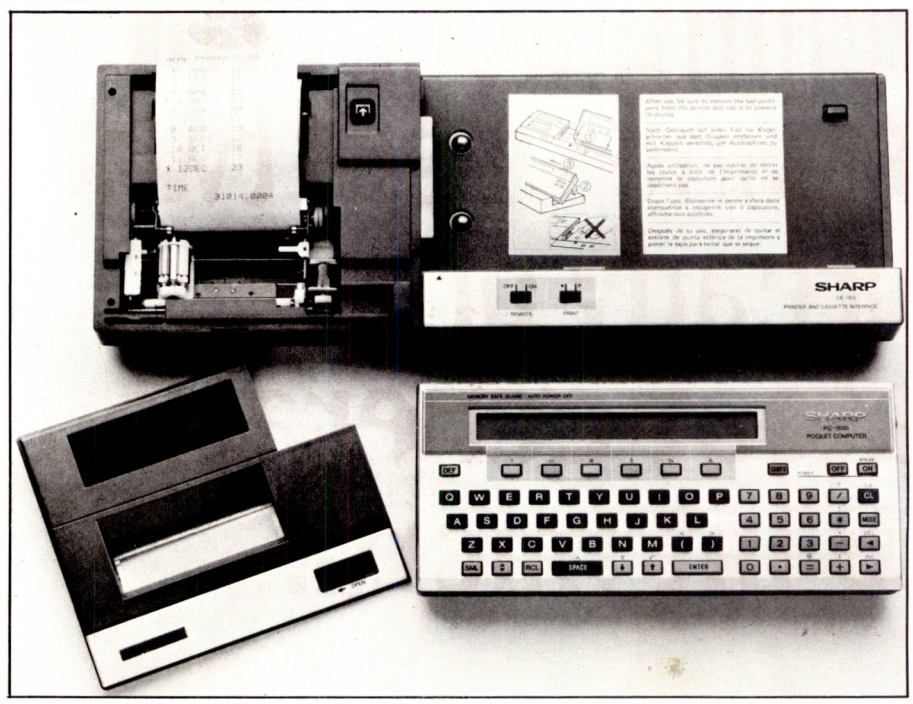


SHARP PC1500

By Dick Pountain

It has been quite fascinating to watch at close quarters the battle for supremacy in the hand-held computer market over the last two years. Sharp got in the first blow with the PC1211, which was the first hand-held with Basic; Casio retaliated with the 702p which is faster and has more memory. Meanwhile, Hewlett-Packard strapped on quadruple memory and an interface loop to its established HP-41C calculator. Now Sharp has come back with a block-buster, the PC1500. Though it is clearly related to the 1211, it's an all-new machine which builds on the good features of the old but is very much more powerful. And it features a truly remarkable four-colour plotter/printer which has no rival at present.





Hardware

The PC1500 computer unit is enclosed in an alloy-faced ABS case of considerably larger size than the 1211 (195x86x25.5mm), which reflects the use of four AA size batteries to power the expanded memory instead of the normal silver oxide or lithium 'button' cells. These give around 50 hours of use; a 6V mains unit is available for desk use. Opening up the case reveals a two-board computer with 14 ICs including the processor, a full 8-bit CMOS unit of Sharp's own manufacture, 16k of ROM and 3.5K of on-board RAM. A compartment on the back of the case next to the batteries has an edge connector for an expansion RAM module (4k on the test machine; 8k is due this month). All of the RAM is, of course, non-volatile CMOS memory.

The keyboard is of qwerty layout; similar to the 1211's but with rather larger keys which greatly improves its ease of use. The most noticeable difference is the row of six function keys under the display, of which more later. Upper and lower case letters are obtainable either by the SHIFT or by a key called SML (for small) which toggles a caps-lock. The display is a 26-character LCD job with annunciators for operation and angular mode and BUSY to show a program is running.

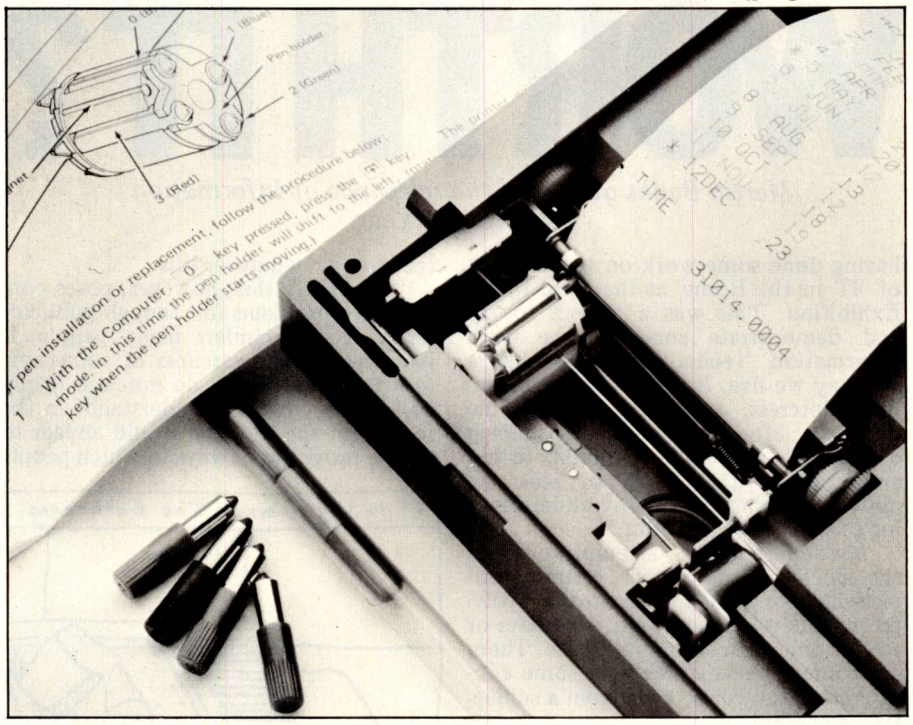
Calculations are performed to 10 figures (dynamic range of $10^{\pm 99}$) plus a two-digit exponent when in scientific notation. The speed of calculation is very greatly improved by the 8-bit processor; the 1500 ran my calculator Benchmark (see 'Calc Corner' Jan 82) in 13 seconds, which beats the previous best Casio 702 (20 secs) quite comfortably. I also ran the *PCW* Benchmarks out of interest; to put things in perspective, even this is an order of magnitude slower than a typical 2MHz, 6502-based machine.

The 1500 has, like the 1211, four modes of operation, but the ergonomics have been considerably improved. The MODE key toggles between RUN and PROgram mode. The DEF mode now has its own key and the top keyboard row has Basic reserved words permanently assigned; 18 of the other keys are available to have user programs assigned. The RESERVE mode now operates on the six function keys under the display and allows 18 commands (including carriage returns) to be assigned to them and used in RUN or PRO mode. This is achieved by a key ◊ which selects one of the three definition sets flagged as I, II and III in the display. Each command may be labelled with a string, and the RCL key displays the six labels over their respective keys. Reserve assignments are stored in 198 bytes of protected memory just below the Basic program area and can be saved to tape. The arrangement works very well, unlike that on the 1211 which was too fiddly to bother with. The editor is the same as the 1211's with full four-way movement through the program and insertion and deletion.

Basic

The interpreter on the 1500 is a full implementation of a Microsoft-style Basic and includes PC1211 Basic as a subset, together with 62 extra instructions. In particular, a full set of string functions is provided, including CHR$ and ASC, STR$ and VAL. Variable handling is orthodox, unlike that of the 1211 which configured the memory as an array. Names can be of any length, though only the first two characters are significant, and two-dimensional arrays are permitted. Strings are limited by default to 16 characters but may be

DIMensioned to up to 80. A nice touch is that variables with names A—Z are stored in a separate protected area which is not cleared by RUN, thus allowing values to be accumulated between runs. This area can also be used as an array called ∂ or ∂$.



MEMORY MAP

FFFFH	ROM BASIC INTERPRETER	65535
C000H	ROM EXPANSION	49152
8000H	PROTECTED	32768
7C00H	SYSTEM WORKSPACE	31744
7800H	DISPLAY BUFFERS	30720
7600H	PROTECTED	30208
7000H	EXPANSION RAM	28672
5800H	BASIC VARIABLES	22528
	WORKSPACE	
	BASIC PROGS	
40C6H	RESERVE DEFINITIONS	16582
3FFFH	NOT USED	16388
0000H		0

RND n generates a random number between 1 and its argument n and is repeatable unless initialised by RANDOM. In addition to PAUSE for output, there is a programmable WAIT [nnnnn] which holds a display for nnnnn units of 1/60th of a second. The PRINT USING has facilities to provide asterisk fill, commas, signs and the inclusion of characters in numeric formats. ON ERROR GOTO is provided for error trapping and TRON/TROFF for debugging. Another welcome 'big' Basic feature is the inclusion of READ... DATA... RESTORE [line number] to incorporate data into programs.

A real time clock-calendar is built in which displays in the rather unwieldy [monthdayhour.minutesecond] format when summoned by TIME. Together with the built-in beeper (programmable for pitch, volume and duration), this can be used as an alarm or to date-stamp printouts.

LOCK/UNLOCK is a clever feature which allows the programmer to lock the machine in its current operating mode; this stops a ham-fisted user accidentally corrupting programs or otherwise wreaking havoc.

Proper file handling is enabled by PRINT# and INPUT#, which allows multiple field records; CHAIN and MERGE can be used to segment and overlay programs from tape.

As if all this 'real computer' stuff was not enough, there is even a facility for dot graphics! The display is treated as a 7x156 dot matrix and the GCURSOR statement selects any column of 7 dots; the GPRINT statement then allows these dots to be set or unset by specifying a decimal or hex number whose binary representation is the required pattern. GCURSOR can take a string of arguments to define a whole shape in a single statement. POINT reads a column-value from the display.

No, your eyes are not deceiving you, I said *hex*. Not only does the 1500 allow hex (prefixed by an &) to be used in any expression but it has PEEK, POKE and CALL as well! You will look in vain for any reference to these in the manual (a Sharp spokesman tells me that a new manual, which covers machine code operation, will follow in time) but they work. With the help of PEEK I was able to uncover some of the labyrinthine twists of the 1500's memory map (also not in the manual) and to dump Basic programs and hence discover the system of tokens used for storage (two-byte codes beginning with 240 or 241 decimal are used for keywords and ASCII for the rest). A command called STATUS returns the number of bytes remaining (STATUS 0) and used (STATUS 1) as well as the address of the top of program and the bottom of variables (2 and 3). Basic begins at 16582, immediately above the reserve area, and variables are stored from 22528 down.

The basic interpreter/monitor sits between 49152 and the top at 65536. By CALLing into the right location in the latter area you can dump the contents in character-encoded form but until Sharp issues both the processor instruction set and a monitor listing nothing very useful can be done in this way.

To summarise, this Basic is far superior to that on any previous hand-held computer and even to that on some home computers. The only things I can find to bitch about (one has one's credibility to consider...) are the absence of DELete and RENumber and the unwieldy format of the DMS conversion routine which uses a single packed decimal number instead of having proper 01 11 separators. It would also be nice to see some built in statistics routines on a machine of this type, but that is perhaps stretching a ROM too far.

Printer & Cassette Interface

The CE-150 is one of those bits of machinery that must elicit a cry of admiration from anyone who has any respect for human ingenuity.

The unit combines a cassette interface to control two recorders with a miniature four-colour plotter and comes with a neat travelling case which has room for extra paper rolls, leads, pens and a micro cassette recorder. It is powered by built-in rechargeable batteries which provide juice for 1½ hours of continuous printing and require 15 hours' charging from the mains unit. The unit is usable under mains power at all times. When mounted, the PC1500 takes its power from the CE-150, thus saving its own internal batteries.

The plotter is a marvel of miniature engineering. A rotating drum like a gatling-gun contains four inch-long felt tip pens in black, red, green and blue; the required colour being swung into the firing position on request. Removing and loading the pens is quite easy for those with average motor control; it is recommended that they be removed and capped to avoid drying up when not in use.

The device is a true plotter in that it draws continuous lines, not dots; and the paper is moved in both directions. The set of plotting commands provided would shame machines at ten times its price. In text mode it acts as a printer, using the PC1500 character set with a choice of print sizes from 1.2 to 10.8 mm cap height selected by the CSIZE command. ROTATE [0—3] determines the orientation of the printed text according to the points of the compass; it can be vertical or even upside-down. COLOR [0-3] selects the colour printed. LCURSOR positions the pen on the 58mm wide paper in one

Banks Statement.

IS IT WORTH IT?

Martin Banks questions the relevance of Information Technology Year.

All this stuff going around about Information Technology year makes one wonder where it is all likely to lead. What exactly does the future hold in the brave new world that we are constructing — or appear to be constructing (I sometimes get the feeling that it is in fact constructing us)?

The question is an interesting and important one, for, while there seems to be overall agreement that we need to exploit Information Technology, there seems less clarity about what bits of the stuff are, or may be, needed, and exactly why they may be needed. These are important aspects because there is the considerable danger of a variety of boats being missed, either because the technology has been adopted far too keenly for its own sake, or has been adopted not at all because people have been frightened off.

Such topics very often form the subject for debate at lunches or dinners populated by the cognoscenti of the computer and 'Information Technology' industry. The arguments are usually pretty erudite, and fully consider the subtleties that are inevitably involved.

For the average person in the street, however, such debates might just as well be in Swahili. It is an observable fact that among the non-computer-oriented populations of the world, the concepts and applications of computers are very poorly understood. Not only that, they remain poorly understood, no matter how much verbiage those 'in the know' try to lay on them. It is only when something specific happens to one individual — often an inconsequential event of no particular value to others — then suddenly that individual makes the transition from 'non-understander' to the state of enlightenment. It's all rather like Zen Buddhism.

Information Technology is now suffering from this encumbrance. IT (if you'll pardon the word) is important for a wide range of strategic, productive and life-enhancing reasons that are too complex to fully enter into here. But any coherent use of it will come from its natural adoption by users, rather than its imposition by a necessarily small body of planners, no matter how 'correct' they may be. To be effective as an integrated part of our future, Information Technology should have the natural feel, the 'oneness', of a place like Castle Coombe, not the sterile 'correctness' of a high-rise building estate.

But to get to the former, as wide a cross-section of the population as possible has to participate in the design and implementation of the Information Technology infrastructure, and if they don't understand the subject that becomes very difficult. Hence, of course, Information Technology Year, 1982.

This aims to publicise and support Information Technology in a wide range of applications and areas. In some it has already done well, especially where there is an existing and definable user interest — for example in business-oriented applications.

It has also been involved in pushing the subject in other areas where the acceptance has been somewhat slower, but where its long term impact is liable to be far more significant. One such area is the use of IT in the home.

It is now necessary that, for a short paragraph, I come clean. I have had some involvement with this myself, having done some work on the showing of 'IT in the Home' at the Ideal Home Exhibition. This was a project to try and demonstrate some of the ways Information Technology may change the way we live. It was designed to promote interest, and maybe pose some questions, for only through lodging questions in people's minds firmly enough that they wish to seek an answer will there come any understanding of what IT is all about.

I would not dare attempt to assess the success of the project, certainly objectively, for as one of the team involved in its development I am, for better or worse, too close to be objective. There are some aspects which bear some consideration, however, even from a subjective viewpoint.

The main ones are those already stated: getting people sufficiently knowledgeable to contribute to the design of the IT system, and what actual products they are likely to come up with.

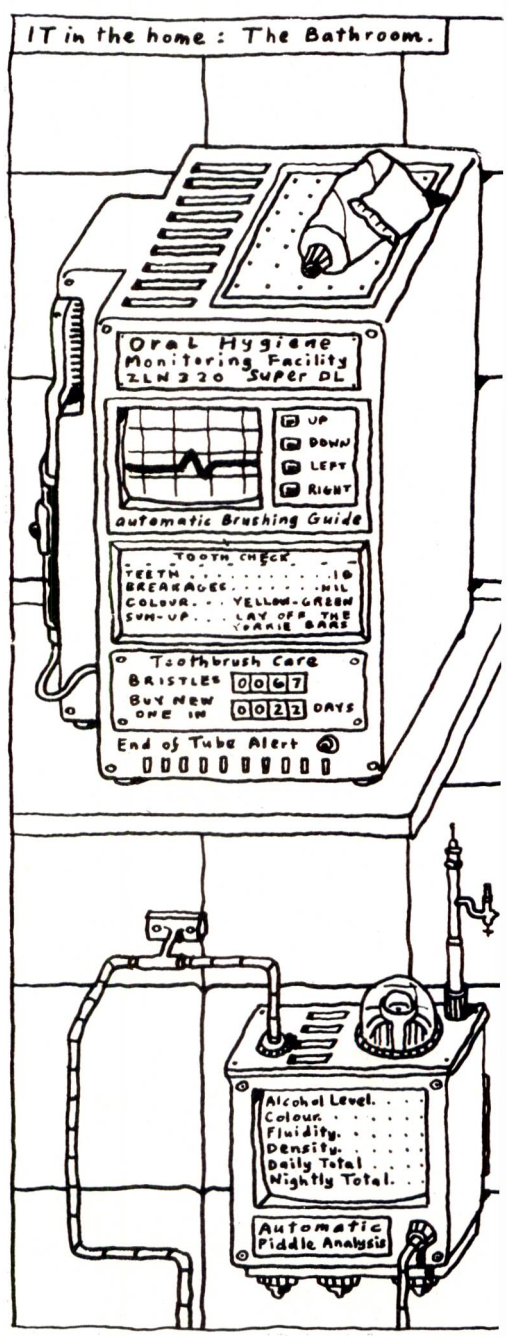
The application of IT in the home is a nebulous area at the best of times, where only one or two specific applications come readily to mind. At the Ideal Home, where the IT project was given extensive bed and board in the show homes of Barratt Developments, these areas were satellite communications, the office in the home, and energy management. Even then, it was only the Office in the Home concept — in this case based around a brand new ICL Personal Computer (*nee* Rair Black Box) coupled to a Prestel interface developed jointly by Johnson Microcomputers and B&B Computers — where the issues were fairly clearcut.

The technology does and will allow more people to work either part-time or full-time at home. The demo at the Ideal Home simply showed how.

But even satellite communications, a subject which at first sight is fairly understandable, has some extensive grey areas, both in terms of telecommunications and telephones, and broadcasting. The same can be said for energy management, where the enhancements that are now possible to the simple control systems of today often require great gobs of lateral thinking for their implications to be fully appreciated.

And appreciation is the problem. There is an ancient law (or if there isn't there should be) that says that people will not accept a new technology any faster than they can see a good reason for having it. Once people see the reason, then they usually become very adept at thinking up entirely new uses for the technology, whatever it is.

To achieve this, however, poses considerable problems for, though publicity helps, it also hinders many people. It just creates an awareness of something 'out there' that they do not, and firmly believe they cannot, understand. In the long term the solution would appear to be the provision of ways in which people



can see IT in action and make use of it themselves. In days of yore there must have been considerable doubt about the railway or electric light until their uses were appreciated. Our trouble, in terms of some of the obvious strategic requirements of exploiting IT, is that we do not have the time to wait for that appreciation to grow. Unfortunately, there seems no way in which the process can be speeded up.

As that appreciation eventually grows, however, the home will become a goldmine of potential applications of IT-oriented products — from the banal to the truly ingenious. There is so much scope for the lateral thinker in this area, for that classic phrase 'we have the technology' is to all intents and purposes now true. This means that at last the technology actually becomes secondary to the application, that the end makes use of the most appropriate means rather than the means dictating what end is achievable.

For the Ideal Home Exhibition we tried to produce such an application. Whether we succeed is arguable, but the end result created some interest if nothing else. That result was the 'Talking House', a system whereby the home owner would be able to interrogate the home using a telephone.

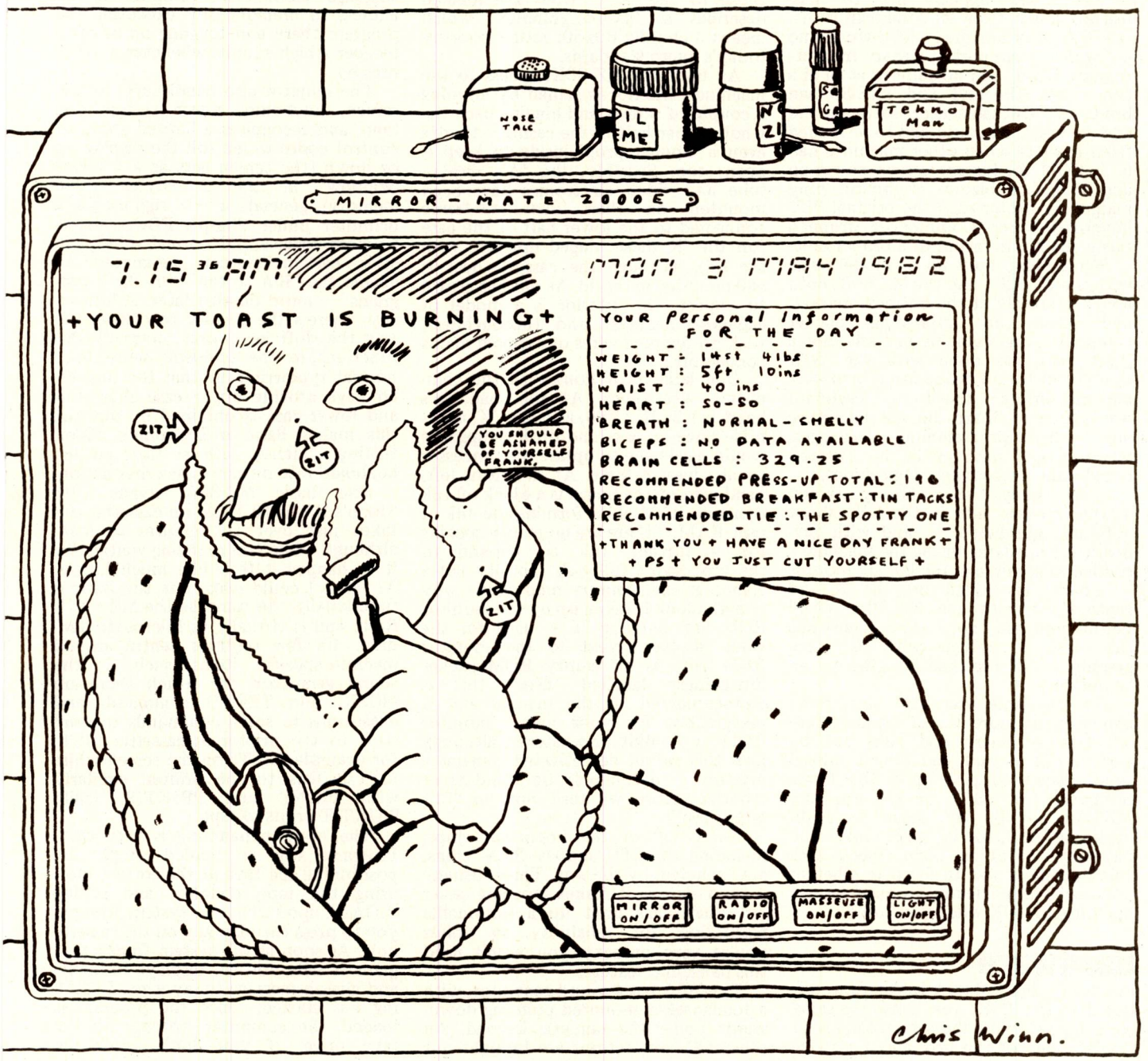
One thing this exercise demonstrated above all else is that, despite the propaganda, things can be achieved very quickly in the UK. The idea was simple enough (a classic 'back of a fag packet' design). Build a computer system that would respond with speech to the sensed input from a telephone keypad. In that way, the house could be interrogated about itself. A typical Q and A would be, for example, about the current temperature. 'The temperature is one-eight degrees', the house might say. To change that, key in the numbers — a simple and direct 'communication'.

From that simple concept to the finished article on the stand at the show took just under three weeks. A Comart Communicator became the basis of the system, which was connected, with some burned midnight oil and the odd oath by Ross Electronics and Millenium (the engineering team), to a Texas Instruments Superspeaker speech synthesis board. All that was missing to make it a real product rather than a demonstration was the interfacing to such items as the central heating controller.

In the end, the most interesting aspect of the exercise was to observe the reactions of the public, especially after the media (and in particular the radio) latched on to the obvious gimmick aspects.

Some just thought it silly (and maybe they were right). Some thought it sounded extremely odd for 'a tape recorder' and failed to comprehend the idea of speech synthesis. Some could see how it could be used — extended even — but then they tended to come from the electronics industry so understood anyway. Some just came to listen because it had been on the radio. Some, like a blind lady who came especially to hear it, could obviously visualise much greater scope for its application in the home.

This was just one potential product for the home. It created interest and in some cases real appreciation not only of its specific details but also of what it represented conceptually. It is highly unlikely that it will ever become a real product. It is to be hoped however that the appreciation does become real. END



BENCHTEST PERSONAL COMPUTER

SHARP

Peter Rodwell takes the lid off Sharp's latest model, the replacement for the popular but ageing MZ-80K.

Considering their track record in the car, camera and domestic electronics markets, the Japanese have been remarkably slow to flood us with their microcomputers. Way back in '79, the first Japanese micro company to sell in the UK, Sharp, launched its MZ-80k with not so much a bang as a murmur: the machine was aimed at the Commodore PET market and offered a fairly similar concept in that it was an all-in-one unit combining screen, keyboard, cassette player and electronics in a single box.

Although other Japanese manufacturers have since launched in the UK, and the long-expected invasion now appears to be gearing up, Sharp's early entry has stood it in good stead and it now has a commanding lead over other Japanese companies.

Yet Sharp appears not to have learned much from its American rivals: the '80K was launched with virtually no software to support it (apart from its cassette Basic) and no add-ons at all at a time when the PET and TRS-80 had built up respectable user, software and add-on bases. Its Basic had to be loaded from cassette when other machines had it in ROM for instant use on power-up and it had a bizarre keyboard, only marginally better than the original PET keyboard which Commodore dropped fairly quickly in favour of a proper unit.

While Sharp built up its model range with the PC-3201 and the MZ-80B, both aimed primarily at the business market, and added an interesting pocket computer programmable in Basic, not a great deal was done with the '80K apart from the introduction of a printer and disk drives — the 'funny' keyboard was kept and Sharp did not introduce any other programming languages, which would have made the cassette-based Basic a reasonably logical idea.

Now, though, after three years and 10,000 models sold in the UK (about 100,000 worldwide) — and with pre-death price cutting giving the machine a sudden sales surge in the last six months — Sharp has killed off the K and replaced it with the MZ-80A. (And before you ask, no, I can't figure out the logic of starting with 'K', progressing to 'B' and then bringing out an 'A' either.)

By the time you read this, there should be no more 'Ks on sale anywhere — certainly Sharp had sold out by early April — and you'll have missed your chance to pick up a 48k home computer for £350 or so. For the MZ-80A you'll pay more — £549 *including* VAT, for the basic unit — and naturally one of my main objects with this Benchtest was to discover whether you ought to be kicking yourself for not grabbing an '80K when you could.

Hardware

Physically, the MZ-80A looks quite different to the '80K: yes, it has the same basic layout, with the screen taking up the left part of the box and a cassette deck on its right side, but the cabinet is more pleasantly styled, although it's in plastic instead of the '80K's metal construction.

The MZ-80K's odd keyboard, on which it was impossible for any ordinary person to touch-type, has gone and is replaced by a proper typewriter quality unit with a very professional feel to it; there's also a conventional numeric pad to the right of the main keyboard.

The K's black and white screen has been replaced with a slightly smaller (21cm) green model, but this has the same 40 characters on 25 lines display as the 'K; earlier rumours that the 'A would have the same display as the MZ-80B (ie, proper 80x24 text and good graphics) can now be ignored, which is a pity. The 'A's graphics are those of the 'K — what the manual describes as 'pseudo-graphics', which means a chunky 80x50; rather poor by today's micro standards.

As with the MZ-80K, access to the machine's interior is gained by undoing a couple of screws and hinging back the whole upper half of the casing — there's even a 'bonnet prop' inside to keep it open, too. Sensibly, the 'A's display tube and video electronics have been mounted on their own sub-frame connected to the lower half of the case (on the 'K these hinged upwards with the lid), although the cassette deck is still mounted in the lid. As one has grown to expect, the interior is a model of Japanese neatness and thoroughness, with no flapping wires or exposed mains connectors.

One large PCB houses all the computing electronics. At the machine's heart is a 2 MHz Z80, as in the 'K, a surprise since an easy and obvious upgrade would have been to uprate the processor to at least 4 MHz. At the front left-hand side of the board is a block of 16k dynamic RAM chips forming the 48k of user RAM — there are no empty sockets for a further 16k to expand to the processor's full 64k capacity but a glance at the memory map shows why — a 4k block is taken up by the monitor ROM and another 2k is used for the video display. Next to the monitor ROM chip is an empty ROM socket intriguingly labelled 'user'; this is undocumented in the manual and is presumably for your own monitor ROM or Toolkit or whatever, although how this would be activated remains a mystery — it can only be a matter of months before we read how in 'TJ's Workshop'!

Nearly all of the important chips, including the CPU and the RAM chips, are socketed, by the way. This is usually a good sign as it makes servicing easier but Sharp has built up a formidable reputation for reliability so unless you're very unlucky you won't need this particular feature.

The '80A has a sound generator, with a loudspeaker mounted pointing downwards under the numeric keypad. All other I/O connections are brought out at the rear of the main board and to interface peripherals, such as a printer or disk drives, an expansion unit is required; this bolts onto the back and houses up to four plug-in interface cards, a neater arrangement than the separate expansion unit of the '80K.

Also at the back are the on/off switch, a reset button, the display brightness control and the sound volume control; on the '80K, this last was inconveniently sited *inside* the cabinet!

Cassette Basic

At power-on, the system enters the ROM-based monitor. This provides only minimal facilities — loading Basic or a machine-code program from cassette, booting an operating system and/or language from disk, jumping to an address in memory and executing the program there and toggling on or off a bleeper which sounds whenever a key is pressed.

The monitor also handles I/O for the screen, keyboard, music system and tape, and recognises a limited group of control codes which roll the display up or down (the screen acts as a 1 kbyte 'window' in the 2 kbytes video memory), generate a '—>' sign used as a delimiter under Sharp's FDOS, toggle between reverse and normal video, and alter certain system parameters to enable the '80A to run '80K Basic programs — more on this later. Additionally, there's the facility to change the way the shift key works; normally this functions in the *opposite* sense to a normal typewriter in that the unshifted keys provide upper case characters and lower case is obtained by shifting; this makes Basic programming easier. Hitting CTRL-A reverses this, putting keyboard into normal typewriter action.

The basic MZ-80A comes with Sharp's SA-5510 Basic on cassette; this takes just over 1½ minutes to load, although while you're sitting waiting for it to happen it feels like much longer. As far as I could make out, this Basic is functionally the same as the MZ-80K's Basic and is virtually to Microsoft standard. Its few oddities centre around machine-specific items such as the sound generator, for which there are MUSIC and TEMPO commands and extensions to some commands to send stuff to the printer or cassette: LIST, for example, LISTs on the screen while LIST/P lists to the printer; similarly with PRINT and PRINT/P, while PRINT/T prints to tape.

The cassette handling is very easy. Programs can be loaded simply by positioning the tape at the correct spot, using the tape counter, and typing 'LOAD', upon which the system prompts you to press the play key on the cassette unit. As soon as the system finds a program it tells you so, displays its name and gives a message to say when LOADing has started. Once the program is loaded, the computer switches off the tape drive. If you don't know the

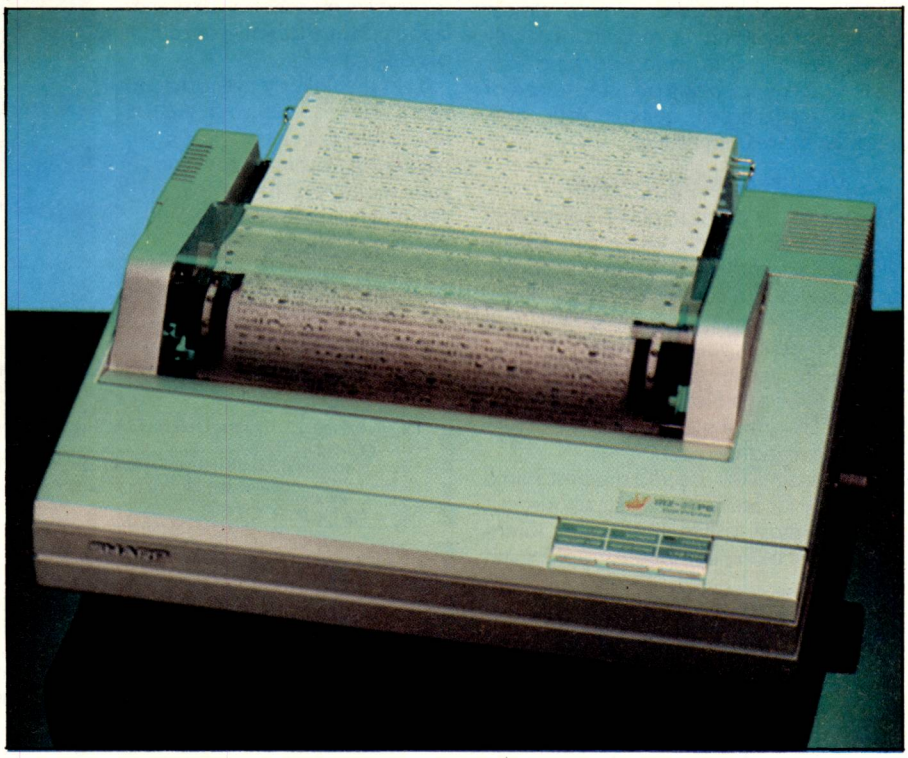
MZ-80A

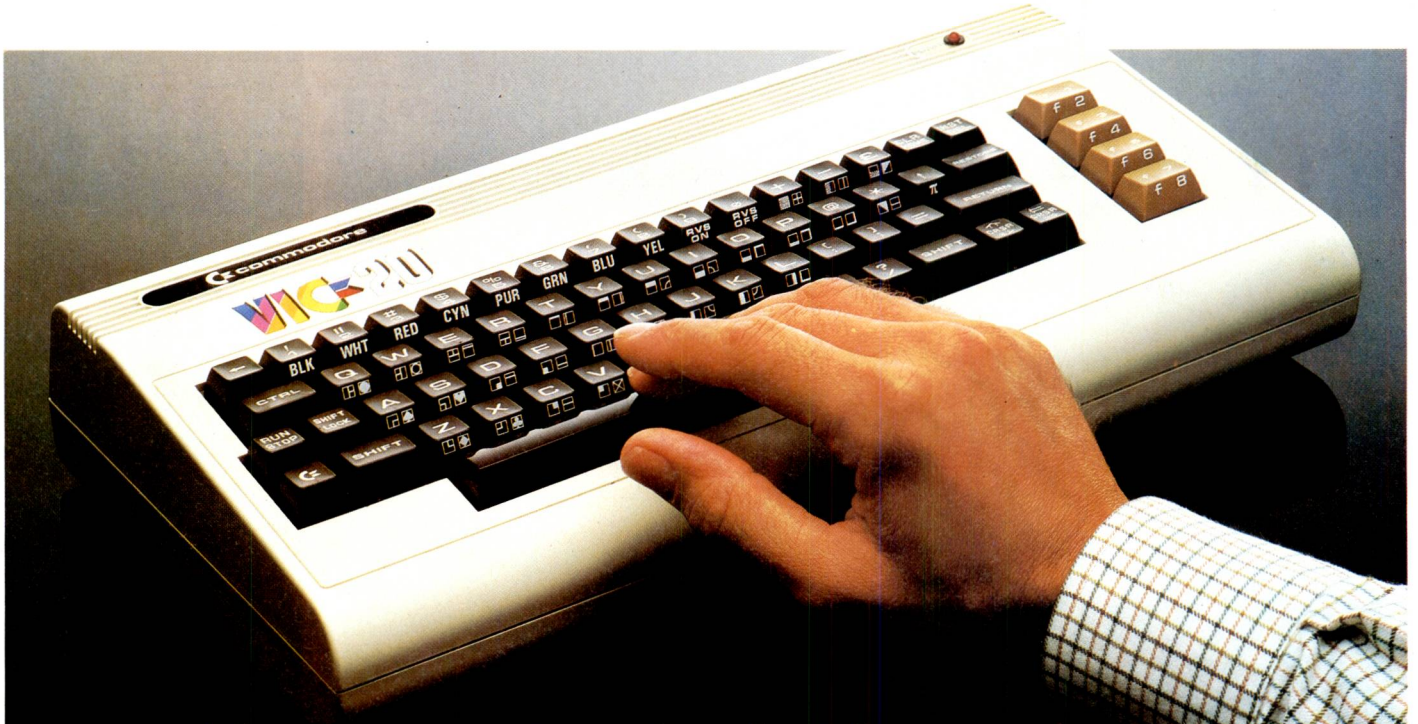
BENCHTEST PERSONAL COMPUTER





position of the program you want, you can instead specify the file name with 'LOAD "Program" ', and the system reads through the tape until it finds it. LOADing can be aborted at any time with the break key. It's just as easy to SAVE a program and there's also a VERIFY command which allows you to check that the SAVE has been successful. Data can be written to and read from tape under program control using PRINT/T and INPUT/T.





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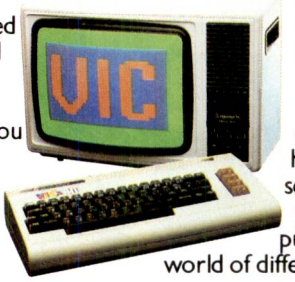

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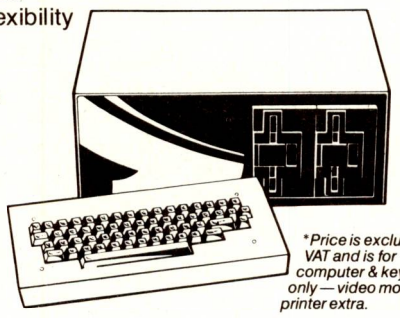

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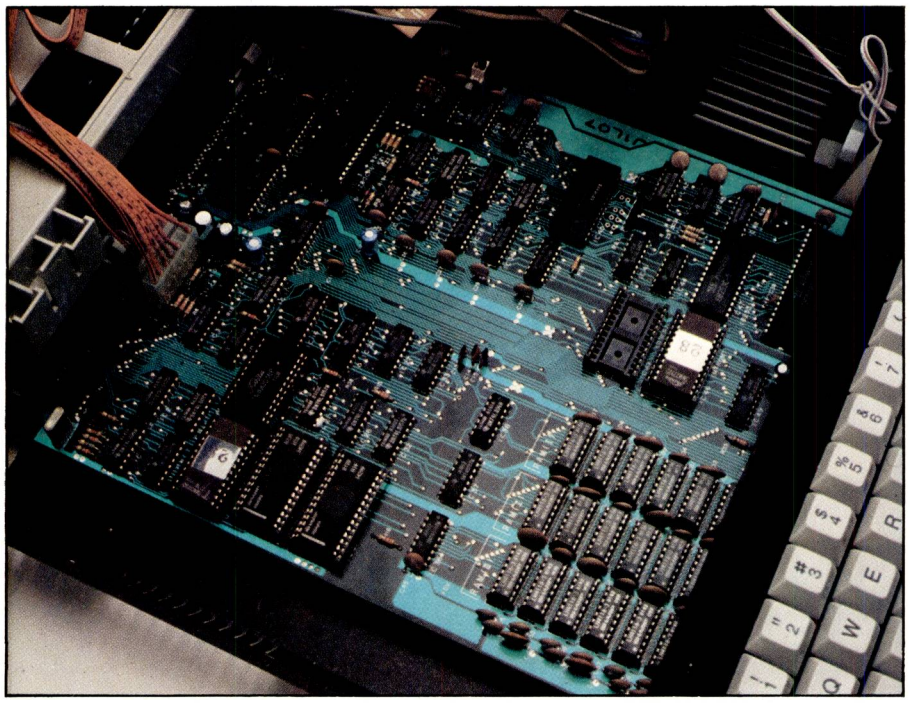
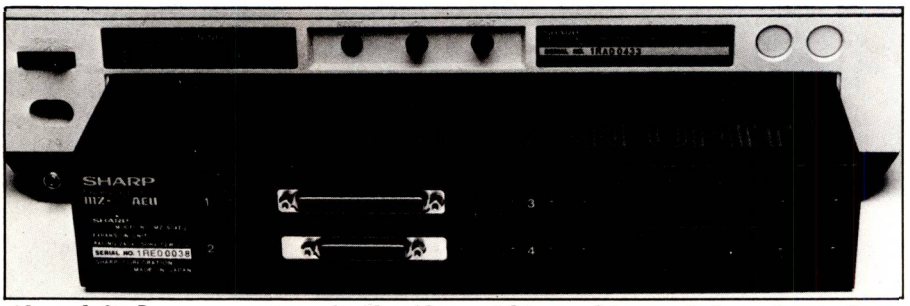
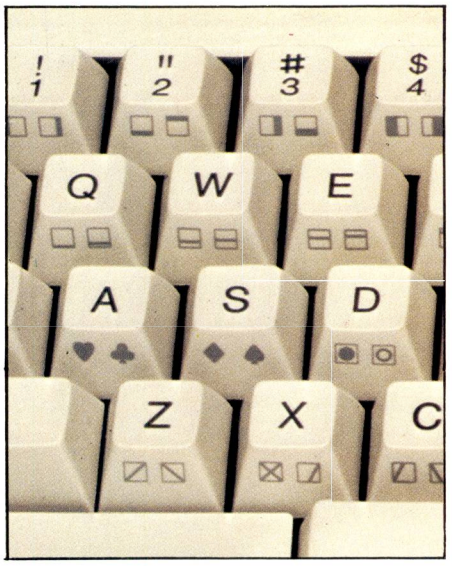






Above left: Japanese neatness inside. Above right: graphics symbols on front edges of keys. Below: controls and I/O ports at rear.

Long variable names are allowed — the manual doesn't specify an upper limit on their length — but only the first two characters are significant. Apart from Basic reserved words, one other variable name is reserved for system use, TI$, which references the internal clock: TI$="123000" sets the clock to 12 h 30 m 00 sec and the clock runs until power-off or reset. You can convert the MZ-80A into a very expensive digital clock by setting TI$ and then running a small Basic program to print the time on the screen. Like the '80K, the MZ-80A has a set of 136 graphics characters available from the keyboard. A graphics key toggles the keyboard between alphanumerics and graphics modes and the cursor changes to reflect the mode chosen. Sharp has reduced the clutter of the '80K's keyboard by placing the shifted and unshifted graphics symbols on the front edges of the keys and this works reasonably well, although I did find myself peering around for the symbols I wanted as they're printed in an only slightly darker shade of beige than the colour of the keys themselves.

The graphics characters (plus cursor movement, home and screen clear) are incorporated in PRINT statements simply by entering "PRINT", hitting the graphics key, typing the required symbols and then getting back into alpha mode for the closing ' " ' at the end of the statement. As well as lines, hatchings and curves, the graphics symbols include little faces, a spaceship and electronics symbols. The MZ-80PG printer, an Epson in a smarter case, prints all the graphics symbols as well as the alphanumerics.

Pressing the reset button at the back of the case puts you back to the monitor. At first sight this seems a pretty disastrous move, implying that you have to re-load Basic — particularly frustrating if you had been debugging a program which you hadn't yet saved to cassette. However, as mentioned earlier, the monitor has a jump instruction; typing 'J1250' warm-starts the Basic and you'll find your program still intact. The Basic can be cold-started by typing 'J1200', but of course this wipes out your program.

Because the MZ-80A's hardware is virtually identical to that of the '80K, the machines are almost completely software compatible too. I say almost, because, although the Basics are virtually the same, there are minor differences: POKEs to the screen are the most irksome — the '80A's screen address is different and the POKEs need to be altered accordingly. I tried LOADing an MZ-80K tape to see what happened: it LOADed OK and I could even LIST it but it wouldn't run. The reason is that internally, the Basics are different — specifically, they use different 'tokens' (the internal representation of Basic reserved words) so that PRINT in the '80K program came out as '=)' when LISTed on the 'A. This can be overcome with a translation tape, which turns 'K software into 'A software, or you can buy a copy of the MZ-80K's Basic and use this with your 'K programs on the 'A.

Disk Basic

The MZ-80A can be expanded with a single or twin 5¼in floppy disk, using the same units as the MZ-80B, which hold 280 kbytes per disk.

Adding the disk drives turns the MZ-80A into a medium-cost, lower-end business machine and Sharp's disk Basic reflects this — it incorporates all the features of cassette Basic with additional facilities to operate the disks, including random access file handling. Interesting features here include LOCK and UNLOCK commands which protect specified files against writing, deletion and renaming. There's a CHAIN command to allow one program to call another and pass values to it through variables, and comprehensive error trapping which includes not only ON ERROR GOTO . . . but facilities for trapping both the error number and the line number on which the error occurred.

Facilities exist for LOADing and SAVEing from and to tape from disk Basic as well as reading and writing tape files; this is handy not only for transferring cassette Basic programs and files but also for making security copies if, like me, you have a vague unease about the reliability of floppy disks and therefore have backup paranoia in a big way. It is even possible to transfer the cassette Basic to disk.

I ran our standard Benchmarks on both cassette and disk Basics and recorded identical timings for both.

Documentation

The basic MZ-80K comes with a 225-page A4 manual which assumes you know nothing about Basic and proceeds to teach you, with plentiful demonstration programs and examples throughout. It also assumes you have a Japanese sense of humour — the text is for the most part well translated, clear and concise, but it is liberally sprinkled with all sorts of unusual cartoons, including one showing decidedly slant-eyed rabbits and foxes.

As far as I can remember, large sections of the manual are in fact identical to the MZ-80K's. Extra information has been added, however: there's a full source-code listing of the monitor, together with detailed notes on all its routines, and a long section on machine-code programming which positively encourages you to get to grips with the Z80 on its own ground. Unusually, Sharp also includes full circuit diagrams of the machine so the soldering-iron freaks will have equal ease in finding their way about the system.

You also get a box of tapes with the MZ-80A. Apart from the Basic tape, the set comprises a Basic tutorial, games, 'home finance' and 'education'. All, with the exception of a Space Invaders game, are in Basic and all seemed reasonable without being particularly exciting. One or two of the games were somewhat bizarre and the geography program on the education tape had a distinct leaning towards asking the capitals of obscure countries (can you name the capital of Togo?). But, generally speaking, all should prove entertaining and useful to the novice home owner, at whom they're clearly aimed, and examining the listings could prove instructive.

Documentation for the disk Basic is rather slimmer as it deals only with the features which aren't found in cassette Basic. The explanations are altogether more business-like and serious, with no cartoons, and there's a *very* long listing of a stock control program with detailed explanations (including flowcharts) to show how it works. Time didn't allow me to 'play' with this but it seemed a fairly good implementation and, as Sharp hopes to sell the disk-based system as a low-cost business machine, it will probably prove both useful and instructive to small businessmen who have the time, inclination and determination to write their own programs.

The printer and disk drives each have their own manuals, which simply cover all a user needs to know about the operation and care of these peripherals. The printer manual is a damn sight better than the manual which came with my (standard) Epson and even includes an assembler source code listing for driving the printer from a machine-code program.

Expansion

As I've already stated, there's nothing you can do to expand the system's RAM — 48k is what you get and 48k is what you'll have to live with.

With the expansion unit fitted, you can add a printer and disk drives by slotting in the appropriate interface cards. Sharp sells a single disk drive unit, but this is a relatively expensive way to go — the extra cost of the twin unit is low enough to make the single unit appeal only to the very hard-up and, in any case, juggling floppies with a single drive can be a most annoying process. Neither printer or disk drives match the MZ-80A's styling — both are painted silver and the twin disk unit is in fact the same as that used on the MZ-80B; the printer, while similar to the '80B's, is slightly different, I'm told.

On the software side, Pascal is promised and CP/M will probably be with us by the time you read this; this latter will give users access to a much wider software base, provided they can find somebody who supplies CP/M software on Sharp format disks: my colleague Dick Pountain certainly has very great difficulty in obtaining software for his MZ80B. Given the high degree of software compatibility, it's likely that many software houses will quickly translate their MZ-80K software — applications as well as languages — to the '80A, so the '80A buyer will be in a much better position than the early MZ-80K owners, who really were on their own to start with.

Conclusions

I must state now that I was in some ways disappointed with the MZ-80A. I had expected a considerable upgrade from the '80K — goodness knows Sharp has certainly had enough time to do this — but what we have is, in essence, just a 're-skinned' machine with improvements which, although undoubtedly in the right direction, are really the sort of things which should have been done 18 months or so back as a half-way stage to bringing out a model with a much higher spec. We're now at the stage where it's possible to mass-produce a 64k, twin-disk CP/M micro with a good display and medium-resolution graphics for an end-user price of around £1000, including a useful selection of software, which means that machines such as the MZ-80A, sitting pricewise at the top of the home range and the bottom of the business range, should offer not only the full 64k of RAM but good quality graphics and colour too, at least as an option.

My feelings are that, provided you could have lived with its nasty keyboard, then yes, you should be kicking yourself for not buying one of the last MZ-80Ks — price is important in the UK and the MZ-80A, at its present price, does not offer particularly good value for money. In six months' time, though, the price will almost certainly have fallen.

With machines such as the BBC Computer and the new Sinclair appearing, offering good graphics, colour, sound, etc, for much less money, it's difficult to see the MZ-80A appealing to many home/hobby computerists. At the lower end of the business market, a twin-disk system could appeal to the cost-conscious buyer; the 40-column screen is a decided limitation in some applications, particularly word processing, but would be sufficient for most general business use, as a demonstration stock control program shows.

Through this Benchtest I repeatedly found myself saying, 'If only . . .': If only Sharp had given it the graphics from the MZ-80B (and this should be possible while retaining MZ-80K compatibility); if only the screen had 80-column capacity; if only there was a colour option; if only the processor had been uprated to 4 MHz . . . any one — and preferably all — of these would have made me a great deal more enthusiastic about the machine. As it is, I'm left wondering what Sharp's development people have been doing all this time . . .

Prices

MZ-80A	£549 (inc VAT)
Expansion unit	£100 (exc VAT)
Disk drives (inc. Interface)	
Single	£400 (exc VAT)
Twin	£590 (exc VAT)
Printer	
Tractor feed	£349 (exc VAT)
Friction/tractor feed	£409 (exc VAT)
Interface	£30 (exc VAT)
Cable	£23 (exc VAT)
Character generator	£13 (exc VAT)

END

BASIC BENCHMARKS

BM1	1.5
BM2	9.2
BM3	16.4
BM4	22.8
BM5	25.6
BM6	37.7
BM7	55.0
BM8	10.1

All timings in seconds. For an explanation and listings of the Benchmark tests, see PCW *Vol 4 No 11, Nov 1981.*

TECHNICAL SPECIFICATIONS

Processor:	Z80, 2 MHz
Memory:	48k dynamic RAM, 4k monitor ROM, 2k video RAM
Cassette:	Integral, 1200 baud
Disks:	Single or twin 5¼in, 280k per disk (requires expansion unit)
Screen:	21 cm, 40 x 25, green on black, 80 x 50 graphics
I/O:	Optional parallel printer, RS232 (requires expansion unit)
Keyboard:	73 keys inc. numeric pad, cursor controls, insert & delete; alpha & graphics modes
System Software:	4k ROM-based monitor
Languages:	Basic (cassette & disk)

BASIC RESERVED WORDS

ABS	INT	RETURN
ASC	LEFT$	RIGHT$
ATN	LEN	RND
AUTO	LET	ROPEN/T
CHARACTER$	LIMIT	RUN
CHR$	LIST	SAVE
CLOSE/T	LIST/P	SET
CLR	LN	SGN
CONT	LOAD	SIN
COPY/P	LOG	SIZE
COS	MID$	SPACE$
CSRH	MON	SQR
CSRV	MUSIC	STEP
CURSOR	NEW	STOP
DATA	NEXT	STR$
DEF FN	ON	STRINGS$
DIM	OUT	TAB
END	PAGE/P	TAN
EXP	PEEK	TEMPO
FOR	POKE	THEN
GET	PRINT	TI$
GOSUB	PRINT/P	TO
GOTO	PRINT/T	USR
IF	READ	VAL
INP	REM	VERIFY
INPUT	RESET	WOPEN/T
INPUT/T	RESTORE	

The above are all in cassette Basic. Disk Basic includes all of these plus the following:

CHAIN	ERROR	RESUME
CLOSE	INPUT#	ROPEN #
CLOSE#	KILL	SAVE/T
DELETE	LOAD/T	SWAP
DIR	LOCK	UNLOCK
DIR/P	PRINT#	WOPEN#
ERL	RENAME	XOPEN#
ERN	RESET	

BOOK FARE

By Malcolm Peltu

Matchstick Basic



Computing Using Basic — An Interactive Approach by Tonia Cope (Ellis H Horwood/John Wiley & Sons, £15.00 hardback, £5.90 paperback)

Matchstick men and women provide a humorous and useful guiding hand through *Computing Using Basic — An Interactive Approach* by Tonia Cope. There are many introductions to Basic; this is a good one, which is lifted out of the ordinary by Charles Beesley's matchstick people.

They are useful little creatures because they make comments that a teacher might make in prompting a student or answering a question. The drawings are liberally sprinkled through the text, which also provides a lively flavour to the whole concoction. The matchstick tutors overcome a common problem in language books, where chunks of coding following text can be a forbidding prospect for a reader. The drawings provide a helping hand.

Programs in the book were developed and tested on a Research Machine S380Z, using BASICSG Version 5.0. An appendix compares command formats for this Basic with ANSI Minimal Basic and other Basics (which says in places 'check your manual'). Like all books on Basic, the problem with dialectics tends to make it more appropriate for readers with access to the Basic used in the examples. Cope's clarity of writing and the attractive presentation of the material, however, makes this book of value to a wider audience than RML users, provided the reader has guidance on the variations of the Basic dialectic theme.

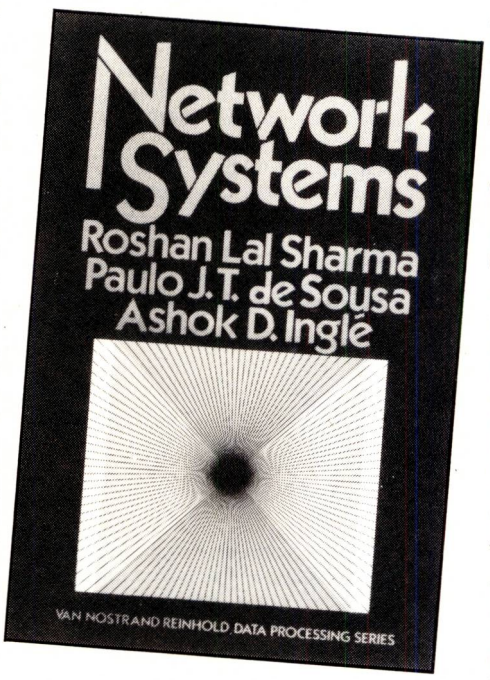
There are two sections in the book. The first describes the Basic language and the second looks at some applications. The language description follows a functional course, starting with general introductory material. The functions covered follow the sequence: arrays and FOR loops; strings and things; printing; reading data; program control; functions and subroutines; graphics; filing; editing and miscellaneous commands. The applications looked at include random numbers; sorting; simulation and modelling; statistics; computer aided design; and controlling a mass spectrometer. Although matrices are not a part of the RML Basic used by Cope, an appendix on matrices is provided, using examples run on a Computer Technology Mod One mini.

All in all, this is a practical and attractive introduction which reflects the fact that Cope developed it after testing an earlier version by over 1000 people, from schoolchildren and students to businessmen and university professors. It is particularly recommended for classroom teaching where there is access to an RML 380Z.

Complex comms

Network Systems by Roshan Lal Sharma, Paulo J T de Sousa and Asok D Ingle (Van Nostrand Rheinhold, £25.45)

The spread of computing is inexorably linked with the development of the new telecommunications networks. Whether it is a local area network of micros or national and international networks involving satellites, optical fibres and microwaves, computers are being hooked together.



Understanding the concept of networks is easy but the details of networking and the jargon surrounding it is a whole technology of its own. If you want or need more than just a superficial knowledge of these nets, then *Network Systems* by three senior technologists from Rockwell International provides a good round-up of the main factors.

There are three sections dealing with modelling, analysis and design. The first section on modelling will probably be of most interest to someone wanting to find out more about networking without having to actually get involved in detailed analysis and design. In this context, 'modelling' is concerned with the structure of the network, how traffic flows within it and how to evaluate system performance. There are seven chapters in this section.

The first chapter provides a brief introduction to the concept of networks. The next discusses the various network topologies that have been used. A topology is the way in which various nodes in the network are interlinked — for example, as a ring or as a hierarchical organisation.

The next four chapters examine the concepts of traffic flow and network control; transmission and signalling; modelling, analysis and design; and system performance. The last chapter of the section provides a detailed look at some existing networks, including the gigantic 'Ma Bell' national telephone network in the US; computer services like the US Department of Defence Arpanet and the commercial Telenet and Tymnet services; and local networks like Ethernet.

The sections on network analysis and design are much more suitable for practitioners and get involved in a considerable amount of detail.

This book is not an easy read, although it is written clearly. It is a useful reference work and an aid in educational courses.

Taking a global view

World Challenge by Jean Jacques Servan-Schrieber (William Collins, £9.95)

The World Challenge is a book to reckon with. It influenced French President Mitterand to establish centres for developing computer technology to meet human and social as well as commercial objectives. Its aim is nothing less than to show how Information Technology can transform world politics and economics. And the publicity hype is even greater than for *The Soul Of A New Machine* (reviewed above).

'Jean Jacques Servan-Schreiber has written the most important book of this decade,' says the publisher's puff. 'He confronts the most important crisis of our generation, analysing its roots and offering a challenging blueprint for our survival. . .' proclaims the cover.

Whereas Tracy Kidder set out with modest aims which were subsequently overblown by the publicity machine, Servan-Schreiber started with an ambitious concept. For his global perspective and his writing style (at least in the English translation) he deserves unstinting praise. But he fails to fulfil the promise of his own ambition.

The oil crisis and the microelec-

tronics revolution are the twin pillars of Servan-Schreiber's argument that a fairer distribution of resources can take place between developed countries and the Third World.

Recent events have thrown into doubt his analysis of how the OPEC oil-producing countries will be able to use their power and wealth to force the West to make a massive transfer of technological knowhow, equipment and services to the Third World. The fall in the price of oil and OPEC's loss of prestige — even if it is only temporary — undermine the certainty of future events which Servan-Schreiber assumes. He writes as if OPEC's stranglehold on oil is invincible and does not even hint at the sudden turnaround this year.

Nevertheless, there is much to be learned from his analysis of why and how the Arabs first seized control of oil and now want to use oil as a bargaining counter to achieve wider ambitions.



Servan-Schreiber is a journalist and politician and he writes about politics like a journalist. Most of *the World Challenge* is written in compelling narrative form, like a romantic adventure novel of intrigue, power play, international diplomacy and the 'making of great events before your very eyes'.

He starts with a meeting of Arab oil ministers in Taif, Saudi Arabia, in 1980. Taif is near Mecca and is the place where Prophet Mohammed gathered a small group of followers which lead the advance of Islam. It was in Taif in 1980 that a report was prepared which Servan-Schreiber says marks a turning point in world affairs.

The Taif Report, he says, 'aims for a new alliance between the Arabs and the Third World against their traditional exploiters, the industralised West. It is conceived as a warning, a challenge and finally a *demand* for a massive transfer of technology from the United States, Europe and Japan to the poor and needy. It is not just another wishful plea — for it is backed up by the most powerful of all new weapons: oil.'

The first 100 pages of this 300-page book are concerned with describing the events that led to Taif in terms of the Arabs' increasing control of oil prices and the shocks to the Western industrialised systems of sudden oil price rises.

He also looks at other developments in Third World countries, at the Suez crisis, the traumatic events following independence of the Belgian Congo in 1960 and attempts by the Third World to get a bigger share of world economic and industrial activity.

The spotlight is then turned on Japan. He graphically describes the Japanese attack on Pearl Habour and the dropping of atomic bombs on Hiroshima and Nagasaki; key events of the Second World War which resulted in Japanese humiliation.

From the ruins of war, Japan rapidly grew from a poor Third World country to one of the leading industrial powers. Much of Japan's industrial success has been built on high technology developments, and Servan-Schreiber shows how Japan is now opening its technological knowhow to the Third World, while the West carries on regardless. I found this section particularly illuminating. Although he glosses over problems in Japanese society, Servan-Schreiber provides a sympathetic insight into the Japanese collective and individual psyche. He provides interesting — and rarely reported — background on recent Japanese moves to share its technological and industrial knowhow with other countries. Led by men like Toshiwa Doki, president of the Japanese Federation of industrialists, and backed by the government and a number of research reports, Japan is planning a new strategy. 'The Japanese industrial giants can no longer concentrate simply on expanding overseas and conquering foreign markets.They must become more closely integrated with the world,' explains Servan-Schreiber. In particular, Japan has started training programmes in countries like Singapore, Hong Kong, Korea and China.

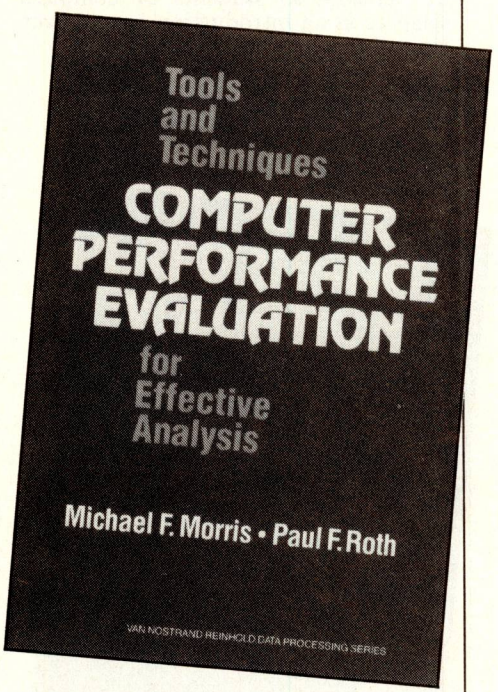
The weakest part of *The World Challenge* is Servan-Schreiber's superficial and uncritical approach to the technology. He makes sweeping statements like 'Computerised systems will be capable of performing all nonhuman tasks on a planetary scale, and thus permitting, in fact demanding, the creative fulfilment of what is and always will be peculiar to man.'

He dismisses all fears that computerisation may cause unemployment: 'The larger the number of microprocessors, the greater the need for vast human contribution,' he comments. All doubts are cast to the wind: 'Computerisation is inevitable, irreversible and desirable. That is the only way for a society, a factory or a bank to survive.'

For a book that is supposed to be concerned about human and social values and the quality of life throughout the world, such an uncritical approach to the impact of information technology is disappointing, to say the least. There are enough books extolling the marvels of the technology. With the breadth of vision he displays elsewhere in the book, Servan-Schreiber should have been more concerned about the impact that the technology might make on the nature of the societies around the world.

Nevertheless, *The World Challenge* is an important book because it provides perspective on the well-known theme of the microelectronics revolution. It places the chip in an international perspective and shows how oil and chips may make a potent mix.

Juice extraction



Computing Performance Evaluation — Tools and techniques for effective analysis (Van Nostrand Rheinhold, £21.20)

Despite the falling price of computing, users must be concerned about squeezing as much juice as possible out of their investment. Over the years, a wide range of aids to determine exactly how a computer is performing have been developed. Once the data is available on performance, it becomes possible to determine a plan of how to tune the computing engine to get more mileage out of the system.

These tools and techniques, however, do not come free. Software and hardware tools and techniques that can best be exploited by skilled performance specialists can cost a lot of money. This probably places many of the tools and techniques discussed by Michael F Morris and Paul F Roth in *Computer Performance Evaluation* beyond the scope of most micro users.

Their book, however, is a practical introduction to a subject that should be of interest to anyone seriously involved in computing. It is written primarily for data processing managers of largish mini/mainframe installations. But small systems have a habit of growing into bigger ones and today's ZX81 freak might be tomorrow's top computer whizzkid.

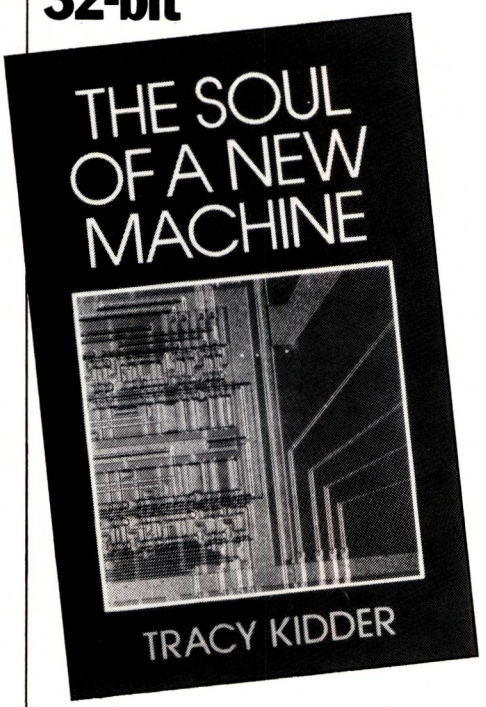
Performance evaluation is a subject that can be easily shrouded in equations. Morris and Roth avoid this danger admirably, except in a couple of places where mathematics is inevitable. All examples are based on actual experiences.

They provide introductory material

to all the main methods of performance evaluation starting with the collection of basic 'accounting data' on how the system has operated, through software monitors and program optimisers to hardware monitor benchmarking, simulation and modelling.

In addition, this book supplies guidelines on how to manage evaluation projects, the type of staff to be used and exactly where and when particular techniques are most useful. It could well be valuable to students of computer sciences as an introduction to and overview of this important subject.

The magnificent 32-bit



The Soul of a New Machine by Tracy Kidder (Allen Lane £7.50)

'The First Great Classic of the Computer Age.' That's how the publisher immodestly advertises Tracy Kidder's *The Soul of a New Machine*, a fast-moving and valuable description of the human effort that went into making Data General's 32-bit mini.

Kidder's book may be a best seller (its unexpected success in the States provided the resources which fuelled a razzmatazz launch in the UK). It may be an excellent piece of fly-on-the-wall journalism. It may even be a brilliant attempt to explain computer engineering in lay language — but to call it a 'classic' is to devalue the word. A literary classic should be multi-dimensional. It should be subtle. It should explore hidden depths beneath the superficial skin.

Kidder is too busy reporting events in a way that rams home his own thesis to explore more than one dimension. His thesis is that computer engineering can be equated with the craftsmanship and achievement of architects and builders of cathedrals and bridges, furniture and steam engines.

He reports on Data General's Eagle team, lead by Tom West. (Eagle was Data General's belated response to mini giant DEC's 32-bit VAX system.) The one dimension he describes brilliantly is the way in which West's team were motivated to complete their work. What he fails to do is to examine fully the context in which the Eagle team were working and those aspects which contradict his thesis. He also became too committed to West himself to explain fully the problems which his management style created.

These criticisms may seem unfair in view of Kidder's original aim. He is a journalist, who was given a unique opportunity to sit in through the design of a new computer. As a piece of journalistic reporting, *The Soul of a New Machine* cannot be faulted. Kidder is particularly impressive in the way he explains the technological jargon sufficiently to enable a non-computing expert to understand the essence of the creative design and exhausting bug searching. Having cracked the jargon problem decisively, he reveals the kernel of Eagle's development effort with the skill of a thriller writer. He turns it into a something like a *Magnificent Seven* or *Dirty Dozen*. Tom West is the leader who gathered the gang together.

The book starts with a chapter about West on a yacht in stormy seas entitled (surprise, surprise!) 'A Good Man In A Storm'. It sketches in the corporate background in which the Eagle project was initiated. Basically, Data General had made a cock-up in the 32-bit mini market, had rival teams working on similar projects and ended up by trying to make a 32-bit version of its old Eclipse range, although other more appealing designs had been worked on.

West then gets the gang together. Those working on the hardware were called the Hardy Boys and, with equal obviousness, those doing the microcode were called the Microkids. The book then follows the roller-coaster ups and downs that led, 18 months later, to the emergence of Eagle in its marketing garb, called the Eclipse MV/8000.

In addition to describing the work, Kidder provides sharp characterisations of some of the key figures, like West's right-hand man, Carl Alsing. At first sight, writes Kidder, Alsing looked like a 'typical engineer' who 'wears a white undershirt and a plastic pouch (known to some as "nerd pack") in his breast pocket, in order to keep his pens from soiling his clothes. An electronic calculator — used to be a slide rule — hangs like a ring of janitor's keys from his belt.'

Then, in a typical passage which combines sharp observation with a quick dip into a psychological nerd pack, Kidder says that Alsing is different from that first impression. 'About his hands, the way he folds them in his lap or puts them together under his chin, there is something delicate. . . I thought that I could see in him the lonely childhood behind him — he would have been the last boy picked in every school yard game, the one who threw out a ball like a girl. But Alsing is gregarious,' observes Kidder. Most of the Eagle team have a characteristic psychological nerd pack provided by Kidder — a liking for finding out how things work, some private hobbies and pursuits, a desire to work on interesting projects and a frustration at the commercial and management constraints which they feel generally hamper their creative work.

Taken at its face value, Kidder's book is a success. It captures the atmosphere of the team's work and gets over the excitement of computing to a lay audience. Yet, because of its commercial success, much more is being claimed for it. That is why I think criticism should extend into the areas which Kidder failed to cover adequately.

Firstly, there is the problem of why West and his team were forced to work on a project which arose almost as an afterthought following failures of other attempts to catch up with DEC's VAX.

Data General was formed in 1968 by three engineers from DEC, including Edson de Castro, now the President. Like many other similar ventures in the States (such as Apple), the entrepreneurial spirit worked well in a small team. But as it grew, the entrepreneurs found it difficult to keep the same spirit going.

As Kidder explains, de Castro runs the company with charisma but a great deal of inconsistency. For such a good journalist, Kidder surprisingly fails to investigate how much of the problems hit by Data General at the time of Eagle (late 1970s) were caused by de Castro. He tends to explain it all away by saying that perhaps de Castro deliberately created rivalries between different teams and failed to give Eagle adequate resources as a deliberate ploy to get the best out of West and his team, in a shoot-out with their backs to the wall. Something more incisive would have been more illuminating on the nature of the computer industry.

The second main criticism is that he mentions but fails to develop a central issue when discussing computer engineering as a craft. At one point West says that the excitement of being an engineer is that it 'provides some notion of control that you can derive in a world full of confusion'. He also says he always wanted to build something 'larger than' himself. Kidder relates these feelings to those of architects who created cathedrals.

But cathedrals were built to last. Before Eagle was started it was out of date because VAX was already established in the market. Even if they had begun in sufficient time, there is an in-built knowledge that any particular computer is likely to become redundant soon.

At one point in the Eagle project, West comments, 'We're way beyond what any one person can do. It's too complex.' And in a private moment, he confesses that 'computers are irrelevant', because they are replaced by new models so quickly.

Kidder is really describing a dying breed, rather than the career of the future as some critics have claimed. As computer design becomes more complex, more automated and more quickly replaced, the craft engineer will be replaced by cogs in a design machine. It is this contradiction at the core of the process described by Kidder — the creative motivation of the engineer

GOTO 187

The RP1600

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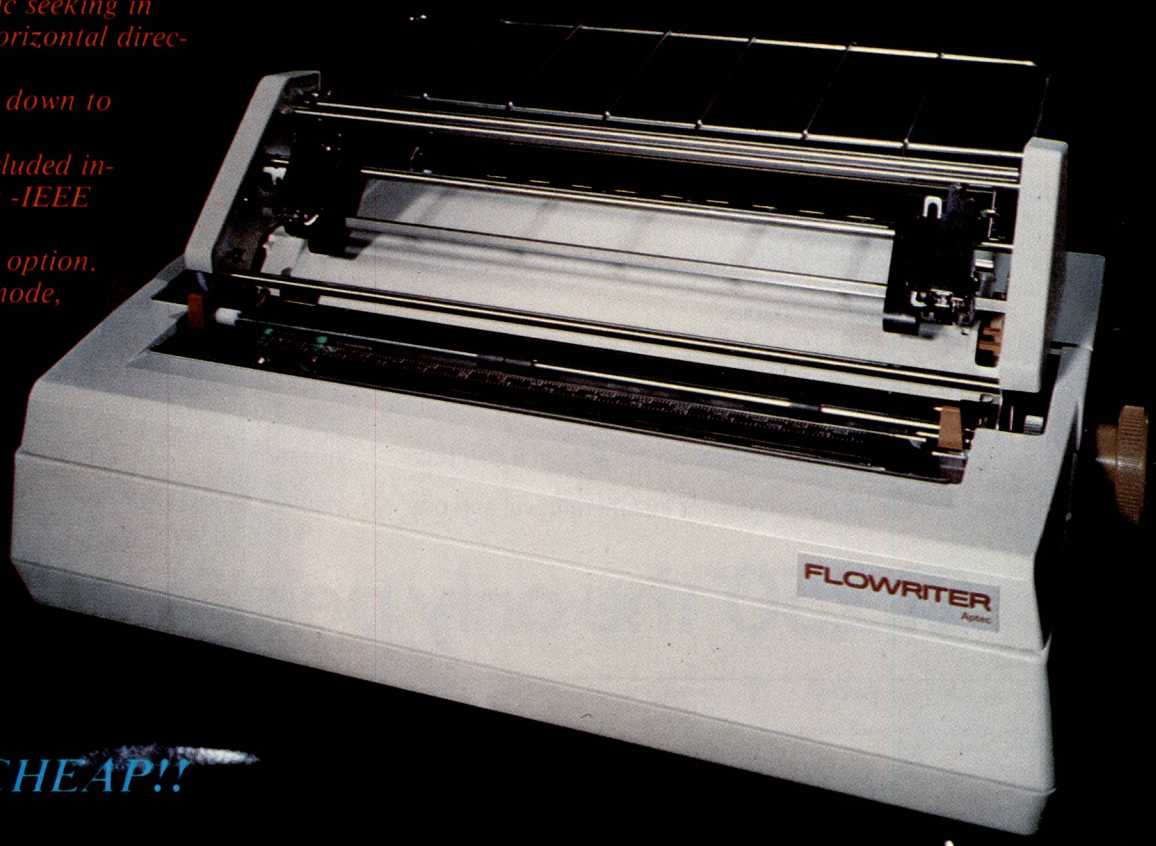

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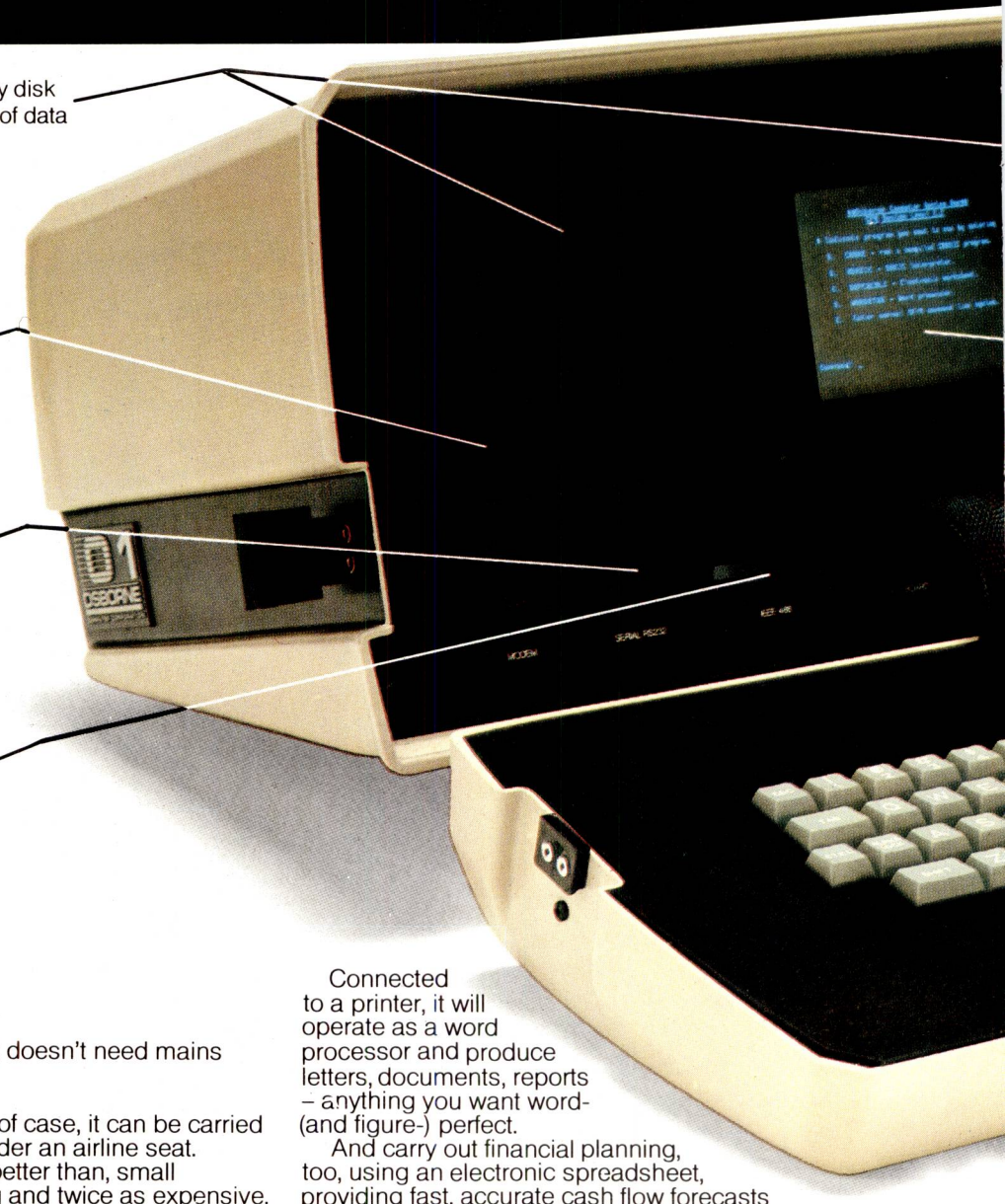
OSBORNE



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Byteshop Computerland, 324 Euston Road, London NW1. Tel: (01) 387 0505

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Microcomputers at Laskys, 19/21 Corporation Street, Birmingham B2 4LP. Tel: (021) 632 6303

BRISTOL
*Microcomputers at Laskys, 16/20 Penn Street, Bristol BS1 3AN. Tel: (0272) 20421

CAMBRIDGE
Cambridge Computer Store, 1 Emmanuel Street, Cambridge CB1 1NE. Tel: (0233) 65334/5

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DERBY
Datron Micro Centre, Duckworth Square, Derby DE1 1JZ. Tel: (0322) 380085

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Microcomputers at Laskys, 22/24 West Nile Street, Glasgow G7 2PF. Tel: (041) 226 3349

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Microcomputers at Laskys, 12/14 St Mary's Gate, Market Street, Manchester M1 1PX. Tel: (061) 832 6087

NEWCASTLE
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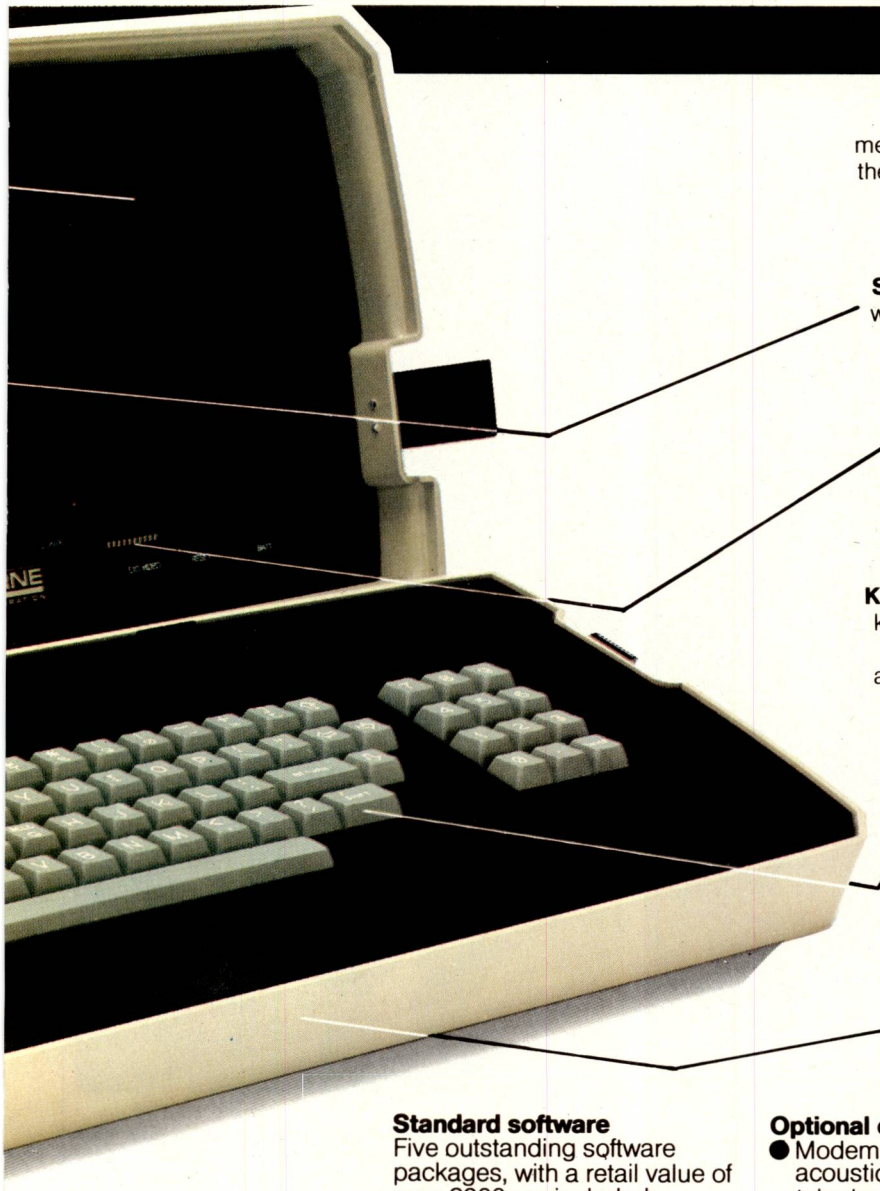
*Microcomputers at Laskys, 1/4 Smithy Row, Nottingham NG1 2DU. Tel: (0602) 415150

PRESTON
Microcomputers at Laskys, 1/4 Guildhall Arcade, Preston PR1 1HR. Tel: (0772) 59264

RNE 1

TM



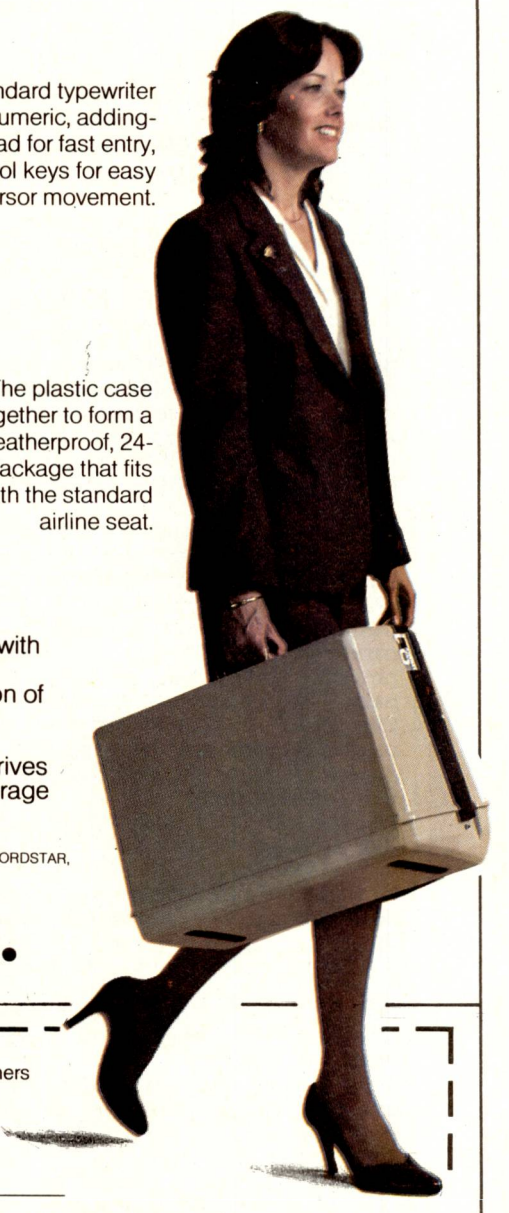
Internal electronics. Z80A™ CPU, 64K bytes RAM memory (60K available to the programmer; 4K used to run the screen.) System software is held in ROM in a separate address space.

Screen. Clear, 5", 24-row screen displays a 52-character window on a 128-character line with automatic horizontal scrolling.

Monitor Interface. Connects the OSBORNE 1 to any monitor screen.

Keyboard. A standard typewriter keyboard plus numeric, adding-machine keypad for fast entry, and cursor control keys for easy cursor movement.

Case. The plastic case snaps together to form a weatherproof, 24-pound package that fits underneath the standard airline seat.



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- CBASIC®

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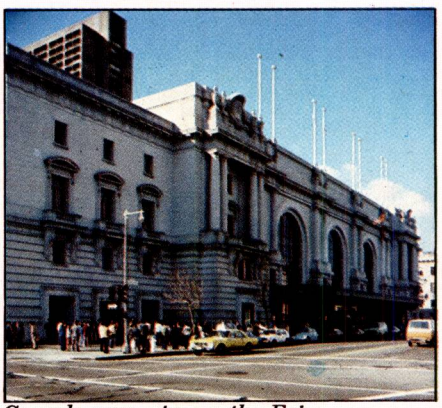
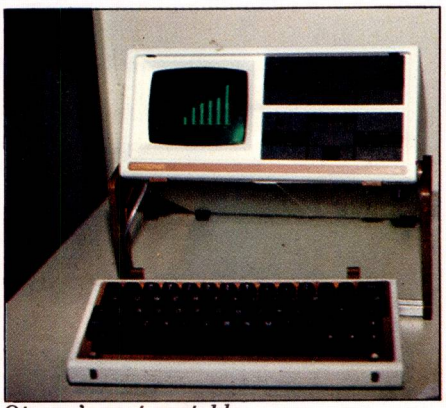
7th West Coast Computer Faire

Several British companies took stands at the Faire. Manning one of them was David Tebbutt, who presents this exhibitor's eye view.



Crowds queue to see the Faire



Otrona's neat portable



Durango's desk-top micro

Something like 40,000 souls risked the spring sunshine and the possibility of an earthquake to attend this year's West Coast Faire in San Fransisco.

Compared to previous shows, there was less of a revolutionary air about the event — it reflected more of an evolution from what had gone before. Fortune systems weighed in with its 32-bit machine, Osborne clones appeared and four British companies bagged themselves stands (or 'booths' as the Americans call them). The IBM machine has spawned a whole sub-industry of magazines, hardware add-ons and software products since the last show when the IBM Personal Computer was only a very faint rumour.

In previous years I have visited the show as a reporter and have managed to visit every square inch, as well as getting to one or two conference sessions. This year my viewpoint has been that of an exhibitor tethered to his stand about 80 percent of the time. Of course, outside show hours there was the usual round of 'receptions' (ie, booze-ups) and visits to local companies. From this I offer my impressions. I leave it to my colleagues, Guy Kewney and Chris Horseman, to fill in the details.

Let's start off with the British contingent — The Last One, Supersoft, Microfocus and Caxton. The TLO booth was full of posters containing quotes from its extensive press coverage. In the corner of the booth was a large screen projector which wasn't working when I passed by. I assume it was demonstrating The Last One in operation. The booth was organised and manned by the American end of the TLO Organisation, Krown Enterprises.

Supersoft from Eastcote was there, too, showing off its excellent, low cost high resolution graphics board for the Commodore PET. It was also showing its Microscript word processor, again for the PET.

MicroFocus was there again this year with its well entrenched CIS Cobol, FORMS-2 and the Animator, which displays lines of Cobol code as they are being executed.

Finally my own company, Caxton, attended with its first two products, Optimiser and Cardbox. Optimiser is an easy to use planning aid which uses linear programming techniques, while Cardbox looks like an enormous electronic card index filing system.

As well as the four booths, two Brits also gave forth at the conference. David Ferris chaired a session on packaged software, while Metrotech's Graham Hawker gave a session on Prestel. Incidentally, Metrotech can supply a very nice line in private viewdata networks. Contact Graham on Uxbridge 58111.

Just after Graham finished his talk he was approached by an American woman who described herself as a 'microcomputer consultant'. She asked Graham who in the UK might be prepared to pay her fare to come over to give a talk. Graham hummed and hahed and in the end he had to confess he couldn't help. Out of curiosity Graham asked her how deeply into CP/M she was. 'What's CP/M?' was the reply!

For me the star of the show (apart from Caxton, of course) was the Otrona Attache. It occupies less than a cubic foot of space and into this manages to pack two high capacity (380k each) disk drives, a full 80-column screen with graphics and all the necessary workings to make it go. The machine is pretty as a picture and would look good on anyone's desk. It comes with some software packages included in the price — CP/M, Wordstar Plus, Basic-80, Valet and Charton. Valet allows you to interrupt whatever you're doing while you perform another task. Charton is a plotting package which takes advantage of the 320 x 240 point display. The reason it won't wipe the floor with Osborne is because the price is more than twice that of the Osborne 1. Further details can be obtained from the Otrona Corporation at 4755 Walnut Street, Boulder, Colorado 80311; tel (303) 444 8100.

Somebody whispered that an Osborne clone was lurking down by the concession area. Further investigation uncovered the Kaycomp II, which looked remarkably similar to the Osborne prototype shown at last year's Faire. Unlike the Osborne, this machine boasts a 9in 80-column screen and vertically mounted disk drives. It is on sale at exactly the same price as the Osborne, and includes CP/M, a word processor, a high level language (Basic, presumably), a spreadsheet program and a mathematical program. All these descriptions are fairly vague in the supplied literature. Further details are available from meter manufacturers Non Linear Systems Inc, 533 Stevens

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Durango had some nice looking desktop machines on show. The most amazing thing about them was the quality of the dot matrix printer which could produce a wide range of fonts. With a bit of luck, *PCW* will have reproduced a sample somewhere in this report.

Adam Osborne was much in evidence at the show. He no longer makes awards, he collects them. *Infoworld* presented him with the world's first 'Floppy' award for the Osborne 1. The reasoning behind the name was if other professions can have Oscars and Grammys, why shouldn't we have Floppies? Why not indeed?

Adam took advantage of the show to pre-announce a couple of upcoming Osborne add-ons. An intelligent double-density disk drive option will be available at the end of April. As well as doubling the Osborne disk capacity, it will also be able to handle a number of other formats including the Xerox 820. The option will cost around $185 in the US and will take a dealer about half an hour to install. The battery option will be available from mid-May. This will give up to an hour of power, sounding an alarm five minutes before the power runs out. This 'Portable Power' unit can be used when running off the mains or a car battery to give continuous power in the event of an interruption of the main supply. A charger is supplied with the unit and it takes something like 16 hours to recharge the batteries inside. Portable Power comes in a leather case and costs $390 in the US.

The IBM machine has spawned a host of add-ons, magazines and software. The only surprising thing about this is the speed with which it has been done. There is a rumour, very faint and very distant, that IBM will launch in the UK at the end of the year. It is a rumour, I hasten to add.

An outfit called Xedex has come up with a Z-80 based peripheral card which allows IBM's Personal Computer to run normal CP/M programs. When not being used for this, it acts as an extra 64k of RAM. With the lovely name of Baby Blue CPU Plus, the card plugs directly into one of the PC's expansion slots. The software which drives Baby Blue is supplied on disk. It allows you to read several different format 5¼in soft sectored disks and to write the CP/M program files in PCDOS disk format. While doing this, Baby Blue tricks a header into the program so that whenever it is loaded it wakes up Baby Blue's own Z80 processor, pops a small translator into BB's memory then transfers the CP/M program to BB. The program is then executed by BB for I/O calls which are passed back via the translator to PCDOS. When the program terminates, BB goes back to sleep and appears to be just another common or garden 64k RAM board.

BB costs $600, unless you'd like Wordstar and MailMerge too, in which case it'll cost you $980.

Further information can be obtained from Xedex Corporation, 645 Madison Avenue, New York, NY 10022; tel (212) 247 1400.

I mentioned Fortune Systems' 32-bitter. It's built around the Motorola MC 68000 and comes with between 128k and 1Mb of RAM plus 4-16k of ROM. It can drive up to four 5¼in floppy disk drives (800k each, formatted) and up to four hard disks, either 5¼in or 8in.

Bell Labs' UNIX system is what makes this thing tick, so not surprisingly, you'll find it allows multi-user, multi-function operation. Plus, it offers a wide range of communications options.

The main languages offered are Basic, Cobol, Fortran, Pascal and C. The 32:16 allows local networking through the Ethernet system.

I could go on and tell you about the hi res (640x480) colour graphics or the business software available, but I won't. If you're interested, write to Fortune Systems Corporation, 150 Industrial Road, San Carlos, California 94070; tel (415) 595 8444.

Another hardware development which caught my eye was the 'modem on a chip'. Perhaps the rumours I have been hearing of a one-dollar built-in modem will come true. I suspect the dollar is the cost per unit in bulk manufacture rather than a retail figure.

Someone told me there is an 8088 add-on for the Apple which sounds mighty interesting. Graham Hawker also told me about a product which is a dealer's dream. It is called Teach/M and it is a software package which answers all the user's questions about CP/M.

The day following the Faire I found myself at the Machine Intelligence Corporation. This is a company set up a few years ago by some people from Stanford Research Institute. While I was there I was shown some interesting vision systems connected to robots which enabled them to 'see' silhouettes of objects and handle them appropriately. A new subsidiary of MIC, Symantek, is about to be created specifically to implement artificial intelligence applications on microcomputers. If the Editor will let me, I shall write an article about their work later on this year. For the moment the details of this work are a secret.

While 'Tebbo' was selling hard, newshound Guy Kewney was sniffing out new products.

All right, all you clever swots who know what software publishing is: answer this one. What is the largest software publishing organisation in the micro business?

Those who know their onions will start with a list of people such as Quality Software, Visicorp, Online Systems, Broderbund, and so on — all people who get programs submitted from ordinary users, and who then sell copies and pay the author a royalty.

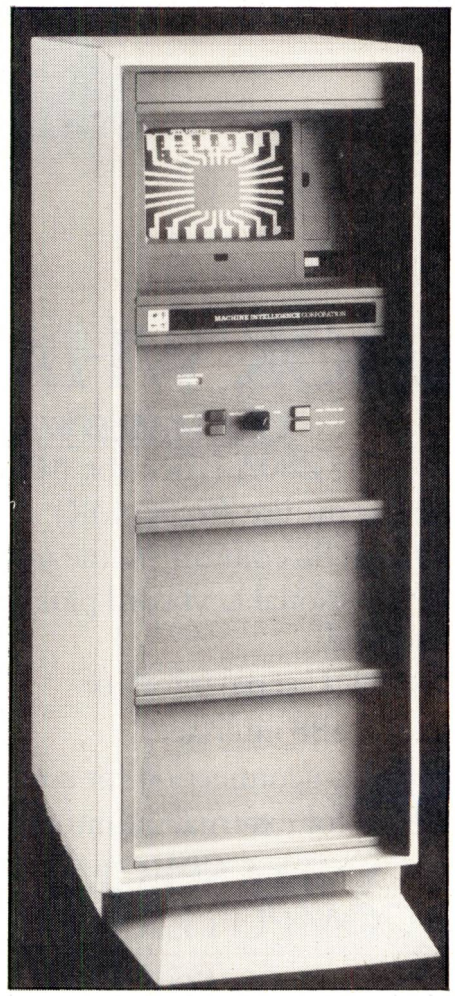
Those who really know their onions will say that Visicorp, the company which used to be called Personal Software until its product Visicalc got more famous than the company itself since it turns over upwards of $20 million a year, is the largest.

At the Faire, I made the interesting discovery that Appple itself now claims to have around $40 million worth of software publishing business this year. Certainly, on a subsequent visit to Cupertino, I found the offices absolutely crawling with outsiders who were claiming to be freelance programmers, and who were working in the Apple offices on their own products, turning them into Apple products.

It would, said one of these programmers in his laconic Californian drawl, be a much more impressive figure if one didn't have to contrast it with the number of programs that it could publish, actually owns rights to publish, but hasn't yet quite managed to organise.

'The only bigger collection of freelance programmers than the bunch inside the Apple buildings', he said, 'is the bunch who used to be in, but who have stormed out in a rage because Apple can't organise their products onto the market — they don't even seem to know they've got them.'

A lot of people have been very sceptical (except they were Americans, so they were skeptical) about the latest offspring of CP/M — something called 'concurrent' CP/M-86. This annoys me, because I thought it was the star of the Faire.



What it is to the user is the answer to all his prayers, if it works. It allows you to run several programs at once.

For example, you are typing away at your word processor and you find that you have to include a quotation for a customer. He has ordered 235 units at $4.50 each, plus 345 units at $2.99 each, plus two dozen at 14 Dmarks, half of each to be discounted at 24 percent and the rest to be discounted at 15 percent which makes them free of tax. . . in short, you need a calculator.

It just happens that your computer, if it were running Basic rather than your

word processor, could let you calculate all these things instantly. If you were running your invoicing program, you could not only use it to calculate all these numbers, but could create an invoice, and store it as a file.

At this point, the phone goes. It's the *Daily Snoot*, wanting to know turnover in Afghanistan this year compared with before the Russians moved in. You know the figures are somewhere in your CMS files, or maybe they were in dBase II. If only you could be sure — a DIR command would tell you what the filename was, but your wretched system won't do DIR while running the word processor... Under concurrent operating



systems, you can run all these programs at once. Under concurrent CP/M-86, you press control and a number, and you get a fresh screen. On that screen, you can load and run a program. On the next empty screen, you load and run a third. You create your invoice, then switch back to Basic to check the arithmetic. It's okay, so you switch instantly back to the word processor, and call up the new invoice file. You read the figures right out of the invoice file, and merge the invoice and the standard 'pay in 30 days' letter.

The reason people haven't been jumping up and down enthusiastically is simple enough: concurrent CP/M-86 is based, mainly, on a program which is called MP/M.

That is a multi-user version of CP/M, and it has amply vindicated those sceptics who forecast that it would never work properly (they said nothing that sophisticated would ever work on an eight-bit Z80 or 8085 type micro). It had burned fingers — not just the users' but also Digital Research's fingers, in trying to improve it and make it work.

One day, maybe it will. In the meantime, however, people are nervous about anything that has the smell of MP/M about it. So naturally, they are wary of concurrent CP/M-86.

As I see it, the problems that bedevilled MP/M don't apply to this new system. Mainly, because although it may have four or five or whatever different programs 'running' at one time, they are in fact not running, but waiting. There is no chance that one program will try to read a record which another program is actively updating, because they can't work together — they take it in turns.

I hope I'm right! If I am, it will be a tremendous boon for the IBM Personal Computer — IBM was due to announce its availability as this piece went to press — and the Sirius One, where Chuck Peddle's company is negotiating to get the system from Digital Research.

On another stand a weird collection of rods was being waved around, pointing at an apple. Not an



Fortune's micro (above) and a general view of the Faire (below)

Apple, but an apple — green, crunchable, nourishing-looking.

The man behind it was pointing the end of his rods at the apple, and pressing buttons on his computer — and eventually it dawned on me that he was producing a three-dimensional picture of the fruit.

Each point where his apparatus touched the skin was connected to the nearest ones until a 'wire cage' around the surface was built up.

This magic trick, by Penguin Software, works for anything you can put on the plotter table. Mark Pelczarski, president, assured me he'd be delighted to have a UK distributor: contact him in Illinois at 830 Fourth Avenue, Geneva, Ill 60134.

When people are asking $2,000 and more for hard disk drives in Britain, it comes as a bit of a shock to walk past something called 'Davong Systems' and see a hard disk for the IBM Personal Computer, costing $2,000.

That was the price for the disk system installed in one of the holes where you normally find a floppy, with an interface, a controller, and software to let the system boot up from MSDOS, the new IBM operating system from Microsoft.

'We placed a $2 million order with Tandon, the disk maker,' explained the company boss. It turns out that the price frightens even the Americans, but not because they think it's impossible — just that they think all hard disk prices will be down to that level soon. Tandon, Seagate and Shugart are fighting the price down, in the hope of encouraging a big market, it seems.

Davong says it is happy to supply to the UK, and is looking for a distributor. Details: 1061 Terra Bella Avenue, Mountain View, CA 94043 or phone (415) 965 7130.

If you were looking for help in choosing the best way of organising vast amounts of data on a micro, you would have done well to stay away from the most obvious source of help at the Faire — the seminar session on database.

All the big ones were there — dBase II, now best-seller outside the Apple world, MDBS, Access 80 (a new one, but impressive to experts), Selector V, Condor, and FM-80.

One by one, each product was 'described' by a senior executive from the company which either sold it or produced it. And, one by one, the audience either fought off sleep long enough to get out of the room, or yielded and went into a dull doze.

My conclusion at the end of the session was that none of the people who were speaking had the faintest idea of what their rivals could or couldn't do. They made little attempt to compare and contrast the abilities of their own database manager with others — instead, they recited a list of 'features'.

The trouble with a list of features is that it conveys nothing about whether the features are useful or not. Is a system with the ability to use five files better or worse than one with one file of infinity size and no restriction on record length? Why?

At the end, I came to the following tentative conclusions:

1. GBS from Quality Software is not available yet.
2. MDBS from Micro DataBase Systems is very powerful, but should be restricted only to programmers of considerable skill. The company says so, and I don't think they say so just to impress customers.
3. Access 80 may be very powerful at storing, and recalling, data you put into it. On the other hand, it may not be suitable for what you have in mind, and the literature, or the program itself, will never tell you anything to help you make up your mind.
4. dBase II is market leader. Some people like it.
5. If Condor is a good product, somebody ought to tell the people who sell it.
6. FMS-80 isn't a database manager, though it may well do more for you than a database manager can.

GOTO Page 185

BENCHTEST
PERSONAL COMPUTER

SINCLAIR ZX SPECTRUM

Once again Sinclair offers value for money with a vengeance — colour, sound and graphics for £125! David Tebbutt reports.

Well, he's done it again, hasn't he? Uncle Clive has gone and shown the world how to produce a decent colour personal computer at the sort of price only he can conceive. Two versions of the Spectrum are available — 16k and 48k at £125 and £175 respectively, *including* VAT. If you want to upgrade your 16k machine to 48k later on, it will cost you £60. At the moment, the machines are available only by mail order. The Spectrum (ZX Spectrum to be precise) offers colour, high resolution graphics and sound and, at the price, it has just got to be the best value for money around.

Like most computers at this level, the Spectrum plugs into the domestic television and uses a normal cassette recorder. The ZX printer can be attached and, with a little modification, ZX81 programs will run happily on the Spectrum. A £50 miniature disk drive (the ZX Microdrive), communications facilities and an RS232 interface will be announced later on.

Hardware

The Spectrum measures just 233x144x 30mm and weighs in at 520 grams excluding the separate power supply and cables. It looks extremely elegant and, unlike its predecessors, it has keys that actually press down.

You'll not be surprised to learn that there are hardly any components inside the machine: 14 chips, a UHF modulator, a piezo-electric 'speaker' and an assortment of capacitors, resistors, diodes, crystals and a coil make up the complement. I swear that some of my crystal sets had more in them. All this is mounted on a single board and, looking underneath this production prototype, I notice that there's not a single patch. The only odd thing about it is that there's a big blob of green plasticine stuck around the coil. The coil on the review machine does whistle a bit but I understand that production machines come with suitably lacquered coils to eliminate this problem.

A hefty edge connector at the back brings out just about every signal you could wish to have. This is used for printers, communications and disk drive connections. Inside there are two spare sockets which accommodate each end of the 32k memory expansion board. This is a great improvement on the ZX81 memory expansion which tended to drop off the back of the machine at the least provocation. Talking of sockets (well I was, just now), every chip except the ULA is socketed. The reason the ULA isn't is because it gets darned hot — putting it on the PCB allows the heat to dissipate better.

The keyboard comprises a one-piece grey rubber moulding mounted over a pressure-sensitive membrane. The keys poke up through holes in a black metal plate and I must confess the feel is more that of a calculator than a typewriter. Most keytops have three symbols on them and, in addition, most of them have another two associated inscriptions printed on the metal surround. If you're anything like me you'll find yourself reading the whole keyboard each time you want to find a function. You do get used to it after a while: in my case it took a couple of days. I found that red symbols on grey keytops are quite difficult to read and, thinking my eyesight might be going, I showed the machine to a number of friends, all of whom had the same difficulty. I showed it to my 11-year-old and he thought it was just fine, though.

A power supply is included in the price, so there's not a lot of point risking one of your own and blowing the Spectrum up. The two cassette leads terminate in 3.5mm jack plugs so be sure that they work with your recorder before you embark on any major programs. It took me four or five tries before I found the right volume setting on my tape recorder. Once this was found, though, program loading presented no problems.

I tried the Spectrum on three televisions and the results matched the quality of the sets used. The display comprises 24 lines of 32 characters with the bottom two lines reserved for messages and entries. The display can also be regarded as 176 x 256 resolution for graphics work. High resolution graphics work is best done in two colours as you will see in the Firmware section of this review. The screen, border and individual characters can each take on one of eight colours and, in addition to this, characters can be bright or flashing. Other screen attributes like inverse and overprinting relate to the whole screen. More on these later.

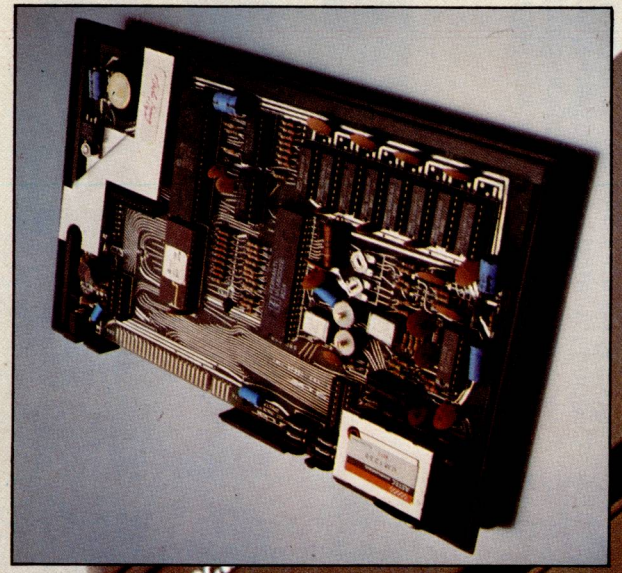
The single channel BEEP facility is about what you'd expect from a piezo-electric speaker. It does sound slightly better amplified from the cassette port but it's still pretty awful. A couple of octaves around middle C aren't bad; but the other eight are best used for sound effects. At the high end they warble and at the low end they grate — BEEP is a refreshingly honest description.

Really, there's not a lot more to say about the hardware. It is a very professional job; looks smart, works well and manages to squeeze 191 legends on to just 40 keys!

Firmware

Here's a new section for *PCW* Benchtests. All the software on the review machine was in the ROM chip which also contained the character set. This time Sinclair has gone for a basic ASCII set (upper and lower case) with the addition of both built-in and user-defined graphics characters. Outside of the range SPACE to QUOTES (32 to 126), many of the codes have special values relating to Spectrum keys and functions. For example, you'll find a copyright symbol key. (Now why didn't anyone else think of that?) You can define up to 21 characters of your own.

Two screen tables are maintained in memory — one for the displayed characters themselves and the other for the attributes which describe how they're to be displayed. These attributes can be tested from within a Basic program. The character colour is referred to as INK while the background colour is called PAPER. Isn't that sensible? Each character can have its own value for INK, PAPER, FLASHING, BRIGHTNESS, INVERSE and OVER. The last two should be explained: INVERSE simply means that the dots which form the character are printed in the PAPER colour while the PAPER is printed in the INK colour. OVER is special: it allows you to merge a new character with the one already at the screen position. The rules are that two INKs or two PAPERs print PAPER otherwise it prints INK. This means that you have a neat way of removing the last thing





Sinclair ZX81 Personal Comp
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1980 saw a genuine breakthrough – the Sinclair ZX80, world's first complete personal computer for under £100. Not surprisingly, over 50,000 were sold.

In March 1981, the Sinclair lead increased dramatically. For just £69.95 the Sinclair ZX81 offers even more advanced facilities at an even lower price. Initially, even we were surprised by the demand – over 50,000 in the first 3 months!

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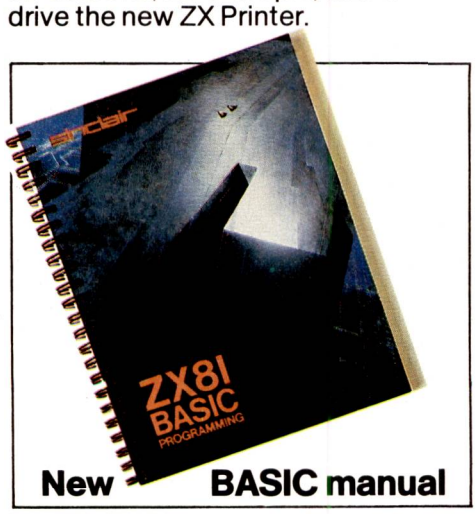
And the ZX81 incorporates other operation refinements – the facility to load and save named programs on cassette, for example, *and* to drive the new ZX Printer.



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iter-



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Qty	Item	Code	Item price £	Total £
	Sinclair ZX81 Personal Computer kit(s). Price includes ZX81 BASIC manual, excludes mains adaptor.	12	49.95	
	Ready-assembled Sinclair ZX81 Personal Computer(s). Price includes ZX81 BASIC manual and mains adaptor.	11	69.95	
	Mains Adaptor(s) (700 mA at 9V DC nominal unregulated).	10	8.95	
	16K-BYTE RAM pack.	18	29.95	
	Sinclair ZX Printer.	27	59.95	
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SINCLAIR ZX SPECTRUM

printed and restoring what was there before it.

By now you have probably realised why it is best to stick to two colours when doing graphics work. Since the colour of the INK and PAPER relates to a whole character position, then each time a new colour graphics point is set, all other set points within the boundary of that character are set to the new colour. This makes for a very curious effect to say the least.

Mathematical accuracy is to 9½ decimal digits and a fairly full range of mathematical functions is accessible from the keyboard. While on the subject of keyboards, this one has a built-in software 'click', an upper-case lock key and automatically repeating keys. Like the ZX80 and ZX81 before it, the Spectrum makes great use of single stroke keyword entries. In fact, I think every standard function and command is obtainable in this way. You'll even find things like >= and <= occupying their own pieces of grey rubber.

Basic

The Spectrum comes with a very useful version of Basic. It will be quite familiar to anyone who is used to the Microsoft types of Basic and a doddle to learn for those new to the language.

Rather than go through all the features and functions of the language, I have summarised them in a separate box. Here, I'll just comment on the unusual and interesting aspects of this particular implementation. Unlike some Basics, it is a teeny bit strict about things like using LET before assigning a value to a variable name or putting GOTO after a THEN. My view is that this is all jolly good discipline and it is more than compensated for by the fact that Spectrum pops in all those spaces which make programs so much easier to read. Of course, once you've found your way round the keyboard, the single stroke keyword entry is a joy. (I've got a feeling I said that in my last two ZX reviews.)

SAVEing and LOADing cassette tapes gives plenty of scope on this machine. You can save a program normally, you can save it so that execution starts automatically when it is reloaded, you can save arrays, you can save particular chunks of memory and if you want to keep a pretty picture you've created then you can use the SCREEN$ option to save that too. All saved programs can be verified after saving. The screen save can't be verified because the display is changed during the verify program and it would not then match that held on tape. The LOAD command can, of course, handle any tape created by SAVE. The MERGE command allows you to merge a program on tape with one already in memory. Program lines which are duplicated are overwritten while all others are suitably interleaved.

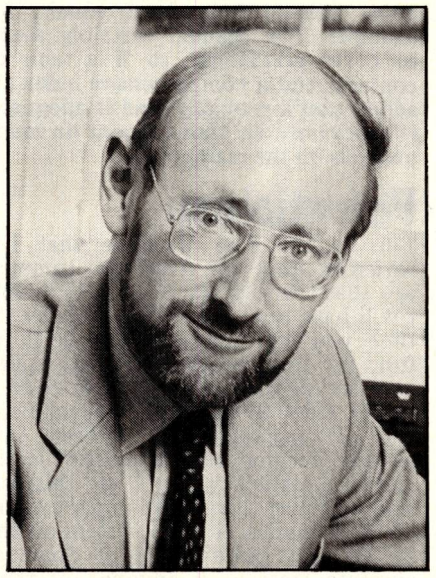
The graphics facilities are great fun. You can draw straight lines, curves and circles on the 176x256 pixel (PICture ELement, or dot) window. Position 0,0 is at the bottom left-hand corner of the screen. You can define up to 21 graphics characters of your own which is a superb feature if you're into writing your own Space Invader or Pack-Man games. I had a lot of fun drawing and animating little people on the screen. The nice thing is that you can do all this sort of thing without leaving Basic. A BIN (binary) notation has been introduced which allows you to define numbers as a series of 0s and 1s — just the ticket for designing funny characters. Each character comprises eight lines of eight points, so a succession of eight BIN numbers is all you need to define such a character. Another use for user-defined graphics is to squeeze some extra colours out of the machine. If you lay out the 64 pixels like a chess board and choose suitable INK and PAPER colours then you can get some interesting effects. Most of them will be awful but persevere — some will be good.

You won't be surprised to learn that line drawing and circle plotting are achieved using the DRAW and CIRCLE commands. A PLOT command allows you to plot single points. POINT enables you to find out whether a particular pixel is set. You always DRAW from where Spectrum thinks you are on the screen. For example, a command DRAW 10,10,pi would draw a semi-circle ending up 10 places to the right and 10 above the current position. A fraction of pi would provide a different arc while zero, or no third argument (DRAW 10, 10) would draw a straight line. The curve can be drawn on either side of the centre line by making the third argument a positive or negative number.

The CIRCLE command uses three arguments: x-axis, y-axis and radius. Remember, the OVER command can be used to erase something already drawn. I used this feature in conjunction with DRAW, PLOT and CIRCLE to create cartoon effects. OVER is also useful for embedding text in a drawing. When set on, the text merges with the existing lines in the drawing. When set off it prints the full 8x8 character, completely replacing anything already displayed at that position. Incidentally, SCREEN$ can be used to return details of the contents of a character position. Used in conjunction with the PRINT AT command, this could be a good way of

What about the '81?

It was no secret that 'Uncle' Clive was going to launch a knockout micro — he's put a bomb under the industry twice already, producing machines which brought computing power within everybody's reach at prices which drastically undercut the competition.



A slightly upmarket (by Sinclair standards) machine offering colour and sound and reasonable graphics at a price far, far below that of any equivalent machine was a logical step to take, especially in view of Sinclair's obvious annoyance at being left out of the BBC deal.

What is interesting, though, is that the Spectrum does not replace the ZX81, as the 81 did the 80 — it's an addition to the range and the ZX81 will continue in production. In fact, production of the 81 is to be *increased* to a target of 150,000 a month by the end of the year.

'The ZX81 will continue to be ideal for the person who wants the lowest possible entry cost into computing,' says Sinclair. And to prove the point, he's knocked £20 off the price of the 16k RAM pack.

At the moment Spectrum is available only by mail order and is only on sale in the UK — there are no plans yet to market it through retail outlets, as is done with the ZX81 through W H Smith, and export versions are not planned until the end of the year, with the USA being the first (and largest) market to get the new machine.

Peter Rodwell

Spectrum Basic

Functions

ABS	ACS	AND	ASN	ATN	ATTR	BIN	CHR$	CODE
COS	EXP	FN	IN	INKEY$	INT	LEN	LN	NOT
OR	PEEK	PI	POINT	RND	SCREEN$	SGN	SIN	SQR
STR$	TAN	USR	VAL	VAL$				

Operations

+ − * / = > < <= >= <>

Statements

BEEP	DATA	GO TO	LOAD .DATA	OVER	RETURN
BORDER	DEF FN	IF..THEN	LOAD .CODE	PAPER	RUN
BRIGHT	DELETE	INK	LOAD .SCREEN$	PAUSE	SAVE
CAT	DIM	INPUT	LPRINT	PLOT	SAVE .LINE
CIRCLE	DRAW	INVERSE	MERGE	POKE	SAVE .DATA
CLEAR	ERASE	LET	MOVE	PRINT	SAVE .CODE
CLOSE	FLASH	LIST	NEW	RANDOMIZE	SAVE .SCREEN$
CLS	FOR..TO..STEP		NEXT	READ	STOP
CONTINUE	FORMAT	LLIST	OPEN #	REM	VERIFY
COPY	GOSUB	LOAD	OUT	RESTORE	

SINCLAIR ZX SPECTRUM

making your program find a suitable place to print a sort of 'label' on a drawing. The AT allows you to define the row and column at which printing should start.

A few instructions I particularly noticed as I went though the manual were READ, DATA, RESTORE and VAL$. READ and DATA are old friends although I can't remember them being on previous ZX machines. Using the DATA command you can provide lists of information at the beginning of a program. Each READ instruction takes the next word from this list. RESTORE can be used to set the DATA pointer to any DATA statement. VAL$ baffles me — it strips the outside quotes from string expressions and returns the string value of the result. Perhaps some kind reader would care to suggest a worthwhile application for this feature.

Now let's have a look at our honestly named friend, BEEP. There's not a lot to tell, really, except that you can control both pitch and duration. Notes below middle C are represented by negative numbers, those above by positive. Twelve numbers make an octave. (If you look at a piano keyboard you'll find that there are seven white notes and five black notes per octave.) Middle C is zero. The duration is expressed in seconds or fractions of a second. As I mentioned earlier, the sound isn't brilliant but it has the saving grace of being fairly quiet (ComputerTowns please note). You can pick this sound up from the cassette ports if you so wish. I'd say these facilities are more likely to be used for sound effects than composing symphines.

That's really all I have to say about the Basic. It is a very good implementation for a machine of this size. A PAINT instruction would have been nice to fill in graphics shapes, but I think it would look a bit weird in multicolour mode with the colours changing at each character boundary. A routine to do this should be simple enough. I think the screen resolution is quite adequate for most personal users of the machine. In fact you can churn out some quite stunning effects using DRAW, PLOT, CIRCLE and the user-defined characters.

Before moving on to documentation, here's a list of the disk commands just to whet your appetite: CAT, CLOSE, DELETE, ERASE, FORMAT, MOVE, OPEN. CAT is probably short for Catalogue which lists the files on a disk. MOVE probably copies a file from one place to another. The others are self-exaplanatory.

Documentation

Two manuals come with the Spectrum — a thin but useful introduction for the complete novice and a thicker one which explains things in depth. A lot of effort has been put into this latter manual. It is professionally presented and easy to read. Unfortunately, I was given a photocopy of the final proofs and it contained no index and no table of contents. I read the whole manual a couple of times before starting the review and I found it a real problem to find things that I knew where there somewhere. I must admit that the style wasn't to my liking; it's a little verbose and the individual chapters seem to lack structure. I also found the inevitable errors which might cause a beginner problems — things like a minus sign being printed instead of equals, for example. The manual certainly seems to cover everything, so if a table of contents and a comprehensive index are added you'll probably find it adequate. It's certainly an improvement on many manuals on the market.

Potential use

This is the first machine that I've reviewed since the Atari two summers ago that I would actually buy — in fact I will have probably ordered one by the time you read this. I would use it for fun, for fooling around with graphics and for programming in Z80 code. I would treat it as a hobby machine, a way of relaxing. My children have already become very interested in the graphics capability and I see this as a way of giving them a real understanding of mathematics. A Logo system on this at the right price would go down an absolute treat — if anyone out there thinks of doing it, I'd love to review it. Of course, there are those who want to learn to write programs. Once again, this is an excellent machine to cut your teeth on. I think that schools and homes have got to be the prime targets for Spectrum at the moment.

Later on when the disk drives appear, this may change. At a predicted £50 for a 100k drive, a lot of people who will have written the Spectrum off as a hobby machine will have to think again. Add to that a £20 combined RS232 and communications facility, and you could be talking about some very interesting and fairly sophisticated networks. At that stage, it becomes a very real prospect for schools looking for a fairly grown-up system, but one which can involve as many pupils as possible. At Sinclair's prices could we possibly be heading for the 'one on every desk' scenario painted by so many futurologists?

Until those disks arrive there is no great office potential for the Spectrum. Once they're on stream then it's probably just a question of appropriate software. Information management and Visicalc-type applications would seem to be the most likely and, because of the price of the television, they will probably be used with portable black and white machines. No doubt the dedicated will take their Spectrums (or is it Spectri?) home to plug into the colour TV. Most people will probably wait until Sinclair announces a flat screen colour television. The network idea could then be useful in offices for things like telephone directories, noticeboards and memos.

Prices (inc VAT)

16k Spectrum	£125
48k Spectrum	£175
32k Memory	£60
Microdrive disk	(estimated) £50
RS232 + Comms	(estimated) £20
ZX Printer	£59.95

Conclusions

Well, for the benefit of those who only read the first and last paragraphs of these reviews here are my conclusions: Clive Sinclair has produced a very good 16k personal computer which offers colour, high resolution graphics and limited sound for just £125. That represents very good value for money provided that this is the sort of machine you want. It is ideal for people who want to learn about computing and have a lot of fun while they're doing it. Given the right sort of graphics-based educational software, it can bring people very pleasurable ways of learning subjects such as mathematics and geography. Once the games programs start to appear, a lot of people will use it just for that, although it does seem a bit of a waste.

Later on, the provision of disk drives and communications facilities will make it an even more serious contender for the school markets and it will begin to creep into businesses. When the flat screen television appears then I suspect that the business interest will rise because the price will be far more appropriate. Bulletin boards, memos, telephone directories, spreadsheet calculation and information management seem to be the most likely applications.

The 'proper' keyboard is a distinct improvement on its predecessors, but it still doesn't achieve — or try to achieve — the quality of an IBM. All the old regular Sinclair features are included — the single keyword entry and the automatic syntax checking as you enter each command, for example.

My verdict? The best value for money you can find today! END

I would like to thank John Mathieson of Sinclair Research for so patiently answering my questions.

Benchmark timings

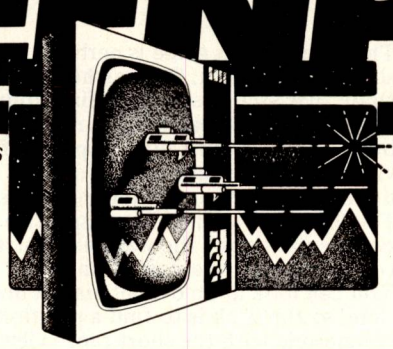
BM1	4.8
BM2	8.7
BM3	21.1
BM4	20.4
BM5	24.0
BM6	55.3
BM7	80.7
BM8	25.3

All timings in seconds.

Technical data

CPU:	3.5 MHz Z80A
Memory:	16k Dynamic RAM, 16k ROM, 32k expansion option
Keyboard:	40 keys rubber moulding. 183 functions + 8 colour labels. Auto-repeat
Screen:	Domestic colour television. 8 Colours or 6 grey shades.
Cassette:	Domestic recorder.
Disk drives:	To be announced. 100k per drive.
Ports:	To be announced. RS232 & comms.
Language:	Basic in ROM

SCREENPLAY



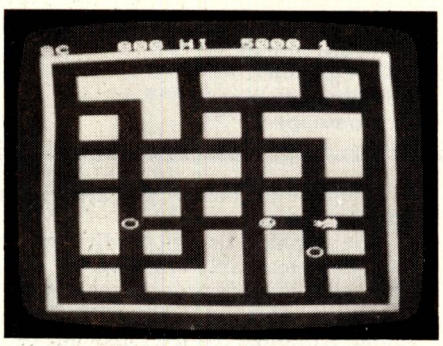
This month Dick Olney reviews games for Commodore's VIC-20

Hardware

The VIC-20 is part of Commodore's marketing strategy of gearing its products to more specific markets and attempting to exorcise the spectre of the PET (CBM is, it seems, upset that this rather endearing brand name has become so integral to its 'corporate image'). It is very much a home machine, offering colour graphics and sound through a domestic TV (see Benchtest in September '81 *PCW*). To keep the price as low as possible, however, the basic machine carries only 3k of user RAM. This means that for most of the cassette-based games (ie, those not supplied by Commodore), you'll need a 3k RAM expansion and even then the complexity and presentation (though not necessarily quality) of these programs is rather inhibited by the lack of space.

The configuration I used would cost £165 for the CPU unit, with an extra £40 for the cassette and £26 for the 3k RAM (ex VAT), making a total of £231 — though the same set-up with 16k RAM (as offered by most machines in this range) would cost you £270. Some of the games use a joystick costing £7.50 and the Pinball uses a pair of paddles.

The operating system on the VIC is refreshingly friendly, giving clear messages as to what it is doing when loading in from cassette, which makes the machine very easy to use. Overall I have only two complaints regarding the hardware. Firstly, the lead going to the television could be a bit longer, though of course it would be easy to extend it yourself. The second criticism is rather more important and regards the ROM packs on which nearly all the Commodore games are supplied. The edge connector on these is very exposed and quite difficult to guide into the socket on the back of the CPU unit. This makes them highly susceptible to damage, particularly if they are to be handled by impatient children.

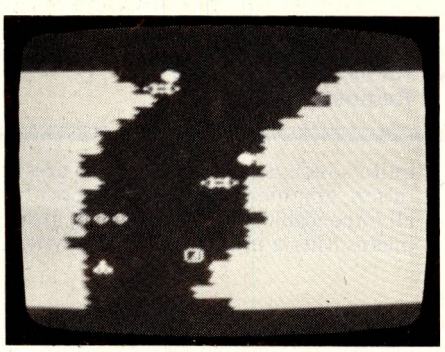


Game: Alien
Supplier: Commodore
Price: £19.95

Another descendent from the arcades, this game takes its general principles from a machine called 'Space Panic' which I have always felt was rather understated. You are being hunted by aliens in a maze and the only way to destroy them is to dig a hole, wait until one falls in and then bury him. Space Panic showed a vertical section with several floors and the creatures would actually drop through the holes but in Alien you are given an aerial view and thus there is only one level. The enemy are quite fast but very dumb so they won't necessarily find you — but if your time runs out all hell breaks loose with hordes of super-fast aliens appearing from nowhere.

Movement can be controlled by either the keyboard or the joystick. Digging and filling, however, are initiated only through the keyboard (the 'A' and 'D' keys) so if you use the joystick you will find you need three hands to operate the game properly (can this mean that Commodore plans to bring out an add-on limb interface?). I overcame the problem by grasping the joystick between my knees and I'm sure there are other possibilities! Despite a good response time and reasonable graphics Alien is not nearly as good as its predecessor but it still has a certain unique quality that makes it attractive.

Value for money: ***
Use of graphics: ****
Addictive quality: ****
Response speed: *****

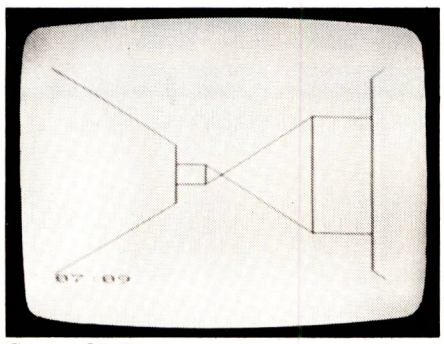


Game: Canyon Fighter
Supplier: The VIC Centre
Price: £5.95

Another program loaded in two parts with the first setting up the graphics. This one seems to be widely based on the arcade game Scramble (last month's Arcade Ace). There is a slightly different version on each side of the cassette, one using the joysticks and the other the keyboard. You guide a spaceship through a jagged (and in some places very narrow) ravine. The game has a vertical orientation so in fact you just move the ship left and right as it moves downwards at a steady rate. Your aim is to avoid crashing into the walls or asteroids and, if possible, to destroy enemy ships and fuel bases. As in Scramble, you have limited energy which is replenished only when you hit a fuel base. At the end of the game (when you are destroyed) your score and the amount of remaining energy are displayed. It is one player only with nine skill levels.

Unfortunately there are a number of design faults in this game which ruin what might otherwise be a lot of fun. Fairly frequently the game starts, only to be immediately terminated as your ship materialises right next to the wall. Considering the rather poor control you have, the game gets far too difficult at higher skill levels and there is occasionally an impenetrable line of asteroids blocking your path. The only sound is when you fire or crash and the graphics are less than inspired. Having said all this I should hastily add that the game *is* fairly addictive — it just needs a bit of polishing up.

Value for money: ****
Use of graphics: **
Addictive quality: *****
Response speed: ***



Game: 3D Maze
Supplier: Hi-Tech
Price: £8.63

The name of this game is perhaps slightly misleading. One might be led to think that your task was to find your way around a three-dimensional maze but in fact — from a playing point of view — the maze in question quite definitely has a mere two dimensions. The 3D refers to the line perspective representations of the walls and entrances displayed while you are inside it. You can look at an overall map at any time, so the trick is to find a position compatible with the short range view you are given of the corridor. Movement and mapping are controlled by either the joystick or the keyboard. This must have been an interesting graphics project but as a mind teaser it has severe limitations. I'm afraid the distributor's proud proclamation that 3D Maze provides 'hours of endless frustration' is highly exaggerated (though I'm not sure how inviting that sounds anyway!).

Value for money: **
Presentation: **
Use of graphics: *****
Addictive quality: **

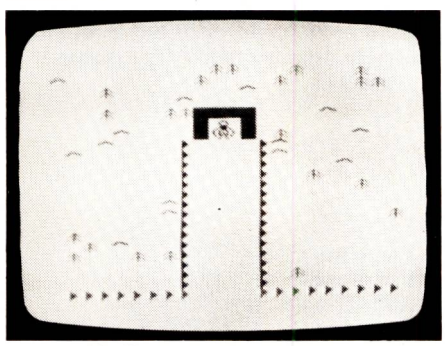


Game: Rat Race
Supplier: Commodore
Price £19.95

Using either the joystick or the keyboard, your task in this game is to navigate a mouse through a maze; it is running from a group of deadly rats while attempting to eat 10 pieces of cheese. It is in most respects identical to an arcade game (whose name escapes me) which is based on racing cars and flags. In the latter there is an extra hazard of oil slicks, here replaced by stationary black cats. You are given a short-range view of the maze and also a small-scale plan showing just the relative positions of rats, cheese and your mouse. Your only defence against the rats is to lay a 'star screen' in their path which temporarily confuses them. This, however, uses up your time units and so must be used sparingly. The score value of the cheeses increments as you eat them and one of them doubles the value of any subsequent meals.

After completing a couple of runs you play one frame against the clock in which the rats remain stationary; after this the number of rats increases. You lose a life (you are given three) each time a rat catches you, you run out of time or if you run into a black cat. I used to thoroughly enjoy playing the original version of this game and Rat Race is no less attractive. It should particularly appeal to those afflicted with the recently isolated disease 'Puckman fever', now apparently reaching epidemic proportions in the USA.

Value for money: ****
Use of graphics: ****
Addictive quality: *****
Response speed ***



Game: Ski Run
Supplier: Rabbit Software
Price: £10

One way to improve on the memory limitations posed by the VIC is to load the program in two parts, and Ski Run is one of the many games which use this technique. The first part displays the playing instructions and sets up the graphics, while the second actually runs the game, of which there are three variations. It basically involves guiding a cleverly depicted skier down a mountain, avoiding snowdrifts, trees and flags. In Slalom and Giant Slalom, the idea is to ski between evenly spaced pairs of marker flags (in Giant Slalom the flags are more widely spaced) while downhill involves following a narrow fenced track. A skill level of one to nine determines the quantity and complexity of the hazards. The skier moves quite fast at a steady speed and you move it left or right using the 'A' and 'D' keys (there is one joystick option). If you manage to complete the course, you are given a time for the run.

The graphics, though hardly complex, are remarkably effective — especially the sideways movement of the skier — as is the steady whooshing sound. Although Ski Run may not be particularly sophisticated, it is well designed and executed and is certainly worth looking at.

Value for money: ***
Use of graphics: *****
Addictive quality: ****
Response speed: ****



Game: Blitz (cassette)
Supplier: Commodore
Price £4.99

There are a number of versions of this game around for various machines. The basic principles are extremely simple. The program builds a city (looking rather like New York) with 18 skyscrapers of various sizes (it changes in each game) and you use the space bar to bomb it from an airplane travelling across the top of the screen. The latter is gradually getting lower so you must destroy the buildings before you crash into the side of one. You can only have one bomb at a time on the screen and they drop quite slowly so you must be extremely selective about your targets. This game is much more difficult than one might think and demands quite a high degree of skill. The presentation, graphics and sound effects are all impeccable and the give-away price makes Blitz a must for all VIC owners.

Value for money: *******
Use of graphics: *****
Addictive quality: *****

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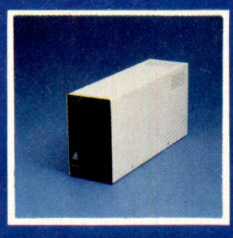

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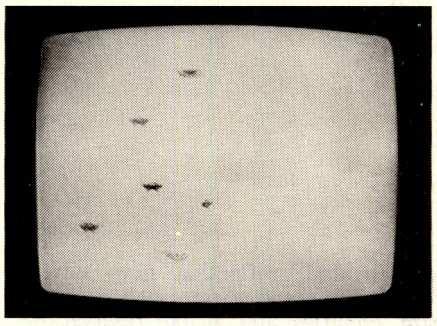


Game: Invader Fall
Supplier: Hi-Tech Ltd
Price: £8.63

Based on Space Invaders, this is a simple, one-player game which uses a joystick or the keyboard to move a traditional firing platform around the bottom of the screen. Instead of the usual marching formation, the invaders appear randomly at the top of the screen and move directly downwards. As might be expected, you are destroyed if any of them reach the bottom. The invaders themselves do not fire any missiles at you, although the occasional flying saucer makes up for this with highly accurate and rapid artillery.

One of the best features of this game is the series of bright colours which the invaders take on during their descent (the screen background is white). As with many of the VIC cassette-based games, the program is kept down to size by excluding common features of presentation such as a running score or players' initials; you simply play the game and are told your score and how many shots you fired at the end of it. Despite this, Invader Fall combines traditional Space Invader playing concepts with its own unique qualities and a very reasonable price to create a fast moving and addictive game which is well worth the money.

Value for money: ***
Use of graphics: **
Addictive quality: **
Response Speed: ***

Game: Adventure Island, Pirate Cove, Mission Impossible, The Count, Voodoo Castle
Supplier: Commodore
Price: £19.95 each

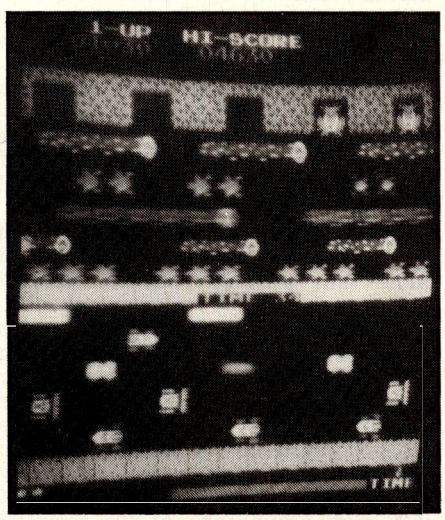
This set of Scott Adams Adventure games is due out soon on Commodore's own ROM packs. The ones I was sent had apparently only just arrived in this country and were each held on a pair of EPROMs (TI264s in fact) poking from the standard packaging. I can't claim to have fully completed any of them but I did have a good look at them all. Their format is completely standard with no concessions to the VIC's graphics capabilities except coloured text. All of them are imaginative and complex and should certainly provide hours of entertainment even for the most cunning adventurer. The price is a little high, unfortunately, considering the single completion redundancy of such games; but if you can afford it, you'll not be disappointed.

Value for money: ***
Presentation: ***
Complexity: ****

Conclusion

Except for the memory restrictions I mentioned at the beginning, the Commodore VIC-20 has all the makings of a superb games-orientated home computer and this has been reflected in its popularity. The general quality of the games is quite high and I was particularly impressed by the way some of the cassette software overcomes the lack of space. Commodore seems to be developing a very good selection of ROM packs, which is greatly enhanced by the introduction of the Adventure games. The graphics could be better, but used properly they yield some good results. The price of this machine makes the VIC not only a strong contender in the home market but also a viable alternative to a non-programmable games console.

ARCADE ACE

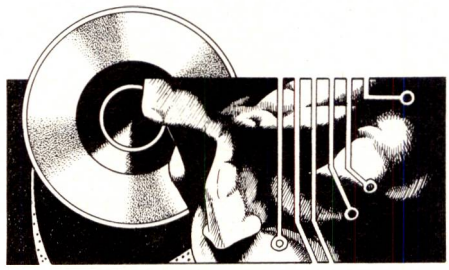


Having so far concentrated on well-established classics the game I have chosen this month is rather more recent, although it already has a good following. It is called Frogger and is definitely in the Puckman rather than the Space Invaders genre. You control a small green frog using a joystick to move and a button to jump. It has to cross a road followed by a river in order to reach its home on the other side of the screen. The road is crowded with vehicles of various types which speed up as you work through the frames and must be negotiated using the joystick. Since the frog is unable to swim the river due to a stream of logs (and the odd crocodile), he must jump from log to log, taking care not to be swept away. As you progress other creatures appear presenting further hazards.

I can't claim to be an expert at this, though the small boy who was playing when we took the photograph most certainly is. The graphics on Frogger are extremely good, however, with all sorts of nice touches which make it an interesting spectator sport. Timing is the essence of this game, which requires quick and careful planning if you're to avoid getting squashed. It may not be as hectic as a space battle but it demands just as much concentration. The concept behind Frogger is pretty sick in a harmless sort of way but the game itself is amusing and challenging.

END

FRAMES OF REFERENCE



A DP MANAGER'S GUIDE TO MICROS

By Alan Wood of Digitus Ltd.

PART 6: PUTTING YOUR MICRO TO WORK

It is easier to determine what microcomputers are not good for than it is to describe the numerous applications for which they are suited. Micros are not good for handling vast files of data, for handling many users simultaneously, or for handling huge number-crunching tasks. The practical hardware limits of today's micros are: 1 megabyte of RAM, 100 megabytes of disk store, eight users on a multi-user system or about 24 single users on a network.

The software limitations of micros are more significant than the hardware limits. The development of a multi-user or network operating system is not a trivial task; such software takes many years of talented design and programming to produce and many more years before it is largely debugged. Some of the offerings in the micro market are simply not credible, although there are excellent examples of software, eg, the Unix implementations and Xionics Xibus/Xinet. The software available on micros is lacking when it comes to organising and getting rapid access to data in large files. There are few languages and operating systems with even ISAM facilities and there are fewer database management systems.

It is important to get the limitations of microcomputers in perspective before you consider their application and place in your company. It is also helpful to start with a working definition of the operational differences between computers:

A mainframe is a computer which requires an operational department to run it.

A mini is a computer which requires an operations manager to look after it.

A micro is a computer which is operated by its user.

Microcomputers offer a number of benefits compared to their computing antecedents: rapid delivery... from one to four weeks; low entry cost. . . £6000 for a complete single user system that could grow to a 24-user network; fast implementation. . . complete small systems installed three months from order and no system installed in longer than six months; package abundance. . . low cost implementation and maintenance; physical size. . . micros pack more and more power into desktop units — yesterday's mini literally fits into today's desk.

The disadvantages of microcomputers in the hands of users can be described as:

1. Publicity greater than performance . . . microcomputers do not equal mainframe computers; the cost of a system does not equal the cost of the hardware — personal computers are good as super-calculators but not as file processors.
2. Users are not disciplined enough to have own computers. . . floppy disks get lost/disorganised, data backup is not taken regularly if at all, hardware is abused with dust, coffee and crumbs.
3. Hardware and software limitations not understood. . . a little knowledge leads to doing dangerous things, DP departments adopt a 'not invented here' attitude and refuse to get involved/help until the user is humbled by mistakes.
4. Surreptitious microcomputing. . . micros sneaked in by users, little, no or fallacious justification, self-indulgence in doing interesting things in computing (previously the prerogative of DP people only!).

Applications

In addition to familiar data processing tasks, the cost of micros justifies new applications which were previously uneconomic, impractical, or low on the priority list. Data processing departments have seriously underestimated the role of micros, associating them with game playing and trivial tasks. Microcomputers are extensively displacing and supplementing timesharing services with significant cost savings; they are replacing tasks previously undertaken on minis, much as minis usurped the position of the low-end mainframes; and they are pushing computing facilities further up and down organisation hierarchies. . . the first computer on the director's desk is often a micro.

The computer manufacturers of the '50s and '60s found an eager market in the commercial and industrial companies whose operation and expansion was inhibited by manual systems. The first systems they installed were a computer replication of what was there already. Then the systems became more sophisticated, reflecting new services companies could offer, such as credit card facilities and airline reservations. The increasing complexity of those systems led in turn to bigger computers. At the same time, the individual manager's job grew in complexity to a point where computers were needed to aid decisions. The data needed for those decisions is not easily abstracted from traditional data processing systems in the format the manager needs. Consequently, the microcomputer manufacturers have found an eager market among professionals in large companies hungry for computer assistance. The microcomputer is excellent at handling the top layer of management information. It can be applied to taking a lateral view of data in a hierarchical data processing system. It can be applied to calculating and assembling data in a digestible form. In the hands of an intelligent user it functions as a brain-extender to help reduce costs, make better returns on investments, sharpen negotiations and provide 'considered' responses more quickly.

Personal and company systems

It is important to distinguish between the personal and the company system, between personal data and company data. Personal data can be defined as 'unique to an individual'; company data is 'integral to the company'. An engineer working on a project will have data unique to him on which calculations need to be performed. Similarly, scientists, managers, accountants and executives have unique data requirements. The needs of this group can be partially satisfied by a personal system which has some of the following characteristics: uses unique data; is applied as a super-calculator or electronic file index; encourages computer literacy; supplements/replaces timesharing service; prepares for future electronic office; uses programs and packages which do not require central support.

One danger associated with personal systems is that managers will spend more time learning programming and playing with computers than managing. In practice, what is tending to happen is they put in extra hours in the evening and weekends and also encourage junior office personnel to become computer literate. A more significant danger is the creeping system: the simple personal system which creeps into a company system with all the dependencies that this implies but none of the essential standards or controls.

Company systems are by definition not unique to an individual but integral

to a company. They develop as the company develops and they require control and support. If the company system's operator, manager or user leaves it is essential that the system can be passed on, understood and operated by his or her successor. Micro-based company systems are similar to traditional data processing systems, even if they are used like 'link-less' terminals. There are many examples of such systems. They lend themselves to company-developed packages which can be used at a number of sites: warehouse stock location, local stock recording, stock taking; 'specials' purchasing, goods receipt; personnel records, career/salary administration, graduate recruitment; depot, division, department, and branch record keeping; quotations, contracts, proposals and project administration.

Fertile areas for micros

The 'no-man's land' for microcomputers is between what users want and the border with existing mainframe systems. If you leave aside that territory, there are still acres of applications untouched by existing company systems. Two of the most rewarding areas are office systems and timesharing replacement, sometimes in combination.

The functions performed in offices up and down the country are basically similar. The typically comprise calculating, record keeping, typing and communicating via telephones and mail. These functions suit standard systems and packages because they are so alike.

The off-the-shelf microcomputer can perform most office functions using packages, with a few tailored programs to meet justified special needs. There is a variety of standard calculation aids, such as Visicalc and Supercalc. There is a choice of information managers from the simple electronic index, Visidex and Cardbox to the more detailed electronic file cabinet, Auto-Index, DataStar and DMS. Word processing packages abound, often in combination with record keeping (eg, WordStar/DataStar, Silicon Office) and with other facilities like spelling dictionaries (Spellguard, Spellstan). A feature of networked micros is the ability to send messages to other users of the network, such as Nestar and Xinet. Micros can also be used with acoustic couplers and modems to communicate messages over the public telephone system, so authors creating text on a home computer can send it down the line to the publishing house central machine.

The point has already been made about the limitation of the micro as a super number-cruncher. Timesharing services thrive on the software and databases they offer; they will continue but cursory analysis reveals that many of the smaller programs can be run on micros and many of the new micro packages offer a top cut off the timesharing service at a fraction of the cost.

The trend began with tools like Visicalc, a rows-and-columns program providing a matrix of 64 columns by 200 rows, automatic re-calculation facilities and a variety of mathematical formulae. Visicalc is much friendlier than timesharing programs which do not provide screen interaction. It has been followed by a variety of other aids — Micro Modeller and Micro Finesse for financial modelling, Micro Pert and Micro-Planner for critical path applications, Optimiser for linear programming. More management aids and personal productivity programs will follow. The 16-bit desktop micros with these programs will eat further into timesharing spend. Using micros for front-end data entry is also an economic extension of your timesharing service, so that you keep connect costs and phone bills down. The added facilities that the micro provides off-line combined with use as a terminal are valid justification.

In some departments dedicated word processors are required, eg, updating from a typing to a word processing pool. In others, the general-purpose microcomputer with word processing software provides an economic and versatile solution. At today's prices, £5000 buys a high-quality micro with a daisywheel printer and word processing software. The software is not as friendly or as feature full as the specialist word-processors, but the fancy features for which those machines are bought are seldom used. Applications combining data processing, word processing, information processing and number processing are ideally satisfied by microcomputers. A small bonus (or hazard, depending on your point of view) is the extension of keyboard skills in the organisation and the dispersal of some typing to two-fingered word processing users.

Data processing on micros

It is in their application in data processing that microcomputers cause most agony, antipathy and indecision in larger companies. Just how far should you let them go or grow? The hardware and, particularly, the software limitations of micros automatically exclude them from many applications, although the boundaries are being pushed steadily outwards. The cost of converting software on existing systems is another natural boundary to micro encroachment. Then there is the preservation of computing skills and all those hard-learned standards and controls built up over the years. And superimposed on the top is the company organisation and computing policies. Is yours a heavily centralised organisation, with controls flowing outward from the centre? Or does your management favour operating in relatively autonomous groups with just top-level financial controls?

In the Big Brother company, the best micros to use are the first level personal computers, perhaps with mainframe communication. In the Little Brother company, there is a lot of scope for more powerful micros. The network of micros has a place in both centralised head offices and in despersed organisations.

For the most part, ledger applications will be well taken care of and will be much too big for micros. However, some of the small business subsidiaries of big companies can fit quite nicely and quickly on to a microcomputer. Examples are overseas or remote small companies, companies acquired in a takeover, companies set up to market a new product of service. Another common application for micros in large companies is executive payroll — often a tedious job for the company secretary or financial controller.

There's a whole variety of standard application packages for ledger applications so it should not be necessary to develop special software, other than a small number of tailored programs. Reputable suppliers include MicroProducts Software and Omicron.

The minicomputer made great headway as a machine dedicated to regional and branch order processing and stock control. The micro is equally successful for smaller order processing systems, as a single-user, or networked configuration. A number of big companies use micros for local stock control and repeat the same system in lots of locations, eg, Shell. There are a variety of order processing and stock control packages, eg, Omicron, MicroProducts, Paxton, Peachtree. Purchase order processing, particularly specials as opposed to bulk purchasing, is a common micro application in the larger company.

Teletype communications and 2780 and 3270 emulators provide the means of connecting microcomputers to mainframes. The other popular protocols are gradually appearing from computer manufacturers and from independent vendors. The availability of such software removes one of the main deterrents to DP applications on micros; the micro becomes simply an extension of the existing facilities. A microcomputer used locally for a variety of tasks can be switched to an intelligent terminal to talk to, and receive data from, the mainframe computer. As more protocol software becomes available, micros will be used to replace expensive emulation terminals. Suppliers of communication software include: Micro Integration with Bysync 2780, 3270, Lifeboat with RBTE, Winterhalter Associates also with 2780/3780 and 3270 emulators.

Multi-function applications

The microprocessor is overturning the traditional approach to multi-user, multi-tasking computers in a number of ways and providing new options in multi-function computing.

The mainframe and minicomputer solution to providing access for many users to an information facility has been to share central memory and store. A sophisticated operating system handles the management of many users and tasks, apportioning part of the memory and store to each task, handling queues of users and protecting files from corruption through simultaneous access by more than one user. Advanced multi-user computers partition and use virtual memory, allocate priorities and have extensive security and data management features, all of these housekeeping tasks consuming an increasing proportion of the power of the computer — for example, if you have an IBM environment you virtually need one machine to manage CICS and IMS and another machine to run your applications.

Multi-user and multi-tasking

There are two solid justifications for large computers for multi-user work.

FRAMES OF REFERENCE

The first is where a vast amount of data has to be stored and manipulated. The second is where many people must share data and have access to it at the same time; the classic example is airline reservation systems.

The justification of multi-tasking — the performance of many jobs simultaneously by one computer — is based more on economics than the need for big computers *per se*. Multi-tasking can still be justified where it is more economic to fulfil applications on one big machine, rather than on a series of small ones. If the applications are up and running, it may also be cheaper to keep them there because of software conversion costs. However, if the applications have not yet been implemented, or have to be updated, or the computer has to be changed, a series of machines performing one or more different tasks can provide a highly resilient, economic and responsive solution.

There are two simple examples of multiples of microcomputers being used to satisfy requirements economically and securely. Firstly, when the tasks become too many for one machine in an office, a second machine can be installed to meet the expanded requirement. Secondly, when the same jobs have to be repeated in different locations, the distributed microcomputer can be the ideal solution. Set up to produce quotations, keep stock, run an estate or personnel agent's office in one location, the microcomputer can be cloned for as many sites as is economically justified.

The essential characteristic of distributed micro systems is that users do not need simultaneous access to the same files. Transfer of floppy disks from one machine to another or telecommunications to a central point is sufficient to satisfy occasional sharing of information. Because we are used to thinking of traditional multi-user file sharing, we too often jump in that direction without examining the options sufficiently. Even micros stacked one on top of the other can provide more resilience and take up less space than one multi-tasking computer.

Where it is vital for a small number of users to share the same files, a multi-user microcomputer can be employed. On 8-bit single processor machines, the practical limit is about four terminals. The multi-user features are achieved in differing ways; for example, by switching from one bank of memory to another, dedicating memory to each attached terminal. On a bank-switching system, the users share disks and operating system. Speed of response depends on disk speeds, sophistication of operating system and the cleverness of the programmer. Hard disks are essential to provide adequate data storage and response and backup should be available by tape or exchangeable disk. More advanced 8-bit multi-user microcomputers provide several processors to support multiple users.

On 16-bit micros with Unix derivatives or own operating systems, the limit is 16 users and the typical load is 6-12. On these machines input/output is a greater limitation than processor capacity since most typically operate with only one disk channel. They are well suited to multi-user information management and word processing tasks where all operators must share the same files but where transaction levels on individual records are not very high.

Where a lot of workstations, data storage and peripherals are needed, the trend is to go to local micro networks. There's a variety of systems available, of ascending capability, which at one end of the scale simply share storage media and at the other end enable users to connect micros-to-minis-to-word-processors-to-mainframes.

The Nestar shared resource system enables connection of a series of Apple computers to a central store of data or programs, thus extending store capacity whilst retaining a computer for each individual user. For example, in an accountant's office, each Apple user could be dedicated to his client's incomplete records processing. When the job was finished the accountant could call the 'group' time recording system on the 'shared' resource and log in the time taken on the job for central charging.

The DSC Hi-Net enables its users to connect 30 intelligent workstations at a series of nodes on the network. Attached devices can be microcomputers, 64k terminals or shared resources — eg, winchester disks and printers. Different activities can be conducted at different nodes on the network — eg, word processing, order processing, stock control. The operation is rather comparable to a multi-tasking computer, except that if one microcomputer on the network goes down the others continue to operate.

Xionics Xibus data management and Xinet networking systems come in the most powerful category of networking systems: those providing a highly resilient, general purpose resource to enable unification of the various computing and digital devices in a large organisation. For example, a Xibus/Xinet user in a company with IBM mainframes, DEC minis, Vydec word processors, Zilog microcomputers and Prestel Viewdata can call down on his workstation a mainframe or mini file, or send data to the micro and word processors and later read pages of Prestel — always provided he has the necessary security clearance and access code for those transactions.

Finally, there are both general-purpose and special-purpose computers being built around multiple micro processors, rather than on one processor, eg, the Triton 4 microcomputer with four processors and Xibus/Xinet with multiple processors. To improve resilience and effficiency and to capitalise on microprocessor costs, tomorrow's special and general-purpose machines are being built on a honeycomb of microprocessors, with each cell performing or duplicating a function, all intricately interconnected.

Existing computer users have a wide variety of options and constraints with regard to microcomputing. Should they: connect micros to mainframes?/use micros as 'linkless' terminals for remote tasks?/use micro networks?/or interconnect micros with word processors, minis, mainframes? The new users also have many options; should they choose multiples of micros, a multi-user micro or a micro network to satisfy their needs? There is no absolute answer for either the existing or new user, other than selecting a reliable system at the bottom end of its capability so that it will grow with your needs. The key words are 'reliable' or 'proven' at the 'lower end' rather than at the extremities of what suppliers claim. These requirements limit choices and ease the process of selection, once the more difficult decision is made about what conceptually will suit present and future needs.

More radical thinking

So far we have taken a traditional approach to the new computing, carefully matching capabilities and limitations with possibilities and constraints. Some managers are more radical in their approach to take full advantage of powerful low-cost micros. Forget for the moment that you are constrained by years in DP and by all the computing paraphernalia your organisation has accumulated. Without those trappings, how would you proceed?

Starting at the baseline in your organisation, you could equip every worker from director to office administrator with a computer which would occasionally connect or feed into a central hub. Everywhere you see a typewriter or find a calculator, install a dumb terminal; everywhere there is a telephone, and a few more places besides, you could put in a micro. Connect them by cables and you have a computer utility. Connect your cable to existing minis, word processors and mainframes and you have closed the loop on existing computing. The technology, products and costs are such that radical-thinking managements are achieving or planning this computing scenario now.

The costs of personal computers are comparable to the costs of quality electric typewriters. A network of microcomputers providing calculating power also facilitates inter-office communication. An 'incompatibles' networking facility of the Xinet class enables you to connect your micros and liquorice allsorts of mainframes, minis, word processors and information services. The choice for the larger organisations lies between allowing a piecemeal approach or developing a rational architecture for the 80s which will fully employ new technologies linked to existing computing.

The sixth commandment of microcomputing

Thou shalt not treat micros as transaction processing machines. Micros are at their best as single-user or multi-function computers on which each user is processing a discrete task. Micros are ideally suited to office systems, time sharing replacement and intelligent workstation tasks. They are not suited to transaction processing where many users want to simultaneously access and update the same files and records — eg, order processing. END

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*

Random numbers

There was a misprint in February's RANDM routine, leaving both the mnemonics and hex code incorrect. As luck would have it, J A Lewis of East Grinstead chose this particular routine to try out on his home-made computer as his introduction to 'Sub Set'. He sent some suitable comments. Sorry J A! The code should have been:

```
RANDM: PUSH AF     ;save                          F5
       PUSH BC     ;registers                     C5
       PUSH HL     ;save original HL              E5
       LD   H,L    ;                              65
       LD   L,+10  ;HL← 256*HL+10                 2E OA
       POP  BC     ;BC← original HL               C1
       OR   A      ;clear carry                   B7
       SBC  HL,BC  ;HL← 255*HL+10                 ED 42
       ADD  HL,HL  ;HL← 510*HL+20                 29
       ADD  HL,HL  ;HL← 1020*HL+40                29
       SCF         ;prepare to add 1              37
       ADC  HL,BC  ;HL← 1021*HL+41                ED 4A
       POP  BC     ;restore                       C1
       POP  AF     ;registers                     F1
       RET         ;return                        C9
```

Another reader more charitably recognised the misprint and sent this improved version of the code, two bytes shorter and 19 T-states quicker:

```
RANDM: PUSH AF     ;save                          F5
       PUSH DE     ;registers                     D5
       EX   DE,HL  ;save HL                       EB
       LD   H,E    ;                              63
       LD   L,+10  ;HL← 256*HL+10                 2E OA
       OR   A      ;clear carry                   B7
       SBC  HL,DE  ;HL← 255*HL+10                 ED 52
       ADD  HL,HL  ;HL← 510*HL+20                 29
       ADD  HL,HL  ;HL← 1020*HL+40                29
       ADD  HL,DE  ;HL← 1021*HL+40                19
       INC  HL     ;HL← 1021*HL+41                23
       POP  DE     ;restore                       D1
       POP  AF     ;registers                     F1
       RET         ;return                        C9
```

This would have made a respectable seeming Datasheet if Dr Brian Ripley of Imperial College of Science and Technology had not written:

'You ask if there are better multipliers: there are! The best reference is indeed Knuth, but the second (1981) edition is needed. He stresses the importance of the *spectral test* which identifies the problems with all generators known to be bad for other reasons. None of a = 257, 765, 889, 989, 1021 or 2009 passes acceptably. High potency is a necessary but not sufficient condition for a good generator. The choice of a = 257 is dreadful, and a = 765 and 1021 are bad. A search through multipliers from 1 to 2001 with a = 1 mod 4 (so the period is M = 2**16) suggests the following, in roughly decreasing order of merit: 293, 389, 1509, 249, 1785, 685.

'Little seems known about the choice of c except that it should be odd. All the more powerful tests look at the whole sequence, which doesn't depend on c. The choice of c = 41 seems as good as any.

'A more serious point is whether 16 bits are good enough. It seems that for serious work they are not. The spectral test looks at the lattice of successive k-tuples $(X_i/M, X_{i+1}/M, \ldots X_{i+k}/M)$. In four dimensions the points of the lattice are at least 1/16 apart, which is very different from the uniform scatter they should have. It would be worth the effort of producing a 32-bit generator. Try a = 69069, 71365 or 100485.

'Unfortunately this is a rather technical subject area in which many mistakes have been made. (See, eg, P J Brown's comments in *'Writing Interactive Compilers and Interpreters'.)* All I can say is that it is one of my research interests and the algorithm used is an improvement on Knuth's.'

So, if we are sticking with our algorithm $X_{i+1} = aX_i + C \bmod 65536$ and 16 bits, we need a routine with 'a' = 1509 (potency of 5, > 655 and < 64880) in order to satisfy all our correspondents. But what about a 32-bit routine with an 'a' of 69069, 71365 or 100485!

This is where W E Thomson of Aldeburgh comes in. For some 20 years he has been unhappy with numbers using a modulus which is a power of 2, because of their non-random nature when you look at the individual bits. For 16-bit numbers and M = 2**16 = 65536, the leading binary digit, bit 15, has a period of 2**16, but bit 14 has a period of only 2**15, bit 13, 2**14 and so on; the 2nd least significant byte repeats every 256 numbers and the numbers are alternatively odd and even.

W E Thomson prefers the well-known r(i+1)=u*r(i) mod M, where M is a large prime and u one of its primitive roots, with u and M chosen to avoid full-length multiplication and division. For 16-bit numbers the obvious choice to him is the Fermat prime 65537=2**16 + 1 and he sends a routine using this for our first Datasheet this month.

He tells us Sinclair uses this modulus in the ZX80/81 with a primitive root of 75. W E's primitive root, 254, lends itself to simplifying the multiplication.

Datasheet

```
;=RNDM-16-bit pseudo-random number generator

;/CLASS:2 (not position independant)
;/TIME CRITICAL?: no
;/DESCRIPTION: generates a 16-bit number from
;/              the series r(i+1)=(254*(r(i)+1)
;/              mod 65537-1
;/ACTION:The 24-bit number p=254*(r(i)+1)-1 is
;/       built up in A & HL thus: Let r(i)=256*
;/       r1+r0; Then since 254=246-2, p=65536*r1
;/       +(256*r0+253)-2*(256*r1+r0)=65536*A+HL
;/       =65537*A+(HL-A)
;/       If HL-A>=0 then r(i+1)=HL-A
;/       If HL-A<0 then r(i+1)=HL-A+65537
;/SUBr DEPENDANCE:none
;/INTERFACES:two bytes of directly addressed RAM,
;/           used to store the previous random
;/           number, r(i), or an arbitrary seed.
;/INPUT:a seed or the previous random number in
;/      store addresses RN,RN+1
;/OUTPUT:the new random number r(i+1) appears in
;/       HL and is also transferred to RN,RN+1
;/REGs USED:A,DE,HL
;/STACK USE:none
;/LENGTH:29
;/TIME STATES:148
;/PROCESSOR:Z80
RNDM:  LD   DE,(RN) ;DE:=r(i)=256*r1+ro        ED 5B XX XX
       LD   H,E     ;                          63
       LD   L,FDH   ;HL=256*r0=253             2E FD
       LD   A,D     ;A:=r1                     7A
       OR   A       ;this & next 4 instrs      B7
       SBC  HL,DE   ;set 65536*A+HL=254*       ED 52
                    ;(r(i)+1)-1
       SBC  A,O     ;it can be shown that      DE OO
       SBC  HL,DE   ;SBC A,O always            ED 52
       SBC  A,O     ;leaves carry clear        DE OO
       LD   E,A     ;                          5F
       LD   D,O     ;HL:=HL-A      (no carry)  16 OO
       SBC  HL,DE   ;   =HL-A+65536 (carry)    ED 52
       JR   NC,+1   ;                          30 O1
       INC  HL      ;                          23
       LD   (RN),HL ;(RN):=HL=r(i+1)           22 XX XX
       RET          ;                          C9
```

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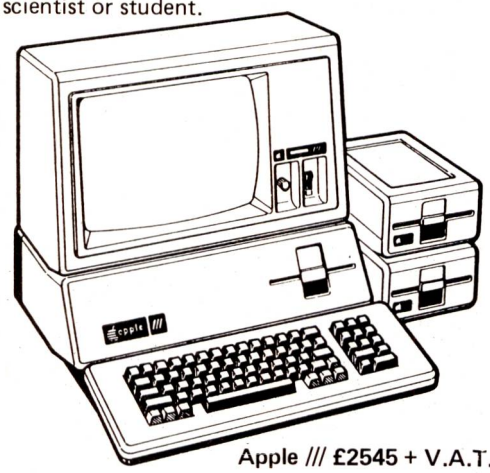

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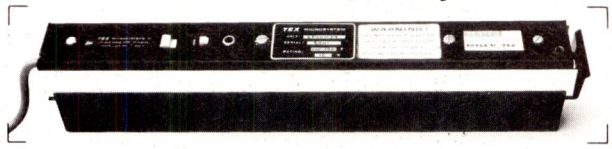

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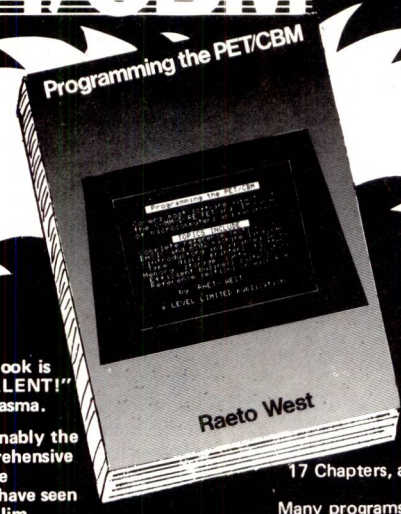

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PCW SUBSET

6502/Z80 check digit

To reduce the chances of miskeying important numbers (say a product number when asking for its price or availability or an account number when asking for its balance) it is common, in business applications, for such numbers to have a check digit added on the end. The check digit is calculated by multiplying each digit of the basic number by a weighting digit from a fixed sequence, adding all the results together, dividing the final result by 10 and taking the one-digit remainder as the check digit.

If, for example, the weighting digits are 1, 3 and 7, a basic number of 2784 becomes 27843 with the check digit, 3, calculated:

```
2 x 1 =  2
7 x 3 = 21
8 x 7 = 56
4 x 1 =  4
       ---
    10) 83

     8 remainder 3
```

If any digit in the number 27843 is entered incorrectly, it is probable that the number will fail the check digit test and the user can be asked to re-enter the number correctly.

At the end of Chapter 8 of his book *Z80 Assembly Language Programming*, Lance A Leventhal sets an exercise to write a routine to calculate a check digit from a string of BCD digits with this weighting 1, 3, 7 mod 10. Our next Datasheet, CADIDZ, from Dave Barrow of Hemsworth, gives the routine to do this in both Z80 and 6502 code.

Datasheet

```
;=CADID-BCD Checksum

;/CLASS: 1
;/TIME CRITICAL?: no
;/DESCRIPTION: calculates checksum (weighted 1,3,7,
;/              mod 10) on packed BCD string
;/ACTION: initialise checksum & multiplication factor
;/        (m) to zero. Iterate for each byte.
;/        Iterate for each digit
;/        Get digit in low-nibble storage
;/        m← m*2+1
;/        m.l.c.← m
;/       if m=7 then m← 0
;/        iterate for m.l.c.
;/        checksum← checksum+digit
;/        checksum← checksum mod 10
;/SUBr DEPENDANCE: none
;/INTERFACES: none
;/INPUT: Z80:HL points 1st byte of string, B=no of bytes
;/       6502: M1,0 points 1st byte, M2= no of bytes
;/OUTPUT: Z80: HL points at string+1, B=checksum
;/        6502: M1,0 points at string+1, M2=checksum
;/REGs USED: Z80: B,HL   6502:M0,1,2
;/STACK USE: Z80: 8   6502: 5
;/LENGTH: Z80: 41   6502: 77
;/TIME STATES: Z80: 87+Av 180 per digit
;/              6502: 134+Av 83 per digit (ignoring page
;/              boundaries)
;/PROCESSOR: Z80   6502

;=CADIDZ- Z80 version
CADIDZ PUSH AF      ;                          F5
       PUSH BC      ;                          C5
       PUSH DE      ;                          D5
       XOR  A       ;initialise checksum and   AF
       LD   D,A     ;mult factor to 0          57
NXTBZ: LD   E,(HL)  ;save byte                 5E
       LD   C,+2    ;set digit counter         0E 02
NXTDZ: PUSH BC      ;save byte & digit counts  C5
       LD   B,A     ;get next digit in         47
       RLD          ;low-nibble C              ED 6F
       LD   C,A     ;and                       4F
       LD   A,B     ;checksum in A             78
       SLI  D       ;m← m*2+1                  CB 32
       LD   B,D     ;additive loop count       42
MADDZ: ADD  A,C     ;checksum← checksum+       81
       DAA          ;(digit*m)                 27
       DJNZ MADDZ   ;                          10 FC
       BIT  2,D     ;if m=7 then m← 0          CB 52
       JR   Z,TDIG  ;                          28 01
       LD   D,B     ;                          50
TDIG:  POP  BC      ;restore byte&digit counts C1
       DEC  C       ;                          0D
       JR   NZ,NXTDZ;                          20 EA
       LD   (HL),E  ;restore byte and          73
       INC  HL      ;point to next             23
       DJNZ NXTBZ   ;                          10 E3
       AND  OFH     ;mod 10                    E6 0F
       POP  DE      ;                          D1
       POP  BC      ;                          C1

       LD   B,A     ;return checksum in B      47
       POP  AF      ;                          F1
       RET          ;                          C9


;=CADIDZ-6502 version
CADIDZ:PHP          ;                          08
       LDX  £4      ;save accumulator          A2 04
PHLP:  PHA          ;and                       48
       LDA  M1,X    ;M5,4,3                    B5 ZZ
       DEX          ;                          CA
       BNE  PHLP    ;                          D0 FA
       STA  M3      ;byte count                85 ZZ
       TXA          ;initialise checksum and   8A
       TAY          ;pointer index and         A8
       STA  M4      ;mult factor to 0          85 ZZ
       SED          ;decimal mode              F8
NXTBS: LDX  £2      ;set digit counter         A2 02
NXTDS: STA  M2      ;save checksum             85 ZZ
       LDA  (MO),Y  ;get byte                  B1 ZZ
       CPX  £2      ;and if                    E0 02
       BNE  NEWDIG  ;high nibble digit         D0 04
       LSR  A       ;shift it                  4A
       LSR  A       ;down                      4A
       LSR  A       ;into                      4A
       LSR  A       ;low-nibble A              4A
NEWDIG:STA  M5      ;                          85 ZZ
       LDA  M4      ;m                         A5 ZZ
       CMP  £7      ;                          C9 07
       BNE  NEWFAC  ;if m=7 then m← 0          D0 01
       TYA          ;                          98
NEWFAC:SEC          ;m← m*2+1                  38
       ROL  A       ;                          2A
       STA  M4      ;                          85 ZZ
       TAY          ;m.l.c.                    A8
       LDA  M2      ;                          A5 ZZ
MADDS: CLC          ;checksum← checksum +      18
       ADC  M5      ;        (digit*m.l.c.)    65 ZZ
       DEY          ;                          88
       BNE  MADDS   ;                          D0 FA
       DEX          ;                          CA
       BNE  NXTDS   ;                          D0 DB
       INC  MO      ;point to next byte        E6 ZZ
       BNE  TEND    ;                          D0 02
       INC  M1      ;                          E6 ZZ
TEND:  DEC  M3      ;                          C6 ZZ
       BNE  NXTBS   ;                          D0 CF
       AND  £OF     ;mod 10                    29 0F
PLLP:  STA  M2,X    ;return checksum in M2     95 ZZ
       PLA          ;and restore M3,4,5        68
       INX          ;and accumulator           E8
       CPX  £4      ;                          E0 04
       BNE  PLLP    ;                          D0 F8
       PLP          ;                          28
       RTS          ;                          60
```

I hardly dare draw your attention to the sly use in CADIDZ of the non-existent SLI (shift left and increment) instruction. But what more perfect application of it could there be than to implement m ← m * 2 + 1 in calculating check digits with a 1, 3, 7 weighting specified by Levanthal ?

Nobody reported non-execution of the mystery op codes CB 30 to CB 37, when we asked in Feb 81. But if any reader has a Z80 processor which doesn't execute SLI D, let us know and we will apologise.

Extra instructions-Z80

The code printed in April for LD HL,(HL) is improved by Roger Hargrave of Crawley to:

```
PUSH DE        ;D5
LD   E,(HL)    ;5E
INC  HL        ;23
LD   H,(HL)    ;66
LD   L,E       ;6B
POP  DE        ;D1
RET            ;C9
```

Roger asks why not a LD DE,(DE) and gives:

```
PUSH AF        ;F5
EX   DE,HL     ;EB
LD   A,(HL)    ;7E
INC  HL        ;23
LD   H,(HL)    ;66
LD   L,A       ;6F
EX   DE,HL     ;EB
POP  AF        ;F1
RET            ;C9
```

or a LD BC,(BC) not so conveniently coded as follows:

```
PUSH AF        ;F5
LD   A,(BC)    ;0A
PUSH AF        ;F5
INC  BC        ;03
LD   A,(BC)    ;0A
LD   B,A       ;47
POP  AF        ;F1
LD   C,A       ;4F
POP  AF        ;F1
RET            ;C9
```

LISP

Michael Liardet spent several years as a research worker in artificial intelligence and computer aided design and has worked for the last two years as a systems consultant for a well-known microcomputer systems house. Here he presents an overview of one of the most fascinating of computer languages.

In this article I shall present the background and a basic introduction to the programming language Lisp. As a motivation for the readers who doubt that Lisp can hold any advantages over their own favourite language, I shall wind up with an almost trivial Lisp program that would be a fairly daunting project in most other programming languages: the symbolic differentiation of an arbitrarily complex mathematical expression.

Lisp is a programming language widely used in artificial intelligence research but now available to the more general public through various implementations on micros. Lisp is an acronym for LISt Processing and, although not quite the earliest list processing language, it is certainly the earliest one that is still with us. Designed by John McCarthy and implemented by him and his students at Massachusetts Institute of Technology, the language has been around for over 20 years now, which certainly pre-dates the more familiar Basic and Pascal (both from the late '60s).

In these last 20 years, Lisp has been used on a wide variety of fascinating research projects such as computer chess, natural language understanding, automatic theorem-proving and even program correctness verification. In addition, it has spawned a number of other languages, most of them not widely known outside the AI community, including languages like Prolog and Pop-2.

The language has not been greatly used outside academic circles but this is due more to general unawareness of it rather than some intrinsic flaw. Certainly the language could be extremely useful in, for example, the implementation of a database system where complex relationships and interrogations need to be handled. It could be a highly relevant language in other applications, too, but it does not look as though the great mass of Fortran/Cobol/Basic programmers are going to be reaching for their Lisp manuals just yet!

Lisp completely outclasses the better-known languages when symbol processing and complex data structures are required. It's ideal when ideas need to be quickly coded up, tested and re-evaluated, etc. (Once the ideas have been shown to work, the solution can, if necessary, be re-coded in some other language which can execute them more efficiently — most of the super-fast machine-code chess programs are based on principles first explored by Lisp programmers.) Most Lisp systems, mainframe and micro alike, are fully interactive and generally interpretive rather than compiled, just like Basic in that respect at least! An interesting historical note: a lot of the pioneering work in interactive multi-user mainframes was based around Lisp systems.

Following its strong emphasis on symbol processing, Lisp tends to pay lip-service (Lisp service?) only to number-crunching facilities. So if you want to have some fun with matrix inversion (does anybody?) then you had better stick to Fortran and friends. If, however, you want to experiment and possibly break new ground with some AI project, or even if you are just interested in learning some new programming techniques and concepts, then there's a whole new world awaiting you!

Before embarking on a quick run-through of the Lisp features, a word of warning to the experienced programmer: Lisp is likely to have next to nothing in common with any previous language of your experience. Thus learning Lisp is almost like learning to program all over again! This is not going to be particularly discouraging to someone who cannot yet program anyway but does place a higher than expected learning curve in front of someone who is expecting it to be as easy as, say, a transfer from Fortran to Basic.

So much for the background; but what is the language like to use? The first sight of a Lisp program is, to put it mildly, likely to be slightly discouraging. With its vast numbers of parentheses and curious terminology, the language looks almost as unreadable as APL. (Incidentally, it has at least one other feature in common with APL — the fanaticism of its converts!) Anyway, bear in mind that beauty is only skin-deep and try not to be put off by superficialities. The language has great beauty and elegance underneath all those parentheses! For example: just about everything, from a simple arithmetic expression through to conditional expressions or even complex function definitions, is based on the same underlying structure: the list! As the data is also generally represented in lists, some very useful possibilities start to emerge — for example a program to modify a program can be written as simply as a program to modify a data structure. (If you are wondering why you should need to do that then ask yourself what a program (as opposed to *PCW!)* editor is? (By the way the Lisp lesson has started (basic training in the use of '('s (and ')'s too!))))).)

To get some sort of feel for the language let's see how you might translate a relatively simple Basic statement into Lisp. We will break down the translation into simple stages. Of course the intermediate stages are for explanatory purposes only and don't resemble any programming language yet devised! Let's try:

IF A+B=2 OR C*D< 5 THEN E=C—D

If we now introduce brackets everywhere, to make the order evaluation absolutely explicit (in Basic, order of evaluation in expressions is implicitly determined by operator precedences):

(IF (((A+B)=2)OR((C*D)<5))
THEN (E=(C—D)))

Next we re-name most of the functions with rather more lengthy names. Note that IF... THEN translates as COND, '<' as LESSP and the assignment '=' as SETQ. We won't bother if we now have to write the expression on several lines, as Lisp always ignores the way a program is laid out, and just relies on the parentheses to determine when expressions begin and end:

((((A PLUS B) EQ 2) OR ((C TIMES D)
LESSP 5)) COND
(E SETQ (C MINUS D)))

Now there is only one step left to reach Lisp. All the functions, currently lying between their arguments, are moved in front of their arguments and one extra pair of brackets (just after COND) is introduced.

Lisp uses 'prefix' notation; to add 2 and 2 we say PLUS 2 2. So the actual Lisp translation looks like this:

(COND ((OR (EQ (PLUS A B) 2)
(LESSP (TIMES C D) 5)
(SETQ E (MINUS C D)))

The extra brackets (mentioned above) must be introduced to allow for the fact that the Lisp COND is more general than Basic's IF... THEN. Most Lisps support:

(COND (test1 do this)
(test 2 do this)
etc)

This is the IF... THEN... ELSEIF structure and thus (COND test1 do this) would be a correct translation.

Having seen what a fragment of Lisp code looks like, now let's look at a fragment of Lisp data. Let's suppose we need to represent details of various people's names, ages and sex. (Imagine we have written a program to organise the seating at a dinner party or some similar style of problem uncomplicated by disk accesses or validations, etc.) Under these circumstances, in Basic we would probably choose to set up the details in DATA statements and then initialise pre-dimensioned arrays with these details. The Lisp way of doing this would be:

(SETQ PEOPLE '((BASIL 32 M)
(CYNTHIA 30 F) (JOHN 28 M)))

The variable PEOPLE is assigned (SETQd) a list of length three (it could easily be much longer), each element in the list itself being a list of length three. A list is defined by enclosing its elements ('atoms') in parentheses. Notice the small quote '" just before the start of the list. This single character is really all that is needed to distinguish between program and data. It means that the list following is to be treated literally and not 'evaluated' — to use the Lisp jargon. In contrast, a list like (PLUS 2 NUM) would not generally be quoted as normally we would be expecting Lisp to evaluate it to the number two greater than NUM. Notice also that there is no closing quote — the parentheses determine the extent of the quotation.

Now, suppose we need to access details of the first of the PEOPLE. What is required is the front or head of the list held by the variable PEOPLE. The Lisp function CAR returns the head of a list and so (CAR PEOPLE) will return (BASIL 32 M). The sister function to CAR is CDR which will return the rest of a list without its head. These two functions used in combination allow any part or sub-part of a list to be accessed — eg, CAR (CAR (CDR PEOPLE))) returns CYNTHIA. The terminology CAR and CDR by the way, is a hangover from the original terminology where these functions were encoded using Contents Address Register and Contents Decrement Register machine instructions. The probable reason for them still being in use today is that it is absolutely trivial to set up alternate names — just SETQ CAR or CDR to name of your choice and use that instead!

Before moving on from the data structuring, there is only one other major Lisp list function to cover, CONS, which constructs lists, Thus if we want to add another person, say (JEAN 21 F, to PEOPLE then we use CONS to construct a new list whose CAR (ie, head) is (JEAN 21 F) and whose CDR (ie, tail) is the old list PEOPLE. The new list is simply SETQd (ie, assigned) to PEOPLE which will henceforth have a list of length four rather than three. In case you can't work this out for yourself the code to do this is:

```
(SETQ PEOPLE (CONS '
(JEAN 21 F) PEOPLE))
```

At this point we have covered enough ground to start on a simple Lisp function — a function to determine the length of a list. A Lisp function, by the way, is almost directly analogous to a Basic function, which is usually restricted to being an expression. In Basic this amounts to a very severe limitation, since conditionals, loops and so on are not counted as being expressions, but in Lisp things like COND, as we have already seen are not greatly distinguished from things like PLUS and so function definitions are not really limited in Lisp at all.

It is possible to determine the length of a list by setting a counter to zero and then repeatedly CDRing the list and incrementing the counter until there is no list left to CDR (Lisp calls such a list NIL — equivalent to a pair of parentheses with nothing between them). This sort of approach is an iterative solution but we shall consider an alternative recursive solution: to find the length of a list, find the length of its tail and add one. If it doesn't have a tail, (ie, it's NIL) then its length is zero. The essence of a recursive solution is that it doesn't 'try very hard' to solve the problem but just simplifies it enough to call upon itself again to solve the simpler problem and so on until the solution is transparently obvious (when the list is NIL the answer is 0). Without further ado, here is the code for LENGTH (DE is the function defining Function, called DEFUN in some dialects):

```
(DE LENGTH (LIST)
  (COND ((EQ LIST NIL) 0))
     (T (PLUS 1 (LENGTH
(CDR LIST))))))
```

You may wonder how a Lisp function returns a value. Well, in this particular instance, LENGTH will return either 0 (if (EQ LIST NIL)) or (PLUS 1 (LENGTH (CDR LIST))) (if it isn't, T means 'true' and will always satisfy a conditional).

Basic programmers who may not be familiar with recursion should try and master it. Most interesting applications of Lisp rely heavily on recursion and an iterative technique very rarely works as well. For example, many games programs use a variant of the recursive algorithm — to evaluate the current position generate, in turn, every possible move to modify this position and evaluate the new position (recursively). The value of the position is the value of the best possible continuation.

Well at this point we have really come far enough to demonstrate the promised program to differentiate symbolically an arbitrarily complex mathematical expression. First a quick refresher course for those whose O-level maths has got a bit rusty (using DIFF to mean 'differential with respect to x') — see Figure 1.

The Lisp implementation of differentiation is almost solely a syntactic translation of the above, substituting Lisp symbols for mathematical ones and using the standard Lisp 'grammar' of prefix function operators, rather than the infix — see Figure 2.

```
(DE DIFF (X)
(COND
 ((EQ 'X X) 1)
 ((ATOM X) 0)
 ((EQ (CAR X) 'PLUS)
  (CONS 'PLUS (CONS (DIFF (CADR X)) (CONS (DIFF (CADDR X)) NIL))))
 ((EQ (CAR X) 'MINUS)
  (CONS 'MINUS (CONS (DIFF (CADR X)) (CONS (DIFF (CADDR X)) NIL))))
 ....
 (T 'UNKNOWN)))
```

Fig 2

```
DIFF (A+B) = DIFF (A) + DIFF (B)
DIFF (A-B) = DIFF (A) - DIFF (B)
DIFF (A*B) = A*DIFF (B) + B*DIFF (A)
DIFF (A/B) = (B*DIFF (A) - A*DIFF (B))/B²
DIFF (Aⁿ) = n*(Aⁿ⁻¹)*DIFF (A)
DIFF (n) = 0
DIFF (X) = 1
where A and B are expressions in X and
n is a constant
```

Fig 1

Not all of the definition of DIFF has been included here. The rules for *, / and powers should be inserted as '. . .'. Briefly the definition can be read as:

To define differential of x:
If
1 x is in fact 'x' then return 1.
2 x is not a list (and it can't now be 'x') then return 0.
3 x's head is 'plus' (and it must now be a list) then return a list of the form (plus (diff of 2nd element of list) (diff of 3rd element of list)). NB:CADR, etc, is the abbreviation of CAR(CDR.
4 x's head is minus then return a list of the form (minus (diff of 2nd element of list) (diff of third element of list)).
5, 6 & 7. An exercise for the reader!
8. If all else fails then return 'unknown'.

To use this function (assuming by now you have (a) rushed out to buy a Lisp system and (b) typed it in), just enter:

```
(DIFF '(PLUS (TIMES X 3)
(quotient 4 X)))
```

If everything is okay the system should immediately respond with the answer. Notice how, although the answer is mathematically correct, it is not in its simplest form, containing subexpressions like (TIMES 1 3) where 3 would do just as well, etc. Well, I didn't promise a simplification of a symbolic differentiation, did I? In any case it leaves you with a nice little follow-up exercise! Or alternatively (if your version of Lisp supports floating point arithmetic), you can use this routine without simplification in, for example, a numerical analysis program which would otherwise expect the differentiation to be done by the user (eg, Newton's method to find the roots of an equation) — a touch of irony for Lisp to be useful in numerical analysis!

Finally, for any reader who has been stimulated to the point of buying a Lisp system, here are the best known currently available (but not reviewed!):

Owl Lisp — for Apple II. (My thanks to Owl for lending me a copy — the system worked very reliably and the examples above use the Owl dialect.)

Mu-Lisp — a Microsoft product for CP/M systems.

Mu—Simp — Ditto with simplification facilities. END

BENCHTEST SOFTWARE

DBMS2

A SCREEN-BASED DATA MANAGEMENT SYSTEM

Kathy Lang continues her series of database reviews

DBMS2 is a set of programs written in Basic to run under the CP/M operating system. It provides facilities to store and access data in individual files and also some linkage among data fields in different files. It is produced and supported by GW Computers of London, who supplied my review copy. GW also markets an accounting suite based on the same approach, with a similar user image.

DBMS2 uses a 'driver' file, called VOCAB file, to keep track of the characteristics of all the data files it currently knows about. So, to use a data file, you must have appropriate entries in a VOCAB file on the program disk. This file contains the names of all the files currently available, and information about their structure. When the main DBMS2 program is first loaded, it displays a menu on the screen; the first 12 items show the names of data files held in the current VOCAB file. The menu also contains a list of functions which are available before a particular data file has been selected for processing: a typical main menu is shown in Figure 1.

The main DBMS2 program carries out functions such as data input, editing, retrieval and update. Special functions, like sorting, are carried out by separate programs. Once the particular program you need has been loaded, you can dispense with the program disk until you need to change programs — the only necessity is to have a valid VOCAB file available for the program to use. Once you have selected the current data file, each program prompts the user to choose among processing options for the required responses in sequence, requesting a single character response — Q for Quit, R for Random access (by record number) and so on. This prompting is hierarchical, so that once you have, for instance, selected a type of access, your only alternatives are either to continue responding to each prompt in turn or to Quit to the main menu. (A diagram showing part of the prompt system as it looked to me is shown as Figure 2.) There is no provision to allow the experienced user to override the prompting mechanism.

DBMS2 stores information in fixed length records; each record in a single file must have the same structure. The basic unit of data display for both input and retrieval is the screen. Each record is displayed on a single screen, one field per line and one record per screen. Records are stored using Basic random access files, so that access to records by record number is extremely fast, but is less quick when retrieving by other fields, unless the data file has previously been sorted.

Constraints

Records in DBMS2 may contain up to 1400 characters, and files may have up to 32,000 records; within those limits, the total size of any one data file can be as large as the physical disk or the operating system permits, whichever limit you hit first, provided you leave enough space for the VOCAB file. Subfiles, that is files containing subsets of the main data file created by running a selection option on the main file, may contain records not more than 250 characters long. Because data file names are stored in special locations in the VOCAB file, and displayed in the main menu, you are limited to a maximum of 12 types of files on any one disk. Names of data files may not be more than eight characters long, including the two character drive prefix where the file is on drive B (which is of course a greater limitation than that imposed by CP/M, where file names may be eight characters long excluding the drive prefix).

In the current version of the package, a record may contain up to 20 fields, and the total length of each field and the 'label' used to describe it must not exceed 70 characters. A subsequent release of the package, due out in the late summer of this year, is likely to permit at least 100 fields per record.

Input and updating

Data file creation involves providing the VOCAB file with the necessary entries describing the structure of the records in the file. DBMS2 provides a program which prompts for the appropriate responses, or you can edit the VOCAB file directly — not a process I'd recommend, even for the experienced user, as it is very easy to get it wrong. For each field, you can specify whether it is to be text or numeric and, if the latter, whether its validity is to be checked on input. You must also specify the field length. There is no specific date format, so dates have to be entered in year/month/day order as ordinary numbers if you are likely to need the records sorted in date order.

Records are stored in order by the record number, which must be included as one of the fields in the record. Record numbers need not be consecutive or start from 1, so you can use an existing numbering scheme provided the numbers don't exceed the limit of 32767 imposed by MBasic. However, if you do want to use consecutive numbers, you can make use of the prompt that DBMS2 gives you, displaying the next 'free' record number. To put records in the file, you respond to the main menu with the number of the file you want to access, request random access and then give the number for the record you want to insert. A blank record is displayed on the screen, one line per field, using the labels specified in VOCAB. Amending is carried out in a similar way — you specify the record you want to amend, using one of the access methods outlined in the next section, the record is displayed, and you can then edit any fields which need changing by retyping them. When creating a sequence of records which have a few common entries, you can cause the common fields to be carried over without having to type them again. If two records are very similar, you can call up the existing record by number, overtype the number and make the necessary changes and store the record, whereupon the new version will be saved without affecting the original record.

So much for inserting and amending records from the keyboard. To get data into DBMS2 from other programs — for instance, to import straight ASCII data files — you have to write your own Basic program to rewrite the data to a Basic random access file. I wrote a program to do this quite quickly for my benchtest data, but you do need the necessary understanding of Basic programming. Having converted the data, you simply amend the VOCAB file to

reflect the new file's name and record structure in the usual way.

However, utilities are provided to get data out of DBMS2 into sequential format, and to reconfigure DBMS2 files to have a different record structure, although I didn't get a chance to try these out.

Displaying data

Data records are always displayed in the same format, with the name of each field down the screen and the value alongside it (sometimes accompanied by totals — see the Calculations section later). You can get access to particular records in four ways. If you give the record number, DBMS2 will go directly to the record in question. If the file has been sorted on a particular field, then you can request keyed access via that field; this just means that the program utilises the fact that the data has been sorted on the field in question to use a binary search technique to find the right record with a small number of reads — for instance about 10 reads for a file of 1000 records.

Where you need to access records on the basis of other fields, sequential access is necessary, that is each record is read in turn in the order in which it is stored. In this case, all the records may be read, or a subset selected. Whichever access method is used, after displaying the requested record you can then scroll forward or backward from that point in the data file, for instance, displaying the records with record numbers immediately next to that of the current record, but to access another record directly by number or key involves quitting the current search, reselecting the file from the main menu and requesting the access method all over again.

In addition to the methods of accessing records by field values, it is also possible to make an explicit relationship between one record and another in the same file, or between a single record in one file and a corresponding record in another. This is achieved by having at the beginning of a data field a pointer consisting of the number of the file and of the record to which the linkage is to be made. This could be a quite useful and powerful facility; for instance, if you had two files of information about the same people — say one containing their accounts information and another their names and addresses — you could use the same record number for someone in each file, and have a field in each record referring to the equivalent record in the other file. This would enable you to make connections between related records in different files without going back to the main menu.

However, since the relationship must be set up individually, the facility would be much less useful if you wanted, say, to link two dissimilar files with one common field, for instance a product file and a supplier file where only the supplier identifier was common to the two files. The other constraint is that while you may use an ordinary data field for this purpose, and have it contain raw data too, by delimiting the pointer with the special characters '!C' (which does of course prevent you having this combination in your data if you use cross-referencing) the manual advises against doing this. But to use a field or fields specifically for this purpose would limit the user even more in terms of the number of data fields available.

All these methods of displaying your data are exclusive, in the sense that once you have opted for a particular form of access — random, keyed, sequential or cross-reference — to change the mode of access involves quitting and selecting the data file again from the main menu.

Reporting

Reporting on complete files is achieved by creating a print mask which dictates the layout of the printed report. Two types of mask are available: for the simpler version, you specify the number of fields you want to print and the width of the printed page. The program divides that width by the number of variables, allows that figure as the width for each column of printing, and prints each value centred within the column. The second type of mask enables you to specify the column number to which a value is to be right-justified when printed. In either case, you can set up headings, and ask for actual field values (referring to fields by number), for computed values, and for accumulated totals to be printed. Where computations or totals are required, the rules by which the values are to be calculated must have been set up in advance, using the 'compute functions' call from the main menu. There are no facilities for sub-totals when field values change.

In addition to printing all or parts of a file using a mask, you can request a printout of a record as you run through the file using any of the permitted display access methods.

Selecting sets of records

When using sequential access, you can define one or more criteria by which to select particular records for display or printing. Selection can operate over all the records in a file, or a subset specified can be specified by record number. The criteria can be defined when you select from the file, or in advance and saved in a text file and recalled when needed. If you just want to select a record where one field has a particular value, you can specify exactly that. If you want something more extensive, you are presented with a screen display of the record structure, and must specify selection criteria for each field in turn (carriage return allows matching any value) — ie, you must specify whether or not you want to select on each field, rather than just specifying those fields on which you *do* want to select. With a maximum of 20 fields per record, this is not a serious problem, but when that maximum is increased it could become a great nuisance.

The process of specifying selection criteria has some highly esoteric features. One of the options available allows you to specify identity with one or more constants within a field (eg, to ask if a name is equal to SMITH or JONES or BROWN). You request this by typing a question mark followed by the first value you want to match, then another question mark followed by the second value and so on. When you type the second question mark, the cursor moves back to the beginning of the test field,

```
01= CUSTOMER FILE                13= - - - - - - - - - - - - - - - - -
02=STOCK LIST                    14= - - - - - - - - - - - - - - - - -
03=PARTS LIST                    15= - - - - - - - - - - - - - - - - -
04=OUTSTANDING ORDERS FILE       16= - - - - - - - - - - - - - - - - -
05=JOB COSTS FILE                17= - - - - - - - - - - - - - - - - -
06=CUTTING LIST FILE             18=PARAMETER SECTIONS
07=PERSONNEL FILE                19= - - - - - - - - - - - - - - - - -
08=PENSIONS LIST                 20=COMPUTE FUNCTIONS
09=SUPPLIERS FILE                21=FILE MAINTENANCE
10=SCHEDULING DATA FILE          22=CALL OTHER PROGRAMS
11=FILE TYPE '11'                23=AUTOMATIC DRIVE
12=FILE TYPE '12'                24=EXIT SYSTEM
```

Fig 1

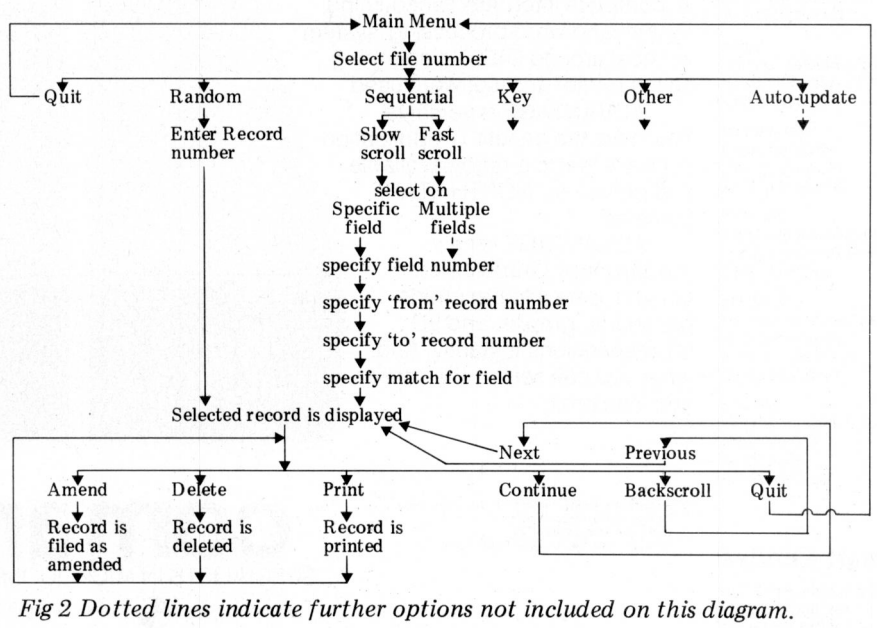

Fig 2 Dotted lines indicate further options not included on this diagram.

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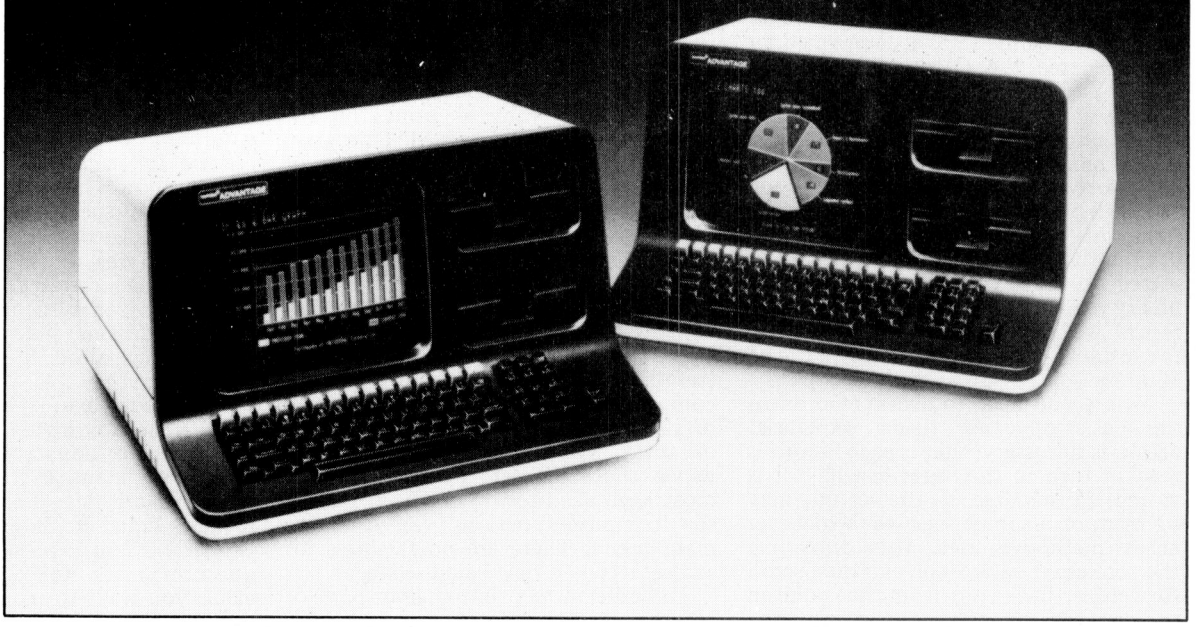

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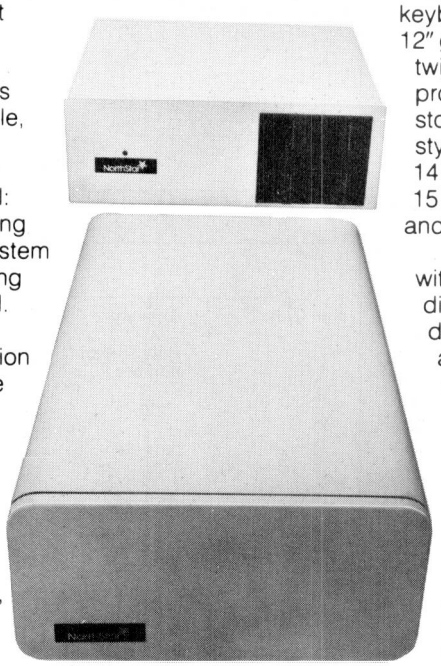

For the technically minded, ADVANTAGE is a 4MHz, Z80A™ based microcomputer with 64K dynamic RAM, a 20K Byte display dedicated RAM, plus 2K Boot PROM.

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so that the second value overtypes the first. Thus you don't see all the possible matches you've selected for that field, only the match most recently entered.

'Identity' in this context means 'identical with or contained within'; for example, a request to match 'SMITH' would also match 'SMITHSON' and 'ARROWSMITH'. This means that if this test were used in an attempt to select all records with a numeric field identical with '1' the program would match values of that field such as '12', '212' and so on, as well as just '1'. There is a different test for matching a number exactly, but no equivalent is available for text fields. Fields may also be tested for being greater than or less than a numeric value (these comparisons don't seem to work with text fields; the program doesn't complain, but it doesn't find the records with matching fields either) and for being not identical with a value. Apart from the special case of textual identity, you can make only one test on each field, so that I could not, for instance, find a way to test for a numeric field having a value within a range. The results of the tests on each field are ANDed together, except that it is possible to OR a pair of results where the test for each is identity with a constant.

It is also possible to store in another file the records which a set of tests select, provided the subset which results does not contain more than 250 records.

Sets of selection criteria are stored in ordinary text files, so if you understand their format you can edit them as you might any CP/M text file.

Sorting records

DBMS2 has two sort programs available — a memory sort and a disk sort. They can be invoked via the 'call other programs' option on the main menu. The memory sort is restricted to quite small files but the disk sort, though much slower, allows you to sort a file as large as the disk can hold. This is because if you specify the same file name for source and destination files DBMS2 uses an interleaving technique so that the sorted file overwrites the source file. Sorting is allowed on only one field at a time, so that to sort on several fields you would have to do one sort for each field starting with the least significant. Of course, you may have as many sorted versions of the raw data file as you like, one for each field on which you might want keyed access. You can specify all or part of the field to be used as a sort key, but as far as I could tell sorting was always in ascending order.

Once sorted, a file can be used through the keyed access method by matching against the field on which the file was sorted. However, the program takes no steps to ensure that if the parent file is changed the sorted versions keep in step — you just have to re-sort the data file, which is a slow process for a file of any size. This, of course, is a criticism which applies to all the packages I have reviewed so far. But it is of greater significance with DBMS2, as it is only by sorting the whole data file that you can have keyed access to fields other than that containing the record number. Without any facility for creating indexes which relate field values to record numbers, the user must rely heavily on full sorts to permit direct access to individual records.

Calculations

DBMS2 provides the means to do three kinds of calculation. You can carry out simple calculations on the values of particular fields and display the results when the record is displayed, or store the results in another field — for instance, you can update the old price of stock by 5 percent and place the old price in another field in the record. You can also accumulate values across records. These calculations can be displayed when you show records on the screen, or when printed out. The ability to display fields, calculations derived from them and accumulated totals all at the same time reflects the accounting background of the parent package.

The kinds of calculation you can do contrast curiously with the selection criteria you can set up for sequential record access. With selection, you can test values only against constants and not against the values of other fields. With calculations the opposite is true: you can perform calculations only with respect to field values and cannot, for example, add a constant to a field. Calculations allowed include the ability to add, subtract, multiply and

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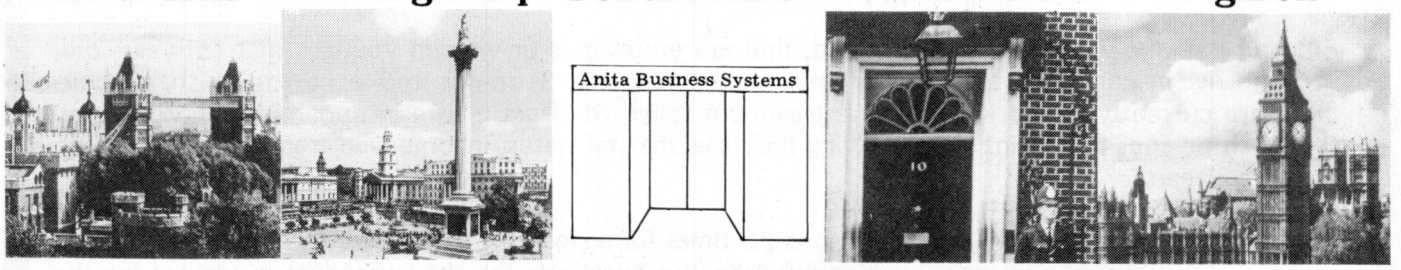

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*** THE NEW DBMS (DATABASE) ***

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	Budgetting	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 contains a W or X or Y or Z, who is either in London or Birmingham, and available for work at a salary of less than 10,000.000; 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 wharehouse 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 50lbs. **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 **7 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!!

THE NEW RELEASE DBMS 2a

In the time with the bechtest article in Personal Computer World on pages 138-143 , we append our notes regarding some subsequent implementations arising from constraints referred to by Dr Lang.
Version 2a has now the following new features:
a. All fast output to screen or printer has a pause sequence that stops output at a prompt that enables the user to either continue, amend, jump, or quit.
b. A default to all records option exists now which precludes the need to specify a record range when searching files.
c. The runtime module BRUN.COM is now no longer needed on the master disk.
d. It is estimated that by the time this article comes to press, the program will have the ability to create records of up to 100 fields, and that a full screen form generating module will be implemented to simplify the creation of file architectures.

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DBMS2

divide one field by another, to add or subtract from a field a percentage of that field, and carry out some standard functions such as squaring the value of a field.

Security

The package provides a facility for copying to the printer every record as it is input or updated. Apart from this transaction logging, DBMS2 does not provide any security facilities such as password protection of files or masking of record display so that only some fields are seen.

Tailoring

Because the program keeps all its prompts in the VOCAB file along with the record structure information, they can be easily changed if the user wants to make them more appropriate to his environment, for instance by translating them into another (human) language. Otherwise, tailoring depends on the user's ability to write Basic programs.

Stability and reliability

The package is regularly updated, and users who keep in touch with GW get updates, at present free of charge. The version of the package I had seemed reliable; I managed to produce its catch-all error message several times (you are asked to record the Basic error message number given and reload the program) but never in situations which caused me to lose data.

User image

As usual with these reviews, I shall try to distinguish comments on the appearance of the package itself from the way the package is described in the manual. I should also emphasise that GW says it is not aiming at the naive user but at people who are already reasonably knowledgeable about computing. However, I think that even experienced people will have some difficulty with the inconsistencies of the user image and the lack of any coherent model, either explicit or implicit, by which to deduce the way instructions are formed. A good example is the contrast I noted between expressions for calculation and for selection. On the other hand, the programs don't provide short-cuts for experienced users, for instance to enable the user to specify all parameters required by a routine at once, instead of having to respond to prompts one at a time.

I eventually learned to avoid the dangers of trying to build on experience in one part of the package to work out how to use another, and an experienced user should be able to cope. I found the package much easier to use when I'd drawn a diagram of the routes the prompt mechanisms appear to take, part of which is shown as Figure 2.

However, the user image also has some merely irritating features. Those I encountered included not always being able to 'quit' (ie, get back to main menu level) from every prompt level, having to type the prompt characters in upper case (lower case letters are met with a bleep), and the vagaries of the selection process. These included the over-typing of the 'OR' responses I've already mentioned, and the fact that one does not have the option of editing the selection before it is stored. Another great nuisance is the necessity to specify the range of records over which you wish a selection to operate — the package doesn't let you default this to 'all records' but requires you to specify the lowest and highest numbers each time. Just as irksome is the inability to terminate a selection once you've started it — if, for instance, you realise too late that you've mistyped a value, and no match of the selection will be found. Since CTRL-C is (sensibly) disabled and no alternative mechanism provided, you just have to let the package find out by reading every record — and that's a long time to hang about for a large file . . .

I got away to a bad start with the documentation, as the page numbering, though ordered, followed no obvious pattern. In one chapter, for instance, the pages run 040,050,051 to 057,060, 070 . . . I worked out how to cope with that in the end by making my own table of contents, which also helped me to live with the fact that the lack of a coherent user image for the package itself is more than reflected in the manual. Rather than comment on the documentation in detail, I've included a couple of quotes so that readers can judge it for themselves. The first relates to the thought processes the user is expected to go through when considering altering file structures: 'The probative exercise will pass you through the stages of conjecture, as you learn by error; until you reach a true epistemological contact with your object. That will be the stage when you are in effective control, knowing and understanding the nature of the medium you are involved with.'

The other quote is from a section telling the user how to set up file structures: 'Having decided upon a system of limited lengths and restricted inputs, you will insert a number of such records into the file and they will actually be recorded as a continuous set of characters seated side by side in one long string, separated by a "FIELD" statement after each line finish. When the file is subsequently read, it is in a manner that accounts for the field statements and understands that each is a field separator. When reading twelve such fields it is clear that the next read will be at the commencement of field 1 of the next record.'

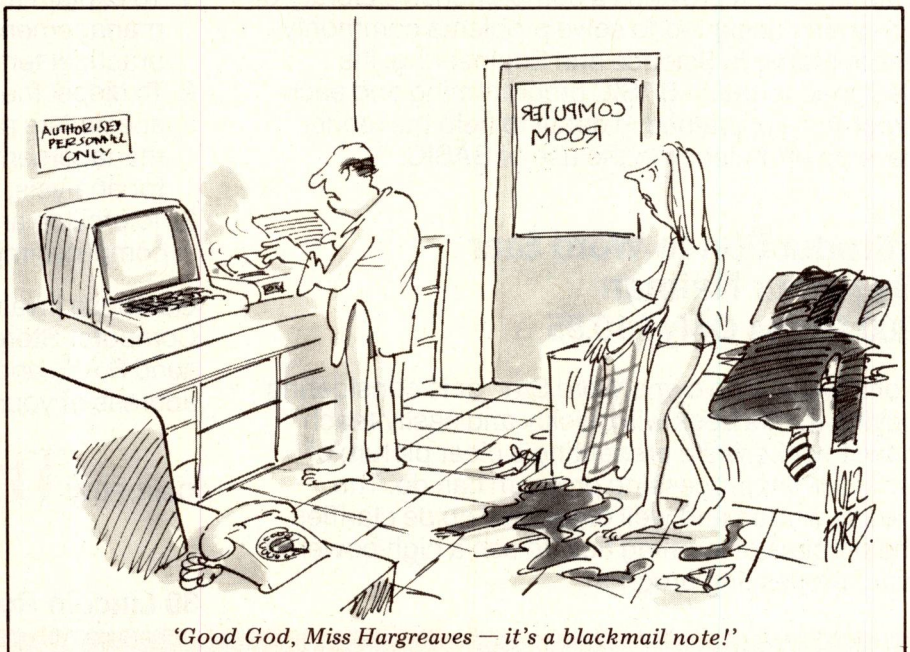
I've tried to choose representative quotations, but they are of necessity out of context and readers should of course make allowances for that. GW is in the process of adding to the manual a set of nine 'lessons' to help new users; the first three were available when I tested the package and they are an improvement.

Costs

The latest version of DBMS2 costs £575 including MBasic (some features, such as the program which allows you to set up new file structures, require Basic to run). Even allowing for the inclusion of Basic, this makes the package as expensive as most of those I've reviewed so far.

Conclusions

DBMS2 provides facilities for creating, updating and accessing files in a limited way. At present, the user may have only 20 fields per record. File access is restricted to direct access by record number, keyed access by sorting on a single key field, sequential access, and cross-reference between fields and among fields by explicit, individual linkage. Its selection and sorting capabilities are also rather limited. But it does give the user access to almost the whole of both disk drives for data storage, since the whole main program lives in core. It would also have particular application where the types of processing required are close to those used in the accounting suite from which it derives. The package is supplied and supported from London by its originator, GW, and whenever I had queries I found the company extremely helpful. END



'Good God, Miss Hargreaves — it's a blackmail note!'

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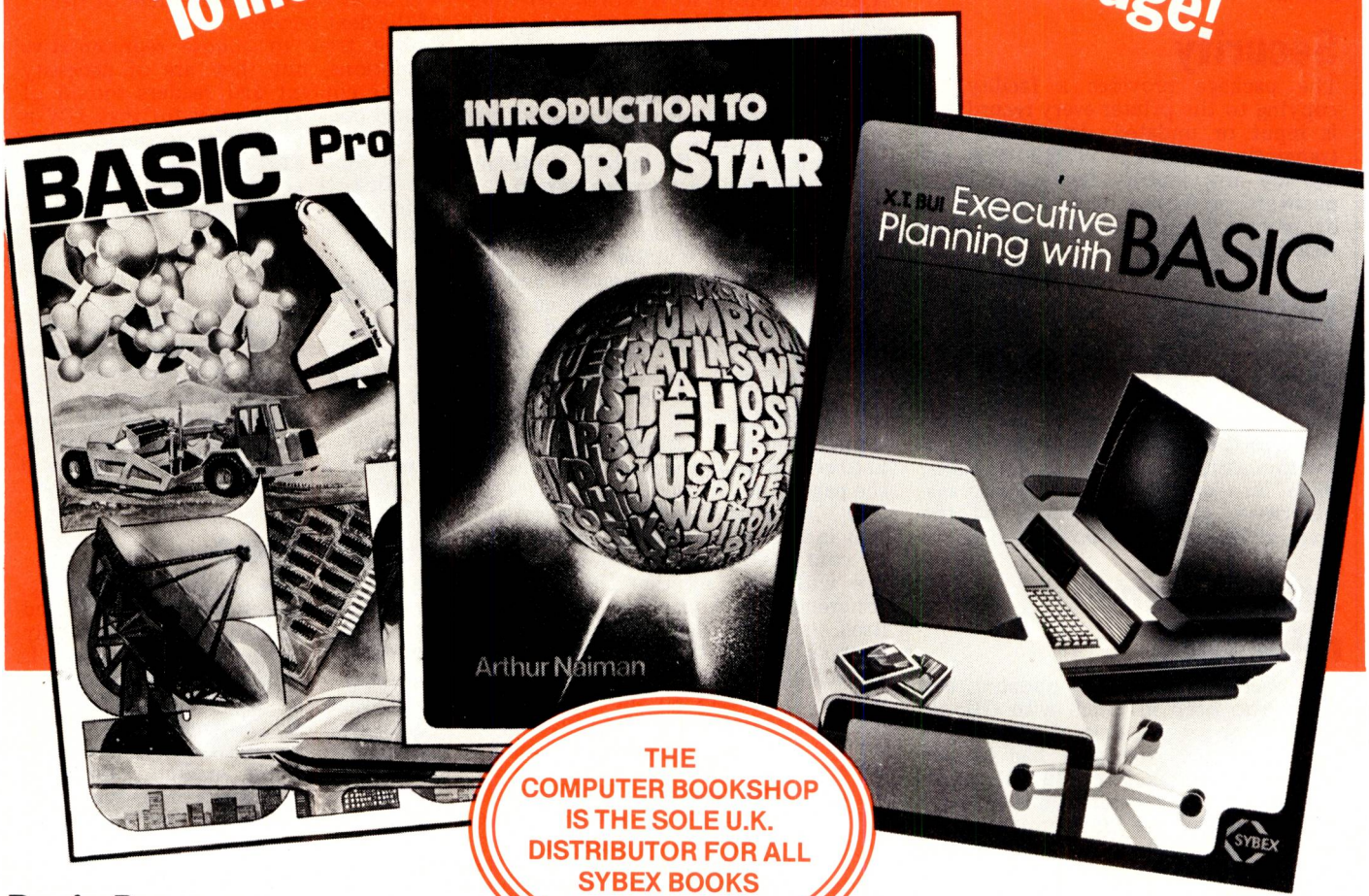

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PATTERNS

Alan Sutcliffe continues his series with a look at generating textures.

Misunderstanding is among the mothers of invention. As a for instance, I recently read a fascinating article in *Computer Graphics and Image Processing* about programs to analyse and then synthesise textures. Reading it again later and more carefully, I found that I had not followed it at all — but in the meantime I had written my own program based on what I thought was proposed. And it worked: at least it is capable of producing many kinds of texture. I have not used it for analysis but that seems straightforward once a texture has been digitised and stored in the computer.

For the purpose of explanation, I present a more limited program and before that a few words on the use of the textures that can be produced.

Suppose you want to simulate flying over an area of the moon. If it is possible to characterise the appearance of the surface using just a few numbers, then suitable-looking fine detail of the terrain can be invented. This will cost a little more in processor power than keeping precise data on a vast area but there will be a great saving in the storage needed and, probably more important, in the time needed to enter the data. Major known features could be imposed on such statistically correct texture.

At the level of personal computing, there are many games and simulations that would be much improved by the addition of appropriate textures to otherwise bald and unconvincing superfices.

The method (this much I did get right at the first reading) can be applied to any kind of display that uses a cellular array of picture elements or pixels. It is easily adapted for whatever number of colours or grey levels the system has, from simple black and white upwards.

Here is the simplest possible version of the method. Each pixel is black or white and its colour is controlled by the one immediately to the left of it and the one immediately below it. Thus there are four cases, as shown in Figure 1. The value of N, representing the colour of the current pixel, is not fully determined by its two neighbours. What *is* fixed is the probability of its being black or white in each case. This requires just one number between 0 and 1 in each case, the probability of being black, say. The difference between this number and 1 is then the probability of being white, since a probability of 1 represents certainty; in this case, the certaintly of being black or white. Figure 1 shows some possible values.

The implementation of this version is given in Program A. The probabilities are stored in the array T. There is clearly a problem in getting the process started, since the pixel at the bottom left of the display does not have the neighbours it needs to determine which probability applies, so these extra cells must be provided. X(XMAX) is a row of cells, not displayed on the screen, to provide neighbours below for the bottom row proper. XMAX is the width of the display. Similarly, Y(YMAX) is an extra column of cells to the left of the main array. These are first of all filled with values 0 or 1 for black or white at random.

It may be thought preferable to fill these two starter arrays with values distributed like the values in the resulting display — but we do not know yet what will be. I have found that this edge effect from starting with a row and column not typical of the main texture is small and when some effect can be seen it affects only the bottom few rows and a few columns at the left. Each texture seems to settle down quickly to a more or less characteristic pattern,

Pixel to the left			
	1	T(1,0)=0.2	T(1,1)=0.7
	0	T(0,0)=0.7	T(0,1)=0.5
		0	1
		Pixel below	

Fig 1 Probabilities for this pixel based on two neighbours.

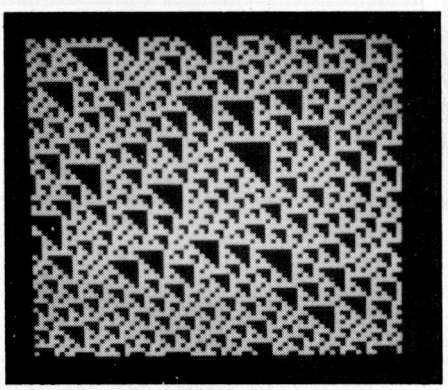

Fig 2 Output with certainties.

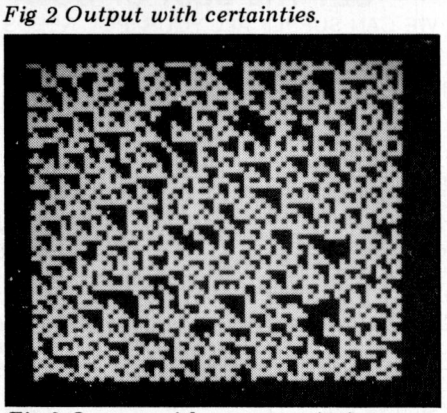

Fig 3 Output with near certainties.

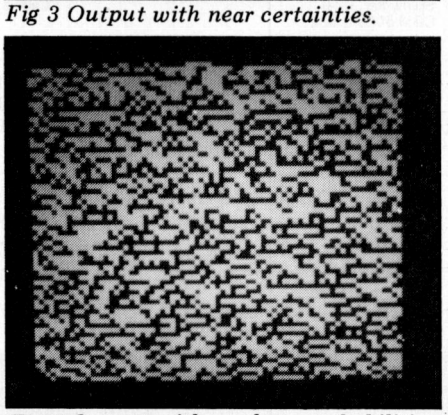

Fig 4 Output with random probabilities.

```
IMP INT                          Variables are integer
IMP FPT P-T                      except those starting P to T
CLEAR 1000
100 MODE 2                       Low resolution
110 COLORG 0 1 2 3               Set colours - only 1 is used
120 DIM X(XMAX),Y(YMAX)          Boundary values
130 DIM T(1,1)                   Probabilities
140 T(0,0)=1.0                   Set probabilities
150 T(0,1)=0.0
160 T(1,0)=0.0
170 T(1,1)=1.0
180 FOR I=1 TO XMAX              Set up X boundary
190 X(I)=RND(2)                  50/50 0 or 1
200 NEXT I
210 FOR J=0 TO YMAX              Set up Y boundary
220 Y(J)=RND(2)                  50/50 0 or 1
230 NEXT J
240 FOR J=0 TO YMAX              Main loop for each line
250 C=Y(J)                       Set left cell effect
260 FOR I=0 TO XMAX              For each cell on a line
270 D=X(I)                       set effect of cell below
280 S=RND(1.0)                   Random selector
290 N=0                          If S>T(D,C)
300 IF S<T(D,C) THEN 330         select case
310 N=1
320 DOT I,J N                    Draw dot
330 X(I)=N                       Save value for next line
340 C=N                          Set effect for next cell
350 NEXT I
360 NEXT J
370 COLORG 0 15 00               Set col to black & white
380 GOTO 380                     Keep display on screen
```

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which remains stable across the display.

Figure 2 shows the result when the probabilities have been turned into the certainties of 0 and 1, as in lines 140 to 170 of Program A. In this case, the value of each pixel is fully determined by its two neighbours. Looking at the pattern you can see that each pixel that has black pixels below and to the left of it is white, with a probability of 1 = certainty. The whole pattern depends entirely on the values in the two random starter arrays, X and Y.

Figure 3 shows what happens when the probabilities are changed slightly to 0.9, 0.1, 0.1, 0.9. This is very like Figure 2, but with 10 percent noise added. But if the probabilities are changed completely then quite different textures result: Figure 4 shows an example with probabilities set at random.

This simple system is not complex enough to produce a very rich variety of textures. There are at least two ways to think of this intuitively. First, four variables, the four probabilities, are not enough to represent or characterise the many different dimensions of texture. Second, working at the level of single pixels is too low: there is in most textures a lowest level of detail that is more or less random and the texture itself is somehow operating at a slightly less microscopic level.

A move that copes with both these points is to use small groups of pixels. In the example presented here a simple array, two pixels by two pixels, is used, and I call this unit a cell. With just black and white there are now five possible values for a cell, ranging from all four pixels black, three black and one white, to all white. When, say, one pixel in a cell is black, it is not considered important which one it is. In Program B the setting of pixels within a cell is fixed, and is set in the array A. For a little more computer time the one to be set could be chosen at random.

Program B implements this scheme in Pascal and Figure 5 shows five textures produced by this program, where the probabilities stored in T are themselves set by calls to the random function. The function RAND takes an integer in the range −32768 to +32767, which is what the system function Random produces, and converts it to a floating point value in the range 0.0 to RANGE. Most of the variables have the same uses as in the Basic program. It is necessary to have U and V as the coordinates for plotting pixels as twice X and Y which are coordinates of the cells. The array of probabilities T now has three dimensions, there are 5 x 5 = 25 different cases for the values of the two neighbours, and for each case there are now four probabilities. The multiple calls to RAND in setting the values in T ensure more variety in these settings.

Reference: Monne, Schmitt and Massaloux, 'Bidemensional texture synthesis by Markov chains', *Computer Graphics and Image Processing*, September 1981. (Academic Press).

END

```
Program TEXTURE;                                Prog to plot textures
Const
 XM=100;                                        Screen width
 YM=100;                                        Screen height
Var
 C,D:Integer;                                   Val of cells left & below
 I,J:Integer;                                   Loop ctrl, cell co-ords
 N:Integer;                                     Current cell value
 U,V:Integer;                                   Pixel co-ords
 S:Real;                                        Random selector value
 X:Array[0..XM] of Integer;                     Start values along X
 Y:Array[0..YM] of Integer;                     Start values along Y
 A:Array[0..4,0..3] of Boolean;                 Cell definitions
 T:Array[0..3,0..4,0..4] of Real;               Main table of probabilities

Function RAND(RANGE:Real):Real;                 Random function 0 to RANGE
Begin
 RAND:=RANGE*(Float(Random)+32770.0/65540.0;    Scale Random to range
End;

Begin                                           Main program
 InitRandom;                                    Initialise Random
 Readln(I);                                     Read in seed
 For J=1 to I do                                Ignore 1st I random values
  N:=Random;
 For I=0 to 4 do                                Set up array for cell values
  Begin                                         0 to 4 pixels set
   For J:=0 to 3 do
    Begin                                       1 3 4 pixels
     A[I,J]:=false;                             0 2 in each cell
     If I>J then A[I,J]:=true
    End;
  End;
 For I:=0 to 4 do                               Set up main array of
  Begin                                           probabilities
   For J:=0 to 4 do                             5 values at left
    Begin                                        by 5 values below
     T[0,I,J]:=RAND(RAND(RAND(3.0)));           Ist case quite likely
     T[1,I,J]:=RAND(RAND(RAND(1.0)))+T[0,I,J];  2nd 3rd & 4th no so
     T[2,I,J]:=RAND(RAND(RAND(1.0)))+T[1,I,J];  likely
     T[3,I,J]:=RAND(RAND(RAND(1.0)))+T[2,I,J];  Rest is 5th case
    End;
  End;
 For I:=0 to XM do                              Set up X boundary
  X[I]:=Trunc(RAND(5.0));                       Random integer 0 to 4
 For J:=0 to YM do                              Set up Y boundary
  Y[J]:=Trunc(RAND(5.0));                       Random integer 0 to 4

 For J:=0 to YM do                              Main loop for each line
  Begin
   C:=Y[J];                                     Effect of cell to left
   V:=J+J;                                      Double the Y co-ord
   For I:=0 to XM do                            For each cell on a line
    Begin
     D:=X[X];                                   Effect of cell below
     U:=I+I;                                    Double the X co-ord
     S:=RAND(1.0);                              Random selector
     N:=4;                                      If S>T[3,C,D]
     If S<T[3,C,D] then N:=3;                   Select case according to S
     If S<T[2,C,D] then N:=2;
     If S<T[1,C,D] then N:=1;
     If S<T[0,C,D] then N:=0;
     If A[N,0]=true then Dot(U,V,U,V);   Plot points
     If A[N,1]=true then Dot(U+1,V,U+1,V);
     If A[N,2]=true then Dot(U,V+1,U,V+1);
     If A[N,3]=true then Dot(U+1,V+1,U+1,V+1);
     X[I]:=N;                                    Save value for next line
     C:=N;                                       Set effect for next cell
    End;
  End;
End.
```

Program B Pascal program for 2 x 2 cells in black and white.

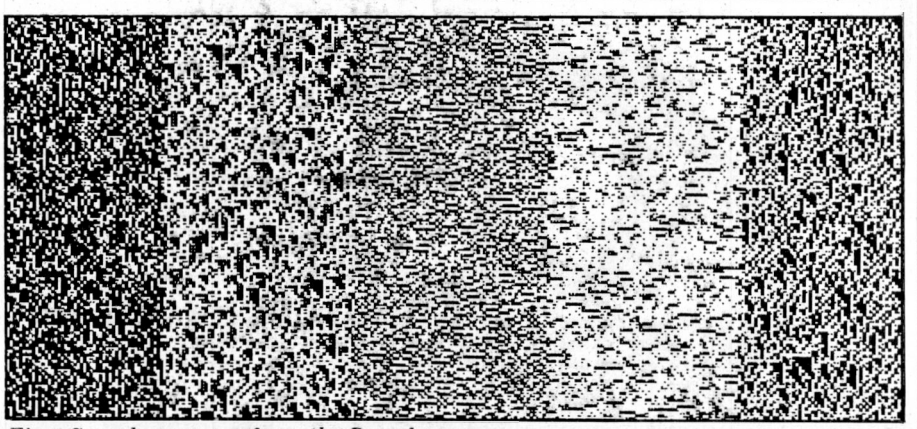

Fig 5 Sample textures from the Pascal program

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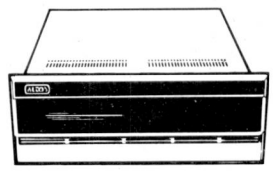

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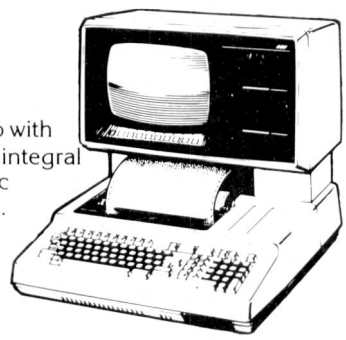

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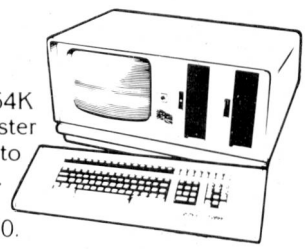

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POURING QUARTS INTO PINT POTS

When you plan to buy your computer equipment you normally look very carefully at the things that cost most money. You tend to think very hard about, for instance, what printer you need and can afford. People usually regard the purchase of disk units as inevitable, with no scope for savings. That is not necessarily so: this article discusses a technique which could save you money.

Have you thought carefully about how data is stored on your disk? For example, when you investigate the way numeric data is stored on the Apple Disk II using the normal facilities of Applesoft and DOS 3.3 you will discover it is rather like a sieve. Each numeric digit is put into a separate byte. This is very wasteful since each byte can hold numbers up to 255 and we can normally only put in values up to 9.

Figure 1 shows how the value 12,345,678 is stored in 9 bytes, using conventional methods. Although the number is held in binary form in memory, it gets expanded to base 10 on the disk. The accompanying program shows how the number can be compacted to three bytes expressed to base 256, as in Figure 2. This technique can make all the difference between needing bigger, or more disks, and being able to manage with what you've already got.

The example in the program is based on an imaginary requirement, in which an organisation needs to store information (sales figures perhaps) for 99 products and 29 areas over a period of 12 months. The program enables us to store numbers for all these combinations (34,452 in all), each with a value up to over 16 million. Using conventional methods this requires over 310,000 bytes. Using this method it requires only about 195,000 bytes, and can therefore be stored on a 5¼in disk II.

You can store numbers (option 1), add to them (option 2) and display them (option 3). Option 0 allows you to set the file up in the first place. Although this takes about 20 minutes it is necessary in order to avoid problems on reading fields which have not previously been addressed. Option 4 is required to close the file down, and to clear whatever happens to be in the buffer. Each option returns you straight to the Menu except option 3, which lets you read the value displayed and waits until you press any key before returning to the Menu.

The method used is by successive division to reduce numbers into three one-byte portions of values up to 255. The three byte fields are joined together in the buffer area and written to disk using the facilities of DOS Random Access storage. They are subsequently read from disk, unpacked and converted back to their original form. This process inevitably requires the use of PEEK and POKE, since Basic by itself does not allow us to address individual bytes.

Record length is given as 256 bytes — that is the whole of the buffer area. Bytes 0 and 1 contain 1 and Return respectively. Bytes 2 to 253 contain 84 fields of 3 bytes packed together with no separating characters between fields. Bytes 0 and 1 contain the values stated because a DOS "WRITE" needs a PRINT, and a DOS "READ" needs an INPUT. The 1 in byte 0 has no data significance, of course, but is there in order to take the 84 packed binary fields on to the disk by POKE and from the buffer by PEEK. Bytes 254 and 255 are wasted because there is no more room in the sector for a 3-byte field. (The loss of the first two and last two bytes in each sector is a minor but unavoidable loss of efficiency.)

A Write Indicator (WR) is used to keep the Buffer READs and WRITEs under control in subroutines 600 and 700. Without this additional check DOS will use other buffer areas some of the time, which would prevent this method from working correctly.

Extensions

The method can be extended in four different ways.

Firstly, although the program illustrates the method with a three-byte field, the number of bytes can be changed by altering the value of 1 in subroutines 400, 600, 800 and 900, and expanding the range of values for Z. The more bytes you pack together into one field, the bigger the saving of space.

Secondly, it is possible to add to the code by recording negative numbers. This can be done by allocating one binary position for negative numbers prior to coding and POKEing them and later PEEKing and de-coding them.

Thirdly, decimals can be coded by moving the decimal point before coding and after de-coding.

Fourthly, alphabetical characters can also be coded — although the saving is not as great. Since the range of alphanumeric characters can be accommodated within six bits (0-63) it will be possible to store four alphabetical characters in three bytes by using an extension of this method. END

Contents	188	97	78
Byte No	0	1	2

188 x 65536 = 12,320,768
97 x 256 = 24,832
78 x 1 = 78
12,345,678

Figure 2

Contents	1	2	3	4	5	6	7	8	R
Byte No	0	1	2	3	4	5	6	7	8

Figure 1

```
5  REM  COMPACT
6  REM  AUTHOR ERWIN SCHNEIDER
7  REM  TRIAD COMPUTING SYSTEMS
8  REM  TEL 01-831-7211
15 REM
16 REM  THE PURPOSE OF THIS
17 REM  PROGRAM IS TO COMPRESS
18 REM  NUMERIC DATA ON DISK.
19 REM
21 REM  THIS IS ACHIEVED BY
22 REM  DIVIDING NUMBERS INTO
23 REM  SUCCESIVE BYTES ON DISK
24 REM  EACH BYTE REPRESENTS AN
25 REM  ELEMENT TO BASE 256.
26 REM  THIS IS DONE WITH PEEKS
27 REM  AND POKES IN THE BUFFER
28 REM  AREA.
29 REM
50 Z(1) = 65536
51 Z(2) = 256
52 Z(3) = 1
70 GOTO 1000
100 REM  ** INPUT **
110 HOME : VTAB 5: HTAB 10
120 PRINT "INPUT DATA"
140 VTAB 7
150 INPUT "AREA (1- 29)     ";A
160 IF A < 1 OR A > 29 THEN 140
170 VTAB 9
180 INPUT "PRODUCT (1 - 99) ";P
190 IF P < 1 OR P > 99 THEN 170
195 VTAB 11
200 INPUT "MONTH (1 - 12)   ";M
210 IF M < 1 OR M > 12 THEN 195
220 RETURN
250 REM  ** GET VALUE **
260 VTAB 15: HTAB 5
270 PRINT "DATA INPUT"
280 INPUT "VALUE (1 TO 16777215)
    ";V
290 IF V < 0 OR V > 16777215 THEN
    260
295 RETURN
300 REM  ** FORM KEY **
305 K2 = K1: REM  PREV REC NO
310 K = (1188 * (A - 1)) + (12 *
    (P - 1)) + M - 1
320 K1 =  INT (K / 84): REM  REC
    NO
330  = 3 * (K - (K1 * 84)): REM
     REMAINDER
340 K1 = K1 + 1
350 RETURN
400 REM  ** TO BINARY **
410 FOR I = 1 TO 3
420 V(I) =  INT (V / Z(I))
430 V = V - V(I) * Z(I)
440 NEXT I
450 RETURN
500 REM  ** BUFFER CONTROL **
510 IF K1 = K2 THEN 540
520 GOSUB 700: REM  OUTPUT
530 GOSUB 750: REM  INPUT
540 RETURN
600 REM  ** NEW ITEM IN **
610 FOR I = 1 TO 3
620 POKE (38401 + K + I),V(I)
630 NEXT I
650 WR = 1: REM  WRITE INDIC
660 RETURN
700 REM  ** OUTPUT **
707 IF WR = 0 THEN 740
710 PRINT D$;"WRITE COMPACT-B DA
    TA,R"K2
720 PRINT 1
730 WR = 0
740 RETURN
750 REM  ** INPUT **
760 PRINT D$;"READ COMPACT-B DAT
    A,R"K1
770 INPUT A
780 RETURN
800 REM  ** FROM BINARY **
810 A = 0
820 FOR I = 1 TO 3
830 A = (A * 256) + V(I)
840 NEXT I
850 RETURN
900 REM  ** GET ITEM **
910 FOR I = 1 TO 3
920 V(I) =  PEEK (38401 + K + I)
930 NEXT I
940 RETURN
1000 REM  ***INITIALISATION***
1010 D$ = CHR$ (4)
1020 PRINT D$;"OPEN COMPACT-B DA
     TA,L256"
1100 PRINT D$
1105 HOME : VTAB 5: HTAB 10
1110 PRINT "MAIN MENU"
1120 VTAB 7: HTAB 5
1130 PRINT "0. INITIAL FILE SET-
     UP"
1140 PRINT "      (TO BE USED ONL
     Y ONCE"
1150 VTAB 10: HTAB 5
1160 PRINT "1. REPLACE A FIELD"
1170 VTAB 12: HTAB 5
1180 PRINT "2. ADD TO A FIELD"
1190 VTAB 14: HTAB 5
1200 PRINT "3. DISPLAY A FIELD"
1210 VTAB 16: HTAB 5
1220 PRINT "4. STOP"
1230 VTAB 18: HTAB 6
1250 INPUT "";N
1260 IF N < 0 OR N > 4 THEN 1230

1270 ON N + 1 GOTO 1300,1400,150
     0,1600,1700
1300 REM *** FORMAT SECTORS ***
1310 FOR K2 = 1 TO 411
1320 FOR I = 2 TO 255
1330 POKE (38400 + I),0
1340 NEXT I
1350 GOSUB 710: REM OUTPUT
1360 NEXT K2
1370 GOTO 1100
1400 REM ***** REPLACE *****
1410 GOSUB 100: REM INPUT
1420 GOSUB 250: REM GET VALUE
1430 GOSUB 300: REM FORM KEY
1435 GOSUB 500: REM BUFFER CTRL
1440 GOSUB 400: REM TO BINARY
1450 GOSUB 600: REM NEW ITEM IN
1460 GOTO 1100
1500 REM **** ADD TO FIELD ****
1510 GOSUB 100: REM INPUT
1520 GOSUB 250: REM GET VALUE
1530 GOSUB 300: REM FORM KEY
1540 GOSUB 500: REM BUFFER CTRL
1550 GOSUB 900: REM GET ITEM
1560 GOSUB 800: REM FROM BINARY
1570 V = V + A
1580 GOSUB 400: REM TO BINARY
1590 GOSUB 600: REM NEW ITEM IN
1595 GOTO 1100
1600 REM *** DISPLAY FIELD ****
1610 GOSUB 100: REM INPUT
1620 GOSUB 300: REM FORM KEY
1630 GOSUB 500: REM BUFFER CTRL
1640 GOSUB 900: REM GET ITEM
1650 GOSUB 800: REM FROM BINARY
1660 VTAB 15: HTAB 5: PRINT D$
1670 PRINT "VALUE IS ";A
1680 GET A$: REM TIME TO READ
1690 GOTO 1100
1700 REM ****** END ******
1710 K2 = K1
1720 GOSUB 700: REM OUTPUT
1730 PRINT D$;"CLOSE"
1740 END
```

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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 £10 for any tips we publish (think how much solder and/or Elastoplast that would buy).*

UK101 OUTPUT

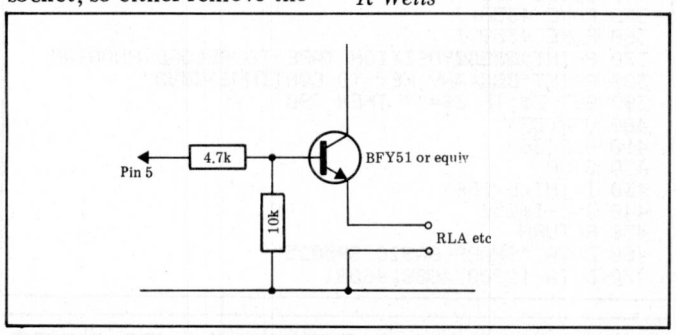
This modification allows the ACIA chip on a Superboard/ UK101 machine to be used as a single bit Input/Output port.

On the ACIA, pin 5 is the ready to send enable pin. By POKEing location 61440 with 81 and 51, logic at this pin goes high and low respectively. This output facility allows use of the ACIA as an output port without the need for a PIA. It should be noted that the current available is low, and the circuit below ought to be used when driving relays, etc.

The Input side of this arrangement is a little more complex. Cut the track on the component side of the board that is connected to pin 5; it runs under the socket, so either remove the IC and cut there or trace the track until it emerges from the socket. Connect a 4.7k resistor to the pin 5 side of the cut, and a positive +5v power line to the other side of the resistor. Then connect the input line to pin 5. Logic high or low is detected by PEEKing 61440, and bit four of this location goes 1 or 0 depending on the state of input at pin 5. If the input side of the above does not function, swap the 4.7k for a 2.7k. There should be no difficulties with the output side, as it is very straight forward.

Below is the circuit for the enhanced output port. This will drive a small relay, tape recorder, light, etc.

R Wells



MBASIC TIP

In your February issue P H Elliott points out how to duplicate MBasic lines with control-A. There is another very useful technique akin to this. When testing a program, a syntax error can be corrected and the program continued without restarting, as follows:

1. The program is run and halts with an error in, say, line 550.
2. Edit mode is entered automatically.
3. Enter Q. Edit mode is exited, without altering the statement in error or losing variable values.
4. Enter control-A. Statement 550 will appear in direct mode, without a line number.
5. Edit the line to correct it, without re-entering a line number.
6. Press RETURN, and the statement will execute in direct mode.
7. Enter GOTO 560 (assuming this is the next statement in sequence), and the program will continue.

Note that it will still be necessary to correct the statement in error before saving the program, but this technique can save debugging time.

Brian Hebbes

MICROTAN EPROMS

If you own a Microtan 65 with Tanex the following modification will allow you to run several EPROMs from one of the EPROM extension sockets. You will be able to switch between these using a software or hardware switch. I am currently running three EPROMs in this expansion board and I have found no problems whatsoever.

As can be seen from the circuit diagram the EPROMs are connected in parallel except for CE and OE. To enable any one chip at a time these two lines are taken low. If any other EPROM has its outputs enabled at this stage you will fry these instantly. To make sure that this does not happen I used a 74LS139 which is a 2-4 line decoder. This ensures that only one EPROM is selected at any one time. This 2-4 line decoder is connected to one of the spare ports on Tanex, allowing software control of which EPROM is being selected. The useful thing about this is that on reset EPROM 0 is selected. I have used this modification to allow me to use two different versions of Toolkit (one high-res, the other sound).

The following circuit assumes that 2716 EPROMs are used and that you are not using more than three in parallel. If you wish to use more I suggest that you buffer the address bus to avoid loading it too much.

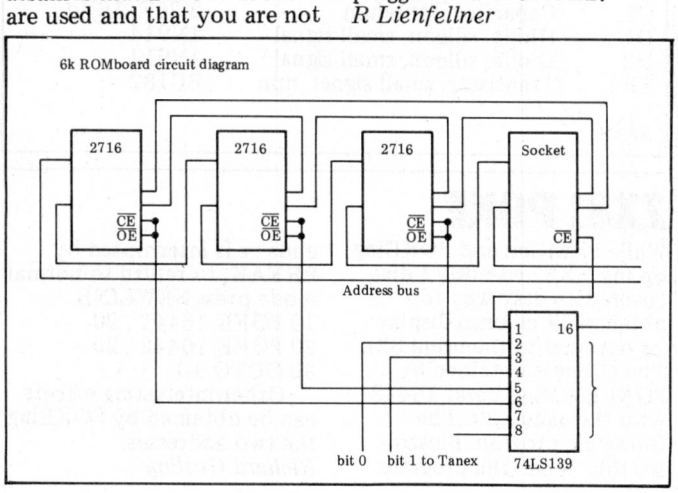
The circuit was built on veroboard and connected to EPROM socket E2 and bits 0 & 1 of port 1 B.

The following pins of the EPROMs are simply connected in parallel.

pin	function	pin	function
1	A7	24	Vcc
2	A6	23	A8
3	A5	22	A9
4	A4	21	Vcc
5	A3	20	see text
6	A2	19	A10
7	A1	18	see text
8	A0	17	D7
9	D0	16	D6
10	D1	15	D5
11	D2	14	D4
12	Vss	13	D3

All the address and data lines are connected together in parallel. Pins 20 and 18 are connected together. When these lines are taken low the chip is selected. From every EPROM these lines are taken to one of the outputs of the 74LS139. The enable pin on the 74LS139 is connected to the CE signal that comes from Tanex. I used a 24 pin connector cable which was plugged into socket E2.

R Lienfellner



TJ's WORKSHOP

UK101 NEGATIVE SUPPLY

Most RS232 interface devices require that the signals from the computer can swing negative with respect to ground. This often means that an extra negative supply must be provided.

To save the expense of an additional transformer and the need to find space for it inside the case of my Compukit I have used a negative supply generator which operates off the 5 volt supply of the Compukit. This can be built on a small piece of veroboard and will fit into any small available space.

The circuit used was as shown in Figure 1. This consists of a transistor switched on and off by the TXCLK signal available at IC68 pin 11. When this transistor is off, capacitor C1 charges to about 4.5 volts through resistor R3 and diode D1. When the transistor turns on, the positive end of C1 is taken to 0 volts while the negative end is at −4.5 v.

If the voltage on C1 is more negative than the voltage on C2, diode D2 will conduct to allow capacitor C2 to charge up and C2 will end up with a voltage of about −4 volts on it.

If the link at W10 on the Compukit is broken and the supply now available from the junction of C2 and D2 is connected to J3 pin 7, a check with an oscilloscope connected between J3 pin 2 and J3 pin 1 will show that when data is being output from the serial port J3 pin 2 will go from about +4 to −4 volts.

I have used this modification on my Compukit to allow me to drive a TI Silent 700 terminal and a TRS-80 Line Printer VII. With neither of these has there been any problem of corruption of data during transfer.

A parts list indicating typical component values is included as Figure 2.

R A Shackleford

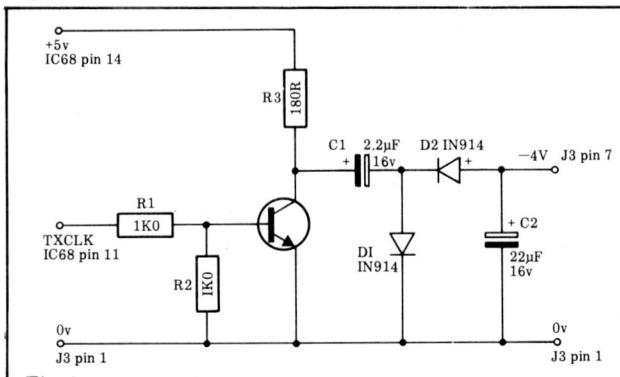


Fig 1

Item	Description	Value
R1	Resistor, carbon film	1K0, 5%, 1/4W
R2	Resistor, carbon film	1K0, 5%, 1/4W
R3	Resistor, carbon film	180R, 5%, 1/4W
C1	Capacitor, tantalum	2.2uF, 16Vdc.
C2	Capacitor, tantalum	2.2uF, 16Vdc.
D1	Diode, silicon, small signal	1N914
D2	Diode, silicon, small signal	1N914
TR1	Transistor, small signal, npn	BC182

Fig 2

ZX81 POKE

While PEEKing and POKEing on my ZX81 recently I discovered an easy way to obtain a 34 column display (as opposed to the usual 32). The effect is obtained by POKEing 16441 and 16442 with the values 20. The following program illustrates this. When the program ends or is interrupted by BREAK, to return to normal mode press NEWLINE.

```
10 POKE 16441 , 20
20 POKE 16442 , 20
30 GOTO 10
```

Other interesting effects can be obtained by POKEing the two addresses.

Richard Gosling

MZ80K BACKUP

It is unfortunate that Sharp does not provide information to aid making a back-up copy of its tape Basic interpreter, SP5025. This is, however, quite simple, using the enclosed program.

The procedure is as follows:

1. Load Sharp Basic SP5025 in the normal way.
2. If you have Knights Commander, load that too.
3. Load the copy program, as a normal Basic program.
4. Run the program and, at the prompt, insert a blank cassette, positioned to record.
5. Press any key on the keyboard to continue and, at the next prompt, press RECORD & PLAY.

The interpreter will now record, and this recording can now be loaded from the monitor in the normal way.

Clinton Evans

```
100 REM ********************************
110 REM * BASIC TAPE BACK-UP PROGRAM *
120 REM ********************************
130 REM
140 POKE 4336,1
150 REM READ TITLE IN A$
160 READ A$
170 J=4336+LEN(A$)
180 FOR I=4337 TO J
190 POKE I,ASC(MID$(A$,I-4336,1))
200 NEXT
210 POKE J+1,13
220 REM READ LENGTH OF PROGRAM
230 READ L
240 GOSUB 430
250 POKE 4354,J
260 POKE 4355,I
270 REM READ PROGRAM START ADDRESS
280 READ L
290 GOSUB 430
300 POKE 4356,J
310 POKE 4357,I
320 REM READ PROGRAM EXECUTE ADDRESS
330 READ L
340 GOSUB 430
350 POKE 4358,J
360 POKE 4359,I
370 PRINT"■■■■■POSITION TAPE TO RECORD PROGRAM
380 PRINT"■■■(ANY KEY TO CONTINUE)■■■■"
390 GET Z$:IF Z$="" THEN 390
400 USR(33)
410 USR(36)
420 STOP
430 I=INT(L/256)
440 J=L-I*256
450 RETURN
460 DATA "SHARP BASIC SP5025"
470 DATA 12900,4608,4608
```

PRINTING TO 3 DECIMAL PLACES

Basic normally prints numerical values less than 0.01 in the exponent form 1.23E−03. This can be annoying and untidy if you are listing a table of figures where the third decimal place is needed (eg, dimensions in mm or thou or prices).

To overcome this I developed the short subroutine below, which can be inserted into the program where the number is to be printed. A sample run is shown to demonstrate the improvement to the format.

```
10 INPUTN
20 IFN<.01THENPRINT
   " .00"; CHR$(48+INT
   (N*1000+.5)):GOTO40
30 PRINTN
40 GOTO10
```

Example of formats

Normal	Improved
.123	.123
.012	.012
1E-03	.001
5E-03	.005
.054	.054
.543	.543

Sample program

(Line 20 is for print enhancement)

D Gayler

TJ's WORKSHOP

APPLE SCREEN BUG

With most TV/monitors the Apple produces half-intensity dots at certain points on the screen. This occurs with colours 5, 6 and 7 and is apparent in both b/w and colour. The only system, known to the author, in which this doesn't occur is an Apple with Sony TV and special Sony colour card. To assess whether this problem occurs with your system try program 1 which produces three half-intensity dots and then changes them to full intensity. If the dots remain unchanged then your system has no problems and you need read no further. To see how annoying this problem is run programs 2 and 3.
The problem in plotting the point X, Y only occurs in a limited number of situations. Namely:
1. HCOLOR = 5, X odd and X+1 divisible by 7.
2. HCOLOR = 6, X even and X+1 divisible by 7.
3. HCOLOR = 7 and X+1 divisible by 7.

Normally the remedy is to set HCOLOR = 4 (ie, black) and then to plot the point X+1, Y in black. Thus program 2 can be corrected by adding the lines:
35 HCOLOR= 4: HPLOT 14,1 TO 14,150: HCOLOR= 5
65 HCOLOR= 4: HPLOT 49,1 TO 49,150: HCOLOR= 6
105 HCOLOR= 4: HPLOT 98,1 TO 98,150: HCOLOR= 7

The remedy for program 3 is similar. Add the lines
42 HCOLOR= 4: HPLOT 245,0 TO 245,100
44 HPLOT 49,0 TO 49,100
46 HPLOT 231,20 TO 231,80.

Note that if HCOLOR = 7 is used in program 3 instead of HCOLOR = 6 then the given correction produces two small black dots at 49,0 and 49,100. This can be corrected by changing line 44 to:
44 HPLOT 49,1 TO 49,99.

This problem is caused by a fault in the Apple's plotting routines. Since this can be corrected in Basic then the machine code routines could also be corrected. Let's hope that Apple will correct this most annoying fault.

Dr G A Manson

```
10  HOME : TEXT : HGR
20  HCOLOR= 5
30  HPLOT 13,1 TO 13,150
40  HPLOT 17,50 TO 17,150
50  HCOLOR= 6
60  HPLOT 48,1 TO 48,150
70  HPLOT 52,50 TO 52,150
80  HCOLOR= 7
90  HPLOT 96,1 TO 96,150
100 HPLOT 97,1 TO 97,150
110 HPLOT 101,50 TO 101,150
120 HPLOT 102,50 TO 102,150
130 END
```

Program 2

```
10  HOME : TEXT : HGR
20  HCOLOR= 5
30  HPLOT 13,100
40  HCOLOR= 6
50  HPLOT 48,100
60  HCOLOR= 7
70  HPLOT 96,100 TO 97,100
80  VTAB 21: PRINT "WATCH THE LEFT HAND DOT"
90  PRINT "AND PRESS THE 'SPACE BAR'": GET A$
100 HCOLOR= 4: REM  BLACK
110 HPLOT 16,100: REM  SHOULD BE NO CHANGE
115 HOME
120 VTAB 21: PRINT "NOW WATCH THE NEXT DOT"
130 PRINT "AND PRESS THE 'SPACE BAR'": GET A$
140 HPLOT 52,100: REM  AGAIN THERE SHOULD BE
    NO CHANGE SINCE PLOTTING IN BLACK
145 HOME
150 VTAB 21: PRINT "NOW WATCH THE LAST DOT"
160 PRINT "AND PRESS THE 'SPACE BAR'": GET A$
170 HPLOT 100,100: REM  THERE SHOULD BE NO
    CHANGE SINCE PLOTTING IN BLACK"
180 END
```

Program 1

```
10  HOME : TEXT : HGR
20  HCOLOR= 6
30  HPLOT 48,0 TO 244,0 TO 244,100 TO 48,100 TO 48,0
40  HPLOT 52,20 TO 230,20 TO 230,80 TO 52,80 TO 52,20
50  END
```

Program 3

VIDEO GENIE SEARCH

This program allows the user to determine which lines of his program contain any Basic keyword or any other form of text string. Also an indication will be given (by line number repetition) of how many times the search key was found on each line.

```
2 CLS: DEFINTI-L:
L=PEEK(16634)*256+PEEK
(16633)—4: K=17133:
FORI=K—5 TOL: IFPEEK
(I)=0: N=PEEK(I+4)*256+
PEEK(I+3): I=I+4: NEXTI:
ELSEFORJ=K TOK+20:
IFPEEK(J)=38: NEXTJ:
ELSEIFPEEK(J)=0:
PRINTN; : NEXTI:
ENDELSE IF PEEK(J)<>
PEEK(I+J—K): NEXTI:
ENDELSENEXTJ: NEXTI:
END
```

When typing the program use ? instead of PRINT otherwise the ND of the final END will have to be inserted using the Edit mode. This is because the keywords are not tokenised until after the line has been entered and the line is too long until this has taken place. Using the ? means that less initial text is entered.

Line number 1 is also required by this program to create the search key. This is used in the following manner:

The search key may be any basic keyword or any text not including a keyword, eg, 1 PRINT 1 SPIDERS 1PRINT"SPIDERS.

But note the problem if the search key is 1 TARGET — GET is a Basic keyword, hence the word TARGET will not be found. To overcome this problem the text may be shortened or the special character (&) used, eg, 1 TARGE or 1 TARG&T. Keywords split by blanks are the same as those not, eg, GO TO is the same as GOTO but GOTO24 is not the same as GOTO 24.

Note: & is reserved for use as follows:
1. Immediately after the line number of line 1, to separate a numeric search key from the line number. This *must* be used for a numeric search key to avoid accidental deletion of a line in the user program — eg, 1&24 will create a search key for 24, while 1 24 will delete line 124 if it exists.
2. Following an extra blank after the line number 1 to enable a blank to be used as the search key — eg, 1 &.
3. In any other position the character in a search key occupied by the & will not be checked. Therefore, & can be used in place of any character to disallow a keyword or if the spelling of a word is not known exactly.

Line 1 may contain any data for the search key and does not have to be in correct Basic syntax. This line is not intended to be run.

There are some restrictions with this routine:
1. The user program must start at a line number greater than 2.
2. The search key must not exceed 20 characters (although keywords may be counted as only 1).
3. The search program and search key line will occupy up to 190 bytes.

After the search key line is entered simply enter RUN 2. To run the user program enter RUN number, where number is the first line number of the user program. Alternatively, replace line 1 by 1 GOTO number then RUN will access the user program directly.

Each time the search key is found, the line number of the line containing the search key will be printed starting at the top left corner of the screen. The line number will be printed each time the search key is found, therefore the number of times the line number appears indicates how many times the search key occurred on this line. Approximately 12 line numbers are printed for each line of display.

M S Hale

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BBC BASIC APPEND

BBC Basic has no explicit APPEND statement to allow selected procedures to be added to a program from a library.

Here is a routine which allows repeated appending of Basic statements (complete programs or library sets of procedures) by loading the programmable function keys, f0 to f8, with a sequence of instructions and messages. You work through the keys from left to right and repeat the sequence as often as required for multiple appending. Step-by-step instructions are designed to give the user, at all times, a screen display containing the next action to be taken and a reminder of which key to press next.

Before using the program, a little thought regarding the line numbers of the statements to be appended will prevent ambiguities in the resulting programs. The highest line number of the first set of statements must be lower than the first line number of the second set, since the program does not *merge* but only appends. However, the first step in appending, loaded on key f0, can force a renumbering of the first set (from 1 in steps of 1). Similarly, key f3 is loaded with an instruction to renumber the second set from 10000 in steps of 1, and, to repair the odd appear-appearance that this would give in the final version, the appended statements can be collectively renumbered, using key f8, from 10 in steps of 10. After the APPEND program is run to load the keys, and before any of the keys have been pressed (or subsequently between key presses if required), keys f0, f3 and f8 can be reloaded to any convenient renumbering system desired by the user. The chosen renumberings are designed merely as default values.

The APPEND program is loaded and run, setting LOMEM to the high end of memory in order to protect a small section of RAM, for the instruction strings to be called down later by the function keys — the only variables used by the program are the static variables in the range A% to Z%. The orange function keys are left loaded for subsequent use and the first set of instructions is displayed on the screen. These tell the user to load the first set of statements (referred to as Program 1, but not necessarily a complete and executable program), to renumber using f0 if required, and to press f1 for the next set of instructions.

Loading the first set of statements is done by the user with the usual LOAD " " or LOAD "name"; this statement can not be put on a function key since the quote symbols terminate the *KEY statement. However, leaving this step to the user has the advantage that the correct name of Program 1 can be incorporated in the LOADing. Note that this action also deletes the APPEND program, but by now the subsequent actions are all stored on the function keys and the APPEND program has no other part to play. The ESCAPE and BREAK keys don't actually clear the keys if one of these is pressed by accident.

If Program 1 is to be renumbered, f0 is pressed when loading is complete.

When key f1 is pressed and immediately before the next set of instructions is displayed, PAGE is set to TOP+256 to move 'user memory' above program 1. (The BBC manual is misleading here since it gives a programming example of PAGE = TOP + 1. This is highly unlikely to move PAGE above TOP, since the Basic interpreter strips the lowest two bytes from PAGE to force it to a 'hexadecimal hundreds' boundary.)

The instructions now displayed tell the user to load Program 2 (again, it may be an executable program or just a set of procedures or statements) which is done by a LOAD " " or LOAD "name" as before. Since BBC Basic programs are stored in a fully relocatable format, the statements will be positioned in memory from the new value of PAGE, even though they were saved from the normal program location (starting at &0E00 in a tape-based Model B).

Key f2 is now pressed for further instructions.

Key f3 may be pressed for an optional renumbering of Program 2.

Key f4 brings up the next set of instructions, but before they are displayed the length of Program 2 is stored in L% for use in the appending stage, and PAGE is reset to its original value (stored by the APPEND program in P%).

Key f5 resets TOP for Program 1 by executing an 'OLD' command — TOP is not a variable but a function, and cannot be directly reset by storing its old value, as PAGE can.

Key f6 brings up the final set of instructions and executes the FOR. . .NEXT loop which successively PEEKs the values from Program 2 and rePOKEs them at the end of Program 1, resulting in what, on the Nascom2, would be an 'intelligent copy'. That means that, unless Program 2 is very short, the appended programs will eventually overwrite Program 2, but, by the time they do, the overwritten part of Program 2 has already been safely transferred.

For those who like to know how their Basic programs are stored, the BBC interpreter uses the following format (all in hex, of course): 0D AA BB NN (statements with reserved words tokenised) 0D (where AA BB is the hex representation of the line number, and NN is the number of bytes in the line, expressed in hex, the whole program being terminated with one hex byte, &FF, following the last &0D.

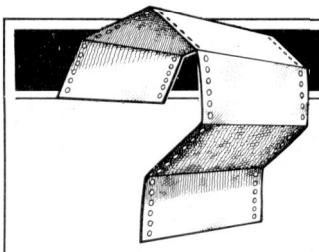
Key f7, which must not be pressed until the command prompt > reappears, resets TOP for the appended program. If this step is omitted, TOP still refers to Program 1 and any attempt to list or run the appended program will result in the obdurate message 'Bad program'.

Pressing f8, the final key in the sequence, renumbers the appended program from 10 in steps of 10. This may be necessary even if the earlier renumbering options were not exercised.

Finally, if further programs or sets of statements are to be appended, the APPEND program itself need not be reloaded, as the function keys still retain the necessary information and the instruction strings remain at the high end of memory. The final instructions will have reminded the user to commence the sequence again from f1 (or f0 to renumber the appended program from 1 in steps of 1), the appended program now being 'Program 1' and the new material to be appended, 'Program 2'.

Gwyneth Pettit

```
   10 REM BBC BASIC APPEND   MARCH 1982
   20 REM Authors - Leslie & Gwyn Pettit
   30 REM    (C) PETTIT 1982
   40 REM
   50 LOMEM=HIMEM-500
   60 DIM O%60,R%70,S%80,T%160
   70 CLS:VDU15
   80 PRINT'"APPEND routine for programs in BBC BASIC"
   90 PRINT'" This program uses the function keys in order (f0 to
f8).  Instructions will be given in detail as you go along."
  100 PRINT'" Note that PROCEDURES at the end of the 1st program m
ay need to be moved to the end of the merged program."
  110 PRINT'" You need not renumber either part, but MAKE SURE lin
e numbers are in sequence  and DO NOT OVERLAP in this case."
  120 PRINT'" If you choose to renumber either part, the APPEND pr
ogram will renumber the 1st program from 1 (steps of 1) and the 2n
d from 10000."
  130 PRINT'" Further programs may be APPENDED by pressing f1 (or
f0 to renumber) and following instructions."
  140 PRINT'"Press the space bar to continue -"
  150 REPEAT UNTIL GET=32:CLS
  160 PRINT''"      Load program 1."
  170 PRINT''"Press f0 if you want to renumber and f1 for next ins
tructions"
  180 P%=PAGE
  190 $O%=" Now load Program 2 and then f2 for next instructions"
  200 $R%=" Press f3 if you wish to renumber and   f4 for next ins
tructions"
  210 $S%="Press f5,then f6 to append the programs. Then press f7
to reset parameters."
  220 $T%="DELAY  Press f7 when > reappears. Key f8 may be used to
 renumber resulting program. To append again repeat the sequence f
rom f1 (or f0 to RENUMBER 1,1)"
  230 *KEY0"REN.1,1|M"
  240 *KEY1"PAGE=TOP+256:N%=PAGE:CLS:P.''$O%|M"
  250 *KEY2"CLS:P.''$R%|M"
  260 *KEY3"REN.10000,1|M"
  270 *KEY4"L%=TOP-N%:PAGE=P%:CLS:P.''$S%|M"
  280 *KEY5"OLD|M"
  290 *KEY6"P.''$T%:FORI%=0TOL%:!(TOP+I%-2)=?(N%+I%):N.|M"
  300 *KEY7"OLD|M"
  310 *KEY8"REN.|M"
```



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.



PET GET

I have been writing some games programs on my PET and have been having some trouble with the keyboard input. The GET function cannot detect a key that is being held down. How can I get the PET to recognise this?
D Harrison, St Helier, Jersey

Fortunately for games writers, the keyboard on Commodore computers is controlled by the operating system. It is possible to bypass these functions and directly find out the state of the keys. This is best done in machine code programs but the Basic operating system has some useful locations which may be examined. As an example look at location 152; this will normally be 0, but while the shift key is pressed it will be 1. If this is not enough, then location 151 shows which key is being pressed down. You can use GET to detect a key being held down. Try including in your GET loop the statement: POKE 151,255. This will confuse the machine into thinking that the key was previously released. This can be used to construct a simple screen editor with auto-repeat keys in Basic. I'll leave you to work out how to start the repeat after a preset time, at a defined rate.
Mark Wratten

BBC monitor

I am due to take delivery of a BBC Computer any day now. Would you recommend that I purchase a monitor rather than use a TV?
D O'Brien, Whitstable

The answer depends entirely on what you want to use it for, how good quality your present TV set is, and whether you wish to use colour or black and white. The BBC Computer will be unsuitable in its 80-column mode with an ordinary TV set. Also, some black and white sets have difficulty when the BBC displays are in colour. I have had reasonably satisfactory results using my home Sony colour TV, whereas many other people using other sets find the picture very bad. The answer is also dependent on your finances, because colour monitors are still rather expensive. Two sources that you might like to try for a colour set are Gadney Electronics 179 Torridon Rd, Catford, London SE6 (01-697 0079) and MicroVitec Ltd, Futures Way, Bolling Rd, Bradford, BD4 7TU (0274 390011). Black and white monitors are very easy to come by and are getting cheaper by the month — just look through *PCW* for ads. A good monitor is a joy to use, mainly because it reduces eyestrain. BEEBUG (National Independent BBC Micro user group, PO BOX 50, St Albans, Herts, ALI 2AR) is currently negotiating discounts for members on monitor sets.
Sheridan Williams

Beeb delay

I ordered a model A BBC Computer two months ago and have not received it yet. What is causing the delay, and when should I expect my machine? Can you tell me if it is possible to increase the memory to 32k without upgrading the machine fully, which I will not be able to afford?
K Jackson, Catford

As you may have read in the computer press some time ago, there have been production problems with the BBC Computer. The biggest problem has been caused by the ULA chips made by Ferranti Ltd. These are custom-made integrated circuits that replace a vast number of logic gates and reduce production costs and machine size considerably. The problem arose because, while the prototypes worked okay, only a small fraction of the production-run ULAs functioned at the required speed (16 MHz for the model B!). The problem is apparently not totally resolved, and Acorn has told us that when ULAs are tested many are still rejected, and the remainder are sorted for A and B machines; with model As getting lower grade ULAs. This has implications for the last part of your question.

Before we get on to that, one or two more points about supply. We talked to a spokesman for Acorn today asking about supply rates, and it would seem that the backlog of model A orders has now been largely cleared, so that a model A machine ordered on 31 March 1982 could reasonably be expected to be despatched by 8 May. The backlog on the model B is somewhat greater, since model Bs have only just begun to emerge (at the time of writing), and model Bs were in the majority among the first 12,000 orders for the BBC machine. Acorn's prediction for a model B ordered on 31 March gives a despatch date of 12 June. So the supply problems are clearly not yet resolved. Production rates are currently 800 model As per week, and 1000 model Bs, according to our information.

Upgrading the model A to 32k can be done by purchasing a set of eight 4816 dynamic RAMs (100ns) and making an appropriate link change on the main board, but there are two catches for the unwary. Firstly the cost of 4816s varies considerably. One retailer is advertising a BBC Computer upgrade for £55. In our view you should aim for around £25, and there are one or two retailers with suitable 4816s at this price. But there is a further problem to the would-be upgrader — the ULA in the A machine may not be fast enough to run the higher graphics modes with the memory upgrade and Acorn has said it will only release the higher grade ULAs in full upgrade kits to dealers. There is not space here to go into this issue fully, but it is treated in the April issue of the BEEBUG newsletter, along with full notes on memory and printer upgrading. Moreover, BEEBUG is pressing Acorn to change its stance on this question.
D E Graham, National User Group for the BBC Computer

Loading problems

I have had three ZX81s that have given me tape loading problems. I want a more reliable micro and have used a CBM PET that has a VERIFY command which seems a very useful feature because it reduces the risk of tape load errors. Is it available on other micros and what are the problems with cassette loading?
B W Moore, Stockton, Co Cleveland

You are quite right that tape loading problems are both common and annoying. Most of the problems can be traced back to a mismatch between the signal from the micro or back to it, or to what is called the 'azimuth' adjustment of the recording head in the tape deck. The read and record heads each have a very narrow gap between the poles of the magnet that records or the soft iron core that senses the recording on playback. If these gaps are not exactly at right angles to the line of movement of the tape, the signal is blurred unless the recording machine was similarly out of adjustment. This blurring may be bad enough to cause errors on reading the tape even if the signal levels are perfect. I have sometimes only been able to read tapes produced on other machines by forcing down one corner of the cassette or putting a cardboard wedge under one side (a procedure to adopt with caution). Your suggestion that there should be a VERIFY instruction at first surprised me, as I am used to the Nascom machine which has one. It works exactly the same way as the READ routine, except that the characters when read and added into the parity check are not then put into memory. Furthermore, there is also available an intelligent read routine for the Nascom which only transfers a block of data to store if read correctly (on most machines an error in a previously correctly read block will be put into store and will spoil the good data). This intelligent read is in issue three of the Nascom magazine produced by Program Power, of 5 Wensleydale Road, Leeds. (But beware — there is a correction to it announced in issue four.) To return to signal levels — there is nothing I can do to help you to tell the difference between a satisfactory recording and a duff one, except to advise you to find a friendly computer club where you can listen to good recordings that sound clean and undistorted. Another approach is simply to try every recorder you can beg or borrow. It is not usually necessary to use anything of high quality. A micro club may also have someone with a meter who will help adjust any circuits if your machine has adjustments.
Anthony Camacho

Micro shares

I am looking for a package on a microcumputer that will enable me to produce portfolios for clients whose stocks and shares I manage. I am aware that there are packages on mini and large computers but these cost in excess of £20,000.
(Name and address withheld by request)

I only know of one such package. This runs on a Hewlett-Packard HP125, which is not the cheapest micro on the market. It runs under CP/M so should be convertible to other micros without too much problem. You do not say how many clients, or how many stocks and shares you wish to handle, as

the limiting factor for most micros is the disk capacity. The package mentioned will handle up to 1500 stocks and shares held by up to 300 clients, although if you reduce the number of clients you can increase the number of stocks held, and vice versa. If a hard disk was used this would increase the capacity tenfold. It handles purchases, sales, adjustments, bonus and rights issues, performs stock analysis, and produces portfolios. The only supplier is Sumlock Bondain Ltd, 263-269 City Road, London N1 (01-250 0505).
Sheridan Williams

All change

I have an extender board for my UK101 which has sockets for four EPROMs. I have configured these sockets for the single-rail 2716. I would like to be able to plug 6116 RAM into these sockets but find that I cannot write data to the 6116.

I have full manufacturer's sheets on the 2716 but the only data I have on the 6116 is a pin-out diagram, which appears to be pin compatible with the 2716 with the exception of pin 21 which needs to be a R/W line. I have coupled pin 21 to a R/W line which is working sixteen 2114s and up to four 2716s without problems, but I thought that it may be overloaded and fitted a 4.7k pull-down resistor. I have tried two 6116s in the socket with exactly similar results, and the 2716 in the same sockets reads out perfectly.

Even more peculiar is the fact that because the 6116s are addressed continuous with the top of RAM, the Basic thinks it has the extra RAM, and shows a free area showing 19000 bytes free, when there are only 16k of 2114s in the machine.

I get the same results whether I run the processor at 1 or 2 MHz, Can you assist?
K P Wood, Wakefield, W. Yorks

The add-on board that you describe sounds like the Elektor 8k RAM plus EPROM board, which I myself have used and I ran into exactly the same problem as you did. The 6116 is certainly static rather than dynamic RAM and, moreover, it is a CMOS device, so its current loading will be minimal, much less than that of a 2716.

The major difficulty is simply a question of pin incompatibility between the 2716 (for which link connections are given with the particular memory board that you have) and the 6116 (for which no details are given). In fact you have dealt correctly with pin 21, but there is a little track cutting that needs to be done before the switch can be made.

First, isolate each of the pin 18s of the four 2716 sockets, and then simply link pin 18 of each socket to pin 20 of the same socket. The reason for these alterations is that pin 18 of each socket has been earthed, which is okay for a 2716 but not so good for a 6116 or a 4118, where pin 18 is in fact the chip select! It is pin 20 of the 2716 that carries the chip select — hence the need to link 18 and 20. Note that leaving pin 20 of the 6116 connected to the chip select causes no problems.

There is one further catch with this particular board that could try your patience, though you have probably already discovered this. The addressing order of the two EPROM sockets is altered when you go from using four 1k devices (eg, 2708) to four 2k devices (eg, 2716 or 6116). The result is that the addressing order for the 2k configuration is IC 26, 28, 25, 27.

If by any chance you are in fact using a different memory board, there should still be enough here for you to work out a fix for your particular board.
D E Graham

Disk control

After reading the letter 'Corrupted Commodore' in the March issue I thought you might be interested in the disk controller developed at Merchant Taylors' School in Crosby.
Mark Atherton

Mark has sent documentation on a system that allows multi-access to the IEEE bus for a number of PETs, so they may communicate, without interference, with a disk. If the documentation is to be believed, then the system is far superior to the MUPET mentioned in my reply referred to in March. It overcomes many of the MUPET's weak points. It should also be a lot cheaper. If you require further details write to: Mark Atherton, Merchant Taylors' School, Crosby, Liverpool L23 0QP. I would have thought it worth marketing, and it should bring the originator a fair return for his development.
Sheridan Williams

Dates

I was interested to read your comments on a question from Barbara Sanders in the March issue of *PCW*. She asks how to create a file called DATES. COM which will, when executed cause the Basic program DATES.BAS to be run. I have the following program which can be assembled using the CP/M assembler and it creates a file identical to the SUBMIT command's temporary work file. Thus when a warm-boot is performed the system is tricked into thinking that it is in the middle of a SUBMIT. To change the follow-on program change the line labelled COM: appropriately.

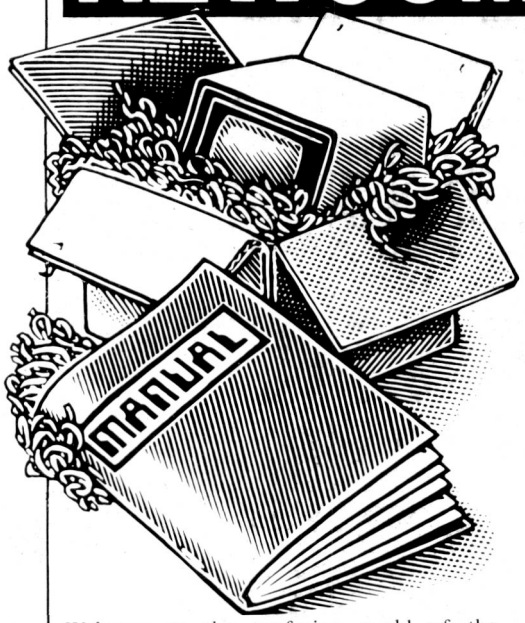
```
SYS     EQU   0005H
BOOT    EQU   0000H
OPEN    EQU   15
CLOSE   EQU   16
DELETE  EQU   19
WRITE   EQU   21
MAKE    EQU   22
SETDMA  EQU   26
BUFF    EQU   0080H
        ORG   100H
        MVI   C,MAKE      ;) Make
        LXI   D,FCB       ;) Scratch
        CALL  SYS         ;) File
        MVI   C,OPEN      ;) Open
        LXI   DFCB        ;) Scratch
        CALL! SYS         ;) File
        MVI   C,SETDMA    ;) DMA
        LXI   D,COM       ;) Set to
        CALL  SYS         ;) COM
        MVI   C,WRITE     ;)
        LXI   D,FCB       ;) Write
        CALL  SYS
        MVI   C,CLOSE     ;)
        LXI   D,FCB       ;) Close
        CALL  SYS
        MVI   C,SETDMA    ;) Restore
        LXI   D,BUFF      ;) Default
        CALL  SYS         ;) DMA
        JMP   BOOT
FCB:    DB    0,'$$$      ' , 'SUB' ,0,0,0,0
        DS    16
        DB    0
COM:    DB    12, 'MBASIC DATES',0  ; Initial number
                                    ; is length of
                                    ; command string
                                    ; including the
                                    ; space but
                                    ; excluding the
                                    ; final O
        END
```

J S Linfoot, Oxford



'Isn't that nice, Grandad — a telegram from the Queen's microcomputer.'

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.

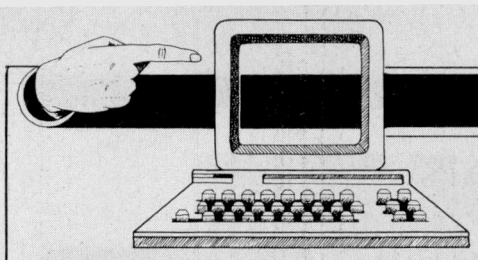
Half-way between cassettes and disks is the **stringy floppy** — a miniature continuous loop tape cartridge, faster than a cassette but cheaper than a disk system. **Hard disk** systems are also available for micro-computers; they store more information than floppy disks, are more reliable and information 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.



IN STORE

I'm afraid that, due to pressure of work, I have been unable to fully update 'In Store' this month. I have however corrected the telephone number of Sinclair — I hope that, in the fullness of time, the lady who has been taking their calls will forgive me!

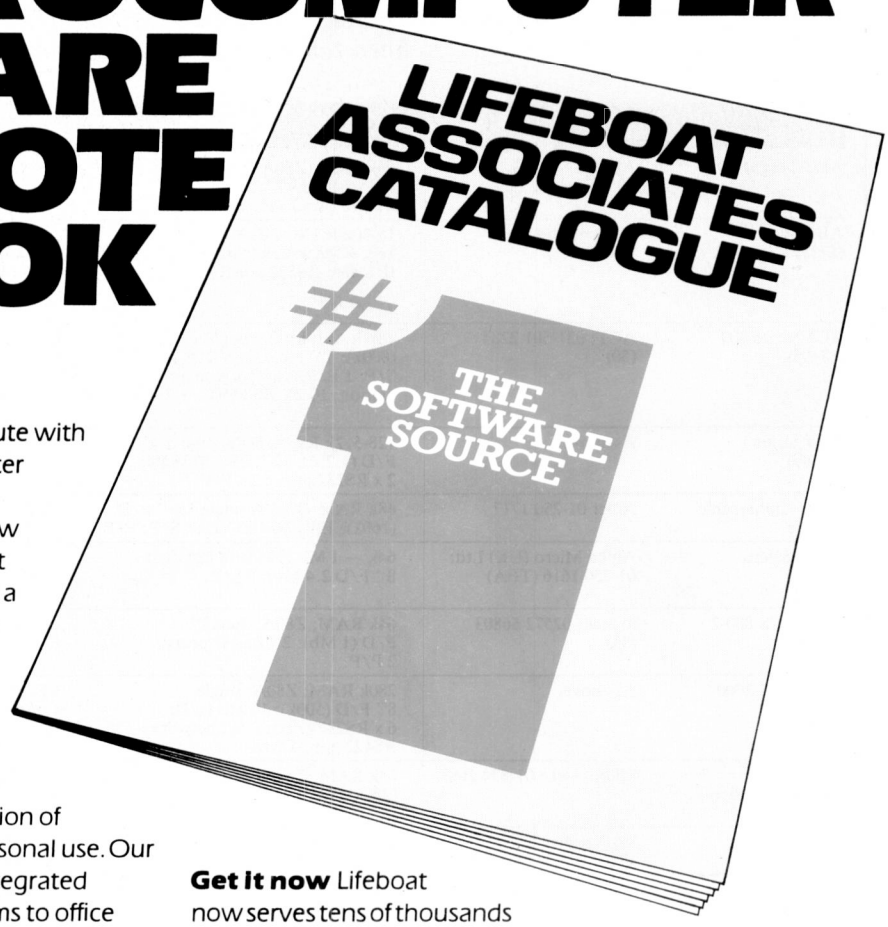
Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
ABC 24 (£3195)	AI 09237-77139	64k RAM: Z80A: dual 5¼" F/D (640k): 12", 24 x 80 VDU: 2 x S/P: 2 x P/P	CP/M: *Basic: Cobol: Fortran: Pascal.*	BT 4/81 (S)
ABC 80 (£738)	Datormark Ltd: 97 44896	16-40k RAM: Z80A: C: 12", 16 x 40 b&w VDU: 4680 bus: IEE 488: RS232 port.	DOS Basic (16k ROM: *Fortran: Pascal: A: Multi user Basic.*	Colour video graphics with UHF output. Viewdata compatible. Loudspeaker. Numeric keypad. Options: dual 5¼" F/D (320k) £895: dual 8" F/D (2 Mb). BT 1/80. (1)
ACT Series 800 (£3495)	ACT: 021-501 2284 (50)	48k RAM: 6502: dual 5¼" F/D (800k): 12", 30 x 64 VDU: 1 S/P: 1 P/P: Multi-screen int. Option: 10-20 Mb H/D	MDOS: Basic: A: *CBasic:* PL/M: *Forth: Fifth: Cesil: Pilot: Fortran.*	IBM compatible K/B High resolution graphics. Available with dual 8" F/D (2.4 Mb) £4950 — 4.8 Mb maximum. BT 2/80(E).
ACT Sirius 1 (£2349)	As above	128-512k RAM: 8088: dual 5¼" F/D (1.2M): 12", 25 x 80 VDU: 2 x RS232 ports: 2 x P/P	CP/M 86: U: *Basic: Cobol: Fortran: Pascal*	High res graphics. Options: 10 Mb H/D: dual 5¼" F/D (2.4 M).(S)
Adler Alphatronic (£1600)	Adler 01-250 1717	48k RAM: 8085 A single 5¼" F/D (160k): 12", 24 x 80 VDU: S/P: P/P	CP/M: *Basic: CBasic: Fortran: Cobol*	With 80 cps printer and dual F/D £2345 (inc CP/M). (S)
Alpha Micro (£5650)	Alpha Micro (UK) Ltd: 01-250 1616 (TBA)	64k — 1 Mb RAM: 16 bit: dual 8" F/D 2.4 Mb): 6 S/P.	Multi-user OS: Basic: M/A: Pascal: U. *Fortran: Cobol*	Modular. Expands to 1200 Mb, 24 terminals or multiprocessor system. (E)
Altos ACS 800-2 £2995)	logitek: 02572 66803 (33)	64k RAM; Z80A; dual 8" F/D (1 Mb): 2 x RS232 ports: 2 P/P.	CP/M: *Basic: CBasic: Cobol.*	Single user. Options: DMA. Floating point processor. Phototyping board.
Altos ACS 8000-10 (£6675)	As above.	280k RAM: Z80A: single 8" F/D (500k): 10 Mb H/D: 6 x RS232 ports: P/P: network RS422 port: DMA	CP/M: *MP/M: Basic: Cobal: Fortran: APL: Pascal.*	Multi-user/multi tasking. Up to 4 users. Options: 10 Mb: mag tape backup (S + H).
APL Signet (£1750 or £130pm)	Micro APL: 01-834 2687	64k RAM: Z80A: dual 5¼" F/D (380k): 2 x RS232 ports.	CP/M: APL: *Basic: U: Fortran: Cobol: Algol: Forth*	Desktop APL computer with self teaching course. (S)
Apple II (£695)	Microsense: 0442 41191 (190)	16-48k, RAM: 6502: 8 I/O slots.	OS: Basic: *Pascal: Fortran: Cobol: Pilot*	280 x 192 high resolution graphics: Option: single 5¼" F/D (116k) £349.
Atari 400 (£345-16k)	Ingersoll: 01-226 1200 (40)	16k RAM: 6502: C int: cartridge slot: 12 x 20 TV int: RS232C port: touchpad k/b: Opt: C £40	OS (10k ROM): Basic (8k ROM). *Pilot: Forth.*	High resolution colour graphics. 4-channel sound. Four games controller/light pen sockets. BT 10/80. (I/B).
Atari 800 (£645-16k)	As above.	16-48k RAM: 6502: C int: 4 x cartridge slots: 12 x 20 TV int: RS232C port. Opt: single 5¼" F/D (90k) £345: 16k RAM £65.	As above.	As above. Software & RAM on cartridge modules. Up to 4 disk drives. BT 10/80. (I/B).
Athena 8285 (£5694)	Butel-Comco Ltd: 0703 39890 or 01-202 0262 (TBA)	64k RAM: 8085A: dual 5¼" F/D (644k): 12" 25 x 80 VDU: 150 cps printer: RS232 port.	AMOS: T/E: Basic: *Cobol: Fortran: Pascal: APL: M/A.*	Extended ASCII K/B with numeric pad: graphics. Options: dual 8" F/D (2 Mb): up to 1200 Mb H/D.
Atom (£120)	Acorn: 0223 312772 (35)	2-12k RAM: 8-16k ROM 6502: Full K/B: C int: TV int: 20 I/O lines: 1 P/P. Options: 80 col printer £199, Prestel adaptor £120.	Basic in 8k ROM: A Cass O/S.	High resolution graphics on bigger model: colour monitor O/P. Loudspeaker. Note also, systems based on Acorn SBC. BT 7/80(B).
Attache 201 (£8000)	COLT 01-572 3784 (10)	64k RAM: Z80: dual 8" F/D (2.4 Mb): 12" 24 x 80 VDU: 180 cps printer.	Basic: *Fortran: Cobol.*	Upgradable to multiuser system with 18 Mb H/D. Full range of business packages included software dealers TBA. (S)
BASF 7120 (£3600)	BASF: 01-388 4200 (12)	64k RAM: Z80A: 3 x 5¼" F/D (480k): 12", 24 x 80 VDU: RS232 port: P/P	DOS: (OASIS) *Ex Basic: Cobol U. A: CP/M*	H/D available soon. Also 7125 with *930k* F/D £4280 and 7130 with single F/D (430k) & 5Mb H/D £4950. Disk controller has own Z80A. BT 9/80
BBC Micro (£205)	BBC Micro Systems 14 Station Road Kettering Northants (no tel)	16-32k RAM: 6502: C int: TV int: RS423 port: P/P: Option: single 5¼" F/D (100k) £230	MOS: Basic A	Video text & second processor int. 32k model with Econet and disk interface £3.95. BT 1/82 (I)
Billings BC-12 FD: (£3995)	Mitech: 04862 23131 (TBA)	64k RAM: Z80A: dual 5¼" F/D (640k): 12", 24 x 80 b&w (or b&g) VDU.	DOS: Basic: *Fortran: Cobol: A*	With dual 8" F/D (2 Mb) £5995. Additional dual 8" F/D £300 option: 50Mb H/D. (S).

List of Abbreviations

A	Assembler	G/C	Graphics card	M/A	Macro assembler	S	Software
BT	Bench Tested	H	Hardware	N/A	Not available	S/P	Serial port
C	Cassette	H/D	Hard disk	N/P	Numeric pad	T/E	Text editor
E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	P/P	Parallel port	U	Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

WHEN IT COMES TO MICROCOMPUTER SOFTWARE WE WROTE THE BOOK



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IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
C/09(£3500)	SWTP Ltd: 01-491 7507 7507 (16)	64k RAM: 6809: dual 5¼" F/D (700k) 9", 24 x 80 VDU: 2 S/P: 1 P/P.	TSC FLEX: *Basic: Fortran Pascal: A: Dis A: T/E: U.*	Expandable to S/09 UniFLEX *32 user system. (H)*
Canon BX-3 (£4250)	Canon 01-680-7700.	32k RAM: 6809: dual 5¼" F/D (640k): 28 char display: 80 cps printer: 3 x RS232 port: P/P.	OS: Basic: A. *Cobol: Pascal*	Fully integral unit. Extensive applications support offered on all Cannon Machines. Options: dual dual 5¼" F/D (640k) £1500.
Canon CX-1 (£6000)	As above.	128k RAM: 6809: dual 5¼" F/D (640k): 12", 24 x 80 VDU: 180 cps printer: 3 x V24 ports: P/P: light pen.	OS: Basic: A: *Cobol: Pascal.*	Price includes installation & training. Extensive application support offered. Options: dual 8" F/D (1Mb) £3300.(S)
Canon TX-25 (£1600)	As above.	16-32k RAM: 6809: C: 20 char display: 26 col, 2.4 lps printer. Option: 2 x RS232 port.	Basic: A	Fully integral unit. Cassette is Cannon's own design (8k). Can be used with communications. (S).
Challenger IP & C4P (£220 & £395)	CTS: 0706 79332 Millbank Computing: 01-549 7262. Mutek: 0225 743289. U-Microcomputers: 0925 54117 Watford Elec: Watford 40588 (18)	4.32k RAM: 6502: C int: RS232 port. Options: dual 5¼" F/D (160k) £550: for C4P dual 8" F/D (1.15 Mb) and 20MB H/D	O/S: Basic (8k ROM) *Ex Basic:* A.	D/A conv: colour capability. Runs OSI business software on 8" F/D Plato educational software avail soon. BT 4/80. (S).
Challenger 2 (£150)	As above	48k RAM: 6502: dual 8" F/D (0.5 Mb): RS232 port.	OS65U: Ex Basic: A.	Designed as low cost business system (S).
Challenger C3 (£2334)	As above	32-56k RAM: 6502: 6800: Z80: dual 8" F/D (1.15 Mb): 2-16 S/P.	OS65U: Basic: *CP/M: Fortran: Cobol*	Expandable to multi-user (8) system. Options: C3B & C3C H/D units, 74 Mb for about £8500. (S&H).
Clenlo Conqueror (£2475)	Clenlo Computing Systems Ltd: 01-670 4202 (TBA)	64k RAM: Z80: dual 8" F/D (1 Mb): 3 S/P: 2 P/P.	CP/M: CBasic-2: Pearl 1: *U Fortran: Cobol: Pascal*	With 2.4Mb F/D £2950. Also H/D systems with 10 Mb H/D & tape drive £5430.
Comart Communicator (£1995)	Comart 0480 215005 (25)	64k RAM: Z80A: dual 5¼" F/D (780k): 2 S/P: P/P.	CP/M: *Basic: Cobol: Fortran: Pascal*	With 1.5 Mb F/D £2295. With 4.8 Mb H/D & 790k F/D £3795. Option: 18 Mb H/D. £3395 (S).
Compucolor II (£1175)	Dyad Developments: 08446 729 (TBA)	16-32k RAM: 8080: 13" 32x64 8-colour VDU: single 5¼" F/D (5lk): RS232 port.	DOS (ROM): Ex-Basic (ROM): A. *M/A: T/E: Fortran: U*	32k version £1295. High resolution graphics. 6-month subscription to user magazine inclusive BT 9/79. (S).
Compucorp 625 (£6000)	Compucorp: 01-952 7860 (17)	48-60k RAM: Z80: dual 5¼" F/D (630k): 9". 16x80 VDU: 40 col printer: RS232 port, P/P.	Basic: A: *Fortran: Pascal:* U	IEEE-488 Controller and S100 int. Many applications packages avail. (E).
Compucorp 655/ 665/675/685 (from £5050)	As above	60k RAM:. Z80: Up to 4x5¼" F/D(160k-2.4 Mb): 9", 20x80 or 12" 20x80 or 20" 60x80 VDU: 40-col printer: RS232 port.	As above	Prices incl installation and training. Opt: 10-20 Mb H/D
Computermart 2000 DS (£1500)	Computermart: 0603 615089	32-256k RAM: 8085: dual 8" F/D (1-2 Mb): S/P: P/P.	CP/M: *Cis Cobol: Basic: Fortran*	Expandable to multi-user, multi-tasking,, multi-processor 96 Mb H/D system (around £15000).
Cromemco System Zero/DDF, System 2, System 3, System Z2H. (£2627/£2873/ £4893/£6118).	Datron: 0742 585490. Comart: 0480 215005 MicroCentre: 031-556 7354 (18)	64k RAM: Z80: dual 5¼" F/D (346k) on System Zero, System 2 & Z2H: dual 8" F/D (1.2 Mb) on Sys 3: 10 Mb H/D on Z2H: S/P: P/P.	CDOS: *Basic: Cobol: Fortran: RPG II: Lisp: A: W/P: Multi-user Basic. Cromix.*	System 2 & 3 expandable to Multi-user (max 7) £8373 System 2: £10252 Sytem 3. Options: dual 8" F/D (996k): 11.2Mb H/D. BT 10/79 (E).
DAI (£595)	Data Applications (UK): 0285 2588 (7)	48k RAM: 8080: C int: 24x60 VDU int: RS232 port: over 20 industrial ints. option: dual 5¼" F/D £5.95	Basic (ROM): U	Colour graphics up to 255 x 335: 3 notes & noise generator: PAL O/P to TV: Paddle int: H maths option. (1). BT 10/80.
Diablo 3000 (£6950) (TBA)	Business Computers Ltd: 01-207 3344	32k RAM: 8085: dual 8" F/D (1.3 Mb): 12", 24x80 b&w VDU: 45 cps printer.	DOS: Basic: DACL: A: U.	Selection of business packages included (S).
Digital Micro-systems DSC-3 (£3530)	Modata: 0892 41555 (14)	64k RAM: Z80A: dual 8" F/D (1.14Mb): 4xRS232 ports: EIA port.	CP/M: CBasic: *Cobol: Fortran: Pascal: PL/I*	Expandable to multi-user system with 10-28 Mb H/D. Extensive software avail. (S).
Digital Micro-systems DSC-4 (£4395)	As above	128k RAM: Z80A: single 8" F/D (500k): 11 Mb H/D: 4x RS232 ports: 2 P/P.	CP/M: Basic-E: CBasic: *Cobol: Fortran: Pascal.*	Also DSC-3 with 64k RAM. Options: 128k RAM £1295: up to 4 Mb F/D and 20 Mb. H/D. (H).
Durango F-85 (£4995)	Comp Ancillaries: 0784 36455 (12)	64k RAM: 8085: dual 5¼" F/D (1 Mb): 9", 16x64 green VDU: 132 col 165 cps printer: N/P.	O/S: D Basic: *CP/M: CBasic: Micro Cobol.*	Up to 5 work stations: fully integrated system. Options: additional dual 5¼" F/D (1 Mb): 12-24 Mb H/D.(S).
Dynabyte 5200 5900 (£2600)	Metrotech 0895 57780(15)	64k RAM:. Z80: S100 bus: 2 ser ports: 1 par port: any com of 5¼" F/D (630k), dual 8" F/D (1Mb), 9/27/45 Mb H/D, 32/64/96 Mb Cart Module Disk.	CP/M: MP/M: CP/Net, CBasic, MBasic Cobol, Fortran, Pascal, PL/1-80	All systems expandable to multi-user and net working: CP/M inc in base price for F/D system, MP/M for H/D systems.
Equinox 200 (£7500)	Equinox: 01-739 2387 (N/A)	64-512k RAM: Z80: 10 Mb-1200 Mb H/D: 6xS/P: 1 P/P.	CP/M: CBasic: *Cobol: Fortran.*	Multi-user MVT/FAMOS available in place of CP/M. 16-bit version (Equinox 300) £10,000. (S&H).

List of Abbreviations

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E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	P/P	Parallel port	U	Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

IN STORE

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Exidy Sorcerer (£695)	Liveport Data Products: 0736 798157 (27)	48k RAM: Z80: RS232 port: 1 P/P: S100 connector: 30x64 VDU int. N/P.	O/S: Basic (ROM): *T/E: A: CP/M: Algol: Fortran: Basic: 80. Pascal: W/P.*	High-resolution graphics capability: user programmable character set, Option: single 5¼" F/D (316k) £600
Gemini 801 (£1075)	Gemini: 02403 22307 (7).	64k RAM: Z80A: Single 5¼" F/D (315k): 25x80 VDU int: RS232 port. P/P.	*CP/M Basic: Cobol: Fortran: Pascal: A: T/E.*	Up to two integral & two external F/D. Graphics. With no F/D and C int. £750. (S).
Gemini Multiboard (£602)	As above	64k RAM: Z80: 25 x 80 VDU int (with Z80): Option: dual 5¼" F/D £550.	CP/M: *Basic Cobol: Pascal Fortran*	Modular system. Other options inc ROM board & EPROM programmer. Complete cased disk system £1450 BT 2/82 (H&S).
Gimix System 68 (£2000)	SEED: 05433 78151: Windrush 0692 505189	16-64k RAM: 6800/6809: dual 5¼" F/D (500k): 2xRS232 ports.	OS-9: Flex *Basic: Pascal: A: Dis A: T/E:U*	With dual 8" F/D (2 Mb) £2900. Designed as development system for industrial control. (H).
Haywood 3000 (£1925)	Haywood: 01-428 0111. (TBA)	32-64k RAM: Z80A: dual 5¼" F/D (800k): RS232 port: P/P. Opt: 15" 28x80 VDU £799.	CP/M: *Basic: Cobol: Fortran: Pascal: W/P.*	Also system 7000 with 48-65k RAM and 8" F/D (2.5 Mb) £2999. (S).
HP 85 (£1830)	Hewlett Packard Ltd: 0734 784774 (16)	16-32k RAM: C.P.U.: 5", 16x32 VDU: C(200k): 64 cps printer: 4 P/P. Options: dual 5¼" F/D (540k) £1408: fusl 8" F/D (2.4 Mb) £3744.	Basic (ROM)	Full dot matrix graphics. Complete range of interfaces, peripherals and application packages avail. 16k RAM £222. (S).
IMS 5000 (£1500)	Equinox: 01-739 2387 (20)	16-56k RAM: Z80: dual 5¼" F/D (320k): 2xS/P: 1 P/P:	CP/M: C/Basic: *Cobol, Fortran.*	3 drives option: (S&H).
IMS 8000 (£2500)	As above	64-256k RAM: Z80: dual 8" F/D (1 Mb): 2xS/P: 1 P/P	CP/M: CBasic: *Cobol: Fortran: MicroCobol.*	Multi-user MVT/FAMOS available in place of CP/M. (S&H).
Intecolor 8000 (£2999)	Dyad Developments: 08446 729 (TBA)	8-32k RAM: 8080: 19", 80x48 colour VDU: single 5¼" F/D (90k): Option: up to 26 Mb H/D.	DOS(ROM): Ex-Basic: *A:M/A:T/E: Fortran: U*	High res graphics avail: Many options including size of F/D and VDU. (S).
ITT 2020 (£867)	ITT: 0268 3040 (15)	16-48k RAM: 6502	Monitor: A: ExBasic: Dis A.	360x192 high res graphics. Ex-Basic in 6k ROM: Options: single 5¼" F/D (116k): £425: 16k RAM, £110: RS232 port, £96: 32k system, £931: 48k system £995: (B).
Ithaca DPS1 (£3995)	Ithaca: 01-341 2447 (10).	64k RAM: Z80: dual 8" F/D (1 Mb): 2xRS232 ports: 4xP/P. Opt: H/D.	CP/M: *Basic: Cobol: Fortran: Pascal: A: U.*	Z8000 16-bit processor board avail. IEEE/S100 (8 or 16 bit) compatible. (E).
LX-500 (£3500)	Logabax Ltd: 01-965 0061 (13)	32k RAM: Z80: dual 5¼" F/D (180k): 12" 25x80 b&w VDU: 100 cps printer.	DOS: Basic: A.	Other printers available. (S).
LSI M-One (£4200)	LSI Computers: 04862 23411 (20)	8-16k RAM: 8080: dual 8" F/D (1.2 Mb): 12", 24x80 b&w VDU	FMOS: A	Choice of standard business packages included in price. (S).
LSI M-Two (£7900)	As above	64-128k RAM: 8085A: dual 8" F/D (1.2 Mb): 12", 24x80 VDU: 60 cps printer	Elsie: *CP/M: Basic: Cobol Fortran: Pascal: A: U*	Max 8 VDUs and 4 printers. Many applications packages available. Option: 10 Mb H/D £2600. (S).
Macro 1 (£3950 or £294 pm).	Micro APL Ltd. 01-834 2687 (TBA)	64k RAM: Z80A: dual 8" F/D (1 Mb): 4xRS232 ports.	CP/M: APL: U: *Basic: Fortain: Cobol: Word-2star Algo: Pascal: Forth.*	Designed as timesharing replacement. Macro 2 with 2 Mb F/D £4750 or £334 pm.
Megamicro (£6080)	Bytronix: 0252 726814(5)	56k RAM: Z80: dual 8" F/D (500k): 12", 20x80 green VDU: 180 cps printer: 2 S/P: 2 P/P.	CP/M: U: *Basic: A: M/A.*	Range of bus. packages now avail. from Ludhouse of Streatham. (H&B).
Micro Trainer 1 (£650)	Hewart: 0625 22030 (N/A)	16-32k RAM: 6800/6809: 10" 16x24 VDU: 2xC int: Opt: dual 5¼" F/D (160k) £595: 8k RAM £17.	Basic: A: *Pascal: PL/M: W/P*	SS50-based system. Graphics avail. Int card with real time clock £17. (1).
Microstar 45 Plus (£4800)	Data Efficiency Ltd: 0442 63561 (30)	64k RAM: 8085: dual 8" F/D (1.2 Mb): 3 S/P, RS232 port.	Stardos: CP/M: Basic: *Cobol: Fortran*	(E)
Microtan 65 (£69)	Tangerine: 0353 3633(6)	2k RAM: 6502: T Mint: Exp up to 277k RAM.	2k TANBUG monitor: 2k A, disassembler, cassette firm ware: *10k Microsoft Ex. Basic.*	Options: bulk I/O modules, hi-def graphics, CP/M, system racking, ASCII keyboard. Prestel adaptor (S&H).
Millbank Sys 10 (£2995)	Millbank: 01-788 1083(6).	65k RAM: Z80: dual 5¼" F/D (700k): 12", 24x80 VDU: 2x RS232 ports: RS4449 port: P/P.	CP/M: *Basic: Cobol: Fortran: Pascal: PLI: W/P.*	One high level lang. included. 12-month warranty. Main-frame comm. package. H/D avail. soon. (S&H)
MS5001 (£7450)	BMG Ltd: 0793 37813 (N/A)	64k RAM: 8085: dual 8" F/D (1 Mb): 12", 80x24 VDU: 80 cps printer: RS232.	CP/M: *Basic: Cobol: Fortran: MP/M.*	Price includes desk mounting and one computer. Hardware & software support. Leasing arrangements available. (E).
MSI 6816 (£1200)	Strumech: 05433 4321 (5)	16-56k RAM: 6800: dual 9" 16x64 b&w VDU: C int: 1 S/P: 1 P/P.	Basic: A.	Graphics & PROM programmer available. (S&H).
MSI System 12 (£8000)	As above	56-184k RAM: 6800: 10 Mb H/D: single 8" F/D (500k) 24x80 VDU: 1 S/P: 1 P/P.	SDOS: Basic: CBasic: U.	As above. Business packages avail. Up to four terminals. (H&S).
NEC PC 8001 (£599)	IBR 0734 664111	32k RAM: Z80A: P/P Option: dual 5¼" F/D (326k) £699	Basic N: (24k ROM) *CP/M: Fortran: Cobol: Pascal.*	Colour monitor £359 (low res) or £579 (high res) both 12", 25x80 many expansion units avail. (E) BT 6/81

List of Abbreviations

A	Assembler	G/C	Graphics card	M/A	Macro assembler	S	Software
BT	Bench Tested	H	Hardware	N/A	Not available	S/P	Serial port
C	Cassette	H/D	Hard disk	N/P	Numeric pad	T/E	Text editor
E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	P/P	Parallel port	U	Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Newbrain MB (£199)	Grundy: 0223 350355 (TBA)	32k-2 Mb RAM: Z80A: Nat 420: 2xC int: TV int: 2xV24 ports.	CBasic (16k ROM): A.	Graphics. Battery or mains. Options: ½ Mb RAM £450 16 char display £30.(E).
North Star Horizon (£2230)	Comart: (25) 0480 215005. Comma: 0277 811131. Equinox: 01-739 2387(20)	48-56k RAM: Z80A: dual 5¼" F/D (360k): 15", 24x80 VDU: 150 cps printer: 2 S/P: 1 P/P.	DOS: Basic: CP/M: *Cobol: Fortran: Pascal.*	Options: 18 Mb H/D.
North Star Advantage (£2195)	Comart 0480-215005 (25)	64k RAM: Z80A: dual 5¼" F/D (720k): 12", 24 x 80 VDU: S/P.	GDOS: CP/M: *CBasic: MBasic: Fortran: Cobol: Pascal*	Price includes business graphics & demo software. 6 slot expansion.
Oki if 800 (£400)	Encotel.	64k RAM: Z80A: 2k ROM: dual 5¼" F/D (560k): 12", 24x80 VDU: 80 col printer: loudspeaker: RS232 port: 20k ROM cartridge.	Basic: A: *CP/M Cobol: Fortran:*	Fully integral unit. Graphics. Options: dual 5¼" F/D (560k): RS232 port: PP. (1). BT 10/81
Onyx C8000 (£6875)	Onyx Dist Ltd: 0734 664343 Colt 01-577 2150. (TBA)	64k RAM: Z80: 12 Mb Cartridge: 10 Mb H/D: 4 S/P: P/P	CP/M: *MP/M Oasis: Unix: Fortran: Pascal: W/P*	C8001 with 128k RAM £8220. Multi-user version avail. using Oasis.(E) BT 3/81.
Oscar (£2560)	IDS Ltd: 0908 313997(30)	64k RAM: Z80: dual 5 ¼ F/D (800k): 12", 25x80 VDU: RS232 port: 1 P/P	CP/M: *Basic: Pascal Fortran: Cobol: W/P:A*	Also avail. with dual 5" F/D(1.6Mb) £2905 and 8" F/D(2 Mb) £3380. Advanced video board. S&H).
Panasonic JD 800U, JD840U (£4275, £4950)	Panasonic Business Equipment: 0753 75841 (10 regional dist)	56k RAM: 8085A: 12-4k PROM: dual 8" F/D JD800U (500k): JD840U (2 Mb): 12", 24x80 green VDU: 3xRS323 ports.	CP/M: Basic: *Micro-Cobol.*	Also available with 5¼" F/D: JD740U (570k) £4095. H/D avail soon. BT 3/80 (S).
Pascal Microengine (£2295)	Pronto Electronic Systems Ltd: 01-554 6222	64k RAM: MCP 1600: 2x RS232 ports: 2 P/P.	Pascal.	CPU instruction set is P-code: no interpreter needed. Available with dual 8" F/D (2 Mb) £3900.
Pasca 640 (£3700)	Westrex Ltd: 01-578 0957 (TBA)	64k RAM: Z80A: dual 8" F/D (512k): 12", 24x80 VDU: RS232 port: P/P	CP/M: *Basic: Cobol: Fortran: Pascal: A: W/P: U*	Maintenance contracts avail. 10 Mb H/D avail. soon. (S) BT 5/18
Periflex 630z564 (from £2250)	Sintrom: 0734 85464(5)	64k RAM: Z80: dual 5¼" F/D(1.2 Mb): 2xRS232 ports. 1 P/P.	CP/M: *Basic: Fortran: Cobol:A*	One-day installation training on site included in price. Option: dual 5¼" F/D(630k) £464, dual 8¼" F/D(1 Mb) £1025. 35 Mb H/D. BT 6/80 (S&H).
Periflex 1024/64 (from £2750)	As above	64k RAM: Z80: dual 8" F/D (1.2 Mb): 2xRS232 ports: 1 P/P.	As above	As above
PET 16k, & 32k (£550, £695)	Commodore: 0753 79292 (150)	16-32k RAM: 6502: C: 9" 25x40 VDU: IEEE-488 port: Options: dual 5¼" F/D (353k) £695: same but (950k) £895	O/S: Basic (in 8k ROM): *Forth: Pilot: Pascal: Comal: Lisp: A*	8032 with 80-col screen (32k) BT 12/80. £895 Field service avail. (1).
Philips P2000 (£2444)	Philips Data	16-48k RAM: Z80: dual 5¼" F/D (140k): 12", 24x80 VDU: RS232 port.	PDOS: UCSD p-system: *Pascal: Basic Fortran:A.*	With 48k RAM, Pascal and Basic £3300: BT 12/81.(S).
Powerhouse 2 (£1125)	Powerhouse Micros: 0422 48422 (TBA)	32-64k RAM: Z80A: 5" 29x96 VDU: RS232 port: external bus.	4k Monitor: *FDOS: Basic: ExBasic (14k EPROM)*	VDU has flexible screen logic. Options: FDOS & Basic £210: graphics card £200. (H).
Powerhouse 3 (£2600)	As above	32-64k RAM: Z80A: dual 5¼" F/D (350k): 5", 29x96 VDU: RS232 port: external bus.	As above	VDU as above. With 1.2 Mb F/D £3500. ExBasic & FDOS in 14k EPOMs £300. (H).
Prince (£3045)	Digico: 04626 78172 (TBA)	48-64k RAM: 2xZ80: dual 5¼" F/D (800k): 2xRS232 port: 12", 24x80 VDU	CP/M: *Basic: Pascal: Fortran: Cobol: W/P:A:* T/E:U	High res graphics. Options: single 5¼" F/D (400k) £600: dual 8" F/D(2 Mb) £2000. Rentals avail. (S).
Raannd SPI (£4500)	Raannd: 0506 33372 (TBA)	64k RAM: MCP 1600: dual 8" F/D (2 Mb): 12", 24x80 VDU: RS232 port: P/P	Pascal *ADA: Basic*	Based on Microengine (with integrated P-code). Up to 4 F/D drives. 64k RAM expansion avail. BT 12/80. (S).
Rair Black Box 3/30 (£3750)	Rair: 01-836 6921 (N/A)	64-512k RAM: 8085: dual 5¼" F/D (260k): 10 Mb H/D: 2xRS232 ports.	CP/M: Basic: Cobol: Fortran: M/A	64k RAM expansion £500. 256k RAM £1250. Up to 16 RS232 ports.
Research Machines 380Z (£895)	Research Machines: 0865 49791 (N/A)	16-56k RAM: Z80A: 2xC: RS232 port. P/P.	ExBasic: A: T/E: U: *CP/M: Fortran: Cobol: Algol: Cesil: Pascal.*	High res colour graphics. Many possible systems. With 48k RAM & dual 8" 'FD (1 Mb) £3394.
S/09 (£7000)	SWTP Ltd: 01-491 7507(16)	128k RAM: 6809: dual 8" F/D (2 Mb): 12", 24x80 VDU: 2xS/P: 1 P/P.	UniFLEX: *Basic: Pascal: Fortran: A: Dis A: TIE:U.*	Expands to 32 users, 768k RAM, 90 Mb H/D, UNIX 'look alike'. (S&H).
Saracen (£1925)	Bytronix 0252 726814 (TBA)	32-64k RAM: Z80: dual 5¼" F/D (800k): 2xRS232 ports.	CP/M: *Basic: Cobol: Fortran: Pascal: A:*	Applications packages & maint. contracts avail. With dual 8" F/D (2 Mb) and 64k RAM, £2676. (E).
SBS 8000 (£1449)	Manhattan Skyline Ltd: 0801 3442: C Itoh 01-353 6090 (TBAz7	64k, RAM: Z80A: 12", 16 x 64 VDU: 1 P/P: RS232 port (extra £133)	ExBasic (24k ROM): *DOS*	Options disk control card £237: dual 5¼" F/D (368k) £795: dual 8" F/D (2 Mb) £1400. BT 11/80. (S)
SEED System 1 (£2000)	Strumech: 05433 4321 (5)	32-56k RAM: 6800: various disk options: 12", 24 x 80 VDU: RS232 port: P/P	DOS: Basic U: *Fortran: A: Pilot: Strubal: T/E*	Graphics. PROM programmer Also system 19 multi-user (£3000). (E)

List of Abbreviations

A	Assembler	G/C	Graphics card	M/A	Macro assembler	S	Software
BT	Bench Tested	H	Hardware	N/A	Not available	S/P	Serial port
C	Cassette	H/D	Hard disk	N/P	Numeric pad	T/E	Text editor
E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	P/P	Parallel port	U	Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

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IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Sharp MZ-80K (£460-34k)	Sharp Electronics (UK) Ltd: 061-205 2333 (22)	6-48k RAM: Z80: C: 10'' 24 x 40 VDU: Option: dual 5¼'' F/D (289k) £695	Basic, A. *CP/M: Pascal: Fortran: Forth*	Graphics: loudspeaker. BT 10/79 (B)
Sharp MZ-80B (£1095)	As above	64k RAM: Z80A: C: 9'', 25 x 80 VDU: RS232 port: P/P.	Basic: *A: Pascal: FDOS*	High res graphics. Options: dual 5¼'' F/D (560k) £800: 80 cps printer £415. (S)
Sharp PC3201 (£2995)	As above *CP/M: Cobol*	64k RAM: Z80A: dual 5¼'' F/D (500k): C int: 12'', 25 x 80 VDU: 70 1pm printer.	DOS: U: Basic: *CP/M: Cobol.*	Various expansion cards avail. BT 7/81 (I&B)
Sinclair ZX81 (£50-kit, £70-built-prices inc VAT).	Sinclair: 0276 66104 (100 +)	1-16k RAM: Z80A: C int: TV inb: full K/B: 44-pin expansion port.	Basic (8k ROM).	Advanced 4-chip design. Printer now avail. soon BT 6/81
Signet 202 (£2145)	Interram 01-675-5325(N/A)	64k RAM: Z80A: dual 5¼'' F/D (400k): 12'', 24 x 80 VDU: 2 x RS232 ports: 80 col printer.	CP/M: *Basic: Fortran*	Options: dual 5¼'' F/D (800k): dual dual 8'' F/D (2M). (S)
Smoke Signal Chieftan (£1800)	Windrush 0692 405189: Seed 05433 78151 (TBA)	32-64k RAM: 6800/6809: dual 5¼'' F/D (500k): 2 x RS232 port.	DOS: *68/FLEX: Basic: Fortran: Cobol: A: Disc A: Pascal: U.*	With daul 8'' F/D (2 Mb) £2600. Designed as development system for industrial control. (H).
Solitiare WP & BS200 (£6750 & £8200)	Solitaire KPG: 01-995 3573 (TBA)	64k RAM: 8085: 14'' VDU (with own CPU): 45 cps printer: CPU port: dual 5¼'' F/D (700k) 8'' F/D (1.02 Mb) with BS200.	DOS: Basic	All solitaire systems are compatible: anmd can be upgraded to multi-user H/D system. (S)
Sord M100 ACE (£2339)	Midas Computer Services Ltd: 0903 814523 Exleigh Bus. Mach. 0735-66577.(10)	48k RAM: Z80: 8k ROM dual 5¼'' F/D (245k): 24 x 64 green VDU: RS232 port: N/P	O/S: Basic: *A: Fortran: Pascal.*	Up to 3 drives possible. Colour graphics avail. Option S100 bus. (I)
Sord M223 Mk II-VI (£4078)	As above	64k RAM: Z80: 8k ROM: dual 5'' F/D (700k): 12'', 24 x 80 green VDU: RS232 ports: S100 bus: N/P	*O/S:* Ex Basic: *CBasic: Multi-User Basic: Fortran: Cobol*	Expandable to 4 Mb F/D. 32 Mb, H/D, 5 screens, 2 printers. M243 with 192k RAM & 1.4 Mb F/D £5087.
SPC/1 (£3770) (TBA)	Digital Data: 01-573 8854	64-1024k RAM: 8085 A-2: dual 5¼'' F/D (90k): 12'', 24 x 80 VDU: 2 x RS232 ports: Option: single 8'' F/D (1 Mb) £1090:	Mikados, Comal: Pascal: A.	With 32k RAM and single F/D (Comal only) £1995. Expandable to multi-user system (8 users). BT 7/80 (S).
Superbrain (£1950)	Icarus: 01-485 5574 (45)	64k RAM: 2 x Z80: dual 5¼'' F/D (320k): 12'' 25 x 80 VDU: 2 x RS232 port.	CP/M: A: *Basic: Cobol: Fortran: APL: Pascal*	Limited graphis, Mainframe int avail. Full range of appliation packages avail. Also avail with 700k & 1.5 Mb F/D. BT 8/80. (S&H)
System 10 (£2995)	Millbank 01-788 1083 (TBA)	64k RAM: Z80: dual 5¼'' F/D (700k): 12'', 24 x 80 VDU: 2 x RS232 port: P/P	CP/M: *Basic: Fortran: Pascal: Cobol: PL/1: W/P*	12 month warranty. Maint. contracts. Applications packages avail. Choice of high level language in price. (E)
System 20 (£3500)	Extel: 01-739 2041 (TBA)	64-512k RAM: Z80A: dual 8'' F/D (1 Mb): 12'', 24 x 80 VDU: 3 x V2	CP/M:E Basic: *M Basic: Pascal: Cobol: Fortran*	Maintenance contracts avail (132 field service engineers). Expands to multi-user system. Options 13.7 Mb H/D £5799: 27.4 Mb H/D £6674. (S)
System 80 (£1355-48k)	Nascom: 02405 75155 (32)	16-48k RAM: Z80A: dual 5¼'' F/D (560k): TV int: RS232 port.	CP/M: Basic (8k ROM)	EPROM firmware avail. Colour graphics card £165. Many configurations possible. (S&H)
Tandberg EC10 (£4000)	Tandberg: 0532 774844 (N/A)	64k RAM: 8080 A: single 8'' F/D (250k): 12'' 25 x 80 VDU: 7 x RS232 ports: printer int.	CP/M: Ex Basic (24k) *Multi-user Basic: Pascal: Cobol:* A: U:	Up to 7 terminals. Includes V28 comms port. (S&H)
Tandberg TG 8450 (£2200)	As above	64k RAM: 8085: single 5¼'' F/D (77k): C int: 12'', 24 x 80 VDU: RS232 port: P/P	TDOS: *Basic: Cobol: Fortran: Pascal.*	TDOS is CP/M compatible. Opt: single 5¼'' F/D (77k) £250 (up to four): dual 8'' F/D (2 Mb) £1800. (S&H)
Tandy TRS-80 Model 1 (£252)	Tandy: 0922 648181 (200)	4-48k RAM: Z80: C: 12'', 16 x 64 VDU: RS232: P/P	Basic (4k ROM): A.	Fully expandable. Option: single 5¼'' F/D (175k) £320 (up to 4). Many extras available. 32k RAM £304. (I)
Tandy TRS-80 Model II (£2347)	As above	64k RAM: Z80: single 8'' F/D (500k) 12'' 24 x 80 VDU: 2 x RS232 port: P/P	Basic *M/A Fortran: Cobol*	Option: single 8'' F/D (500k) £782 (subsequent £391, up to 4).
Tandy TRS 80 Model 3 (£500-£1700)	As above	See Model I Levels I and II		Fully integral unit. Up to 2 integral and 2 external 5¼'' F/D. BT 8/81
Tandy TRS-80 Colour (£304)	As above	4-16k RAM: 6809: 8-16k ROM: C: 16 x 32 TV int: RS232 port.	Colour Basic.	With 16k RAM, 16k ROM & Extended Colour Basic £390 (I). BT 9/81.
TECS (£1200)	Technalogics Computing Ltd: 061-793 5293 B&B Computers Ltd: 0204 26644 (TBA)	4-56k RAM: 8k PROM: 6800/6809: 2xC: TV int: 2xRS232 ports: internal viewdata modem & printer port.	FLEX: Basci: *Pascal: TDOS: A: T/E: Pilot: Fortran: Cobol.*	Fully viewdata compatible. Options — dual 5¼'' F/D (320k) £850: dual 8'' F/D £120 £1200. (S&H).
Terodec PBM-1000 (£4095)	Terodec: 0734 664343 (40)	80k RAM: Z80A: single 5¼'' F/D (819k): 2 S/P: 3 P/P	CP/M CP/Net CBasic: *Fortran: Pascal: Cobol*	System with Okidata 80 printer: TV1 910 VDU: W/P and various application packages £5995 (S&H)
Terodec DPS 64/2M (£3598)	As above	64k RAM: Z80A: dual 8'' F/D (2 Mb): 2 S/P: 3 P/P. Options: 10 Mb H/D: Tape.	CP/M: *MP/M: CP/Net: CBasic: Fortran: Pascal: Cobol: Basic.*	2 user system with 10 Mb H/D £7400 4 user system with 34 Mb H/D & tape back up £11981. (S&H)
TI 99/4 (£299)	TI: 0234 67466 (TBA)	16k RAM: 26k ROM: 9900: 2 x C int: 24 x 32, 16 colour TV int: 3 tones & noise: P/P.	OS: Basic.	12 month guarantee. Options 32k RAM: 2 x RS232: 3 x 5¼'' F/D (92k each): Speech Synthesiser.

List of Abbreviations

A	Assembler	G/C	Graphics card	M/A	Macro assembler	S	Software
BT	Bench Tested	H	Hardware	N/A	Not available	S/P	Serial port
C	Cassette	H/D	Hard disk	N/P	Numeric pad	T/E	Text editor
E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	P/P	Parallel port	U	Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Tuscan CP/M Starter (£999)	Transam: 01-405 5240 (N/A)	24k RAM: Z80: single 5¼'' F/D (190k): Cint: TV int: RS232 port: P/P: N/P.	CP/M: *Basic: Fortran: Pascal: Cobol:*	Options: single 5¼'' F/D (190k) £155: single 5¼'' F/D (370k) £285: 8k RAM £50. (S&H)
Tuscan Starter Kit (£299)	As above	8k RAM: Z80: Cint: 56-key K/B Options: Case £110: 5 x S100 sockets £20: TV int £3.50	8k Basic	Fully assembled version £499 BT 1/81 (H&S)
UDS 3000 (£2300)	Kemitron: 0244 21817. (TBA)	64k RAM: Z80A: dual 8'' F/D 2 Mb: 2 x RS232 ports. Option: 10 Mb H/D	CP/M: *Basic: Cobol: Fortran: Pascal.*	Full range of industrial support cards, and applications software. (E)
Vector MZ (£2650)	Almarc: 0602 52657 (3)	56k RAM: Z80A: dual 5¼'' F/D (630k): 3 S/P: 2 P/P.	CP/M: Basic: *Algol: Cobol: Pascal: Fortran: Coral: CBasic: A.*	High resolution graphics. Also system B with video board & terminal £3450. (E)
Vector System 2800 (£4600)	As above	56k RAM: Z80A: dual 8'' F/D (2.4 Mb): 3 S/P: 2 P/P	As above	High-res graphics. Many Options. Fully expandable to 5005 multi-user system (max 5) £5400.
Vic 20 (£200)	Commodore: 0753 79292 (150)	5-32k RAM: 6502: Cint: 22 x 23 TV int: S/P: P/P: Games int.	Basic	Graphics 3 tone sound generator. Will interface to PET. Option: single 5¼'' F/D (170k). BT 9/81(S).
VIP (£2650)	Almarc 0602 52657 (3)	64k RAM: 3k ROM: Z80B: single 5¼'' F/D (630k): 12'', 24 x 80 VDU: RS232 port, 3 x P/P	CP/M: *Basic: fortran: Cobol: Pascal: A.*	Up to 3 additional F/D drives. Options: dual 8'' F/D (2 Mb) £1063, 32 Mb H/D (TBA). (H&S). BT2/81
Video Genie EG3003 (£300)	Lowe Electronics: 0629 4995 (N/A)	16k RAM: Z80: 500bps C: 16 x 64 TV int: extra C int: 1 P/P	Basic (12k ROM): *Pascal: A M/A: Fortran*	Graphics available with ex-Basic (13.5k) £3.50.
WH8 (£352)	Heath 0452 29451 (N/A).	16-64k RAM: 808A (or Z80): 4 S/P. Option: single 5¼'' F/D (102k) £241.	OS: HDOS: CP/M: *Fortran: Pascal: Basic*	Kit. 3 drives max. Colour graphics avail. (S&H) BT 2/80.
Xerox 820 (£1750)	Xerox	64k RAM: Z80: dual 5¼'' F/D (162k): 12'', 24 x 80 VDU: 2 x RS232 ports: P/P	Monitor: *CP/M: Basic: Cobol: Fortran: Pascal.*	With 8'' F/D (500k) £2250. CP/M £95. BT 1/82 (S + H)
Zentec (£4838)	Zygal Dynamics: 02405 75681 (TBA)	32-64k RAM: 2 x 8080: dual 5¼'' F/D (256k): 15'', 25 x 80 VDU: RS232 port.	OS/: A: U: *Basic:* Cis Cobol	User programmable character set. Option: dual 8'' F/D (1 Mb). (S)
Zenith WH-11A (£2673)	Heath Ltd: 0452 29451 & 01-636 7349 (N/A)	LSI 11: 16-32k RAM: 25 x 80 VDU: S/P: P/P.	*O/S: Basic, Fortran:* A: U.	PDP 11-compat. Option: 2 x 8'' F/D (1 Mb). £1717 (S&H).
Zenith Z89 £1570-£1710	As above	16-48k RAM: Z80: single 5¼'' F/D (102k): 12'' 24 x 80 b&g vdu: RS232.	*Basic: A: HDOS:* CP/M: *MBasic: CBasic: Fortran.*	3 x 5¼'' F/D possible. Options: dual 8'' F/D (1 Mb) £1717, 20 Mb H/D.
Zilog MCZ 1/05 (portable): MCZ 1/20A (£3250)	Thames Systems: 084421 5471 (N/A)	64k RAM: Z80: dual 8'' F/D (600k): RS232 port: MCZ1/20A only 1 P/P: Option: 10 Mb H/D £7100	RIO: O/S: *Cobol: Basic: Fortran: Pascal: M/A: U.*	Available desk top or rack mounted. Debug in 3k PROM. 1/20A runs multi-user Cobol, up to 5 terminals with 40 Mb H/D. (S&H).

SINGLE BOARDS

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Acorn System 1-5 (£65-£1600)	Acorn: 0223 312772 (35)	11/8k RAM: 6502: EPROM socket: Hex K/B: C int: 8-digit LED display: up to 16 ports. Options: Eurocard 64-way connector: VDU card: full K/B card.	½k monitor: *Basic. Pascal: Forth: DOS.*	Kit. Programmable address linking. On-board 5 V regulator. linking. On-board 5 V regulator. Can be expanded to disk-based system. (S&H)
AEX-09 (£750)	Micro Design 0908 663655	8k RAM: 32k PROM: 6809: 16 I/O lines: RS232 port: RS422 port.	OS-9: *(Basic: Pascal: Fortran avail soon)*	Full A/D & D/A conversion facilities. 4 x 8 but outputs. (H)
Aim 65C (£259)	Pelco: 0273 722155(7)	1-4k RAM: Full K/B 2 x C: 20 char LED: 20 char thermal printer: RS232 port.	A. Disc A: T/E: 8k monitor: *Basic (8k ROM): PL65. Forth*	Expandable using RM65 models to full disk systems. (E)
Bigboard (£450)	Maclin-Zand 01-837 1165 (N/A)	64k RAM: Z80, F/D controller: 24 x 80 VDU controller	2k monitor: *CP/M: Basic: Fortran: Cobol: Pascal: A.*	Many options. Will support up to four 8'' F/D drives. BT 3/81. (E)
Biproc (£119)	B L Micros: 0494 44307. (TBA)	1k RAM: Z80: TV int: RS232 port. Opt: 4k RAM £8: K/B £30.	2k Monitor: A.	With 9980 instead of Z80 £155 as well as Z80 £180. Kit. (H)
Cromeco SC (£355)	Comart: 0480 215005 (25) Datron. 0742 585490.	1k RAM: Z80A: 8k EPROM sockets: RS232 port: 3 P/P. Option: S100 bus.	Monitor: *Basic.*	5 program interval timers. Can put own Basic program in EPROM. (E)
Elf II (£50)	Newtronics: 01-348 3325 (N/A)	¼-64k RAM: RCA 1802: Hex K/B: 2-digit LED: TV int: C int: RS232. Options: Full K/B: VDU card.	1k monitor: A: Dis A: T/E: Elf-bug *Tiny Basic: Basic,*	TTY N-line decoders. Low re-solution graphics (high res avail). Kits or built. Full range of peripherals. (H).
Explorer (£82)	As above	4-64k RAM: 8085: Full K/B. RS232 port: 6 x S100 bus: C int: 1k video RAM.	2k monitor: *Basic (8k) CP/M: Basic Fortran: Cobol.*	Supplied in kit or built. Full range of peripherals including F/D. (H)
Hewart 6800S (£299)	Hewart: 0625 22030 (N/A)	16k RAM: 6800: full K/B VDU int: 2 x C int: 1 S/P: 2 P/P: Option: 16k RAM £90	1k monitor: A: T/E.	Can be upgraded with 6809. (H)
Hewart 6800 Mk 111 (£152)	As above	1k RAM: 6800: VDU board	1k monitor.	Options: single 5¼'' F/D (75k) £350: PROM programmer £32. (H)

List of Abbreviations

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E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	P/P	Parallel port	U	Utility

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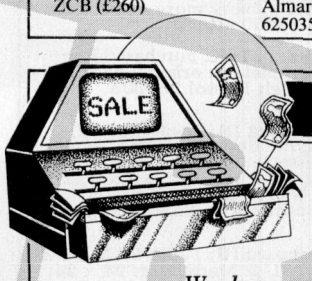
IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Microaxis 1 (£250)	Micro Design 0908 663655 (N/A)	1k RAM: 1-8k PROM: 6809: 8 channel A-D system: 12 optically isolated I/O lines.	1k monitor	Designed for industrial control. Can be expanded to F/D system. (H)
MPC 09 (£750)	As above	17k RAM: 48k PROM: 6089: RS232 port: 50 I/O lines: 4 timers: 1 W audio amplifier.	1k monitor: *Multi-tasking OS*	As above. New 64k version avail.
Microtan 65 (£69)	Tangerine: 0353 3633 (6)	2k RAM: 6502: 16 x 32 TV int: Options: 64 Pixel graphics £6.50	2k monitor, *Basic*	TANEX expansion kit with 7k RAM: 4k EPROM sockets: 14k Basic: 4 S/P: 32 P/P £145. (E)
Nascom 1 (£125)	Nascom: 02405 75155 (20)	4k RAM: Z80: Full K/B: TV int: 2 P/P: 1 S/P. Options: 16k RAM £140: single 5¼" F/D (250k) £240 (4 disk controller £127).	2k monitor: *B Basic: Tiny Basic: A: T/E: U.*	Kit. Built version £140. Also Nascom 2 with 8k Microsoft Basic in ROM £225 (no RAM). (S&H)
77/68 (£90)	Newbear: 0635 30505 (N/A)	4k RAM: 6800: LED: C int: VDU int.	1k monitor: *Basic*	Expandable to 64k RAM with F/D. (B)
79/09 (£65)	As above	1k RAM: 6809: P/P: S/P	2k Monitor.	Designed to upgrade 77/68. (H).
SBC 100 (£135)	Airamco: 0294 57755 (TBA)	1k RAM: Z80: 8k ROM: S100: 1 S/P: 1 P/P.	*1k monitor: DOS in ROM*	Kit. Available assembled £196. (E)
Superboard (£188)	(as Challenger)	4-8k RAM: 6502: 10k ROM: full K/B: VDU int: C int.	Basic (8k ROM)	Options: RS232 port: single 5¼" F/D (100k) £316: 8k RAM £188. (S&H)
Smoke Signal SCB 68 (£181)	Windrush 0692 405189 (TBA)	1k RAM: 6800/6809: 8k EPROM: 1 S/P.	2k monitor	Fully expandable to 64k RAM with F/D. (H)
SYM-1 (£160)	Newbear: 0635 30505 (N/A)	1-4k RAM: 6502: C int: VDU int: 2 x 6522 ports. Option: TV int.	4k monitor: *Basic A.*	Expandable to 64k RAM with F/D. (B).
Tuscan (£299)	Transam 01-405 5240 (N/A)	8k RAM: 8k ROM: Z80A: 5 x S100 slots: RS232 port: TV int: C int: 1 P/P.	*2k monitor: 8k Basic: CP/M: Pascal*	High res graphics available. Can be expanded to F/D system. BT 1.81. (S&H)
UK101 (£149)	Comp Shop: 01-441 2922 (4)	4k RAM: 6502: full K/B: 16 x 48 VDU or TV int: C int: RS232 port, Options: 4k RAM £16	2k monitor: 8k Basic: *Dis A: U.*	Graphics. Expansion & colour avail. Kit or fully assembled. (S&H)
Windrush 6801 (£175)	Windrush: 0692 405189	2k RAM: 6801/3/5: 12k EPROM: S/P: 3 P/P	2k Monitor	Designed for industrial control & dedicated small systems. (H)
ZCB (£260)	Almarc: 0602 625035 (3)	1k RAM: Z80A: 3 PROM sockets: RS232 port: 3 P/P	*Will take any 2708/16 = 32 software.*	S100 bus compatible. Expandable to full system. (E)



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Sinc 16k RAM. . . used twice, boxed with guarantee slip. + 3 superb games on a TDK cassette; Defender, Breakout and Nightmare Park. Only £50 the lot (worth £65). Tel: 01-866 6321 eve.

Microtan 65 + Tanex. . . full expansion, 8k RAM, Microsoft Basic, XBug etc. In system rack with system Motherboard, Cost £480 will accept £300 ono. Tel: Dewsbury 45 24 24 after 6.

TRS80. . . LII 16k + VDU, CTR80, printer interface. Lower case mod, T-Bug, Edtasm, disassembler, manuals etc. £430. Phone David Fitzgerald 01-836 0386.

Mk 14. . . SC/MP processor, with revised monitor. Also available training manual with Nat-Senus assembler and applications manuals. + I/O RAM chip and tape interface. £60 ono. Tel: 01 807 4190 eve.

TI59 + PC100 Printer. . . Exc cond, in box with Master, Maths Utilities and structure, modules, printer utilities and fun, s/ware packettes, charger, case, paper rolls. 90 magnetic cards, complete with all literature. Any test. £230 ono. East Horsley, Surrey, 4239 eve.

Sharp PC1211. . . Pocket computer — still boxed with carrying case. K/board overlay, full instructions, program library containing over 100 programs and guarantee. £70 ono. Tel: Andrew Falconer after 6 on 01-452 1275.

Bargain Atom. . . 13k RAM 12k ROM via buffers etc. Lots of s/ware + books. Also Seikosha GP80 printer + paper. Sensible offers. Phone after 6.30pm 021-747 5084.

ITT. . . 2020 disk drive. Used only a few times as a second drive. £175. Phone South Benfleet 52147.

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Sharp MZ80 48K. . . Basic manuals cassettes etc. 1yr old. Perfect cond. £300. No offers please, buyer collects. Tel: 01-960 1404.

ZX81+16K RAM. . . Sinc built, manual, PSU, leads + 5 games books. Worth £150, accept £110. 19 Drayton Road, Cambridge.

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Sharp MZ-80K. . . 48K per cond. Many progs inc Missile Command, Invaders and adventure games. Club newsletters and machine code language. Only £350 ono. Tel: 041-776 3250.

TRS80. . . LII, 16K, new ROM, num k'pad, inc CTR41 cass recorder, all leads, manuals, tapes + assorted s/ware. 10 months, faultless, working with original packing. £295 the lot. Tel Epsom 24727 — Dick.

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Acorn Atom. . . 12K + 12K, printer drive, V.I.A. fitted, power supply, leads, cass recorder, full documentation, magic book, carry case, games incl Space Invaders, Breakout etc, £200 ono. Tel: Stonehouse 791940 (Scotland).

Apple II. . . Pascal language system, discs + operating system and Language reference manuals £200. TeL: Formby (Merseyside) 70998 after 7.

Atari 400. . . + 410 program recorder only 6 months old, with original packing £340 ono. Tel: Didcot 814656.

PET 2001. . . 8K, old ROM, integral cassette, reasonable cond. will accept £220, buyer collects unless in area. Tel: 0632 733707 after 6.

Apple II. . . Europlus 64K, Apple Pascal, dual drives (3.3), B&W Monitor, all leads, manuals, software & extra software, all perf working cond £1600. Tel: Kings Langley 62403 after 6.

Mattel . . . Intellivision, 1 year old, great cond, with 12 cartridges worth £416, will sell for £300 ono. Tel: 594 7222 ex 3107 weekday between 2 and 4 only. Need quick sale.

TRS80. . . Level II 16K with VDU, power supply and cassette recorder, complete with manuals, leads, etc, games on tape £400 ono. Tel: Gloucester 411410.

PET. . . 8K old ROM, integral cassette deck, small keyboards, recently overhauled and guaranteed, complete with £100 of games cassettes, £265 ono. Tel: 01 486 61009.

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UK101. . . 16K cased with Cegmon, Basics 1,3,4, 300/600 Baud, 1-2 MHz, 16/32 lines 9 amp power supply, colour graphics, masses of programs (Assembler, Toolkit, Forth, Space Invaders etc) £250. Tel: Hamilton 426973.

MZ-80K. . . 20K RAM, 12 months old, very good cond, incl Space Invaders and other programmes £350 ono. Tel: 0256 26057.

ZX81. . . factory built, hardly used, 16K RAM, leads, manual and software, complete with Redditch electronics full-size quality keyboard £140 ono. Tel: 01-946 5161 preferably between 7.30 and 9.30

6802 Computer. . . machine code, colour (uses same colour chip as Acron Atom), display on TV, 10K RAM, needs ASCII keyboard £50. Tel: Hamilton 426973.

Atari 800. . . 32K + cassette player, 3 games 'Le Stick' £700. ZX81 1K Sinc built, manula etc, £40 12" B/W TV £35. Tel: 01-731 5512. after 8.30.

Wanted. . . Sharp Mz80K, 48K, used peripherals, owner state model no., purchase date and supplier. Dr W F Coxon, 3 Talycoed Court, Monmouth, Gwent, NP5 4HR.

Epson MX-80. . . printer, F/T Type-2, hi res graphics, 1 month old £450. Video Geneie EG3003 some books and software, worth £100, all for £250. Parelal interface £20. Tel: 01 947 8837.

32K Pet. . . new Rom, integral cassette desk, soundbox, super-chip, toolkit, reset switch, 15 cassette game porogs £680. Tel: B. Taylor 031-667 1971 ext 28 or 0557 30856.

Video Genie. . . sound level extra keys in box + £200 software incl editor/ass + Level 3 Basic, T-Bug, Temple Apshai, Cosmic Fighter + many more £350. Tel: 0926 23850 after 5.

Genie I. . . 16K, purchased Feb '82 complete in original packing £290. Tel: Bristol 568305.

Superboard III. . . cased, PSU, leads, full documentation, games on cassette, excellent cond, 4K RAM, 8K microsoft in Rom £130 ono. Write: Graeme Hills, 27 Devonshire Ave, Southsea, Hants

Superboard III. . . 8K RAM cased with PSU & Modulator. 24 x 24 or 48 x 12 display, DAC, software incl Space Invaders, magazines & manuals £175 ono. Tel: 0827 62714.

ZX81. . . 3K expandable 8K, mini superboard, full size QWERTY keyboard all in case, room for more. Software cassette library and 4 books, plus more! worth £160, want £100. Tel: 03752 5934.

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O.S.I. . . Superboard II, PSU, modulator case, 48 x 32 display, Cegmon, 8K RAM, leads and manuals £200. Tel: Paul 01-778 6402 after 6.

MZ80K. . . Sharp Assembler and machine code tapes, both with manuals hardly used, cost new £65 accept £22. Tel: 0706 45019.

ROM Pet. . 32K new, cassette, soundbox, toolkit, Pet-revealed, much software incl: many Cursors, Adventures, Invaders, Meteorites, Asteroids, Assembler course, Extramon, P.E.P., Microchess, 3-D Startrek, Glooper, £750. Tel: Cuffley 2865.

Power Supply unit. . . open frame type, 5v, 24v and 12v, suitable for floppy disc etc £19. Tel: 01-573 5635.

Wanted. . . ZX81 in echange for CB radio Cybernet 2000, K40 MAE mount, noise cancelling mic, power supply, free 45wt amp, all boxed, worth around £130. Tel: Aldershot 21489.

Centronics 737-2. . . printer unused £400 ono, ICL Termiprinter 30cps typewriter quality ASCII code send/receive terminal, many features, RS232/V24 — ideal for Nascom etc £50. Tel: Jon 021-743 3442 evenings.

Sharp MZ80. . . 48K Basic, machine language, Zen, Knight Commander, lots of games and cassettes, monitor and other listings, all manuals incl 18 months guarantee still remaining £395. tel: 0709 816721.

Tandy Line Printer VII. . . few months old, still under guarantee, cost £239 new, will accept £179. P. Bramwell, 87 Anderson Cres., Great Barr, Birmingham B43 7ST Tel: 358 5312

Pet 3032. . . 32K + dual disc drive (4040) + diskettes + tape + various manuals + complete 'Basic Basic' course on disc + tape. Buyer collects. Tel: G Smith 01-928 1858.

ZX81. . . Sinc built with 5K RAM and fullsize keyboard with case, lost of v. good software inc Space Invaders, Asteroids etc. all leads and manuals. For quick sale £90. Tel: Mr Quigley 01-549 7657.

UK101. . . in microtype case with 8K RAM. New monitor and Basic in eproms. Complete with manual £200 ono. Tel: 0908 662437.

Ohio Superboard II. . . 8K RAM, 32x32 screen, modulator, PSU, new Cegmon monitor, Basic 3, all manuals etc. Also Exmon, PIA, & VIA interface boards inc, upgrading, hence £160 + postage. Tel: 0225 20074 day or w/end.

8080 Digital board. . . 8K static RAM, 1K monitor Rom inc 8255, 8251, 8224, 8228, NE556A, MC1488, MC1489, Data, Schematics, connectors etc. £25 ono. Tel: 0484 89 3711

ZX81. . . 16K RAM, Sinc built, ex cond only 4 months old, unwanted gift, with 16K games inc Invaders and Startrek. A bargain at £100. Tel: Stourbridge 3420.

Pet 32K. . . Basic 4, keyboard reset buttons etc 4040 twin disk drive, latest DOS, cass rec, lots disk software inc word processor + documentation + books. Offers over £850. Tel: 01-741 755 evenings.

Nascom 1. . . expanded, 32K RAM, Cottis-Blandford interface, Rom graphics, 3amp P.S.U., Nassys monitor, tapes inc Zeap, Basic and games, cost £470, accept £350 ono for quick sale. Tel: Steve Winchester 65410.

Pet 3032. . . 32K, £600. CMB 3040 dual disk drive with 15 disks £600, CMB 3032 printer £400, cass drive £45, all items little used offers invited. Tel: 0243 574014.

Intellivision. . . TV game £160, 5 cartridges at £15 each ono. Mr Wilson, 70 Cambridge Way, Haverhill, Suffolk Tel: 0440 705531.

Acorn Atom. . . 12K + 12K, 6522 VIA, all leads, manuals etc £240 chess cassette £4, several games cass + personal finance cass £3 each. Tel: 01-508 2895 evenings.

S100. . . several S100 boards, CPU, floppy disk controller, RAM, video etc also ASR 33 upgrading system, most boards SD-sales. Tel: Norrie 0294 822634, evenings 7-9.

MPs 6550. . . memory chips for old Commodore Pet, only £7.50 each. Tel:Bitton 6206 (nr

TRS80. . . Level II 16K, VDU monitor and cass rec, + loads of programmes £330. Tel: 01-381 5312.

Compshop TV game. . . Break out £10 also Touch Me by Atari £3.50 also Optim 600 Video cartridge programmable TV game with cartridge £8. Tel: 01-903 3089.

ZX80. . . Sinc built 8K ROM with video upgrade (Compshop allows use of fast and slow mode), books and software, ideal for beginners £50. Tel: Hertford 56751.

ZX81. . . with 16K RAM, complete with adaptor, instruction book, all leads and compatible tape recorder also games book and tape, £120. Tel: Ipswich 713134 after 5.

APPLE II. . . Europlus 48K with one disk drive, controller, manuals, software, £875. Tel: Rickmansworth 78335 after 6.

UK101. . . 40K with 10K Basic, Cegmon, interface boards, 58174 clock/calendar, Space Invaders and manuals, £450 ono or sell in parts. S Riddle, 51 Marshalwick Lane, St Albans, Herts.

Acorn Atom. . . 12K + 12K, PSU, leads, manuals, printer driver chips, fully working, software incl Space Invaders, Astrobirds, Breakout, Star Trek, Star Gate, Maze, Asteroids and many more, £170. Tel: Ingerabourne 70681.

ZX81. . . Sinc built, also Sinclair printer and paper, 7K RAM, leads, PSU + manual, software incl Defenders, Invaders, Cassette 1, £150. R Snell 19 Fulbeck Rd, Scunthorpe, South Humberside DN16 2LL.

CT64 Terminal. . . RS232, 56 stations kb, alpha lock, 2 page memory, 32 or 64 char/line, screen reversal, hi defn monitor, full docs, perfect, £150. Tel: Berkhampstead 4194.

PET 4032. . . 4040 Disk Unit, 3022 Dot Matrix Printer, all cables, disk covers, games programs, Visicalc etc, as new £1300. Mark Thomas. Tel: 01 853 0702 evening.

Wanted. . . Nascom 2, Old Pet, Acorn Atom, Nascom 1 + VDU or Superboard 2 + VDU system for student with only £160. Tel: 01-942 6800.

TRS80. . . Model 1 Level II 48K, VDU, tape, lower case, RS232C, books, games, six months old, original boxes £650. Cumana (Teac) twin discs, TRSDOS, LDOS, Scripsit, £500. Tel: 0625 524596.

ZX81. . . Sinc built, brand new, full guarantee £65. Unwanted gift. Tel: 01-521 3237 after 6.

Atari 800. . . 16K with Atari 410 recorder, 'Le Stick', assem/editor, Basic, Star Raiders cartridges, 9 months warranty remaining £600. Tel: 0253 35967.

TI 99/4. . . chess, statistics, American football, modules, double cassette lead and manuals incl, bought Oct '81 for £400, will sell for £275. All as new. Write with tel. no. R Muldoon, QEMH, Woolwich, London SE18 6XN.

TI-59. . . programmable mag, cards, charber, case, manuals, original box, VGC £60. Tel: 0436 71151.

PET. . . 32K New ROMS, large keyboard, Green screen, cassette, soundbox, many programs incl PETchess, Microchess, Temple of Apshai etc, excellent cond, manuals, buyer collects £600. Tel: 01 521 8897.

8K PET. . . old ROM with built-in cassette £240 ono. Tel: Bristol 292685.

Atari 800. . . 48K, cassette recorder, interface module, joysticks, paddles, 3 cartridges, 4 cassettes incl assembler, disassembler, character generator hardware and software manuals, best offer around £800. Tel: 0903 812227 after 6.

Acorn Atom. . . 12K RAM, 12K ROM, Via power supply (10 amp), Euro connector, printer interface, with software £225. Tel: Canvay Island 699364 evening.

ZX81. . . Sinc. built as new with leads, manual, adaptor, original packaging + about 50 progs £50. UK postage free. Tel: Geoff 0632 577186.

ZX80. . . for sale VGC still in original packing, leads and manual for quick sale, £35. P Gower, 4 Clyffard Cres, Newport, Gwent.

ZX81. . . +16K RAM all sinc built and in VGC, manual, Leads, and OSU incl £80. R Haydon, 21 Manchester mansions, Hazellville Rd, London N19.

Sharp MZ. . . 80K 48K, manuals etc, excellent cond £295. Tel: 01-868 9709.

ZX81. . . +16K RAM, Sinc built, 1 software tape, all leads, manual, power pack, original box etc, first offer of £95 secures. David Brookwood. Tel: 04867 5100, 5-9 evenings.

Aculab. . . floppy tape for Genie complete with manual, extended Basic plus manual and 13 wafers, assorted software on wafers, perf. cond £150. Tel: 0429 61667.

Atari Video Computer. . . complete system plus Combat, Invades, Adventure Outlaw, Basketball, Asteroids, cartridges, excellent cond 11 months old, worth £250, only £150 ono. Tel: Letchworth 72904 after 6.

Video Genie. . . 16K RAM with cassette, lots of software, programmes, books etc. £225. Tel: Spalding 3999.

UK101. . . 8K prof built, metal case, fan, tape recorder, all leads, incl powerful sound generator, large number of programs incl Space Invaders and Screen Editor, £300 ono. Tel: South Benfleet 54200.

TRS80. . . 48K, Level II, with Hitachi 12" VDU, cass, manuals etc, £499 ono or will split. Tel: 0494 444612.

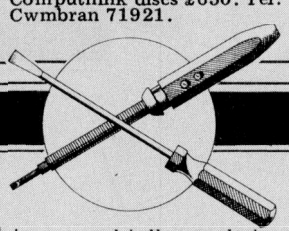
Nascom 2. . . 16K graphics, toolkit, zeap, Nas-Dis, Microsoft and Xtal Basic, cased, lots of software and N2 literature £325. Tel: 0323 57572 after 6.

PET. . . 32K, old ROMs, Integral cassette, small keyboard, many programs in word-processor, invaders, £450 ono. Tel: 0602 708011 after 6.

IBM. . . I/O selectric typewriter, upper & lower case, spares, manual, super print quality £180. Tel: 0621 740075.

Commodore PET. . . 24K plus Computhink discs £650. Tel: Cwmbran 71921.

ACC NEWS



This month, I thought I'd tell you about the ACC Club Affiliation Scheme, whereby your club can obtain a cheap newsletter via the ACC. I have mentioned this before, but the full gory details come this month. But first, here is the news. . .

At a Committee meeting which I was locked out of (inadvertently — at least that's their story and I believe them), the ACC Committee considered changing the ACC's name to remove the apparently taboo word 'Amateur'. One suggestion was 'National Association of Computer Clubs' or NACC for short — I don't like that since I was brought up knowing that NAK meant transmission error, please retransmit, while ACK meant message received and understood (some bright spark will point out that the ASCII codes are 6 for ACK and 25/21/19 (depending on your favourite radix) for NAK). But seriously, I don't see what's wrong with the name Amateur. I happen to work as a computer professional but I choose to devote part of my spare time to hobby computing. When I am being a hobbyist, I am quite happy to be an 'amateur'; it is only because the others around me are also doing it for fun that I do it for fun — otherwise I would charge the going rate. I don't really believe that the computer hobbyist exists to be exploited by businessmen who want a machine to do a job. Well there's a nice provocative view. I hope you'll all write to me and tell me what you think of this issue.

The ACC was at the National Amateur Radio Show at Belle Vue, Manchester on the 4 April, and a good time was had by all (or so our correspondent writes). There were seveal thousand people there and the crush was somewhat reminiscent of last year's *PCW* Show at the Cunard Hotel. All sorts of computer and radio equipment was there, including homebrew, surplus and shiny boxes. As the

ACC NEWS

winners of last year's inter-club quiz, the ACC was punished by having to run the quiz this year (teach our Chairman to be so damn clever). This year it was won by Bury Radio Society, with the other computer club at the Exhibition, the Manchester Computer Club, being sadly knocked out in an early round.

Clubs. . . if you want space at the next (I think it's the fifth!) *PCW* Show for your club, then write to: Dr David Annal, 142 Windermere Road, Norbury, London SW16 5HE as soon as you can, as he's sorting out the space in the ACC's area (on which your club may have a stand — if there are any left) *very soon*. The show will be at the Barbican complex; David has all the details.

I have heard of one new club this month, namely Bottisham BBC Micro Users' Group. The guy to contact there is Mr P M Rank, 27 Bell Road, Bottisham, Cambridge, CB5 9DF. Perhaps they have meetings composing rude letters asking about late delivery. . .? If you're in that area and have another machine, I'm sure they might consider broadening their horizons to more than just the Beeb machine. There's a Club in Nottingham which seems to deserve a plug, if only because they wrote to me (hint. . .), the Nottingham Micro-computer Club (Mr K Swainson, 9 Brayton Cres, Bulwell, Nottingham). Our friends in Oxford, OPeCC (Oxford Personal Computer Club) have tugged my sleeve again, to point out that they're taking off very successfully, with a recent large speaker meeting on computer music. Contact: Tim Fowler, 39 Charles Street, Oxford. The membership fee is £8 per annum, including affiliate membership of the ACC (see below). I hear a rumour that a full barrel of crude oil will be accepted as payment for a year's subscription.

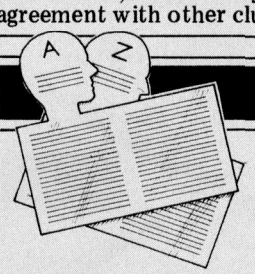
I have frequently informally described the ACC full affiliation scheme (which has been taken up by North London and Oxford Clubs, since its somewhat tentative launch a few months ago), whereby a club pays a much reduced subscription to make all its members ACC affiliate members, and the club uses the ACC's newsletter *ACCumulator* as its own newsletter by the simple insertion of a flysheet. This enables the club to take advantage of the ACC's large and therefore cheap print runs; it will often be cheaper for a club to affiliate then to produce its own newsletter, plus there are the benefits of ACC affiliate membership. To show you exactly what is meant, I will give you the text of a sample set of terms for our imaginary friends the West Somewhere Computer Club.

Terms of Club Affiliate Membership

These terms are applicable only to the agreement between the Amateur Computer Club (abbreviated herein ACC) and the West Somewhere Computer Club (abbreviated herein W Somewhere). Whilst they may be a guide to the kind of agreement with other clubs, the ACC realises that the details of each club's application for full affiliation will differ widely, and that each application will have to be treated as a special case. In particular, it may be possible to reduce the costs for very large clubs.

1. The ACC shall provide W Somewhere with one copy of each issue of *ACCumulator* published during the currency of this agreement, for each paid up member of W Somewhere, plus a margin of 5% to cover honorary members and the like.
2. The individual members of W Somewhere will become affiliate members of the ACC, and will be granted the following rights and priviliges: a) A copy of each issue of *ACCumulator*, supplied to W Somewhere as in (1) above and distributed by them; b) Eligibility for members' special offers; c) Use of the ACC libraries.
Affiliate members are not allowed to vote at ACC General Meetings.
3. W Somewhere will pay to ACC, during September 1982, the sum of two pounds 75 pence for every paid up member of the club. This sum is to be reviewed according to the ACC's costs for each annual renewal of this agreement.
4. Special provisions exist for those members of W Somewhere who are already individual members of ACC. These members will continue to remain full members of the ACC, but the ACC will pay to W Somewhere the sum of one pound 50 pence per such member as a discount. The ACC feels that it might be appropriate for the club to pass such sums on to the members concerned. Those ACC members who are paying at the concessionary rate of two pounds per annum shall not attract the discount.
5. W Somewhere shall be responsible for notifying the ACC of the names and addresses of its members. The ACC will assign each affiliate member an individual membership number, which he should use when applying for special offers or using the libraries. The ACC will also provide W Somewhere with labels for the distribution of *ACCumulator*, should W Somewhere wish to distribute any or all the copies by post.
6. The ACC will promote W Somewhere at any exhibitions or other events attended by ACC. It is hoped that W Somewhere will assist in this by providing publicity material.
7. W Somewhere will notify the ACC Membership Secretary of the names and addresses of new members of the club during the course of the year, and include their capitation fee of two pounds 75 pence (or whatever sum shall be agreed in the future in (3) above). The ACC will include a set of back numbers of the current year's *ACCumulator* for the new affiliate member in the next mailing of *ACCumulator* to W Somewhere.
8. The ACC will provide each affiliate member with a membership card.
9. These provisions apply for the year 1982/83 (1 Oct to 30 Sept), ie, *ACCumulator* Volume 10. The W Somewhere membership shall initially be as on 15 August 1982, but subject to increase under item (7) above.

USER GROUPS INDEX



Here's an update of changes and new clubs. Full listing in July.

INTERNATIONAL

EZUG: Educational ZX users' group. 1982 sub £2 (UK), £2.50 (Europe), £4/$8 (rest of world). Bimonthly newsletter, ZX Directory £1. 16k RAM £32.50 (UK). Contact: Eric Deeson, Highgate School, Birmingham B12 9DS.

PPC (Personal Programming Centre): Worldwide group of Hewlett-Packard calculator & computer users. The 1st and largest calculator user group in the world. 5-weekly journal — good source of hardware & software advice. For sample issue & other information send 8x12 SAE with 2 int reply coupons (or 20z US postage) to: PPC, 2545 West Camden Place, Santa Ana, CA92704, USA.

Amateur Computer Club, 2650 Library. 2650 related data and assistance only. No newsletter or meetings. Still alive & kicking following a rather quiet 1981 in which Roger Munt (contact) moved house. New address: Tyn-Y-Coed, Kilnwood Lane, South Chailey, East Sussex BN8 4AU. Tel: (0273) 400347.

NATIONAL

Amateur Computer Club. National Organisation with seminars, local group meetings. Bi-monthly newsletter 'ACCumulator'. Fee £4.50. SAE to: Rupert Steele, St John's College, Oxford.

BEEBUG: BBC Micro Independent User Group. Regular magazine with programs feature in each issue, hardware tips, software library, advice and reviews. Discounts on hardware, software, maintenance and books. £4.50 half year, £8.50 full. BEEBUG, PO Box 50, St Albans AL1 2AZ

Atom User Group. Quarterly newsletter, software library, technical help whenever possible. Some local groups. Membership £4 pa. Contact Peter Frost, 18 Frankwell Drive, Potters Green, Coventry CV2 2FB.

Church Computer Users Group: There are a few people already interested in starting one. Are there any others? Teaching programs, humn choosers, agendas, addressers etc. ZX81, BBC Micro and others. For information SAE to Nigel Hardcastle, 112 Rotherfield Road, Birmingham B26 2SH.

VIC User Club & Software Library: soon to be formed. Library contributions welcome — all tapes returned & programs paid for. SAE for information to: Matthew Stibbe, The Lawn, Lower Woodfield Road, Torquay Devon.

REGIONAL

Gwent Amateur Computer Club. Anyone in the South Wales area interested contact Ian Hazell, 50 Ringwood Hill, Newport, Gwent NPT 9EB (SAE appreciated) or phone Rotheray Harris on Newport 852924. Meetings at St May's Church Hall, Stow Hill, Newport on Thursdays from 8pm.

North West TRS-80 User Group. Monthly Meetings, bi-monthly newsletter, software library, subgroups and more. Will exchange newsletters with any other TRS-80 group. Contact: Melvyn Franklin, 40 Cowlees, Westhoughton, Bolton BL5 3EG. Tel: Westhoughton 812843

Strathclyde Computer Club. Meetings 3rd Wednesday monthly at Strathclyde University, Wolfson Centre, 106 Rotternrow. Contact: Brian Duffy, 24 Lomond Drive, Condorrat, Cumbernauld G67 4JW.

USER GROUPS INDEX

COUNTY

North Wilts Computer Club. Meetings at Holt Village Hall, 2nd & 4th Wednesdays monthly. Entrance fee 50p to non-members. Speaksers welcome. Contact: Matthew Jones, Pinhills, Bowood, Calne, Wilts SN11 0LY or Gary Hawkins, 198 The Common, Holt, Trowbridge.

TOWNS

Edinburgh ZX User Group. Meetings 2nd Wednesday monthly, Claremont Hotel, Claremont Crescent, Edinburgh, from 7.30pm. Also Saturday workshops & outings arranged. Newsletter, software library. Membership £3 for children, students, OAP and unemployed. £5 otherwise. Contact: Keith Mitchell, 19 Meadowplace Road, Edinburgh EH12 7UJ (031 334 8483) or John Palmer 031-661 3183.

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).

York Computer Club new venue: Guppy's Enterprise Club, 'The Old Brit', 17 Nunnery Lane, York.

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.

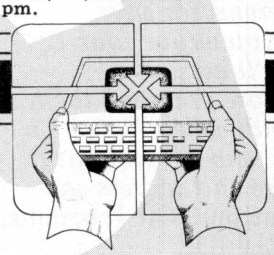
ACC. . . members bulletin board, Peter Whittle (0908 44262)

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.



CTUK! CENTRES

Paul Maddison,
Gardenways,
Chilworth Towers,
Chilworth,
Southampton,
SO1 7JH

Lyn Antill,
1 Defoe House,
Barbican,
London

Peter J Kiff,
52 Stone Road,
Broadstairs,
Kent CT10 1DZ

Patrick Colley,
52 Queensway,
Caversham Park Village,
Reading,
Berks RG4 0SJ

Pete Shaw,
15 St Vincent Road,
Clacton-on-Sea,
Essex C015 1NA

Andrew Stoneman,
135, Birchdale Avenue,
Newcastle-upon-Tyne,
Tyne & Wear

Ray Skinner,
62, Central Avenue,
Billingham,
Cleveland
TS23 1LN

David Tebbutt,
7 Collins Drive,
Eastcote,
Middx HA4 9EL

Vernon Gifford,
111 Selhurst Road,
Croydon,
London SE25 6LH

John Stephen Bone,
2 Claremont Place,
Gateshead,
Tyne & Wear NE8 1TL

Mike Baker,
5 Edinburgh Road,
Hanwell,
London W7 3JY

Vernon Quaintance,
50 Beatrice Avenue,
Norbury,
London SW16 4UN

R L Saunders,
14 St Nicholas Mount,
Hemel Hempstead,
Herts.

Roger Shears,
18 Woodmill Lance,
Bitterne Park,
Southampton SO2 4PY

Brian Taylor,
Tonbridge Area Library,
Avebury Avenue,
Tonbridge,
Kent

Robin Bradbeer,
Polytechnic of North London,
Holloway Road,
London N7

B J Candy,
CTUK! Gloucester,
9 Oakwood Drive,
Gloucester GL3 3JF

Ted Broadhead,
27 Cardinal Road,
Leeds LS11 8EY

Andrew Holyer,
10 Masons Field,
Mannings Heath,
Horsham, Sussex RH13 6JP

Brigitte Gorton,
18 Purbright Crescent,
New Addington,
Croydon CR0 0RT.

Susan Kelly,
Head of Reference Services,
PO Box 4,
Civic Centre,
Harrow,
Middlesex.

Ron Wright or Bill Phillips
Mountview Youth Centre,
Mountview School,
Fisher Road,
Harrow Weald,
Middlesex

Philip Joy,
130 Rush Green Road,
Romford,
Essex.

Richard Powell,
22 Downham Court,
South Shields,
Tyne & Wear

Derrick Daines,
18 Cuttings Avenue,
Sutton in Ashfield,
Notts

Keith Taylor,
Carter Hydraulic Works,
Thornbury,
Bradford BD3 8HG

Chris Woodford,
CTUK! Burton,
31 Hopley Road,
Anslow,
Burton-on-Trent,
Staffordshire

J.M.A. Kilburn,
Headmaster,
Shawfield Norden
Community Middle School,
Shawfield Lane,
Norden,
Rochdale
OL12 7QR

Derek Knight or Bob Carter,
Rayners Lane Library,
Imperial Drive,
Rayners Lane,
Middlesex.

Bill Gibbings,
3 Longholme Road,
Retford,
Notts DN22 6TU

Alan Northcott,
Rushmoor,
464 Reading Road,
Winnersh,
Wokingham,
Berks RG11 5ET

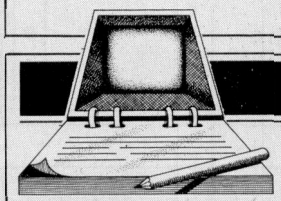
Alan Sutcliffe,
4 Binfield Road,
Wokingham,
Berks RG11 1SL

Tony Cartmell,
54 Foregate Street,
Worcester WR1 1DX

Tom Graves,
19a West End,
Street,
Somerset BA16 0LQ

Alan S Waring,
50 Drayton Gardens,
Winchmore Hill,
London N21 2NS

Derek Moody,
2 Victoria Terrace,
Dorchester,
Dorset DT1 1LS



DIARY DATA

Readers are strongly advised to check details with exhibition organisers before making travel arrangements to avoid wasted journeys due to cancellations, printer's errors, etc.

Hong Kong	Int Computer Technology Exbn. Contact: Industrial & Trade Fairs Ltd, 021-705 6707	19-21 May
Wembley	(Conf Centre) Int Word Processing Exbn & Conf. Contact: Business Equipment Trade Assoc, 01-405 6233	25-28 May
London	(Earls' Court) Consumer Electronics Trade Exbn. Contact: Andry Montgomery Ltd, 01-486 1951	30 May - 2 June
London	(Cunard Hotel) 3rd International Commodore Computer Show. Contact: Print Promotions & Publicity Ltd, Slough (0753) 79292	3 - 5 June
London	(Barbican Centre) Nat Office Automation Show & Conf Contact: Clapp & Poliak Europe Ltd, 01-747 3131	15 - 17 June
London	(Royal Lancs Hotel) Nat Conf & Exbn on Computers in Personnel. Contact: Peter Mirrington Exbns Ltd, Brentwood (0277) 74290.	22 - 24 June

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LEISURE LINES

by JJ Clessa

We must have got it about right this time. 128 entires came in, with 92 correct. For those who couldn't manage the problem (or didn't get it right) the largest number whose prime factors add up to exactly 100 is $2^2 \times 322 = 7,412,080,755,407,364$. This month's winner is from Northern Ireland — Jim Henry of Belfast. Congratulations, Jim. By the time you read this you should have received your prize.

Quickie

No answers, no prizes. How is it possible to be on board an ocean liner halfway between Newfoundland and Ireland, and yet to be only two miles from the nearest land?

Prize puzzle

Tadpoles cost 59p each. Terrapins cost £1.99 each, tortoises cost £2.87 and turtles £3.44. £100 exactly has to be spent on the purchase of 100 of these creatures. How many of each one can be bought?

Answers, on postcards only please, to: June Prize Puzzle, *PCW*, 14 Rathbone Place, London W1P 1DE, to arrive not later than June 30 1982.

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RML Altered Basic

by H Pyle

This program will search and alter the Basic command table in RML's 12k Basic interpreter. This is done by scanning the table (located between addresses 8702 and 9148) into an array, I$ (), for the commands and I () for their locations. The new command is entered, converted to upper case and checked against the contents of the array until a match is found.

If LIST is replaced by a string of numbers (eg 1234) the command is effectively disabled as the computer will interpret this as a line number. The program uses roughly 2k and the variables another 2k so with the 12k interpreter this program requires 16k to run.

The actual interpreter used is Extended Basic VSID from RML.

```
1000 :
1010 REM  INSTRUCTION FIND/CHANGE FOR 380-Z
1020 :
1030 REM  HUGH PYLE , DEC. 1981
1040 :
1050 CLEAR 1000
1060 DIM I$(113),I(113)
1070 I(1)=8702
1080 C=1
1090 TEXT : PUT 12
1100 ? "INSTRUCTION FINDER"
1110 :
1120 FOR J=8702 TO 9145
1130 : A=PEEK(J)
1140 : IF A>128 THEN 1580
1150 : IF A<32 THEN 1170
1160 : I$(C)=I$(C)+CHR$(A)
1170 NEXT J
1180 :
1190 FOR J=1 TO 112
1200 : ? I$(J);CHR$(9);
1210 NEXT J
1220 :
1230 ? "WHICH INSTRUCTION ";
1240 INPUT A$
1250 GOSUB 1660
1260 :
1270 FOR K=1 TO 112
1280 : IF I$(K)=A$ THEN 1330
1290 NEXT K
1300 ? "INSTRUCTION NOT FOUND."
1310 GOTO 1230
1320 :
1330 ? "OK, ";A$
1340 ? "CHANGE TO ";
1350 INPUT A$
1360 IF A$="" THEN 1340
1370 IF LEN(A$)=LEN(I$(K)) THEN 1410
1380 ? "WRONG LENGTH. TRY AGAIN."
1390 GOTO 1340
1400 :
```

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PROGRAMS

```
1410 GOSUB 1660
1420 IF LEN(A$)=1 THEN 1540
1430 FOR L=1 TO LEN(A$)-1
1440 : POKE I(K)+L,ASC(MID$(A$,L,1))
1450 : PRINT  CHR$(ASC(MID$(A$,L,1)));
1460 NEXT L
1470 ? RIGHT$(A$,1)
1480 POKE I(K)+L,ASC(RIGHT$(A$,1))+128
1490 ? "OK, CHANGED."
1500 A$=GET$(100)
1510 RUN
1520 :
1530 :
1540 POKE I(K)+1,ASC(A$)+128
1550 ? A$
1560 GOTO 1490
1570 :
1580 A=A-128
1590 IF A<32 THEN 1630
1600 I$(C)=I$(C)+CHR$(A)
1610 C=C+1
1620 I(C)=J
1630 GOTO 1170
1640 :
1650 :
1660 IF LEN(A$)=0 THEN RETURN
1670 FOR U=1 TO LEN(A$)
1680 : U1=ASC(MID$(A$,U,1))
1690 : IF U1>96 AND U1<123 THEN U1=U1-32
1700 : B$=B$+CHR$(U1)
1710 NEXT U
1720 A$=B$
1730 B$=""
1740 RETURN
1999 :
OK,
```

VIC-20 Large Characters

by M Ahmed

Using this program should provide VIC users with some insight into how to make full use of VIC's graphics. It will display chosen characters in magnified form on the screen. Characters available are the alphabet, all ten digits, &, *, £, $ and mathematical signs. Graphics characters themselves cannot be reproduced using this program.

Input is requested by a large flashing cursor, and characters are displayed simply by pressing the appropriate key. Deletion is done by backspacing.

For use on PET computers the following modifications are all that are needed; in line 106 change T=T-4 to T=T-5; in line 240 change T=T+4 to T=T+5; line 140 should be IF T>38 THEN PRINT "QQQ": T=Q (here 'Q' is in inverse video).

An inverse 'R' and '—' in this listing mean inverse on and off respectively. An inverse heart is the symbol for clear screen. 'Q' reversed is cursor down and a circle (inverse) is cursor up.

Listing courtesy of Lasky's.

```
10 DIMB$(45,4),C$(45):L=45
20 FORI=1TOL:READC$(I):FORJ=1TO4:READB$(I,J):NEXTJ,I
30 U$="TTT"
90 PRINT"□";
100 GETG$:IFG$=""THENGOSUB300
105 IFG$=CHR$(13)THENT=0:GOTO90
106 IFG$=CHR$(20)THENF=1:GOSUB300:T=T-4:IFT<1THENT=0:GOTO115
110 GOSUB200:IFX=0THENG$="":GOTO100
115 GOSUB220
120 PRINTU$;TAB(T);
140 IFT>18THENPRINT"QQQ":T=0
150 GOTO100
200 X=1:FORJ=1TOL
210 IFC$(J)=G$THENC=J:RETURN
215 NEXTJ:X=0:RETURN
220 FORI=1TO4
230 PRINTTAB(T)B$(C,I):NEXT
240 IFQ=0THENT=T+4
290 Q=0:RETURN
300 IFF=1THEN350
310 G$="CR":F=1:Q=1:RETURN
350 G$=" ":F=0:Q=1:RETURN
500 END
1000 DATA"A"," ▚▞ ","▞▀▀▚","▞▀▀▚","▚▄▄▞"
1010 DATA"B","▛▀▀▙","▛▀▀▙","▛▀▀▙","▜▄▄▛"
1020 DATA"C"," ▟▀▀▜","▌   ","▙▄▄▟","▜▄▄▛"
1030 DATA"D","▛▀▀▙","▌  ▐","▙▄▄▟","▜▄▄▛"
1040 DATA"E","▛▀▀▀","▛▀▀ ","▙▄▄ ","▜▄▄▄"
1050 DATA"F","▛▀▀▀","▛▀▀ ","▙   ","▜   "
1060 DATA"G"," ▟▀▀▜","▌ ▀▐","▙▄▄▟","▜▄▄▛"
1070 DATA"H","▌  ▐","▙▄▄▟","▙  ▐","▜  ▛"
```


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PROGRAMS

```
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1090 DATA"J","   ■■ ","   ■■ ","  ■ ■■ ","  ■■■ "
1100 DATA"K","■■  ■ ","■■■  ","■■ ■ ","■  ■ "
1110 DATA"L","■■   ","■■   ","■■   ","■■■■ "
1120 DATA"M","■■ ■ ","■■■■■","■■ ■ ","■  ■ "
1130 DATA"N","■■  ■","■■■ ■","■■  ■","■  ■ "
1140 DATA"O"," ■■■ ","■■ ■ ","■ ■ ■","■■■ "
1150 DATA"P","■■■■ ","■■■■ ","■■   ","■■■ "
1160 DATA"Q"," ■■■ ","■■ ■ ","■ ■ ■","■■■ "
1170 DATA"R","■■■■ ","■■■■ ","■■ ■ ","■  ■ "
1180 DATA"S"," ■■■ ","■■■ ","■■■ ","■■■ "
1190 DATA"T","■■■■■","  ■  ","  ■  ","  ■  "
1200 DATA"U","■■ ■ ","■■ ■ ","■■ ■ ","■■■ "
1210 DATA"V","■■ ■ ","■ ■ ■","■■■ ","■■■ "
1220 DATA"W","■■ ■ ","■■■■■","■■■■■","■  ■ "
1230 DATA"X","■■ ■ ","■■■ ■","■■■ ■","■  ■ "
1240 DATA"Y","■ ■ ■","■■■ ","  ■  ","  ■  "
1250 DATA"Z","■■■■ ","  ■■ ","  ■  ","■■■■ "
1260 DATA"£","  ■■ ","  ■  ","■■■■ ","■■■■ "
1270 DATA"!","  ■  ","  ■  ","  ■  ","  ■  "
1280 DATA"%","■  ■ ","■■■■ ","■■■■ ","■■■■ "
1290 DATA"&"," ■■■ ","■■■ ■","■■■■ ","■■■■ "
1300 DATA"'","  ■■ ","  ■  ","     ","     "
1310 DATA"*","■ ■ ■","  ■  ","■■■■■","  ■  "
1320 DATA" ","     ","     ","     ","     "
1330 DATA".","     ","     ","     ","     "
1340 DATA"0"," ■■■ ","■■ ■■","■■■ ■","■■■ "
1350 DATA"1","  ■  ","■■■  ","  ■  ","■■■■ "
1360 DATA"2"," ■■■ ","   ■ ","  ■  ","■■■■ "
1370 DATA"3"," ■■■ ","   ■ ","   ■ ","■■■ "
1380 DATA"4","  ■■ ","■■■■ ","■■■■ ","  ■■ "
1390 DATA"5","■■■■ ","■■■■ ","■■■■ ","■■■■ "
1400 DATA"6","  ■■ ","■■■■ ","■■■ ■","■■■ "
1410 DATA"7","■■■■ ","  ■■ ","  ■■ ","  ■  "
1420 DATA"8"," ■■■ ","■■■ ■","■■■ ■","■■■ "
1430 DATA"9"," ■■■ ","■■■ ■","  ■■ ","■■■ "
1440 DATA"CR","■   ■","■   ■","■   ■","■   ■"
```

BBC Breakout

by R Trevellyan

After roundly proclaiming that I'll have nothing to do with 'old faithfuls' like Lunar Lander, Space Invaders, Life and Nim, I feel a bit of a hypocrite publishing this. *But* it is a genuine *bona fide* BBC Micro program and, as such, merits a public viewing.

It is the same as any other Breakout game as far as rules are concerned but the author pointed out some aspects of the program itself which show facilities not mentioned in the manual. Lines 100-190 are an assembler routine which draws a new wall as soon as the old one is completely knocked out. Line 100 reserves space for this routine. In lines 380 and 430 "?" provides PEEK and POKE depending on the context. ?215 gives the code (non-ASCII) of the key being pressed and is used here because INKEY (0) does not repeat fast enough.

Instructions are given before you start which are programmed in mode 2. The main program uses 2K. Breakout was written on a model B.

```
  60 VDU23,240,0,255,145,177,255,177,145,255
  70 VDU23,241,0,255,137,141,255,141,137,255
  80 MODE2:PROCTITLE
  90 MODE7:SCREEN=HIMEM-98
 100 DIMP%100
 110 FOPT0
 120 .WALL LDA #255
```


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PROGRAMS

```
130 LDY #220
140 .LOOP STA SCREEN,Y
150 STA SCREEN+80,Y
160 STA SCREEN+160,Y
170 INY
180 BNE LOOP
190 RTS:]
200 PRINT'" ########################################"
210 FORA=1TO22
220   PRINT" #                                      #"
230   NEXT
240 VDU30
250 FORB=1TO8:FORA=129TO133STEP2:PRINTCHR$A:NEXT:NEXT
260 CALL WALL
270 LVE=5:SCORE=0
280 YPAD=24
290 X=RND(36)+1
300 Y=8
310 PAD=18
320 PRINTTAB(PAD,YPAD)"_____";
330 T=TIME:REPEAT:UNTILTIME>T+99
340 XINC=RND(3)-2:IFXINC=0GOTO340
350 YINC=1
360 PRINTTAB(X,Y)"o";
370 FORA=1TO2
380   M=?215
390   IFM=153 PROCLEFT ELSEIFM=249 PROCRIGHT ELSE PROCDELAY
400   NEXT
410 NX=X+XINC:NY=Y+YINC
420 IFY=24PROCLIFE:GOTO290
430 BALL=?(HIMEM+NX+40*NY)
440 IFBALL=32PROCSPACE:GOTO360
450 IFBALL=95PROCSIDE:GOTO410
460 IFBALL=96PROCBAT:GOTO410
470 IFBALL=255PROCHIT:GOTO360
480 DEFPROCSPACE
490 PRINTTAB(X,Y)" ":X=NX:Y=NY
500 ENDPROC
510 DEFPROCLEFT
520 IFPAD-1=0PROCDELAY:ENDPROC
530 PRINTTAB(PAD,YPAD)"      ";
540 PAD=PAD-1:PRINTTAB(PAD,YPAD)"_____";
550 ENDPROC
560 DEFPROCRIGHT
570 IFPAD+1=35PROCDELAY:ENDPROC
580 PRINTTAB(PAD,YPAD)"      ";
590 PAD=PAD+1:PRINTTAB(PAD,YPAD)"_____";
600 ENDPROC
610 DEFPROCHIT
620 PROCSPACE:YINC=-YINC
630 SCORE=SCORE+1:IFSCORE/100<>INT(SCORE/100)ENDPROC
640 PRINTTAB(PAD,YPAD)"      ";:YPAD=YPAD-1
650 PRINTTAB(PAD,YPAD)"_____";:CALL WALL:VDU7
660 ENDPROC
670 DEFPROCBAT
680 IFRND(2)=1:IFX<36PRINTTAB(X,Y)" ":X=X+1:PRINTTAB(X,Y)"o"
690 YINC=-YINC
700 ENDPROC
710 DEFPROCSIDE
720 IFNY=1YINC=-YINC:ENDPROC
730 XINC=-XINC
740 ENDPROC
750 DEFPROCLIFE
760 VDU7
770 LVE=LVE-1:IFLVE=0PROCFIN:RUN
780 PRINTTAB(PAD,YPAD)"      ";
790 PRINTTAB(X,Y)" ";
800 ENDPROC
810 DEFPROCFIN
820 T=TIME:REPEAT:UNTILTIME>T+99:CLS:*FX 15,0
830 PRINT'''"End of Game"
840 PRINT'"You scored ";SCORE;" points"
850 PRINT'"Another Game (Y/N)?":Z$=GET$
860 IFZ$="N"END
870 ENDPROC
```


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PROGRAMS

```
 880 DEFPROCTITLE
 890 COLOUR131:CLS
 900 COLOUR12
 910 PRINTTAB(2,14)"B R E A K O U T"
 920 COLOUR1
 930 PRINT'''"Instructions? (Y/N)";Z$=GET$
 940 IFZ$<>"N"PROCINST
 950 ENDPROC
 960 DEFPROCINST
 970 COLOUR128:CLS
 980 COLOUR7
 990 PRINT''"You must knock"''"bricks from the wall"
1000 PRINT"by hitting the ball"''"back with your bat."
1010 PRINT''CHR$240;" Moves it left"''CHR$241;"Moves it right."
1020 PRINT''"You have 5 lives."
1030 COLOUR15
1040 PRINT'''"Hit any key to Play":A=GET
1050 ENDPROC
1060 DEFPROCDELAY
1070 FORA=1TO60:NEXT:ENDPROC
```

VIC-20 Trailblazer

by Bob Chappell

This is a colourful, fast-moving game in which you and the computer both draw different-coloured trails about the screen for as long as possible without colliding with part of either trail or going back on your own trail. The game is played in rounds, the first (either VIC or user) to win 10 rounds being the overall winner.

Trailblazer is a game which needs fast thinking and quick reactions. The computer makes a worthy adversary even at the slowest trail speed (the program includes speed options). Full playing instructions are presented at the beginning of the game.

Listing courtesy of Lasky's.

```
 2 GOTO300
 10 PRINT"TRAILBLAZER"
 20 H=7948:V=7958:GOSUB80:GOSUB90
 25 A=FNA(4):GOSUB99:H=H+M:LH=A
 27 A=FNA(4):GOSUB99:V=V+M:GOSUB80:GOSUB90:LV=A
 30 FORJ=1TO4:A(J)=0:NEXT:GETA$:IFA$=""THENA=LH:GOTO32
 31 A=ASC(A$)-132:IFA<1ORA>4THENA=LH
 32 GOSUB99:IFH+M<L1GOTO35
 33 H=H-L3:IFPEEK(H+M)=46GOTO45
 34 GOTO200
 35 IFH+M>L2GOTO40
 38 H=H+L3:IFPEEK(H+M)=46GOTO45
 39 GOTO200
 40 IFPEEK(H+M)<>46GOTO200
 45 LH=A:H=H+M:GOSUB80
 46 A=LV:IFA=2ORA=3THENFV=A
 47 J=FNA(24):IFJ>4GOTO51
 48 A=J:IFFV=2ANDA=3THENA=FV:GOTO51
 50 IFFV=3ANDA=2THENA=FV
 51 GOSUB99:IFV+M<L1GOTO54
 52 IFPEEK(V-L3+M)=46THENV=V-L3:GOTO62
 53 GOTO61
 54 IFV+M>L2GOTO57
 55 IFPEEK(V+L3+M)=46THENV=V+L3:GOTO62
 56 GOTO61
 57 J=V+M+M:IFJ>L2ANDJ<L1ANDPEEK(J)<>46GOTO63
 61 IFPEEK(V+M)<>46GOTO63
 62 LV=A:V=V+M:GOSUB90:GOTO30
 63 FORJ=1TO4
 64 A=FNA(4):IFA(A)=1GOTO64
 65 A(A)=1:GOSUB99:IFPEEK(V+M)=46GOTO62
 70 NEXT:GOTO205
 80 POKEH,160:POKEH+P,6
 85 IFV3=1THENFORJ=1TO2:K=FNA(L3)+L2:POKEK,46:POKEK+P,2:NEXT
 87 GOTO95
 90 POKEV,102:POKEV+P,5
 95 POKEN,NN:FORJ=1TOV/10:NEXT:POKEN,0:FORJ=1TOV:NEXT:IFV1=1THENV=V-5
 97 RETURN
```


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PROGRAMS

```
 99 ONAGOTO101,102,103,104
101 M=U:RETURN
102 M=L:RETURN
103 M=R:RETURN
104 M=D:RETURN
200 PRINT"■■":A=H+M:K1=160:K2=6:GOSUB280:PRINT"■■■■YOU ■";:VS=VS+1:GOTO210
205 PRINT"■■":A=V+M:K1=102:K2=5:GOSUB280:PRINT"■■■■VIC ■";:HS=HS+1
210 PRINT" CRASHED!":PRINT"■■VIC";VS;"■■YOU";HS
215 IFVS=10THENPRINT"■■■■■■VIC WINS!■■":GOTO500
220 IFHS=10THENPRINT"■■■■■■YOU WIN!■■":GOTO500
230 PRINT"■■■PRESS F,S,M O OR R
260 POKE198,0:PRINT"■":GOTO430
280 IFA>L1-1THENA=A-22
282 IFA<L2+1THENA=A+22
285 FORJ=1TO30:POKEA,42:POKEA+P,1:POKEN+2,J+190:FORK=1TO30:NEXT
287 POKEA,K1:POKEA+P,K2:POKEN+2,0
290 FORK=1TO30:NEXTK,J:RETURN
300 N=36874:POKEN+5,29:POKEN+4,15
301 DEFFNA(A)=INT(A*RND(1)+1):L=-1:R=1:U=-22:D=22:P=30720:A=RND(TI)
305 L1=8186:L2=7679:L3=506
310 PRINT"■■■■■TRAILBLAZER
320 PRINT"■ YOU ARE ■  ■":PRINT"■ VIC IS ■■■■■"
330 PRINT"■ YOU MUST NOT CROSS":PRINT" YOUR OWN OR VIC'S":PRINT" TRAIL.
340 PRINT"■ TO CHANGE DIRECTION,":PRINT" HIT■    F1■■■↑":PRINT"  F3<  >F5
350 PRINT"         V■F7":PRINT"■ FIRST ONE TO WIN 10  ROUNDS IS THE WINNER.
360 PRINT"  ■PRESS ANY KEY NOW■
370 GETA$:IFA$=""THEN370
380 PRINT"■■ TO START A NEW":PRINT" ROUND PRESS:-
400 PRINT"■■ F FOR FAST SPEED
410 PRINT"■ M FOR MEDIUM SPEED
420 PRINT"■ S FOR SLOW SPEED
425 PRINT"■ R FOR RISING SPEED
426 PRINT"■ G FOR FAST + GAPS
427 PRINT"■■ ■PLEASE PRESS ONE OF":PRINT" ■■THESE KEYS NOW.
430 NN=150:V=0:V1=0:V3=0:T1=TI
440 IFTI-T1>999GOTO10
450 GETA$:IFA$=""GOTO440
460 IFA$="M"THENV=100:NN=170
470 IFA$="S"THENV=300:NN=190
480 IFA$="R"THENV1=1:V=300
485 IFA$="G"THENV3=1
490 GOTO10
500 FORJ=1TO40:CP=PEEK(N+5):CR=CPAND8:POKE36876,(CR=0)*30+160
502 IFCR=0THENCP=CP+8:GOTO506
504 CP=CP-8
506 POKEN+5,CP:FORK=1TO50:NEXTK POKE36876,0:NEXTJ:FORJ=1TO4000:NEXT
510 POKE198,0:POKEN+5 27:PRINT"■■■■■■ PLAY AGAIN (Y OR N)
520 GETA$:IFA$=""THEN520
530 IFLEFT$(A$,1)="Y"THENRUN
540 END                    LIST
```

The (MZ-80K) Next to Last One

by Simon Pack

This is a fascinating piece of programming which will generate subroutines for adding pretty titles to other programs. It is not so much for its actual use as for its interest value that I have chosen it. The NTLO will actually generate listable code from instructions input via the keyboard (namely title characters and shade). Using the program is self-explanatory.

A final point worth mentioning is the author was a mere 13 years of age when the program was written.

```
 99 REM ***********************************
100 REM*DO NOT CARRIAGE RETURN PAST  *
101 REM*DISPLAYED PROGRAMME IF PARENT*
102 REM*PROGRAMME HAS NOT BEEN SAVED *
103 REM*AND LINE 106 HAS BEEN DELETED*
104 REM***********************************
105 Z$="NEW":GOSUB2000
106 Z$="REM":REM - THIS LINE SHOULD BE DELETED BEFORE SAVING PARENT PROGRAMME
107 PRINT"■THE 'NEXT TO LAST ONE'.";:PRINT"■■■■■■
```

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PROGRAMS

```
112 PRINT"programmes."
113 PRINT" The title may be about nine characters"
114 PRINT"long  and in addition  to  letters  and"
115 PRINT"numbers, the following symbols may also"
116 PRINT"be used :-"
117 PRINTTAB(14);"@! & ( ) . ? '"
118 PRINT"@JUST A MOMENT";
119 DIMA$(58,5):FORB=1TO5:PRINT' ,";
120 READA$(1,B),A$(7,B),A$(14,B),A$(31,B)
125 FORA=16TO25
132 READA$(A,B)
135 NEXTA
137 FORA=33TO58
142 READA$(A,B)
145 NEXTA,B:FORB=1TO5:READA$(6,B ,A$(8,B),A$(9,B),A$(0,B):NEXTB:PRINT
150 PRINT"@WHAT STARTING LINE No. IS REQUIRED ?"
158 INPUT"@@ ";A:IFA<1THEN158
160 PRINT"@WHAT INTERVAL BETWEEN LINE Nos. ?":INPUT"@@ ";B:PRINT"@"
170 R=0:PRINT"TYPE IN THE TITLE OF YOUR CHOICE":INPUT"@@ ";H$
175 FORD=1TOLEN(H$):B$=MID$(H$,D,1)
177 IF(B$="M")+(B$="4")THENR=R+5:GOTO189
180 IFB$="W"THENR=R+6:GOTO189
182 IF(B$="I")+(B$="(")+(B$=")")+(B$=" ")THENR=R+3:GOTO189
184 IF(B$="I")+(B$="!")+(B$="'")+(B$=",")+(B$=".")THENR=R+2:GOTO189
185 IFASC(B$)>90THEN190
186 IFLEN(A$(ASC(B$)-32,1))=0THEN190
188 R=R+4
189 A$=A$+B$
190 NEXTD:IFR>40THENPRINT"@TOO LONG ENTER AGAIN.@":GOTO170
191 J=INT(27-(R/2)):S=J-7:PRINT"@@WHAT SHADE OF LETTERING   1 = ▒ , 2 = ▓"
192 GETG:IF(G<1)+(G>2)THEN192
194 K=0:PRINT"@@@DO YOU WISH THE TITLE TO BE UNDERLINED"
195 GETX$:IFX$=""THEN195
197 IFX$="Y"THENPRINT"@@TYPE THE SYMBOL YOU WISH FOR UNDERLINING"
198 IFX$="Y"THENINPUT"@@ ";Y$:K=1
200 PRINT"@@@"
202 Q=53373:POKEQ,73:POKEQ+1,98
205 POKEQ+2,198:POKEQ+3,193:POKEQ+4,193:POKEQ+5,193
210 FORC=ATOA+((6+K)*8)STEP8:PRINTC;"@":NEXTC
220 A=53328+(40+3)+5
230 FORC=ATOA+((5+K)*40)*2STEP80:POKEC,73:POKEC+1,98:NEXTC
300 FORV=1TO5:PRINT"@@":FORX=0TOV+2+1:PRINT"@":NEXTX
305 FOKI=1TOJ:PRINT"@":NEXTI
310 FORZ=1TOLEN(A$):B$=A$(ASC(MID$(A$,Z,1))-32,Y)
320 C$="":FORV=1TOLEN(B$):U=VAL(MID$(B$,V,1)):ONGGOSUB500,600
330 NEXTV:PRINTC$;
400 NEXTZ,Y:R=R-2
405 IFK=0THEN430
410 PRINT"@@@
```

PROGRAMS

```
1210 DATA5120,1010,1110,10010,1010,5120,1000,5113,1010,5120,2100,5120,0100
1220 DATA010100,1010,0100,1110,4130,470,530,000,5020,100,010,000,4200,100,010
1250 DATA000,1010,100,010,000,5120,570,920,000
2000 PRINT"■■■■■■■■■■■■■■■HAVE YOU SAVED THE PARENT PROGRAMME"
2005 GETY$:IFY$=""THEN2005
2010 IFY$="N"THENPRINT"■WELL,DO SO NOW.BUT FIRST DELETE LINE 106■■■":END
2020 IFY$="Y"THENRETURN
2030 GOTO2005
```

MZ-80K Tarot

by D Boylen & B Harvey

If you want to know whether or not *PCW* will publish that article you sent in in January or if you're likely to meet a tall, dark stranger on the morning bus, Tarot sets out to provide the answers. It will give a straightforward Tarot reading of the past, present and, more importantly, the future (please note: *PCW* accepts no responsibility if it tells you you're due for a big windfall and you overdraw in anticipation!).

When the program is run it presents a neat title routine followed by the instructions. Good use is made of sound and graphics throughout and a well-constructed tune accompanies the instructions. There is then a pause while the computer 'shuffles the cards' and a number must be input to begin the reading. It is necessary to press any key between cards to continue the reading — this is not mentioned in the instructions.

All in all, this is a well thought out and executed program and makes quite decorative viewing. The program itself uses 25.86k leaving 8.82k free after loading on top of Basic SP5025. It will, therefore, require a 48k machine to run.

```
1 PRINT"■":FORH=1TO3000:NEXT
2 FORX=1TO2
3 FORG=1TO5
4 FORT=1TO4
5 PRINT"■■■■■"
6 PRINT"                    ▗▄▄▄
```

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*GUNFIGHT Shoot it out across a canyon with three desperadoes. Get them all before they get you!

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Suitable for white & green phosphors

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trim to size, fixers supplied

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204 Harrogate Road
Leeds LS7 4QD

PROGRAMS

```
 53 PRINT"A reading from the Tarot may bring "
 54 PRINT"much happiness and peace of mind,"
 55 PRINT"but because it can reveal hidden truths"
 56 PRINT"and give indications of what may come"
 57 PRINT"a reading may not tell you what you"

 58 PRINT"what you want to hear."
 59 PRINT"Press any key to continue";WZ$
 60 GETWZ$:IFWZ$=""THEN60
 61 RESTORE:CLR: PRINT"There are Three Card Spreads you"
 62 PRINT"may choose from:"
 63 PRINT:PRINT:PRINT"(1)The Nine Card Spread
 64 PRINT"(Relates to Past,Present and Future)"
 65 PRINT:PRINT"(2)The Circular Spread":PRINT"(Relates to the Year Ahead)"
 66 PRINT: PRINT:PRINT"(3)The Horseshoe Spread"
 67 PRINT"(Relates to Specific Questions)":PRINT
 68 PRINT"    ┌──────────────────────────┐"
 69 PRINT"    │                          │"
 70 PRINT"    │ Please Press Button 1,2 or 3 │"
 71 PRINT"    │                          │"
 72 PRINT"    └──────────────────────────┘"
 73 GETW$:IFW$=""THEN73
 74 SP=VAL(W$)
 75 IFSP>3THENPRINT"I forcast a long wait unless you press  the right button"
 76 IFSP=1THENU=10:GOTO80
 77 IFSP=2THENU=14:GOTO80
 78 IFSP=3THENU=8:GOTO80
 79 GOTO73
 80 GOSUB160
 81 PRINT"Please cross my keyboard with Silver":PRINT
 82 PRINT"While I shuffle the cards"
 83 DEF FNA(Q)=1+INT(RND(7)*Q)
 84 LIMIT51999
 85 FORA=52000TO52500:POKEA,200:NEXT
 86 DIMN$(15)
 87 FORA=1TO78:GOSUB695:NEXT
 88 FORA=1TO14:READN$(A):NEXT
 89 GOSUB160
 90 PRINT" Your generosity overwhelms me!":PRINT
 91 PRINT"Now you have to cut the cards"
 92 INPUT"Enter any Number from 1 to 500 and      then press CR ";D

 93 IFD>500THEN92
 94 Z=0:NC=0:DR=D
 95 Z=Z+1:IFZ=UTHENGOTO682
 96 IFD>500THEND=1
 97 CD=PEEK(52000+D):IFCD=NCTHEND=D+1:GOTO96
 98 IFCD=200THEND=D+1:GOTO96
 99 PRINT"This card refers to:"
100 IFSP=1THENGOSUB115
101 IFSP=2THENGOSUB121
102 IFSP=3THENGOSUB135
103 NC=CD
104 IFCD>78THENCS=CD-78:GOTO106
105 CS=CD
106 IFCD>78THENPRINT"(Reverse)":PRINT:GOTO108
107 PRINT""
108 IFCS<8THEN218
109 IFCS<15THEN338
110 IFCS<23THEN458
111 IFCS<37THEN143
112 IFCS<51THEN167
113 IFCS<65THEN184
114 GOTO201
115 IFZ=1THENPRINT"Your present circumstances":RETURN
116 IFZ=2THENPRINT"The highest you can attain at this time":RETURN
117 IFZ=3THENPRINT"Hidden factors in your affairs":RETURN
118 IFZ=4THENPRINT"Past causes of your Situation":RETURN
119 IFZ=5THENPRINT"The outcome if present trends continue":RETURN
120 IFZ>5THENPRINT"Your progress in the near future":RETURN
121 IFZ=1THENPRINT"The overall tone of the reading"
122 IFZ=2THENPRINT"Conditions a Month hence":RETURN
123 IFZ=3THENPRINT"Conditions Two Months hence":RETURN
124 IFZ=4THENPRINT"Conditions Three Months hence":RETURN
125 IFZ=5THENPRINT"Conditions Four Months hence"
126 IFZ=6THENPRINT"Conditions Five Months hence"
127 IFZ=7THENPRINT"Conditions Six Months hence"
128 IFZ=8THENPRINT"Conditions Seven Months hence"
129 IFZ=9THENPRINT"Conditions Eight Months hence"
130 IFZ=10THENPRINT"Conditions Nine Months hence"
131 IFZ=11THENPRINT"Conditions Ten Months hence"
132 IFZ=12THENPRINT"Conditions Eleven Months hence"
133 IFZ=13THENPRINT"Conditions Twelve Months hence"
134 RETURN
135 IFZ=1THENPRINT"Past Influences"
136 IFZ=2THENPRINT"Your Present Circumstances"
137 IFZ=3THENPRINT"General Future Conditions"
138 IFZ=4THENPRINT"The Best Policy for you to follow"
139 IFZ=5THENPRINT"The Attitudes of those around you"
140 IFZ=6THENPRINT"Obstacles standing in your way"
141 IFZ=7THENPRINT"The probable final outcome"
142 RETURN
```


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Or Phone: (0752) 264646

PROGRAMS

```
143 N=CS-22:PRINT"
144 PRINT"                ";N$(N);" "
145 PRINT"
146 PRINT"
147 PRINT"
148 PRINT"
149 PRINT"
150 PRINT"
151 PRINT"
152 PRINT"
153 PRINT"
154 PRINT"
155 PRINT"
156 PRINT"
157 PRINT"
158 PRINT"
159 GOTO595
160 PRINT"
161 PRINT"
162 PRINT"
163 PRINT"
164 PRINT"
165 PRINT"
166 RETURN
167 N=CS-36:PRINT"
168 PRINT"                ";N$(N);" "
169 PRINT"
170 PRINT"
171 PRINT"
172 PRINT"
173 PRINT"
174 PRINT"
175 PRINT"
176 PRINT"
177 PRINT"
178 PRINT"
179 PRINT"
180 PRINT"
181 PRINT"
182 PRINT"
183 GOTO595
184 N=CS-50:PRINT"
185 PRINT"                ";N$(N);" "
186 PRINT"
187 PRINT"
188 PRINT"
189 PRINT"
190 PRINT"
191 PRINT"
192 PRINT"
193 PRINT"
194 PRINT"
195 PRINT"
196 PRINT"
197 PRINT"
198 PRINT"
199 PRINT"
200 GOTO595
201 N=CS-64:PRINT"
202 PRINT"                ";N$(N);" "
203 PRINT"
204 PRINT"
205 PRINT"
206 PRINT"
207 PRINT"
208 PRINT"
209 PRINT"
210 PRINT"
211 PRINT"
212 PRINT"
213 PRINT"
214 PRINT"
215 PRINT"
216 PRINT"
217 GOTO595
218 ONCSGOTO219,236,253,270,287,304,321
219 PRINT"
220 PRINT"
221 PRINT"
222 PRINT"
223 PRINT"
224 PRINT"
225 PRINT"
226 PRINT"
227 PRINT"
228 PRINT"
229 PRINT"
230 PRINT"
231 PRINT"
232 PRINT"
233 PRINT"                THE FOOL
234 PRINT"
235 GOTO595
236 PRINT"
237 PRINT"                I
238 PRINT"
239 PRINT"
240 PRINT"
241 PRINT"
242 PRINT"
243 PRINT"
244 PRINT"
245 PRINT"
246 PRINT"
247 PRINT"
248 PRINT"
249 PRINT"
250 PRINT"                MAGICIAN
251 PRINT"
252 GOTO595
253 PRINT"
254 PRINT"                II
255 PRINT"
256 PRINT"
257 PRINT"
258 PRINT"
259 PRINT"
260 PRINT"
261 PRINT"
262 PRINT"
263 PRINT"
264 PRINT"
265 PRINT"
266 PRINT"
267 PRINT"                THE PAPESS
268 PRINT"
269 GOTO595
270 PRINT"
271 PRINT"                III
272 PRINT"
273 PRINT"
274 PRINT"
275 PRINT"
276 PRINT"
277 PRINT"
278 PRINT"
279 PRINT"
280 PRINT"
281 PRINT"
282 PRINT"
283 PRINT"
284 PRINT"                EMPRESS
285 PRINT"
286 GOTO595
287 PRINT"
288 PRINT"                IV
289 PRINT"
290 PRINT"
291 PRINT"
292 PRINT"
293 PRINT"
294 PRINT"
295 PRINT"
296 PRINT"
297 PRINT"
298 PRINT"
299 PRINT"
300 PRINT"
301 PRINT"                EMPEROR
302 PRINT"
303 GOTO595
304 PRINT"
305 PRINT"                V
306 PRINT"
307 PRINT"
308 PRINT"
309 PRINT"
310 PRINT"
311 PRINT"
312 PRINT"
313 PRINT"
314 PRINT"
315 PRINT"
316 PRINT"
317 PRINT"
318 PRINT"                THE POPE
319 PRINT"
320 GOTO595
```


MICROMART

Great products from Mutek

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Mutek's Tiny PILOT (MTP) is a small-scale yet comprehensive implementation of the PILOT text-oriented programming language for OSI and UK101 computers.

Commands are: **R:** remark; **T:** type text (or graphics character); **?:** accept name; **A:** accept answer (numeric or alphanumeric); **M:** match (full range of comparisons); **J:** jump to label; **U:** use subroutine at label; **E:** end subroutine; **C:** compute (26 single-character variables); **I:** input numeric value to variable; **P:** produce random number; **S:** stop (end program)

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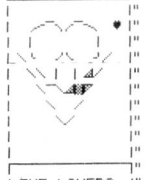
PROGRAMS

```
321 PRINT"                    "
322 PRINT"                    "
323 PRINT"                    "
324 PRINT"                    "
325 PRINT"                    "
326 PRINT"                    "
327 PRINT"                    "
328 PRINT"                    "
329 PRINT"                    "
330 PRINT"                    "
331 PRINT"                    "
332 PRINT"                    "
333 PRINT"                    "
334 PRINT"                    "
335 PRINT"                    "
336 PRINT"                    "
337 GOTO595
338 S=CS-7:ONSGOTO339,356,373,390,407,
          424,441
```

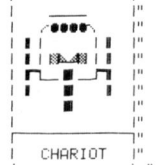
VI



THE LOVERS

```
339 PRINT"                    "
340 PRINT"                    "
341 PRINT"                    "
342 PRINT"                    "
343 PRINT"                    "
344 PRINT"                    "
345 PRINT"                    "
346 PRINT"                    "
347 PRINT"                    "
348 PRINT"                    "
349 PRINT"                    "
350 PRINT"                    "
351 PRINT"                    "
352 PRINT"                    "
353 PRINT"                    "
354 PRINT"                    "
355 GOTO595
```

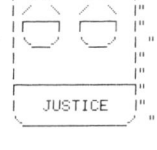
VII



CHARIOT

```
356 PRINT"                    "
357 PRINT"                    "
358 PRINT"                    "
359 PRINT"                    "
360 PRINT"                    "
361 PRINT"                    "
362 PRINT"                    "
363 PRINT"                    "
364 PRINT"                    "
365 PRINT"                    "
366 PRINT"                    "
367 PRINT"                    "
368 PRINT"                    "
369 PRINT"                    "
370 PRINT"                    "
371 PRINT"                    "
372 GOTO595
```

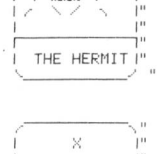
VIII



JUSTICE

```
373 PRINT"                    "
374 PRINT"                    "
375 PRINT"                    "
376 PRINT"                    "
377 PRINT"                    "
378 PRINT"                    "
379 PRINT"                    "
380 PRINT"                    "
381 PRINT"                    "
382 PRINT"                    "
383 PRINT"                    "
384 PRINT"                    "
385 PRINT"                    "
386 PRINT"                    "
387 PRINT"                    "
388 PRINT"                    "
389 GOTO595
```

IX



THE HERMIT

```
390 PRINT"                    "
391 PRINT"                    "
392 PRINT"                    "
393 PRINT"                    "
394 PRINT"                    "
395 PRINT"                    "
396 PRINT"                    "
397 PRINT"                    "
398 PRINT"                    "
399 PRINT"                    "
400 PRINT"                    "
401 PRINT"                    "
402 PRINT"                    "
403 PRINT"                    "
404 PRINT"                    "
405 PRINT"                    "
406 GOTO595
```

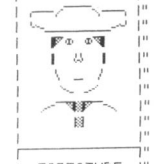
X



THE WHEEL

```
407 PRINT"                    "
408 PRINT"                    "
409 PRINT"                    "
410 PRINT"                    "
411 PRINT"                    "
412 PRINT"                    "
413 PRINT"                    "
414 PRINT"                    "
415 PRINT"                    "
416 PRINT"                    "
417 PRINT"                    "
418 PRINT"                    "
419 PRINT"                    "
420 PRINT"                    "
421 PRINT"                    "
422 PRINT"                    "
423 GOTO595
```

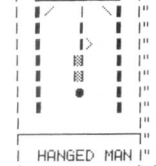
XI



FORTITUDE

```
424 PRINT"                    "
425 PRINT"                    "
426 PRINT"                    "
427 PRINT"                    "
428 PRINT"                    "
429 PRINT"                    "
430 PRINT"                    "
431 PRINT"                    "
432 PRINT"                    "
433 PRINT"                    "
434 PRINT"                    "
435 PRINT"                    "
436 PRINT"                    "
437 PRINT"                    "
438 PRINT"                    "
439 PRINT"                    "
440 GOTO595
```

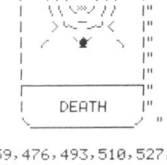
XII



HANGED MAN

```
441 PRINT"                    "
442 PRINT"                    "
443 PRINT"                    "
444 PRINT"                    "
445 PRINT"                    "
446 PRINT"                    "
447 PRINT"                    "
448 PRINT"                    "
449 PRINT"                    "
450 PRINT"                    "
451 PRINT"                    "
452 PRINT"                    "
453 PRINT"                    "
454 PRINT"                    "
455 PRINT"                    "
456 PRINT"                    "
457 GOTO595
458 S=CS-14:ONSGOTO459,476,493,510,527,
          544,561,578
```

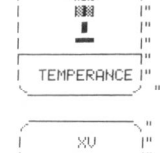
XIII



DEATH

```
459 PRINT"                    "
460 PRINT"                    "
461 PRINT"                    "
462 PRINT"                    "
463 PRINT"                    "
464 PRINT"                    "
465 PRINT"                    "
466 PRINT"                    "
467 PRINT"                    "
468 PRINT"                    "
469 PRINT"                    "
470 PRINT"                    "
471 PRINT"                    "
472 PRINT"                    "
473 PRINT"                    "
474 PRINT"                    "
475 GOTO595
```

XIV



TEMPERANCE

```
476 PRINT"                    "
477 PRINT"                    "
478 PRINT"                    "
479 PRINT"                    "
480 PRINT"                    "
481 PRINT"                    "
482 PRINT"                    "
483 PRINT"                    "
484 PRINT"                    "
485 PRINT"                    "
486 PRINT"                    "
487 PRINT"                    "
488 PRINT"                    "
489 PRINT"                    "
490 PRINT"                    "
491 PRINT"                    "
492 GOTO595
```

XV



THE DEVIL

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PROGRAMS

```
493 PRINT"                "
494 PRINT"      XVI       "
495 PRINT"                "
496 PRINT"                "
497 PRINT"                "
498 PRINT"                "
499 PRINT"                "
500 PRINT"                "
501 PRINT"                "
502 PRINT"                "
503 PRINT"                "
504 PRINT"                "
505 PRINT"                "
506 PRINT"                "
507 PRINT"   THE TOWER    "
508 PRINT"                "
509 GOTO595
510 PRINT"                "
511 PRINT"      XVII      "
512 PRINT"                "
513 PRINT"                "
514 PRINT"                "
515 PRINT"                "
516 PRINT"                "
517 PRINT"                "
518 PRINT"                "
519 PRINT"                "
520 PRINT"                "
521 PRINT"                "
522 PRINT"                "
523 PRINT"                "
524 PRINT"    THE STAR    "
525 PRINT"                "
526 GOTO595
527 PRINT"                "
528 PRINT"     XVIII      "
529 PRINT"                "
530 PRINT"                "
531 PRINT"                "
532 PRINT"                "
533 PRINT"                "
534 PRINT"                "
535 PRINT"                "
536 PRINT"                "
537 PRINT"                "
538 PRINT"                "
539 PRINT"                "
540 PRINT"                "
541 PRINT"   THE MOON     "
542 PRINT"                "
543 GOTO595
```

```
544 PRINT"                "
545 PRINT"       XIX      "
546 PRINT"                "
547 PRINT"                "
548 PRINT"                "
549 PRINT"                "
550 PRINT"                "
551 PRINT"                "
552 PRINT"                "
553 PRINT"                "
554 PRINT"                "
555 PRINT"                "
556 PRINT"                "
557 PRINT"                "
558 PRINT"    THE SUN     "
559 PRINT"                "
560 GOTO595
561 PRINT"                "
562 PRINT"       XX       "
563 PRINT"                "
564 PRINT"                "
565 PRINT"                "
566 PRINT"                "
567 PRINT"                "
568 PRINT"                "
569 PRINT"                "
570 PRINT"                "
571 PRINT"                "
572 PRINT"                "
573 PRINT"                "
574 PRINT"                "
575 PRINT"   JUDGEMENT    "
576 PRINT"                "
577 GOTO595
578 PRINT"                "
579 PRINT"      XXI       "
580 PRINT"                "
581 PRINT"                "
582 PRINT"                "
583 PRINT"                "
584 PRINT"                "
585 PRINT"                "
586 PRINT"                "
587 PRINT"                "
588 PRINT"                "
589 PRINT"                "
590 PRINT"                "
591 PRINT"                "
592 PRINT"   THE WORLD    "
593 PRINT"                "
594 GOTO595
```

```
595 MUSIC"G2▪R2G2▪▪":RESTORE:FORA=1TOCD+14:READCD$:NEXT
596 PRINT:PRINT"and indicates:"
597 PRINTCD$
598 GETA$:IFA$=""THEN598
599 GOTO95
600 DATA" A"," 2"," 3"," 4"," 5"," 6"," 7"," 8"," 9",10," P",KN," Q"," K"
601 DATAUnexspected Influence,Initiative or Diplomacy
602 DATAInfluence of a Woman.Intuitive insight,Fruitfulness.Stability
603 DATAInfluence of a great person.Will-Power,Enlightenment
604 DATAA time of choice by intuition,Success over obstacles
605 DATAAn act of judgement.A just outcome,A need for advice or plannins
606 DATAA new start.Good luck,opportunity through courage.
607 DATAFlexibility.Thoughtfulness,A major change.A blessing in disguise
608 DATASuccess through skillful control,A need for selfcontrol
609 DATASufferins through destiny,Possibilities in the future
610 DATAA need for intuition not reason,Success against all odds
611 DATAA new lease of life,"The successful finish to any matter in▪ hand"
612 DATASuccess desrite adversity,Success through equilibrium
613 DATAUpheaval for something better,Peace and order from strife
614 DATAA need to ac ept the inevitable,The solvins of immediate problems
615 DATA"A need for prudence against powerful    opposition",Restrictions
616 DATAStrength through sufferins
617 DATADisruption but things can only improve
618 DATADiplomacy and keen sightedness,Courage for comins battles
619 DATAIntelligence and versatility,Inventiveness and anbition
620 DATAJoy and plenty,Friendship.Co-Operation
621 DATA The healins of ills,Emotional happiness already attained
622 DATADisappointment to be overcome,Happiness from the past
623 DATAChoice through careful judgement,A change of perspective
624 DATAEmotional stability.Generosity of spirit,peace and concern
625 DATAPoetic.Foresighted.Medative,Ideas.Offers and opportunities
626 DATAHighly imaginative.Easily influenced,skilled in worldly things
627 DATAMaterial security,movement and change
628 DATASuccess in work and business,Financial stability
629 DATAMaterial worries,balance in material matters
630 DATAGood fortune by swift action,the use of skills for material gain
631 DATAComfort.Good sense,family wealth
632 DATASound business sense and responsibility,lover of practical virtues
633 DATADown to earth and compassionate,cautious methodical and practical
634 DATANew beginnings.Fertility,strength of will.Earned success
635 DATADreams turned to reality,artistic achievement
636 DATAOpposition to be fought by ingenuity,success earned by hard work
637 DATAPossibilities to be grasped,hopeful change.The end of delays
```


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* CLEAR – remove any character
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PROGRAMS

```
638 DATASaftey and security,the triumph of force
639 DATAResourcefulness and enthusiasum,unreasoning but intuitive
640 DATAFertility physically and mentallt,virility and passion
641 REM REVERSE **********
642 DATAImpulsive action can cause problems,weakness of will
643 DATAProblems through emotional instability,domestic upheaval
644 DATAFailure of ambition.Immaturity,misinformation.Bad advice
645 DATADanger of moral lapse,overbearingness.Ruthlessness
646 DATAInjustice.Bias,refusal of sound advice
647 DATAThe closing of a cycle of fortune,surrender to unworthy impulses
648 DATAOver-reliance on the concrete mind,enforced removal
649 DATAOpposition through ineptitude,abuse of one's position
650 DATAUnnecessary suffering,rigidity of mind
651 DATAFailure of nerve,misjudgement.Fantasies
652 DATALoss.Guilt.Punishment,stagnation
653 DATANegative force,love of tension and discord
654 DATADiscord.Disorder,failure of nerve.Depression
655 DATAWeakness could result in disaster,need fOr continued effort
656 DATAFailure of nerve,hard work with little reward
657 DATAIsolation from help,a false dawn
658 DATADeviousness and vindictiveness,headstrong carelessness
659 DATAUnderhandedness and slander,cruelty and coldness
660 DATADespair.Loss of faith,dissent.Jealousey
661 DATAUnbridled passion,excesses of all kinds
662 DATAWorries and anxieties,inabitity to adapt to change
663 DATASelf-delusion.Fantasy,restlessness and dissatisfaction
664 DATAVanity and complacency,anti-social actions
665 DATASelfishness.Surface knowledge,duplicity and fraud
666 DATAIdle fantasy.Untrustworthyness,treachery and dishonesty
667 DATAGreed.Avarice.Miserliness,inconsistency and foolhardiness
668 DATAConceit or prejudice,covetousness.Inability to delegate
669 DATALack of imagination,carelessness with money
670 DATASelf-induced money worries,the misuse of skills
671 DATASuccess on others misfortunes,the restricting effect of tradition
672 DATADull-wittedness.Idleness,lack of foresight.Smugness
673 DATANarrow mindedness.Extravagance,dullness and weakness
674 DATAOver-confidence and greed,unbridled ambition
675 DATAFrustration with reality,decadence and snobbishness
676 DATAAvoidable litigation,news delayed
677 DATAIndecisiveness I think?,wasted brilliance
678 DATAObstinacy and suspicion,deceit and guile
679 DATASlanderous gossip,wilful destruction of order
680 DATAOverbearingness and a cruel wit,lacking in feeling.Autocratic
681 STOP
682 GOSUB160
683 PRINT"■■■■■■Do you wish to.":PRINT
684 PRINT"■■■■■■■■■■(1)See the cards again.":PRINT
685 PRINT"■■■■■■■■■■(2)Try another spread.":PRINT
686 PRINT"■■■■■■■■■■(3)Finish the readings."
687 GETX$:IFX$=""THEN687
688 XR=VAL(X$):IFXR=1THEND=DR:GOTO94
689 IFXR=2THEN61
690 GOSUB160
691 PRINT"■■■■■Thank you for your valued enquiry"
692 PRINT"■■■Do come again and ■■■■■■■■brings some money"
693 PRINT"■■■next time"
694 FORU=1TO3000:NEXT:GOTO699
695 B=52000+FNA(500):IFPEEK(B)<>200THEN695
696 E=FNA(2):IFE=1THENJ=A
697 IFE=2THENJ=A+78
698 POKEB,J:RETURN
699 PRINT"■■                    "
700 PRINT"                    "
701 PRINT"                    "
702 PRINT"                    "
703 PRINT"                    "
704 PRINT"                    "
705 PRINT"                    "
706 PRINT"                    "
707 PRINT"                    "
708 PRINT"                    "
709 PRINT"                    "
710 PRINT"                    "
711 PRINT"                    "
712 PRINT"                    "
713 PRINT"                    "
714 PRINT"                    "
715 PRINT"                    "
716 PRINT"                    "
717 PRINT"                    "
718 PRINT"                    "
719 GOSUB721
720 END
721 TEMPO4:MUSIC"A5#C5#D#E#F#G#F0#G#F4#E5#D#CBA5#D2R0#D1#E2#D#C5B#C7#"
722 PT=53703:POKEPT,0:POKEPT-39,119:POKEPT-40,67:POKEPT-41,118:POKEPT-80,71
723 GOSUB736
724 POKEPT-39,0:POKEPT-40,0:POKEPT-41,0:POKEPT-81,86:POKEPT-80,67
725 POKEPT-79,66:POKEPT-120,71:GOSUB736
726 POKEPT-81,0:POKEPT-80,0:POKEPT-79,0:POKEPT-120,67:POKEPT-161,78
727 POKEPT-160,71:POKEPT-159,78:POKEPT-158,77:POKEPT-118,66
728 GOSUB736
729 POKEPT-121,86:POKEPT-120,0:POKEPT-119,67:POKEPT-161,78:POKEPT-160,77
730 POKEPT-159,71:POKEPT-158,78:POKEPT-118,0:POKEPT-157,77:POKEPT-117,66
731 GOSUB736
732 FORU=0TO6
733 POKEPT-121,66:POKEPT-117,86:POKEPT-155,66:POKEPT-151,86:GOSUB736
734 POKEPT-155,86:POKEPT-151,66:POKEPT-121,86:POKEPT-117,66:GOSUB736
735 NEXT
736 FORA=0TO100:NEXT:TEMPO7:MUSIC"A1#R1G1#":RETURN
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BARCLAYCARD VISA

Continued from page 117

7th West Coast Computer Faire.

Meanwhile, Chris Horseman was looking at the lighter side of computing.

As a games designer, I was particularly interested to see what was new on the games scene. The vast majority of new American games fall into the 'arcade' category, although the original fervour for producing copies of 'Space Invaders' has largely died down. Most games producers have finally come around to the idea that arcade games need to be in machine language. We are thus seeing better use of graphics and a generally more professional standard of quality. There are still more games available for the Apple than for any other system, though this is largely due to the time it has been on the market. Most of the top games are now being converted for the Atari (eg, Raster Blaster and Apple Panic), but these conversions do not usually take advantage of the superior graphics capability. There is still much copying of ideas for games with a sort of 'goldrush fever' surrounding Pacman. I saw perhaps ten versions, each with their own strong points and improvements but still copies. This has finally aroused some copyright action from Atari who bought the rights for the game from the designers. There have already been some minor court proceedings over Pacman but no one has been successfully sued yet.

There were some excellent new games on show and some people are beginning to stand out as producers of games software. Possibly the most noticeable of these was Scott Adams Inc , who had a large mock castle set up in the windows. Scott has a large (and still growing) range of software available for all of the popular machines including his increasingly famous adventures. These have been recently enhanced on the Apple by the addition of colour graphic illustrations and a 'voice track' which can be used if you own a Vocoder. The graphic adventures should soon be available for the Atari.

Nasir Gebelli's company Gebelli Software Inc is one of the newer US software producers, and to judge by the high quality of the games will become one of the majors very soon. Nasir (who I believe used to program for Sirius) is producing a range of arcade type games for the Apple and Atari which should be available in this country soon. The games include a high quality racing car game for the Atari called Match Racer.

One of the most original games that I saw was the Swashbuckler by Datasoft; this is a simple game but has stunning animation. In the game you control a man with a sword and must fight off a series of piratical and animal opponents whilst descending through the decks of a pirate ship. Swashbuckler runs on Apple II. Datamost also produces a range of other games including the obligatory Pacman-type game called in this case Snack Attack; all Datasoft's programs so far are for the Apple.

Broderbund produce software for the Apple, Atari and TRS-80. This includes an excellent pinball game called David's Midnight Magic for the Apple (and shortly for the Atari); also a very compulsive game called Apple Panic. This is a 'man with a hammer' game, and also involves knocking rampaging apples through floors (honestly!). This is also available for Apple and Atari. Their TRS-80 games are less arcade-oriented and include Galactic Empire and Galactic Trader.

On-line Systems produce highly polished and professional games for Apple and Atari, including Jawbreaker — which is arguably the best Pacman-type game. Mouse Attack is an excellent Pacman-inspired game with additional features such as two-player option. On-line are also producing a version of the arcade game Frogger for the Atari which looks remarkably close to the original. They are also producing a mammoth graphic adventure called Time-Zone which is retailing for a hundred dollars and is reckoned to take over a year to play. (Does this mean that it will be obsolete by the time you finish it?)

Sirius Software produces games for the Apple II with excellent cover art work and some amazing captions on the games. The games don't look bad and were certainly attracting interest from the crowd. Titles include Hadron, Space-Eggs and 'Cops and Robbers'.

One company producing solely for the TRS-80 is Big Five Software, which makes imaginative use of of the limited graphics facilities. It produces six games, including Supernova and Robot Attack, which has voice sound.

Automated Simulations continues its EPYX adventure range with Crush, Crumble and Chomp. Datamost was showing an original game called Tumble Bugs (or sometimes Dung Beetles), which uses an unusual 'lens' effect to magnify part of a maze on the screen and has some simple voice synthesis.

GO TO Page 187

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NOT CALCULATOR CORNER

Continued from page 99

character (whatever the size) increments. In text mode the printer can LLIST programs and print manual calculation results as well as program ones.

In GRAPH mode the paper is mapped with a coordinate grid with 220 units on the X-axis across the paper. The origin can be set to the current pen position by the SORGN command and the pen placed anywhere without drawing by GLCURSOR [X,Y]. If a point off the paper is specified, no error results; if neither coordinate exceeds +/—2048, the pen merely stops at its limit. LINE draws between any number of pairs of points, so a whole polygon may be drawn in one statement; its parameters include the colour and any one of 10 styles of dotted and dashed line! RLINE behaves in the same way but draws relative to the current pen position rather then the origin. With these few but powerful and well-conceived commands almost any type of plot can be produced (curves are approximated by polygons with short sides; when the side is less than 10 units the illusion of a smooth curve is achieved. Text can be added to plots, so you can label graphs and diagrams. The whole system works so well that one must be very hardboiled indeed not to emit some sort of 'wow!' on seeing it in action.

The cassette interface function of the CE—150 allows for two recorders, one input and one output, to be remote-controlled by a program so that automatic data processing and storage can be performed, or large segmented programs run with storage of results. The side of the unit sports a 60-pin expansion bus socket for the connection of future peripheral devices.

Documentation

The good news is that most of the manual is written by an American and is in a comprehensible, English-like language for a change. The bad news is that he has a dreadful, coy sense of humour which makes me want to barf, upchuck or otherwise lose my lunch. However, it does cover most of what you need to know with the notable exception of PEEK and POKE and some of the STATUS values. The section on the cassette operations is definitely in the venerable Japanese tradition, with a terse and original syntax which often defies understanding, and the documentation of the 80 error messages often does not correspond to reality; I have seen an Error 203 once or twice. The program library contains all the old maths and engineering favourites plus a game called 'Mole Banging' which is not in my edition of Krafft-Ebing.

Expansion

Sharp has promised for this year, in addition to an 8k RAM module, an RS232 interface and a touch-sensitive pad with 150 user-definable keys on it. There are rumours as well of a full 132 character wide printer and a video interface. The extensive facilities will probably attract more of an independent software base than previous hand-helds and already MiCROL has announced an enhanced version of its Procos and a package of plotting and charting routines for the 1500.

Conclusions

The PC1500 is a real *tour-de-force* which, at its price of £150, or £375 for the whole system (11k), is going to make life difficult for competitors. For scientific and engineering, or even some business applications which demand portability and sophisticated hard-copy records, it is very attractive. To maximise its appeal in the scientific area, though, some sort of instrument interface would be advantageous and possibly ROM software for complex statistical and other calculations; the design of the machine leaves the road wide open to both of these possibilities. As to its power as an executive toy/psychological weapon, it is bound to cause gaping mouths wherever it is wielded. And it's a hell of a lot of fun to play with, too. END

PCW BENCHMARKS

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CALCULATOR BENCHMARKS

	Time	% mem used
HP41CV	37 secs	3.5
Sharp PC1211	52 secs	5.9
Casio fx702p	20 secs	4.6
Sharp pc1500	13 secs	1.2

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Continued from page 185

7th West Coast Computer Faire.

Bill Budge's Raster Blaster has been available in this country for some time, but only for the Apple II. This game has just been released for the Atari, although the colours don't come out well on the British television system. Bill received *Softalk* magazine's game of the year award for this game, and I was astonished to see that Bill is only 19, although an old man of the software industry.

On the subject of awards, Chris Crawford, head of Atari's games research group won the Creative Computing game of the year award for his innovative and excellently engineered Atari war game Eastern Front.

The only British contributions to the games software market that I saw were my Darts and Pool produced by Thorn EMI! These are being distributed by Creative Computing and were drawing a good deal of interest from the crowd.

It's worth mentioning the huge discrepancy in the price of software between the US and the UK. In the US, games prices range between $12.95 and $34.95, while in the UK, prices are between £12 and £29. An additional factor in this is that most software in the US is produced on diskette, which is more expensive than the tape used in many cases here. I originally thought that this was a result of shipping costs but even British software is much cheaper in the US. One can only hope that as the market here expands the prices will drop to sensible levels and so reduce the incentive to make pirate copies. END

BOOK FARE

Continued from page 110

versus the drive of the technology and marketing forces to override individuality — which is more striking in the end than Kidder's analogy between computers and cathedrals.

His desire to depict West as the hero leads Kidder to allow criticisms to be made but not to be explored. Many problems arose, both technical and personal, which derived from West's personality and management style. In the end he delivered the goods, but a more objective assessment of West would have been fairer.

Finally, Kidder fails to question his own role. Data General let him sit on the project for most of its duration, although it became worried towards the end because of security reasons. One of the main motivations of the Eagle team was that the project was backed by de Castro and would be seen to a conclusion, when other projects they had worked on had been scrapped.

Obviously, Kidder's presence contributed to that sense of importance and of excitement. This is a relatively minor criticism but I think that the role of the reporter on TV or in written journalism is important when the end product presents itself as an objective report.

My criticisms are therefore on broader issues than Kidder's original objective. And he does at least mention aspects which I feel he did not investigate properly. It is, however, a book well worth reading. And what is more, it is as enjoyable and un-put-downable as a good thriller. END



BLUDNERS

In the March edition of Calculator Corner it was erroneously stated that the Casio FP-2 is a 'dumb' printer. Subsequent investigation reveals that there is in fact an IC for decoding on the reverse side of the board, in fact the printer works with the 502, 602 and 702 without the FA-2 adaptor being present.

In the April edition of Newsprint we gave the price of the CP/M add-on for the Hewlett Packard HP-87 as £927; this was an error in the press release and the correct price is £354.

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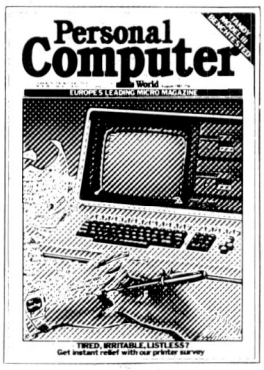

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Vol 4 no 11
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Benchtests: Osborne 01, IBM Personal Computer. Checkout: Sharp IQ3100 Microtranslator. Calc Corner: Casio fx702p. *PCW* Show report, Benchmark Summary, Euro Micro Chess Championship report. Programs: TRS-80 Sheepdog trial, ZX81 Sun and Planets.



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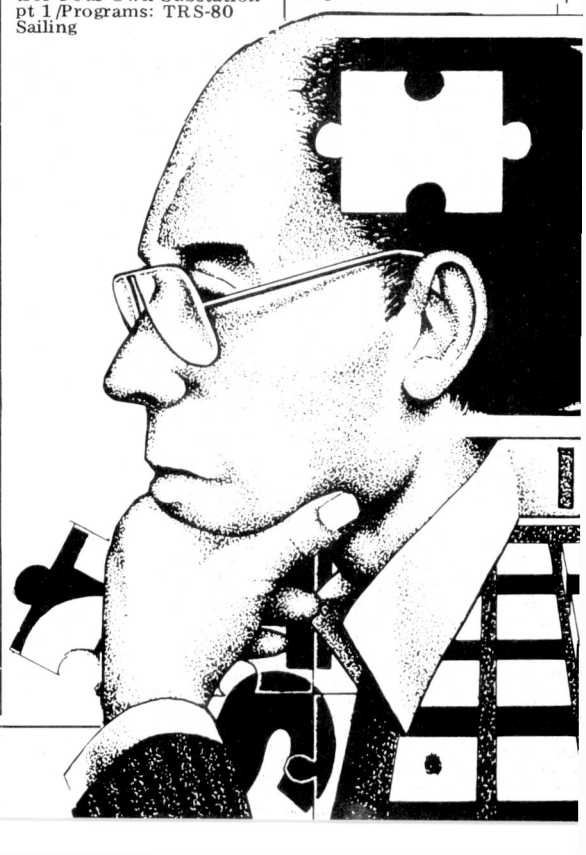



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Benchtests: Sirius-I, Casio fx-9000p, Gemini Multiboard/Word Processor Benchtest: Scripsit 2.0/ Plotter Checkout: Watanabe/Hardware feature: High Density VDU card project/Music system: FREQOUT/Calc Corner: Aerial Navigation/Programs: Pet Haemophilia, 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
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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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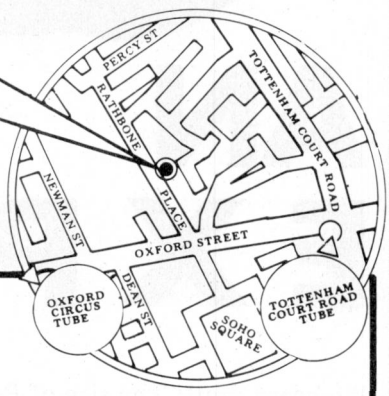

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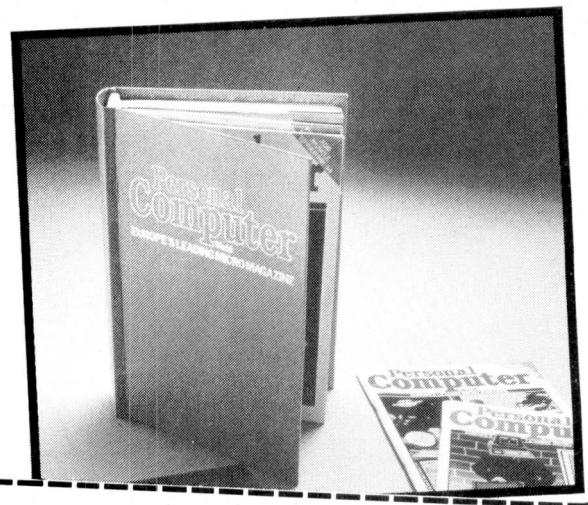

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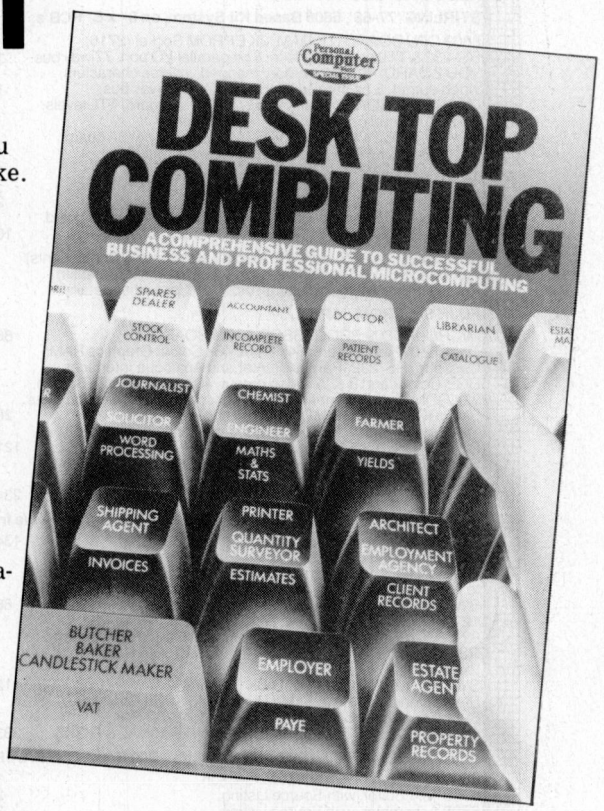



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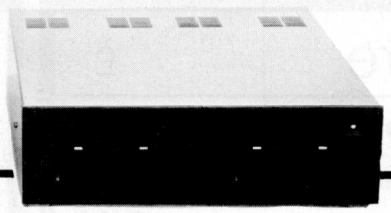

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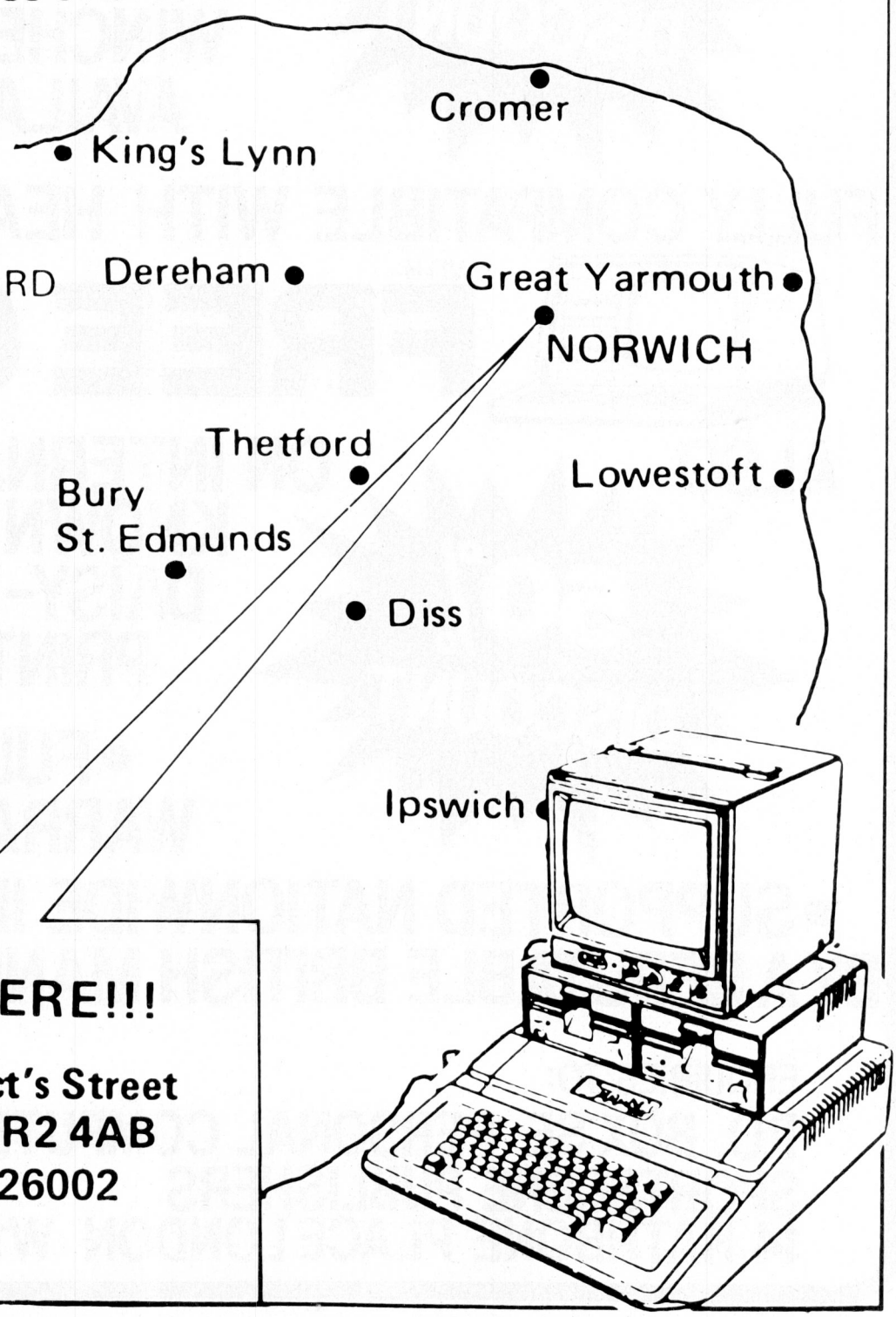

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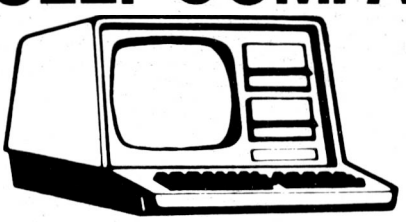

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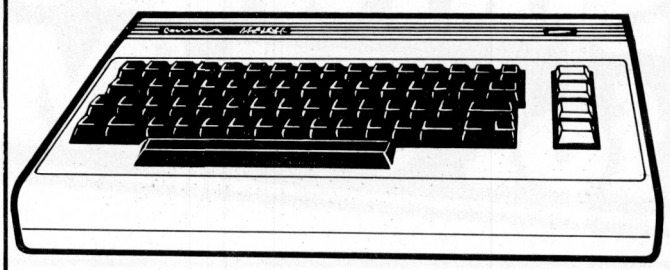

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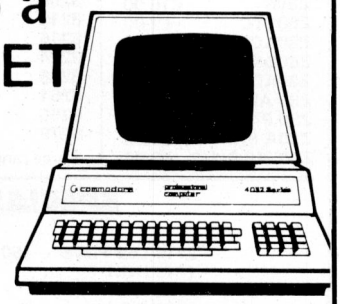

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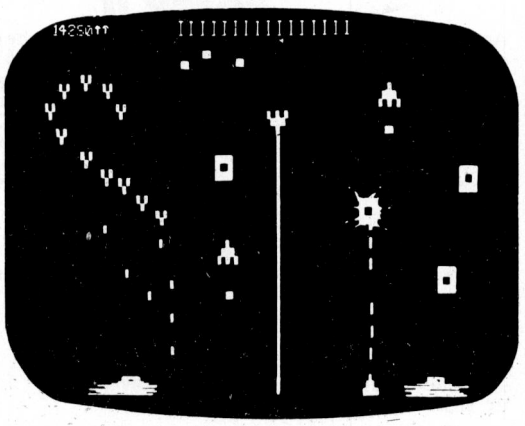
Galactic FIREBIRD



Those ever circling, swooping, diving Firebirds of the famous arcade machines, brought to the micro in Mike Chalk's ultimate achievement––Galactic Firebird

Yes, it's the latest in the Kansas Arcade series, but alas, his last, for Mike has been writing these right back from the original Arcade Invaders, and feels he wants a rest.

The reason being that he has always bettered his preceeding program, and feels that with Firebird he has reached a pinnacle.

Many programmers of many machines have tried to emulate the arcade game, Firebird, but nobody, the Americans included, have managed to get the circling, swooping firebirds on a computer. Until now!

For TANDY TRS-80 & VIDEO GENIE

It is incredible how the Firebirds peel away, circle around in numerous positions on the screen, then suddenly sweep in to attack, all the while raining down their bombs.

Even if you manage to dodge all their bombs whilst shooting them down, it is as though they realise they will not get you this way, for without warning they'll take kamikazi action and come straight for you!

Then come the Astro Blasters, shooting down a solid energy bolt, to fry you completely, in adition to their own brand of super bomb. Oh, you can fire at them, but a solitary hit will have no effect whatsoever on these nasties.

As though Firebirds and Astro Blasters are not enough, as the game progresses, come the Megon Bombs. With no less than three hits needed to destruct! And you can't dodge them easily either, as their explosions spread.

Scores are kept of course, and there is the now expected realistic sound effects. And––wait for it––it progresses to FOURTEEN levels of difficulty! Mike's last words: "Nobody will ever get there!"

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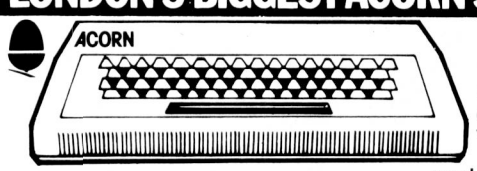

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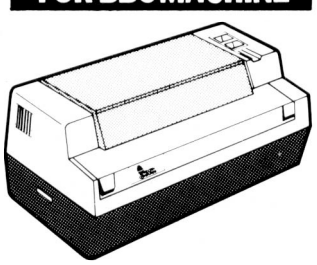

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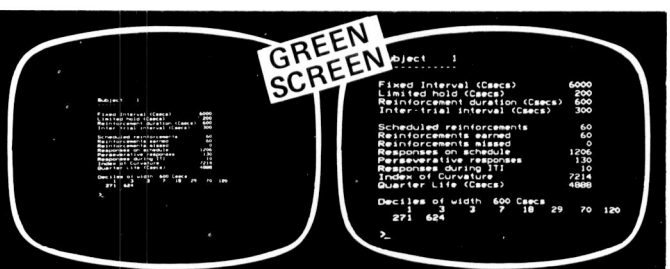

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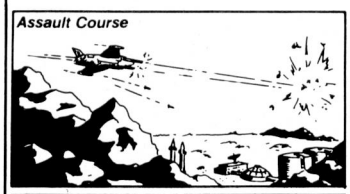

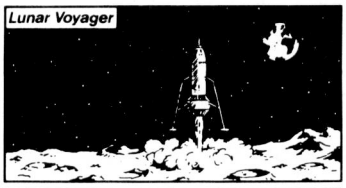

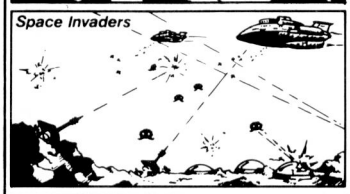

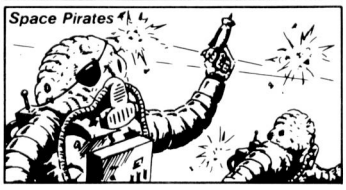

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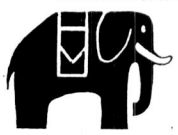

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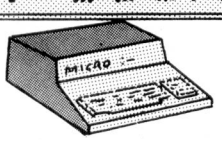

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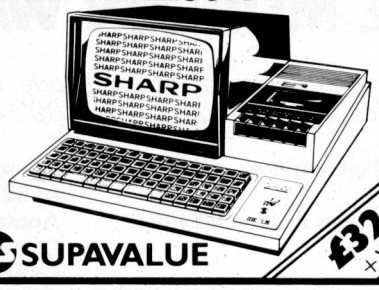

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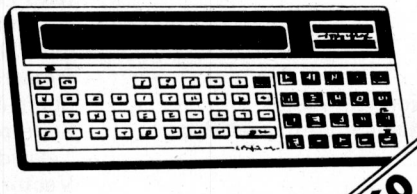

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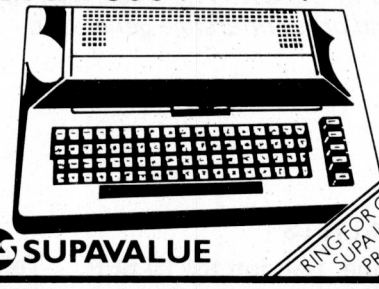

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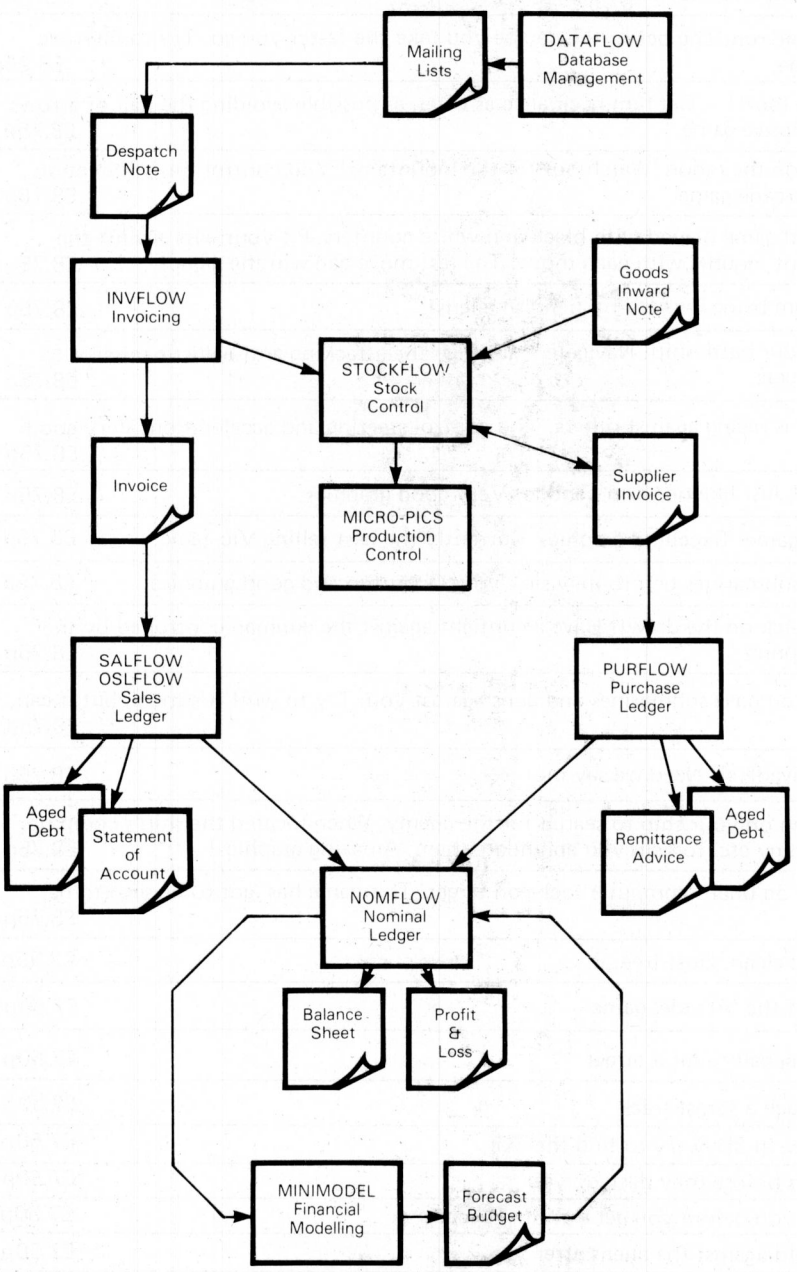

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All instructions are in everyday conversational english, so you need never have used a computer before. Just tell DMS what information you need to store, then type your information on to disk. Once they are on there you really start to reap the benefits. For instance DMS will find an individual records for you to check, amend or print, or it will find all those which meet various parameters handling batches of record faster than you could image possible. It can sort them into any order need print lists, or transfer the information into your wordprocessor (eg Wordstar, Spellbinder, etc) to do selective mailing. (It even gives a little extra help by printing labels to match.) Or it can do some clever calculations. Or print reports, to your own special layouts. Every facility is designed to save you time, remove those tedious clerical tasks and make your organisation more efficient. More than anything, DMS allows you to have all your information at your fingertips as soon as you want it.

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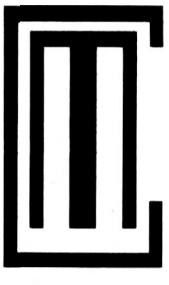

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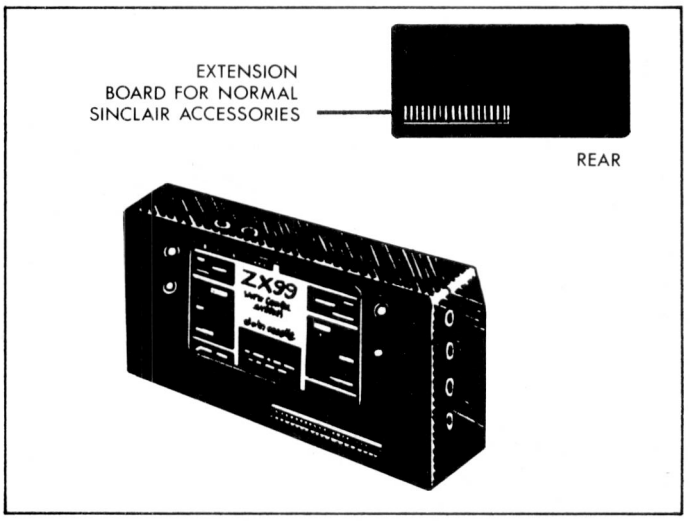

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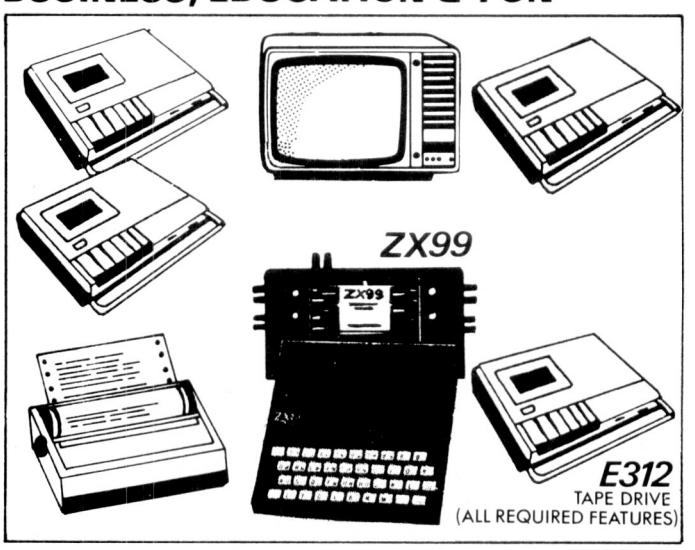

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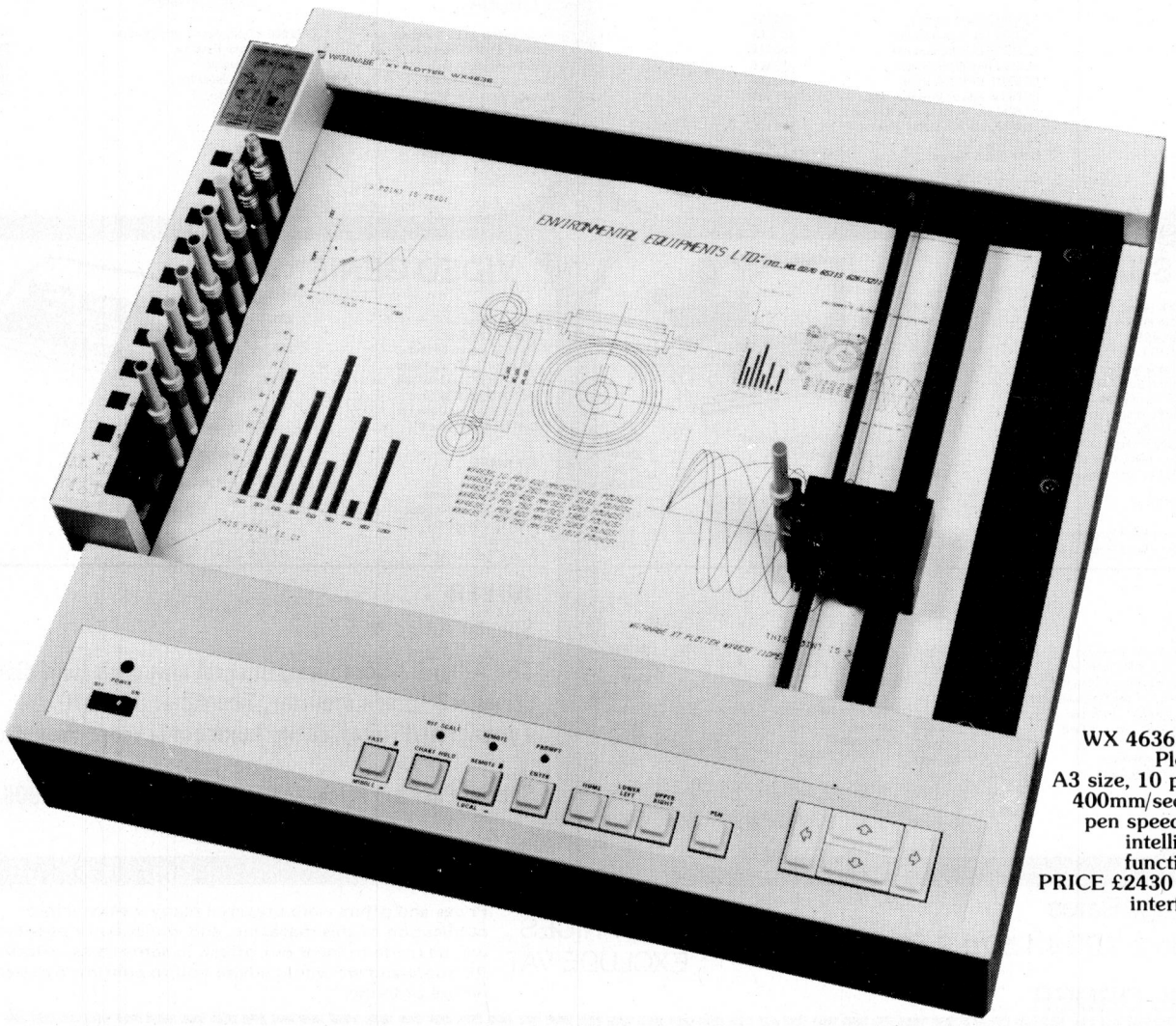

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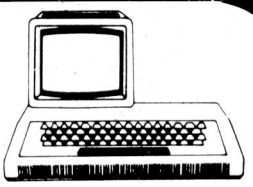

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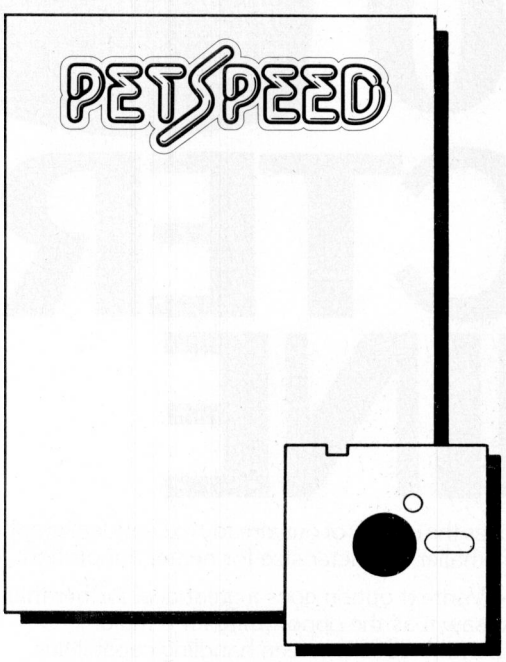

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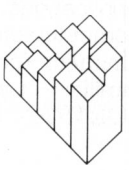

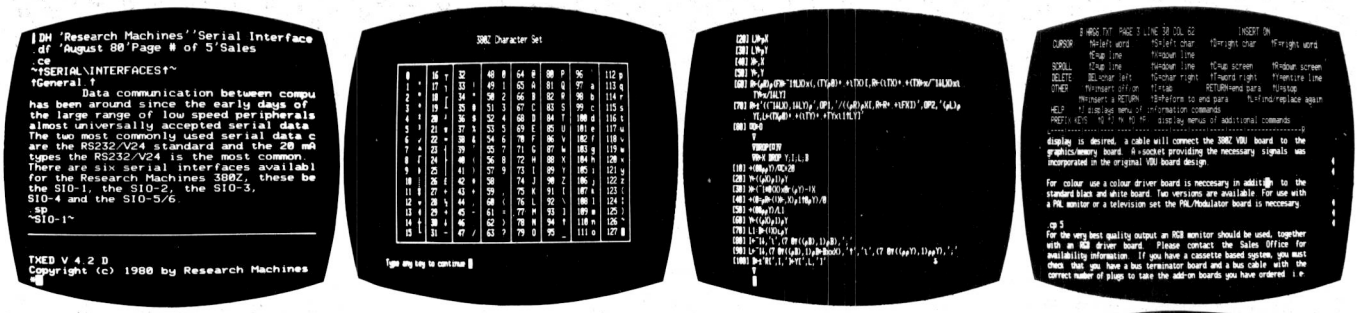

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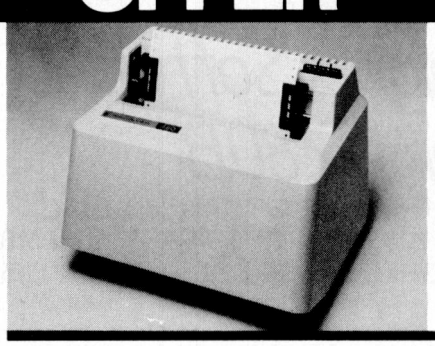

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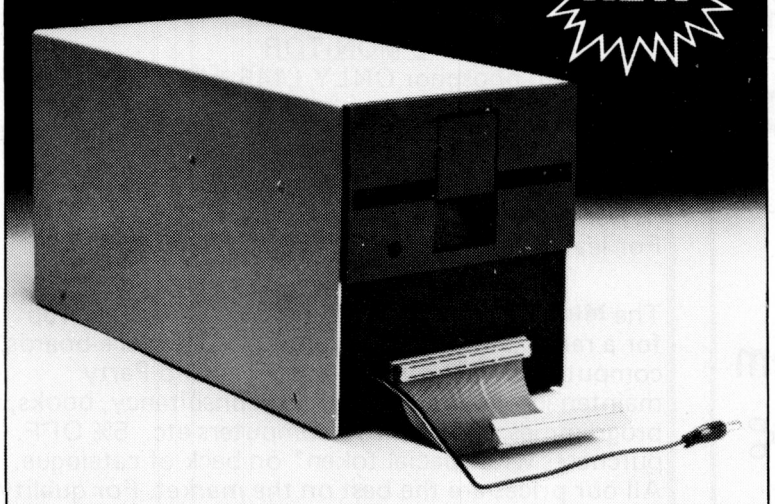

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FIN open file for input SHUT close file EXT find extent of file PRT find value of pointer into file
PUT put number to file BPUT put byte to file SPUT put string to file GET get number from file
BGET get byte from file SGET get string from file

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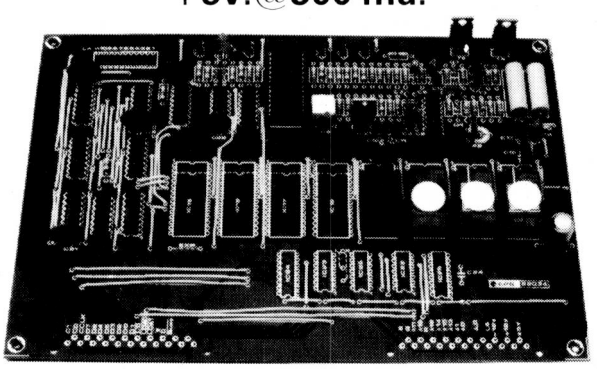

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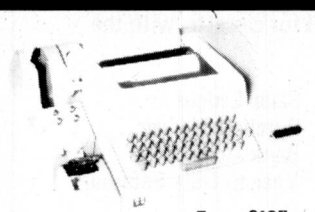

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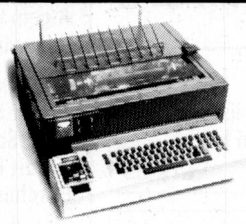

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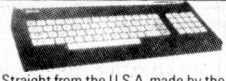

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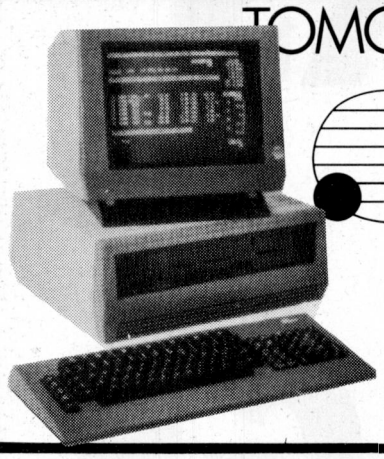

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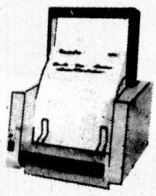

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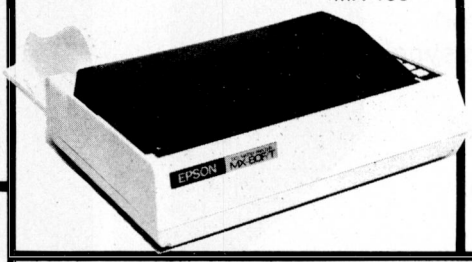

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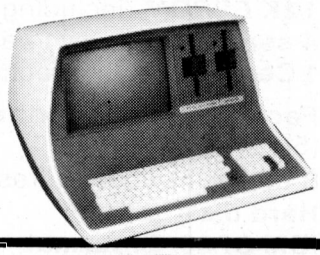

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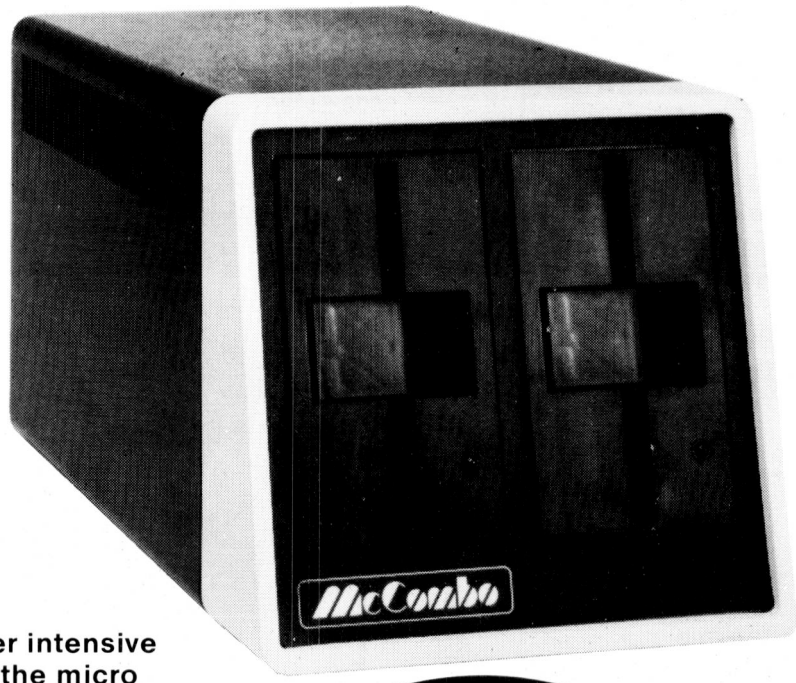

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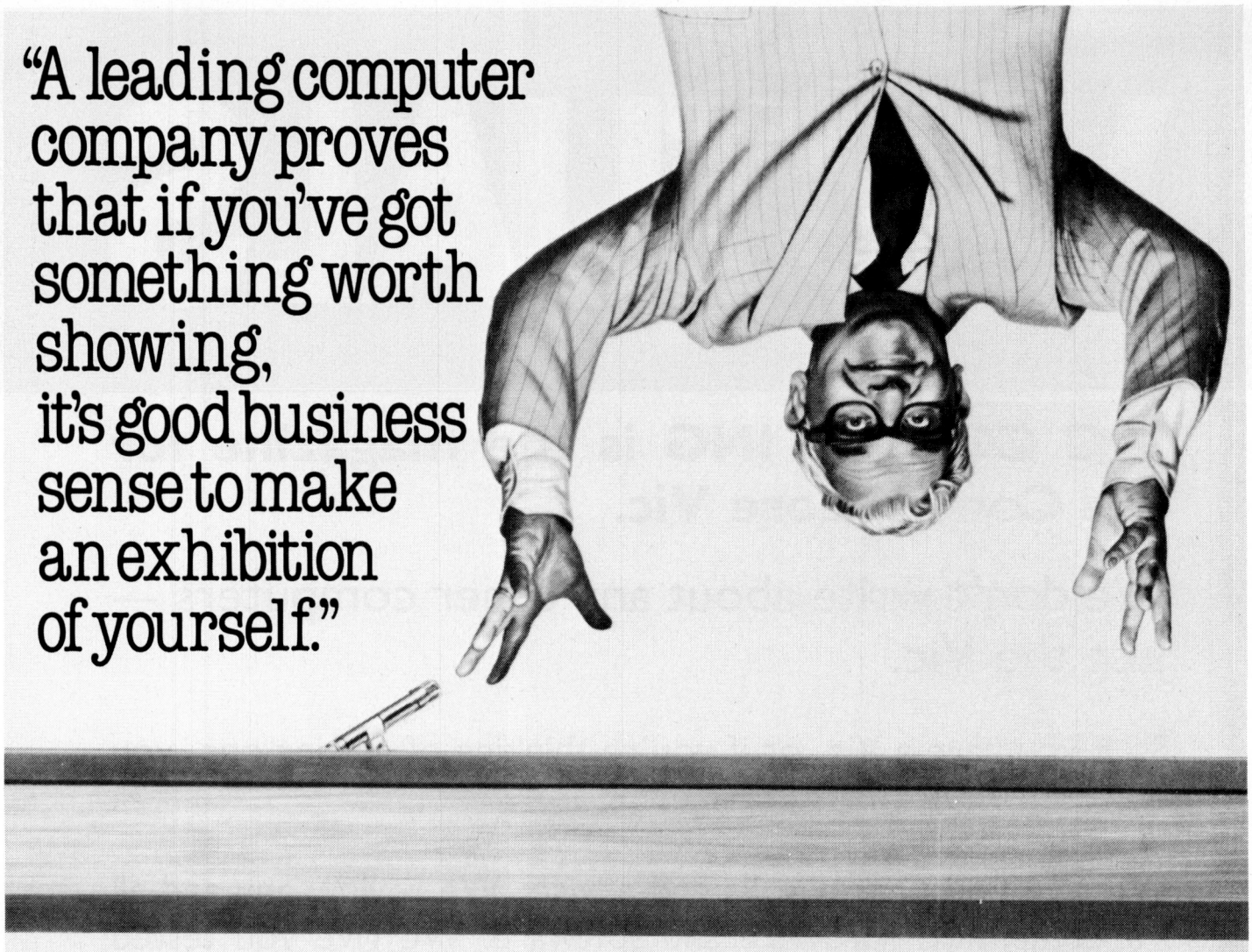

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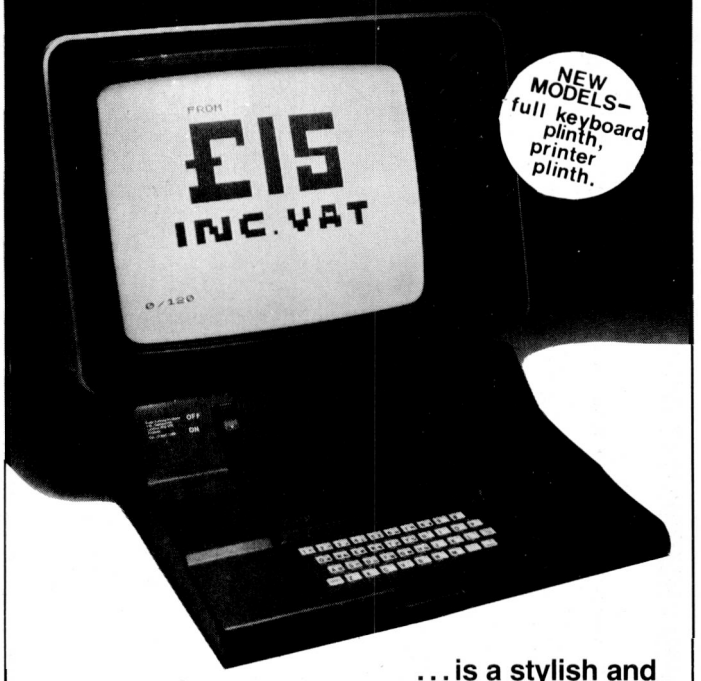

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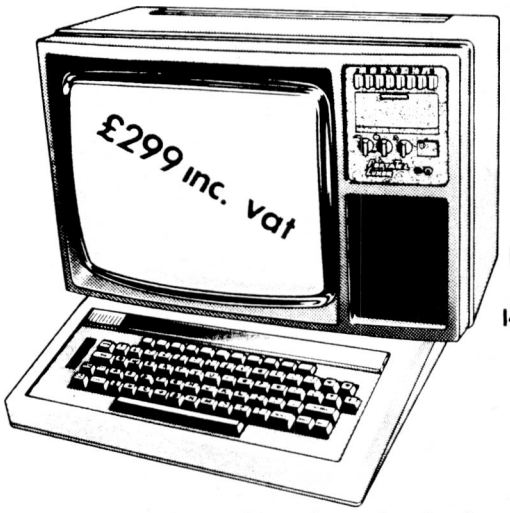

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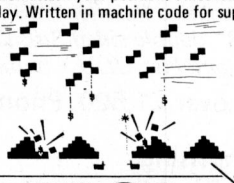

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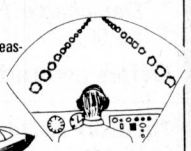

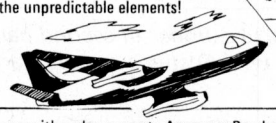

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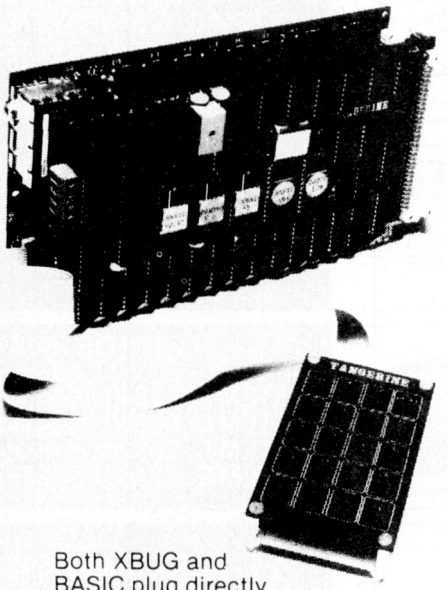

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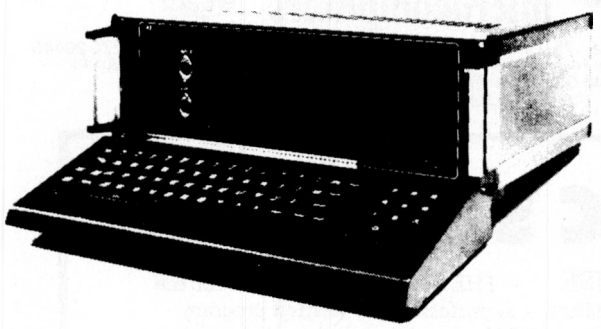

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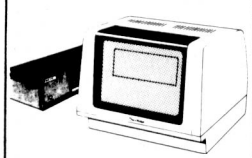

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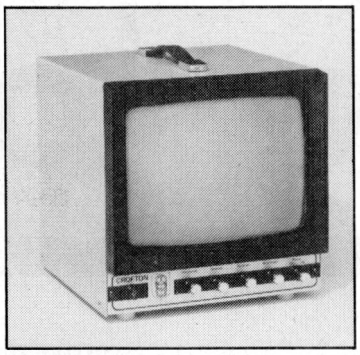

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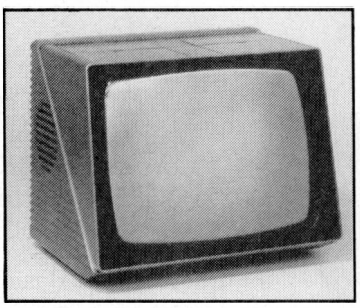

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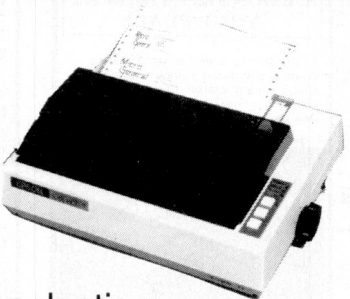

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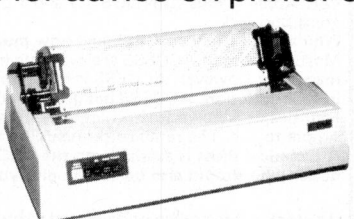



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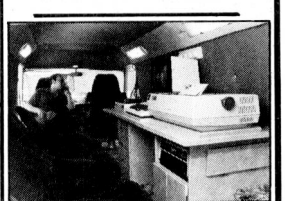





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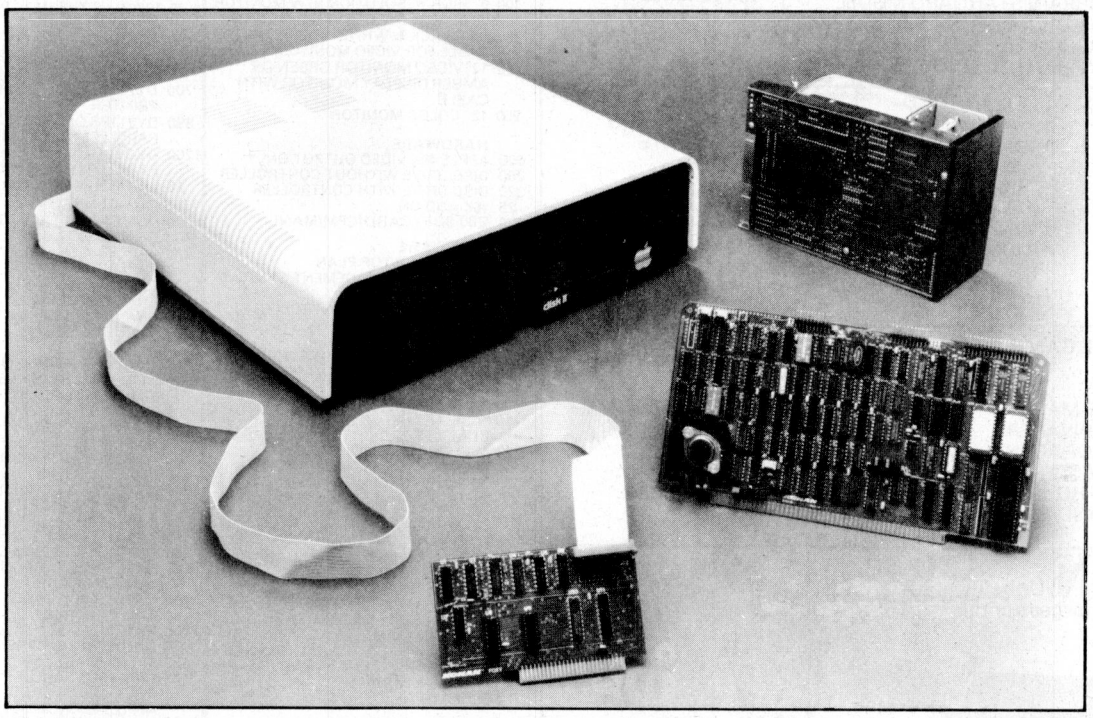

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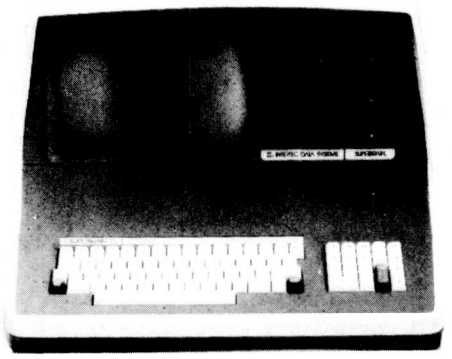



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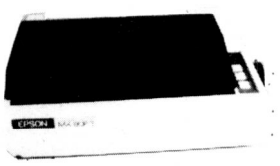

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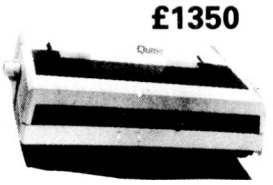

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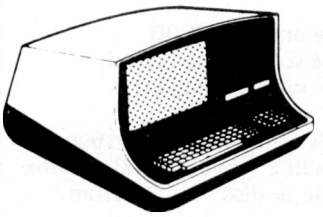

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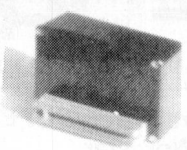

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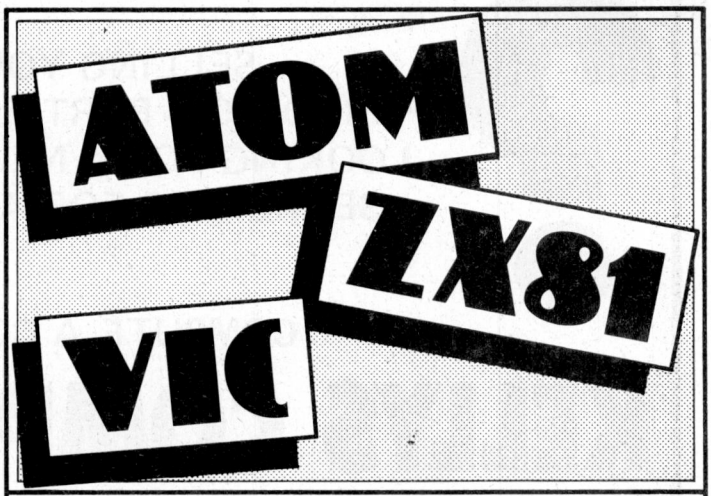

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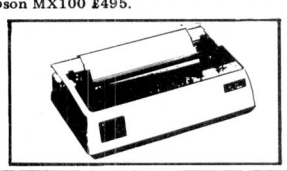

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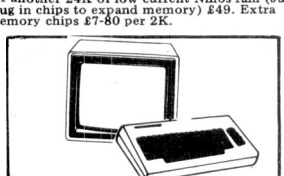

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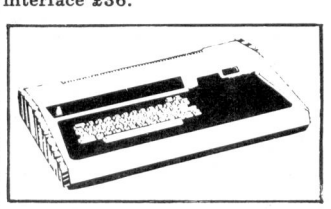

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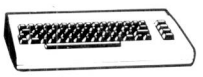

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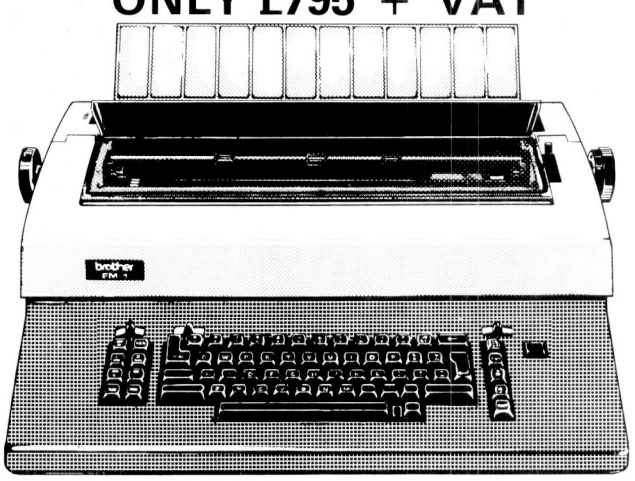

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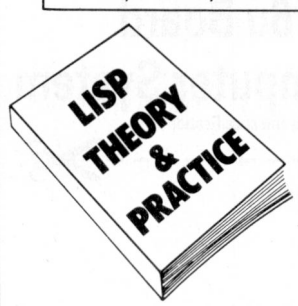

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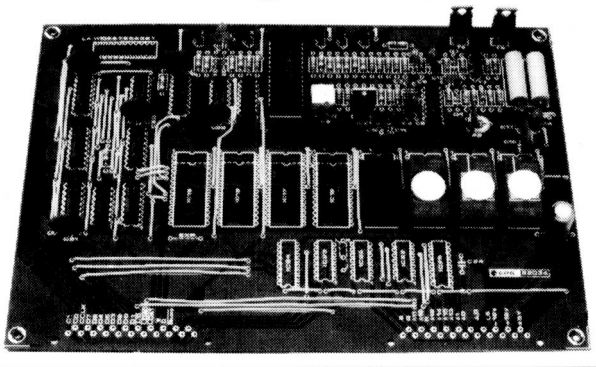

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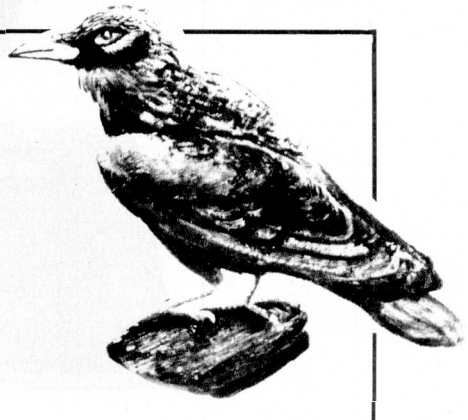

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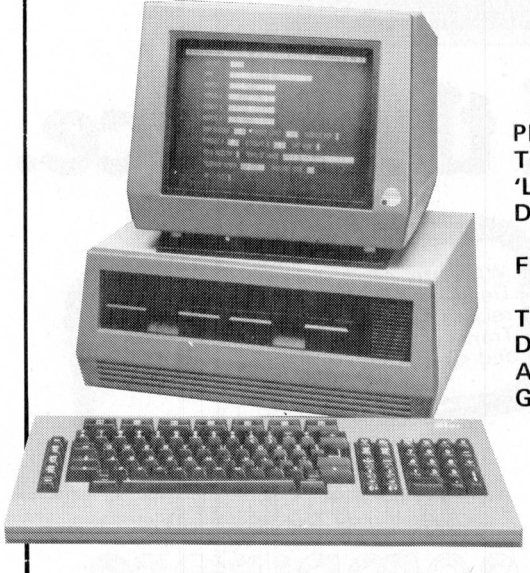

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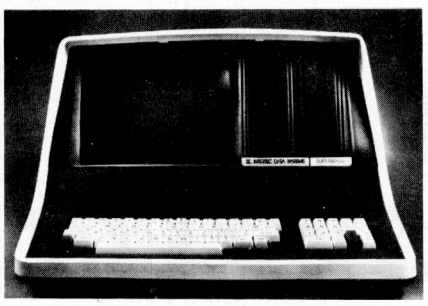

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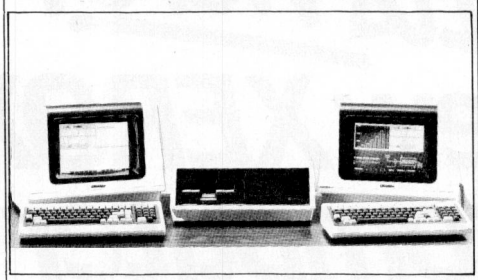

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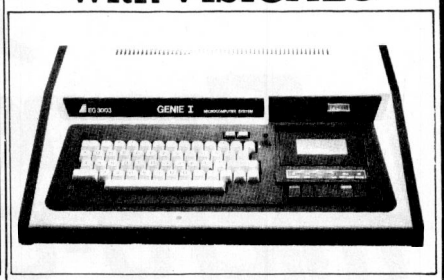

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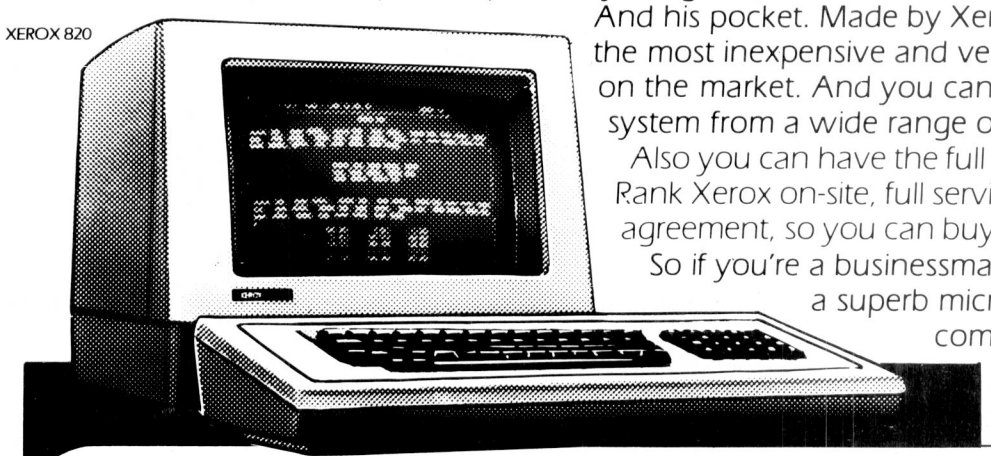

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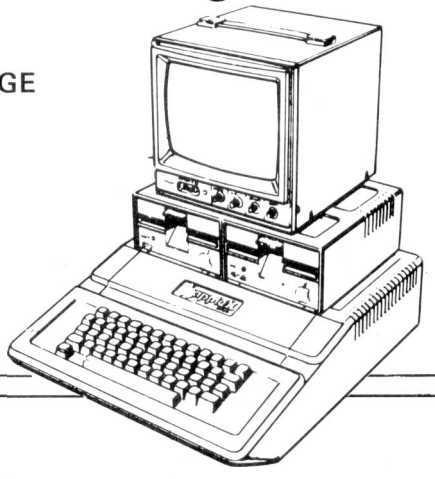

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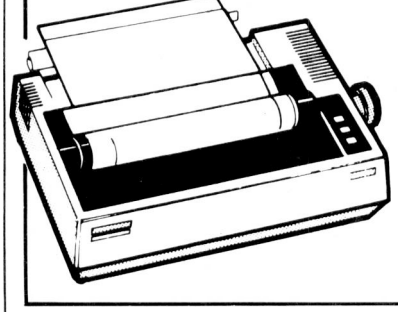

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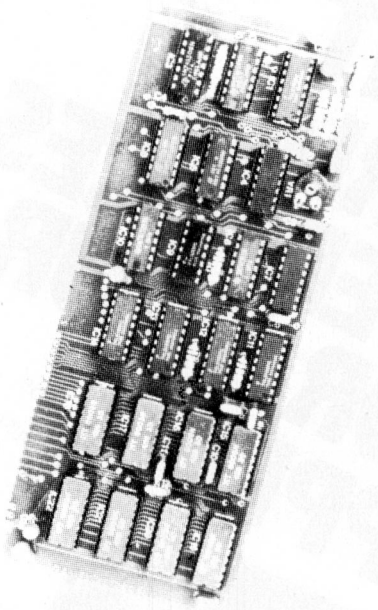

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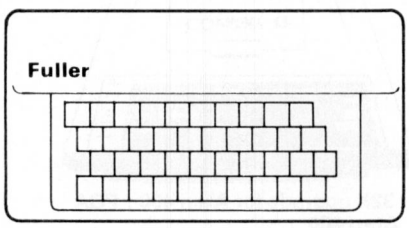

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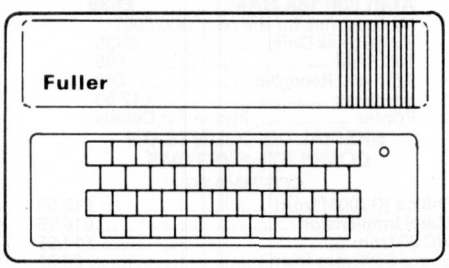

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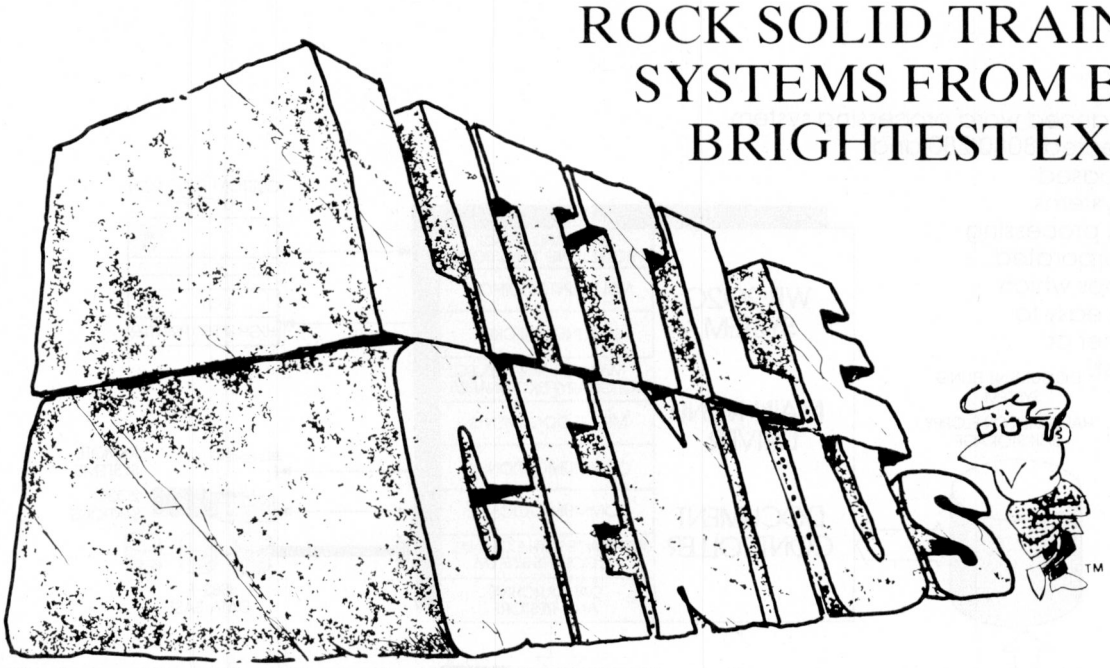

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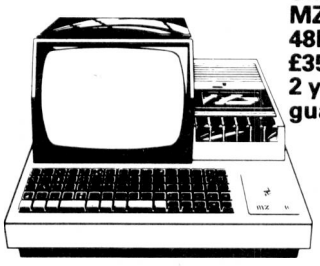

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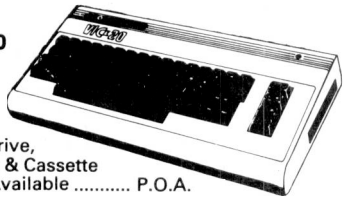

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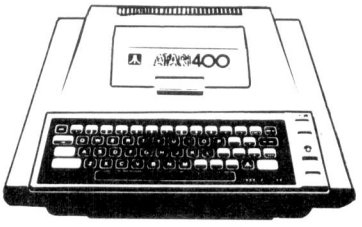

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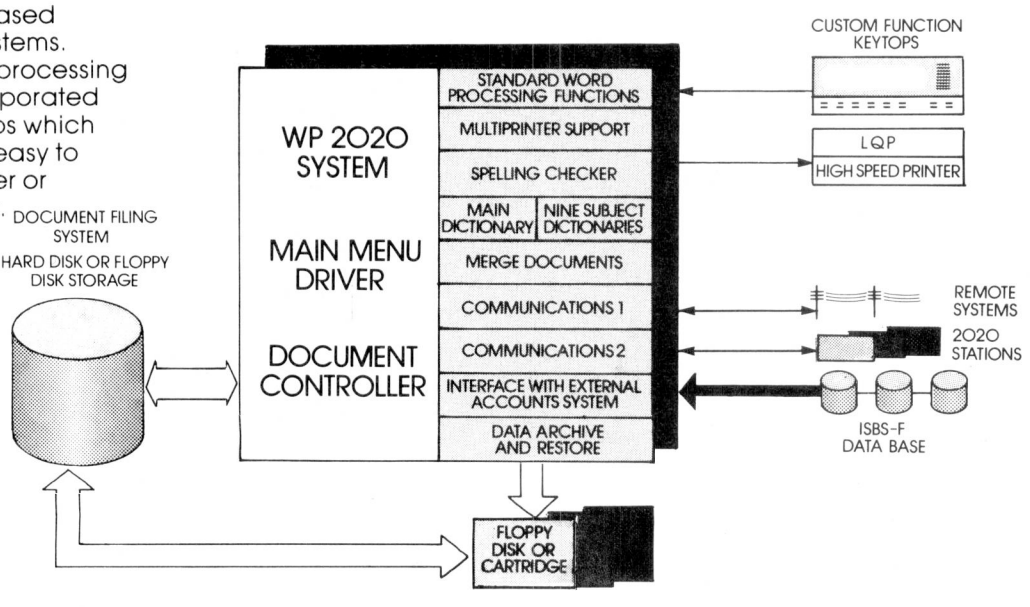

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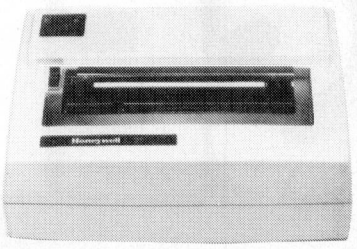

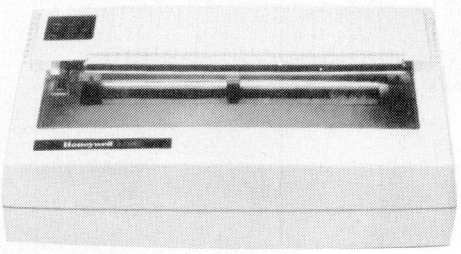

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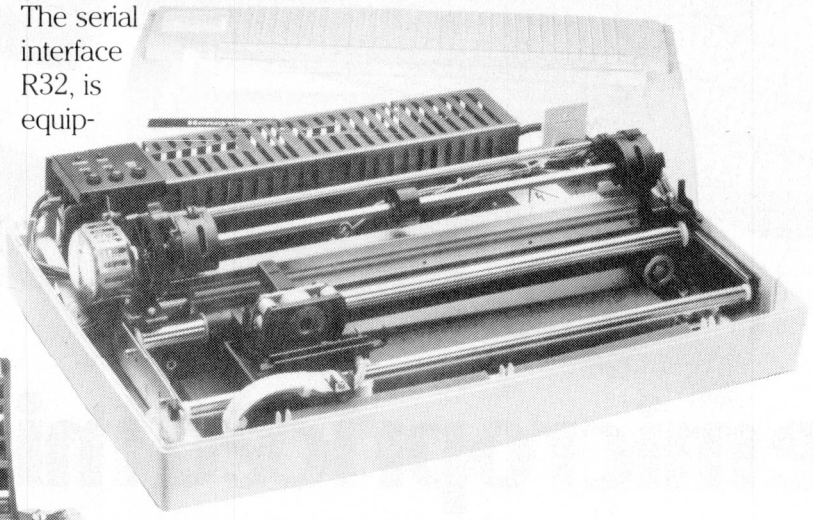

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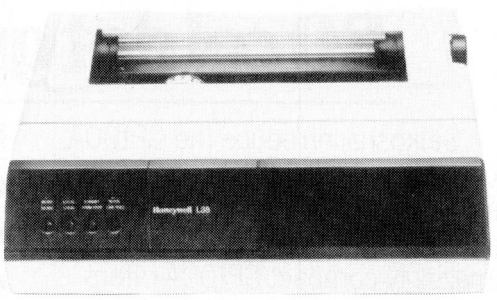

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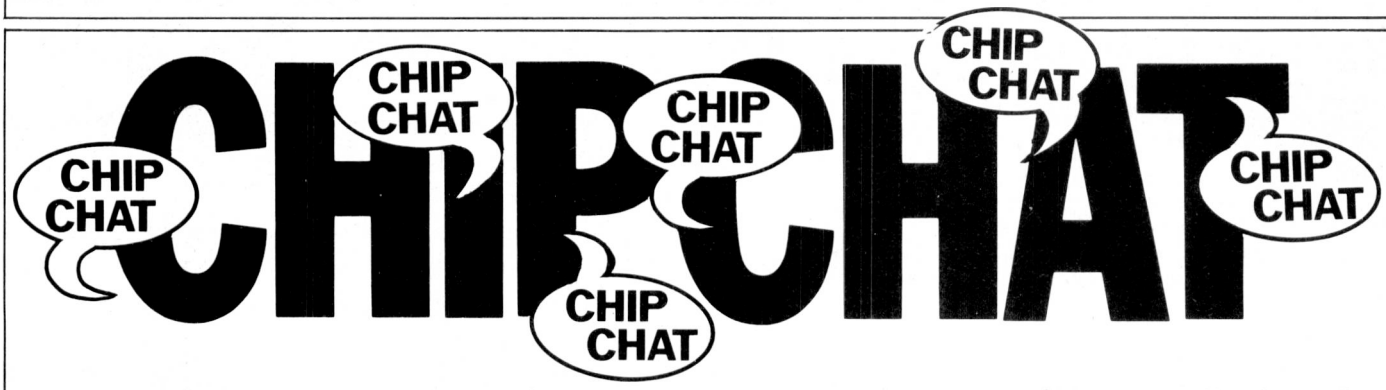

The life of a micro-hack isn't — as many seem to imagine — a constant round of free booze-ups accompanied by a deluge of gifts. Occasionally, though, there's a break in the drudgery of sorting through hundreds of press releases, and one such break occured recently in the form of the Commodore trip to the Hanover trade fair. This year's trip was nothing like as exclusive as last year's (when the PET Jet was pressed into service, allegedly to Jack Tramiel's annoyance) but made up for this in entertainment value. Some 15-odd (or 15 odd) hacks assembled one evening at the Gatwick Hilton (sic) for a press briefing on the new machines and dinner. Rather oddly, the dinner took place before the briefing, so the latter was considerably, er, enlivened by the antics of those who had become, well, lubricated. The festivities continued in a late-night bar which was something to do with the Miss Reigate contest taking place in the hotel's ballroom and where, to his horror, 'Legless' found himself conned into paying for a round (with his American Express card)! To cut a long story short (ie, we can't remember much of what followed), when the hacks assembled at 6.30am the following morning to catch the plane to Hanover, three of their number refused steadfastly to leave their bedrooms and were thus left behind when the plane took off. For a medium-sized consideration from each of these stay-at-homes, we shall refrain from publishing their names next month. Worse was to follow, though, when Henry 'Shoestring' Budgett developed 'food poisoning' and had to keep leaving the room during the technical briefing on the Commodore stand at Hanover. . .

Long standing readers of 'Chip Chat' (if there are any) will vividly recall our contretemps with Commodore a year or more ago, when CBM inisisted on billing us for a review machine, even though we'd returned it. Not to be outdone, and, having waitied a decent interval to avoid being accused of jumping on a bandwagon, Ingersoll has taken to doing the same over an Atari plus extras which we borrowed — and returned — some months ago. First a request to return the goods, then an invoice have been received in the *PCW* ivory tower. On both occasions it was explained in words of few syllables that the machine had been returned. But now we've received another invoice, with an accompanying letter which includes the immortal phrase: '. . . according to our Computerised ON APPROVAL Ledger the above amount is due to us and the goods are definitely in your possession'. Well, we have news for the 'Computerised' Ledger — the goods are definitely *not* in our possession and we don't owe the £1305 on the invoice. We'll keep you posted. . . Has Editor Rodwell gone mad? Not only has he put himself into hock to buy a Sirius to accompany his ageing Cromemco but he decided to put Sinclair to the test at the recent Spectrum launch — when somebody asked about delivery times, Uncle Clive promptly replied: 'If you order one today you'll get it in two weeks.' Equally promptly, 'Rodders' filled in an order form and handed it to a surprised Clive; now he's going around claiming to be the first person in the world to order a Spectrum. . .

Finally, news of a new micro from Acorn, due for volume production in October or thereabout: 32k RAM, 32k ROM, BBC Basic, colour, sound, Econet capability and a rubber membrane keyboard, selling at around £120-£150.

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