Personal Computer World

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August 1981 75p

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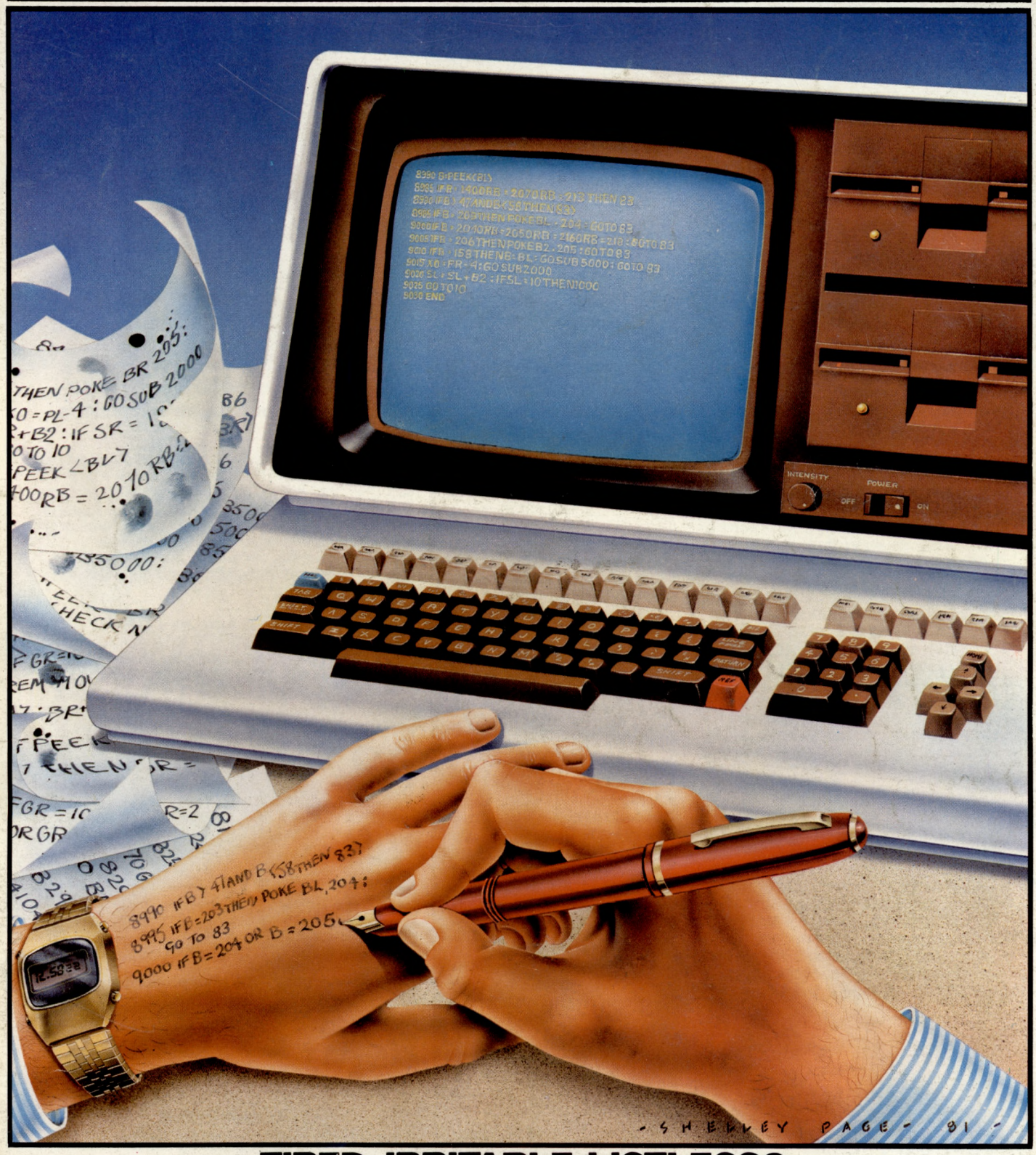

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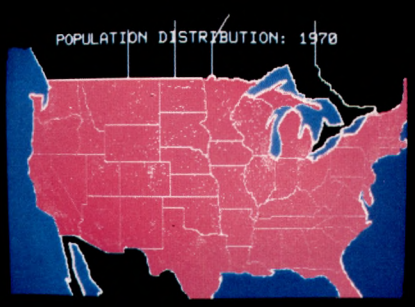
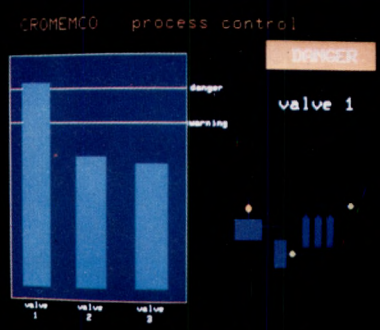
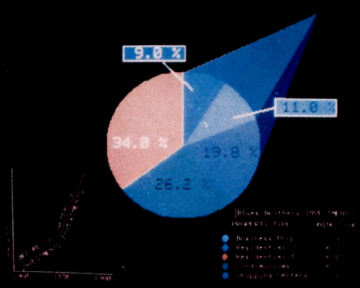


Demographic Display

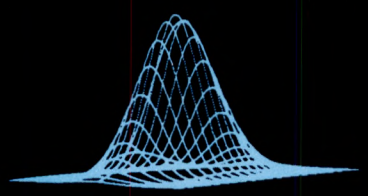
Management information



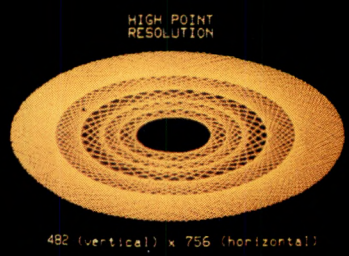
Control system display



3-D display with angled labels



3-D plots



High-resolution display with alphanumerics

Up to 16 colours can be displayed simultaneously, from a choice of 4069. Areas can be filled with colour, windows created, graphs plotted, etc—all under control of simple Basic, Fortran or Assembler functions.

At the heart of any Cromemco graphics system is Cromemco's "SDI" board, the most versatile video interface in the microcomputer industry today. The Cromemco SDI is designed to meet the challenge of professional and industrial environments where uncompromising performance, reliability, and continued compatibility are essential.
With its high point resolution, colour map selection, dual page windowing function, automatic fill mode, and NTSC or PAL broadcast compatibility, the most demanding requirements for a video interface can be met. The SDI provides a choice of 4096 individual colours and up to 754 by 482 point resolution. Its different modes of operation include bit or nybble mapped displays with varying levels of resolution, and window effects requiring as little as 12k data storage.

RGB-13 Colour Monitor

The Cromemco RGB-13 Colour Monitor has been specially designed for optimum colour graphics performance when used with Cromemco's SDI video interface. It includes a fine-pitch 13" CRT with a high-precision electron gun, internal magnetic shielding, and implosion protection band. The monitor combines alphanumeric character generation with colour graphics and high resolution, to give an overall performance vastly more superior than conventional colour TVs or CRT terminals.

Graphics Software

Cromemco's graphics software package provides an interface to Fortran IV, Ratfor, Macro Assembler, 16K Extended Basic and 32K Structured Basic. It is written for ease of use and takes full advantage of the RGB-13 monitor's special graphics facilities. Thus it is efficient, flexible and extremely fast. The package contains routines to change the colour map, scale the display area, draw dots, lines and circles, display text, and fill areas with colour.
Screen addressing can be by absolute or relative co-ordinates.

Model Z2H/GS Graphics System

The Z2H/GS is a special configuration of the Z-2H Hard Disk computer which includes full graphics capability and software. Yet at under £8,000 it's a fraction of the cost of comparable systems. It is ideal for applications in medical imaging, computer-aided instruction, pattern recognition, and the television industry.

The Z2H/GS includes a Z-80A processor, 64k of RAM memory, integral 11 megabyte hard disk, RGB-13 colour monitor, 2 floppy disks, printer interface, RS-232 serial interface, and graphics software package.

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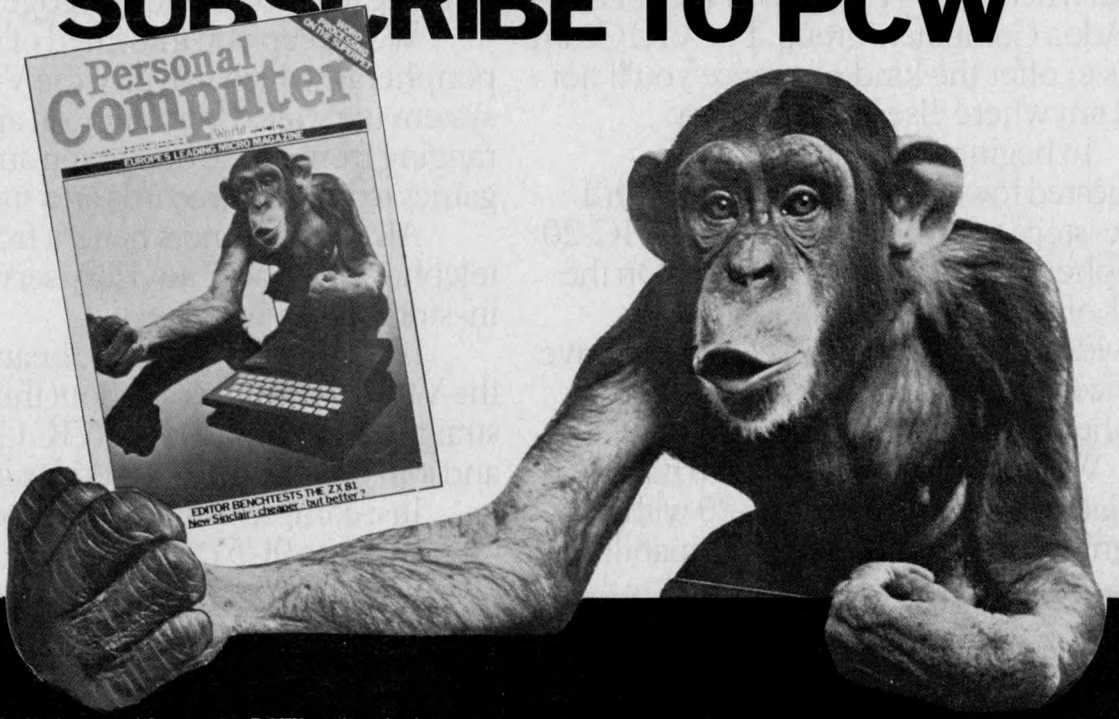

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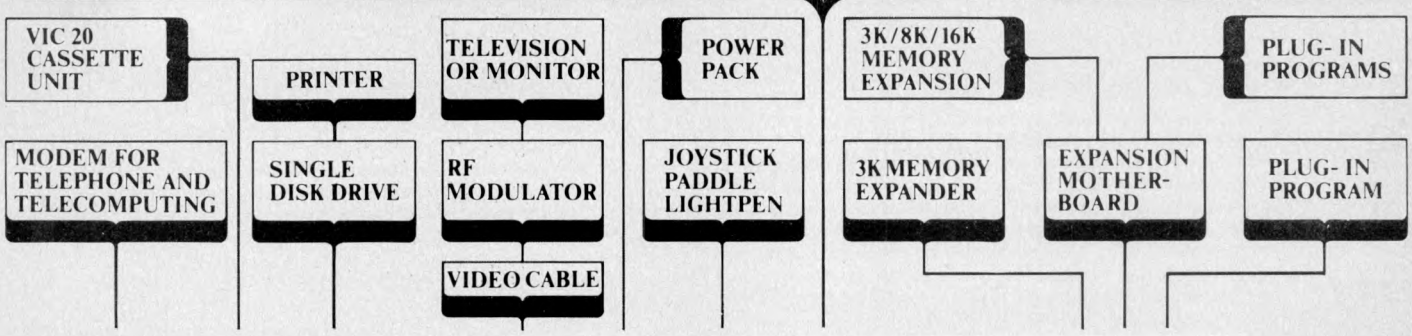

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Illustration by Shelley Page

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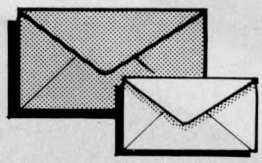

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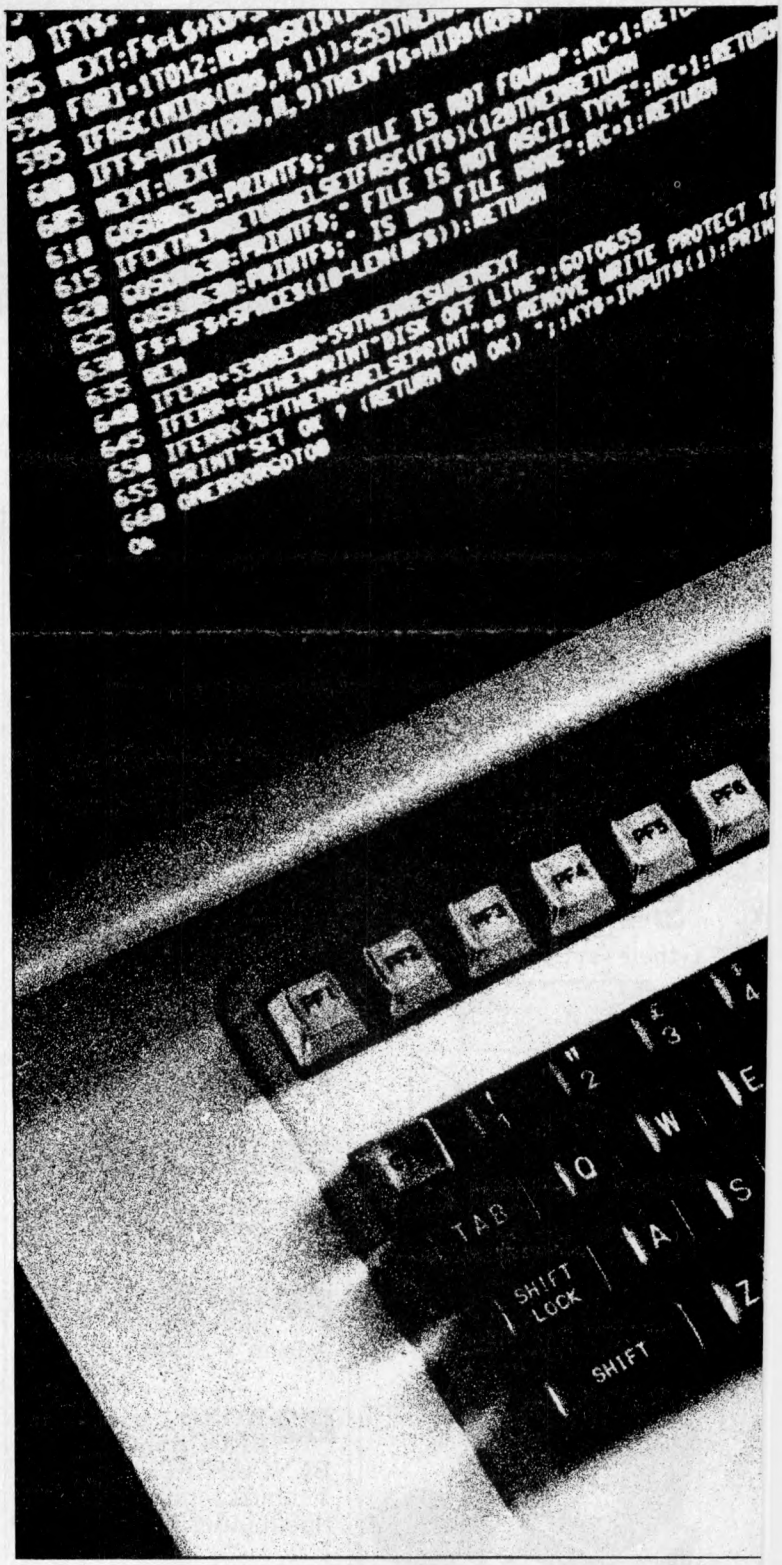

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Touch the keys in the picture. Nothing happens, right? There just isn't any substitute for hands-on experience of new and exciting machinery and software.

This year, The 4th Personal Computer World Show is twice the size of last year's event. Almost every big name (and a lot of smaller ones) in the micro-electronics industry will be represented somewhere in our new-style exhibition. And there will be many products on display that have never seen the light of day before.

Taking a leaf out of the West Coast Computer Faire's book, we've divided the Show into two broad areas of interest. A massive display of business applications upstairs, and a mouth-watering range of hobbyist-orientated products downstairs. Downstairs, too, you'll be able to watch a battle of electronic wits in The 2nd European Microcomputer Chess Championship or talk to any one of the many representatives from computer societies and the ComputerTown UK! network.

In short, The 4th Personal Computer World Show will have something for everyone to get their hands on. Can you really afford *not* to be there?

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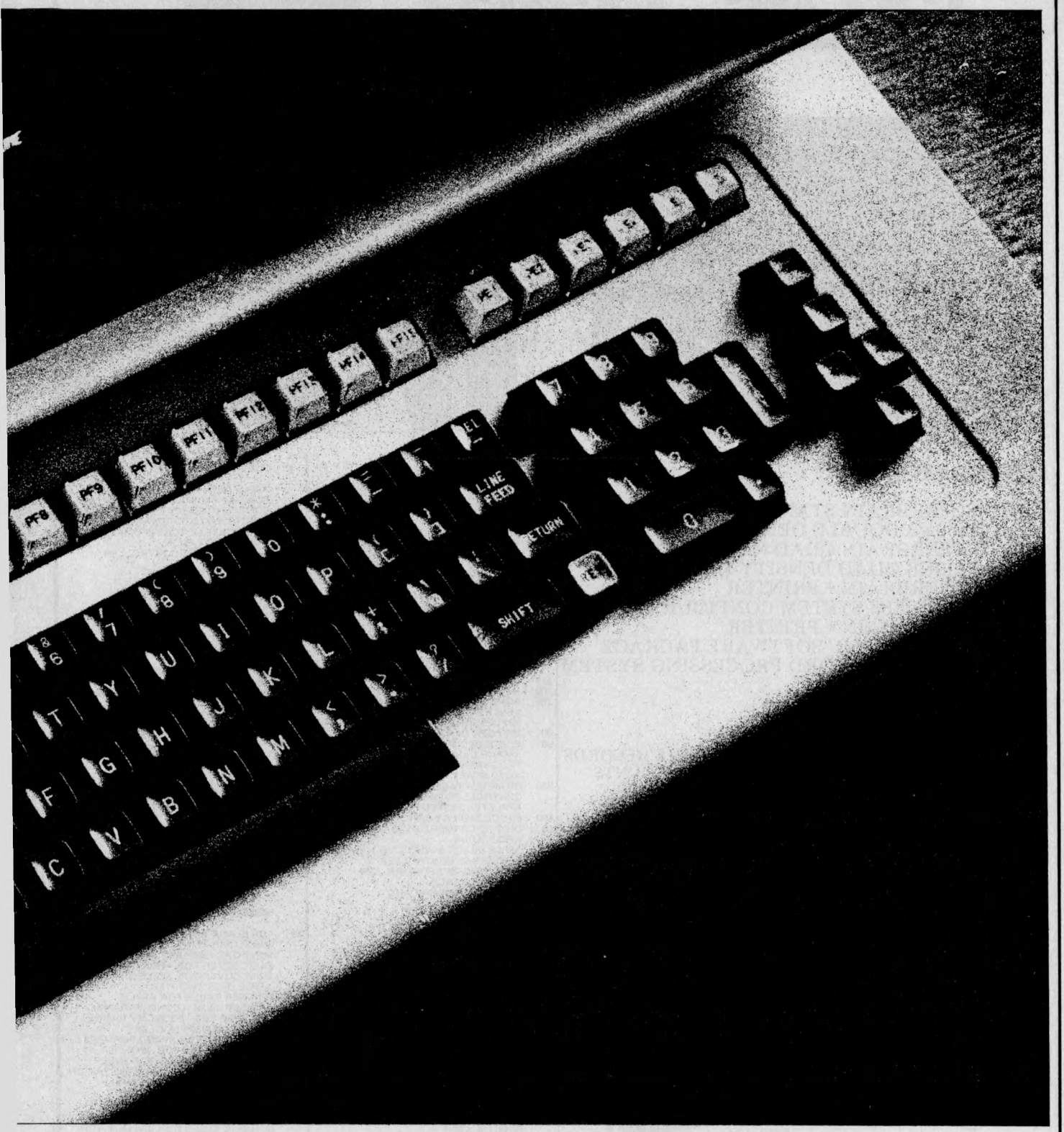

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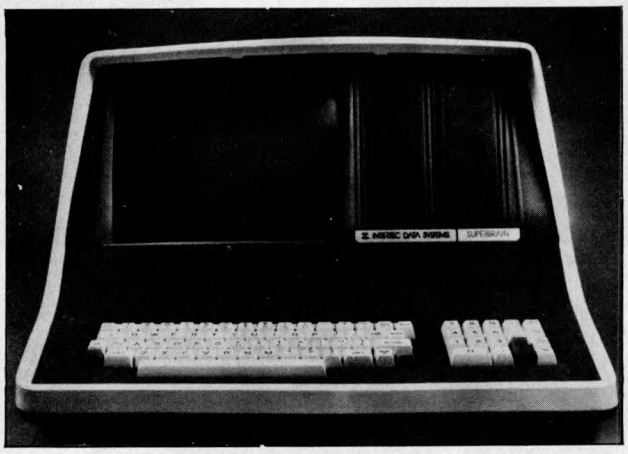

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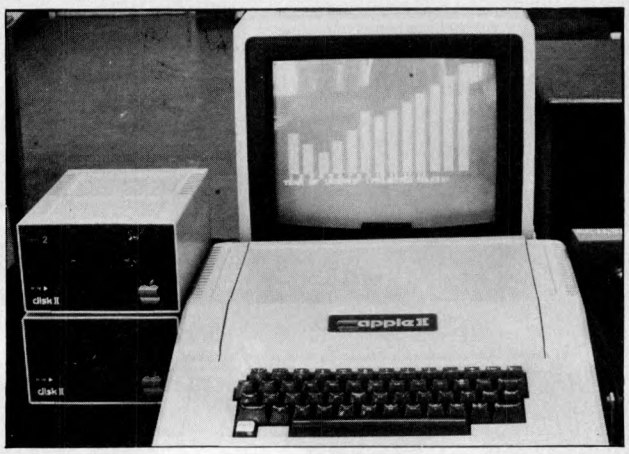

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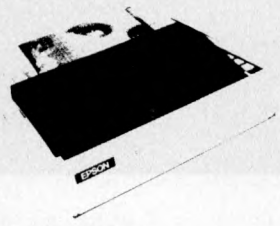

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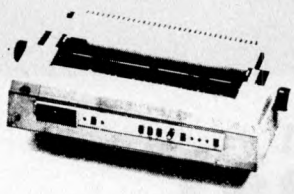

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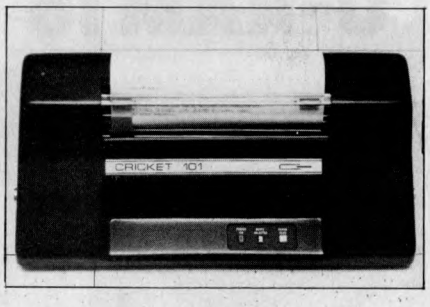

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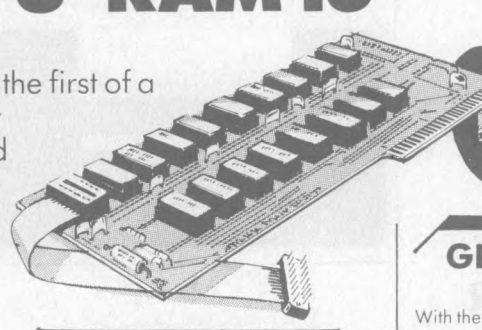

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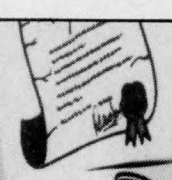

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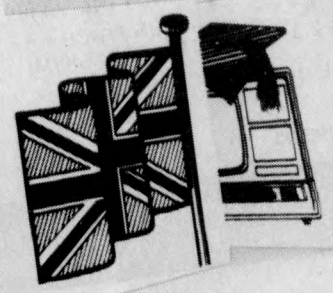

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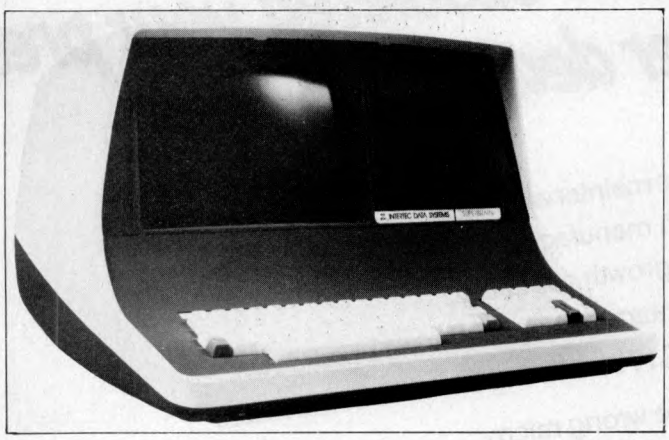

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COMPUSTAR™

Functional characteristics
The CompuStar 10 megabyte Disk Storage System (DSS) consists of read/write and control electronics, read/write heads, a track positioning mechanism, a spindle drive mechanism, dual disks, an air filtration system, and our exclusive 255 user controller – all packaged in a compact desktop enclosure. Although designed primarily to accommodate multiple CompuStar Video Processing Units (described at left), the unit can easily be connected to a single SuperBrain Video Computer System to facilitate additional disk storage. When used with CompuStar VDUs, however, the integral Z80 based controller will permit up to 255 users to "share" the resources of the disk with minimal CPU response degradation.

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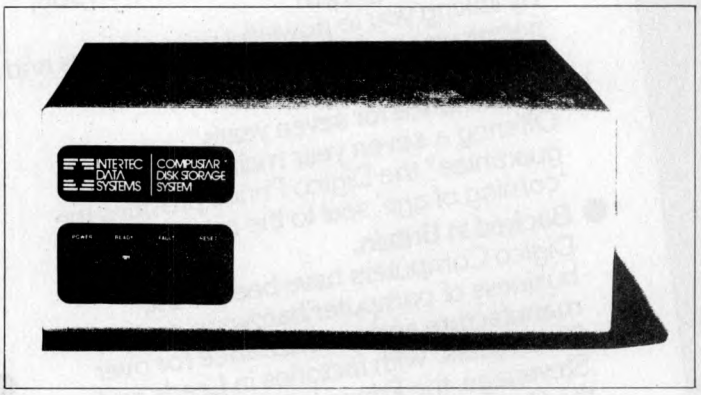
The recording media consists of a lubricated thin magnetic oxide coating on a 200mm diameter aluminium substrate. This coating formulation, together with the low load force/low mass Winchester type flying heads, permits reliable contact start/stop operation. Data on each disk surface is read by one read/write head, each of which accesses 256 tracks.



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04-12 MONTH WARRANTY	235.00
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12-MBASIC-80	150.00
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)Quit or .All or .Part or .Specific
)Quit or .Fast screen or .Slow screen or .Rapid print or .Pausing print
)Quit or .Continue or .Amend or .Delete or .Print
)Quit or .Double entry or .Alter filename or .Echo input or .Print options
)Quit or .Mail ticket or .Columnated or .Raw data line
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GRAMA (WINTER) LTD/G.W. COMPUTERS LTD. ARE THE PRODUCERS OF THIS PACKAGE WHICH IS UNEQUALLED FOR ITS LEVEL OF TOTAL INTEGRATION, LINGUISTIC FLEXIBILITY AND MAXIMISED DISK/MEMORY CONSERVATION.
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DOS + AND DIAGNOSTICS FOR SUPERBRAIN SPECIAL . . . . 125.00 . . . . . REPEAT KEY AUTO-LOAD, RAM CHIP TEST, FAST FORMAT BOTH DRIVES, FAST COPY TRACK TO TRACK TPU TEST, RS232 TEST, SCREEN TEST, DISK TEST (VARIOUS), DISK I/O TEST.

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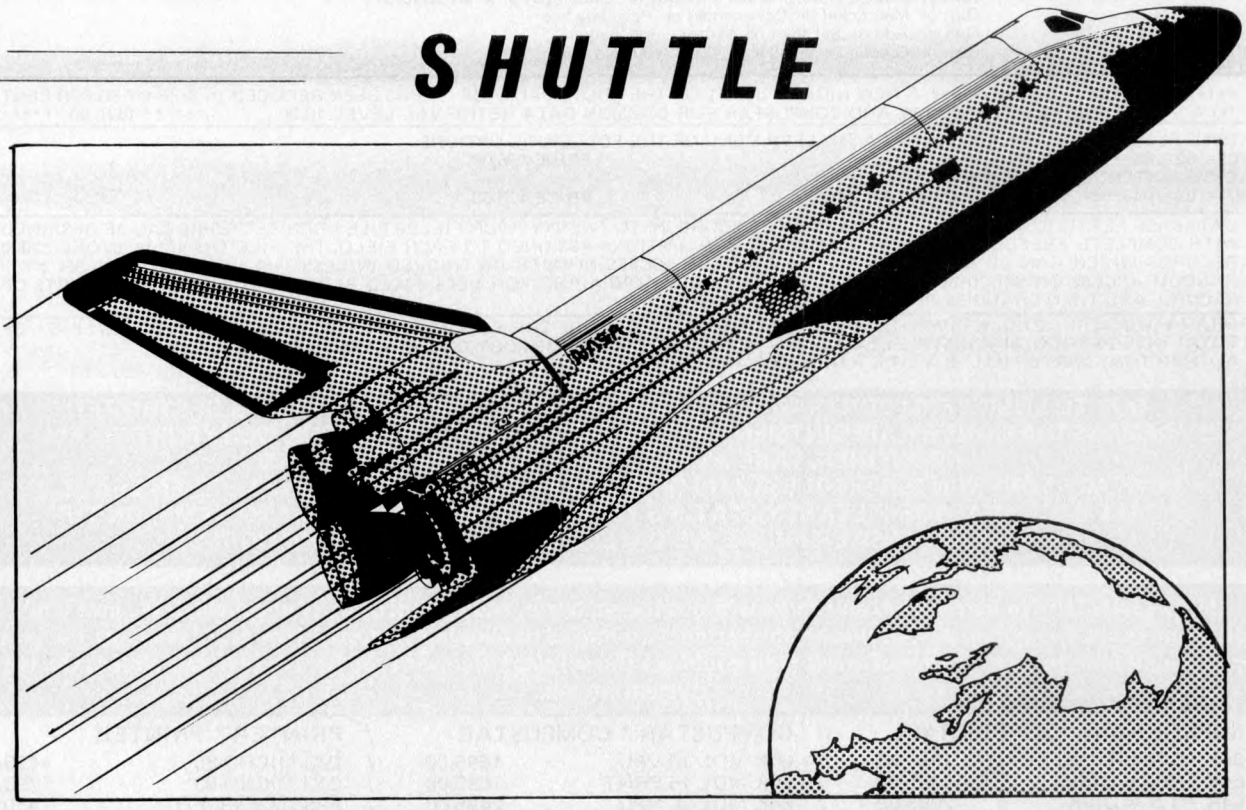

This program is a highly accurate computer simulation of the flight of the Space Shuttle Columbia from the initial countdown through the launch period, the launch itself and into a stable orbit. The craft may be manoeuvred within the orbit and then dropped out to finally fly through the atmosphere to a safe touchdown.

The attraction of this simulation is its authenticity. So far as is possible, it follows the actual parameters of the first Columbia flight with only one or two minor exceptions. The shuttle, of course, starts its flight pointed vertically into the sky and carries a huge fuel tank to provide the fuel for its three main engines in addition to the solid fuel rockets which provide the major thrust to lift it off the ground. Two minutes into the flight the rockets are jettisoned, having burned all their fuel. The count-down for take off starts at T-20 seconds. At T-10 seconds the shuttle motors start firing, but the shuttle remains tethered until T = 0. When the shuttle blasts off, the pilot must guide the craft into its orbit by controlling its attitude and track. A number of guidance controls are supplied, together, of course, with control of the shuttle motors' thrust.

The simulation may be started at one of three points in time: either at take off, at a point where the Columbia is in a stable orbit round the earth, or finally, prior to landing. Measurements of speed, fuel and so on may be selected for either Metric or Imperial measurements. All of the physical forces which acted upon the actual flight are taken into account. One departure from fact has been included in that the two solid fuel rockets have had their thrusts increased from 26 to 36 million Newtons so as to give the pilot an increased latitude for error. In other words to make the take off easier.

A fascinating program, the more so because it follows fact so closely. Available for the Model I and Model III TRS 80, Model I and Model II Genie and on tape or disk. The tape version will run in 16K, the disk in 32K.

Tape version.....**£14.95** Disk version.....**£17.95**

Both inclusive of V.A.T. but plus 50p P & P (if ordered alone).

TRS-80 & VIDEO GENIE SOFTWARE CATALOGUE £1.00 [**refundable**] plus 50p postage.

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LDOS

First there were the TRSDOS's, 2.0, 2.1, 2.2 and 2.3. Then came Newdos+, essentially a patched version of the TRSDOS's but with a number of very useful commands and utilities added. Then VTOS 3.0 and VTOS 4.0. These constituted a departure from the earlier DOS's and featured Device Independence so that devices such as the keyboard, printer, VDU and disk drives could interact directly together. Then came Newdos80 which is a rewrite of Newdos+, adding new utilities and new Basic commands, its main features being the ability to mix different capacity drives on the same cable and the ability to use variable length records. Now from LOBO International comes LDOS, the fifth generation disk operating system for the TRS-80 microcomputer. It combines most of the advantages of the preceding disk operating systems and unlike some of them, is accompanied by a complete and readable set of documentation, which includes a Technical Section containing relevant addresses.

It is impossible to describe all of the features of LDOS in an advertisement. For instance it includes no less than 35 library commands as follows:—

APPEND	COPY	DEVICE	DIR	DO	FILTER	KILL
LIB	LINK	LIST	LOAD	MEMORY	RENAME	RESET
ROUTE	RUN	SET	SPOOL	ATRIB	AUTO	BOOT
BUILD	CLOCK	CREATE	DATE	DEBUG	DUMP	FREE
PROT	PURGE	SYSTEM	TIME	TRACE	VERIFY	XFER

All of the useful abbreviations in Newdos are included and the System Commands in Basic (CMD) now number eleven. A program called LBASIC/FIX is included, with which the normal TRSDOS Disk Basic may be patched to include a number of new commands and features. A Job Control Language is included and in fact is one of the most powerful features of LDOS. It allows the user to compile a sequence of commands or key strokes for later execution as a chain, with or without user intervention. There are too many new features to list them herein, but examples are: The ability to provide an audible signal, output through the cassette port. To flash or blink a one line message on the video display. A WAIT feature is included so that the machine can be put into a "sleep" state until such time as the system clock matches the time specified. And so on!

Hard disks in addition to single/double density, single/double sided, 8" and 5¼" floppies are supported although they may, of course, require hardware modifications. Utilities included in the package are:

BACKUP	COMMAND FILE	FORMAT	LCOMM
PATCH	RS232	KEY STROKE/MULTIPLIER	PRINTER FILTER

A Basic Renumber facility is included, as is a Basic Cross Reference function. Both are similar to the ones in Newdos+ and Newdos80. Most of the utilities are library commands which were existent in the previous DOS's, have been improved with the addition of new functions or facilities.

The prime development team of LDOS consisted of no less than 8 first rank programmers and they had the support and advice of six other well known programmers. They have done an excellent job to bring to the user what must be the best disk operating system so far produced for a microcomputer, which is destined to become the Standard DOS.

LDOS is totally upward compatible with TRSDOS, that is to say LDOS will be able to copy files and programs from TRSDOS disks onto LDOS formatted disks. As they are competitive disk operating systems, it is not suprising that the manual states that disks created under Newdos are not guaranteed to be compatible with LDOS, but we have not experienced any difficulty. We have done some work on investigating the compatibility of LDOS and the Video Genie and at the time of going to press we have found no incompatibilities. LDOS appears to run on the Video Genie without any problems at all. LDOS is compatible with either the Tandy or Electric Pencil lowercase modifications and Scripsit. LDOS is available for the Model I and Model III. A Model II version will be available shortly.

LDOS .....£85.00 **plus** VAT and £1.50 P&P.

TRS-80 & VIDEO GENIE SOFTWARE CATALOGUE £1.00 [**refundable**] plus 50p postage.

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Video Genie...

Are you a home enthusiast taking your first tentative steps into the enthralling world of micro-computers? If so, the Video Genie is the ideal complete system for you!

It's a real micro-computer, not a pocket one, yet it only needs connecting to a domestic T.V. set to produce superb results.

The Genie is compatible with the popular TRS 80 16K level 2, the best selling computer of all time. As well as its lower price, the Genie offers an in built cassette deck, 16K RAM, 12K ROM with BASIC interpreter, full size keyboard and a stylish carrying case. So it is not only excellent value for money, but an ideal "First computer" on which to learn programming.

There are literally 1000's of pre-recorded programs available, including educational, leisure and small-business applications, and simple BASIC language means you can write your own programs with ease.

Extended BASIC.

The Microsoft extended BASIC has many powerful features, including double precision variables, scientific functions, formatted printing, extended editing sub-commands, automatic line numbering, multiple dimensional arrays, complete string manipulation, direct access to graphics and machine language sub-routines.

Memory.

The Genie EG 3003 model has 16K of internal RAM expandable externally to 48K using the special Expansion unit. 12K of ROM contains the Microsoft BASIC.

Cassette.

Two cassette interfaces are provided for both the internal and an external cassette unit.

CPU.

The machine uses the industry Standard Z80 micro-processor.

Display.

64 or 32 characters × 16 lines are available on the full display.

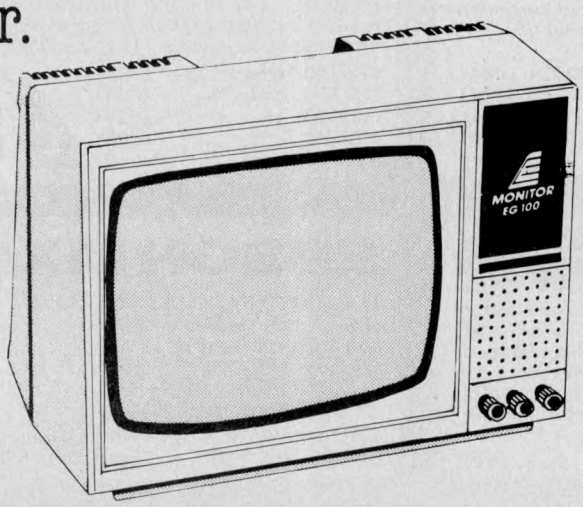
TOWE electronics

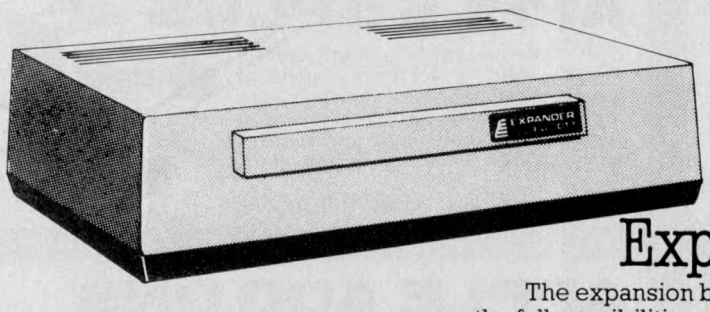
one giant step for micro-computer systems

12" Monitor.

The additional purchase of the EG 100 Monitor offers 3 distinct advantages

- It gives a considerably better quality display.
- It does not interfere with domestic T.V. viewing.
- It comes in an attractive, matching style.



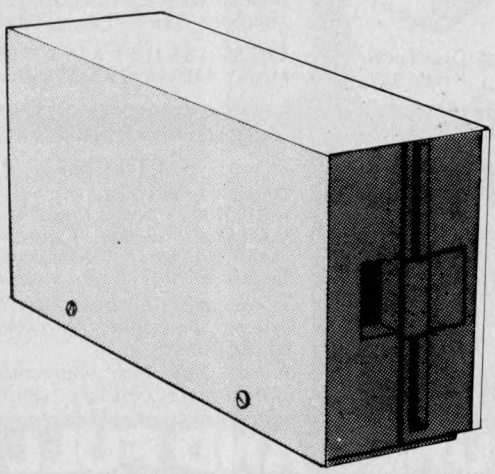


Expander.

The expansion box unleashes the full possibilities of the Genie. It contains a selection of interfaces, allowing the connection of up to 48K RAM, 4 disk drives, printers and S100 cards.

Disk Drive.

As well as the obvious advantage of mass-storage, the addition of the disk system to the Genie means much faster access to other languages and full random access file handling. Up to 4 drives can be used on a system.



For full details and demonstrations of the Video Genie system (EG 3003), contact your local dealer, or write directly to the sole importers at the address below.

Video Genie Approved Dealers

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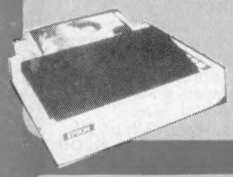

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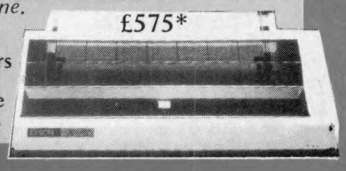

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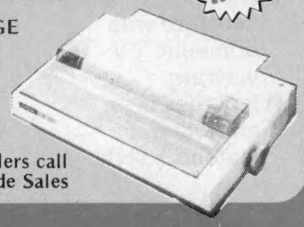

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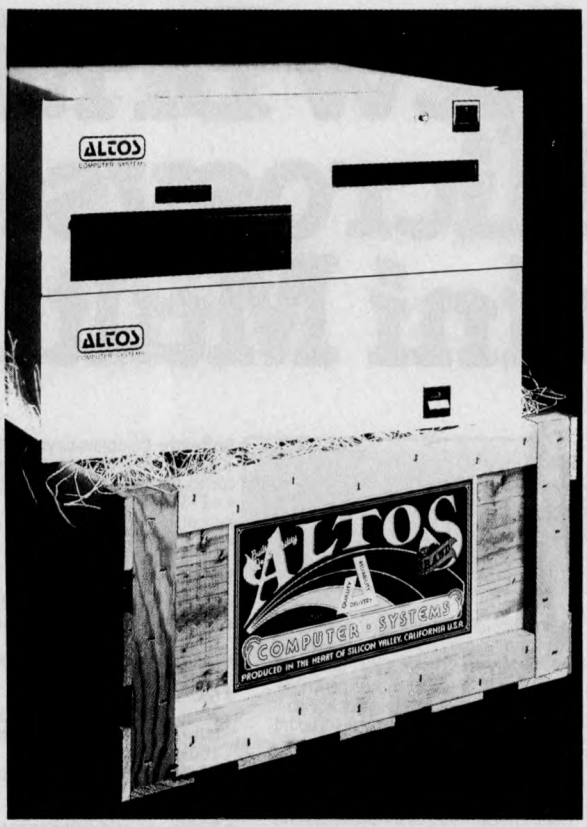
FRESH IDEAS ARE GROWING AT ALTOS

Silicon Valley, California. At one time few places in the world were as abundant with orchards. Today, no other area is as technologically fertile. And nowhere on earth is the business climate as prolific with computer innovation.

Yet within this competitive environment, one microcomputer firm continues to grow above the rest. Altos Computer Systems. Recognized as a world leader in single board microcomputer technology, Altos flourishes on its ability to produce ideas and deliver them to the market while they're still fresh and packed with price performance value.



Ideas like Altos' new ACS8000-6/MTU single board microcomputer system with a DEI ¼-inch cartridge tape back-up drive, and Shugart's 8-inch floppy and 14-inch Winchester hard disk drives, with total on-line capacities from 14.5 M Bytes to 58 M Bytes.

The ACS8000-6/MTU joins Altos' growing family of products that branch out to a multitude of single board system configurations to serve the OEM, the business sector, and many other end users. These systems range from the ACS8000-2 with its dual 8-inch floppy disk drives, to the powerful ACS8000-5, which is upgradable to any of Altos' hard disk and multi-user systems.

Altos supports three industry standard operating systems: single/multi-user CP/M and MP/M.* Seven high level programming languages are offered which are CP/M and MP/M compatible.

Ideas aren't the only things growing at Altos. In three years over 5,000 field-proven microcomputer systems have been shipped worldwide to an ever-increasing customer base of over 300 companies. And recently a new facility has been acquired, expanding Altos' plot to over one-and-a-half acres of production facilities.

Weed through the microcomputer system alternatives. No matter what your application, you'll pick Altos.

For specific details about pricing or performance, call or write:
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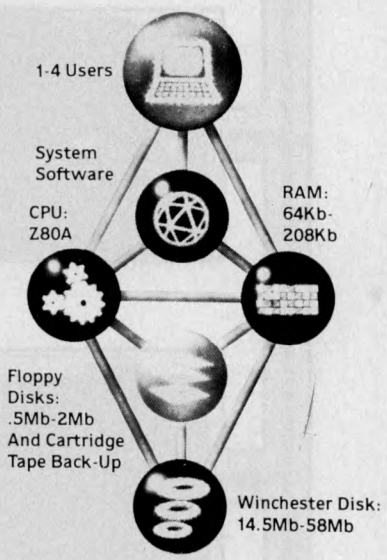

Packed with Fresh Ideas

ALTOS
COMPUTER SYSTEMS

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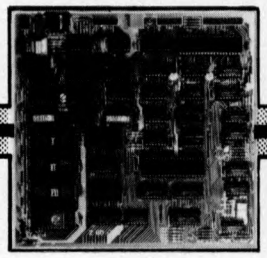
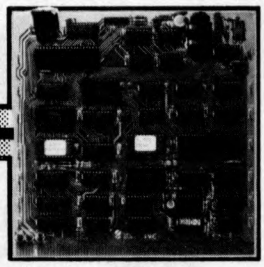
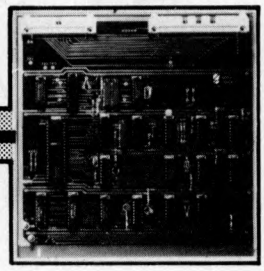
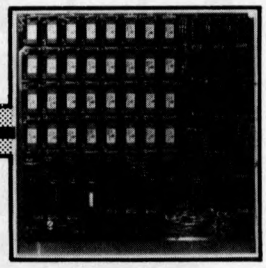
MicroValue

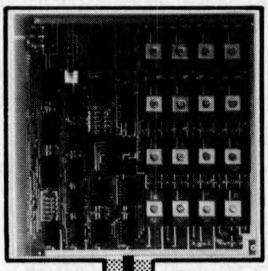
New British Microsystem. Gemini MultiBoard

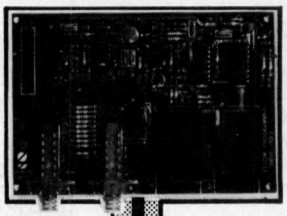


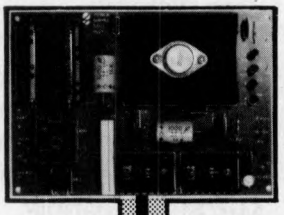












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Processor: Z80A CPU at 4MHz. Optional wait-states. Reset jump to any 4K boundary.

Parallel I/O: 8 bit ASCII keyboard socket. Uncommitted Z80A PIO giving two 8 bit bi-directional ports with handshake.

Serial I/O: 8250 UART with programmable baud rates and software selectable between RS232 or 1200 baud CUTS cassette interfaces.

Memory: 4 'Bytewyde' sockets to accept EPROM/ROM/RAM. Memory switched in/out of memory map under software control.

Software: Comprehensive monitor. Optional 12K Microsoft BASIC (ROM). Standard configuration PROM provides decodes for 4 x 2732 (4K x 8) EPROMs.

The CPU Board is fully buffered to the Gemini 80-BUS standard.

INTELLIGENT VIDEO

- Z80A microprocessor controlled.
- 80 x 25 display controlled by 6845 CRTC chip.
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- I/O port communication with host computer.
- Light pen socket.
- 8-bit input port allowing several video boards (each with its own keyboard) to be connected to a single CPU board.

FLOPPY DISK CONTROLLER

- Controls: Pertec FD250 5.25in 48 TPI, Micropolis 1015 5.25in 96 TPI, Pertec FD514 8in.
- Controls up to 4 drives of same type.
- Single/double density software selectable.
- Single or double sided.
- Western Digital FD1797 controller.
- Up to 8 drives (2 boards) can be used in the same system.

64K RAM

- Runs at 4MHz with no wait-states.
- 4 banks of 16K dynamic RAM, each bank locatable on any 4K address boundary.
- Page Mode supplied as standard allowing up to 4 memory boards to be addressed.
- All the memory can be used by switching out on-board CPU memory, e.g. in disk environment.

EPROM/ROM BOARD

- Accepts up to 40K of firmware.
- 4 banks of 4 sockets.
- Banks can be mixed between 2708 or 2716.
- 24-pin ROM socket.
- Wait-state generator.
- Supports Page Mode scheme.

EPROM PROGRAMMER

- Programs multi-rail 2708 or single rail 2716.
- Connects to PIO on CPU board.
- Software provided on tape.

3A PSU

- Supplies 4/5 boards.
- LED on each output.
- +5V at 3A; +12 at 1A; −5V at 1A; −12V at 80mA.

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- Full alpha-numeric ● 59-keys ASCII encoded ● Exclusively designed for Gemini
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FLOPPY DISK UNIT

Gemini unit suitable for MultiBoard. Holds one or two 5¼in double sided, double density Pertec drives. Intergral power supply. Price £375 plus VAT for one drive, £575 plus VAT for two drives. CP/M2.2 and documentation £90 plus VAT.

KENILWORTH CASE for MultiBoard	**£49.50 + VAT**
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VERO Frame (also suitable for Nascom)	**£32.50 + VAT**
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KEYBOARD enclosures available soon.

MultiBoard Modules are available from the MicroValue dealers listed on facing page.

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GEMINI G805 FLOPPY DISK SYSTEM FOR NASCOM-1 & 2

It's here at last. A floppy disk system and CP/M

CP/M SYSTEM. The disk unit comes fully assembled complete with one or two 5¼" drives (FD250 double sided, single density) giving 160K per drive, controller card, power supply, interconnects from Nascom-1 or 2 to the FDC card and a second interconnect from the FDC card to two drives, CP/M 1.4 on diskette plus manual, a BIOS EPROM and a new N2MD PROM. All in a stylish enclosure.

Single drive system ..... **£450 + VAT**
Double drive system ..... **£640 + VAT**
Additional FD250 drives ..... **£205 + VAT**

D-DOS SYSTEM. The disk unit is also available without CP/M to enable existing Nas-Sys software to be used. Simple read, write routines are supplied in EPROM. The unit plugs straight into the Nascom PIO. Single drive system **£395 + VAT**

DCS-DOS A greatly enhanced version of D-DOS, running under Nas-Sys. Gives named files in BASIC, ZEAP, NAS-PEN and machine code programs ..... **£50 + VAT**

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The powerful text editor written for the Nascom is now available on a 5¼ inch floppy disk with a number of new features. **Price £43.25 + VAT.**

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KENILWORTH CASE FOR NASCOM-2

The Kenilworth case is a professional case designed specifically for the Nascom-2 and up to four additional 8" x 8" cards. It has hardwood side panels and a plastic coated steel base and cover. A fully cut back panel will accept a fan, UHF and video connectors and up to 8 D-type connectors. The basic case accepts the N2 board, PSU and keyboard. Optional support kits are available for 2 and 5 card expansion.

Kenilworth case ..... **£49.50 + VAT**
2-card support kit ..... **£7.50 + VAT**
5-card support kit ..... **£19.50 + VAT**

CASSETTE ENHANCING UNIT

The Castle interface is a built and tested add-on unit which lifts the Nascom-2 into the class of the fully professional computer. It mutes spurious output from cassette recorder switching, adds motor control facilities, automatically switches output between cassette and printer, simplifies 2400 baud cassette operating and provides true RS232 handshake.

Castle Interface Unit ..... **£17.50 + VAT**

A NASCOM-2 BASED SYSTEM FOR LESS THAN £1500 + VAT

The proven Nascom-2 microcomputer can now be bought as a complete system from under £1500 + VAT. For this price you get the Nascom-2 kit, 16K RAM board kit, Kenilworth case with 2 card frame, Centronics 737 printer—10 inch monitor, and the Gemini Dual Drive Floppy Disk System. The CPU and RAM boards are also available built – the additional cost is available on application.

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For really interesting and useful interactions with the 'outside world' the Milham analogue to digital converter is a must. This 8-bit converter is multiplexed between four channels – all software selectable. Sampling rate is 4KHz. Sensitivity is adjustable. Typical applications include temperature measurement, voice analysis, joystick tracking and voltage measurement. It is supplied built and tested with extensive software and easy connection to the Nascom PIO.

Milham A-D Converter (built and tested) ..... **£49.50 + VAT**

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For Nascom ROM BASIC running under Nas-Sys. Supplied in 2 x 2708 EPROMs. Features include: auto line numbering; intelligent renumbering; program appending; line deletion; hexadecimal conversion; recompression of reserved words; auto repeat; and printer handshake routines. When ordering please state whether this is to used with Nas-Sys 1 or 3. **Price £28 + VAT.**

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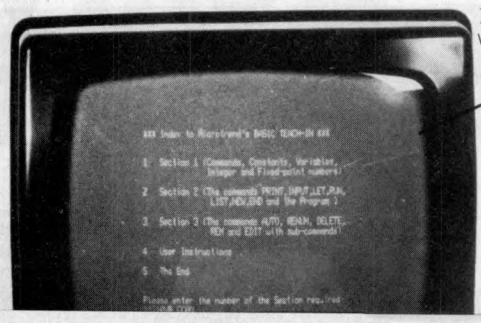

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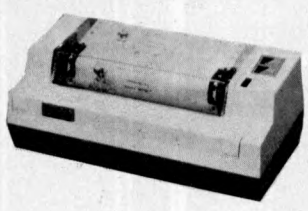

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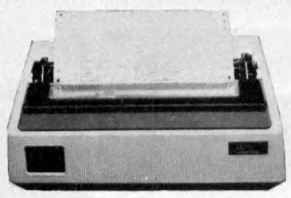

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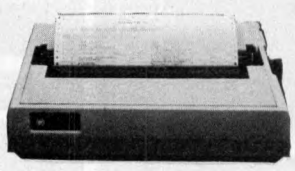

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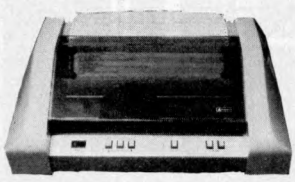

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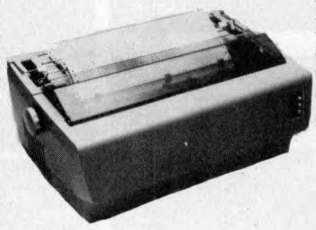

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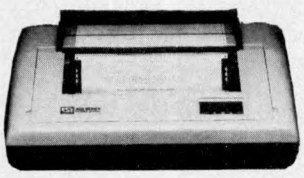

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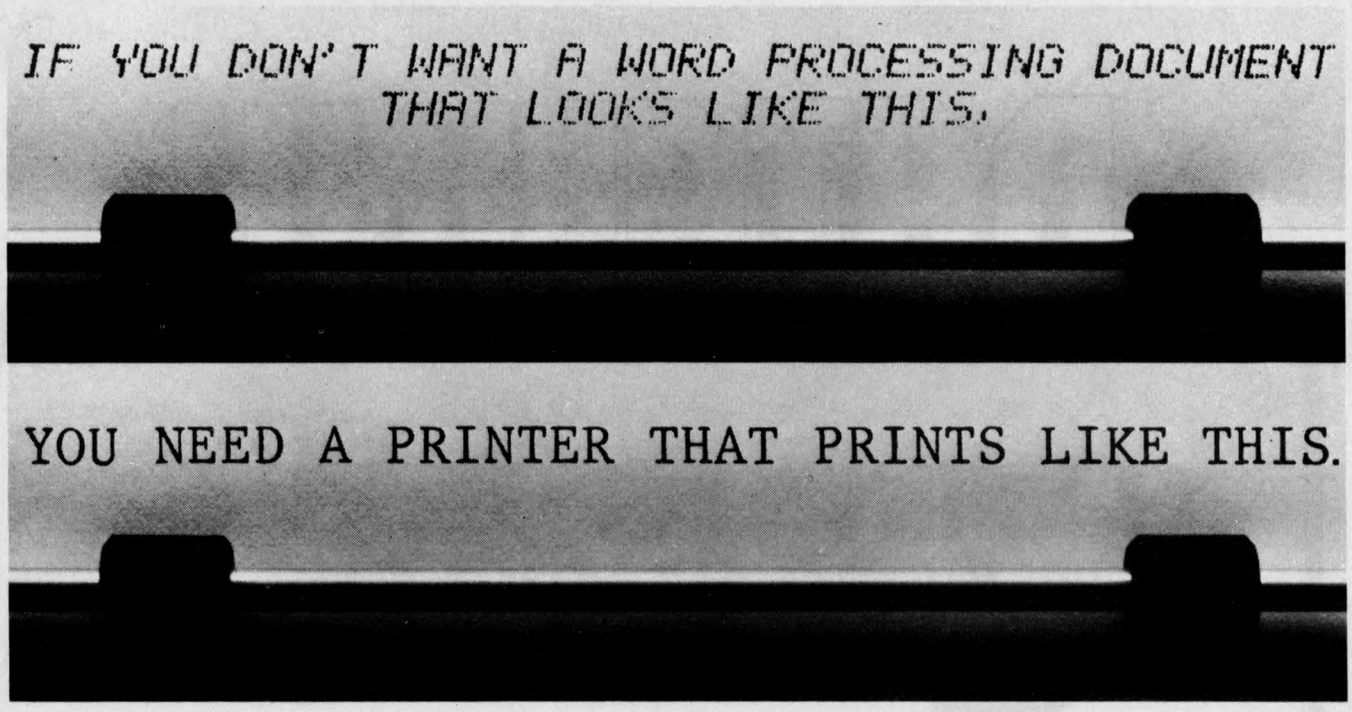

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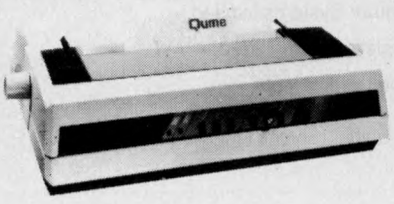

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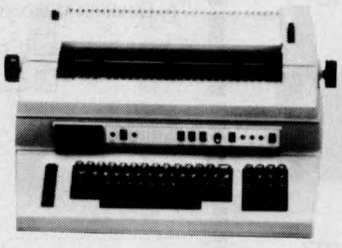

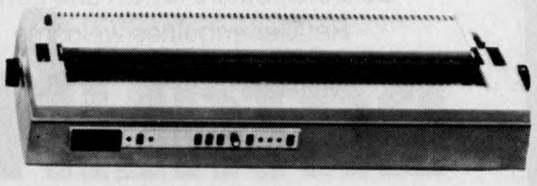

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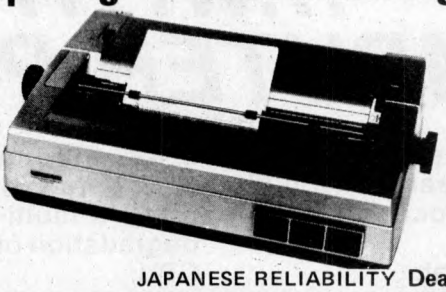

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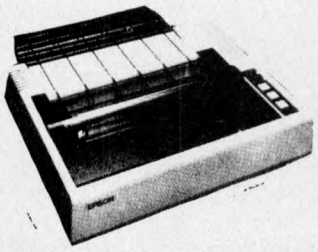

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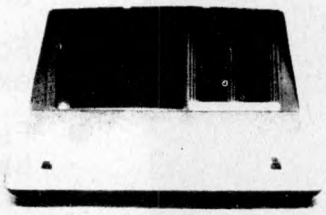

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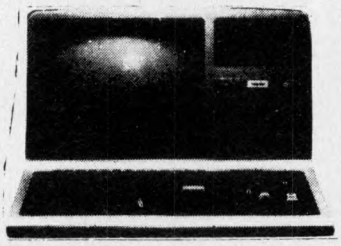

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The appeal of the game is that it combines skill and chance, so that though developing strategies are important, there is not guarantee that having learnt a strategy it will work twice!

The game is an adaption of Tolkien's book 'The Lord of the Rings', spell words actually being taken from the book as are the characters.

Tolkien enthusiasts will not need convincing of the necessity of saving Middle Earth by escaping from Shelob's Lair; those without this background knowledge will have to play a few games before they become addicted!

In your quest to cast the ring into the Crack of Doom to destroy its evil power you will travel a long and dangerous road. The Lair is on many levels, so you must find the stairs, and beware of the clever nasties, monsters and dwarves which can detect you from a distance and rush for your gold, which you need to bribe. There are secret tunnels, monster's tombs and the like.

During your travels you can meet Shelob herself, a Fiery Balrog, Lord of the Nazgul, a Hideous Hill-Troll Chief, a Numakil from the Far Harrad, Hissing Gollum, a Howling Warg, a Barrow-Wight and all those characters of the spell words.

The game, though easy to actually play, is complicated in itself with many and varied happening along the way. But its advantage is that all the time you can see and manipulate yourself in eight different directions.

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- **Bankers**
- **Teachers**

to name but a few

Just a few tasks a microcomputer could be organising for your company, division or department:–

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- **Sales Ledger**
- **Purchase Ledger**
- **Nominal Ledger**
- **Sales Forecasting**
- **Stock Control**
- **Job Costing**
- **Estimating**
- **Payroll**
- **Word Processing**

(automatic compilation, editing and production of repetitive letters and documents).

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SYSTEM A Basic computer including screen & keyboard	£399	£775	£450	–	–
SYSTEM B As 'A', plus floppy disk drive(s) and matrix printer for small business user.	£1700	£1655	£1750	£2200	£2480
SYSTEM C As 'B', but quality printer for word processing instead.	£2700	£2050	£2250	£2600	£2850
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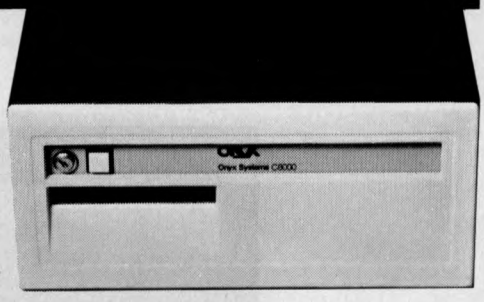


The intelligence options...

Onyx C8001 8-bit micro
Onyx C8002 16-bit micro
12Mb cartridge tape back-up

64Kb RAM 512Kb RAM
128Kb RAM 1032Kb RAM

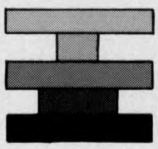
10Mb hard disc drive
18Mb hard disc drive

CP/M, OASIS, MOASIS, or
UNIX 7 operating systems

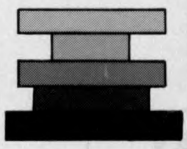
BASIC, COBOL, FORTRAN,
UCSD PASCAL, MUMPS, C

MARATHON relational DBMS

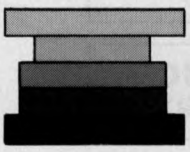
..and the intelligent applications.



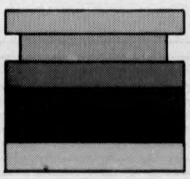
Onyx C8001 8-bit micro
64Kb RAM
10Mb hard disc drive
CP/M operating system
BASIC
£5690



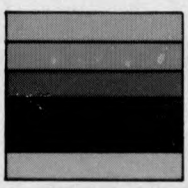
Onyx C8001 8-bit micro
128Kb RAM
10Mb hard disc drive
MOASIS
UCSD PASCAL
£6685



Onyx C8002 16-bit micro
256Kb RAM
10Mb hard disc drive
UNIX 7 (8-user)
C BASIC/UCSD PASCAL
£11930



Onyx C8002 16-bit micro
512Kb RAM
18Mb hard disc drive
UNIX 7 (8-user)
UCSD PASCAL
MARATHON DBMS
£16790



Onyx C8002 16-bit micro
1032Kb RAM
18Mb hard disc drive
UNIX 7 (8-user)
UCSD PASCAL
MARATHON DBMS
£20610

"What gives you the power of a mainframe in a desk-top device?"
The Onyx C8002.

"Explain the advantages of its UNIX 7* timesharing operating system."
It enables up to 8 users to share files and compile or execute programmes written in BASIC,* COBOL, FORTRAN, UCSD PASCAL, MUMPS and C – concurrently and independently. On custom programming, UNIX 7 cuts costs and increases productivity enormously.

"Name the new database management system that can be used with the Onyx C8002 computer and describe its advantages."
MARATHON. It's a relational DBMS designed specifically for UNIX commercial users. It has everything that's needed to help systems designers and programmers cut costs and heighten applications reliability and expandability. Features include an interactive query language, an interactive data entry and maintenance programme, report writers, and audit trail and recovery programmes.

"Describe how Onyx computer users can get the power and versatility of mainframe network systems costing many thousands of pounds more."
By using OMNINET – a new low cost carrier-sense multiple-access network that can provide up to 80Mb of shared storage. It uses shielded twisted-pair cable for the interconnection of up to 64 microcomputers in a 4000-feet serial link.

"Name the other Onyx system, together with its operating system."
The Onyx C8001. It's ideal for 1-4 users and can operate under CP/M,* OASIS* and Multi-User OASIS (MOASIS).

"Explain the advantages of OASIS and MOASIS."
OASIS offers applications software developers an unrivalled range of development tools for fast, easy and practical creation of sophisticated software. MOASIS makes micros run like minis. File and Automatic Record Locking denies other users access to a record when someone is updating it; Logon Password and Privilige Level enables a systems manager to specify which programmes and files may be accessed by various individuals; and OASIS Re-Entrant BASIC means less memory is needed for practical operation.

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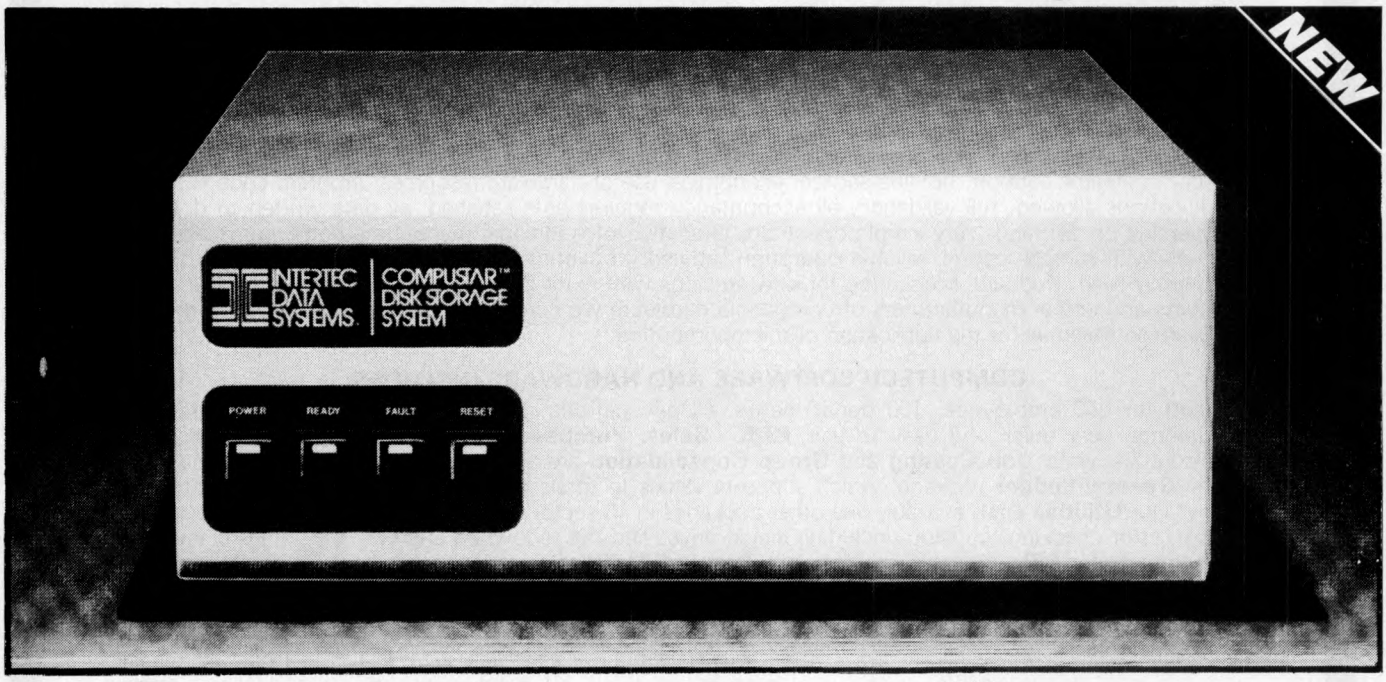

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ZN1034	200
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74284	199
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74290	105
74293	125
74297	236
74298	100
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LS166	85
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LS196	58
LS197	85
LS200	345
LS202	345
LS221	120
LS240	165
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LS261	195
LS266	25
LS273	90
LS275	290
LS279	88
LS280	250
LS283	45
LS290	57
LS293	46
LS295	215
LS298	130
LS299	420
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LS302	175
LS320	270
LS323	270
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LS326	315
LS327	150
LS347	190
LS348	185
LS352	185
LS353	37
LS365	37
LS366	37
LS367	90
LS368	75
LS373	75
LS374	48
LS375	90
LS377	69
LS378	69
LS379	250
LS384	250
LS385	378
LS386	28
LS390	62
LS393	60
LS395	199
LS396	190
LS398	275
LS399	220
LS445	140
LS447	195
LS471	620
LS490	245
LS541	135
LS571	620
LS640	225
LS641	225
LS645	210
LS668	175
LS669	150
LS670	175
LS673	550
LS674	750

74L	74L
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74L75	145
74L85	349
74L121	165
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74S132	138
74S138	240
74S158	240
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74S194	380
74S195	795
74S201	
74S241	540
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74S288	210
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1.8432MHz	300
2.0MHz	305
2.4576MHz	300
3.2768MHz	300
3.57954M	195
3.6864M	300
4.0MHz	290
4.032MHz	323
4.19430M	270
4.433619M	135
5.0MHz	300
5.185MHz	323
5.24288M	425
6.0MHz	300
6.144MHz	295
6.5536MHz	290
7.0MHz	290
7.168MHz	290
7.680MHz	323
8.0MHz	300
8.08333M	362
8.867237M	362
9.375MHz	323
10.0MHz	300
10.7MHz	323
12.0MHz	392
14.31818M	362
16.0MHz	290
18.0MHz	300
18.432M	323
19.968MHz	300
20.0MHz	323
26.0MHz	383
26.69MHz	290
27.145MHz	300
27.648MHz	323
38.6667M	350
48.0MHz	323
100.0MHz	323
116.0MHz	300

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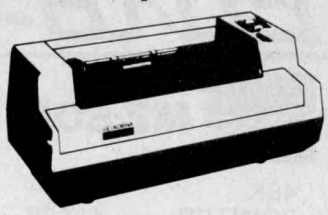

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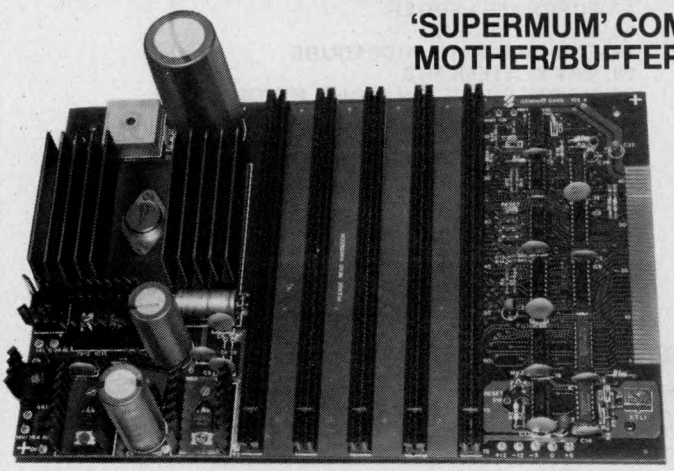

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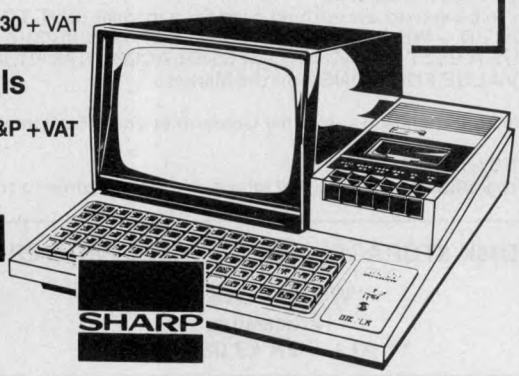

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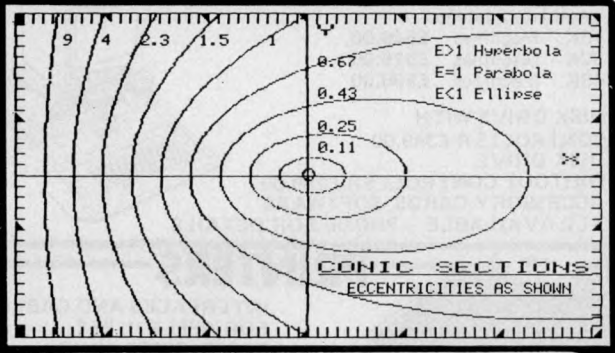

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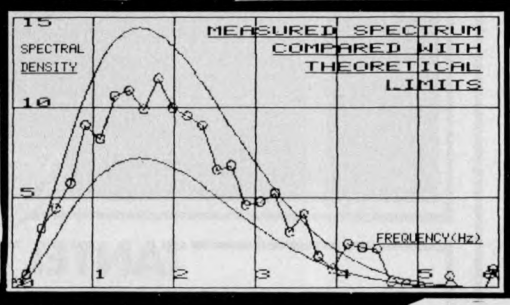

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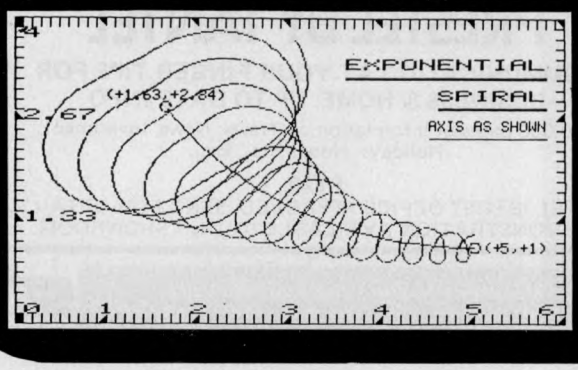

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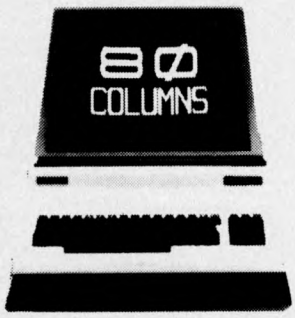

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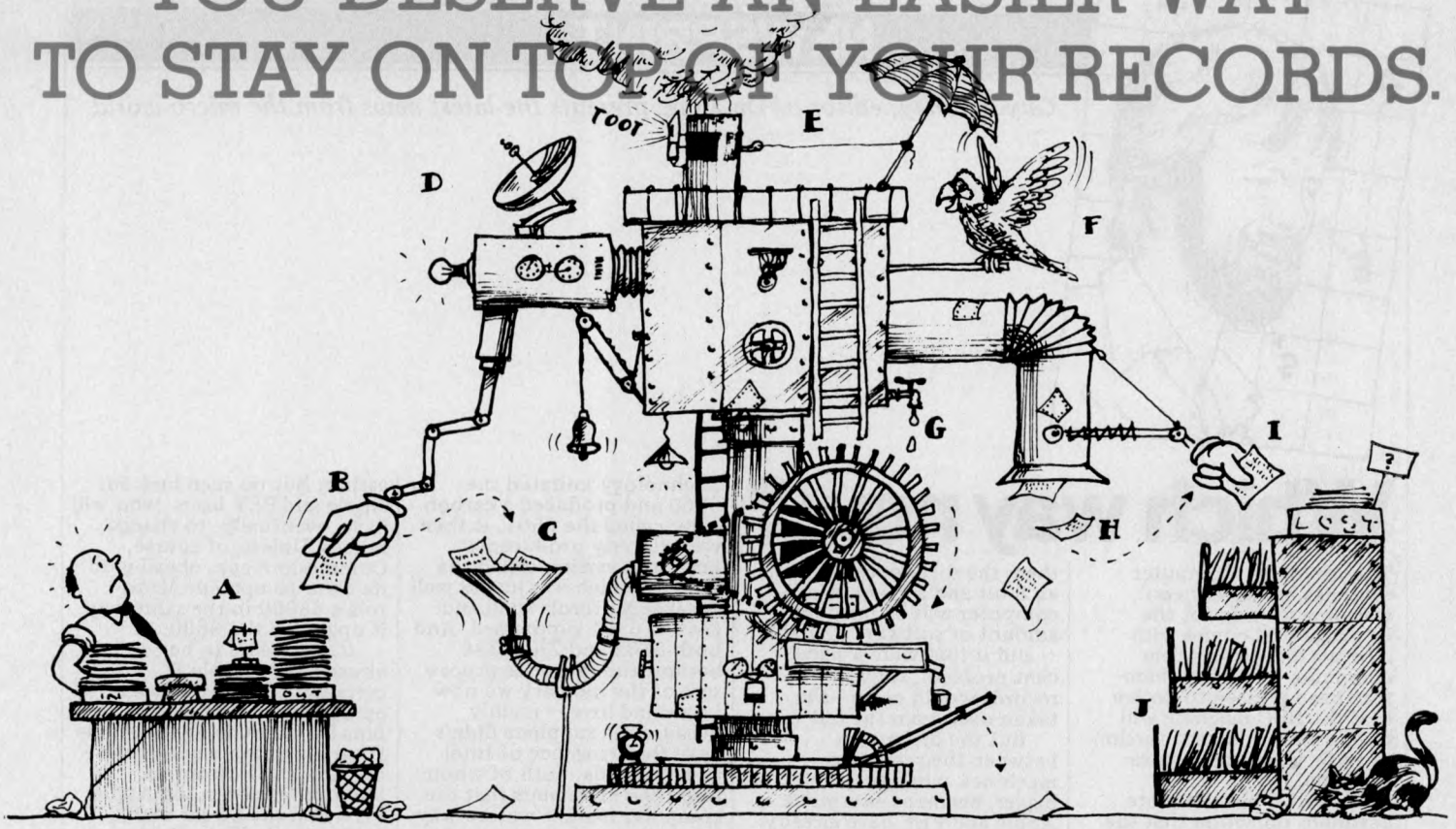

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NEWSPRINT

Guy Kewney, editor of Datalink, *presents the latest news from the micro world.*

Which way now?

The Amateur Computer Club has had a very cool welcome waiting for the language that comes with Acorn's nice little Atom computer — and has therefore been pleased to notice that the BBC machine will have a more standard version of Basic when it becomes available.

The ACC has the more pertinent objection that the machine uses the 6502 micro for its central processor — rather than the Z80 or 8085. Even to those to whom these numbers are more than a string of digits, the point of the ACC's objection might seem a bit abstruse. After all, the 6502 is the central processor of the Apple II which is just about to become the most common computer of all time. It is the heart of the Commodore PET, which is still Britain's number one seller (after Sinclair's ZX81) and still stands a good chance of improving its position in America. And the 6502 also can be found in all Atari micros — not to mention most Ohio Scientific machines (and UK101 imitations) — so what can be so bad about it?

The problem is simple enough: it goes nowhere.

Simply put, the 6502 is an 8-bit processor, but it has no 16-bit descendant whereas the Motorola 6809 has the enormously powerful 68000 to follow, and the 8085 has the 8086, plus the gigantic 32-bit Intel iAPX 432; and Zilog's Z80 has the Z8000 already quite readily available in very small quantities.

At the moment, these more powerful versions of today's best-selling processors are sold as high-price machines. The reason appears to be: they cost more. The real reason is: you can't get a lot, so you sell the few you can make for the highest price the market will stand. When these bigger chips are in mass production, the difference between them and the ordinary 8-bit chips, in cost terms, will not make more than a couple of fivers' worth of difference to a system price. In two years' time, then, the difference between an 8-bit and a 16-bit small computer will be only the amount of software available — and if that were a significant problem, then LP records would never have taken over from the old 78s.

But the difference between the same two machines, when they get bigger, becomes enormous. Apple and PET have already shown us what a problem this is. Those who went to the PET show in June will have found two big PETs announced. There was the 8096, and there was the Waterloo machine, or Micromainframe — both designed to get round the simple problem of putting more than 65,536 memory locations inside an 8-bit machine.

Naturally, neither is compatible. You can't take programs written for one and guarantee to run them on the other — and you certainly couldn't run them on the Apple or Atari or Atom.

The good news behind all that, is that Commodore is planning to build a 16-bit micro. That is to say, the chip-making company which Commodore took over before launching the first PET, MOS Technology, is hoping to get the go-ahead to design one.

The idea is that the logical ancestry of the PET chip, the 6502, is taken to its logical conclusion. And to state that, we have to have a little history.

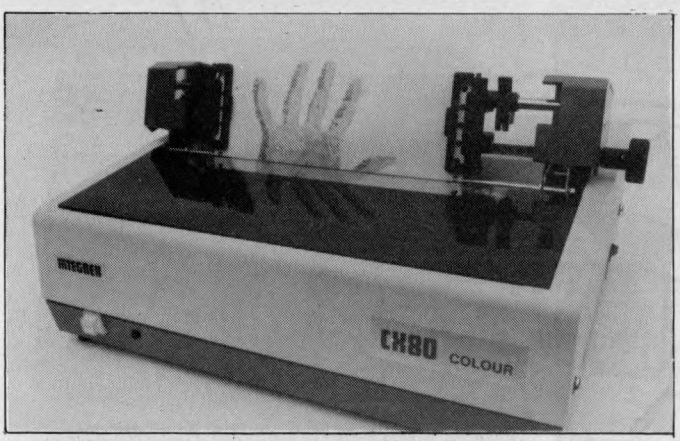
Originally, there was a micro called the 8008, an 8-bit device made by Intel for the data communications market. Its potential was instantly jumped on both by Intel, and by its then giant rival, Motorola. Intel produced the 8080, and Motorola produced the 6800 — both of them improved versions of the old 8008. At that point, all the also-rans climbed on the bandwagon. The two that mattered from our point of view were Zilog, and MOS Technology, both small, eager and unknown. Both adapted a best-selling chip; Zilog copied the 8080 and added instructions which it thought would make it faster and slicker, while MOS Technology imitated the 6800 and produced a carbon copy called the 6501. It then very cleverly produced an improved version called the 6502 — which was just as well because Motorola sued and got the 6501 suppressed. And both 6502 and Zilog Z80 became the favourite processors of the industry we now know and love — mainly because the suppliers didn't have the arrogance of Intel and Motorola, both of whom told their customers that the computer market was no way for a microprocessor to go.

Since then, Intel produced several new, bigger chips which it claims are the natural choice of anyone moving up from the 8080: similarly, Motorola and Zilog see no reason for anyone to leave the fold and move to a rival supplier when they have the big chips mentioned earlier. But no such luck for Apple and PET users, who will have, eventually, to change horses. Unless, of course, Commodore goes ahead with its plans to upgrade Motorola's 68000 in the same way it upgraded the 6800.

It may seem to be too late, already. For Apple, it certainly is: it has slightly embarrassed itself and its fans by announcing the Apple III as a stopgap while preparing to use the Motorola 6809 processor in the Apple Five, and the bigger 68000 in the Apple Four. Both Four and Five actually exist, and can be seen in prototype form in various parts of California.

Now it is possibly true that Apple will delay Four and Five until three is ready (it was described tartly as a 'very nice coffee table' by one proud owner who did it

It doesn't get very hot in your office, does it? Certainly not over 50 deg C. So there's no point in becoming anxious, just because Verbatim has revealed that these diskettes don't get destroyed by deformations caused by temperatures above that limit. Oh, yes, standard diskettes do get destroyed by those temperatures, didn't you know? They also go funny if used when it's colder than 10deg C — but it's all right, these ones don't. . . ah, you haven't got any yet, have you? Worrying, isn't it, the way these people never tell you what's wrong with the products until they produce one that overcomes the problem. Just as well it's not that hot in your office — what's wrong? Burned you hand on the top of the micro, did you? Ah well. Details: 01-941 4066, and watch where you put that hot coffee cup.



The untidy mess appearing on the sheet of paper in this printer, is a hand. It is being printed in colour. You too can do this sort of thing by getting the Integrex CX80 printer at £900-odd from Davidson-Richards of 14 Duffield Road, Berby DE1 3BB. It prints at up to 125 characters per second and does graphics (as you can almost see), too.

less than justice because it is also a very nice book stand). But it is unlikely to tear up the prototypes in favour of a Commodore chip that must be two years in the future, even if that chip turns out to be better than the 68000.

However being too late for Apple isn't the same as being too late.

The Motorola 68000 may look like the ultimate in hairy computer power now, and far greater than anything we might seriously want inside a portable typewriter — but in ten years' time, it will look very limited, with no built-in instructions to understand speech, for example. Intel's iAPX 432, now the unbelievably big mainframe on a chip, isn't actually on a chip. It's on three, the way the 8080 was when it first appeared (except you could only get one of them at the time). There's room for development and improvement there — and somebody will do it, and it won't only be Intel who does.

Name game

It only seems like a long time since *Dr Dobbs Journal of Computer Calisthenics and Orthodontia* (running light without overbyte) astonished us by suggesting that micros didn't have to be programmed by feeding in a string of meaningless digits. You could program them in Tiny Basic, a dreadful language which seemed then like the height of sophistication.

By comparison, the really truly Basic that Microsoft wrote for the first PET seemed incredibly powerful. In fact, it was merely outrageous — the company had the cheek to assume that users could afford more than 8 kbytes of memory.

One of the things about Microsoft Basic was that it gave us variables. You could have a formula like 'Let volume = pi*radius ^{3} *4/3' and translate this into Basic by inputting R for radius, and printing V for volume. This has been passed down from father to son: from PET to VIC. It is now about time to admit that variables should be meaningful even if they are longer than two letters long.

On the Atari micros, a variable called antidisestablishmentarianism is instantly distinguishable from antihistamine — not that you would want to use either, but you can. On Microsoft, they are both equivalent to 'an' all by itself. And if you chose a variable called antifreeze, it will be rejected outright because it includes the word if.

I know that one of the objects of the VIC was to be compatible with the old PET — but with so many extras, couldn't this one be improved, one asks? It is, after all, Commodore's claim that VIC is 'user-friendly'. Well, it is true that the manual presents the machine in a very 'chummy' fashion, but that isn't what user-friendly means. User friendly means that if you write a program using two variables like volume and voice, or coffee and cocoa, you can tell which is which, rather than having to call one VL and other VC, or CF and CC — which would mean nothing at all to you a year later.

We know that the current VIC is the cheap one, and that a better version will come along one day — maybe in a year or so — with 40 characters on the screen. Can we ask for these little unfriendlinesses to be tidied up, please? And with them, little things like having that very necessary character, the $, plus brackets, available on one key, rather than only after pressing SHIFT?

And the same for all the other special Basic characters. Most of these problems can be easily solved by taking the numbers off the top of the typewriter keyboard, and putting them on a special calculator keypad. including the arithmetic signs and decimal points. It may sound like a trivial thing, having to press down the Shift button, but most of us, when programming, have only one hand free (the other one is holding the books open at one page or another, and keeping a finger in the index page at the same time) and little things like this matter.

Bubble blows

The news for bubble fanciers is still not good: after last month's Intel announcement that it had a product for sale at last, two blows have struck the business.

One of these won't particularly worry Intel: it was the sad decision of Texas Instruments that there was no future in its own bubble factory, and that it would buy parts, if anybody wanted them, from somebody else (mainly Intel).

It was the wrong moment for New World Computer Company to hit the market from the other side. That is, the wrong moment for the bubble people. For New World, the timing was impeccable.

The bubble is simply an electronic disk: that means no moving parts to wear out or get dust in or get bent or bumped. You store data in it, and when you want to unplug the bubble cartridge, you simply pull it out, and plug in another.

It's the cost per word stored that makes disks look so good, and New World's costs are astonishing: especially as it has produced the first big-capacity 'hard' disk that can be unplugged from the system, just like a diskette can, and swapped for a different one with different information in it.

This one offers eight megabytes. Four of those megabytes are permanently built into the box, which fits into the space occupied by a normal mini-floppy diskette. The other four megabytes are removable, magnetic read-write heads, disks, sealed unit and dust-free atmosphere all in one cartridge. And just compare the $1600 price for this unit with around three times as much for Intel's bubble cartridge offering only 128 kbytes, and it becomes clear how far bubbles have to go before the technology becomes irresistible.

New World is in America, phone no (714) 556 9320 — which is in Santa Monica.

The last chance

The truth lies somewhere between the people who don't believe that The Last One can write programs, and those who think it can write them better than people can.

The truth is that there is more to software than writing programs, and with a little luck, hundreds of users are now on the point of finding out what the difference is, because the product is due out at the end of July.

It's hard to judge how many people will actually end up buying The Last One. What I do know is that either Scotty Bambury is an outright liar (and I don't think he is) or they've been getting over 200 enquiries from all round the world, each day.

The real news, as I sit down to type, is the number of machines that this program writer runs on. Originally, it was available only on an obscure Ohio Scientific model. By now, the list includes the PET the Tandy Model II (the big, expensive dual disk business

Once upon a time a computer company called North Star set up in business as the Kentucky Fried Computers store, and instantly got a lawsuit from Colonel Sanders. Here we see a Kentucky Fried Chicken store using a Tandy TRS-80 supplied by Chess Consultancies and user Tom Allen of Colonel Foods says they really understood his problems. And I don't see any way for North Star to sue. Chess is in Salford on 061-832 6795.

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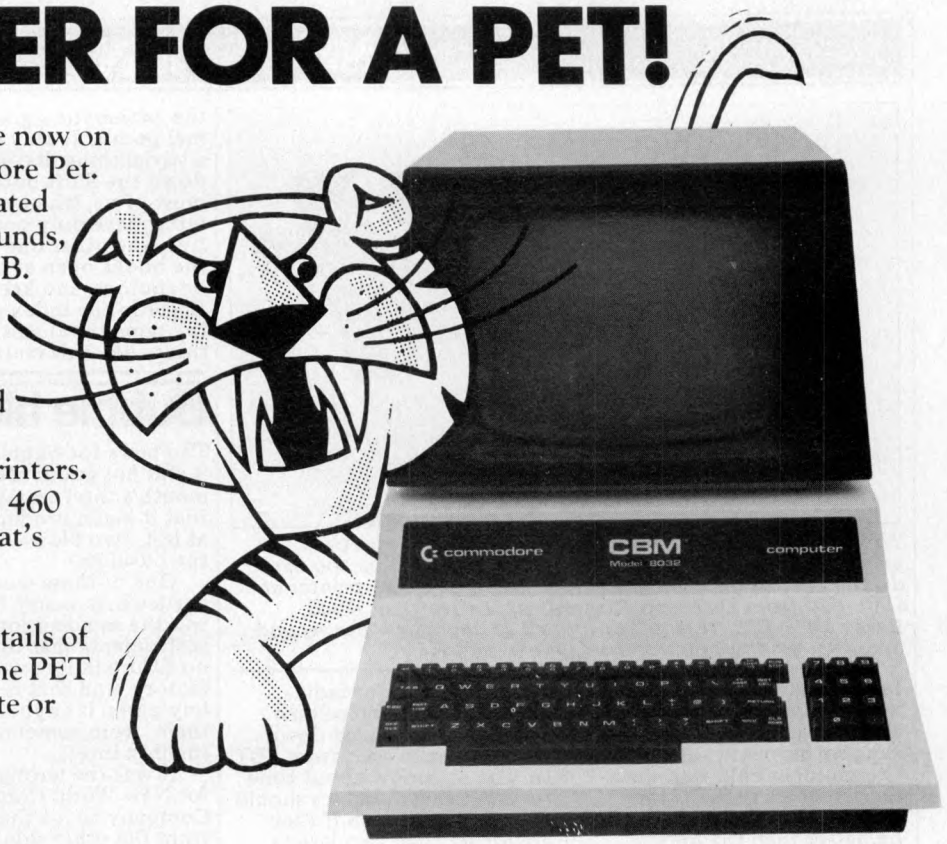

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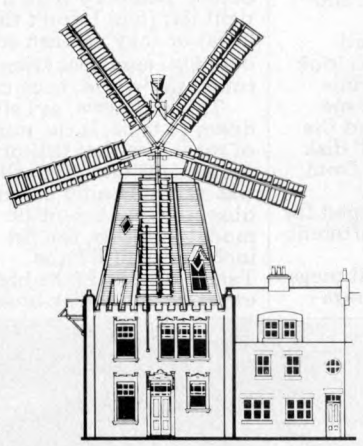

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machine which is going to become so much cheaper when Osborne gets going), the Apple, and any CP/M type machine with CBasic II, as well as the Sharp MZ-80K and its powerful daughter, the PC3201.

More important, the first machine code generators are being put together. It wasn't silly of the inventor, David James, to generate Basic code with his program, because so many of today's computers have Basic code interpreters built in — but machine code will be faster, more powerful, and more suited to each machine if it is done properly.

Scotty Bambury rather fancies himself as a manipulator of markets, however. Instead of having The Last One ready when he started advertising, he decided to advertise it well in advance, and then release the product only when everyone in the world was anxiously lining up with their cheque-books at the ready. That way, he reckons, everyone who wants one will buy from him, rather than ripping off copies from each other. And equally deviously, if there is to be a machine code version which is better (for some purposes) than the version which writes Basic, then he's not going to release the better version, even if it's ready, before people who want the original have lashed out their cash — so the machine code version will arrive slowly, probably in over a year from now. It may even be a bit better and more clever, but you never know, do you?

Pascal problems

At the PET Show, gossip was exchanged on the likelihood of running a program called Micromodeller on the new 8096 PET. The significance of this is that the program is written in a language called Pascal, which is still not available on the 8096. . . or is it?

Yes, it is true that Commodore announced Pascal last year, in a version written by Keith Frewin of Transam (the company that invented the British Triton and Tuscan micros) called TCL Pascal.

That version is one backed by the International Standards Organisation, but not yet a standard. It is also not *the* standard, which is the version originated at the University of California in San Diego or UCSD, and which is only a standard because everybody uses it.

The two versions of Pascal vary enormously, not so much in the instructions which the machine obeys, but in the operating software which lies behind them. The result is that one can easily fit TCL Pascal onto a small (32 kbyte) PET, but UCSD Pascal together with all its run time software, won't fit, and you need the extra 64 kbytes of the 8096 machine. And programs that run on the Apple, which uses UCSD Pascal, will run on the new machine, and this includes Micromodeller. (And they just won't, on TCL Pascal).

Before being a trifle snide about Micromodeller, and saying that I really have met people who think it is worth six times as much as Visicalc, (and not all of them are cretins), it is worth saying that UCSD Pascal won't be available instantly on the PET. There was still a lot of work to be done in getting the software right, and people inside Commodore didn't hold out too much hope of having it ready immediately they received the first faulty diskettes from the US in June — but they were optimistic, in a cautious way, of having something by the end of the year.

This will be good news for Systematics, a software company which has specialised in writing for the Apple because of its preference for writing in Pascal. After all, at the time of writing, Pascal still wasn't available on the Apple III, and, because of an absurd dispute between Apple, UCSD and UCSD's agent, Softech, programs in Pascal still don't load and run by themselves on Apple II unless you pay a fortune for something called run time Pascal which is virtually free in America. But watch this space.

Blowing in the ether

Uncomfortably, I have the feeling that once I suggested that Ethernet, a method of linking several micros to a single disk or printer or both and sharing the storage costs, would catch on faster than Cambridge ring, which is the same sort of thing. I suggested that there were so many different people climbing on the Ethernet bandwagon, that it was bound to succeed.

I now have a sinking, doubting feeling.

The sinking feeling arises from a visit to the Intel Fair, which was once more important than any other micro show in Britain, and which is now an interesting backwater.

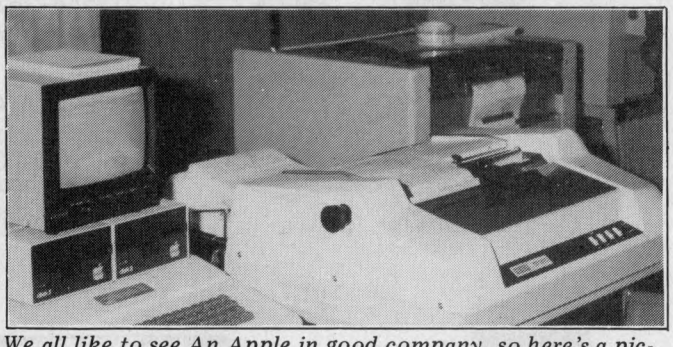
At the show, a presentation was made on the Real Ethernet, at which an Intel man revealed that the cost per terminal of Ethernet would be $5000, a figure which made me swallow hard. The goal was to bring this down to $200, he said (that's the *extra* cost, by the way, after you've bought the terminal). Ethernet was actually invented by Xerox, the copier company, and is operated by that company for its own purposes. One thing it did which was clever, was to share its problems with Intel, and with a big minicomputer company called DEC; one thing it did which was very far-sighted but less clever, was to invent the telephone number all over again.

It isn't widely known that according to Xerox, every Ethernet device is unique. It has a unique device code, assigned to it by Xerox, whether it is actually made by Xerox or not. You pay Xerox for an Ethernet licence, and it assigns a batch of numbers to you, and you give one to every device you make.

All other 'Ethernet compatible' networks you may have admired are not operated under the licensing agreement, and therefore will not fit into the Xerox Ethernet, if it catches on.

I said it was farsighted of Xerox. In a sense, it is, since the plan will come into its own on the day, not perhaps too far away, when all terminals in the world are linked together somehow. On that day, all Ethernet terminals will know each other, and will never mistake themselves for something else when they both put their identities on the network, asking for time.

It's hard to see how that problem can't be overcome in good time, however, without that sort of foresight. And the plans may have scuppered themselves — because at $5000 *extra* per terminal today, who on earth is going to go the Ethernet way? Ethernet-compatible, sort of: yes, but — Ethernet? I have this horrible sinking feeling that Xerox may be blowing its third big attempt to take over the world from IBM.



We all like to see An Apple in good company, so here's a picture of one at Norwich printing football tickets for First Division Computers, using a Nexos DP1800 printer. It's nice of the football club to call its software subsidiary First Division Computers — and I hope nobody is going to be churlish enough to cast their minds back to last year's football season and check out which team was relegated from first to second division.

Not so super

Intriguingly, crossing salt water doesn't seem to suit the SuperBrain micro.

It is one of the nicest micros around and, until Osborne hits us all smack between the eyes, it is definitely the best value system running the CP/M operating system, selling for under £2000 with two disk drives built into its box.

The trouble is: whereas its builder, Intertec, reports that only five percent of SuperBrain computers leaving its US factory are faulty, dealers on this side of the Atlantic assure us that the figure is closer to 60 or even, say some 80 percent.

One dealer estimates that he spends £200 per machine, just getting it into working order so that the customers won't bring it straight back — others estimate that the average cost of preparing a SuperBrain for market is around £100, which would roughly square with a 60 percent fail rate.

I suppose as long as the customers are getting fine, working SuperBrains, it doesn't really matter what is causing them to fail in the cargo holds, but nonetheless the statistics seem worth studying. Perhaps its a magnetic storm that causes the problem?

Penguin power

The only thing I really liked about the *Penguin Dictionary of Microprocessors*, recently sent to me by a foolish penguin for review purposes, was its definition of the word 'database'. It defined it, rather succinctly, I thought, as 'a file structured in a certain manner' and went on to describe, quite briefly, how that structure aided recover of data from the file. It then added that the word would also be found to be applied 'to any file which would sound more important if called a database'.

It's quite possible that Stage One's new database, like many others available

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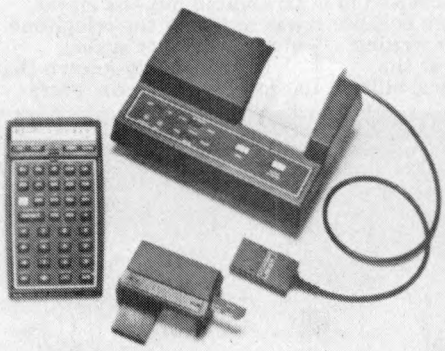

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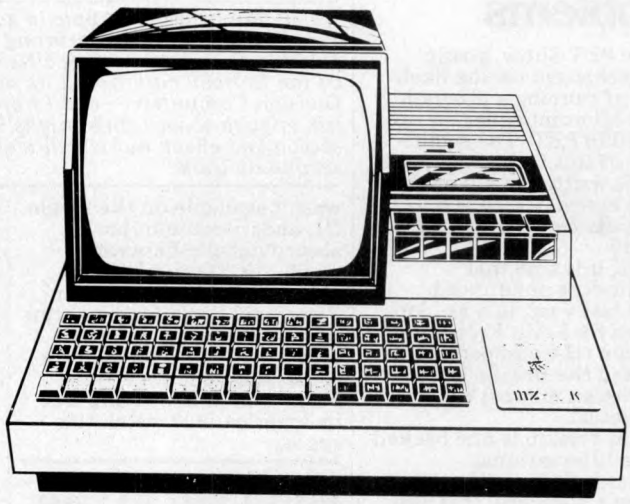

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for diskette-using microsystems, is capable of performing well on really large files, other than the PET 8050 diskette unit which it actually handles — but it is equally possible that its skill at sorting through a megabyte or so, generating audit trails and so on, will start to groan a bit the way most very big database managers do when faced with a high volume of complex questions over tens or hundreds of millions of characters.

What makes the software worth a mention is that it is 'the first transactional database on the PET,' in Stage One's own words — it has all the features which were provided in previous versions of Petaid plus extra features. I don't know how to explain 'accounts and postings with mathematics on the header or on the transaction or between both' in English, so I won't try. Talk to Stage One on Bournemouth 23570. And also, avoid the Dictionary.

Forthright

I gather that I am a human being — or at least, a group of people who write their programs in Forth have written to say they assume I am. They must be right, because I am also, it says here, 'monumentally ignorant' and 'incompetent'.

I rather hope that the Editor can arrange to print the letter in question, as a good example of how not to write to a journalist. I happen to be extremely broadminded and rather wonderful, and therefore take it as quite a compliment that people expect such omniscience as these folk do, but other writers not blessed with my monumental ego might have been a little upset to see their good faith called in question quite so roundly.

The good news, however, is that four fans of the Forth Interest Group wish readers to know that versions of the language suitable for running on micros other than the Cosmac 1802 processor are available for $10 from FIG. This, I think I have mentioned before, with a UK FIG address: for good measure the US address is PO Box 1105, San Carlos, CA 94070, phone (415) 8653.

Blue wardrobes

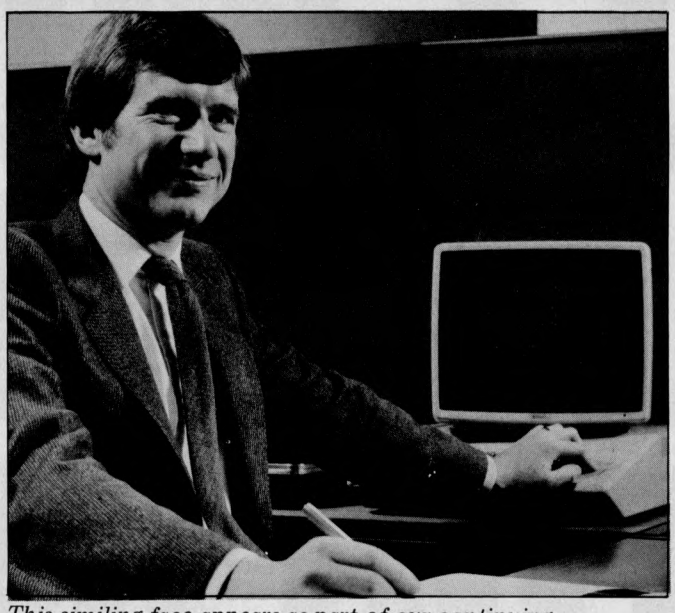
Once upon a time, two computer companies became a little fanciful over products they had made, which were big. And each company said to itself: 'How best can I convince the world that my product is the biggest thing since the Brontosaurus, or since Garbo played St Joan?'

The first company was Intel (or perhaps it was the second). It had produced a huge chip, number 432, which was not actually one chip but several which could be laboriously linked, making it into a 32-bit processor which means little to many, but to the computer industry is a magic phrase meaning macho, big, powerful, wonderful, and all the rest. Big computers, known as blue wardrobes in the trade, are also called mainframes in public, so Intel called its chips the Micromainframe.

Strangely enough, when Commodore decided that Waterloo University in Canada had been very clever by putting the big Motorola 6809 micro inside a PET and turning it loose, they too sought for a telling phrase which would convey how *big* the new machine was.

Yeah, verily mate, they too called it the Micromainframe. And when asked, neither company had got round to putting a little R in a circle, denoting Trade Mark, and neither company knew the other had done it (used the name) and neither knew which came first.

It's a silly name, anyway.



This similing face appears as part of our continuing propaganda war against the big computer companies. It belongs to Roy Sheridan, who worked for IBM selling what he scornfully calls 'personal computers' in ironic quotation marks. He wasn't just Joe Soap — he spoke on IBM's behalf in several seminars and symposia — but he tells me he left the company for the Apple networking company Zynar in despair at the slow movement towards true personal computing inside that company.

I'll take this opportunity to stick my neck way out, and predict that IBM will not, repeat, despite rumours not launch its cheap personal computer this year. I keep getting rumours and I'll pass them on faithfully as is my duty to you, oh faithful readers. But I don't believe them.

Prismatic program

Managing a list of customers, parts, subscribers, patients, employees, property listings, vendors and most other types of information is a simple as you want it to be — or as powerful as your software can make it.

According to the Micro Applications Group, simplicity comes from clever software: its list management system was used to write the letter they sent me, announcing PRISM/LMS for $225. 'With this product, the data to be stored in the files is defined by the user — this eliminates the constraint of the pre-defined file format imposed by most maintenance systems,' they summarise. They're pleased with their forms generator, which allows special forms — like address labels or letters — to be generated automatically from any list.

Details from California on (213) 881 8076.

Fail safe

People who supply extra power supplies so that your system can function when the CEGB cuts out tend to emphasise the fact that memory evaporates when you trip over the plug.

This is quite true, but that isn't to say that keeping a supply of 5V to the memory banks is enough to keep your system going, because there is quite often a printer and diskette to think of too.

Turn off the power when your storage diskette is running, and prepare for a sad surprise when you examine the magnetic surface. And turn off the printer, and watch your expensive operating software go schizophrenic as it decides that there never was a printer, so it's going to wait for ever before it admits that power has returned. You have to restart (and often lose all the data you generate).

So Power Testing has produced a backup power system which will drive both diskette and printer, for up to an hour, if the mains power fails. It costs £350. Details on Upminster 26938 or write to Alan Hobbs at 1 St Mary's lane, Upminster, Essex RM14 3PA.

Onyx-offical

As predicted (it wasn't hard) Onyx now has five official distributors, and praise the Lord, they aren't talking about being exclusive any more. Instead Scan Computers, one of the authorised distributors of this 16-bit microsystem, is telling the world how good it is: 'Our dealers will have all the software backing they could possibly need to help them secure large-scale systems,' is the way Steve Russell put it in calling for volunteer dealers. Nice to see healthy competition at the quality end. Details on 09066 5432.

Conversation piece

Micros can generate speech, it is true: only an optimist would describe most systems that do this as convincing imitations of the human voice. Then again, for £90, a device that will add on to any micro using the S100 bus, and also to the PET, Apple or Acorn micros, could sound quite bad before your patience ran out — so Speakeasy may be in for a few sales.

Since it is contrary to Telecom regulations, for example, to use your micro's ability to dial phone numbers, none of you will have done this; so none of you will have your micro able to ring up at at home from work (or vice versa) messages like 'the burglar alarm sensor in the basement has just been broken,' or 'the humidity in the laundry drier hs risen to 3 percent' or 'oil stocks are below critical and the boiler will burn out in two hours.' If you want to know how this might be done, ring Intelligent Artefacts on (0223) 207689.

On the ball

A Curser is one who is trying to get a cursor to occupy exactly the right spot on a video screen. First he presses the button with the arrow going up, then the one with

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the arrow going left. Oddly, the first one works, but the second moves the cursor right until he remembers and presses the SHIFT key. . . yes, we've all done it.

Irritatingly, the device which can solve this is regarded disparagingly as a 'joystick' — good for nothing but games. By all, that is, except Atari, whose model 400 and 800 should be available in Britain around now.

Atari supplies joysticks for its micros, and you can write software to use them for cursor control — as you will find out if you play the games.

Even more splendid, the company is taking the trackball under its wing. That is a device like a ten-pin bowling ball buried in a desk, and if you want to see this sophisticated data processing device in operation controlling a cursor with incredible speed and precision, turn away from your computer technology companies, and head down to the game arcade. There you will find one controlling the destruction of missiles in Missile Command.

Soon, you will also find it available for Atari machines. It has the incredible advantage of not having to move in vertical or horizontal lines only, it can move from any point on the screen directly to any other point, and the speed depends on how fast you spin the ball.

Just imagine how useful one would be for scanning through a database of alphabetic listings, too. . . but you can bet the data processing world will regard it as just a games controller.

6800 newsletter

As of this moment, Tom Boyd knows of no other source of information on the 6800 micro or the SS-50 bus than his own brand new user group.

Boyd has put together a 'modest newsletter' on the subject, with typical information including hardware which people have designed and will sell/supply details of, plus a product directory, including software.

Boyd is available at Belmont School, Feldmore, Holmbury St Mary, Dorking, Surrey RH5 6L0

SuperBrain specials

No system which 'enhances' any part of CP/M remains a standard CP/M system, whatever Icarus may say about Superbios for the SuperBrain. The idea is a nice one — to provide features like a repeating keyboard, a real time clock, automatic startup in your favourite program when you switch on, and software support for mixed multiple types of disk drive, and so on.

Icarus has also released another product from Micro-Mods, called Supervid, which does nice things to the video display — which most critics single out as being the most disappointing feature of the SuperBrain. Supervid gives such necessary 'luxuries' as proper upper and lower case letters, plus all those cunning little tricks that good video terminals give to make using them easier — such as flashing words, dim words, and histogram drawings. drawings.

These things are nice, and it's good to see them — but they aren't standard because your programs, if they use them won't run on standard machines. Just on your modified SuperBrain. Details on 01-485 5574.

Plug-in winnie

There is no problem in adding a disk drive to a North Star Horizon microsystem, even if the drive is a big capacity mini winchester with five megabytes of storage — in theory. The theory is held by Hotel MicroSystems which is supplying add-on drives for the North Star: it says that 'fitting the kit to a Horizon should present no problems since no soldering is required and the unit is held in by the same two screws which held the floppy drive.' There are also three extra S100 cards to plug in. Ask for more on 01-328 8737.

Bulk buy bargain

At first sight, there is little that is unusual about X-Data's plan to supply large quantities of printers, terminals and diskettes for discounts — everybody gives a discount for bulk. What makes it a bit different is that the X-Data discount doesn't come only when you buy 55 diskettes: it can be 55 units made up of 30 videos, ten disks and 16 printers, or any other mix. And they don't, says Tom Blaszkowicz (sales director) have to be the same sort of videos to qualify. For small-scale bulk buyers, the phone number is Slough 49117.

Bolt-on Beeb

My own anxieties about the Acorn Atom and the BBC machine which follows it do not concern the fact that the Acorn uses a funny version of Basic, nor that it uses the 6502 micro — both points which annoy the Amateur Computer Club.

Instead, I worry about the number of Acorns that are being made.

The idea of putting a computer into a BBC series on how to become literature in computers is a very good one, especially if viewers can buy the machine.

Frankly, I see no hope that they will be able too. As of the time of writing, Acorn is producing more Atoms per month than many thought it would ever sell — 1600. The only trouble is that this figure is still 400 under what Acorn had hoped to have coming off the stocks in February. And my opinion is that anybody who expects 50,000 machines to be available to eager viewers when the TV programs start appearing, is an optimist to the point of nuttiness.

I rather think Acorn agrees with me. It has put together a nice little plan, which will turn the Atom into a BBC micro, running BBC Basic, for around £30.

The money will buy a couple of extra program chips. You plug them in, and get all the extra Microsoft Basic (which has its own limitations) instructions. All you don't get is the ability to draw the extremely detailed graphics that the Proton/BBC machine will be able to, eventually. And it hopes to produce a conversion program to re-write the higher resolution graphics sections to run on the Atom — a great, necessary, idea.

On the face of it, this is just a nice gesture for Atom users; they too can watch the telly and run the programs. The question is whether they won't be the only ones — and my money, if the BBC series isn't heavily postponed from its early 1982 planned start, is on the TV programmes to be ready before the machine. I hope I'm wrong.

In the meantime, the project has been given a little support from Manchester Poly, which is planning a layman's course on computers starting with building an Atom from kit. The course costs £240 including the computer: details from John Appleyard on 061-228 6171.

Spread it about

It's pretty hard to explain why multi-tasking systems aren't much use, if one is talking to somebody who didn't know they existed — even harder to explain why multi-processor systems are a good idea by contrast, as exemplified by the new UK computer company, Future Technology Systems Ltd.

First off, you try to explain that multi-tasking software interrupts what the computer is actually doing, so that it can work on something else, several times each second. The drawback is usually that the multi-tasking system ends up being most of what the computer is doing, and the users got to share around 20 to 30 percent of its power if the system is working well. At this point, your typical layman user wants to know why on earth anyone would do anything so daft.

These days, it is daft, You can give each user a screen for the cost of a TV tube and some fancy boxing around it, plus the necessary control electronics. For pennies more, these control chips can

I put this picture in so you could admire Hewlett-Packard's wonderful black-and-white pictures. It's one of 14 9845 machines, and you don't really want to know what they cost. Oh, all right, from £7845 to £29,215. But they are nice pictures, aren't they? Details on 0734 61022.

include a powerful computer chip: so why not make the computers, and flog them as terminals? No reason. Then you link them all together, to share very large disk storage because for twice the price you get four times the disk store.

Future Technology has produced some pretty boxes, and they have powerful micros (Intel's 8086 and 8088, which run identical programs) inside them. They use variants of CP/M mainly MP/M-86, from CP/M's producer, Digital Research — and they link together.

The aspect that I like is the fact that Professor Martin Healey a professor at University College Cardiff, is research director of the company. This system of having academics on the board has worked well for the Americans — let's hope it sets a successful trend here.

And anyway, I like Martin.

Wow

When micros were new, and pioneers could only get one chip a month because you had to save up, and key switches were too expensive to buy more than a dozen, there were kits with a micro, and a claculator type display, and a whole 128 bytes of memory!

Just imagine!

Well, for a mere £500, you too can step right back into that nostalgic age. Motorola, which makes the 6800 chip, has now offered a course based on the virtually identical 6802 — and the board you get for the course is the evaluation kit, the D5. Not only does it have a whole 128 bytes (not kbytes, bytes) on the processor chip itself 'dedicated to the user' but there is also another whole 1024 bytes of memory and 2048 of read only memory with a monitor called D5BUG. Courses in July, September and November. It takes four days. Oh, and you get to keep the board. *Wow!*

Call Janet Wilkes, MPU Training, York House, Empire Way, Middlesex. Or just Motorola, Wembley. 01-902 8836.

PET power

At £30, getting twice the speed out of PET's Basic interpreter doesn't sound like paying a little for a little. However, Supersoft has produced a really valuable program with its tape accelerator. Arrow is the name of the software: it speeds up the rate at which programs are transferred to and from tape cassette by six or seven times. It still makes disks look good, but a 6 kbyte program loads in 20 seconds. Both products detailed on 01-861 1166.

Bug blah

Atom users get a magazine. It costs £4 for six issues, and the first issue came out in July, and it must be good news. Unfortunately I can't announce it as the Atom users' 'own magazine' since it is published by somebody who produces Atom software — Bug-Byte. Bug-Byte will offer discounts on Atom software to subscribers — guess whose software will carry the discount?

Details from 251 Henley Road, Coventry CV2 1BX.

Discord?

Since this is my PET column (I didn't plan it like this, it just happened that way) I should say that I'm most impressed with the clever way the new VIC can make sounds through the loudspeaker of a television.

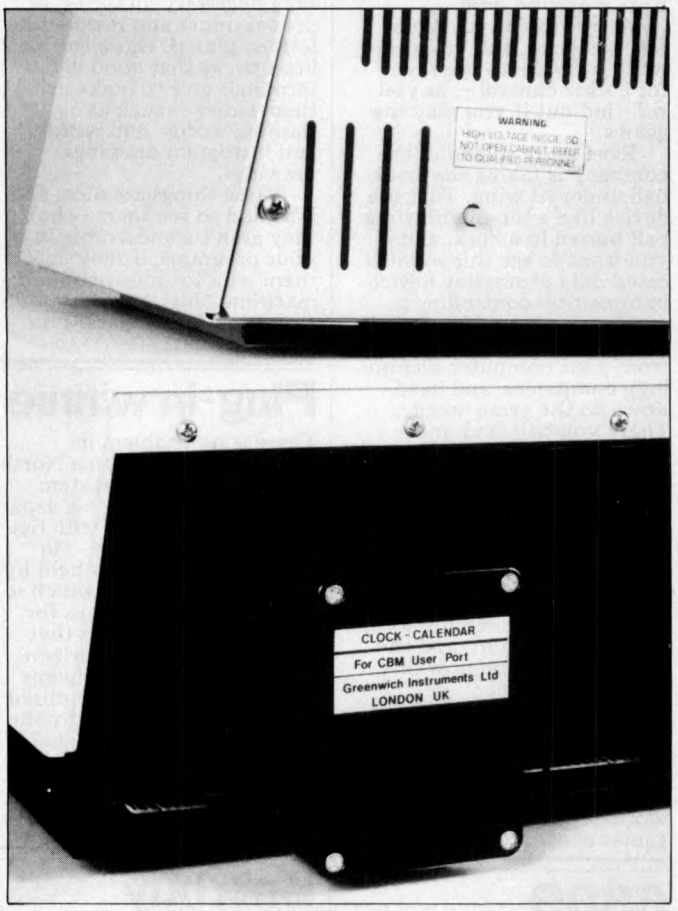
I have some reservations about the mathematical correctness of the frequencies which it generates — that is, the notes are out of tune, because an octave is not exactly a doubling of frequency, but only nearly a doubling. Nonetheless, it's clever for sound effects like Big Ben or the roar of surf.

For users of a different machine, the Sharp, the process is a little easier: just £10 for a program from Newbear Computing Store. This one I haven't listened to, so can't compare it to the VIC music, but the notes, according to Newbear, must be a bit doubtful.

I mean, they say that it needs a key signature called K sharp, 48k sharp to be precise.

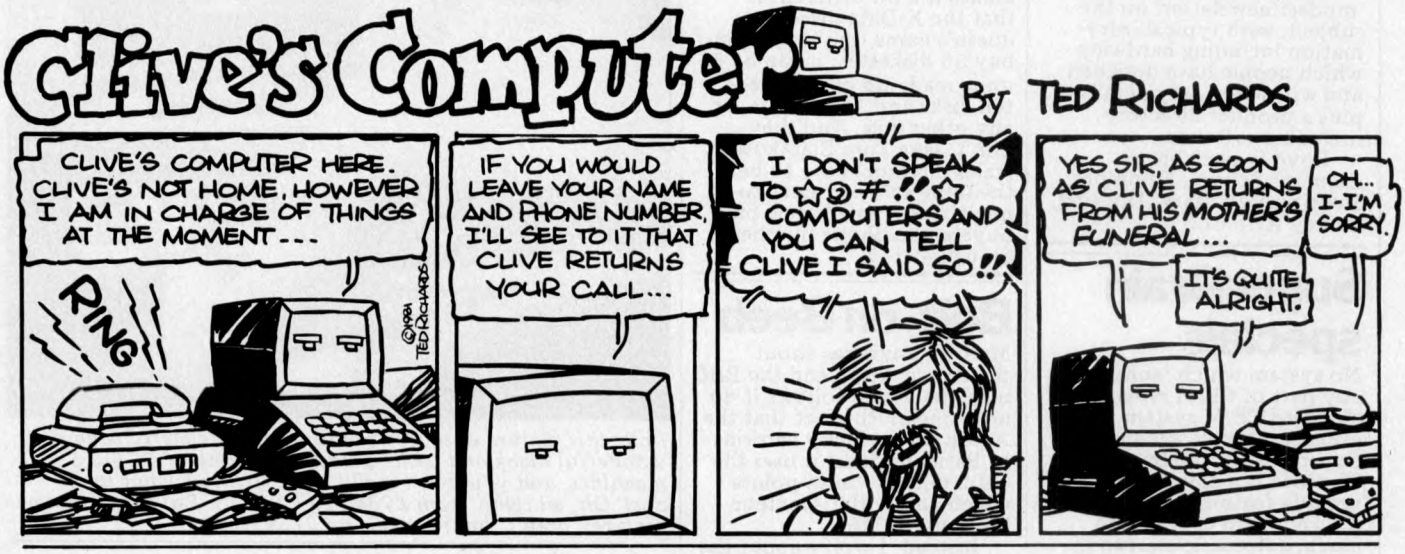
I wonder if they meant that sharp to be Sharp?

Details on 0635 30505. Don't hum.



Greenwich Instruments has put a battery in the clock it has developed for the PET, to avoid the clock stopping each time the computer is turned off.

Having a clock is useful enough for a PET: this one will interrupt the processor (quite harmless) at one second intervals — and software is provided to read the precise date and time from the clock's circuits. The only snag is that, since it fits so neatly over the user port plug, nothing else can go there. Details on 01-853 0868.



NEWS

ComputerTown UK! is a nationwide network of voluntary computer literacy centres. All letters should be addressed to: **CTUK!, c/o 14 Rathbone Place, London W1P 1DE.**

Once again, ComputerTown has had a good month. A new one has started up in Wokingham and we've had several letters from people very seriously considering setting up their own. The 'ComputerTown Guidelines' document has been written and is all ready to go to the printers. By the time you read this we may even be sending out copies to enquirers (remember to send an SAE). A ComputerTown representative went along to the press launch of '1982 — Information Technology Year' and managed to slip copies of ComputerTown guidelines to the assembled VIPs. A couple of days later we received a letter from one of them, Alan Benjamin — Chairman of the 1982 Committee — praising CTUK! fulsomely and promising to recommend its involvement in the forthcoming IT year. A day or two later this same CTUK! representative was involved in a brainstorming session with other invited participants to thrash around the theme of 'The Role of National and Voluntary Organisations'. The minutes of this session will be circulated among members of Her Majesty's Government, Members of Parliament, civil servants and key people involved in the application of information technology. Good ideas will be incorporated into national IT plans and, needless to say, ComputerTown was mentioned once or twice.

Now, back to Wokingham. Alan Sutcliffe and Alan Northcott are largely responsible for this group which meets on the second Wednesday of each month. As well as this, they go out to local schools: they spent a happy Saturday recently helping out at the local primary school fete. Since then they've had a meeting with the headmaster, who is jolly keen to get a micro for the school. CT Wokingham will keep closely in touch with this, instructing teachers, giving advice and guidance when necessary and generally helping the installation to success. Another local school, this time a comprehensive, has a 380Z and, to be frank, has a certain amount of trouble relating to the out-of-date 'O' level syllabus to the more modern phenomenon of the micro. Who needs to know about punched cards anyway? CT Wokingham has arranged to give four talks and demonstrations in what is left of this term and hopes to pick up again after the summer break. Any lack in quantity of CTs this month certainly seems to be compensated by the quality of this particular 'Town. If you'd like to join in the fun then write to Alan Sutcliffe at 4 Binfield Road, Wokingham, Berkshire RG11 1SL. Telephone 0734 781283.

Now let's go through what I call the 'letters of intent'. ComputerTown Leeds looks all set to start in the premises of Care Computer Services. Philip Clarke is the man in charge and he is seriously considering the use of his offices on Saturdays so that local children can be introduced to the joys of computing by members of the West Yorkshire Microcomputer Group. Sundays aren't out of the question, either, if demand is high enough. Anyone who'd like to help out should contact Ted Broadhead on Leeds 717137 or Philip on Leeds 450667.

Robin Bradbeer, Consultant Editor of *Educational Computing* and a leading light on the London computer club scene, has written to say that he's seriously considering a special Saturday morning affair at the North London Computer Centre. Robin will aim this session at those under the age of 16 but before he starts he really needs help. The computers are no problem — he has about 20 systems in the centre. He needs real live volunteers that between them can cover every Saturday. Write to him at PNL, Holloway Road, London N7 8DB.

Ralph Aldhous is a project supervisor for the, wait for it, Wolverhampton Community Services Agency Youth Opportunities Program. He is especially interested in starting a YOP computer literacy project. He'd love to hear from anyone in the West Midlands/Wolverhampton area who might be able to chew things over with him. His address is WCSA (YOP), YWCA Central Office, 100 Penn Road, Wolverhampton WV3 0DR. Telephone 21500.

P Brown of Morpeth thanks me for putting his town on the map in a recent issue. More importantly, he tells me that he'd like to start up a CT and would love to hear from anyone interested. From previous experience he knows that visitors tend to outnumber machines by a significant factor and he was wondering if there are any friendly local suppliers who might like to help out, too. Whatever your interest, contact P Brown at 16 West View, Northgate, Morpeth, Northumberland NE61 3BP or telephone 512601. If you're a Miss, a Mrs or a Ms then I apologise, P Brown.

Over to Wales now where M R Aldridge is thinking of starting a ComputerTown in Dinas Powis. Anyone in the area who'd like to help make it a reality should write to 14 Pembroke Close, Dinas Powis, S Glamorgan CF6 4PA. Telephone Dinas Powis 512979.

Susan Kelly of Harrow Civic Centre Reference Library came along to Eastcote ComputerTown recently and she went away wildly excited about getting one going in her library. She has spoken to one or two local computer buffs but, like all the rest of us, needs more people to come forward to join in. We know there are lots of computerists in Harrow, so get 'phoning 01-863 5611 extension 2055 immediately. Failing that, you could write to Susan at PO Box 4, Civic Centre, Harrow, Middlesex HA1 2UU.

Roger Trump and his Challenger would love to help out at a ComputerTown but he doesn't know of one nearby. Would anyone in the Cambridge area who'd like to get one going please write to Roger at 87 De Freville Avenue, Cambridge CB4 1MP. Ta!

Not a ComputerTown, but an organisation with the same broad aims, is ATEC (Alternatives in Technology and Employment Centre). It is aiming to run a computer literacy/education project in a Bradford youth club during the summer holidays. If you'd like to help out or if you'd like to lend equipment then please write to Richard Haselgrove at ATEC, 4 Grove Terrace, Bradford 7. Telephone 0274 394083.

Graham Wood would like to start a 'Town in the Hamilton/Motherwell area of Scotland. Contact him at 10 Airdrie Road, Carluke ML8 5EW or telephone Carluke 50003.

Kevin Stock wrote twice. Once to say that he'd like to set up a CT in Belfast, Coventry or both and again to tell us about a poster-making kit which comprises large red, green and black letters. The company to contact is Letterkit, 20 Jamaica Street, Liverpool L1 0AF. To help Kevin out, write to him at 44 Park Avenue, Belfast BT14 1JJ, N Ireland or at CH3-019, University of Warwick, Coventry CV4 7SL during term-time.

Did you read about Computer Camp in June's West Coast Computer Faire report? Well it's sort of coming to England. Stewart Wiley is running a day camp during the summer holidays in conjunction with the folks from the American operation. Buses will tour London picking up children prior to whisking them down to Old Windsor (near Runnymede) for a day of fun, including computing, at Camp Beaumont. The fun begins on 27 July and lasts five weeks. Stewart Wiley can be found on 01-402 0050: he's looking for counsellors and teachers with microcomputer experience. In case you might be wondering, there's no connection between this activity and ICL's nearby Beaumont College where grown-ups learn about computers and related things.

Other places showing interest this month are: London W1, N5, SW9, NW5, Sutton, St Leonards-on-Sea, Torquay, Bournemouth, Hitchin, Worthing, Stanford-le-Hope, Coventry, Rhondda, Swindon, Witham and Devizes. Thank you all very much for your encouraging letters. Remember to write again the moment you get your own ComputerTown off the ground so that we can give you another plug.

Finally, if you'd like to start a ComputerTown or would like to know more about it, please send an SAE to CTUK!, 14 Rathbone Place, London W1P 1DE. Please don't try to phone us because ComputerTown is entirely a spare time project.

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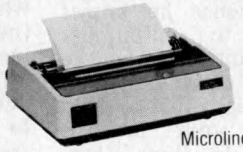

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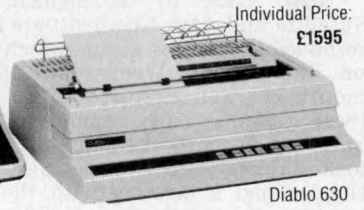

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Cunard Hotel, 10-12 September

The *PCW* Show machine rolls on. From what our exhibitors have been telling us, it should be very interesting, whatever your taste in microcomputers.

Datalink magazine plans to stage an 'event' on the first two days. Its journalists, under the watchful eye of its redoubtable editor, Guy Kewney, will be actually writing copy at the show on a word processor. The copy will then be transmitted direct to the harassed subs back at *Datalink*'s own offices.

Acorn is in. This company, as you know, is supplying a version of its Proton computer for the BBC series. Acorn and *PCW* hope that the machine will be on display at the show, but there are still one or two things to be sorted out. Even if the Proton can't be there, all Acorn's other products will be. Atoms galore with all the usual accoutrements, plus four new software packages. Two are language programs — Forth and Pascal — one is a word processing package and the other will make the Atom a Prestel terminal.

If you thought that John Wiley only publishes books by such notable worthies as Legless Banks — think again. As well as a huge range of computer books the company will be marketing a new software package. It is the Hayden Applesoft Compiler which can increase Basic program speeds ten-fold while occupying only 3 kbytes of memory. Wiley is pretty excited about all this and is offering the program for just £140 (plus VAT).

Another special offer comes from Compshop. This company has told us that its own Compukit UK101 will be for sale at a *very* special show price but doesn't know yet what that will be. NewBear Computing Store has three new software packages for the Sharp MZ-80K. One is the Music Composer-Editor for potential Beethovens. The others are more mundane but useful. They are a Program Filing Index and a Disk Based Editor Assembler. Incidentally, the latter is a first in the UK.

Atari will be very much in evidence on the Ingersoll stand with a novel idea. This is that mum or dad buys a personal computer for work during the day running payroll or whatever. Then they take it home at night and improve the kids' minds and chances with such educational programs as algebra, economics and spelling.

More for the TRS-80 models I and III from Southern Software. The main attraction will be a compiler for TRS-80 Basic. This will be demonstrated to show the speed gains that can be achieved by taking a normal TRS-80 Basic program and compiling into machine code.

Companies booked at the time of going to press:

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ST Commercial Systems
Tandy
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Ties Investments
Transam
Vero Electronics
John Wiley

COMMUNICATIONS

PCW welcomes corespondence 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.

Computer science

Although not a computer scientist, my work as a hydrogeologist involves extensive computing. Lyn Antill's 'Secrets of Systems Analysis' in the May 1981 issue proved a rich and thought-provoking article.

I should like to enlarge on points made about computer *science* graduates. My first impression was that these people should be avoided, a dangerous view, particularly if taken out of context from the text that followed. I would agree that a computer science degree does provide a sound theoretical background. But additionally, it can be of enormous benefit to graduates who decide on a career in software. It will help them to appreciate various hardware subtleties which may otherwise be obscured, or remain hidden. Furthermore, they may be able to turn this to their (or their clients') advantage in any applications program they write.

You would certainly be well advised to '. . . quiz them . . . on what they've understood and appreciated'. A polytechnic or university degree is certainly about more than actually getting the qualification, it's about removing conceptual blinkers from the chosen subject and cutting through dogma. Anyone really worth their salt will be looking to relate their new-found knowledge to the real world, perhaps via applications programs — if they can find anyone willing to give them their first opportunity.

D M Taskis, London N8

Musical note

In the May 1981 issue of *PCW*, we noticed that you reviewed a book by Chamberlin: *Musical Applicatios of Microprocessors'*. This book is now distributed by John Wiley & Sons Ltd in the UK and Europe. I would be grateful if you could mention this in a forthcoming issue.

Bernice Preddy, John Wiley & Sons

Calne club

I would like to see a computer club start up in the area of Chippenham and Calne and am prepared to liase with people interested in helping to start it up and run it, as well as those who just want to come along. I aim to make it into a multi-machine, multi-language, multi-processor club to cover everything and with two aims: 1 To spread ideas from machine to machine, language to language, etc; 2 To enable newcomers to learn and choose a computer for themselves.

Write to me giving details of your machine, interests and what you can do to help and what day you would like it on, enclosing an SAE.

Matthew Jones, Pinhills, Bowood, Calne SN11 0LY.

Single liner

When looking back through some old issues of *PCW*, I came across P Smith's intriguing one-line program for the Superboard (*PCW* Vol 3 No 10). May I add another program to this specialist branch of concise programming:

```
0 N=N+1—4*R : R=RND(N)
* FOR I=0 TO 999 :
I=I+6*R: POKE I+53300,N
AND 255 : NEXT : GOTO
```

Note that the absence of a line number after the GOTO is not an error! Has anyone else any good one-line programs?

Jack Pike, Chawstone, Beds

Clip off

I recently changed the batteries on my TRS-80 Pocket Computer and it subsequently died. The Tandy Service Department found that I had replaced the battery clip the wrong way round, and has charged me £22 to correct this fault. I feel that your readers should be warned that although the manual is not clear, it is vital to replace the clip correctly, and also that if any little thing goes wrong with your TRS-80 computer it may cost an arm and a leg to repair.

Q Gardner, Croydon, Surrey

Get it together

May I suggest some guidelines for firms who sell by mail the products which we micro-enthusiasts lust after? These are intended to let us get on with our hobby instead of watching for the postman, writing letters or making phone calls.

1. If we order something, please acknowledge our orders if you can't supply promptly.
2. Don't advertise things which do not yet exist, in order to test the market.
3. Please make sure that kits are not missing components.
4. Please reply to letters, at least some of the time.
5. At least, *read* letters re long overdue orders before filing them under 'pending'.

If only all firms were like those (mainly smaller ones) who despatch items quickly and give cheerful and helpful advice to the stumbling novice.

David Henniker, Edinburgh

Zor tweaks

If any of your correspondents with Superboards or UK101s are about to try the 'UK101 Zor' from your June issue, let me give them a word of warning: the program requires POKE 15,46 at line 70. If this is not cleared to POKE 15,72, the program will not load or save properly, since this location will also modify the line length. The result will be a long series of truncated lines with dozens of syntax errors.

A useful hint for Superboard/UK 101 users: the command WAIT 57088,2,3 will wait until the right shift key is pressed before continuing with the program — the return key is unnecessary; the command WAIT 57088,4,6 will wait for the left shift to be pressed. This is much easier (and neater) than using either an INPUT or a machine code routine for the same purposes. OSI does not document its WAIT command.

Henry Merritt, Cambridge

Seeing doubble

Have you noticed that in the ZX81 there's a picture of a TV screen on which line 35 reads: LET P=RND(300). This is only legal on the ZX80! The TV has the same program on it as the old ZX80 adverts — has Sinclair Research spent all its money on 'Uncle' Clive's Porsche?

I Hegerty, Maidenhead

Piracy

It was supposed in 'Up The Sharp End' (*PCW* May 81) that people are copying programs which they should have bought and that this is reducing the income of programmers. This, it was argued, would so discourage programmers that no works of genius would ever be produced. Thus, ran the argument, computing would be forever impoverished.

This is like the argument of Marx, who said that workers forever had their humanity denied to them because capitalism was based on exploitation.

Computing benefits from the spead of knowledge — this was the case in Silicon Valley where engineers and programmers move from company to company or set up on their own.

Copyright does not really protect the programmer: the law is directed merely against copying. For example, while the actual text of a novel is protected, the plot — no matter how original — is not. Plots, themes, algorithms and computer programs express abstract ideas. It is not possible to formulate a law which would protect abstract ideas. One which did would be the instrument of a totalitarian state.

Although software piracy may reduce the income of a particular programmer, it will contribute to the spread of ideas, so all will gain in the long term. Many of the wicked copyists are probably other programmers who may be able to combine ideas and create even better software.

Having one's hard thought-out programs copied by dealers is very annoying but there's no point going to great lengths to prevent it. Remember, the law of diminishing returns. If someone is determined to copy a program, there is absolutely nothing you can do about it: they may regard it as a challenge.

The answer would appear to be either try to sell high volume at low prices and write off the loss, or sell direct to end users by mail order. Keep a file of customers. On finding your program on sale you can nail them.

Gavin Haines, Hastings.

Keyboards

I read with interest in your May issue, the letter from R L Barbour, South Queensferry and your reply, which included a reference to the Maltron Keyboard.

Since I have been fortunate enough to have a 'hands on' demonstration of this unit, I would like to point out that, because of its shape and new letter layout, I found the Maltron Keyboard much easier and quicker to learn and more

acceptable to use than the flat qwerty model.

I am not a trained keyboard operator. However, in the short time available, I attained a speed equal to that reached on the qwerty keyboard, which I have used during the last six months, in my first year as a computer science student at university. Given the hoice, I would most certainly choose the Maltron.
Virginia Wheeldon, Camberley, Surrey

Comeback

It was someone like Christopher Hampton who said writers feel much the same way about critics as dogs do about lamposts. So I'm not going to carp about Malcolm Peltu's less than enthusiastic review of my *Good Computing Book for Beginners* in your May issue.

Still, I do think the arguments behind his antagonism are fundamentally wrong; and they represent prejudices that should be treated as such.

He castigates me for proposing a whole new set of computing myths to the effect that computing is simple. Well, I'm not ashamed about that — except it's no myth. It's a book for beginners, you see, and at that level particularly, computing can and should be simple. Malcolm Peltu on the other hand gets stuck on the kind of institutional, puritanical all-or-nothing notion that all bike-riding is the Tour de France. For that kind of person, with a big-computer big-company background and an overriding faith in the virtues of thought rather than action, the idea that buying something for a few hundred quid and doing something useful and/or enjoyable with it smacks of heresy.

So Mr P starts his review by accusing me of trying to fool the innocent into thinking that 'information management is simple because it is easy to write a Basic program'. I can't argue with that, he's right. And had I been trying to write a beginners' book on information management, I would even now been hanging my head in shame. But since I wasn't and since I'm not, the standard-bearer of the New Information Revolution somewhat wastes his energy on fighting with me.

Malcolm Peltu sneers at my propositions that computers are functional tools, goal-directed and capable of being used on a very wide range of activities (from the very simple to the very complicated), and fundamentally accessible to the beginner in the form of micros with Basic. He doesn't question the veracity of the statement, of course: but loudly he doubts its validity. He *wants* computing to be 'information management'. He wants the tool-users (kids with PETs and Basic?) to be replaced by concept-users, cyberneticists and Information Technicians for the New Order.

So he demands that what he calls 'the deeper structures beneath the surface' be shoehorned into a beginners' book. He wants my glossary to include terms like 'structured programming', because he thinks they're necessary — for beginners. He believes in the information revolution: but he's not keen to give the raw recruits some ammunition with which to get stuck into the fray. Maybe the 'deeper structures beneath the surface' book is one *he* should write — he's got the necessary zeal, after all. Me, I'm reluctant to lie down and lot his hobbyhorses trample all over me.

Oh, and I can't let his snide remarks about the glossary entry for *PCW* pass by. They read as if the book denies my early-days association with *Practical Computing* (I tried to make that very plain, though I've had nothing to do with *PC* since 1979) and imply that I was claiming to be objective and unbiased in the *Good Computing Book* — whereas the text again is quite clear: I set out to produce an opinionated, biased, personal view of computing.

Still, I confess the *PC* and *PCW* entries reflect what I thought when I wrote the book. But the timescales in book publishing mean that was a whole year ago; things have changed since then, and so have my opinions. If there ever is a second edition, *PCW* will certainly get the applause now. My compliments and keep it up.
Dennis Jarrett, London N7

Reminiscences wanted

I am currently engaged in compiling an alternative History of Computing.

The history will focus on the lighter side of the development of the subject. Highlighting the failures, the accidental discoveries, the legends both famous and infamous that have helped to shape the present day state of the art.

I would be grateful for any help in the compilation of this work and any contributions in the form of press cuttings, references, personal recollections etc, would be most welcome.
Martin Wakeman, 996 Warwick Road, Acocks Green, Birmingham.

Second go

Despite what happened last time I commented on 'Computer Answers', I'm going to stick my neck out again.

J Mason, Hemel Hempstead asks about Basic interpreters: Volume 1 of *Dr Dobbs' Journal* contains several fully commented source listings of tiny Basic interpreters, mainly for the 8080. If Mr/Ms Mason is interested in the nuts and bolts and not just in obtaining a fully supported product, this book would make fascinating reading (well, I enjoyed it!).

There is another way for Mr Williams to put Applesoft into his Apple, and that is to buy a RAM card. The one made by Andromeda comes with details of how to obtain the interpreter (the most honest is probably to buy the DOS 3.3 Master Disk, but he'll need a disk for word processing, as Mike Dennis advised). This has the advantages of being able to switch from Applesoft to Integer and back again, and other programs (eg VisiCalc and CP/M) are able to make use of the extra RAM. The only disadvantage I can think of is that it wouldn't be covered by an Apple 'Extended Warranty'.

May I put in a good word for one of your advertisers? Pete & Pam Computers offer good quality products at very low prices, and yet seem able to give good service at the same time! I know of no other dealer who can repair a computer on a Saturday night without charging a fortune.
Steve Withers, Coventry

Garbage

I refer to your comment (May *PCW*) that garbage collection is a problem with all versions of Basic. With respect, this is not so, and the reason that your correspondent has had no problems with bigger microcomputers designed for commercial use is that commercial Basics do not use string space and rewrite changed string variables into the new RAM areas, but deal with strings in exactly the same manner as they deal with numeric variables, ie, by overwriting the old variable with the new form.

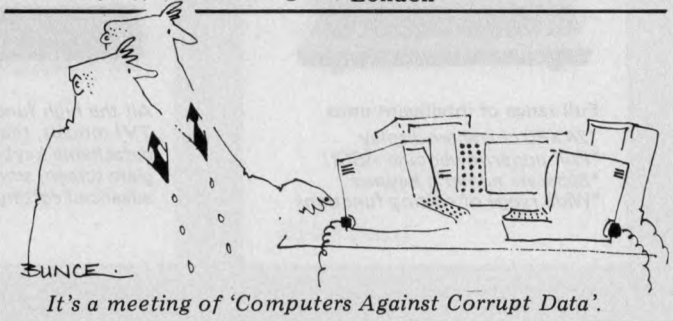
It is true that this requires declaration of strings (eg, DIM A$(20)) but declaring numeric variables is quite common to distinguish between integers, short and long versions and I am not aware of any complaints about the extra work (apart from Hewlett-Packard, I am unaware of any Basic which gives you the speed of integer arithmetic without the programmer having to do something to mark the variables concerned). Some languages demand declaration of variables as a matter of routine.

The real answer to the problem lies with the interpreter writers, and the treatment of strings and avoidance of garbage should be a major question in the evaluation of a Basic package. Unfortunately reviewers have concentrated on raw speed and have not used their expertise in looking at the practical applications.
Neville A Joseph, Wendover, Bucks.

Remote Microwriting

In your May edition you published a letter from a Mr Clifford regarding the use of a Microwriter to send information down the line to a bureau. May I inform *PCW* readers and all Microwriter users in the UK that our company, Microwriting Communication Bureau, was set up some months ago to cater especially for the needs of Microwriter users who need this facility, as well as potential Microwriter users who are prepared to spend about £800 on a Microwriter, TV interface and cassette storage, but not £1500 — £2000 for a daisywheel printer.

We can prepare tapes for customers, edit their work on a word processor or put it onto disk for them. The input to the word processor (a Bitsy with a communications interface) is either plugged in directly via an RS232 interface or may be used via an acoustic coupler. Either way the benefits are enormous and we feel that the versatility of a word processor combined with the low cost, portability and flexibility of the Microwriter as part of the system is the ideal answer.
E Mussin, Microwriting Communications Bureau, London



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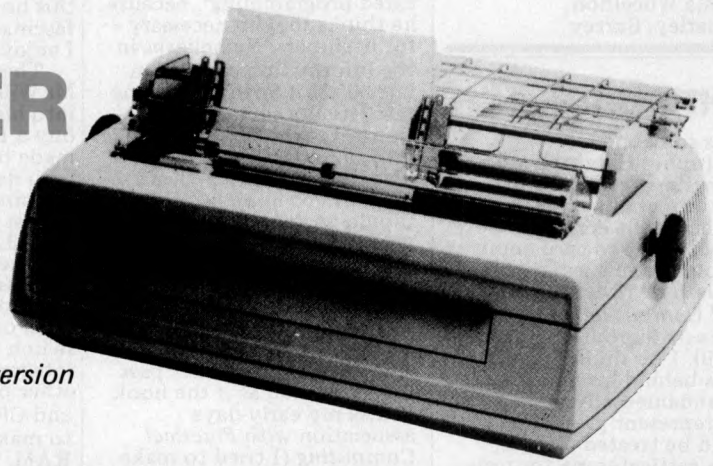

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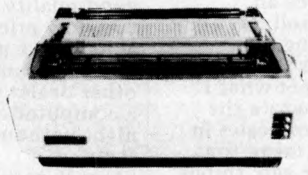

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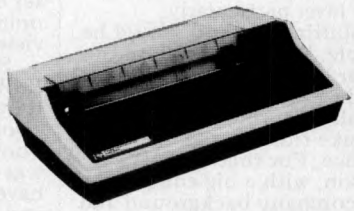

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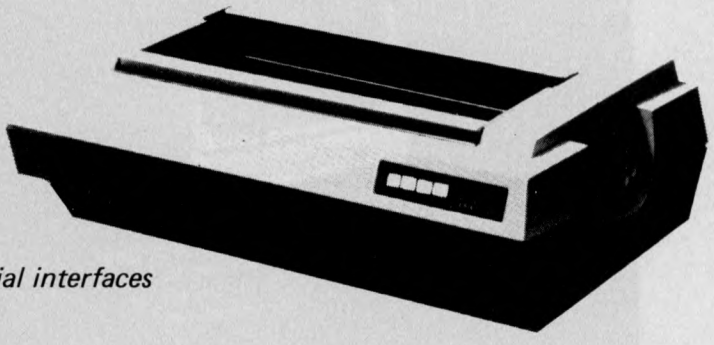

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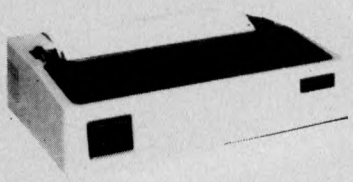

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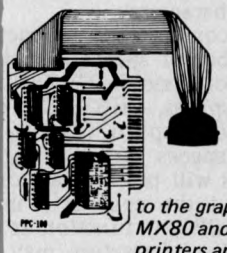

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BENCH TEST

TANDY MODEL III

Steve Withers tests the latest addition to the TRS-80 stable.

The TRS-80 Model III shows a strong family resemblance to the other computers from Fort Worth. Its attractive silver and black plastic case houses what is functionally a Model I plus an expansion interface, with room for two 5¼in disk drives and an RS-232 port. While 'portable' would be an unsuitable adjective, it is certainly lighter and easier to carry than my metal-cased PET, although it is a couple of inches wider.

Hardware

The machine supplied for this Benchtest was the 'Business Computer', fitted with 32k of RAM, disk controller and two drives, plus cassette, printer, and RS-232 interfaces. The minimum configuration with Model III Basic is 16k RAM, cassette and printer interface. All systems have 14k of ROM (except for the 4k RAM Level I machine) containing the Basic interpreter and other systems firmware.

Sixteen lines of 64 characters may be displayed on the very stable 12in CRT. The option of using double width characters is available, but this is only possible on a whole screen basis. The character set itself deserves examination as, in addition to the 96 printing ASCII characters (with small descenders), there are also 64 'chunky' graphics characters and 31 European characters. The remaining codes (between 192 and 255) are used in any of three ways, depending on the setting of two software switches. They may be 'space compression' characters, special symbols, or Japanese Kana characters.

The space compression characters generate a number of spaces according to their code. For example, CHR$(192) produces zero spaces, CHR$(193) one space, and so on, up to CHR$(255) which gives 63 spaces. Only the higher numbered codes will produce a worthwhile saving, but the concept is more useful than the SPC(n) function as the space compression characters may be used in string expressions, as well as in PRINT lists.

A useful selection of symbols may be found in the special character set, including the Greek alphabet, some maths symbols, card suits, a smiling and a glum face, and three characters which together form a hand, pointing to the right.

The majority of the characters may be PRINTed to the screen, using CHR$ where necessary, but the European characters must be POKEd into the video RAM, as their codes (0-31) double up as the usual non-printing control characters. The problem is eased as the current address of the cursor may be found by PEEKing at locations 16416 and 16417. These European characters include a £ sign and variously accented vowels.

Apart from the extended character set, the display has several other useful features. An appropriate POKE will protect up to seven lines at the top of the screen from scrolling and being cleared. This could be useful when previewing a headed table that will later be sent to the printer, or to protect a line giving information about the program.

The default cursor is a small block, but this may be changed to any of the characters available (it amused me to use the 'Smiley'!), although the manual states that only codes 32-255 may be used. A further POKE specifies a flashing or steady cursor. If you don't want a cursor at all, just use a steady space.

A 'screen print' function is built in; pressing three keys (shift, down-arrow, and *) simultaneously dumps the screen contents to the printer, even when a program is running. Pressing Break will interrupt this process.

The keyboard itself does not warrant a special mention, being neither notably good nor particularly bad. A few more keys would be useful, as shift-0 is used as a caps lock toggle, and shift-down arrow in place of a control key. All keys auto-repeat when held down for longer than a second. I found this delay a little long, and the repeat rate too slow, but it avoids unwanted repeats. If these parameters were stored in RAM, the user could adjust them to suit him or herself. Perhaps they are but not mentioned in the manual.

A separate number pad (including an Enter key) is provided, and cursor control and clear screen keys appear on the main board. I would prefer the latter to be grouped together in a cross shape, with the clear key in the middle, but the arrangment used does at least put the down arrow where the control key is normally located, suiting its secondary function.

The on/off switch and video controls (contrast and brightness) are mounted on the underside of the cabinet, respectively to the extreme right and left of the keyboard. This might sound awkward, but in fact is very convenient to use. Being out of the way, they are most unlikely to be accidentally moved, and yet they're easily reached when needed. The bright orange reset button is also sensibly placed, being mounted to the right of the keyboard, but recessed into the panel to avoid mishaps.

The rear panel carries the connector for the mains lead and a DIN socket for the cassette interface. The remaining interfaces emerge underneath the cabinet, making life difficult when moving the computer. These comprise the printer interface and the expansion bus, plus the optional RS-232 port and the connector for the third and fourth (external) disk drives.

If disk drives are fitted, they are mounted to the right of the screen, otherwise their place is taken by covers which bear some resemblance to real drives. I think a better idea would have been to design a front-loading cassette recorder that could mount in place of one of the drives, giving the advantages of a single unit to those unable to afford a disk system. The drives themselves are 40 track units manufactured by Tandon, each with a formatted capacity of 180k, of which 134k are available to the user in drive 0, and 178k in the remaining drives.

Moving inside the case, I found that the CRT and its associated circuitry were fitted to the top half of the cabinet, but the connecting wires were long enough to avoid any problems in separating the halves of the case.

The main board is mounted vertically at the back of the cabinet, with the disk controller and RS-232 interface fitting between it and a well-earthed metal shield. It has been reported by an American columnist (Stephen B Gray, in *Creative Computing*, April 1981, page 188) that one of the main reasons for the production of the Model III was the need to meet new regulations regarding interference with TV and radio transmissions. This shielding is apparently part of Tandy's efforts to comply with these regulations, but the Model III tested caused a noticeable amount of hiss on my FM radio. There are brackets and screw holes present which would allow the fitting of another plate to cover the component side of the board, but maybe Tandy decided it wasn't really necessary in this country.

Another problem with the design is that it is necessary to completely remove the main board in order to gain access to the disk controller and RS-232 boards, and this means undoing a handful of screws and several connectors. If you are repairing the machine yourself it just takes longer, but if you are paying for the job to be done it means a bigger bill.

There is nothing surprising about the main board — a Z80 CPU running at 2.02752 MHz, sockets for up to 48k of 4116 type dynamic memory, four socketed ROMs, and most of the support ICs soldered directly to the PCB. This board also carries the printer interface and some of the video circuits.

Two Astec power supplies are fitted, the second being used to supply the disk subsystem. At no time during the test period did the machine show any sign of overheating or other malady.

Software

Model III Basic is another Microsoft product. Some of the less common features are double-precision real variables, a line editor (but why not a screen editor?), IF. . . THEN. . . ELSE, PRINT USING, and error trapping.

Double-precision arithmetic provides 17-digit accuracy over the same range as single-precision (ie, $1 * 10^{38}$). PRINT USING makes neatly formatted output much easier to achieve. Its facilities include commas after every third digit (eg, 1,000) and a floating currency sign — unfortunately $, not £.

The programmer's task is further eased by the provision of automatic line numbering, PRINT @ (which starts printing at a specialised screen location), and SET, RESET, and POINT. These three commands operate on the low resolution (128 x 48) graphics and respectively turn a block on, off, and test its setting. For example, the following program draws three horizontal lines across the screen, then erases the middle line.

```
10 FOR Y=0 TO 4 STEP 2
20 FOR X=0 TO 127
30 SET(X,Y)
40 NEXT X
50 NEXT Y
60 FOR X=0 TO 127
70 RESET(X,2)
80 NEXT X
```

After running this program, POINT (0,0) will return the value TRUE and POINT(0,2) the value FALSE.

Programs may be saved on cassette at either 500 or 1500 baud, selection being made when the machine is switched on, or by another POKE. The slower speed is compatible with Model I computers and, in fact, many Model I programs will run on the Model III. Minor modifications are needed in some cases and a leaflet is supplied with the computer giving details of these. A third class of program cannot be modified easily and so Tandy will be selling Model III versions. One cosmetic problem is that the up-arrow is displayed as '['. This is doubly unfortunate, as this is the key and symbol used for the exponentiation operator.

Once I had found the correct volume setting for the cassette recorder, I had just one problem with tape handling, even though I used a cassette of indifferent quality. The difficulty was that pressing Break during a load sometimes resulted in a system reset (which also happened when I gave an non-numeric reply to the 'Memory Size?' prompt). Programs may be given single character file names and these may be specified when loading in order to pass over unwanted programs. This facility does not extend to data files, which are created by using PRINT #1 statements and read by INPUT #1.

A nice touch is that the interpreter recognises Disk Basic keywords and prints '?L3 Error' instead of simply flagging a vague syntax error. It is a shame that the error messages are only two characters long, but you soon get used to it.

Stepping up to Disk Basic provides many additional features. Apart from the obvious facilities for saving programs and data in disk files, up to ten machine code USR routines may be used; user defined functions (which can return any type of result, including string) can be employed, and LINEINPUT is also available, permitting the user to input strings containing leading spaces, commas and other characters unacceptable to INPUT. Other labour-saving features for string handling are INSTR, which searches for a substring within a string and returns its position, and MID$=, which allows a portion of a string to be replaced without disturbing the remainder. For example, if A$="HELLO BILL!", then MID$(A$, 7,4)="PAUL" results in A$ becoming "HELLO PAUL!".

In my opinion, no Basic should be without a renumber command, and I am glad to say that Disk Basic has one. The trouble is that the command is NAME (so what is wrong with RENUMBER?) with three optional parameters determining the line at which renumbering is to start, the base

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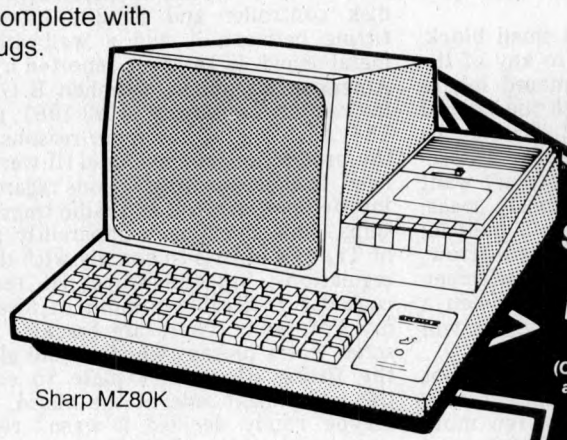

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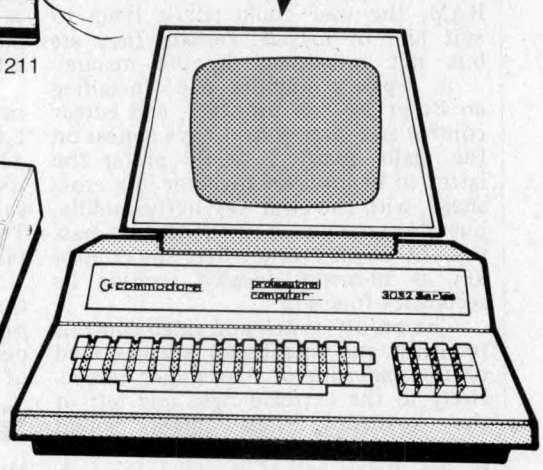

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number, and the increment.

Most of the remaining features are implemented as the reserved word CMD, followed by one or more parameters, with the first parameter specifying the function. Many of these CMDs (and some of the TRSDOS commands, more of which later) provide easier-to-remember alternatives to POKEs and other tricks used to control various system features. An example of this is CMD"R", which turns on the real-time clock display. This is achieved in ROM Basic by POKE 16526,152: POKE 16527,2: X=USR(0).

The syntax of CMD is not completely consistent. Some secondary parameters must be part of the first one, others as a separate string, and yet others as unquoted characters. Examples of each type in turn are:

CMD"D:0" List directory of drive 0
CMD"B","ON" Disables the break key
CMD"C",R,S Compresses program by removing all Remarks and Spaces.

Incidentally, I was pleased to see that the compressor leaves REM lines in, just in case they are targets of GOSUBs or GOTOs. Before I move on, two more commands which deserve mention are CMD"X", anything (which lists the number of every line containing 'anything', which may be a keyword, variable, expression, or any other collection of characters); and CMD"Z" which echoes all screen output to the printer. Nearly all of these CMDs are useful (there is even one to sort a string array into alphabetical order), but a little more consistency would have made them easier to use.

TRSDOS provides all the usual functions for manipulating files, but an important feature is the password protection given to whole disks and to individual files. At the file level, different passwords may be used to give different levels of access. If this feature is used, a Basic program may be run by someone who knows one password, but the system will clear its memory when the program terminates, thus preventing unauthorised editing or examination. Such access is only permitted if the 'update' password is used.

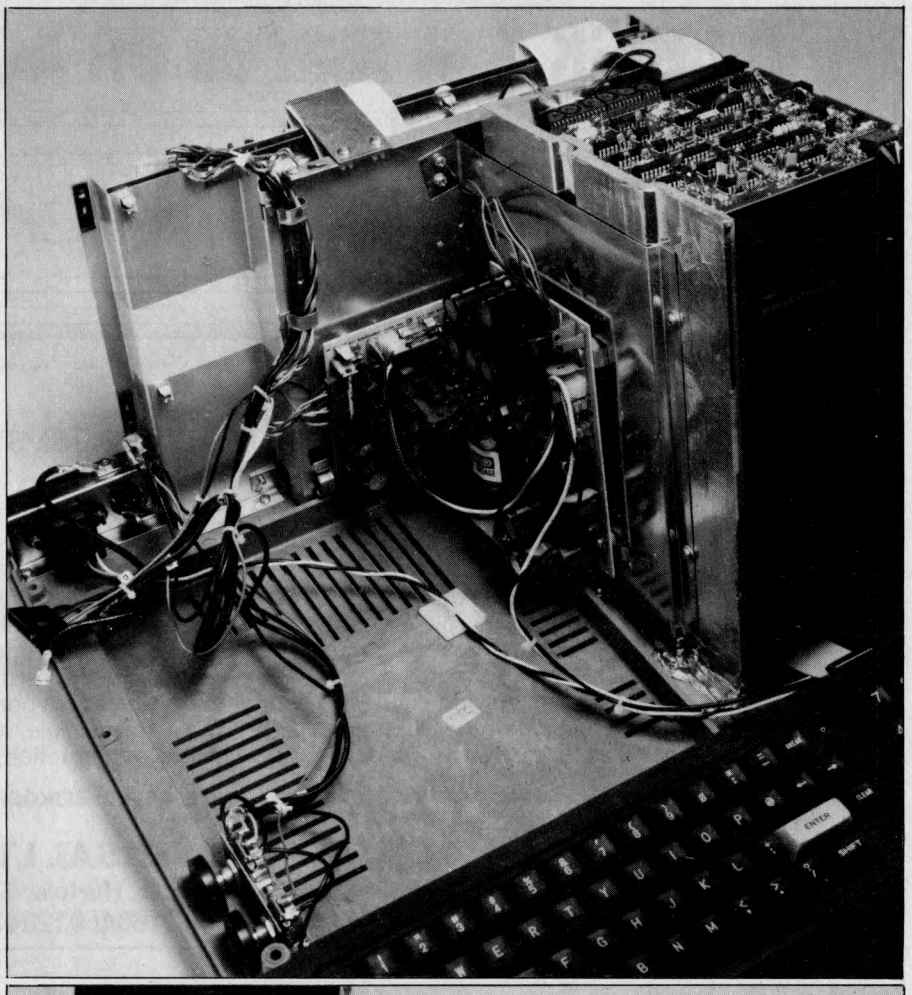
File space is dynamically allocated in granules, a block of three continuous sectors, in order to improve access time by reducing file fragmentation. This dynamic allocation may be overridden by creating a file of an appropriate size in advance, as this forces the system to store the file in a single block, giving the fastest possible access time.

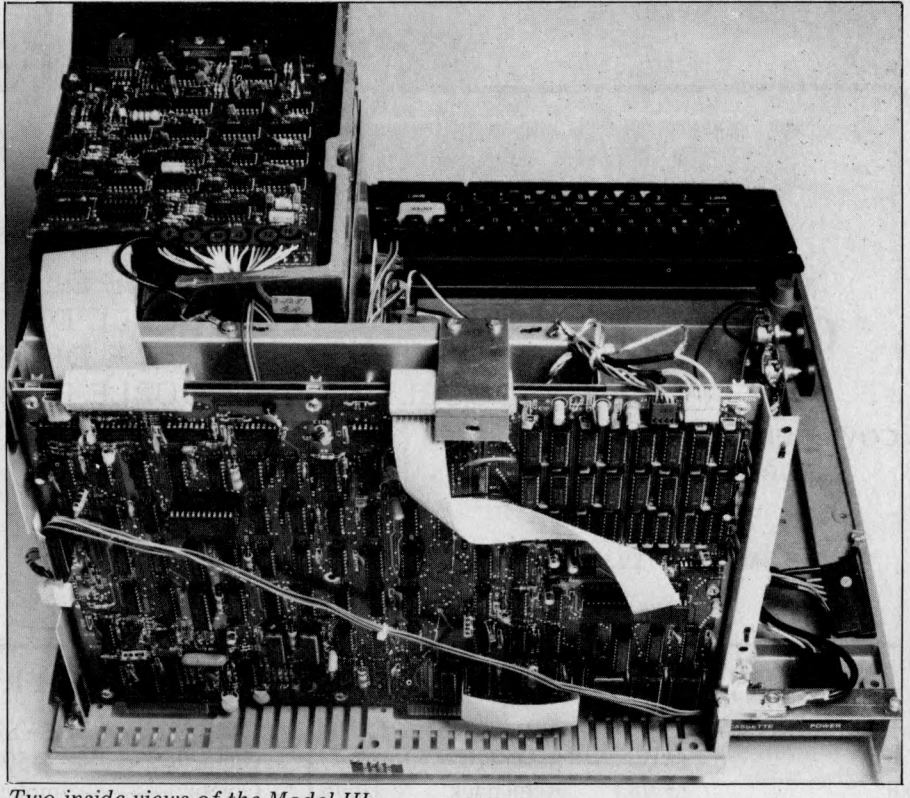
Utilities are supplied to format disks, to produce backup copies of whole disks, and to transfer files from a Model I format disk to a Model III disk. It is interesting to note that passwords are carried over when reformatting files. Transfer in the opposite direction is not possible, but Basic programs may be saved on cassette (use CSAVE), and machine code programs transferred to tape with the TAPE command, then these files loaded into the Model I.

DEBUG provides machine code users with all the usual monitor facilities (including breakpoints), plus the ability to load disk files into memory, make changes and then write them back to disk.

Several other commands are provided to control system features that the non-disk user has to operate by POKEing around, such as specifying printer forms width and length, and RS-232 baud rate, etc.

Now we come to the two commands which make me think that the designer of TRSDOS actually likes people — HELP and AUTO. HELP may be used whenever you cannot remember the syntax of a command. Say you want to change the baud rate of the RS-232 interface, but you can't remember how and the manual isn't nearby. Type HELP and a list of available commands appears. You look through the list. . . ah! SETCOM, that's the one. . . so now you type HELP SETCOM and up comes the syntax needed. Of course, if you remembered the name of the command, the first step would be unnecessary. If you do not understand some of the abbreviations used in the description,





Two inside views of the Model III

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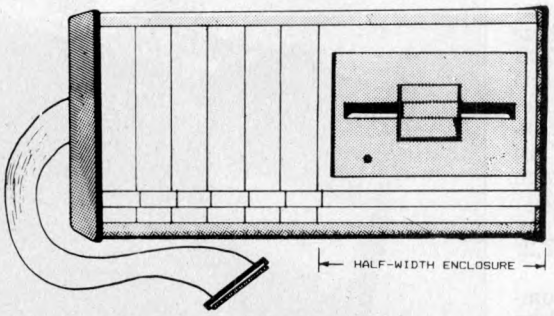

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type HELP SYNTAX for an explanation.

AUTO allows the creation of a turn-key system. Whatever follows the word AUTO is treated as a command whenever the system is reset. If two or more automatic commands are needed, they must be entered into a file by means of the BUILD command. Such files are executed by typing DO filename, so AUTO DO 'filename' submits the file on reset.

For example, if STARTUP/BLD contained

```
BASIC(EN)
1(EN)
(EN)                    (EN)=Enter
RUN "MENU"(EN)
```

and the AUTO command was DO STARTUP, the computer (when reset) would go into Basic, allocate one file buffer, reserve no space at the top of memory and then run a program called "MENU". All the operator would be required to do is enter the date and time. I found that other Basic commands could be put into a BUILD file, but if RUN is used it must be the last command or the remainder will not be executed.

Having dealt with the good points, there are a couple of things that I disliked. The first (literally) is that I didn't like the machine insisting that I told it the date and time each time I switched on — this may be a useful discipline when applications programs use the clock or calendar, but as the directory shows the month and year, but not the day a file was created, I did not find it worth the effort. It would be easy to alter the operating system to get round this (using the PATCH command), if only there was a line in the manual giving the starting address and the new code — three bytes would probably be all that's needed.

Another source of irritation was the machine's habit of displaying '* * ERROR 11 * *' or some other number when I did something wrong, leaving me to type back 'ERROR 11' before it explained what code 11 actually meant!

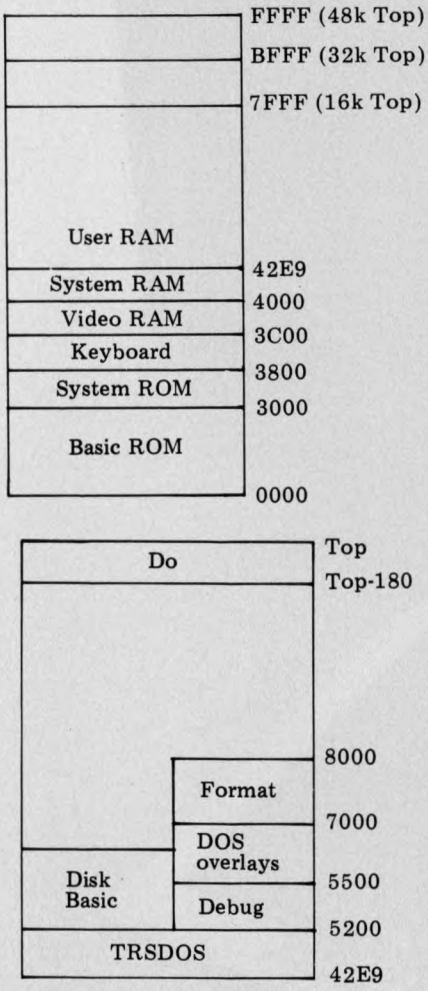

Fig 1 Memory map

Documentation

Three manuals were supplied with the test system. The TRS-80 Model III Operation and Basic Language Reference Manual should prove to be a usefully comprehensive book. In addition to the usual elementary (but not unimportant) instructions, details of the special features of the system are given, with sample programs to show their use. (One program shows how to use the Model III as a terminal attached to another computer.) Also included is sufficient information to allow programmers working in Assembler language to use the ROM routines for I/O and system control. The name, description, entry address, entry and exit conditions, and a sample program are given for 27 routines. Appendices give a concise summary of the Basic language, a chart of the character set and keyboard codes and a brief glossary of terms. An explanation of the RS-232-C standard is also provided.

My only criticism of this manual is that it is numbered within sections, and the Basic manual is numbered separately from the operating section. This means that many page numbers are duplicated, and it takes longer to find a particular page.

Before I comment on the Disk System Owner's Manual, I should point out that the edition currently supplied is a preliminary version, so hopefully purchasers will be given the corrected manual free of charge once it is printed. I spotted a couple of errors, and the index is not very reliable.

Divided into three sections (operation, TRSDOS, and Disk Basic), this document has a similar style to the Reference Manual, although it is ring-bound, not a paperback. The operation section takes the beginner through the steps needed to get the system running, plus some sensible advice on the care of diskettes.

Once the important items have been covered, the TRSDOS section presents each command and utility program in a clear format. The name and fuction are given and the various options are defined. Several examples are given with, where necessary, further explanation of the less obvious ones.

Enough details are provided to allow the use of disk I/O routines from within a machine code program, although no examples are given. While this information may not be of use to everybody, it suggests Tandy intends to be helpful.

The enhancements provided in Disk Basic are described in the same methodical way, with plenty of examples. The use of disk files is well covered, with complete example programs for both random and sequential access. A useful feature not offered by all Basics is the ability to open an existing file and write additional records at its end.

Apart from the errors/misprints, I found the manual easy to read and understand, without being verbose. When the revised edition appears it should be a good example of how to write documentation for users.

The third manual is an introduction to the dialect of Basic used on the Model I and III. Whether or not you like it will depend on how you regard example problems dealing with the allocation of Federal grants to goldfish. At least it treats computers in a light-hearted way; programming is fun — right?

Also supplied are two reference cards containing brief details of the Model III and the disk system and the commands available.

What is not available (and is unlikely to be issued) is a hardware manual containing circuit diagrams and other information useful to those prepared to carry out their own repairs and maintenance.

Summary

The Model III is an attractively packaged, well-documented computer with room for some expansion. Its compatibility with the Model I and the rate at which it has started to sell means that there should be plenty of software available from a variety of sources. Tandy is releasing Cobol and Basic compilers in September (at around £130 each) and a whole new range of applications software is scheduled to appear in November. Fortran addicts will be catered for later.

When compared with other desktop computers the Model III stands up well and is competitively priced. However, the price of disk drives and memory upgrades makes me think that many people will choose to buy from non-Tandy sources, as happened with the Model I.

I hesitate to bring up the old bogey of UK versus US prices, but it is possible to purchase a 16k non-disk Model III for $919 (retail), compared with the £699 you will be charged here. Allowing for freight, duty and VAT, that is at least ten percent higher than I would expect to pay, but it would be unfair to level this charge at Tandy alone.

At a glance

The similarities between the Model I and Model III suggest that the new machine will be used for a variety of purposes. As suitable software starts to appear, it is likely to threaten Apple's domination of the 'manager's assistant' market, but the limit of 48k RAM could prove slightly restrictive to some users of programs like Visicalc (which is why the 16k RAM card has proved popular with Apple users). The low graphics resolution may be a handicap in the education and games-oriented domestic markets, but many amazing graphics programs have been produced for the Model I, so I would not write it off completely. As a 'serious' home computer its good looks and compact shape score highly and the capacity and power of the disk system makes a variety of applications possible. The first thing I would do with it is produce a keyword-based master index to our collection of

GOTO page 151

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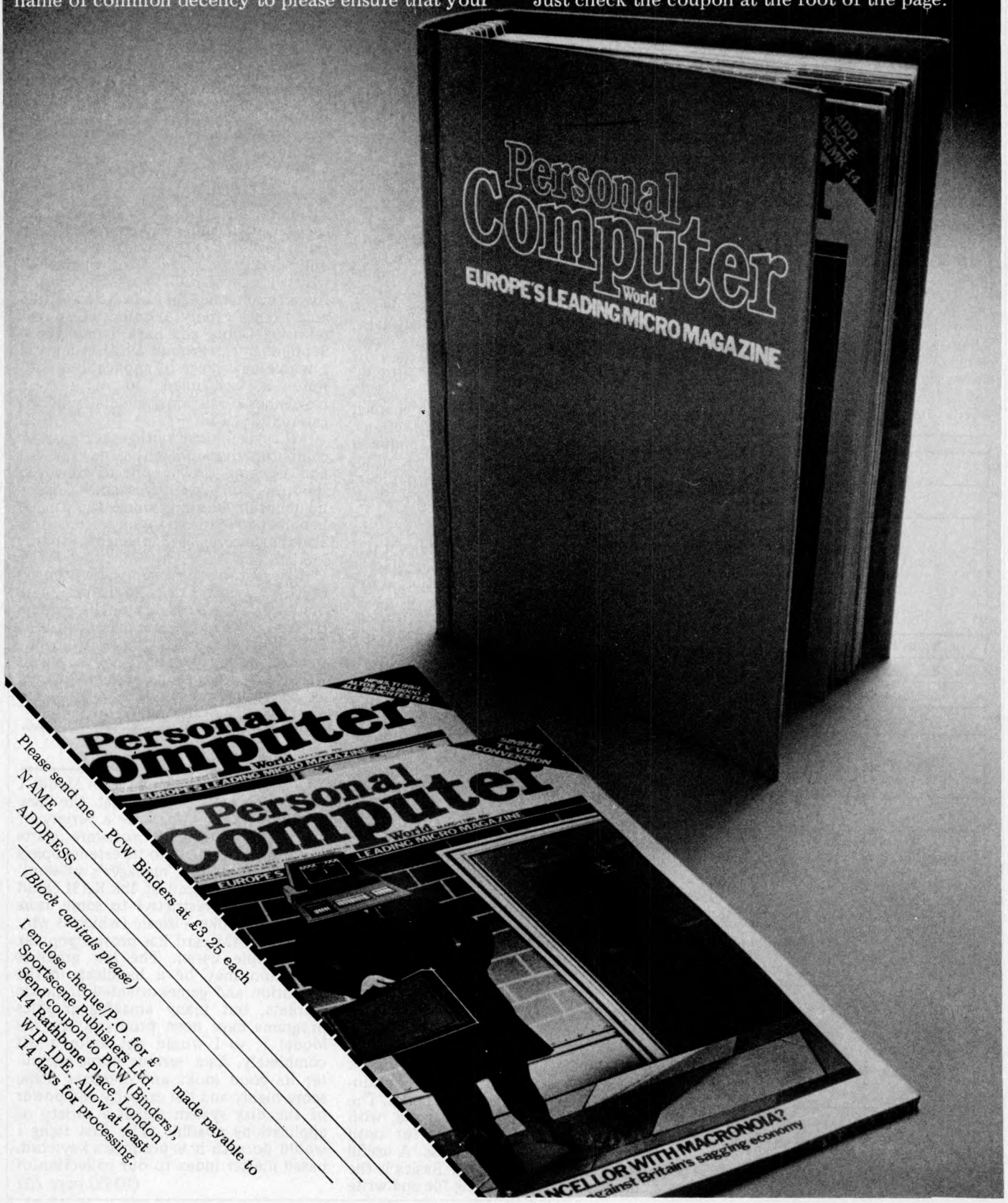

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Although primarily designed for the Sinclair ZX81, many of the cassettes are suitable for running on a Sinclair ZX80 – if fitted with a replacement 8K BASIC ROM.

Some of the more elaborate programs can be run only on a Sinclair ZX Personal Computer augmented by a 16K-byte add-on RAM pack.

This RAM pack and the replacement ROM are described below. And the description of each cassette makes it clear what hardware is required.

8K BASIC ROM

The 8K BASIC ROM used in the ZX81 is available to ZX80 owners as a drop-in replacement chip. With the exception of animated graphics, all the advanced features of the ZX81 are now available on a ZX80 – including the ability to run much of the Sinclair ZX Software.

The ROM chip comes with a new keyboard template, which can be overlaid on the existing keyboard in minutes, and a new operating manual.

16K-BYTE RAM pack

The 16K-byte RAM pack provides 16-times more memory in one complete module. Compatible with the ZX81 *and* the ZX80, it can be used for program storage or as a database.

The RAM pack simply plugs into the existing expansion port on the rear of a Sinclair ZX Personal Computer.

Cassette 1 – Games

For ZX81 (and ZX80 with 8K BASIC ROM)

ORBIT – your space craft's mission is to pick up a very valuable cargo that's in orbit around a star.

SNIPER – you're surrounded by 40 of the enemy. How quickly can you spot and shoot them when they appear?

METEORS – your starship is cruising through space when you meet a meteor storm. How long can you dodge the deadly danger?

LIFE – J. H. Conway's 'Game of Life' has achieved tremendous popularity in the computing world. Study the life, death and evolution patterns of cells.

WOLFPACK – your naval destroyer is on a submarine hunt. The depth charges are armed, but must be fired with precision.

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

Cassette 2 – Junior Education: 7-11-year-olds

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.

SPELLING – up to 500 words over five levels of difficulty. You can even change the words yourself.

Cassette 3 – Business and Household

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

TELEPHONE – set up your own computerised telephone directory and address book. Changes, additions and deletions of up to 50 entries are easy.

NOTE PAD – a powerful, easy-to-run system for storing and retrieving everyday information. Use it as a diary, a catalogue, a reminder system, or a directory.

BANK ACCOUNT – a sophisticated financial recording system with comprehensive documentation. Use it at home to keep track of 'where the money goes,' and at work for expenses, departmental budgets, etc.

Cassette 4 – Games

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

LUNAR LANDING – bring the lunar module down from orbit to a soft landing. You control attitude and orbital direction – but watch the fuel gauge! The screen displays your flight status – digitally and graphically.

TWENTYONE – a dice version of Blackjack.

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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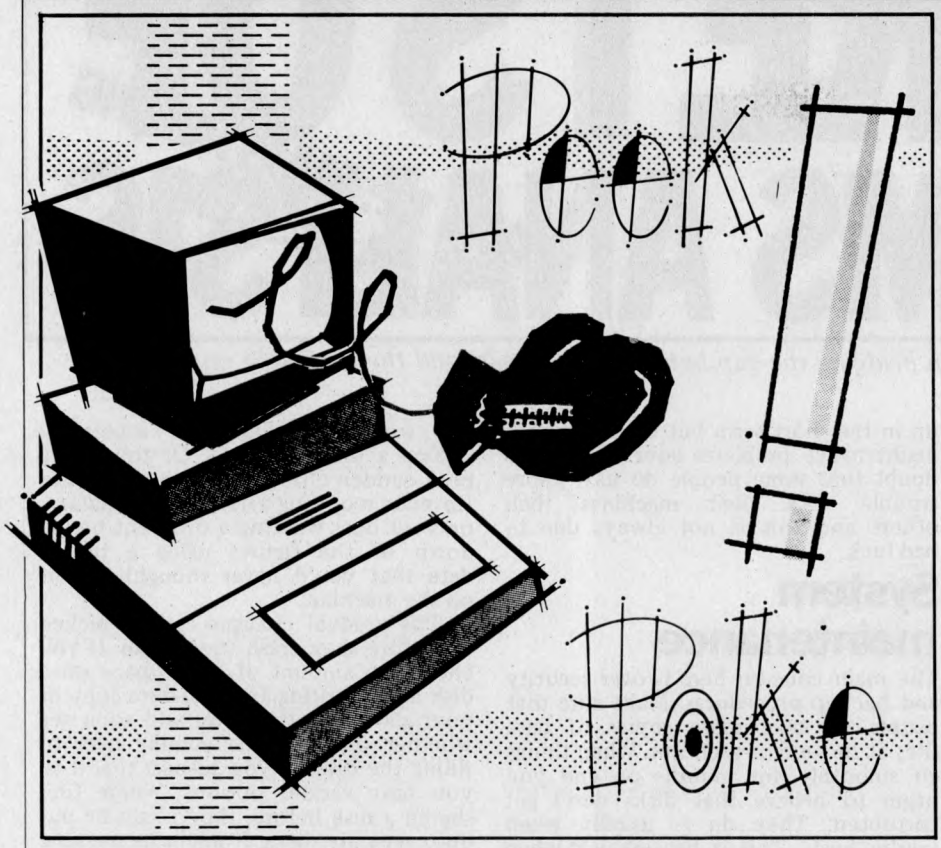

Mike Knight gives another insight into life as it really is in the microworld.

Illustration by Bill Bell

'What takes all the time in programming?'. Since I get asked this question more regularly than any other, I thought I'd try to answer it. I'll do it be defining the rough stages a computer project goes through and then I'll tell you about the sort of problems I've encountered at each one.

To start with, there are four functions to be carried out: Definition, Specification, Program Writing and Testing. I'm including implementation as a 'final test'. Now, logically, the definition of the system to be written should take place right at the beginning of the project but in most cases only lip service is paid to this vital stage. The major problem isn't with the computer or its people, it's with the businessman who often finds it difficult to say what he wants. Many ask for exactly what they've already got and consider that to be a definition of their requirements. Well that does make me wonder why, if their present system is so good, do they want to change it? There should always be a reason for change whether it's an inability to cope with expansion, a shortage of management information or even lots of errors regularly creeping into simple transactions.

Whatever the reason for change, the one certainty is that the 'new' system is bound to be different from the old one and if people thought more seriously about what they wanted before starting, then project timescales would shorten dramatically. An old adage in computing says that 'a day spent in definition saves two in implementation.' I think that's still true.

Some people are still trying to say what they want even as their systems are being implemented. The main reason for this is that they've never been given a specification of the system they're going to get. Specifying is the next project time gobbler. Once the business requirements have been defined, the computer person then has to specify how those needs are going to be met. Normally this stage is the least error prone of all, but one thing which must be checked is that all the information to be produced by the system can be calculated or produced directly from the data entered into it. I saw one system designed to produce a budget report broken down into stages but the input only related to the whole job.

Assuming the system has been specified we must consider whether the 'specifier' is the same person as the programmer. If not, the programmer will take some time to get to know the specification. Once again, the better the understanding, the more chance there is of the eventual system meeting the requirements. One additional element of the learning curve must also be considered. Today, any micro more than a year old is likely to have been superseded by a bigger and better brother. This hardware enhancement will almost certainly have been accompanied by software enhancements, particularly to disk handling and operating systems. I'm almost tempted to add that, in many cases, these so-called enhancements merely allow the computer to do what it should have done in the first place!

Those of you familiar with microcomputer manuals will know that changes are not always that well documented. This means that when the programmer writes his program it may not always do quite what he intended. To overcome this problem, many programmers will write a number of short programs whose sole aim is to show the programmer exactly how the new system behaves. This is even more true if programmers are changing from one machine to another. Not only do they have to learn a new set of PEEK and POKE locations but they might also have to contend with a different version of Basic. That's assuming they're using Basic, of course.

Now, if the programmer isn't held up by all these external problems, he can concentrate on designing the logical flow of his program. It is in this area that changes which seem minor to the user cause immense headaches for the programmer. I know one man whose program made use of the 'fact' that a certain field could only have two values. When the program was implemented, it was found that the field actually needed three values and vast chunks of the program had to be rewritten. Without doubt these 'minor changes' contribute most to the programming workload. If only the requirements and the specification could be agreed properly, even to the extent of identifying areas where changes are possible, then additional programming effort could be kept to a minimum.

One thing that can't change, however, is the computer hardware reliability — or should I say unreliability? Many a manufactuer makes quite a song and dance about how reliable its equipment is. One stated in public that he expected his 'boards' to last 40,000 hours. Well that may well be true but in the last 18 months, using nine different computers, I've had three processor breakdowns, ten disk faults, five printer breakdowns and two VDUs have gone wrong. In almost every case, the supplier expressed surprise and said words to the effect that he'd never heard of that problem before. Well, I think I must mix with the unluckiest set of computer users in the world because almost all of them have experienced at least some of the same problems as me. So come on manufacturers, how about learning from your mistakes? If the present technology won't support your extravagant claims then for goodness' sake put some money into quick and efficient repair services. I've experienced a three week turn-round for a repair from an extremely well-known manufacturer. Imagine what it would have been like if I had been running my business on that machine, three weeks without a system is ridiculous. The programmer suffers the absence of a machine in two ways: first he's held up while the repair is taking place; but, even worse, if the fault is intermittent he can spend days simply proving that the program isn't responsible.

To summarise then, there are many things outside the programmer's control which can cause him problems. If you add to this the work entailed in actually programming the system, the question shouldn't be 'What takes so long?' but 'Isn't it surprising how quick programming is?'

SECRETS OF SYSTEMS ANALYSIS

PART 12: MAINTAINING A SYSTEM

Lyn Antill concludes her series on bridging the gap between the expert and the would-be micro user.

This series has traced all the steps in the creation of a working computer system. First of all, there should be clear terms of reference so that you know how much you are willing to spend, how much time you have, what area of your work you want to think about computerising. Some sort of feasibility study is necessary to ensure that the sort of job you had in mind could work on a micro — whether, for example, there are simple rules governing the way you handle information which could readily be translated into the statements of a computer program. A detailed fact-finding exercise will uncover all the data you want to put into the system, all the processing you need to do with that input, what information you want to get out and how you can arrange that data into records and files for storage on tape or disk.

How much data you want to store and how quickly it has to be processed will dictate the size of machine you need to buy, and the calibre of your local suppliers will influence the make. There may well be program packages which you can buy to do the job you want, or you may have to commission a programmer to write one for you. Programs, especially ones which have been specially written, will have to be tested, and then begins the work of transferring your data and operations onto the computer.

Well, now that you're operational, that's all there is to it, isn't it? Of course, life's never that simple.

Machine maintenance

Hardware maintenance is one of the things that you took into account when you bought the machine, which probably had some sort of guarantee period. As long as you know what was covered by the guarantee and what was not, and when it was due to run out, you're okay. A 12 month guarantee soon runs out when you are busy thinking about other things — don't forget to take out a maintenance agreement before you actually need it.

There is quite a lot you can do in the way of preventative maintenance yourself. I am not recommending that you tinker with the machine, but that you use it properly. Make sure it's not overheating, getting dusty, being knocked about. Because micros are so robust, you might be tempted to treat yours roughly. This might not show up in the short term but could increase maintenance problems later. There's no doubt that some people do have more trouble with their machines than others and this is not always due to bad luck.

System maintenance

The main concern here is over security and backup procedures. Make sure that people do take spare copies of data files at the end of each run. When things go smoothly for months on end you begin to believe that disks don't get corrupted. They do — usually when you're busy. This is because it's when you're busy that you forget to check whether the disk is getting full, or whether you've loaded the right version of the file.

This is largely a problem of getting into the swing of things, but there is a more subtle problem of whether the system is still doing what you want.

There's a near certainty that when you get the system running it doesn't do exactly what you needed. There is always some contingency that you overlooked, or couldn't have foreseen. If you've bought a simple machine and program package, you will probably have to live with the fact that it doesn't do everything for you. You may still have to do some of your calculations by hand, or collect some of your statistics by listing all the data on your files and going through it manually. If the micro is doing most things better for you, then you'll probably decide that it's not worth spending any more money trying to make things perfect.

But if you've spent quite a lot of money already getting a suite of programs written for you, there may be some point in spending that bit more to get the programs exactly right. Sometimes the changes you want can be made quite easily. Unfortunately, a change that looks trivial might seriously affect the way in which the program works and would be absurdly expensive to implement. Only the person who wrote the program can tell you what would be involved. This is covered in program maintenance (below).

The other thing that can go wrong with a system, is that the nature of your work changes, so that a system which was suitable before becomes increasingly less so. There may be a gradual change, such as in continued increase in the workload which will eventually swamp a small machine. Or there may be a sudden change, such as the Inland Revenue requiring a new tax calculation, or your boss wanting a different breakdown of the figures using a bit of data that you'd never thought to put on the machine.

The gradual changes can be picked up before they crash the system. If you check the amount of spare space on a disk after creating an up-to-date copy of your data file, then you will soon see whether or not it is coming near to filling the disk. If you suspect that it is, you have various options. Where files shared a disk before, they could be put onto separate disks. It might be possible to subdivide a file — eg, customers A-M on one disk and N-Z on another. It might take a very small program to divide the one file into two at the start but they could probably be run through the main program in the same way as before. There would be a bit more work for the operator remembering which disk to load. A more expensive alternative would be to upgrade the machine.

There are other problems that might crop up with an increasing workload and which would not always be immediately traceable. Very often a program, or even part of the operating system, works on certain assumptions about how much data there is to store. An array, or table, of values stored within the program might have no defined maximum size, but might accidentally overflow, causing a program crash or at least a loss of data. Similarly, a program which works by searching through a file or table of data could be perfectly efficient with a limited amount of data, but unacceptably slow beyond a critical size. Problems like these are often hit suddenly and with no indication as to what has caused them. For example, my text editor crashes when it is too full, but it took me several days to realise that this was why certain commands were failing some of the time. I still don't know how many lines I can type before reaching this point and err on the side of caution by writing frequently to disk.

Program maintenance

This is strictly a programmer's job, although the analyst and the user have to be aware of what is involved so as to give sensible instructions. This might

involve correcting parts of the program that were found to be inadequate after it had been used in practice. Sometimes program bugs escape testing, but more often there is an unforeseen combination of circumstances that has to be allowed for. This type of maintenance will usually be part of your initial contract with the programmer.

The other activity that comes under this heading relates to the fact that program modifications are often necessary to cope with changes that have taken place in the real world. Mainframe programmers were continually being asked for changes to their programs which the user thought were trivial, but which actually involved massive changes to the code, with corresponding problems of retesting. To get around this, several techniques have been developed for writing 'maintainable' code. The main aim underlying this is that the code should be broken down into logical components — 'procedures' — each of which correspond to an identificable job. If some change is required, then only that procedure has to be changed. This approach is often known as structured programming. Some programmers feel that it is too much trouble to go through the initial planning stage, but it does pay dividends in the much greater ease with which program changes can be implemented later.

More about systems analysis

Many books have been written about systems anlaysis. and about the use of computers in small businesses. These don't necessarily claim to be about microcomputers, but this doesn't mean they're not appropriate to the micro user. There is a very good reason for this. The systems analyst is a detective — looking at a problem and designing a solution for it. Until all the analysis has been done, no assumptions should be made about the sort of machinery that might be employed. It might well be that a small user actually needs to use a large computer and would be better off using a bureau to do heavy calculations where a micro couldn't store and manipulate all the data at once, for example. At the other end of the scale, a large company with many potential users might decide to equip them with their own micros, rather than try to build a single mainframe system which satisfied all their different needs.

The standard textbook on the subject is the NCC *Introducing Systems Analysis and Design.* This comes in two volumes at £7.50 and £15.50. Although too expensive for the casual user, it would be a good idea for the more serious use or a school library.

Another general book, which I recommend to my full time students, is HD Clifton's *Business Data Systems.* It is published by Prentice/Hall and costs just over a fiver. Again, it covers the whole range of machinery, but is well written and as helpful to the PET user as to someone using an IBM 370.

The question of what makes a good systems anlayst is even more debatable than what makes a good programmer. At the top of the list I would put the willingness to look at things from other points of view. This applies to several aspects of the job. You need to see things from the user's point of view — to see what is really causing the problems and what any particular system will actually be like to use. It also applies to the willingness to keep an eye on changes in technology and new ideas for applications. The conventional solution to a problem is not always the best one. The analyst also needs to see what problems might be encountered by the programmer or hardware supplier in order to make workable plans and give sensible instructions.

Another important skill for the analyst is a sense of structure — a feel for the overall shape of a system and the way in which the parts interact. This is necessary for anyone who wants to organise a project. especially where the project encompasses such a wide range of activities — hardware software clerical procedures, suppliers, programmers, abstract designs, and physical pieces of equipment. All aspects require different skills, and each must be given its due weight — neither over-emphasised nor neglected. Every analyst will have his strengths and weaknesses — some have to ask advice on hardware and interfaces between bits of equipment, others will have had little experience of businesses and will have to be readier to ask questions about what the user is doing.

Conclusion

Systems analysis is a complex task. More complex in many ways than

GOTO page 152

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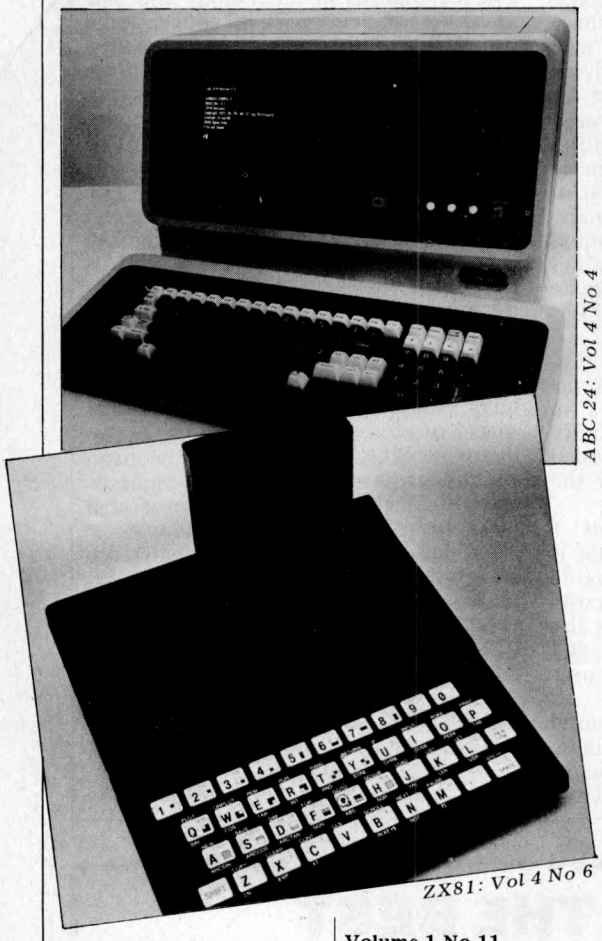

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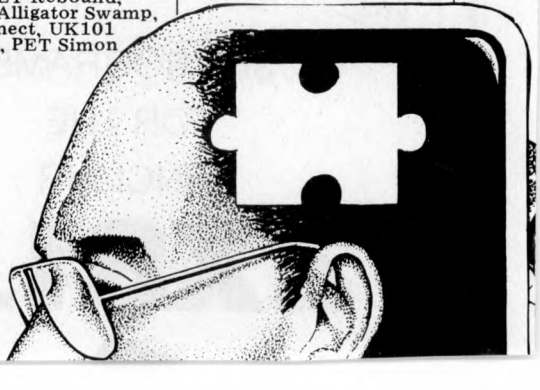

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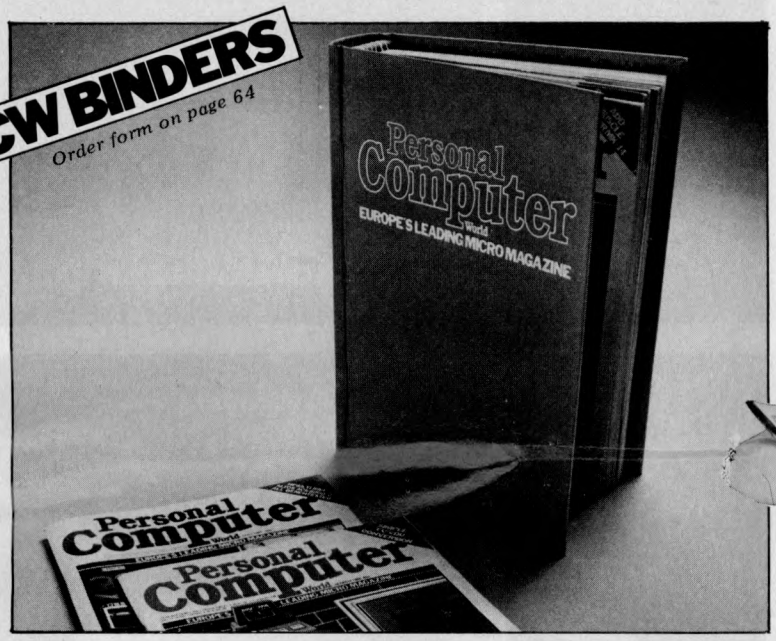

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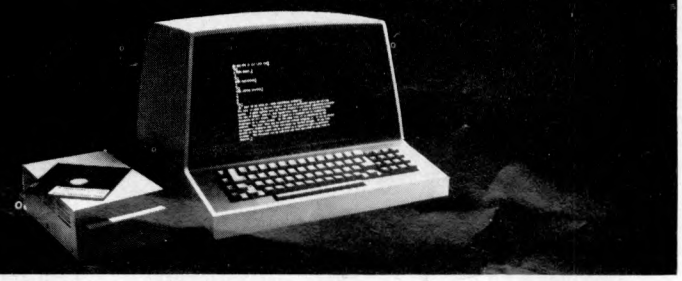

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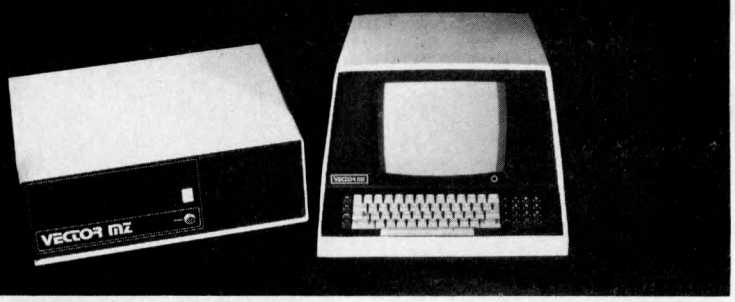

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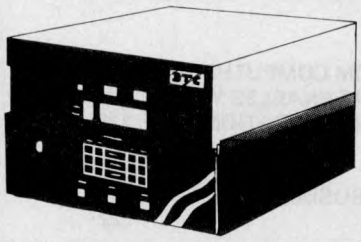

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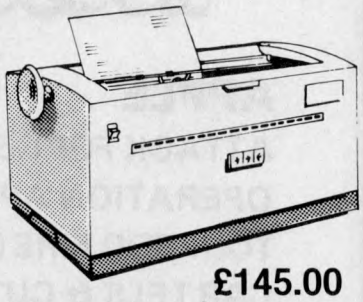

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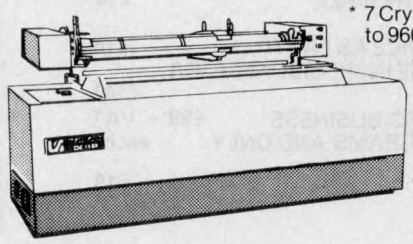

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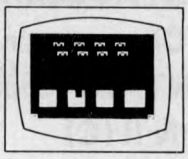

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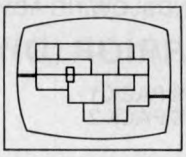

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BANKS' STATEMENT

IS IT A BIRD, IS IT A PLANE...?

This month Martin Banks ponders those common problems with personal computers: What do you do with them and how will they evolve?

Right, hands up all those who think they know what a personal computer is.

Come on now, since you're reading a magazine with the words Personal and Computer writ large within its title, you must think you have some idea. Let's have at least one well-rounded and succinct definition that is capable of covering all eventualities.

It is, I would contend, somewhat more difficult than just saying something like 'a computer that is both small enough and cheap enough to be purchased and effectively used by one person'. Many of them are definitely *not* cheap and, equally many are required to be used by more than one person. In between, there are a million other caveats.

To a large degree, therefore, the definition that the individual arrives at for what he feels is a personal computer is going to be largely a product of his own needs, experience and expectations.

This means that for one group of users a definition can be easily derived, while for another group an entirely different definition will be needed. For one group in particular, it is possible to suggest that the definition has still to be thought out.

One of the easy groups is in small business. Here the personal computer can be defined as a computer system intended for the personal use of one or more workers in the course of their work — a tool effectively — rather than by an elite team of specialists.

It is a tool to overcome a (hopefully) known and understood set of problems in return for a given investment. The only major difference it has as a problem solver compared to a mainframe computer is that it takes that solution to the worker, instead of the worker having to come to the mainframe to pay homage. Now that is all very fine for that particular application of microcomputers, for the task itself is well-understood and defined. That is why many of the manufacturers of micros went for the small business market in a big way, and more power to their elbow for picking a readily exploitable opportunity for establishing themselves.

The difficult group to define is the consumer market, and the consumer personal computer. Many people in the industry, particularly in the manufacturing and distribution companies, feel certain that there is an enormous and as yet untapped market for the truly personal consumer computer. Yet no company, with the possible exception of Sinclair Research, has really got close to breaking in to it. There is an underlying, almost unspoken feeling that if technology can create products — and markets — like television, hi-fi, radio, washing machines, and fully belled and whistled cooking machines, then it ought to be able to do the same with the microcomputer.

Well yes, and no, if you see what I mean.

Yes, we have the technology (to quote that awful quote) to produce virtually any type of product that can be conceived of as a 'personal computer'. That part is no hardship at all.

The big problem comes when the subject is addressed from the other — the user's — end. Now, products like the television and hi-fi and all the rest have succeeded because they are essentially passive. Now, I could go into a whole load of pseudo-sociological and psychological jargon about the essential interrelationships of life and artforms that are integrated into a unified whole by such products, but I won't, I do however feel that it is an important aspect. With such products, the user can see a reason for using them. To the question: ''Ere I want to 'ear this 'ere Stranglers record, 'ow do I do that then, John?' the immediate answer is: 'place it on your stereo thou good and trusty fellow.'

The same goes for microcomputers in small businesses, in schools, in scientific establishments and all the other tightly definable applications areas. The user can see the micro as a means to achieving an end. With the consumer market this is not yet the case. The vast majority of potential users can see no reason for having such a product. They just sort of stand there, and just sort of say: 'What do I do with this, then John?'

In passing, it has to be said that a good number of the existing 'consumer' clientele are asking exactly the same question. They don't want to be educated about the wonders of computer technology or programming in Basic, they have got fed up with playing Space Invaders and chess. They want to be able to use the little beastie as a means to some other end that they have not yet managed to define for themselves. They stand like Linus, thumb in mouth and towel to ear, saying 'having bought it, what do I do with it?'

So, if the vast and untapped revenue is to pour into the coffers of the industry, something has to be done to overcome this mental blockage. What that is is hard to say, and even if I knew I wouldn't tell. (As several people have pointed out before, there is a fortune waiting for the person who gets the right idea, and markets it in the right way.) It is possible to say, however, that there are things wrong with both the hardware and software of microcomputing relative to the 'consumer' market, and that the products will have to change and develop. It is also possible to say that there will be no such thing as the consumer personal computer per se and that instead there will be a wide range of intelligent products that just happen to incorporate the wonders of microcomputing.

So, what will the consumer micro look like; what pointers exist that could give some idea?

Well, taking the already stated point that 'we have the technology', any definition of such a product or products should look at the problem from the user's end. Without even addressing the problem of what users actually want to do with them, we can tackle the easier subject of *how* they can do it. Now I feel that your average punter (and they are the people to be hit, not the techno-freak and small businessman) is intimidated by keyboards, especially when they are responsible for the generation of the input. I have seen excellent copy typists, who could talk lucidly about a complex subject, suffer the ultimate mental hernia when asked to use a typewriter to set their thoughts to paper. They could, however, verbalise those thoughts (often till the cows came home). So speech input and output is going to be an essential prerequisite. Initially, of course, that speech will be somewhat limited in vocabulary, and there is still much work to be done before a system is developed with which you can hold a conversation, rather than just communicate raw information. There will still be a need for keys, but these will probably tend more and more to be function/command

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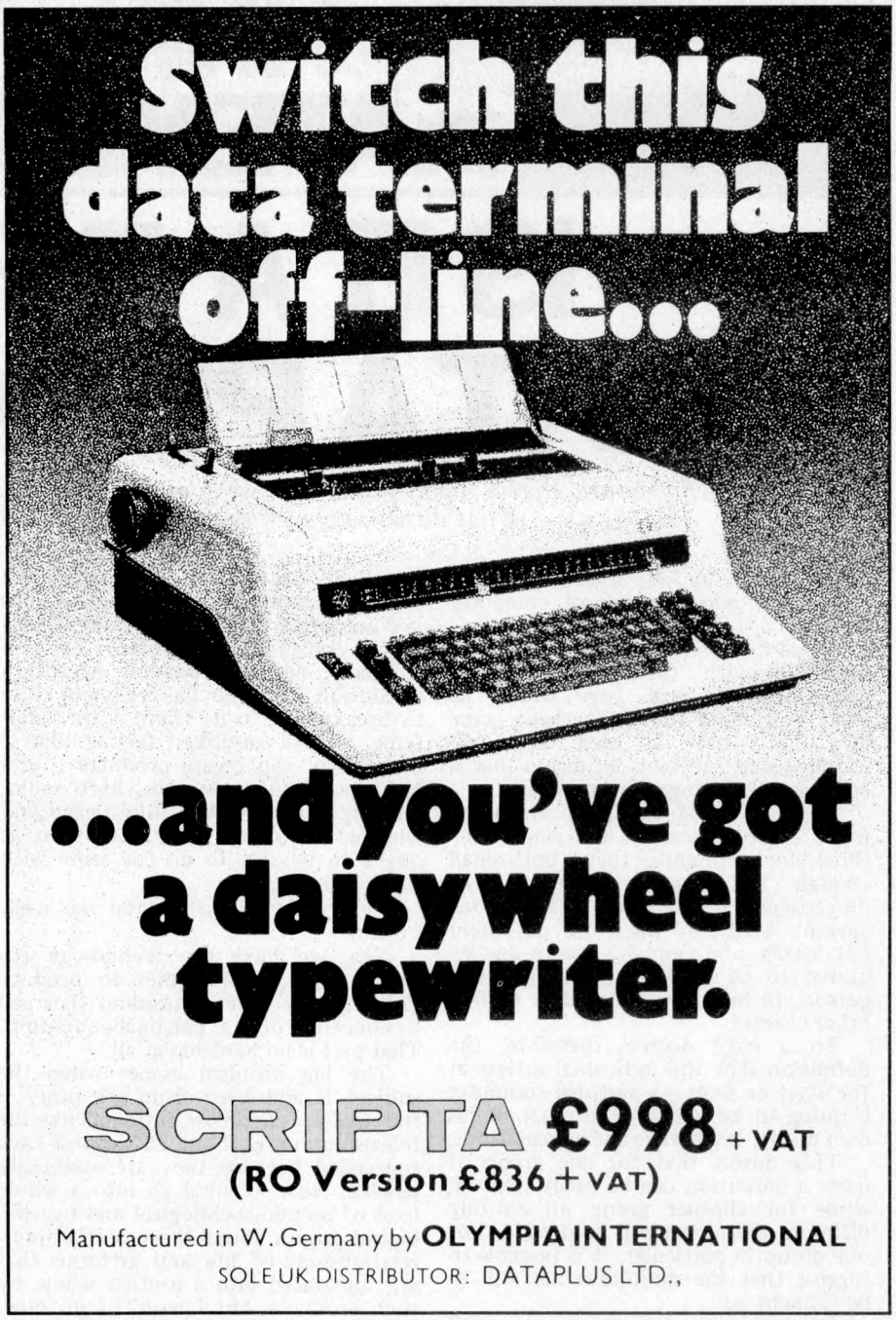

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keys rather than for data entry.

Size is the next item. If a computer is to be personal it will have to be of a size to be with you where you are, in person. That means portability — and that means not only some very aggressive development work in the field of low power consuming microelectronics technologies such as CMOS, and device design techniques such as gate arrays, but also in the technology of power sources. (It is all very well producing a wrist-watch computer that's ever so clever, but what about the car battery you need to carry in your hip pocket?) It will also mean some snazzy work being done in the field of memories, but more of that in a second.

Another area is communications. Now, I know that lots of people pour scorn on Prestel, but in theory it's a great idea, especially if it is extrapolated onwards. Imagine a pocket computer with a small aerial that can link in to a wide range of available databases via radio and/or land line and/or computer/telephone/information access system that also picks up Radio 1. Okay, Radio 3. It could work.

Now back to memories, as promised. It seems to be a function of computers that as they become more flexible and easier for the non-specialist to use, so they become much larger and more complex internally. So to cope with the vagaries of the 'average punter' within the terms of a general purpose computer, a large amount of memory will be needed. There will be a need for a reasonable amount of data memory, but, more importantly, there will be a need for a great deal of program memory. Much of this will also need to be on-board, for the punter is not going to like having to keep and load a number of floppy disks. Tied in with this is, of course, software, and not just the actual applications programs. There is likely to be a need for a new form of systems software that is intelligent, and helps the user get to the required application easily — for example guesses the program needed by successively approximating the user's odd-ball requests into a true program load command.

The programs and system software will have to be in firmware with as much as possible embedded in the system. Other applications programs would have to be in easy-to-handle plug-in modules.

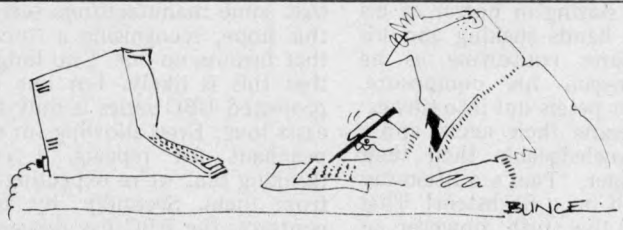
As for the applications programs themselves, well, it's like the pop record business — just try and give the punter what he wants, or what he can be sold. The future here is probably with program generators like *The Last One*, though if the punter still doesn't know what he wants to do, having a computer that can produce a program for it is of little advantage.

All this has been directed towards the idea of a general purpose personal computer — ie, a box that stands by itself. I'm not entirely sure things will move that way, for I feel that many more 'personal' computers will be used in the form of smart televisions, smart cookers, smart hi-fi, smart cars and smart telephones than they will as 'computers' per se.

Exactly what the future holds for the truly personal computer as a consumer item no-one yet knows, or if they do they aren't saying too much. Some people feel it is already here as a product, though at least one, Mike Hambly of the newly opened Computer Supermarket in Corby, admits to a considerable act of faith. 'In two years time I will either be a millionaire, or flat broke', he says.

There are probably as many ideas for this area as there are people willing to buy such a computer. That, I feel, is one of the problems.

Perhaps Lord Tebbutt, esteemed editor of this parish magazine, should organise a competition for the best idea for the ultimate personal computer. The prize for the winner? Oh, I don't know, maybe a fortnight with your favourite psychiatrist!



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Compiled by Derrick Daines

Talking in tongues

The great hall is filled with the hubbub of a packed, expectant audience, when from the front comes a burst of applause, quickly spreading as the audience recognises the leonine head of the famous concert pianist they have all come to hear — Alfredo de Boezer.

Alfredo bows and flashes his magnificent teeth at the audience before shaking hands with the conductor and striding confidently to the grand piano. The conductor taps on his music stand, raises his baton and the strings sweep elegaically into the opening movement. At the appropriate moment, the conductor half-turns towards Alfredo, but instead of the cascading handsful of musical notes there is nothing — the great pianist is staring in horror at his instrument, his hands shaking and his handsome features contorting as he struggles to regain his composure.

The orchestra peters out into silence. The audience crane their necks and a few, more knowledgeable than their neigbours, whisper, 'That's a Steinway — he's rehearsed on a Bechstein!' That is only half of the truth, however, as Alfredo soon makes clear. He snatches the sheets of music and holds them aloft in a passionately trembling hand. 'Zis —' he screams, 'Zis music is written for ze Altenstoefer piano!'

Daft, innit? Well, that's exactly the situation that we have in the computer world right now! We feel awkward — even helpless — when moving from one computer to another, and programs will run only on one type of machine!

You can't help laughing. Science and technology are supposed to be synonymous with order, reason and logic, yet modern technology has produced a situation which would be intolerable in the world of the arts, which are supposed to be chaotic, with everyone doing their own thing.

Of course there are reasons. There are always reasons, but of satisfactory explanations there are none. We know that much incompatibility arises from the need to incorporate new technological developments, but much more arises from selfish commercial considerations. What the manufacturer is after, dear reader, is to make you dependent upon his product and no-one else's. He hopes that when he sells you a basic computer, you will want to expand it, add peripherals, extra memory and all sorts of goodies — and he's ready to oblige. Better, he *knows* that you've got to buy his software, because nobody else's will run on his machine.

My advice to anyone contemplating buying a computer is to take with a very large dose of scepticism claims that this machine is better than the rest. Very often, 'better' simply means 'different'.

Know what sales managers dream about? It's of making their machine — or their bit of it — the 'industry standard.' To a manufacturer, that is better than winning the pools a million times over. They all hope to be able to sell so many machines that theirs becomes the standard to which all other manufacturers must conform. They're not being altruistic about this. Possessing an industry standard means that the door is wide open to all sorts of lucrative deals; licensing, for example, giving restricted information for a price, or denying it to others.

Into this arena has stepped our fairy-footed BBC, with its much-heralded BBC Computer. Among customers, there has been considerable hope that the moral authority of the BBC would at least provide a standard version of Basic. I am even prepared to concede that some manufacturers secretly share this hope, recognising a *force majeure* that favours no-one. I no longer believe that this is likely. For one thing, the projected BBC series is only ten broadcasts long. Even allowing for the Beeb's penchant for repeats, I can't help thinking that we're expecting too much from them. Secondly, by awarding a contract, the BBC has descended from Olympus, entered the market and openly favoured Acorn, forfeiting the moral authority that is its greatest asset.

Lastly, I suspect that the market for home computers is not so big as has been suggested in some quarters. Personally I rate the universal appeal of the current type of computer as being only a tiny fraction of that of the motor-car, the hi-fi set, or the video tape-recorder, for example. All other things being equal, I would say that your average man in the street would sooner have a VTR than a computer — a VTR has immediate entertainment value and there is no learning process to go through. My whole argument revolves around my refusal to believe that vast numbers of the great British public want to learn how to write programs; in the face of this, the idea that the BBC will do it in just ten programs is plainly silly.

On a more constructive note, isn't it time that the British Standards Institute stepped in? It — as the BBC once had — has the moral authority. Wouldn't the BSI be far better employed in establishing a standard for (say) ordinary Basic or bus structure rather than the shape of boxes we should use in flowcharts? (BS4058:1973) We might then see some practical benefit, with interchangeability of peripherals, computer talking to computer and all of us talking the same Basic. Until then, we all might as well talk to ourselves.

Programs recieved

Musical Breakout (TRS-80) by Danny Clark (14) of Norwich.
Farm Manager Game by Paul Hatcher (16) of Alloway, Ayr.
Startrek (UK101) by Martin Witney and Chris Thompson (16) of Orpington, Kent.
Chessboard Display (ZX80) by Peter Dalloz (16) of London
Bomber (PET) by C. Broadbent (17) of York.
Surround (PET) by J P Rowe (15) of Farnham.
Basic Swap (PET) by K Kirkland of Newport, Salop.
One-Arm Bandit by Steven Fairbrother (12) of Blackpool.
Hangman (PET) by Andrew Casson (15) of Whitby.
Bowling and Canyon Bomber (Sharp MZ-80K) by Adrian Johns of Marlow-on-Thames.
Galaxy Invaders (PET) by J M Barnes (13) of Dumfries.
Impact Calculator (PR100) by Graham Kirby of Pitlochry.
Number Guesser (ZX80) by Adrian Mehlig (12) of Eastcote.
Squash (Acorn Atom) by P Brown-Kenyon (15) of Bristol
Cricket by Hugo Clark (15) of Lenton, Nottingham.
Cesil Interpreter by Chris. Thompson (15) of Orpington.
Target (ZX81) by Richard Thornton (15) of Gillingham.
Spiders (PET) by Nigel Cole (14) of Cuffley, Herts.
Dodgem (TRS-80) by Michael Taylor (14) of Christchurch.
Moon Lander (ZX81) by Paul Lipman (12) of Pinner.
Adventure Maze (ZX80) by Philip George (15) of Peterborough.
Real-Time Clock (ZX81) by Shane Sturrock (15) of Scarborough.

My thanks, too, go to all of you who sent me your favourite Mugtraps. There are far too many to mention all by name, but I do appreciate everything you've sent. My favourite is this one sent in by Sean Martin (15) of Heathfield, Essex:

```
100 PRINT "TYPE A
    NUMBER 1 -- 4 (FAST-SLOW)"
110 INPUT S$
120 S=VAL(S$)
130 IF (S—1)*(S—2)*(S—3)*
   (S—4)=0 THEN 150
140 PRINT "PLEASE READ
    INSTRUCTIONS AGAIN":
    GOTO 100
150 REM — REST OF PROGRAM
```

That's nice because it will trap *any* kind of error, although I shudder to think what line 130 would look like if the user was asked to enter a number 1—20! A book-token to Sean — and the rest of you, roll 'em in!

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MICRO FACILITIES

VIEWDATA

WHAT'S NEW

Adrian V Stokes brings the latest Prestel news.

There have been a number of interesting deveolpments for viewdata since the last 'Update' in *PCW* . This month we'll cover four of these, one of which has particular relevance to micro-computers.

The first change occurred at the beginning of July when the tariffs were increased. British Telecom said that the increases will be the first for Prestel since its launch in September 1979, a period of 21 months. During this time, the costs of extending, running and improving the quality of the Prestel service have risen dramatically. Since that time, a total of 18 information retrieval computers have been installed throughout the country and today some 62% of the telephone population in the UK are able to receive Prestel at local telephone rates.

The increase is clearly aimed at reducing daytime usage since the unit for the time-based charge is increased from 3p to 4p (plus VAT, of course) but the time per unit is also increased from three minutes to four minutes in the cheap rate period, while staying at one minute at other times. This means that a domestic user, who presumably makes most use during the evenings and at weekends, will notice a slight increase in costs while a business user will notice a 33 percent increase. However, the additional charge of £12 per quarter for business users is not increased.

This is perhaps a surprising move at a time when British Telecom is trying to popularise Prestel and the rise may well deter potential users.

The second change is the announcement of 'Gateway', a facility originally developed for the West German Bundespost by Systems Designers Ltd. for use on its Prestel-compatible viewdata system, Bildschirmtext. The facility will be available in early 1982 to Prestel users in London and will later be extended to the rest of the UK. By accessing the Gateway page on Prestel, the user will have access to private computer systems (in the standard jargon, 'third party databases') which need not be in Prestel compatible format. There are various obvious uses for such a facility, particularly interactive usage such as booking airline seats, ordering from mail order companies or even conducting banking transactions. Of course, the last will need a high degree of security but this will be provided by the owner of the database and not Prestel.

The third development is still in a very fluid state; it is the question of standards for videotex (the international name for viewdata). A major step forward took place in May when the 26 countries of CEPT (Conference Europeene des Administration des Postes et des Telecommunications) agreed on a standard for videotex.

There are, essentially, three major systems. The first is the UK Prestel system which transmits 8-bit data and can represent graphics and colour, these being transmitted as escape sequences. As a result, any change of these attributes occupies a character position which is often a disadvantage. The graphics are so-called 'alphamosaic', that is, each ordinary character position is divided into six and any possible combination of these may be used. This means that the screen is divided into 80 by 72 squares, any of which may be used but with certain restrictions, such as each whole character position having to be the same colour. Clearly this does not give good definition and British Telecom announced 'Picture Prestel' (see last 'Update') to give better quality graphics.

The French Antiope system is similar in many respects to Prestel but each character is represented by 16 rather than eight bits, the extra eight bits defining the attributes such as colour, flashing or graphics. This is known as the 'parallel attribute' method. Although this might seem a significant difference, there are many similarities. In particular, the graphics are still alpha-mosaic.

A totally different system is used in the Canadian Telidon service. In this system, graphics are represented in a form called 'alpha-geometric' (and is more closely related to usual computer methods for representing graphics). The picture is transmitted as special 'Picture Description Instructions' (PDIs). This gives very much higher resolution graphics but, usually, at the cost of rather more data needing to be transmitted.

The CEPT-agreed standard is not merely a compromise between the two competing UK and French systems but is intended to be a superset, including advantages of both, together with certain new features. It is 'upwards compatible' with the current Prestel standard so that terminals compatible with the new standard can display data in the old format (although the converse is not completely true). The new features include a wider range of colours (16), double-width characters (in addition to double-height) and underlining.

The issue of standards is of particular relevance in the American market and there has been much recent controversy in the computer press as to whether AT&T has decided to adopt the Canadian or European system.

Again, the differences between the system may not be as important as they seem at first sight, especially since the recent demonstration by British Telecom at Videotex 81 in Toronto of a facility known as Advanced Graphics System (AGS). Using a special processor and adaptor, Prestel can now transmit alpha-geometric displays.

It can also transmit higher quality 'Picture Prestel' using a facility called 'Transform Coding' (also demonstrated at Videotex 81). In this, the resolution (up to photographic quality) is dependent on the length of time the picture is allowed to build up.

It seems likely that these changes will lead to a merging of the European and Canadian standards in the not too distant future. The final videotex development, and certainly the most important from the point of view of micro-computer users, is the announcement of the 'BBC Microcomputer' which is to be sold in conjunction with a television series. The suppliers will be Acorn.

The specification for this machine includes, as an optional extra, a Teletext receiver which allows tele-software to be down-line loaded directly from the television signal to the computer's memory. The machine itself is based on the 6502 cpu but, if an additional processor is added (and this can be any one, including 8 or 16 bit processors), the 6502 will handle I/O only, leaving the second processor to perform the language processing. Eight formats will be available for output, including Teletext compatible and colour graphics (up to 16 colours) with high resolution. The machine will also have an interface to Acorn's local area network Econet.

I expect that the availability of this machine at a low price and, hopefully, in large quantities, is likely to have more impact on Prestel/Teletext than many of the other more obviously relevant changes.

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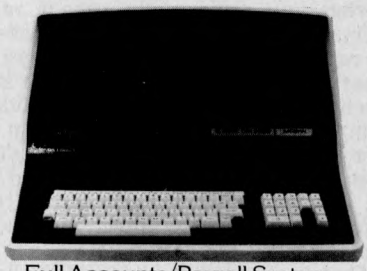

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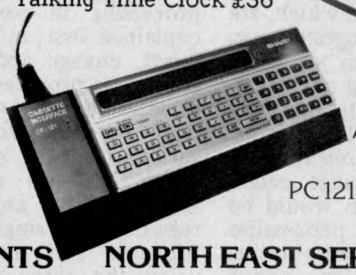

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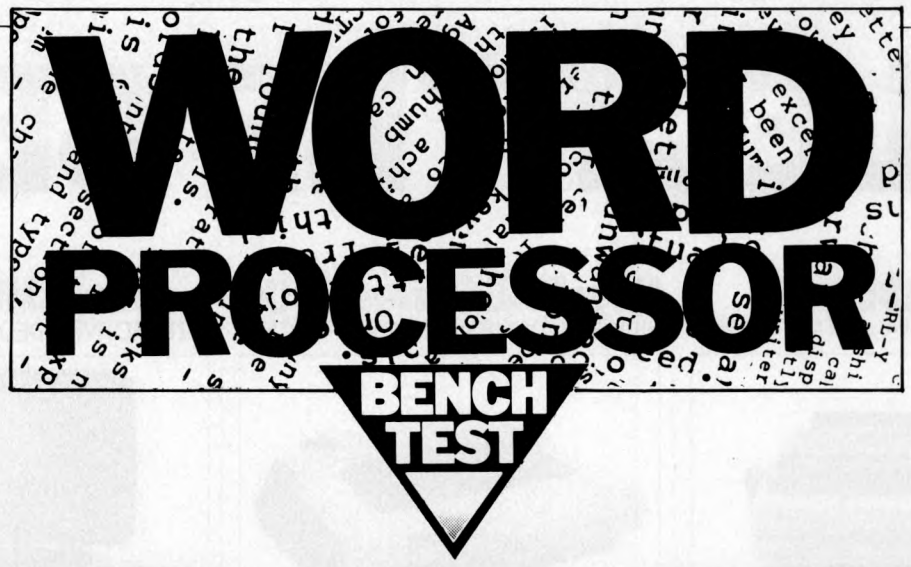


SPELLBINDER

David Tebbutt gets to grips with this CP/M-based package.

In the three months since I bought Lexisoft's Spellbinder word processing system, I've written several articles, lots of ComputerTown letters, a couple of lengthy reports and created a name and address file. So the system has been well exercised and, with just a couple of exceptions, I have been delighted with it. I am still discovering new features and functions which more than match my growing needs. Anyone at all serious about buying a CP/M-based word processing system should consider Spellbinder among their options.

Lexisoft describes Spellbinder as a 'Word Processing and Office Management system' — an interesting description because it's certainly more than a word processor, but how do you define office management? When I read Lexisoft's disclaimer that it 'makes no representation with respect to the fitness of the product for any particular purpose', I really wondered what I'd let myself in for. Still, the company has clearly gone to a lot of trouble in preparing the excellent manual and even used Spellbinder to produce it!

The package can be considered in two parts: word processing and — yes, why not? — office management. The word processing functions allow you to enter and manipulate text, store it on disk and print it out. The office management programs — some of which are provided, others you can program yourself — allow you to perform jobs such as sorting records, extracting and merging information from different files and printing text in multiple columns. These programs are called macros and they're written in a language called M-Speak. A typical program would be one which allows you to personalise a standard document by incorporating previously filed information about the recipient.

That's the overview. Since I quite like the structure of Lexisoft's manual, I shall follow the same sequence. This will introduce you to things in a sensible order and it will also give you a feel for the sort of documentation you'll get.

System operation

The introductory section explains how the manual should be used, describes Spellbinder's highlights and tells you how to tailor the package to suit your requirements. A further section describes how to set up Spellbinder to suit your system configuration. This last task should be performed by your dealer unless you are already experienced in the ways of computers. I run my version of Spellbinder on a SuperBrain connected to an Epson MX 80 F/T printer. Although this denies me a few of Spellbinder's smarter options, such as proportional letter spacing and underlining, I consider this configuration to be almost ideal for a writer. Clearly, most types of office work would demand a better quality print but this isn't a criticism of the Epson, which does its job very well. My system is configured so that I can use SuperBrain's numeric keypad as a set of function keys. Some users will have to use various letters in conjunction with the control key to achieve the same results.

The manual contains a pull-out, bound section called 'Spellbinding Made Easy' which, although it doesn't cover all the features and functions of Spellbinder, certainly gives the beginner enough information to start word processing in earnest. Edit mode is explained first, in which you can create, insert, change and delete text. Cursor control is provided, on the SuperBrain at least, by the normal arrowed keys. One key allows you to change between various 'cursor modes' — character, word, sentence and paragraph. This relates to the amount of text to be regarded as a single unit when skipping forwards and backwards or deleting using the three appropriate function keys. The mode chosen is permanently displayed at the top of the screen next to the current line and column numbers which tell you exactly where you are in the text. I find it best to stay in 'word' mode since it is quite easy to forget to check the mode before deleting. It's a mite inconvenient when you lose a carefully crafted paragraph by mistake! Another handy function key allows you to move the cursor to the beginning or end of the current line. A character delete key allows you to delete one character at a time regardless of cursor mode and an insert key opens up the text to allow you to enter extra material. A touch on the same key closes the text up again following insertion.

Command mode allows you to make major changes to text, print it and move it to and from disk. The word COMMAND is displayed at the top of the screen in place of the word EDIT. If you try to issue a command while you're in edit mode, then the command simply gets incorporated in your text. If you try to edit while in command mode then the outcome rather depends on whether you accidentally type a valid command. Most of the time, the system will regard your attempted command as gibberish and tell you so. A single key switches you between the two modes. On my 64k SuperBrain, I have room to enter 33894 characters before needing to save some to disk. If you need to find out how much room is left in this buffer command, 'm' does the trick. Right now I've got 28636 letters left to go. Cursor movement commands allow you to move the cursor to the beginning or end of text (beginning could be for printing or saving to disk and end for adding new text) or forward and backwards 'n' lines. For example, b5 will take the cursor back five lines. Two delete commands (d and da) allow you to delete all or part of the text. If you attempt to delete more than 1024 characters, Spellbinder gets suspicious and asks the question REALLY? at the top of the screen. Anything but a Y (for 'yes') will abandon the command. There are plenty of other commands but, for now, we'll move on to disk operations.

The four main disk activities are saving text, deleting files, reading files and asking for a disk directory (a list of all the files on a particular disk). Once

again, the commands are pretty simple — to obtain a directory, type the letter q (for 'query' perhaps?) followed by the letter of the disk drive. Up to seven drives can be handled and they would be lettered from A to G. A listing appears on the screen of all the file names and the space each occupies, followed by the total amount of disk storage used to date. The command 'w' causes text to be written to disk and 'wd' allows the disk file to be closed down, so the most usual way of saving text is to type 'w/wd'. This takes care of everything. It is possible to save just a part of the text by specifying the number of lines from the current cursor position. After issuing the first 'w' command, Spellbinder asks you to name the file to which the text is to be saved. If the file already exists, the system automatically renames the existing file and creates a new one. The renamed file can then be used as a back-up in case anything goes wrong with the new file. During the course of writing an article, I frequently write the text to disk using the same name every time. For example, this article is being stored as SPELL and each time I write a new version of SPELL, the previous version is renamed SPELL.BAK by the system. Any existing SPELL.BAKs are lost on completion of a successful save. The 'qd' command followed by a file name allows you to delete a file from disk. To read a file in, simply type 'r' followed by the filename.

Printing is accomplished with the 'p' command and its variants. It is possible to fool the system into sending text to the screen instead of the printer by using a 'v' (view) instruction. This is very useful for checking that everything is laid out properly before actually committing your work to paper. I find that unless you use this facility, you are almost certain to get the odd heading printed at the foot of a page with its text printed on the following page. Or you may find words here and there that you'd prefer to hyphenate at the end of line. For anyone concerned with obtaining the best possible result first time, the 'v' command is invaluable. The layout of the printed page is dictated by two tables which can be modified using command or edit facilities. One table allows you to define page titles, numbering and spacing at the head and foot of the page, while the other table enables you to define things like the page layout and character treatment. In my case, there wasn't a lot I could do with the characters using the table since I don't have proportional spacing or underlining facilities. I do get round this problem to a certain extent, though, by sending control characters direct to the printer — more about this later on. However, I can easily define the other variables like right justification, lines per page, carriage returns per line, text width and indentation. Headings can be centred, and non-printing remarks and forced page-ends are all possible using some of the 'dot command' options. These are single letter commands which you can place at the beginning of a line and, not surprisingly perhaps, each is preceded by a full stop (dot).

Further facilities

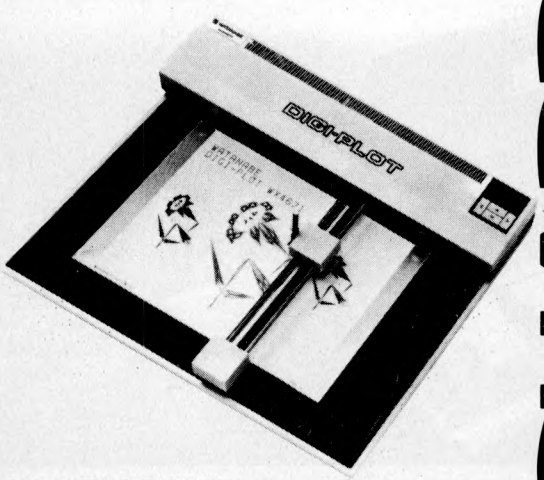
Having dealt with the essential functions, we'll now move on to some of the more esoteric facilities. The first (did I say esoteric?) is the repeat key — on my system I use the decimal point on the numeric keypad. Other users might have to use CTRL-R. To start the repeat, hit the repeat key followed by the character to be repeated; to stop it, hit the repeat key again. One more depression of the repeat key restarts the repeat and so on. To discontinue the repeat function, just hit any key other than the one being repeated. More exciting perhaps is the 'hold' function which allows you to tuck sections of text away into a 'hold buffer' then 'unhold' it anywhere else in the text. If there's space, a copy is left in the hold buffer, so it's sometimes possible to 'unhold' the same text repeatedly. I often use this facility to shift paragraphs around to give my text a better sequence. 'h0' empties the hold buffer and prepares it for a fresh hold command.

Other features covered by the introductory text are tab setting, relining, hyphens, marks, character enhancement and indenting. Tabs can be set at regular intervals by a single command or individually by separate commands. Normally the screen 'wraps around' after 80 characters, taking any half-finished words on to the next line. Relining allows you to redefine the screen width as anything from 16 to 159 characters. The wider screen allows you to set up information in tabular form, for example. As the cursor reaches the 81st character position, the right-hand side of the 'screen' becomes visible. Hyphens come in two varieties: the normal (hard) hyphen which appears as part of the printed text and another, called the soft hyphen, which only comes into play if the word containing it happens to occur at the beginning of a line. If this happens, then Spellbinder will try to print the word up to and including the hyphen at the end of the previous line. This can be useful when a particularly long word causes a large end-of-line gap or weird proportional spacing. Marks are exactly this; they are used to arrest the progress of certain commands. For example, it is possible to hold or delete text up to a mark, or you might want to skip forwards or backwards to a marked spot in the text. I use it most for holding text when I'm doing one of my many reshuffling exercises.

Those with flashy printers will be pleased to hear about the various ways of enhancing text. By using a special character at the beginning and end of the area to be treated, you can underline, boldface, shadow print, slash overstrike (goodness knows why) or dash overstrike (ditto). There are other options but these are the main ones covered in the 'Made Easy' book. Finally, indentation redefines the position of the left-hand edge of text. It is

```
EDIT                          341    0        *WORD*
dive around within the macro and certain system information is made available
for checking.  In particular file status, current cursor position, current
character and current string can all be found and transferred into variables
using the assignment statement.  Messages can be displayed and input accepted
from the screen and the cursor and its associated text can be displayed from
within a macro.  You can include comments in macros so that other people stand
some sort of chance of understanding your brainchild.  I think that it's
probably best if you've had some experience of programming before you have a go
at M-Speak programming.  <
<
@27/069/Who'd use it?<
@27/070/<
        Now you know more about Spellbinder than I did after using it for a
couple of months.  I think that this package has something to offer all our
categories of user.  The writer, of course, will find it a joy to use - it will
probably do just about everything he needs.  The most significant omission as
far as I'm concerned is that it doesn't give a word count.  Since we work out
the layout of PCW, and pay people according to word count, I consider this
omission to be significant!  I'm sure that I could knock up a little macro to
do it but it would be far more convenient to have a built-in function.  I
suppose, while I'm at it, I should bid for an indexing function as well - this
would be especially useful to a text book author.  And, yes, let's go the whole
hog - although I'd never need it (lies - Sub Ed) why not a spelling corrector
```

Above: An important corner of the editor's dining room.
Below: Spellbinder in Edit mode. Note how control codes are sent to the printer.



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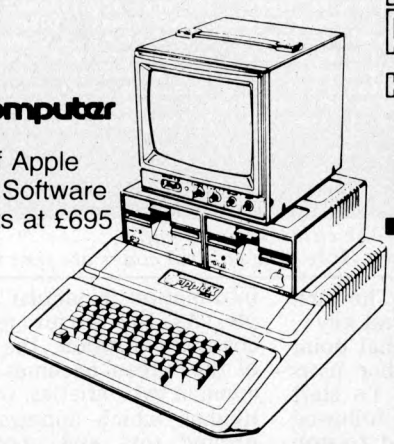

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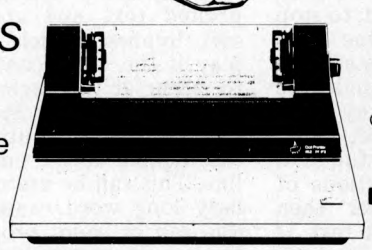

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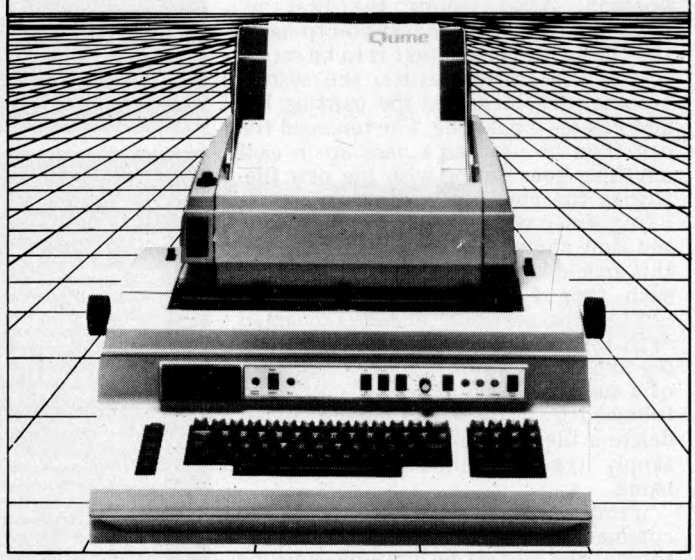

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superior to tabbing because it doesn't fill the unprinted area with spaces. This has two benefits — one is that it saves space and the other is that text can be inserted and deleted within an indented area without affecting the indentation. The same thing in tabbed text would cause the spaces to move around as the text is opened or closed up. The indent is achieved by pressing just one key and, each time you press it, the indentation moves to the next tab stop, taking all the text from the cursor position in the current paragraph along with it. I found this feature ideal when I was drawing up a draft constitution for ComputerTown because it is riddled with clauses and sub clauses.

So ends the beginner's book and very good it is, too. I should think that most people would learn enough from it to get well under way with their word processing. The next two chapters in the manual are reference sections. The first is a quick reference and the second is a more detailed general reference. The quick reference is the bit you'll use most once you get under way, since it lists EDIT and COMMAND instructions, user messages, table entries, dot commands and other special commands which we haven't come to yet.

Right, let's use the quick reference to see what was left out of the 'Made Easy' section. Rewrite is a single key operation which rearranges the screen so that the line containing the cursor becomes the second line displayed. Three major types of command appear in this section — commands which allow you to enter and execute the macro programs mentioned earlier, others which allow you to work on text files which are bigger than the computer's available memory and others which allow you to search through text for specific character strings and replace them if you want to. User messages are listed, together with a full explanation of each and, where appropriate, tips on how to proceed. The table entries relate to printing, as we saw earlier.

The general reference section covers much the same ground as the quick reference, but with much more explanation of each feature, going into the reasons why things are the way they are. I found this most useful once I'd got over the initial shock of having to learn so much in order to master the package. The section is ideal for those who have got the hang of Spellbinder and who now want to ferret out its innermost secrets. One of the first new things you learn in this section is that you have a fair chance of recovering text which you think is still in the computer's memory. Now and again something will go wrong, whether it's finger trouble, a machine fault or a bug in the software, and you'll find yourself sitting outside Spellbinder, probably back in CP/M, just when you least expect it. The answer is to reload Spellbinder and to answer Y to the question OLD FILE? which appears as you enter the package. If it's at all possible to recover the text file in memory, then Spellbinder will do it. And just in case you're worrying, the only times that this has happened to me is when my machine has gone wrong or when I've tried to access a non-existent disk drive. (What am I saying? It's just happened again! I suspect my cooker is sending out all sorts of nasty interference. And when I answered 'Y' I got a right load of rubbish, too. Ah well, thank goodness for backup copies.)

Three types of search are described: simple, discretionary search/replace and automatic search/replace. The first will place the cursor on the first letter of the first occurrence of the string being searched. That's provided that you put the cursor at the top of text before starting. Searching always operates from the current cursor position. Discretionary search and replace gives you the choice of replacing each occurrence of the searched text with a new text, whereas the third option automatically replaces every occurrence with a new string. 'Wildcards' are question marks embedded in the text and allow any character to satisfy the search. For example: '?nd' would result in both 'and' and 'end' satisfying the search argument. Global searches will traverse an entire file from the cursor position forward, including parts which may be on disk. These facilities are jolly useful for correcting misspellings and for expanding abbreviations used through the text. For example, the text used for Benchmarking contains the word 'Microwriter' 50 times. To save time, I entered the abbreviation 'M*' and when the keying was complete I entered an automatic search and replace command to exchange Microwriter for M*.

For those new to the system, it is possible to display a user guide on the bottom eight lines of the screen. This gives the operator a quick reference to the various functions and what keys access them. I certainly found this useful for the first couple of days. Once I'd got used to the keys, I removed the user guide because it restricted my view of the text. Another nice function is the HE command. This allows you to read through a file on disk without losing your place in your work. You could, for example, write a file containing all those odd little functions that you can never seem to remember, or you could even look up facts recorded in another document you might have prepared at another time. When writing ComputerTown News each month, I find it useful to look up the previous month's version because the magazine containing it is usually still being printed.

Sometimes you might use a sequence of commands over and over again. It is possible to carry out these sequences automatically. I often use this feature to print several copies of the same document. By embedding a form advance dot command at the end of a document, I can tell the system to print 'n' copies by issuing the command 'n p/t' the 'n' is the number of copies, the 'p' says I want to print text from memory and the 't' says I want to return the cursor to the top of text after each printing. Almost all commands may be strung together in this way. An 'i' in the command string would allow the operator to intervene after each execution of the instructions preceding it.

It's possible to switch between two alternative print format tables. This is useful if you change stationery regularly between, say, letters and invoices. You can, if you prefer (and I do), build print format tables into the text using our old friends the dot commands. This means that whenever you print a particular document you can be sure that the correct tables are in operation. And there's nothing to stop you sprinkling different tables at different points throughout the same text for some very interesting effects. Titles can be placed at the top or bottom of the page, page numbers can be included which can even be placed in different columns depending on whether the page number is odd or even (if you're wondering what's good about that, look where the *PCW* page numbers are) and the space between pages can be defined and redefined at various places in the text — a very flexible arrangement indeed. If you're writing a book and you write a chapter or two at a time, you can keep the page numbers is ascending order by specifying the starting page number before printing. Once again, you can even redefine it as you go along.

Spellbinder contains all sorts of interesting print options and I only wish I had a nice daisywheel printer to try them out. Here we go with the ones not mentioned already: Downshift and upshift allow you to print subscripts and superscripts. A couple of weirdos called firm hyphen and line tweaker allow you to space lines out neatly, but I'm still trying to figure out how they work. An ASCII transmitter allows you to embed printer control codes in text — ideal for changing character formats on the Epson. Using this facility I can print normal, enlarged and condensed characters either normally, emphasised or double printed — not bad for a low-cost printer, is it? I could even produce low resolution graphics, although I've not tried it yet.

Those of you with daisywheel printers can use a number of special commands comprising an exclamation mark followed by a single letter. If followed by a number between 0 and 7, this replaces the special character entry in the format table with either shadow, underline, slash overstrike, hyphen overstrike, boldface, space instead of character, skip character or ignore an enhancement indicator in the text. A 'p' causes the printing to pause, to change the daisywheel, for example. An 'a' causes a line feed. A 'b' causes a negative line feed. An 'h' causes a backspace. A 'q' changes the ribbon colour to black, while an 'r' changes it to red. Letters 'u' to 'z' can be defined by the user. A proportional spacing table is buried within Spellbinder but, if this doesn't suit you, you can easily define your own and replace the standard one.

The dot commands are used to centre lines, to indicate a title line, to advance the paper (vertical tab and form feed), to negative line feed, to include a non-printing remark, to stop the printer, to redefine format tables and to switch between these tables.

Macros

Nine ready-written macros are supplied with the package. One numbers the lines in a file to correspond to the screen line numbers. This is very handy if you want a document checked by various people before finalising it — they can refer to line numbers when discussing changes and you can go straight to the line when editing the document. Another macro gives a form generation and fill-in capability and a third enables you to extract paragraphs, words and phrases from a 'boilerplate' file and incorporate them into the current docu-

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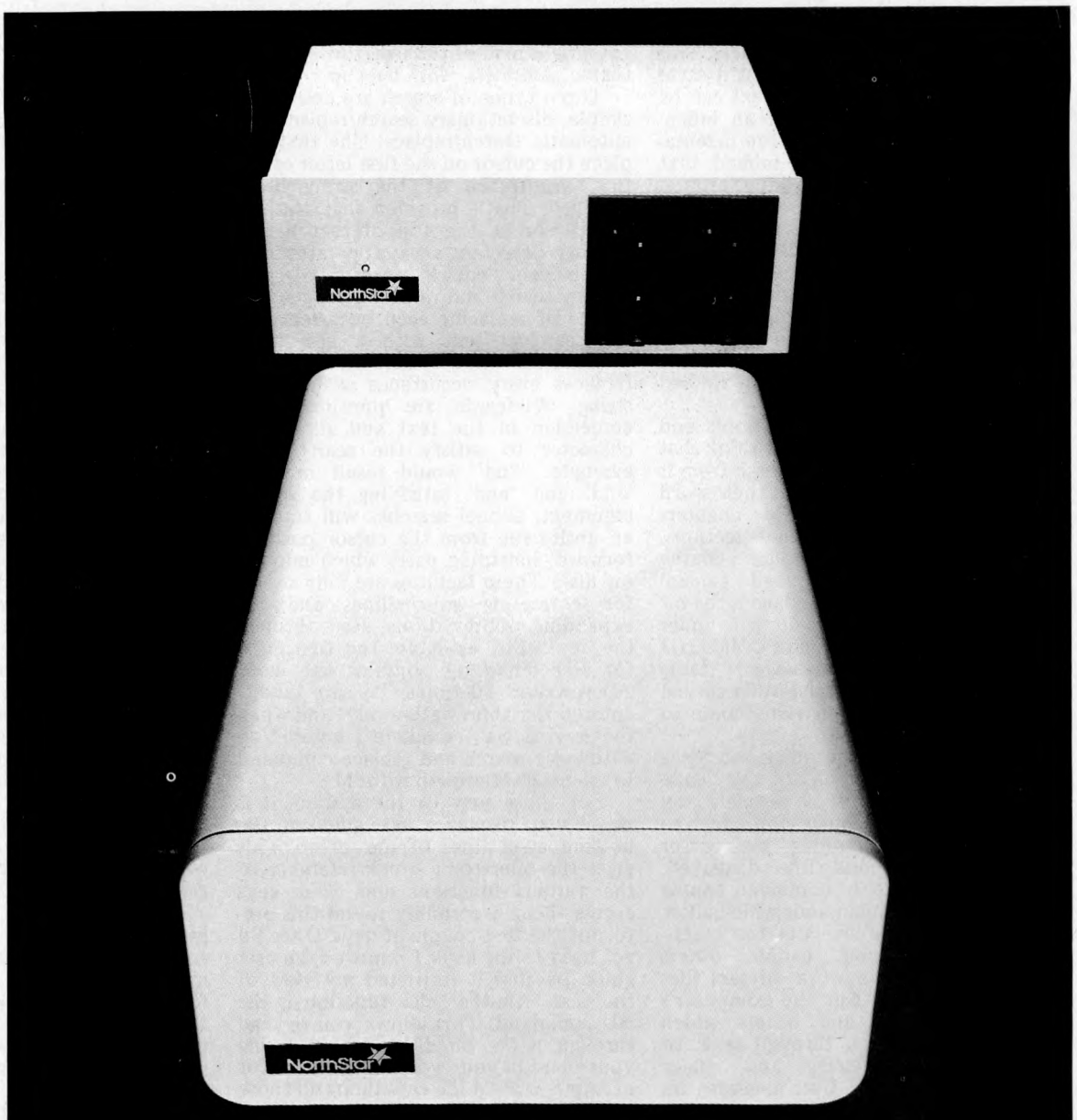

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ment. This would be useful in a variety of situations; one that springs to mind is when creating a contract because you tend to use the same phrases over and over again. Another macro allows you to define a batch of files to be printed and it gets on with the job unattended. Nice if you want to watch a good program on the television. Beware of printer wrecks, though.

Two-column printing is done with a standard macro and three sorts are provided, two of which work with standard format name and address records. These are fine if you want to conform to Lexisoft's idea of a name and address file. The other sort works on any field of any record and sorts the records alphabetically — very useful but, I feel, very slow too. Finally, a mail merge macro enables you to personalise letters by extracting relevant bits from the standard name and address file and incorporating them in your standard letter.

For those who'd like to edit CP/M assembler, MAC or any of the CP/M Basic files, you'll be pleased to hear that special read and write commands exist to ensure compatibility between the two formats.

M-speak

The final section of the manual introduces M-Speak programming so that you can have a bash at creating your own macros. Programs are entered using Spellbinder's edit mode. The M-Speak commands include virtually all the command mode instructions plus a number of special M-Speak commands which I'll come on to in a minute. The macros are manipulated and executed from command mode by a set of four instructions: move macro to or from the macro buffer, execute the macro one or more times, read a macro from disk and execute it and single step through a macro.

It is possible to define up to nine numeric variables and up to 23 string variables using assignment statements similar to those in Basic. I could only find examples of addition and subtraction in the text and I'm not sure if that's the limit of M-Speak's mathematical ability. Strings can be concatenated, truncated, space-filled and enhanced. They can be compared with other strings, their length determined and they can be converted into or derived from numeric variables. Loops in the macros can be created using special indexing facilities to step through alphabetic fields. Branch statements allow you to dive around within the macro and certain system information is made available for checking. In particular file status, current cursor position, current character and current string can all be found and transferred into variables using the assignment statement. Messages can be displayed and input accepted from the screen and the cursor and its associated text can be displayed from within a macro. You can include comments in macros so that other people stand some sort of chance of understanding your brainchild. I think that it's probably best if you've had some experience of programming before you have a go at the M-Speak language.

Who'd use it?

Now you know more about Spellbinder than I did after using it for a couple of months.

I think that this package has something to offer all user categories. The writer, of course, will find it a joy to use — it will probably do just about everything he needs. The most significant omission as far as I'm concerned is that it doesn't give a word count. Since we work out the layout of *PCW*, and pay people according to word count, I consider this omission to be significant! I'm sure that I could knock up a little macro to do it but it would be far more convenient to have a built-in function.

I suppose, while I'm at it, I should bid for an indexing function as well — this would be especially useful to a text book author. And yes, let's go the whole hog — although *I'd* never need it *(lies — Sub Ed)* — why not a spelling corrector built-in as well? The package probably has more than the average manager will ever use, unless he's mad keen on doing his own reports, but his secretary will love it. The fact that the entire package sits in memory allowing you to switch from edit mode to command mode at will makes life very easy compared with some other packages and, on my SuperBrain at least, I can plough on for hours before I start to fill up memory. Let's see now, ah yes — I've still got 7683 characters left to go before I need to worry about popping some of this evaluation on to disk. The fact that the package can run with any printer, from the Sanders through daisywheels to cheapo dot-matrix machines, means that whoever you are and whatever kit you've got, providing you don't mind spending £250 + VAT, Spellbinder has plenty to offer you.

As far as I can tell, Spellbinder has one bug and one fault. The bug is that it is possible, under certain (and rare) circumstances, to create an enormous gap in your text which defies most attempts to get rid of it. It usually happens in insert mode when you're messing around with cursor controls. There are two ways of baling out from this. One is to put a mark on the last line of the gap and to use the delete command (this doesn't always work), the other involves writing the text to disk and reading it back in again. The fault is that the system configuration should include an option to define the number of disk drives being used so that if you enter an invalid drive letter you at least get stopped by Spellbinder and not by CP/M.

Overall, I reckon that Spellbinder is excellent and not at all bad value for money.

The timings which follow reflect the performance of the hardware configuration in conjunction with Spellbinder, rather than giving any absolute measure of the word-processor's performance. The first set of timings relate to a 3000-word text containing 50 occurrences of a word to be replaced. The entire text is held in the memory of the machine.

1. Read from disk	14
2. Write to disk	21
3. Jump from start to end	.5
4. Jump from end to start	instantaneous
5. Replace QQQQQ with Microwriter	12
6. Replace Microwriter with QQQQQ	12

The next two timings are for a 6000-word text containing 100 occurrences of the word to be replaced. Since some of the text overflows the available memory area, this has to be called in from disk during the search and replace operation. The entire text is written to a new file on disk. The timing includes 100 replacements, writing the entire text to a new file and reading in the overflow.

5.	67
6.	66

To print the original 3000-word test text on the Epson MX 80 F/T took 6m 44s. This included headings, right justification, a left margin and an extra line feed between each paragraph.

WRITING FOR PCW

PCW welcomes approaches from would-be writers, even those who may never have appeared in print before. In this game it is often those with practical experience who have important things to say so we don't mind too much if their prose is less than perfect. Providing that submissions have a sensible structure and follow a logical sequence, we can take care of the polishing. Here are some tips:

If the article is already written, simply send it in, making sure that your name, address and 'phone number appear on both the article and the covering letter. If you have submitted the same work to other magazines you should tell us — it would be embarrassing (to say the least) if the same article appeared in more than one.

If you have an idea for an article or a series, write us a letter outlining your ideas. A one or two page synopsis giving the proposed structure, sequence and content will give us a sound basis for discussion. Please give us a daytime 'phone number if possible.

If you have nothing specific in mind but feel qualified to conduct case studies, Benchtests or whatever then drop us a line saying what you'd like to do and why you think you're qualified to do it. We're not particularly looking for strings of academic qualifications — experience carries just as much weight.

Dick Pountain is always on the look-out for interesting calculator features and we wouldn't mind seeing one or two readers getting on their soapboxes but remember: even articles such as this need a structure.

Reading *PCW* will give you a good idea of the style we prefer. You may notice that we try to avoid pomposity at one extreme and flippancy at the other (except in 'Chip Chat', that is).

Finally, have a look through back issue indexes and try not to re-invent any wheels. Oh, we almost forgot — *PCW* does pay for all published work.

AM light pen ...

A true light pen designed for commercial use, the AM pen works directly with normally illuminated pixcels and doesn't need any special software to scan the screen (operational software is supplied).

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The pen comes with one meter of cable and a 5 pin DIN plug; it requires ground + 5 and + 12 to operate.

Outputs it provides are debounced and strobe gated; the pen's speed is typically 500nS and comes with its interface box unit incorporating a board and power supply. The AM light pen is operational with Nascom, Pet, Tandy, Video Genie and the Gemini

AM speech board ...

The self contained speech synthesizer board that uses the National Digitalker MM 54104 chip, two 8K BYTE ROMs, will give you access to a vocabulary of 256 words and sub-sounds. The on-board power amplifier and 2½ speaker makes immediate response to your software instructions possible — that means no extensive re-writes or patching — it gives you speech as easily as display.

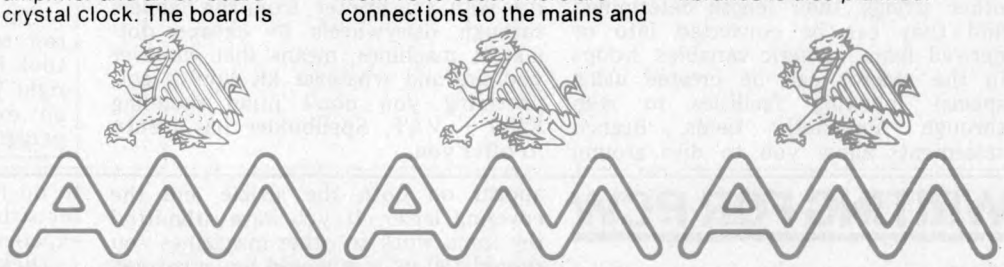
Features include a socket to supply an external speaker or amplifier and an on-board crystal clock. The board is supplied built and tested, and runs to the Nasbus 3 specification .... **£120.00** + VAT

There will be interface boards, available over the next six weeks for Commodore Pets, Apples, Tandy, Video Genie and UK101.

Immediately available is the RS232 interface with an on-board 6402 UART which allows the user adjustable baud rates from 75 to 9600. There are connections to the mains and an RS232 output passed through a DB25 connector.

The two boards are supplied boxed and tested for ..... **£180.00** + VAT

NB. In the last quarter of '81 substitute larger word library ROMs will be available. Expansion to disc based word libraries is also planned.



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PRINTER SURVEY

Brought to you by courtesy of David Tebbutt and Jon Wall.

Each year *PCW* conducts a survey among printer manufacturers, importers and distributors in order to bring you the most up-to-date and comprehensive table of available machines. This year is no exception and on the following pages you will find details of over 140 printers. Below we offer guidance on how to get the most from these tables.

If a feature or function is available on a printer we have put a mark in the appropriate column. This doesn't necessarily mean that it is included in the price, since the price quoted is always the minimum for that particular model. If we know for sure that certain features come extra then we have followed the price with a plus sign. Wherever we have quantified characteristics, we have taken the highest figure. For example, given a range of print speeds, we print the fastest. This has been done to avoid completely filling *PCW* with this survey. Once you have a feel for the sort of machine you're interested in, you can get its details from your dealer or, failing that, the company mentioned in the survey.

Now for the explanations: the supplier is a major importer, manufacturer or distributor. Your local computer store will certainly carry stocks of some of the machines described and even if it doesn't have the particular machine you want, it will probably be able to obtain it for you. We clearly don't have enough room in the survey to list the printers available from each store — it would take up several issues of *PCW*!

We've identified four types of print mechanism. Dot matrix printing is formed by an array of needles fired at the printer ribbon which then impacts on the paper, giving a 'dotty' appearance to the characters. Daisywheel and golf ball printers work by using ready-formed characters cast in metal or plastic. This gives a typewriter or typeset appearance which is obviously much neater. This neatness comes at a price, as you will see. Line printers are so rare in the micro world that we have grouped them together. They are able to print an entire line at a time, either by using a chain, a drum or a 'comb' to form the letters. The chain and drum carry preformed letters which give a neater appearance than the comb, which gives the 'dotty' appearance mentioned earlier.

Where applicable, we have shown the dot matrix format because this will give you an idea of the final print quality. The deeper the matrix, the better the character shape. Some of the smaller matrices can only form y, g and p by perching the descender 'on the line', so to speak. Graphics come in two varieties — high and low resolution. The low resolution are often referred to as 'block' graphics, being small blocks a quarter to a sixth the size of a character. The high resolution graphics are those capable of producing accurate graphs and drawings, for example. Dot matrix printers quite often allow the user to define his own characters, as well as using those included in the printer itself. Daisywheels, golf balls and dot matrix often have the ability to switch between one standard set and another. The 'number of characters' line in the survey gives an indication of this. An entry of 96+, for example, could mean several sets each of 96 characters or it could mean 96 characters plus an option for the user to define his own graphics. The one thing you're certain of in this case is that you get 96 characters minimum, which just happens to be the size of the full ASCII set.

It is probably worth mentioning one or two other features relating to the appearance of the text. True descenders means that the tails of characters hang below the line. Bold means that the character is made to stand out from the others, usually by printing it twice, the second print being slightly offset from the first. Double width is sometimes available on dot matrix printers, giving characters that 'stretched out' appearance. Condensed print again is sometimes available on dot matrix devices and this squashes up the characters so that more can be printed on a line. Super and subscript give the ability to print 'powers' and 'bases' in mathematical notation, for example, while 'other' can include all sorts of facilities such as bar-code printing, special foreign character sets, OCR fonts or whatever. It's simply a clue that there are even more goodies in store on that particular machine.

Moving on to the layout of the printed page, justification relates to the printer's ability to line up the right hand edge of print whether under its own or the computer's control. Proportional spacing separates the words and, sometimes, individual letters evenly to give a neat appearance to each line. Proportional letter spacing gives the best possible appearance to the print.

Speed, characters per line, characters per inch and lines per inch all show the maximum possible for each printer. On some machines this may also be the minimum — you will have to check this out. Some printers have a standard line spacing of six or eight lines to the inch but they also allow a 'micro adjustment' of some small fraction of an inch. A plus sign following the line spacing tells you that some extra control is possible.

You'll find that you may have to pay extra for a tractor feed mechanism, although this is by no means always the case, and price isn't a good guide. Some of the cheapest printers include a tractor mechanism in the basic price. Friction feed is like a typewriter and pin feed is similar, except that the platen has sprockets built in to feed continuous stationery. Horizontal tabbing relates to the printer's ability to move the print head to predefined tab positions, like a typewriter, whereas vertical tabbing allows the machine to pull paper through to predefined vertical positions. A typical example would be of an invoice where, having printed the last detail line, you want to move to the total box to print the invoice value. Bidirectional feed enables the printer to move the paper either forward or backwards and is often found on friction feed printers or those with dual tractors.

Interfaces quite often cost extra and they come in many shapes and sizes. We've covered the main ones here and if you find that every interface type is indicated, then you can be pretty sure that your machine is catered for. The serial interface most commonly relates to the RS232 standard while the parallel often describes the IEEE-488.

If a keyboard is an optional extra, we've said so, but you must bear in mind that it will increase both the price and the dimensions.

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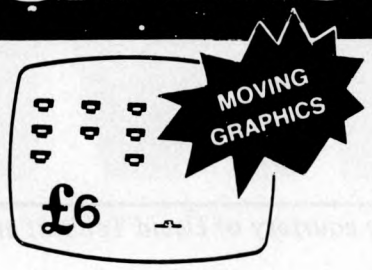
- **3 LEVELS OF PLAY IN EACH GAME**

From easy to dangerously difficult – you'll find it hard to resist the challenge time after time!

- **MOVING GRAPHICS**

No hardware modifications are necessary to get moving graphics. Just follow the instructions for cassette loading and off you go; no extra memory needed.



SUPER INVASION

SUPER INVASION is the machine language game you and your Sinclair have been waiting for. Cruel and crafty invaders have been spotted in battle formation ready to attack with your ship just below them! Quickly and skilfully you shift right and left as you carefully fire your lasers at them. But watch out – they are accurate! 3 levels from easy to almost impossible to beat

- **MACHINE LANGUAGE**

These programs are written in the computer's own language – only this way is it possible for continuous, flicker free action to occur.

- **ALL PROGRAMS ON CASSETTE**

Loads just like any other program on cassette. Each tape contains instructions on how best to load the cassette.

- **FITS IK BASIC MACHINE**

Amazing as it is, all these moving graphics programs fit into your basic IK Sinclair!

3 LEVELS OF PLAY

DOUBLE BREAKOUT

You'll be amazed to see how difficult it is for you to break through the **ZX80 DOUBLE BREAKOUT** – and even more astonished to see this exciting game fit into your IK Sinclair. Try your skill on the easiest level because even with the most skilfull bat control you'll find it hard; to catch at the fastest level! Breaking through the first barricade is easy but don't be fooled for the second – it's much harder than you think! Two ball angles and curved bat will keep the excitement going for hours!

Now only £6 each

THE ESSENTIAL SOFTWARE COMPANY
47 BRUNSWICK CENTRE LONDON WC1N 1AF

I have a ZX80 ☐ Old ROM ☐ New ROM ☐ ZX81 ☐
Please send me ..... copies SUPER INVADERS and copies DOUBLE BREAKOUT.
I enclose cheque/postal order for
Name .....
Address .....
plus 50p post and pack

Access accepted for Mail Order
or phone 01-837 3154

COMPUTING CAN BE FUN

QUALITY PROGRAMS CHOSEN FOR THEIR SUPERB GRAPHICS AND SMOOTH ACTION

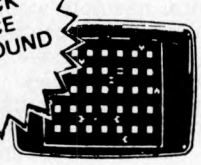
TRS 80

COSMIC FIGHTER WITH SOUND

Your fighter appears Below a convoy of aliens! If you destroy them another set appears who seem to be slightly cleverer than before! Soon your space station nears but before you can dock the station comes under attack! Survival is up to you! The excitement is just beginning!!

TRS80 Levels I & II 16K Tape £10
Video Genie 16K Tape £10

ATTACK FORCE WITH SOUND

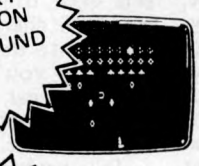


Dodge the alien Ramships and fire missiles to destroy them before they get you. The alien Flagship uses his deadly laser bolt to transform a Ramship into another Flagship or into your ship's double. Look out! Destroy your double and you could destroy yourself.

TRS 80 Level 1 or 11.16K Tape £10
Video Genie EG3003 16K Tape £10

Video Genie

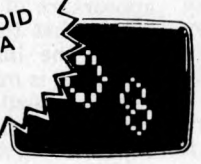
GALAXY INVASION WITH SOUND



The newest and most exciting invaders type game yet! Cruel and crafty aliens attack Earth. You are the sole defender. As you fire your laser at the aliens they swoop down and bomb you. Exciting use of graphics! Must be seen.

TRS 80 Level 1 or 11.16K
Tape £10
Video Genie 16K Tape £10

ASTEROID NOVA



Now the amazing ASTEROIDS arcade game for your TRS80! Your Ship is floating in the middle of an asteroid belt! Your only escape is to destroy them and the crafty alien spacecraft! Blast them with your laser, thrust, rotate or hit hyperspace to survive!

TRS80 Levels 1 & 11.16K
Tape £10
Video Genie 16K Tape £10

3-D ADVENTURES

NEW for TRS80 LEVEL II 16K

A must for all adventure addicts! Walk down corridors depicted in full 3-D graphics. Look around to find the objects you need to survive. But beware! Monsters and Incredible Obstacles can lurk round every corner!

LABYRINTH TAPE £10 DEATHMAZE TAPE £10

LABYRINTH **DEATHMAZE**

THE ESSENTIAL SOFTWARE COMPANY
(Viscounti Ltd.) 01-837 3154
47 Brunswick Centre, London WC1N 1AF

I have a ..... microcomputer
☐ Please send me your software catalogue. I enclose a stamped self addressed envelope.
☐ Please send me .....
I enclose a cheque/postal order for £ .....
(plus 50p post & packing)

Signature .....
Name .....
Address .....
Postcode .....
My ACCESS No. is .....

PRINTER SURVEY

Supplier/tel	Access Data Communications 0895-30831	Anadex Ltd 025672 3401								Centronics 01-581 1011				
Model	Wenger Swiss Matrix	DP-9501	DP-1000	DP-8000	DP-9500L	DP-9500	DP-9001	DP-9000L	DP-9000	700	701	702	703	703G
Price in £ ex VAT	750	995	400	495	795	895	895	695	795	poa	poa	poa	poa	poa
Print Mechanism														
Dot matrix	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Daisywheel														
Golf ball														
Line														
Matrix	7x7	11x9	5x7	9x7	7x9	9x9	11x9	7x9	9x9	9x7	9x7	9x9	9x9	9x9
Graphics	●	●				●	●		●					●
No of ch/symbols	96+	96	65	96	96	96	96	96	96	96	96		96	96+
True descenders		●			●	●	●	●	●					
Underlining		●			●	●	●	●	●					
Features														
Bold	●													
Double width	●	●	●	●	●	●	●	●	●					
Condensed	●	●				●	●		●					
Super/subscript														
Other										●	●	●	●	●
Justified	●													
Prop spacing	●													
Max speed (cps)	100	200	40	112	150	200	200	150	200	60	60	120	150	120
Max Ch/line	132	220	40	80	132	175	132	80	180					
Max Ch/in	var	16.7	12	10	10	13.3	16.7	10	13.2	16.5	10	10	10	10
Max Line/in	var	8	6	6	8	8	8	8	8	6	6	8	8	8
Paper width (ins)														
Min	3	1.75	2.25	3.5	1.75	1.75	1.75	1.75	1.75					
Max	10	15.6	4	9.5	15.6	15.6	9.5	9.5	9.5					
Form length (ins)														
Min	3			.5										
Max	12	42.5		15.5	42.5	42.5	42.5	42.5	42.5					
Paper feed														
Tractor	●	●			●	●	●	●	●	●	●	●	●	●
Pin	●			●										
Friction			●											
Tab														
Horiz	●	●			●	●	●	●	●	●	●		●	●
Vert	●	●		●	●	●	●	●	●	●	●		●	●
Bidirectional feed	●	●			●	●	●	●	●					
Paper out sensor	●	●		●	●	●	●	●	●	●		●	●	●
Interface														
Serial	●	●	●	●	●	●	●	●	●					
Parallel		●	●	●	●	●	●	●	●					
Centronics	●	●	●	●	●	●	●	●	●	●	●	●	●	●
20 mA	●	●	●	●	●	●	●	●	●					
Other														
Keyboard	opt													
Size (cms)														
Width	25	68	28	47	68	68	56	56	56	62	62	62	62	60
Depth	15	39	41	36	39	39	39	39	39	50	50	50	50	50
Height	4	21	15	18	21	21	21	21	21	20	20	20	20	20
Weight (kgs)	10	16	7	10	16	16	13.6	13.6	13.6	27	34	34	34	27

Supplier/tel	Centronics 01-581 1011								Dacoll Engineering Services Ltd 0506-56565					Datac Ltd 061-941-2361/2
Model	704	753	761	792	730	737	739	150	Proportional IMP	DL 120 IMP	DL 180 IMP	737	6080	Sprinter 40
Price in £ ex VAT	poa	poa	poa	poa	poa	poa	poa	poa	1655	1350	1455	399	4270	269
Print Mechanism														
Dot matrix	●	●	●	●	●	●	●	●	●	●	●	●		●
Daisywheel														
Golf ball														
Line													●	
Matrix	9x9	9x9	7x7	5x7	7x7	Nx9	Nx9		Nx9	9x9	9x9	Nx9		5x7
Graphics							●				●		●	●
No of ch/symbols	96	96	96		96	96	96	96	192	96+	96+	96	128	96
True descenders						●	●		●	●	●	●	●	
Underlining						●	●		●	●	●	●	●	
Features														
Bold														
Double width						●	●		●	●	●	●		
Condensed												●		
Super/subscript							●					●		
Other	●	●	●											
Justified						●	●		●	●	●	●	●	●
Prop spacing		●				●	●		●			●		
Max speed (cps)	150	150	60	120	100	80	100		150	120	180	50	1320	160
Max Ch/line									132	132	132	132	132	40
Max Ch/in	10	10	10	10	17	17	17	10	10	10	10	16.5	10	10
Max Line/in	8	8	6	8	6	6	6		8	8	8	6	8	7
Paper width (ins)														
Min									4	4	4	3.5	4	
Max									17.3	17.3	17.3	9.5	16.3	
Form length (ins)														
Min													2	
Max													15.5	
Paper feed														
Tractor	●	●	●	●	●	●	●	●	●	●	●		●	
Pin					●	●	●					●		
Friction					●	●	●	●				●		●
Tab														
Horiz	●	●							●	●	●			
Vert	●	●							●	●	●		●	
Bidirectional feed						●	●					●		
Paper out sensor				●			●	●	●	●			●	
Interface														
Serial					●		●	●	●	●	●	●	●	●
Parallel					●	●	●		●	●	●	●	●	
Centronics	●	●	●	●	●	●	●	●	●	●	●	●	●	●
20 mA							●		●	●	●	●		
Other							●		●	●	●		●	
Keyboard			●						opt	opt	opt	opt		
Size (cms)														
Width	62	62	62	50	37	37	37	38	62	62	62	37	88	27
Depth	50	50	62	46	28	28	28	35	46	46	46	28	75	19
Height	20	20	65	20	13	3	13	15	20	20	20	13	100	10
Weight (kgs)	27	34	29	20	5	5.4	5.4	10	27	27	27	5.4	172	1.7

Supplier/tel	Datac Ltd 061-941 2361/2								Dataplus Ltd 0242-37373/30030		Dataproducts Ltd 0734-585723			
Model	Sprinter 20	Datac 312	Datac 412	Centronics 737	Centronics 739	Centronics 150	Datac 522	Datac 522 VT (View-data)	Scripta KSR	Scripta R.O	D50	M100	2470	2550
Price in £ ex VAT	175	269	269+	399+	425+	499+	525+	750	998	poa	oem	oem	oem	oem
Print Mechanism														
Dot matrix	●	●	●	●	●	●	●	●				●		
Daisywheel									●	●	●			
Golf ball														
Line													●	●
Matrix	7x5	5x7	5x7	9xN	9xN	7x5	5x7	240x280						
Graphics	●			●	●	●		●		●	●	●		●
No of ch/symbols	96+	96+	96	96	96	96+	128	var	96	96	96	128	96	256
True descenders				●	●			●	●	●	●	●	●	●
Underlining				●	●	●		●	●	●	●	●	●	●
Features														
Bold			●				●	●		●				
Double width				●	●	●	●	●				●		
Condensed				●	●			●			●	●		
Super/subscript				●	●	●		●		●				
Other				●	●	●		●	●	●				
Justified	●	●		●	●			●	●	●		●	●	●
Prop spacing				●	●					●	●			
Max speed (cps)	40	35	64	80	100	150	35+	66	15	15	50	140	2640	1200
Max Ch/line	20	20	32	132	132	132	40	40	139	139	132	132	132	132
Max Ch/in	10	10	16	16.7	16.7	16.4	10	10	12	15	10	100	10	10
Max Line/in	6	6	6	6		6	6	9	6	6	8	8	8	8
Paper width (ins)														
Min						6.9			4	4		3	5.125	5
Max				8.5	8.5	9.8			13	13	15	23	23	23
Form length (ins)														
Min											12	3	3	3
Max											14	14	14	14
Paper feed														
Tractor				●	●	●	●	●	●	●	●	●	●	●
Pin				●	●	●								
Friction	●	●	●	●	●	●	●	●	●	●	●			
Tab														
Horiz									●		●			
Vert				●	●						●	●	●	●
Bidirectional feed				●	●				●	●				
Paper out sensor				●	●	●						●	●	●
Interface														
Serial	●	●	●	●	●	●	●		●		●	●		
Parallel			●	●	●		●				●	●	●	●
Centronics	●		●	●	●	●				●		●		
20 mA		●	●				●		●		●	●		
Other			●					●						
Keyboard									●		●			
Size (cms)														
Width	19	22	22	37	37	38	31	31	53	53	62	67	37	123
Depth	13	33	19	28	28	36	42	42	43	30	51	59	43	62
Height	8	10	10	13	13	16	13	13	16	16	23	20	117	117
Weight (kgs)	1.5	2	1.5	5.4	5.4	9	8	8	13.8	12	28.2	27.1	363.2	363.2

CODIFIED COMPUTER SYSTEMS

DAI

£595 Personal Computer with high specification & "real world" expansion.
Easy to program 16 colour graphics with sound.
Socket for printer on RS232 port, also stereo output.
DAI "real world" industrial control Eurocards plug into the DCE bus.
The machine has 48K and a thriving user group is providing software.
As the CPU is the 8080, CP/M (TM) and discs arrive in a couple of months.

OSCAR

£2495 British made commercial computer (with 800K diskette storage)
By Interactive Data Systems of Milton Keynes. Providing as standard 64K, Z80 CPU card with 2 serial ports and 2 spare slots in its S100 bus. Discs are 8", 5" or Winchester. The CP/M operating system means that a mass of written software and facilities are available in addition to the supplied software for sales, purchase & nominal ledgers plus payroll.

PERT

£205 Program for PETS. 1200 activities under 400 cost codes
Keyboard entered networks give a critical path, fixed & free float and earliest/latest start/finish times. Reports (screened or printed) give activities in node/calendar sequence, with float selection by cost code and period. Activity costing & targeting included. Demonstrations available.

S100 Cards

Interactive Data Systems

£235	**SBMC**	An S100 single board microcomputer card with 4MHz Z80A, 1K RAM, sockets for EPROM, 2 serial ports, Z80 CTC.
£105	**Z80 CPU**	A 4MHz Z80A CPU card with the S100 interface circuitry.
£450	**64K DRAM**	64Kbytes dynamic RAM (4116) with bank select, 8 or 16 bit operation, each 4K block deselectable, 24 bit addressing.
£198	**16K SRAM**	16Kbytes static RAM (low power 2114's)
£114	**8K SRAM**	8Kbytes static RAM.
£198	**D.F.D.C.**	Floppy disc controller, single/double density, single/double sided mixed 5¼" and 8" drives, up to 4 in total.
£223	**PCI 10**	A mixture of opto-isolated, analogue and TTL inputs; relay, analogue and TTL outputs.
£32.50	**TERM 40**	Active Termination Board.
£265	**VID 1**	I/O mapped V.D.U. controller with Centronics printer port.
£155	**PSU**	Complete S100 power supply.
£88	**PSUC**	Power Supply Card.
£75	**PSUT**	Power Supply Transformer, bridge, capacitor, cables.

Dual

£135	**CLK-24CPU**	An S100 real time clock-calendar card with a battery on the card giving a typical readout like THURS 8-1-81 3:55:21
£355	**AIM-12**	An S110 A/D card with 16 or 32 input channels giving 12 bit resolution and accuracy.
£245	**AOM-12**	An S100 D/A card with 4 output channels/actuators with an accuracy of 12 bits +/− 0.5Lsb.
£165 4K £290 8K	**CMEM**	An S100 CMOS 200ns memory card working at 4MHz. The battery back up will enable data or program to be held for up to a year.

Matrox

£176	**ALTR2480**	An S100 TV CRT controller displaying 24 × 80 of alpha or graphic data.
£235	**ALT256**	An S100 256 × 256 graphics controller stackable for multiple grey/colour effects using X-Y addressing
£343	**ALT512**	As the card described above but 2 graphics modes, 512 × 256 or 256 × 256 × 2 giving live animation effects.

15 Newington Green,
London. N16. Tel. 01 254 7419

Micro Computer systems,
S100 IEEE Cards & Peripherals.

Codified Computer Systems
supply British in London.

Supplier/tel	Dataproducts Ltd 0734-585723									Data Type Terminals Ltd 01-580 8841/ 06333-69162		DRG Business Machines 0934-416392		
Model	**T80**	**M120**	**M200**	**B300**	**B600**	**B900**	**2230**	**2260**	**2290**	**Infoscribe 500**	**Infoscribe 150**	**Seikosha GP80A**	**Citizen 5800**	**Starwriter FP-1500-25**
Price in £ ex VAT	oem	oem	oem	oem	oem	oem	oem	oem	oem	975	975	225	1475	1085
Print Mechanism														
Dot matrix	●	●	●							●	●	●	●	
Daisywheel														●
Golf ball														
Line				●	●	●	●	●	●		●			
Matrix	7x5	7x5	7x5							9x9	9x9	5x7	9x9	
Graphics	●											●	●	●
No of ch/symbols	96	128	128	96	96	96	96	96	96	96+	96+	128	96	96
True descenders				●	●	●	●	●	●	●	●		●	●
Underlining	●	●	●	●	●	●	●	●	●	●	●		●	●
Features														
Bold										●				
Double width		●	●							●	●	●	●	
Condensed		●	●	●						●	●		●	
Super/subscript										●	●			
Other														
Justified	●	●	●		●	●	●	●	●					
Prop spacing														
Max speed (cps)	80	180	340	660	1320	1980	680	1360	2040	150	150	30	180	25
Max Ch/line	80	132	132	132	132	132	136	136	136	136	224	80	136	136
Max Ch/in	10	10	10	10	10	10	10	10	10	16.5	16.5	12	16.5	10
Max Line/in	6	8	8	10	10	10	8	8	8	8	8	9	8	6
Paper width (ins)														
Min	8.75	3	3	3	3	3	4	4	4	1.5	1.5	4.5	5	
Max		23	23	23	23	23	23	23	23	16	16	8	17	15
Form length (ins)														
Min		3	3	3	3	3	3	3	3	11	11			
Max		14	14	14	14	14	14	14	14	12+	12	12	16.5	11
Paper feed														
Tractor		●	●				●	●	●	●	●	●	●	●
Pin				●	●	●								
Friction	●											●		●
Tab														
Horiz										●			●	●
Vert		●	●	●	●	●	●	●	●	●	●		●	●
Bidirectional feed													●	●
Paper out sensor	●	●	●	●	●	●	●			●	●		●	●
Interface														
Serial	●	●	●	●	●	●				●	●	●	●	●
Parallel	●	●	●	●	●	●	●	●	●	●	●	●		
Centronics		●	●	●	●	●				●	●	●	●	●
20 mA	●	●	●	●	●	●				●	●	●		
Other											●	●		
Keyboard														
Size (cms)														
Width	37	67	67	77	77	77	84	84	84		26	33	63	62
Depth	43	59	59	64	64	64	66	66	66		15	17	40	38
Height	18	20	20	38	38	38	114	114	114		7	13	21	26
Weight (kgs)	10	27.1	27.1	69	69	69	168	168	168		14.51	2.5	30	19.5

Supplier/tel	Epson (UK) Ltd 01-422 5612/4										Facit-Addo Ltd 0634-401721			
Model	MX 80T	MX 80 F/T - 1	MX 80 F/T - 2	MX 82 printer/	MX 85	MX 100	TX 80 T or F	512 mech-anism	210 mech-anism	150 mini mech-anism	4520/1	4525	4526	4530
Price in £ ex VAT	360	399	449	415	tba	575	299	poa	poa	poa	583	890	1052	1900+
Print Mechanism														
Dot matrix	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Daisywheel														
Golf ball														
Line														
Matrix	9x9	9x9	9x9	9x9	9x9	9x9	5x7	9x7	7x9	5x7	9x7	9x9	9x9	5x7
Graphics	●	●	●	●	●	●	●	●						
No of ch/symbols	160+	160+	96+	96+	148	96+	159	prog	prog		109	96+	96+	64
True descenders	●	●	●	●	●	●						●	●	
Underlining	●	●	●	●	●	●						●	●	●
Features														
Bold	●	●				●						●	●	●
Double width	●	●	●		●	●	●				●	●	●	●
Condensed	●	●	●		●	●						●	●	●
Super/subscript	●	●												
Other	●													●
Justified								●						
Prop spacing														
Max speed (cps)	80	80	80	80	80	80	150	120		16	100	150	150	220
Max Ch/line	132	132	132	159	132	226	80	40		16	80	132	224	132
Max Ch/in	16½	16½	16½	19.8	16½	16½	10	12			12	17	17	10
Max Line/in	var	var	var	var	var	var	6	6		6	6	8	8	6
Paper width (ins)														
Min	4	4	4	4	4	4	4					3	3	4
Max	10	10	10	10	10	15.5	10	3.5	3	2	8.5	11.5	15	14.87
Form length (ins)														
Min														
Max							11				12	12	12	12
Paper feed														
Tractor	●	●	●	●	●	●	●					●	●	●
Pin								●	●		●			
Friction		●	●		●	●	●	●	●	●	●			
Tab														
Horiz	●	●				●						●	●	●
Vert	●	●				●					●	●	●	●
Bidirectional feed											●			●
Paper out sensor	●	●	●	●	●	●	●	●	●		●	●	●	●
Interface														
Serial	●	●	●	●	●	●	●				●	●	●	●
Parallel	●	●	●	●		●	●				●		●	●
Centronics	●	●	●	●		●	●				●	●	●	●
20 mA											●	●	●	●
Other	●	●	●	●		●	●				●			
Keyboard														●
Size (cms)														
Width	37	37	37	37	37	61	41	17	12	7	37	46	61	66
Depth	31	31	30	30	30	38	32	16	13	4	35	36	36	25
Height	13	13	13	13	13	13	19	9	7	1	15	18	18	25
Weight (kgs)	7	7	7	7	7	9.2	9.5	1.7	.8	.6	9.5	13.5	15.9	29.5

Supplier/tel	Facit-Addo Ltd 0634-401721					Heath Electronics (UK) Ltd (0452) 29451	Integrex Ltd 0283-	ISG Data Sales Ltd 07535-57955					C. Itoh & Co Ltd 01-353 2463	
Model	4542	RO 45	RO/55	KSR 45	KSR 55	WH 14	CX 80 Colour	Qume Sprint 9	Qume Sprint 5 Wide Track	Qume Sprint 5	Agile 4200	DS 180	8500	GP80A
Price in £ ex VAT	3000	1762	1889	1986	2113	471	895	1553+	poa	1805	2332	1250	450	199
Print Mechanism														
Dot matrix	●					●	●					●	●	●
Daisywheel		●	●	●	●			●	●	●	●			
Golf ball														
Line														
Matrix	9x14					5x7	6x7					9x7	7x9	5x7
Graphics	●	plot	Plot	Plot	Plot		64	●	●	●	●	●	●	●
No of ch/symbols	512+	96+	96	96	96	96	175	96	●	96	96	96	256	lots
True descenders	●	●	●	●	●			●				●	●	
Underlining	●	●	●	●	●			●	●	●	●	●	●	
Features														
Bold	●	●	●	●	●			●			●	●	●	
Double width	●					●	●	●				●	●	●
Condensed	●	●	●	●	●	●						●	●	
Super/subscript	●	●	●	●	●			●			●		●	
Other	●							●					●	
Justified	●	●	●	●	●		●				●			
Prop spacing	●	●	●	●	●			●	●	●	●		●	
Max speed (cps)	250	45	55	45	55	165	125	55	40	55	55	180	100	30
Max Ch/line		158+	158+	158+	158+	132	80	158	316	158	158	132	80	80
Max Ch/in	var	15+	15+	15+	15+	16.5	10	15	15	15	12	10	17	12
Max Line/in	var	8+	8+	8+	8+		8+	8	8	8	8	8	6+	6+
Paper width (ins)														
Min	2					2.5	4					4	4.5	4.5
Max	17.8	13.2	13.2	13.2	13.2	9.5	10	15	28	15	15	15	10	8
Form length (ins)														
Min		3	3	3	3		.14	3	3	3	3	.16		
Max		14	14	14	14	9.5	42.5	14	14	14	14	22	12	
Paper feed														
Tractor	●	●	●	●	●		●	●	●	●	●	●		
Pin		●	●	●	●			●	●	●	●		●	●
Friction		●	●	●	●	●		●	●	●	●		●	
Tab														
Horiz	●	●	●	●	=	●		●	●	●	●	●	●	
Vert	●	●	●	●	●	●		●	●	●	●	●	●	
Bidirectional feed	●	●	●	●	●			●	●	●		●	●	
Paper out sensor	●	●	●	●	●		●	●	●	●	●	●	●	●
Interface														
Serial	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Parallel	●	●	●	●	●		●	●	●	●			●	●
Centronics	●						●			●	●	●	●	
20 mA	●	●	●	●	●	●	●	●	●				●	●
Other	●						●				●	●		●
Keyboard	opt									opt	●			
Size (cms)														
Width	64	60	60	60	60		41	62	93	60	59	61	40	33
Depth	46	48	48	64	64		32	43	34	48	54	41	28	17
Height	25	19	19	19	19		19	17	18	19	21	18	12	13
Weight (kgs)	40	20	20	22.5	22.5	11	9.6	20	16.9	20	21	15.9	8.5	2.5

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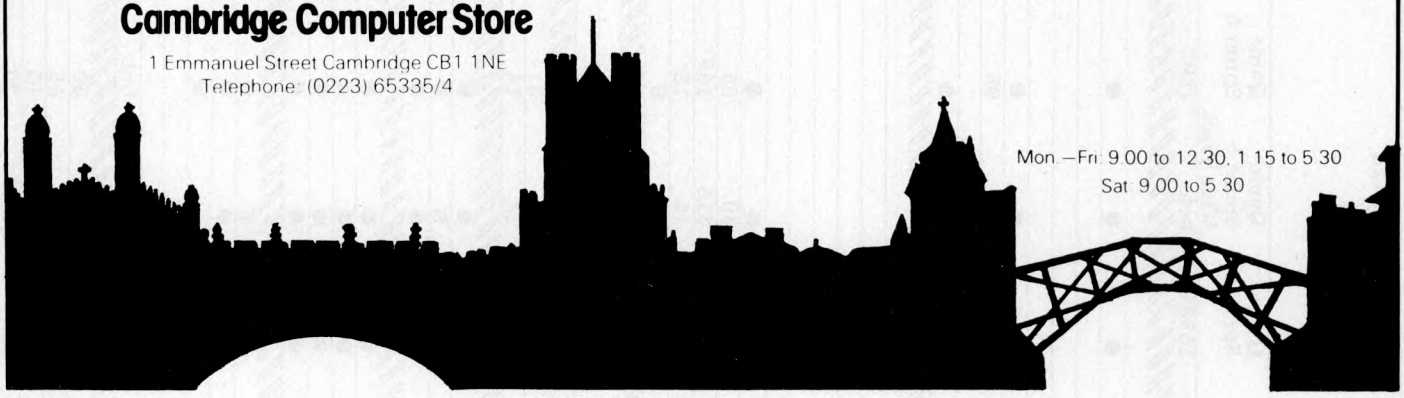

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Supplier/tel	C. Itoh & Co Ltd 01-353 2463					Kingston Computers Ltd (0723)-514141	MBS Terminals 09323-52937					Micro Peripherals 0256-56468		
Model	5800	8300	1541	8000 series	FP-1500	8300 P	Honeywell L31	Honeywell L11	Honeywell 510	Honeywell 530	Century RO	MX 100 FT	MX 80 F/T - 2	MX 80 F/T - 1
Price in £ ex VAT	poa	400	550	poa	1000	295	poa	poa	poa	poa	945	575	449	399
Print Mechanism														
Dot matrix	●	●	●			●	●	●	●	●	●	●	●	●
Daisywheel					●									
Golf ball														
Line				●										
Matrix	9x9	9x7	9x7			5x7	7x7	7x7	7x7	7x7	7x9	9x9	9x9	9x9
Graphics	●											●	●	●
No of ch/symbols		157+	157+	128+	96	96		136	136	136	192	160+	96+	160+
True descenders	●										●	●	●	●
Underlining						●		●			●	●	●	●
Features														
Bold							●	●			●	●		●
Double width	●	●	●			●	●	●			●	●	●	●
Condensed	●	●						●			●	●	●	●
Super/subscript	●											●		●
Other	●	●	●	●										
Justified							●	●	●	●				
Prop spacing					●									
Max speed (cps)	180	125	125	960	40	125	100	100	80	80	112	80	80	80
Max Ch/line	136	132	136	132	163	80	132	132	80	132	96	233	132	132
Max Ch/in	16.5	16.5	10			10	10	16	10	10	12	var	16½	16½
Max Line/in	12	6	6	8		6	8	8	6	6	6	var	var	var
Paper width (ins)														
Min	5			6		4.5	3	4	4	4	2	4	4	4
Max	17		15	17	13.5	9.5	15	10	10	15	9.5	15.5	10	10
Form length (ins)														
Min	12						3	4	4	4	.5	4		
Max	16	12	12				22	22	22	22	16	var		
Paper feed														
Tractor	●			●	●		●	●	●	●	●	●	●	●
Pin		●	●		●	●					●			
Friction					●						●	●	●	●
Tab														
Horiz	●				●	●					●	●		●
Vert	●	●	●		●	●				●	●	●		●
Bidirectional feed						●								
Paper out sensor	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Interface														
Serial	●	●	●	●	●		●	●	●	●	●	●	●	●
Parallel	●	●	●	●	●	●	●	●			●	●	●	●
Centronics	●	●		●	●		●	●			●	●	●	●
20 mA	●	●	●	●	●				●	●	●	●		
Other													●	●
Keyboard								●				●		
Size (cms)														
Width	63	45	56	77	62	45	21	16	16	21	37	37	37	37
Depth	40	37		69	38	37	12	12	12	12	47	30	30	31
Height	21	18	19	106	26	18	7	7	7	7	14	11	13	13
Weight (kgs)	28	10	14.5	180	19.5	10	12	9	9	12	10	5.5	7	7

Supplier/tel	Micro Peripherals 0256-56468					Millbank Computers Ltd 01-788 1083	Mitsui Machinery Sales (UK) Ltd 01-397 5111	Nexos (UK) Ltd 0844-213151				Northamber Ltd 0372-62071/2		
Model	MX 82	MX 80T	MX 70	Seikosha GP-80	Anacom 150	Olivetti PR430/ DY 3111	ASP 35000T	Dolphin BD136	DP 1800	DP 1200	Nexos Ricoh RP1600	Oki Micro-line 83A	Oki Micro-line 82A	Oki Data Slimline series
Price in £ ex VAT	389	359	259	199	699	1250		1500	1500		1420+	799	399	1699
Print Mechanism														
Dot matrix	●	●	●	●	●		●	●	●	●		●	●	
Daisywheel						●					●			
Golf ball														
Line														●
Matrix	9x9	9x9	5x7	5x7	9x9		7x17	9x9	9x9	9x7		9x9	9x9	9x9
Graphics	●	●	●	●		●	9x17	●	●	●	●	●	●	opt
No of ch/symbols	96+	160+	160	96+	96	100	181+	192+	192+	170	128+	96	96	96
True descenders	●	●			●	●	●	●	●		●	●	●	●
Underlining	●	●	●			●	●	●	●	●	●			
Features														
Bold		●				●			●	●	●			
Double width		●	●	●	●		●	●	●	●	●	●	●	
Condensed		●					●	●	●	●	●	●	●	
Super/subscript		●				●			●		●			
Other		●									●			
Justified						●		●	●		●			
Prop spacing						●	●	●	●		●			
Max speed (cps)	80	80	80	30	150	38	180	240	240	125	60	120	120	300
Max Ch/line	159	132	80	80	136	300	136	246	226	132	163	136	80	132
Max Ch/in	19.8	16½	10	12	10	15	16.5	20	16.67	16.5	12			10
Max Line/in	var	var	6	9	8	6+	12	9	9	6	6+	8	8	8
Paper width (ins)														
Min	4	4	4	4	1.5		5	4	5	2.5	13			5
Max	10	10	10	8	15	17.25	16	15	15	10	15			16
Form length (ins)														
Min			11	6					1.5	1.1	3			
Max				11	11				17	12	17	15		
Paper feed														
Tractor	●	●	●	●	●	●			●		●	●		●
Pin							●	●		●	●		●	
Friction						●	●				●	●	●	
Tab														
Horiz		●			●	●		●	●		●	●	●	●
Vert		●			●	●	●	●	●		●	●	●	
Bidirectional feed						●					●			
Paper out sensor	●	●			●	●	●	●	●	●	●	●	●	●
Interface														
Serial	●	●	●		●	●		●	●	●	●	●	●	●
Parallel	●	●	●		●					●	●		●	●
Centronics	●	●	●	●	●		●	●	●	●	●	●	●	●
20 mA						●	●		●		●	●	●	●
Other	●	●	●							●	●			●
Keyboard														
Size (cms)														
Width	37	37	37	33	59	60	61	65	65	53	62	51	36	58
Depth	30	31	30	17	42	45	40	51	51	42	35	33	33	56
Height	13	13	11	13	19	22	19	22	22	18	20	13	13	22
Weight (kgs)	7	7	5.5	2.5	15.5	18	19	24	22	12	14.5	14	9	38.6

Supplier/tel	Northamber Ltd 0372-62071/2			Penny & Giles Data Recorders Ltd (04252) 71511		Pertec International 0734-582115			Roxburgh Printers Ltd Rye 3777				Russet Instruments Ltd 0734-868147	Texas Instruments Ltd Bedford 67466
Model	Anacom 150	Qantex 6000	Qantex 6010	310	Robotron	P80	P250	P360 Stylist	RP 8040	RP 8021	8480C	X80SP printer/ plotter	MPI 88G	WM2000
Price in £ ex VAT	799	749	899	1170	poa	poa	poa	poa	182	163	poa	795	420	tba
Print Mechanism														
Dot matrix	●	●	●	●		●	●		●	●	●	●	●	●
Daisywheel		●			●									
Golf ball														
Line														
Matrix	9x9	9x9	9x9	9x7		7x9	7x9		9x7	5x7	9x7	8x8	7x11	9x9
Graphics						●	●				●	●	●	●
No of ch/symbols	96	96	96	128	96	96+	288	100+	64	64	96	128+	192	170
True descenders	●	●	●	●		●	●	●						●
Underlining		●	●			●	●	●				●		●
Features														
Bold	●												●	
Double width	●	●	●			●	●				●	●	●	●
Condensed						●	●				●	●	●	●
Super/subscript														
Other												●	●	
Justified								●					●	
Prop spacing								●			●			
Max speed (cps)	150	150	150	180	40	80	250	17	48	52	80	100	100	120
Max Ch/line	132	136	132	136	252	120	198	198	40	21	132	96	132	132
Max Ch/in	10	10	10		12	15	15	15	12	12	16.7	10	16.5	16.5
Max Line/in	8	8	8	8		6	8	6	6	6	12	8	8	8
Paper width (ins)														
Min	3	2	3						4.5	2.25	3	9.5	1	2.5
Max	15	15.5	15.5	16		10	15.75	15.5	4.5	2.25	10	9.5	9.5	9.5
Form length (ins)														
Min		11	3									8.25		.37
Max	11	11	22	24			42.5					9	14	11.3
Paper feed														
Tractor	●	●	●	●			●	●			●		●	
Pin						●			●	●		●		●
Friction					●	●		●	●	●	●	●	●	●
Tab														
Horiz			●	●	●	●	●	●				●		●
Vert			●	●	●	●	●	●				●		●
Bidirectional feed				●	●	●	●	●				●		●
Paper out sensor	●	●	●	●		●	●							●
Interface														
Serial	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Parallel	●	●	●	●	●			●	●	●	●	●	●	●
Centronics				●		●	●	●			●	●	●	●
20 mA		●	●	●		●	●				●	●	●	
Other			●								●	●	●	●
Keyboard														
Size (cms)														
Width	59	62	62	27		41	61	52	23	23	39	49	41	
Depth	42	41	41	20		26	45	32	30	30	31	31	27	
Height	19	18	18	8		15	21	17	10	10	12	14	16	
Weight (kgs)	15.5	18.2	18.2	22.6		7.5	25	13				9.5	6.75	

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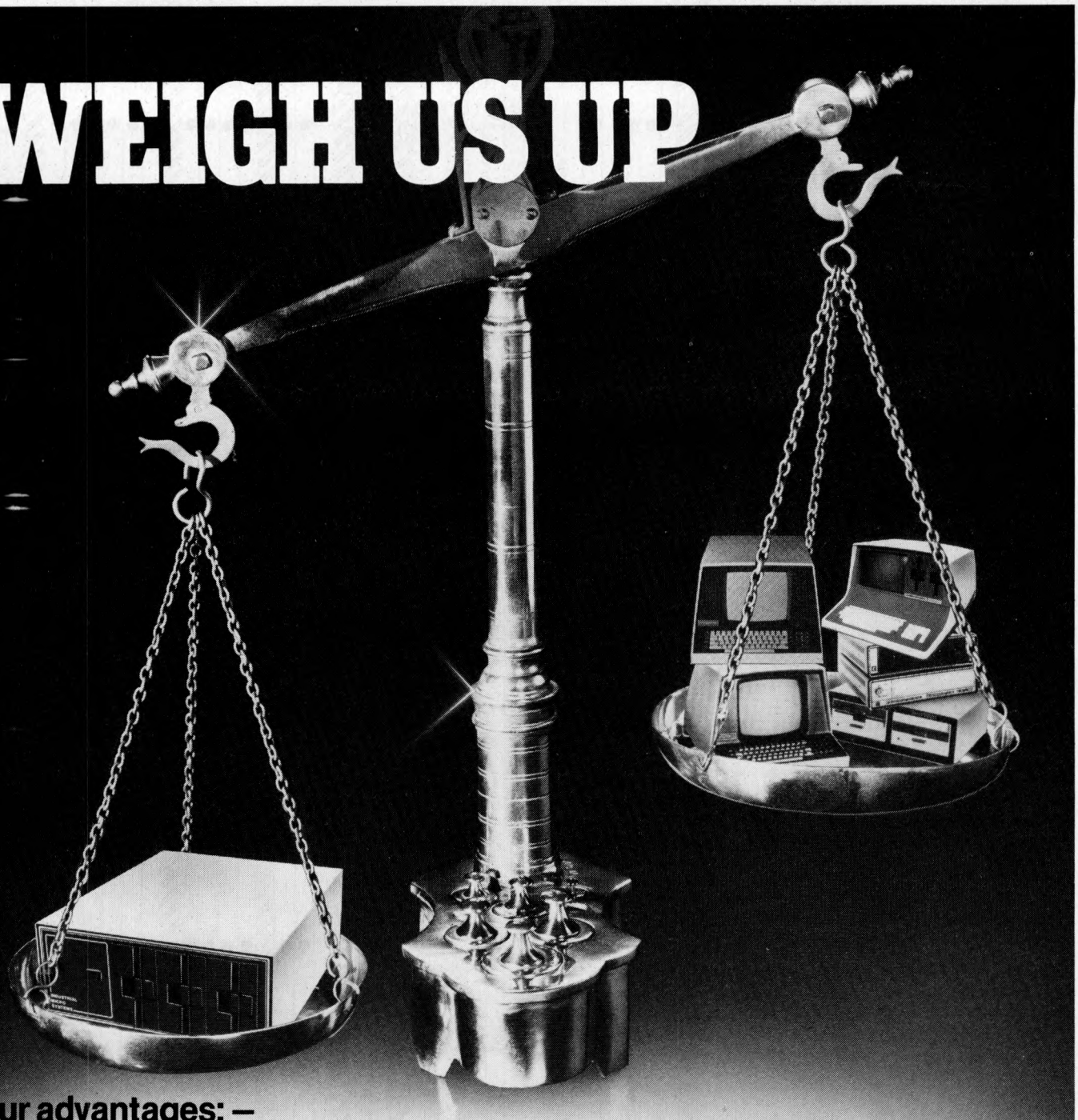

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Supplier/tel	Transdata Ltd 01-403 5115	Westrex Co Ltd 01-578 0957	Weyfringe Ltd 0642-470121	Whymark Instruments Ltd 07372-21937/21735										Zero One Electroncis Ltd 01-689 1280
Model	305 Portable Terminal	43	Century KSR·2	201	204 Label	301 Document	302 Document	404 Label	501 Panel/ Rack	601 Plain/ Label	801	701 plotter/ printer	901 Label	BASE 2 Z800B
Price in £ ex VAT	1205	700	1095	360	440	500	550	360	450	500	650	800	800	319
Print Mechanism														
Dot matrix	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Daisywheel														
Golf ball														
Line														
Matrix	7x5	7x9	7x9	7x7	7x7	7x7	7x7	7x7	7x7	7x7	7x7	7x7	7x7	5x7
Graphics							●	●		●	●	●	●	●
No of ch/symbols	96+	94	192	96	96	96	96	96	96	96+	116+	146+	116+	Lots
True descenders		●	●				●			●	●	●	●	
Underlining	●	●	●				●			●	●	●	●	
Features														
Bold			●	●	●	●	●	●	●	●	●	●	●	
Double width			●	●	●	●	●	●	●	●	●	●	●	●
Condensed			●				●			●	●	●	●	
Super/subscript														
Other	●						●	●		●	●	●	●	
Justified					●	●	●	●	●	●	●	●	●	
Prop spacing							●			●	●	●	●	
Max speed (cps)	30	30	112	40	40	40	120	60	40	120	132	132	132	
Max Ch/line	132	132	96	40	40	40	40	40	40	40	132	132	132	var
Max Ch/in	10	13	12	15	15	15	15	15	15	15	9	9	9	var
Max Line/in	6	6	6	6	6	6	6	6	6	6	6	6	6	var
Paper width (ins)														
Min	8.5	8	2	2	2	2	2	2	2	2	2	2	2	1
Max	8.5	12	9.5	4	4	8	8	4	4	4	9.5	9.5	9.5	9.5
Form length (ins)														
Min			.5		Roll	2	2			2	3	3	3	
Max		14	16											
Paper feed														
Tractor		●	●					●		●				●
Pin		●	●								●	●	●	
Friction	●	●	●	●	●	●	●		●					●
Tab														
Horiz		●	●	●	●	●	●	●	●	●	●	●	●	●
Vert		●	●	●	●	●	●	●	●	●	●	●	●	●
Bidirectional feed						●	●							
Paper out sensor	●	●	●	●	●	●	●	●	●	●	●	●	●	
Interface														
Serial	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Parallel				●	●	●	●	●	●	●	●	●	●	●
Centronics				●	●	●	●	●	●	●	●	●	●	●
20 mA	opt	●	●	●	●	●	●	●	●	●	●	●	●	●
Other				●	●	●	●	●	●	●	●	●	●	
Keyboard	●	●	●	opt	opt	opt	opt	opt	opt	opt	opt	opt	opt	
Size (cms)														
Width	49	51	37	29	29	31	31	23	34	23	42	42	42	
Depth	37	53	47	35	35	33	33	31	26	31	38	38	38	
Height	13	14	14	15	15	20	20	15	16	15	20	20	20	
Weight (kgs)	10	12	11	6	6	7	7	5	7	5	13	13	13	

MICROHOLISM

A NEW TECHNOLOGICAL HAZARD?

Microprocessors have made cheap and powerful computers available in factories, offices, classrooms and homes. The hidden dangers in these apparently harmless devices are illustrated here by the experience of a typical victim — Harry B. Dr David Buchanan tells this sobering tale.

Development in Western industrial societies is largely determined by the technological imperative which states that whatever technology *can* be made to do, it *must* be made to do. Attractive new techniques are frequently rushed into use under this imperative before their potential social and psychological consequences can be assessed. Microprocessors have now become a British national obsession, but most research concentrates on the practical applications of these devices and about their effect on the size and composition of the working population. But little work has been done on the possible effects on the individuals who will live and work with the new products and processes. This is an important gap in current research because the impact of microprocessor-based devices will be widespread. The Department of Industry attributes this to what it calls *The Heineken Factor:* microprocessors can reach parts of society that other computers cannot reach.

One aspect of the microprocessor revolution that is already apparent is the pervasive use of microcomputers for industrial, commercial, educational, domestic and leisure purposes. Research now under way in Glasgow, however, suggests that microcomputers are highly addictive, and that they can have disastrous psychological and social consequences. We have collected a number of case histories illustrating the damaging nature of MicroComputer Addiction, or MCA. The various stages of the 'MCA Syndrome' have been identified, and the purpose of this article is to describe the typical addict's 'career'. The case of Harry B which is described here is based on the collective experience of several addicts rather than on one individual, and the names used are, of course, fictitious.

Harry was first introduced to computers (mainframes) through an option course in Fortran programming as an undergraduate chemist. He had no strong desire to take that particular course. Most of his close student friends, however, had decided to try the programming option, just for fun, and Harry simply went along not wishing to be left out. As soon as his first program was debugged and running, and his printout came back without an error listing, Harry experienced that first surge of elation with which most programmers are familiar. This was the point at which he first became hooked, although early detection and appropriate treatment may have prevented later, more serious outcomes.

During the Fortran option course, and for the remaining two years of his university degree, Harry indulged in what we now recognise as 'social programming', and could not have been described as a full addict. Groups of friends would meet in the evenings to discuss common difficulties with job control, file handling and so on. These gatherings did become strained latterly as programming for Harry became more important than friendship and social discourse. His relationships faltered. Friends started to avoid him when they found that his only topic of conversation was his latest program and the untraceable bug in it.

Remission and relapse

Harry left university with a good degree and got a well-paid job in a sales office. He met Jane, a pretty solicitor's clerk, who easily turned his thoughts away from the computing world. He was more or less free from the craving. But occasionally, in conversations or in television programmes, the subject would be mentioned and the old urges would surface momentarily.

He was able to control these urges without much difficulty, and apart from dashing off a subroutine on an old envelope from time to time, showed few signs of his previous passions. But Harry's remission lasted only two and a half years. When the twins came along, he started to look for a better job. In fact, two important career changes were to push him finally into full addiction. A vacancy arose in the company's data processing division. The position carried a high salary, a company car and good promotion prospects. Harry's intellect, qualifications and knowledge of the company's products and procedures won him the job. The pay and status, however, soon became insignificant in comparison with the opportunity to work on the company mainframe. For the next four years, most of Harry's time was spent either in program development, or in working out where his next algorithm was coming from. At first the company admired his dedication and loyalty and were slow to recognise, as was his wife Jane, the true nature of his obsession.

The commercial pressures of private manufacturing industry irritated Harry by consuming so much of his computing time. To free himself from these constraints, he applied successfully for a university lectureship, even though this meant a significant drop in salary and the loss of his company car. The university mainframe had powerful interactive capabilities which were new to Harry since the company machine was restricted to batch processing. Harry began to spend increasing proportions of his time at a video display terminal. The comparative freedom of academic life allowed him to spend hours at the multi-access terminal without his wife or colleagues realising that anything was wrong.

Harry's condition could have stabilised at this point, but the arrival of cheap and powerful microcomputers precipitated the crisis in his addiction. Early in 1979, he persuaded his department at the university to invest in a microcomputer, for teaching and research. Harry's addiction to the microcomputer quickly became obvious. All day and well into the night the building vibrated with the chatter of the dot matrix printer. His other projects were dropped as his time and energy were channelled into the microcomputer. Opportunities for others to use it were scarce and Harry was clearly jealous when colleagues handled 'his' machine.

By this point his addiction had become deep rooted and the department's microcomputer was not enough. Harry requested a portable for his personal office use, and was soon taking it home to work on in the evenings and at weekends. His wife Jane at last realised that Harry was seriously ill. He began to spend all their money on extra peripherals, software packages and manuals. Their house became cluttered with printers, memory boards, floppy disks, joysticks, and disk drives waiting to be connected. Jane started to find EPROM cards in the wardrobe and back numbers of *Personal Computer World* tucked under the mattress. Harry slept poorly and intermittently, often getting

up in the middle of the night to rewrite sections of program, and to check parts of the operating system manuals. Their marriage could not survive the strain and Jane finally took the children to her parents when Harry moved his bed into the university microcomputer room.

Prognosis and action

Harry B now suffers from a virtually incurable MCA Syndrome. He is one more victim of industrial society's blind pursuit of technological possibilities. No drugs are available to combat this new and powerful addiction, and Harry's future is bleak. But experiments are now being tried in Glasgow with forms of aversion therapy. The withdrawal symptoms are disturbing to observe. Patients murmur control statements and system calls; their fingers twitch in imitation of terminal keyboard operations; glazed and staring eyes hallucinate video display screens. Patients have also been known to call out relational operators and fictitious variable names in their fitful sleep.

Most technological developments are accompanied by both benefits and hazards. The clear and substantial advantages of microcomputers must therefore be considered in the light of the social costs of disrupted careers and broken homes. A total ban on microcomputer sales is not justified on the evidence available so far, but there are some steps that should be taken immediately. Further research is clearly needed to identify those occupational groups most at risk from MCA Syndrome. There is also an urgent need to identify the factors that contribute to the individual's liability to contract this crippling affliction.

Literature on microcomputers is widely obtainable in glossy, attractive magazines that are openly displayed by most newsagents. Children can see and buy these publications without restriction, and the law could be altered to prevent this. The advice of the Advertising Standards Authority should also be sought with a view to monitoring microcomputer manufacturers' advertising practices. Most manufacturers associate their products with socially advantageous properties such as speed, power, memory and so on, but these are the properties that give microcomputers their addictive pull. The contents of advertisements for other addictive products like alcohol and cigarettes have been successfully constrained and similar action may be appropriate for microcomputers. A further practical measure would be to persuade local and national government to set up information centres for MCA sufferers and their relatives and friends.

The MCA Syndrome has only recently been identified and the full nature and impact of the disease have yet to be established. A file of case histories, depressingly similar to the one presented here, is being compiled in Glasgow to assist the development of our understanding of this phenomenon. These most recent victims of technological progress have prompted us to bring a new word into our language; we call them *microholics*, and we have the opportunity, if we act now, to restrict their numbers in the future.

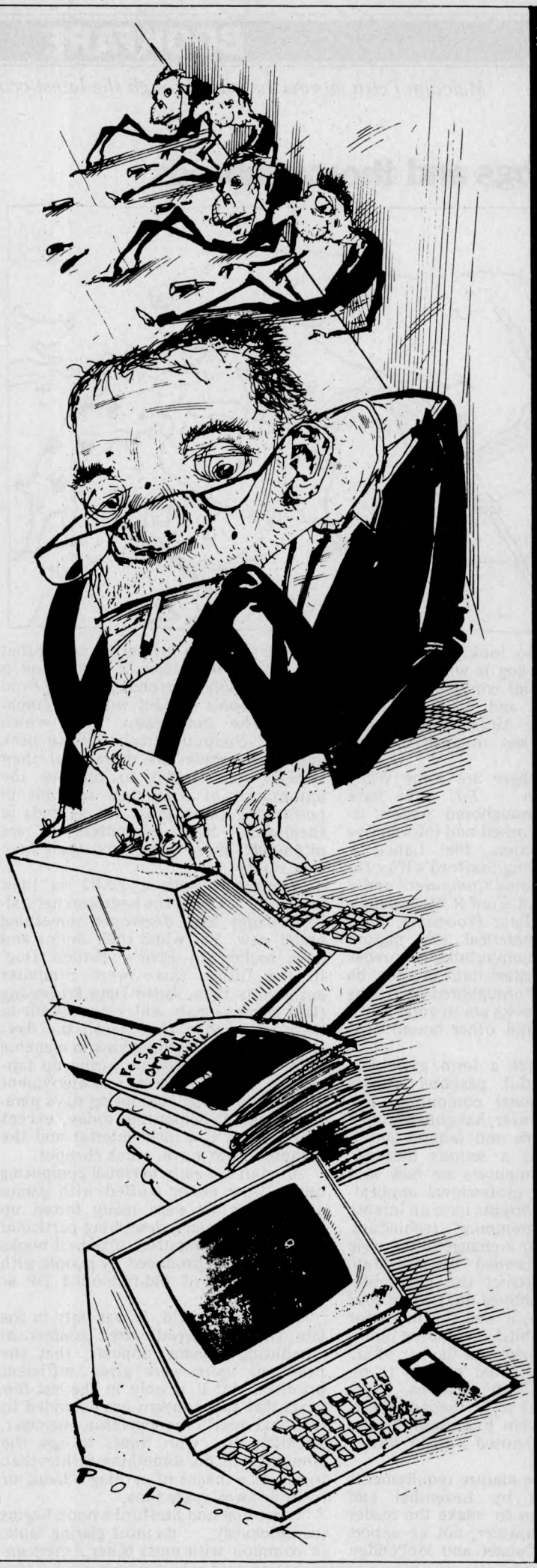


Illustration by Ian Pollock

BOOKFARE

Malcolm Peltu worms his way through the latest crop of microcomputing books.

Hound dogs and thoroughbreds

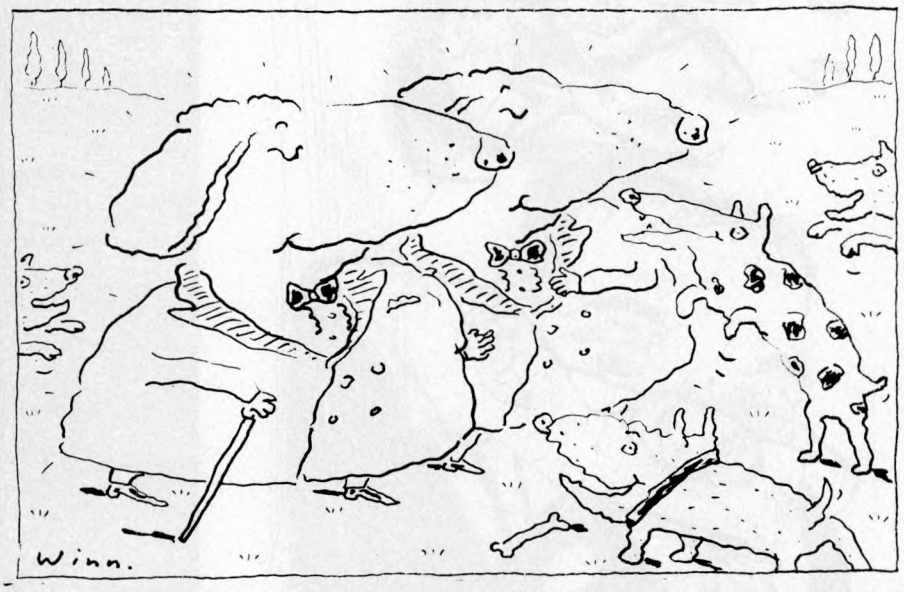


Illustration by Chris Winn

'It is beginning to look like everyone and their hound dog is writing at least one book on small computers.' That's how Jerry Willis and William Danley Jr kick off their *Nailing Jelly To A Tree*, which is less original than its title suggests.

Fortunately, there are some Wiley publishers *(ho,ho — Ed)* who have found some thoroughbred writers to provide other informed and informative intros to computers, like Lance A Leventhal and Irving Stafford's *Why Do You Need A Personal Computer?* and J Daniel Couger and Fred R McFadden's *First Course in Data Processing*, both easy to read, practical and mature guides for novice computniks. (I wonder why American writers hunt in pairs, be they J Arthur Thoroughbred or H Dog Jr?) These two books are so good that I will leave *Jelly* and other hound dogs for later.

Maturity is not a term associated with the youthful passions usually aroused by personal computing. The micro world, however, has gone through its adolescent fads and fancies and is now emerging as a serious business. Most personal computers are now sold for business and professional applications and most hobbyists have an intense interest in programming techniques. This has called for a change in the style of the books needed to enlighten, entertain and instruct the newcomer.

In the early hobbyist days, all of four or five years ago, it was the norm for hound dogs to publish computing books with the gentle anarchist flavour of *Oz* and *IT* (if you are old enough to remember them). With cartoons, jokey titles and laid-back style, these publications were more San Franciscan flower power than hard-nosed Silicon Valley profit pushers.

The new, more mature requirements are hit spot-on by Leventhal and Stafford, who 'aim to make the reader an intelligent consumer, not an expert on computers'. Couger and McFadden develop this even further by saying that one of the objectives of their book is to help in 'solving problems arising from a lay person's contact with the computer'. The enthusiasm with which personal computer freaks like to peek and poke inside the entrails of their systems has tended to obscure the importance of computers as tools in performing other jobs, not as ends in themselves. *What* computers do are ultimately more important than *how* they do it.

Youngsters with a ZX81 in their satchel or a Pet in the bedroom naturally feel they have discovered something brand new. Yet when their mums and dads rocked to Elvis's 'Hound Dog' in the fifties, there were computer enthusiasts then. Jaded Data Processing (DP) professionals still get a gleam in their eyes when they recall the days they spent writing programs in machine code (or assembler), or wiring up tabulators. The excitement and enjoyment of the early 'big' computing days parallels personal computing today, except that now it is a mass interest and the computers are much, much cheaper.

Most of the early personal computing books were either stuffed with games and stories or were really tarted up technical manuals, describing particular languages or computers. The best books are now being produced by people with a good grasp of old-fashioned DP as well as micros.

In the DP world, it was only in the late 1960s, a decade after commercial computing became popular, that the needs of users were given sufficient priority. And it is only in the last few years that this concern has extended to the 'end user', the operator, manager, scientist, etc, who wants to use the computer to do something rather than to act as a means of earning a living or to while away spare time.

Leventhal and Stafford's book begins inauspiciously, — its most glaring fault, in common with most other American-originated books, is that no attempt has been made to tailor the contents for a British audience. All the references to machines, shops, magazines, etc, are American, a particularly serious flaw in those parts of the book which refer to specific examples to assist the new personal computer user. Fortunately, this is only a small part of the book and can be ignored. Given the rapid changes in available systems, book publishers should avoid references to particular products. Leventhal and Stafford, for example, do not mention Visicalc or Wordstar and many of the products they do include have an almost antique air about them. Add these to the failure to mention any British systems and the book becomes a real no-no as a reference guide.

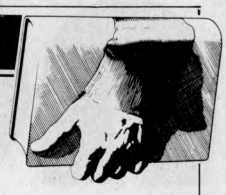
The first few chapters are also rather superficial and pedestrian, covering the basic elements of computing and a brief introduction to Basic. Besides their out-of-date references these parts, though not actually wrong, provide little that could not be obtained from other publications written by any old hound dog.

The best of Leventhal and Stafford begins with Chapter 4, on how to write programs. This is where the maturity of many years computing experience is brought to bear. The writers distil this experience into a number of 'good advice' lists which provide practical and useful guidelines, covering modular programming, good coding style, debugging methods and documentation. All these are language-independent and stress the importance of program *quality*. It may seem a far cry from 'fun' programming but, as the authors say, 'writing programs can be challenging, enjoyable and productive if you proceed with caution and try to get most return from your efforts.' Their main message to programmers should be writ large on every keyboard and should appear permanently at the foot of every screen, like a government health warning: 'The programmer who plans carefully, works cautiously and systematically, and documents each step will be far ahead in the end.'

The flavour of their advice can be gauged from some of the points made on coding: 'Keep the program simple and straightforward. Make changes easy to implement. Stay on firm ground and use the features you understand. Don't be too clever.'

The section on debugging provides a helping hand to the beginner which is often forgotten in introductory literature. The reader is taken through an example of debugging and offered some useful hints on how to tackle the most daunting prospect of facing a new programmer.

Keeping faith with their intention of making the reader 'an intelligent consumer', Leventhal and Stafford also provide succinct and realistic guidelines on how to select disks, printers, interfaces and the system as a whole. They describe the nature of each component in a clear, no-nonsense style, providing



checklists of questions to be asked, capabilities to be considered and problems that may arise. For example, they list and discuss 21 factors to be examined when selecting a printer, including speed and noise, reliability, print quality, ease of maintenance, supplies required, interfaces available, paper size and whether multiple copies can be produced. Their advice on choosing a computer is also eminently sensible and practical. They stress that you should buy a computer to suit your own background and stage of computer know-how. To determine whether a system is right for your background, they suggest you find out if you can read the manuals, start and stop the system easily, understand what the equipment does, how to operate it and how to load programs and data. If you find difficulty in understanding and doing these basics, the system is probably more than you want.

In addition, they say you must look to see if there are many books and magazine articles describing the system, whether it has been used in similar applications, what kind of service contract is available, how many suppliers of software and accessories are providing items for your computer, and so on. There is a whole chapter on operating and maintenance, which tackles basic questions like knowing how much you can attempt to repair and how to avoid getting in a muddle over software maintenance.

Leventhal and Stafford have ambitiously (and largely successfully) tried to warn novices of all the practical aspects of computing which you usually learn about *after* you have got a computer.

At £5.40 it is excellent value. I would recommend it to anyone contemplating buying a first computer or moving up from a 'baby' like a Sinclair to a grown-up system. If you extract its wealth of good advice and then read *PCW* to get an up-to-date guide of what's on the market at the moment, you should be in a good position to make a reasonable judgement.

The First Course in Data Processing, as its name and price (£13.30) suggest, is a horse of a different colour. Yet it shares much in common with Leventhal and Stafford. On the negative side, it is also an unadulterated American edition. As it is primarily an educational text, its references to the American school system and some applications (like computers in American football) are strange to British sensibilities. The style is also very American, with a lot of what I find silly little fill-in-the-blank questions, interspersed with the text.

On the other hand, this American approach to an educational book also means that it is beautifully presented with large text, good illustrations and diagrams and even the odd Charlie Brown cartoon strip to make a point or two. In over 500 well-presented pages, Couger and McFadden cover a breath-taking range of subjects. They discuss each topic with care and clarity, whether it is something as general as the threat of computers to privacy or as specialised as operating systems.

The subjects covered include all those you would expect, such as basic computing concepts, storage, I/O personal computing and telecommunications. In addition, it examines in detail the programming task (with an emphasis, as in Leventhal and Stafford, on structured techniques), flowcharts and decision tables, systems documentation and logical design, database design and implementation and management information systems. Two versions are available. My review copy included chapters on Basic, Cobol, Fortran and RPG but another Basic-only edition has been produced.

I can pay the book no greater compliment than to quote its own three objectives and to say that they have been fully met. The first was to help the lay person become sufficiently 'computer literate' to enable him to take an informed, unfrightened part in using computers and 'taking a stance' on computer-related issues in society.

The second aim was to provide the basic grounding for people attracted to 'the new profession of information analyst.' The information analyst acts as a link between the computer and the lay user.

Thirdly, the book provides the foundation for someone attracted to following a degree course in computer sciences.

I would also add a fourth category, namely someone with a personal computer who wishes to understand what those old DP gran'daddies have been up to and why personal computing, DP and, eventually, electronic office automation will eventually blend into a similar digital *pot pourri*.

Both the thoroughbred books are examples to be followed by other authors. They are written in a relaxed, easy-to-read style. But they never pretend that computing is simplisitic or is an end in itself. They explore computing complexities but show how simple it is to learn how to program and to break through the mystic shroud that used to cover computers. And they place computing in the context of one of my many hobbyhorses — information management.

As someone getting long in the DP tooth, I am pleased to see that people like Couger, with 25 years experience in the business, is able to bridge the generation gap so well.

Jelly, bread, butter and underware

After the heights of Leventhal/Stafford and Couger/McFadden, I came down to earth with a bonk when reading three other introductory books, starting with *Nailing Jelly to a Tree*.

The authors, Jerry Willis and William Danley Jr, christened their work so scrumptiously because, 'learning about software is a lot like nailing jelly to a tree; software is nebulous, and difficult to get a firm grasp on. Willis wrote one of the first best sellers of new wave computing, the *Peanut Butter and Jelly Guide to Computers*. So his tea-time fancies are clear.

What is not so clear is what Willis and Danley are aiming at with this new book. They say it was written 'for the person who has a personal computer and is generally familiar with how it works (eg, how to turn it on, load in a program, and make it go). The book's focus is on the various types of software in common use.'

In fact, the main focus of the book is on underware — the software and logic systems beneath basic Basic. If the aim is to pin down software, it is being approached from the wrong way. Over 30 pages on binary arithmetic and boolean logic, which starts the book, are typical of the old fashioned (pre-micro) educational text which started right at the technical bottom and thereby frightened off many people.

Stripped of its pretentious title and chapter headings, the book is a reasonably good bread-and-butter description of some micro operating systems, machine languages, assemblers and a touch of Basic. It is best, however, at giving guidelines on converting between different Basics.

I am getting a bit tired of corny chapter titles 'Care and Feeding of Small Computers', 'Mr Chips and the Machine Language' and Two, Four, Six, Eight — What You Gonna Accumulate?' At one time, they were a refreshing breath of West Coast fun. Now they are little but hot air when they precede straightforward, nitty bitty descriptions.

If you want underware without any frills other than the jelly wrapping, this is, however, a reasonable but uninspired book. After its opening binary onslaught, there is a look at the basic facilities of some monitors and operating systems. These include Solos (from the late great Processor Technology Corporation, Exidy Sorcerer (very similar to Solos), Northstar DOS and, of course, CP/M. There is then a detailed look at machine language, including the 8080, Z80 and 6502, plus detailed memory maps for a number of machines, including the TRS-80, Sorcerer and KIM. And finally there are a couple of chapters on quick and dirty Basic.

The most useful and valuable chapters are the last two, which give advice on converting from one Basic to another. A glossary is provided which also acts as a conversion guide.

Two other bread and butter introductory books have passed my beady eyes this month: *Introduction to Computer Science* by Vladimir Zwass and *Understanding Computer Systems* by Harold W Lawson Jr. Zwass covers similar technical ground to the Couger/McFadden book reviewed above. But he does so in such a condensed, dry way that it would be difficult to plough through unaided. The book is part of what is called The Barnes & Noble Outline Series which provide 'compact

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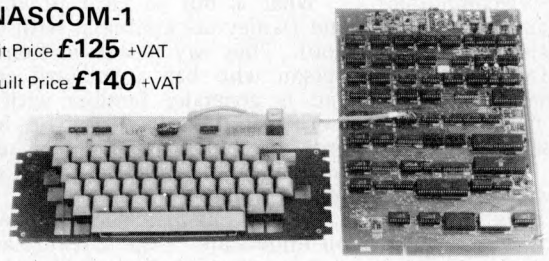
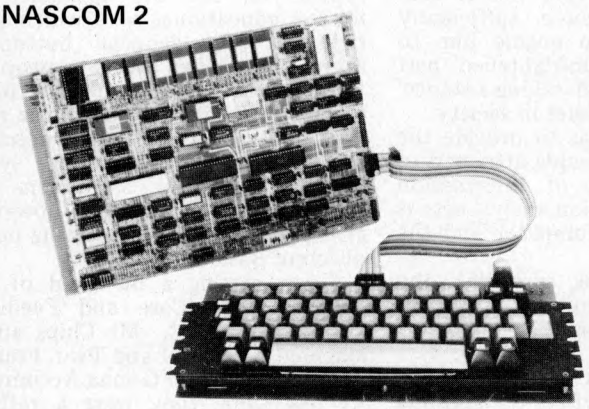


12" x 8" PCB carrying 5LS I MOS packages 16.1K MOS memory packages and 33 TTL packages. There is on board interface for UHF or unmodulated video and cassette or teletype. The 4K memory block is assigned to the operating system and video display, leaving a 1K user RAM complete with keyboard.

NASCOM 2



Kit includes all parts to build CPU board which has resident 8K microsoft BASIC and 2K NAS-SYS 1 monitor for machine code programming. Included with kit is a fully assembled LICON QWERTY SOLID STATE KEYBOARD specially designed to exploit the potential of the NAS-SYS monitor. Other interfaces include video to monitor or domestic TV, Kansas City standard cassette interface (300/1200 baud) or RS232/20mA teletype interface.
System uses Z80A and gives selectability between 2 or 4 MHz.

Nascom 2 Kit Price **£225** +VAT

Power supply—3 amp. Suitable for powering of basic Nascom 1 or 2 and memory expansion.

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SERIES B ramboard gives user option of 16K DYNAMIC RAM. This board can be arranged in page mode to allow use of up to 4 with NASCOM 2. Boards are fully buffered but PAGE MODE facility is an optional extra. This card can be used at 4MHz without wait state.

16K **£100** +VAT

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This board provides support for six eight-bit parallel ports, one serial part and a sophisticated counter/timer unit. Only the support circuitry is provided, the main devices, from one to five, are added separately.

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Optional Packs for I/O Board

PIO Pack	Contains one MK3881 PIO	£12.00 +VAT
UART Pack	Contains one 6402/8017 UART and the components for a crystal controlled V24/RS232C interface.	£16.00 +VAT
CTC	Contains one MK3882 Counter timer circuit.	£14.00 +VAT

TO BE INTRODUCED	*Price*
Programmable graphics colour board	TBA
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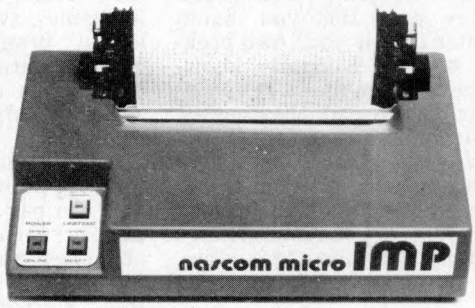

The Nascom IMP (Impact Matrix Printer) features:
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NASCOM FIRMWARE

CPU card can accommodate either 8K of static memory or 82708 EPROMS. This allows for inclusion of standard firmware on board
ASSEMBLER Version 2.1 of ZEAP (Z80 Editor Assembler Package). A comprehensive line editor is provided in addition to an assembler operating in standard Z80 mnemonics. ZEAP can take advantage of special features of NAS-SYS, which was itself developed on this assembler. Supplied on tape **£30.00** plus VAT or in 4 x 2708 EPROMs at **£50.00** plus VAT.

DISASSEMBLER The NAS-DIS 3K disassembler reverses the effect of assemblers such as ZEAP by turning machine code into assembler program, automatically labelling and cross-referencing to produce a complete program listing. Supplied in 3 x 2708 EPROMs at **£37.50** plus VAT.

DIAGNOSTIC PACKAGE NAS-DEBUG is a 1K addition to NAS-DIS which provides remarkable facilities for error elimination, including a full register display which may be edited by the cursor. An unusual feature is the provision for examination of the program *in assembler* as the machine single-steps through it. A second video page may be assigned to allow work on programs which use the screen. A very powerful assembler-based system for program development could be realised on a NASCOM-2. Supplied in a 2708 EPROM at **£15.00** plus VAT and must be operated with NAS-DIS.

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Supplied in 1 x 2716 EPROM.
NAS-SYS 3 is the latest in the current series of Nascom monitors and includes features such as adjustable keyboard repeat and cursor speed, full interrupt handling and a number of powerful routines and commands making this probably the most comprehensive 2K monitor ever written for a microcomputer **£25.00** plus VAT.

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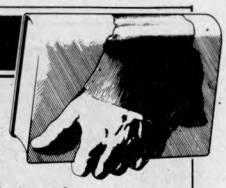

summaries that help the student master the important facts and principles of a course'. As such, it could find a place as part of a course or as a reference guide. But it is nowhere near as lively, lucid and practical as the thoroughbreds which led this month's 'Bookfares'.

Lawson's book has a few drawings but makes pretty turgid reading. It has a much narrower scope than Couger/McFadden and Zwass. Like the Zwass book, its most effective use would be as part of a course, supplemented by tutorials and discussions or as back-up reading for a computer studies student. Although Lawson starts by relating computing principles to a 'real world' example of washing dishes, he has such a spare, academic style that he makes the whole book seem abstracted from everyday life. He goes into detail on computer logic and architecture, but has virtually nothing on high level languages. So it is really one more book aimed at those with an interest in underware rather than the outer software garments. And for personal computing underware addicts, the *Jelly* book is much more practical and relevant.

More impact

As we roll towards British Information Technology Year, there can be few in this sceptical isle unaware of the widespread impact of the micro on virtually every aspect of modern society. Workers' leader Jimmy Reid ironically summarises the scapegoat role of new technology: 'Technology is. . .responsible, so it would seem, for a multitude of sins, including alienation, football hooliganism, unemployment, the rise of neo-fascism and almost all manifestations of anti-social behaviour. No doubt someone is currently busy trying to establish a link between it and legionnaire's disease.'

In an interesting article in *DP International 81* (see below for more on this book), Reid encapsulates the tension created by the Jekyll and Hyde nature of all technological advances.

'The pace of technological change often outstrips the tempo of social change. The tension created by this contradiction can express itself as a blind rage at the advanced technology and not the backward sociology. This is not a new phenomenon. The Luddites are simply the best known of those throughout history who blamed machines for the crimes and mistakes of men.

'To view technology as horrendous in itself is like having a concept of electricity based exclusively on the electric chair. It can bring warmth and energy, or it can electrocute, either by design or accident.

'Electricity is strictly neutral: how we use it determines whether it brings light or the darkness of death. The decision is in our hands. This is true of all the tools, resources and elements discovered, devised or invented by man.'

The practical nature of this impact has been analysed in a wide range of books and publications in the last few years. The Technology Policy Unit (TPU) at Aston University has been helping to find a way through this jungle of literature by the preparation of a number of bibliographies, including one published by the BCS Computers and Employment group, a straightforward annotated listing of the latest literature on the subject. The team has also produced a more detailed summary of the arguments, facts and fancies relating to the micro impact on industry. Although they are a bit weak at times on the technology, particularly in relation to traditional data processing and some aspects of office automation, this is a useful book because it summarises most of the arguments that have been batted around for ages.

It could save you reading many of the literature references which it contains. As well as listing the most important publications and articles, it extracts the marrowbone essence of the most significant work on the subjects covered.

Unfortunately, as with many books, it is already a little out of date, with references ending in early 1980. Sadly, it seems a product from a different era when it states: 'Unemployment is high, with some one and a half million out of work. . .' The rate of increase in unemployment is now almost as fast as the pace of technological change.

DP rock

Microcomputing has been built on the rock of Data Processing. Some of you Basic addicts might even wind up one day writing Cobol payroll routines in a DP department, so you shouldn't ignore what appears to be a rather grey world.

DP International 1981, the Institute of Data Processsing Management (IDPM) handbook, is a reasonable (but relatively expensive for what it is) way of gaining an insight into the current thinking of the DP world.

It has over 40 articles, ranging from Jimmy Reid's radical eye on the social impact of the technology (see above) to articles on training DP professionals and the latest technological developments in mini and mainframe (biggie) systems.

Many of the articles are written by representatives of companies flogging the equipment that they are writing about. But the editors, Ted Cluff and Nicholas Enticknap, have done a good job in keeping out any obvious puff. Overall, the standard is reasonably high for such a *melange* of multi-authored articles.

You may never need to know much about DP but this book provides an interesting snapshot in time. And although it is not very old, the picture is already beginning to fade and turn up at the edges, just like those in granny's album.

This month's Bookfare took a look at:
Why Do You Need A Personal Computer? by Lance A Leventhal and Irvin Stafford (John Wiley & Sons, £5.40)
First Course in Data Processing by J Daniel Couger and Fred R McFadden (John Wiley & Sons, £13.30)
Nailing Jelly to a Tree by Jerry Willis and William Denley Jr (Dilithium Press,
Introduction to Computer Science by Vladimir Zwass (Harper & Row £3.95)
Understanding Computer Systems by Harold W Lawson (Chartwell-Bratt, Bromley, Kent £7.00)
The Impact of Microelectronics: a review of the literature prepared by J R Bessant, J A E Bowen, K E Dickson, J Marsh (Frances Pinter, £13.75)
DP International 1981: The IDPM Handbook (IDPM, 12/13 Henrietta St, London WC2, £8.95 plus postage)

The 4th
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10th-12th September 1981

See pages 4, 5 and 53 for further information.

PATTERNS

Alan Sutcliffe continues his thought-provoking series.

Since I've just purchased a musical high-resolution graphics computer — the DAI — it seems appropriate to take a close look at how I've tackled a music playing program. While I'm at it, I throw in a few comments about the DAI, then I move on to produce the micro equivalent of staring into the flames of a fire. To finish off the article this month, I suggest a competition which you may like to enter.

Prelude and chance

Bach's Prelude No 1 from the 48 Preludes and Fugues is one of the few keyboard pieces that I can play adequately, the reason being that only one note is played at a time, except for the final chord. Figure 1 shows the first bar. The next 32 bars of the piece each follow the same pattern: an ascending arpeggio of five notes, with the last three notes repeated, and then the whole sequence of eight notes repeated.

Fig 1

There are then two bars each with a slightly different pattern of pitches, without the exact repetition. And then the Prelude ends with a chord of notes played together.

Such simplicity and regularity make it a natural piece to synthesise on my new computer, a DAI from Data Applications. It has a sound chip, with three oscillators which are driven by Basic statements. I am not going to describe all these facilities, but I'll give you just enough to follow the program I have written to realise the Prelude: Program A. Each note is shaped by an envelope, which gives it an attack, sustain and decay portion. The shape of the envelope can determine the quality of the note as we perceive it just as much as the tone quality, or wave-form, of the sound.

```
ENVELOPE a c,d;e,f;g,h;i
ENVELOPE 1 8,4;15,8;10,20;0
```

In this example: a is the envelope number, 0 or 1; c e and g are amplitudes, from 0 to 15; d f and h are durations, in arbitrary units of time of 3.2 milliseconds; i is also an amplitude, and since it does not have a duration the note stays at this level indefinitely, until either another note is started on the same oscillator or the SOUND OFF statement is obeyed. There can be any number of amplitude duration pairs. The envelope in the second example is shown in Figure 2.

Amplitude 0 is not silence but gives a positive audible level. A note cannot therefore be turned off simply by putting the final amplitude to zero. One of the two aforementioned means must be used. This is inconvenient because the time that elapses in the program must be matched to the length of note required, rather than just leaving it to the envelope to give a note of the right length. This is done most easily by using the WAIT TIME statement with a suitable integer, which gives a delay in units of 20 milliseconds. Alternatively, the next bit of useful program can be obeyed, but this must be timed — by trial and error — so that the note can be ended at the right moment.

ENVELOPE is a declarative statement and obeying it does not cause any output. Two envelopes can be stored at any one time and either of them can be redefined at any point in the program.

A note is played by executing a SOUND statement:

```
SOUND a b c d e
SOUND 2 1 15 0 4000;
```

a is the number of the oscillator to be used, 0 1 or 2; b is the number of the envelope, 0 or 1; c is the overall amplitude for the note, 0 to 15; d is the tremolo or glissando, not used in this piece; e is the period of oscillation of the note in units of ½ microseconds. In the example, 4000 units of ½ microsecond each gives a frequency of 500 cycles per second. Because this is not a convenient way of specifying frequency, a built-in function is provided to do the conversion. Middle C happens to be a frequency of 256 cycles per second and FREQ(256) gives the number of units to achieve this frequency.

In the program, a table is set up in PH(72) with the frequencies for six octaves of notes, in order to save calling FREQ for each note as it is played.

Sound quality

The sound produced by the oscillators is a simple square wave. A note made with a single oscillator is flat and uninteresting. Being used to using sound synthesisers, it is the weediness of the notes that I find least appealing about most of the tune-playing that is done on small computers, even when several notes are being played at once. In this program, since only one note is played at a time, I use all three oscillators for each note. They are coupled together in octaves in this case and, together with the envelope, this gives a reasonably keyboard-like sound. It is obviously equally easy to set up other harmonic structures, including fifths and thirds above the fundamental note.

It is one of the mysteries of perception that we hear some such sounds as a single note, while some other very similar sounds are heard as chords of separate notes. Even the same sound can be heard in both ways, depending on whether the component sounds all start at the same time or come in one by one.

Even these notes seem somewhat dull and the ear quickly tires of the quality. Since the DAI has stereo sound output, as well as putting the sound out to the TV with the video signal, I can connect this output to my small EMS synthesiser. This is essentially a collection of analogue devices, so that filtering and a little bit of reverberation can be added. The two halves of the sound signal can also be ring-modulated together, which adds further to the harmonic spectrum of each note. A ring modulator takes two input frequencies, A and B, and ouputs their sum and difference, A+B and A—B.

On the DAI oscillators 0 and 1 go to stereo channel 1, while oscillators 1 and 2 go to channel 2. In this piece, with the oscillators tuned in octaves, for each base frequency F, one channel has F and 2F while the other has 2F and 4F. Thus the ring-modulator adds 3F = F+2F = 4F—F, 5F = F+4F and 6F = 2F+4F, as well as repeating the frequencies already present.

Although this involves a bit of arithmetic, it does take us outside the subject of personal computing, since synthesisers are now far less common than computers. However I mention it because I believe that this approach of mixed analogue and digital synthesis is usually the most economical way of making electronic sounds. Each method has its own strengths: digital for completely reliable frequencies and analogue for processes like reverbera-

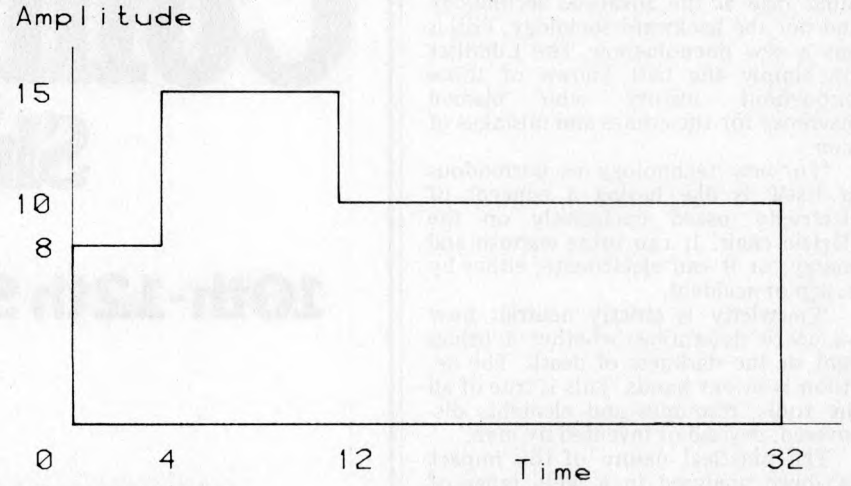

Fig 2 Example envelope

tion that are difficult to perform digitally.

Another unsatisfactory aspect of the sound form this program is the rigid timing, which the ear quickly tires of. There are two approaches to this, both of which depend of altering the parameter to the WAIT TIME statements, since these are what determine the lengths of the individual notes. The refinements to the timing tend to be of two kinds: changes to single notes, usually for emphasis, and changes to whole phrases or sections. In the first approach, an extra piece of data is added for each note to give its individual timing. In this way, both kinds of change can be made, but it is tedious to have to give another data item for every note. It also has the disadvantage of being awkward to change. Obviously this can be partly solved by using variables rather than fixed data. For example, the first note of each of each bar should be emphasised. This can be done by increasing the amplitude slightly, but as important is to lengthen the note by a tiny amount. Also, on the whole, lower notes are played more slowly than higher ones. In this piece, these two aspects work together since the first note in each bar is also the lowest.

The WAIT TIME statement is a little crude for this kind of adjustment as the unit of time is 1/50 of a second. Any such wait statement can be replaced by a dummy FOR loop:
FOR L=1 TO M:NEXT L.
By setting M, the time delay can be set in units that should be less than a millisecond — unless you have a very slow computer. M can then be set either from a data item, or using a formula based on pitch and position in the bar. The other approach is to control M with an input device such as a game paddle. This is most suitable for the macro-changes and is equivalent to the function of a conductor. There is no reason why M cannot be derived as a combination of a value from within the program and another one from the performer.

Program details

Now let me make a few comments on the program as it appears, which should help in following it and in adapting it to another system.

In DAI's the distinction is made between integer variables and floating point ones, as it is in Fortran. This is in addition to the usual further data type for string variables. The default option is that all variables are floating point. The IMPLICIT statement allows, for example, all those variables beginning I to P to be declared as integer variables. This has to be done before any of the program is input as variables are given their type at the time the program line is input. IMPLICIT is therefore better thought of as a command rather than a program statement.

It is also necessary to allocate space for arrays at the start of a program using the CLEAR statement.

A peculiarity of the DAI system is that subscripts, even though they may be typed in as integers, are always listed — and presumably stored — as floating point numbers. This does not seem sensible, but I have not found a way round it yet. The program here is shown as it was input.

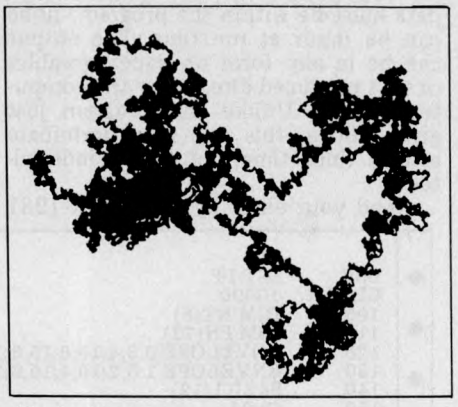

Fig 3a M=0.3

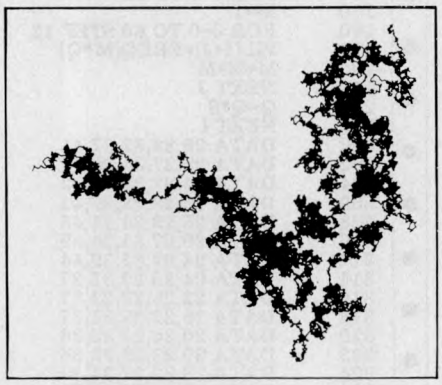

Fig 3b M=0.5

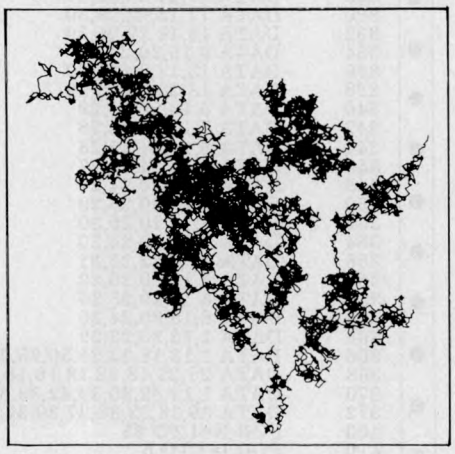

Fig 3c M=1

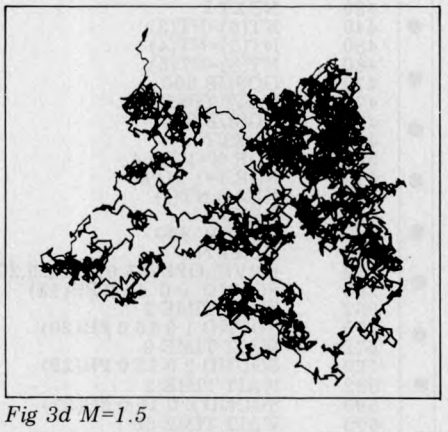

Fig 3d M=1.5

An octave is divided into 12 equal semitones. Since frequency is logarithmic — double the frequency increases the pitch by an octave — multiplying a frequency by the twelfth foot of 2 increases the pitch by a semitone. The frequency of the lowest note in the piece, C two octaves below middle C, is 64, and this is set by Q. The whole piece can be transposed up or down in pitch by altering this initial value for Q. To avoid small errors creeping in from repeated multiplication it is better to compute just one octave of semitones and derive the others from it by doubling the frequencies.

For the main part of the piece only five data items are needed for each bar and the program expands these. The notes are numbered from the lowest as 1, while middle C, for example is 25. These numbers, which are easier to transcribe from the score than the actual frequencies, are converted to the appropriate frequency values via the table PH.

The last two bars need eight values for each half bar. The same subroutine is used to play each group of eight notes. A problem arises from the fact that for each group of notes it takes a perceptible period of time to get the data for the next group and start the loop again. So it is necessary to have a slightly shorter WAIT after the last note of each group than after each of the others. I found that three units less was the right amount.

In the statements, I expected that the two higher components would need somewhat lower amplitudes than the fundamental, but on experimentation I found that having them all at the maximum level of 15 gave as good a result as any.

A characteristic of natural sounds is that the higher frequencies both start and die away more quickly. I have modelled this very roughly by using a slightly shorter envelope for the two higher components in each note. Again, this is a matter for experimentation. At one point I had the envelopes numbered the wrong way round and I did notice that the effect was slightly dulled compared to the intended way, and a tiny bit less like the harpsichord sound I was after. Not that the final result is at all like a real instrument — it is clearly synthetic, but has a pleasing little twang to it.

The final chord is not satisfactory. The notes are spread a little in time and are heard as a chord, but since there is only one oscillator per note, the effect is feeble, when it should rather end the piece with a good solid sound.

This Prelude is the one taken by Gounod as the accompaniment for his 'Ave Maria', a piece of Victorian kitsch that I cannot take seriously, but my next project is to take the top oscillator out and use it for the Gounod tune to see if something listenable can be made of it.

DAI comments

I am in the process of learning the peculiarities of my new DAI system. I chose it particularly for the high resolution colour graphics and am very well pleased with it. But some idiosyncracies of its Basic are worth recording. On the debit side the problem with floating point subscripts has already been mentioned. The most glaring omission is the absence of user defined functions. Very odd. On the plus side I particularly like the MOD operator. I = 7 MOD 3 puts I equal to 1, the remainder of 7 on division by 3. This can always be defined as a user function in a system that allows them, in the following way:
DEF FNM(I,N) = I — N*INT(I/N).
But I prefer to have it as an operator rather than a function as this is more

like the standard mathematical notation.

In my next article, I will write about applying the MOD operator to the Fibonacci series and similar sequences of numbers as an economical way of generating patterns.

Another small bonus on the DAI is the extended RND function. RND(N) for N = 0 returns a random value in the range 0 to 1 generated by hardware, for N < 0 it starts a new, repeatable, sequence of software generated values, and for N > 0 it gives a number in the range 0 to N from the software generator.

While this last facility only saves one multiply to scale a value, over the usual RND function, I find it neat and tidy.

More patterns

So let me end with some different random patterns.

Since I do not yet have a plotter on my own system, this program has been run on the Tektronix system at Systems Simulation Ltd, as have all the graphics programs for my previous articles. I am greateful to John Lansdown for his generosity in allowing me this access. It was also John who first proposed the problem in tiles that I wrote about the May and June issues of *PCW*. Being an architect, he framed it in terms of a set of rooms with connecting doors, none or one in each wall, to form a single connected apartment. This was six or seven years ago and I had quite forgotten their origin when I came across my set of tiles earlier this year and began to write about them. Indeed, I thought I must have invented the problem myself.

John also writes a series in the BCS *Computer Bulletin* on computers and the arts which is always fascinating to read. He is the only person who has devoted more time to the Computer Arts Society than I have over the years since we started it in 1968.

One of the first things that many people do with a graphics system is a random walk or drunken dot pattern. It only takes a few lines of code: see Program B. The patterns in Figure 3 have each been produced by this program, using different values of M. Now that coal fires are so rare, these pictures are the electronic substitute for staring into. As well as the obvious snail trail, people see maps, faces, creatures, mineral structures, vegetation and perhaps whatever is on their mind. The equivalent program running on my DAI, with coloured cells on the screen, produced a very authentic map of southern Africa for a friend of mine just back from there, with the tribal homelands and Malawi picked out. Such is randomness.

You will notice that there is also an effect from the bluntness of the pen used. It is not possible to show the plot for M = 0.2 because the pen worked so intensely in one area that it wore a hole in the paper!

Competition

A small prize will be given for the most interesting output from an original short program in Basic. The conditions are that the program be less than ten lines with only one statement per line. All data must be within the program: none can be input at run time. The output can be in any form on paper, graphics or text produced directly by the computer system. Unlike the program just given above, this one must terminate after a finite time, not run on indefinitely.

Send your entry by 30 August 1981 to: Patterns Competition, *Personal Computer World*, 14 Rathbone Place, London W1P 1DE.

The result and the winning entry will be published in the December issue of *PCW*. I'm sure the editor wouldn't mind giving a year's free subscription to *PCW (agreed — Ed)*.

```
IMP     INT I-P                                  Implicit integer variables
CLEAR   10000                                    Clear space for arrays
100     DIM NT(8)                                Pitch codes in a bar
110     DIM PH(72)                               Scale of frequencies
120     ENVELOPE 0 5,4.10,6;15,8;10,10;5,20;0    Envelope for base
130     ENVELOPE 1 5,2;10,4;15,6;10,8;5,20;0     Envelope for upper notes
140     S=2↑(1/12)                               Factor for semitone
150     Q=64                                     Base note, Low C
160     FOR I=1 TO 12                            For each semitone
170     M=1                                      Initialise multiplier
180     FOR J=0 TO 60 STEP 12                    For each octave
190     PH (I+J)=FREQ(M*Q)                       Store frequency value
200     M=M+M                                    Double M: an octave up
210     NEXT J                                   Next octave
220     Q=Q*S                                    Increase by a semitone
230     NEXT I                                   Next semitone
300     DATA 25,29,32,37,41                      Data for bars 1 to 33
302     DATA 25,27,34,39,42
304     DATA 24,27,32,39,42
306     DATA 25,29,32,37,41
308     DATA 25,29,34,41,46
310     DATA 25,27,31,34,39
312     DATA 24,27,32,39,44
314     DATA 24,25,29,32,37
316     DATA 22,25,29,32,37
318     DATA 15,22,27,31,37
320     DATA 20,24,27,32,36
322     DATA 20,23,29,32,38
324     DATA 18,22,27,34,39
326     DATA 18,21,27,30,36
328     DATA 17,20,25,32,37
330     DATA 17,18,22,25,30
332     DATA 15,18,22,25,30
334     DATA 8,15,20,24,30
336     DATA 13,17,20,25,29
338     DATA 13,20,23,25,29
340     DATA 6,18,22,25,29
342     DATA 7,13,22,25,28
344     DATA 8,16,24,25,28
346     DATA 9,18,24,25,27
348     DATA 8,18,20,24,27
350     DATA 8,17,20,25,29
352     DATA 8,15,20,25,30
354     DATA 8,15,20,24,30
356     DATA 8,16,22,25,31
358     DATA 8,17,20,25,32
360     DATA 8,15,20,25,30
362     DATA 8,15,20,24,30
364     DATA 1,13,20,23,29
366     DATA 1,13,18,22,25,30,25,22              Data for bars 34 to 35
368     DATA 25,22,18,22,18,15,18,15
370     DATA 1,12,32,36,39,42,39,36
372     DATA 39,36,32,36,27,30,29,27
400     FOR N=1 TO 33                            For each bar
410     FOR I=1 TO 5                             For each note
420     READ NT(I)                               Read 5 notes
430     NEXT I                                   Next note
440     NT(6)=NT(3)                              Copy last 3 notes
450     NT(7)=NT(4)
460     NT(8)=NT(5)
470     GOSUB 800                                Subroutines to play 8 notes
474     WAIT TIME 1                              Slight pause for emphasis
480     GOSUB 800                                Same 8 notes again
490     NEXT N                                   Next bar
500     FOR N=1 TO 4                             For each half-bar
510     FOR I=1 TO 8                             For each note
520     READ NT(I)                               Read 8 notes
530     NEXT I                                   Next note
540     GOSUB 800                                Subroutine to play 8 notes
550     NEXT N                                   Next half-bar
552     ENVELOPE 0 5,6;10,8;15,20;10,20;5,20;0   Envelope for last chord
560     SOUND 0 0 15 0 PH(13)                    1st note of chord
562     WAIT TIME 2                              Slight delay
570     SOUND 1 0 15 0 PH(20)                    2nd note
572     WAIT TIME 2                              Delay
580     SOUND 2 0 15 0 PH(29)                    3rd note
582     WAIT TIME 2                              Delay
590     SOUND 0 0 15 0 PH(37)                    Top note
600     WAIT TIME 50                             Hold for 1 second
610     SOUND OFF                                Turn off the sound
790     STOP                                     End of piece
800     FOR K=1 TO 8                             Subroutine to play 8 notes
810     SOUND 0 0 15 0 PH(NT(K))                 Base frequency
820     SOUND 1 1 15 0 PH(NT(K)+12)              1 octave up
830     SOUND 2 1 15 0 PH(NT(K)+24)              2 octaves up
834     IF K=8 GOTO 870                          Jump if last note
840     WAIT TIME 10                             Hold the note
860     NEXT K                                   Next note
870     WAIT TIME 7                              Reduced time for last note
880     RETURN                                   Return
890     END
```

GOTO page 152

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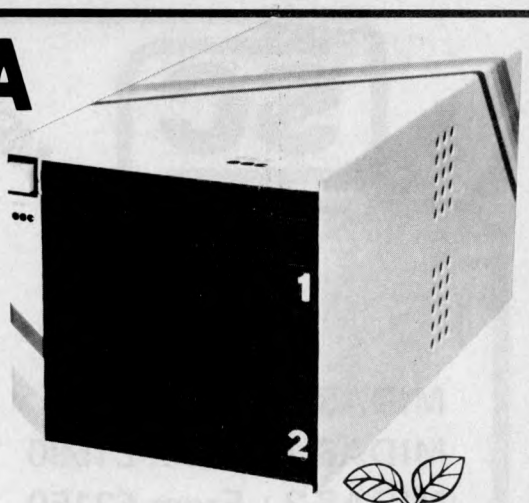

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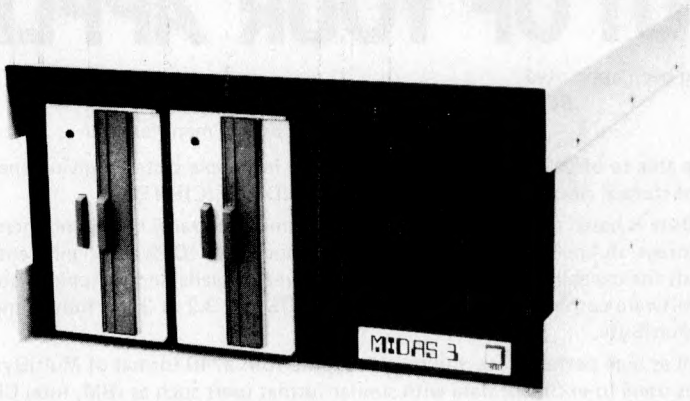

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MICRO CHESS

by Kevin O'Connell

The elaborately titled Paris Chess Programs World Tournament on Personal Computers was played on 28-31 May. This is a new addition to the microchess tournament calendar and was sponsored by *L'Ordinateur Individuel*. A seven-round tournament, it was played under the control of the French Chess Federation but lacked the sanction of either ICCA (International Computer Chess Association) or FIDE (World Chess Federation).

The two most curious happenings during the tournament both involved the Chess Champion Mark IV. In the first round it won its game by default when its opponent, Novag's Microchess, insisted on castling illegally after 19 moves. That was as nothing compared to the last round when the Mark IV lost its game by default – in this it was rather unfortunate, as someone stole it after round 6, but the rules are quite clear that a player who fails to present himself for a game loses, although perhaps an exception should be made for a player who is kidnapped.

Most interest, of course, centred on the pre-tournament favourites, Chess Champion Mark V and the Great Game Machine with its Grunfeld and Morphy modules, although Thomas Nitzsche with his three Mephisto entries could not be ruled out of the running. As the event progressed it became increasingly clear that the favourites and Mephisto experimental X were a class ahead of all the other entries. Two games proved to be decisive for the outcome: in the fifth round Chess Champion Mark V stumbled in a winning position against Mephisto X and lost, while in the last round the Auto Response Board was unable to win its game against Mephisto X, despite being a piece and a pawn to the good. Was Mephisto X lucky? I suppose it was, but having three machines in a tournament is a great way to maximise one's chances of getting some lucky breaks.

Now here is the decisive game of the tournament.

White: Chess Champion Mark V
Black: Mephisto Experimental X

1	e2–e4	e7–e5
2	d2–d4	e5xd4
3	Qd1xd4	Nb8–c6
4	Qd4–e3	Ng8–f6
5	Bc1–d2	Bf8–e7
6	Nb1–c3	0–0(Ke8–g8)
7	0–0–0(Ke1–c1)	d7–d5
8	e4xd5	Nf6xd5
9	Qe3–g3	Be7–h4
10	Qg3–f3	Nd5–f6
11	Bd2–e3	Nf6–d7
12	Bf1–c4	Nc6–e5
13	Qf3–e2	b7–b6
14	f2–f4	Ne5xc4
15	Qe2xc4	Qd8–e8

White has built up a lot of pressure. If 15 . . . Bc8–b7, 16 Ng1–f3 and White's central pressure will be devastating.

16	Qc4–e4	Bc8–b7?

Overlooking the loss of a pawn.

17	Qe4xb7	Qe8xe3+
18	Kc1–b1	Nd7–c5
19	Qb7xc7	Nc5–e6
20	Qc7–e5	

Only now did Mephisto see that 20 . . . Qe3xf4 loses a piece to 21 Qe5xf4 Ne6xf4 22 g2–g3.

20	. . .	Qe3–f2
21	Ng1–f3	Bh4–f6
22	Qe5–e2	Qf2xe2
23	Nc3xe2	Rf8–d8
24	g2–g4!	Rd8xd1+
25	Rh1xd1	Ra8–e8
26	g4–g5	Bf6–e7
27	Rd1–d7	a7–a5
28	Nf3–e5	Ne6xf4?

In human terms, this is a panic move. Perhaps Mephisto could not see as far as 30 Nf4–d3 Re8–e1+ 31 Nd3xe1 or perhaps cut off its search at a critical point.

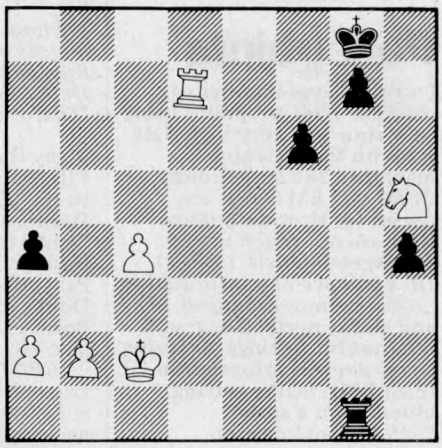
29	Ne2xf4	Be7xg5
30	Nf4–d3	f7–f6
31	Ne5–c4	Bg5–f4
32	Nc4xb6?	

White is a piece for pawn up and should win, but this is dangerous, giving Black three connected passed pawns on the king-side.

32	. . .	Bf4xh2
33	Nb6–c4	Re8–a8
34	Nc4–d6	Bh2xd6

Otherwise Black's king-side will be massacred by the marauding rook and knights working together.

35	Rd7xd6	a5–a4
36	Rd6–d7	h7–h5
37	Nd3–f4	Ra8–e8
38	c2–c4	Re8–e1+
39	Kb1–c2	h5–h4
40	Nf4–h5	Re1–g1



41 Rd7–a7??

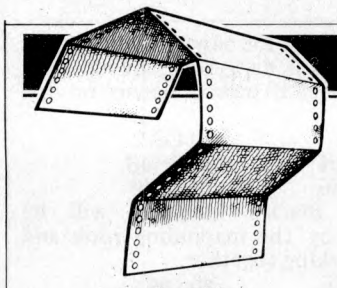
Ruining a fine game by failing to realise that the h-pawn now becomes unstoppable.

41	. . .	h4–h3
42	Ra7–a8+	Kg8–h7
43	Nh5xf6+	g7xf6
44	Ra8–a5	Kh7–g6
45	Ra5–a8	h3–h2
46	Ra8–h8	h2–h1Q
47	Rh8xh1	Rg1xh1
48	Kc2–c3	Kg6–f5
49	c4–c5	Rh1–h2+
50	a2–a3	Rh2–h4
51	b2–b4	Kf5–e5
52	Kc3–d3	f6–f5
53	Kd3–c3	Rh4–h3+
54	Kc3–c4	Rh3xa3
55	Kc4–b5	f5–f4
56	c5–c6	f4–f3
57	c6–c7	Ra3–c3
58	Kb5–b6	f3–f2
59	Kb6–b7	f2–f1Q
	0–1	

GOTO page 152

		1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	Tot	Tie-break
1	Mephisto Experimental X	x	1	½	1	.	½	1	.	.	.	.	.	.	1	1	.	.	.	6	26½
2	Chess Champion Mark V	0	x	½	½	.	1	.	.	1	1	1	.	.	.	.	.	.	.	5	30
3	Great Game Machine (Morphy)	½	½	x	½	.	½	.	1	1	.	.	.	.	.	.	.	.	1	5	28½
4	Morphy Encore	0	½	½	x	.	.	½	.	.	1	.	.	1	.	.	1	.	.	4½	28½
5	Mephisto Experimental Y	.	.	.	.	x	½	.	.	1	0	.	.	1	0	1	1	.	.	4½	20
6	Auto Response Board (Boris 2.5)	½	0	½	.	½	x	½	.	.	.	1	.	.	1	.	.	.	.	4	30
7	Mephisto	0	.	.	½	.	½	x	.	0	.	1	1	.	.	.	.	1	.	4	26½
8	Sfinks (private entry)	.	.	0	.	.	.	.	x	0	0	.	1	+	.	1	.	1	.	4	22
9	Modular Game System (Boris 2.5)	.	0	0	.	0	.	1	1	x	.	.	½	.	.	1	.	.	.	3½	28
10	Sensory Voice Challenger	.	0	.	0	1	.	.	1	.	x	½	1	.	0	.	.	.	.	3½	27
11	Boris Diplomat	.	0	.	.	.	0	0	.	.	½	x	.	1	1	.	.	.	1	3½	23
12	Voice Chess Challenger	.	.	.	.	.	.	0	0	½	0	.	x	.	.	.	1	1	1	3½	20
13	Chess Champion Mark IV	.	.	.	0	0	.	.	–	.	.	0	.	x	1	.	1	1	.	3/6	22
14	Chess Partner 2000	0	.	.	.	1	0	.	.	.	1	0	.	0	x	.	.	.	0	2	26
15	Chess Challenger 7	0	.	.	.	0	.	.	0	0	.	.	.	.	.	x	0	1	1	2	23
16	Challenger Sensory 8	.	.	.	0	0	.	.	.	.	.	.	0	0	.	1	x	0	1	2	20½
17	Microchess*	.	.	.	.	.	.	0	0	.	.	.	0	0	.	0	1	x	½	1½	20
18	Chess Traveller	.	.	0	.	.	.	.	.	.	.	0	0	.	1	0	0	½	x	1½	19½

* New stand-alone unit Novag (nothing to do with the disk-based Microchess)



COMPUTER ANSWERS

Send your queries to: Sheridan Williams, 35 St Julians Road, St Albans, Herts.

Port points

I write a large number of machine code programs using very slow and very high data rates on the Research Machines 380Z. Although CP/M and EMT calls are useful for slow data rates, they are not much use at high speed (above 10kb/s). Do you have any information on the memory-mapped I/O and status ports, along with relevant bit settings, as trying to obtain this information from RML is like getting blood from a stone?
P Hurt, Nottingham.

As far as I know there are no status bits available for the user I/O port, but you can get around this in several ways, depending on requirements. If the data is constantly changing and only the changes are required, you could simply compare one byte with the previous and discard it if the same or store it if different. The obvious disadvantage is the fact that some data will be lost. Another way would be to design the interface so that it only sent data when strobed by the computer, then design software to output a pulse when data is required. This data would be provided on an input port and can be read and stored. If it were possible to make do with only seven bits, then the eighth could be used as a strobe from the interface. Software could be designed to look at this bit and read the remaining seven when the relevant setting occurred.

I should add that it would probably be easier to use a PIO, as this has ample bits available. The other point is where all this information is going. 64k memory will be filled in a matter of six seconds and even if it were possible to dump the data onto disk at these data rates, that would also be filled in seconds, too. I would think that speeds of up to 30,000 bytes/s could be achieved.
John Holland, N Home Counties 380Z user group.

Language listing

One of your earlier questions asked if there were any listings for Basic, Cobol and Fortran compilers/interpreters. There are several available for Basic and I attach a list.
D Stanislaw, St Helens, Merseyside; Walter Hicks, Prestwick, Manchester; Derek Fordred, ACC Dartford.

Many thanks for the response; I list below all references sent to me by all concerned: Denver tiny Basic — Dr Dobbs March 76; Minol tiny Basic — Dr Dobbs April 76; Palo Alto tiny Basic — Dr Dobbs May 76; NIBL tiny Basic — Dr Dobbs Nov/Dec 76.

CP/M User Group Library: Lawrence Livermore Basic — Volume 1; Processor Technology Basic — Volume 11; Palo Atlo tiny Basic — Volume 11; BASIC-E compiler written in PLM) Vol 29/30; Tarbell Basic — Volume 31/32.

Heath of Gloucester sells a listing of its cassette Basic Model no. H-8-60 at £20.50, which is well annotated, but I/O is dependent on H-8 ROM. Of course it is fully copyrighted. (for 8080 code)

Molimerx at one time distributed/published a disassembled listing of level II TRS-80 Basic (*Not* by Tandy I must add).
SW.

Clocking on

In the May edition, you gave advice on how to turn off the 'stop' key on the PET. Your method does not work and was instructive to try, but we discovered that it also turns off the clock. I am sure that a great many people would like a routine that doesn't turn off the clock as this would be invaluable in real-time situations. Could you help?
Professor B Richards, UMIST; O Denstad, Sweden; H Mitchell, Liverpool; and many others

There is no simple way to POKE an instruction. Instead a whole routine will have to be used. I have shown both a Basic program and the Terminal Input Monitor listings for the 4000/8000 series PETs. A similar solution exists for the 3000 series.

I suggest that the short program is located in the first cassette buffer at location 640. If you are using cassette 1 then use the second cassette buffer at 826. Note you cannot use the second cassette buffer if you are using disks since it is used by the system If these are no use then place it at the end of memory and alter the pointers in Basic.

```
1 REM SYS(I) TO DISABLE STOP KEY, SYS(I+11) TO RE-ENABLE
2 R$="78:9968590:9028591586078:9558590:9>48591586020>:"
3 R$=R$+"??>628:528<906=006:900852820>?:9??859;4<58>4"
4 INPUT"START ADDRESS";I:FORN=1TOLEN(R$)/2
5 POKEI+N-1,(ASC(MID$(R$,N*2-1,1))-48)*16+ASC(MID$(R$,N*2,1))-48:NEXTN
6 I2=I+22:I1=INT(I2/256):POKEI+6,I1:I1=I2-I1*256:POKEI+2,I1
7 END
```

Basic routine

```
B*
     PC   IRQ   SR AC XR YR SP
.;   0401 E455 32 04 5E 00 F4
.M 0280,02A8
.:   0280 78 A9 96 85 90 A9 02 85
.:   0288 91 58 60 78 A9 55 85 90
.:   0290 A9 E4 85 91 58 60 20 EA
.:   0298 FF E6 F8 A5 F8 C9 06 D0
.:   02A0 06 A9 00 85 F8 F0 EF A9
.:   02A8 FF 85 9B 4C 58 E4 00 00
.X
```

TIM routine

Mark Wratten

Cassette cure

I have had problems loading Acorn Atom programs. In developing programs, I saved the first part as something like PROGRAM1 and subsequent parts as PROGRAM2, etc, but have been unable to load the second stage.
H Bell Glasgow

You haven't given enough information to be sure of the nature of the problem. Assuming that you have set up the tape machine as in page 8 of the handbook and that PROGRAM2 was developed by loading PROGRAM1 and then adding to it, saving the entire file of both parts as PROGRAM2, then I am surprised that you have any problems.

My guess is that your cassette machine has an 'Automatic Gain Control' (AGC). If this is the case, the cassette test routine in the handbook behaves okay because the Atom emits a continuous stream of data. However, in the conventional mode (ie SAVE "THIS") the Atom starts off producing a tone and your AGC circuit will set up with this quite happily. When data is sent, a header message is sent, followed by a block of data, finally a gap of a couple of sconds is followed by a header and antoher block of data. During the gap, the AGC thinks that the level has gone down, and increases the recording level, making the first part of the next data incorrectly recorded.

This is confirmed by guessing that PROGRAM1 might be less than 256 bytes and no gap will occur, but when you save PROGRAM2 the longer program needs more than one block of 256 bytes. The cure is either to disable the AGC by means of a modification or use a different cassette recorder.
Alan Taylor

Atom magic

Is there a book similar to Tim Hartnell's *Making The Most Of Your ZX80* for the Acorn Atom?
Mrs D Hand, Lancashire

Currently, the only book that I have seen advertised is the *Atom Magic Book*, available from Timedata Ltd, 57 Swallowdale, Basildon, Essex. However, the popularity of the Atom may well prompt a number of books of this nature.
Alan Taylor

Atom advice

The Acorn Atom manual gives a routine to use where READ/DATA statements are required. Is there an easier way than this? Also, the Atom has no TAB function; how can I use the 'COUNT' function to do this?
D V Radisic, Pitsea, Basildon, Essex

The routine used on page 63 uses labels, and is therefore relocatable. If you were to make a cassette of this routine but with line numbers much bigger than you would use in a program, you could add this routine at whatever point you wish by using the 'append' method on p142, followed by the renumber program to put the line numbers into a more useful range. Be sure to use labels rather than GOTO line num-

bers. Besides, it is easier to use labels.

While this routine will allow you to simulate the READ/DATA statements, Acorn Basic has a data structure that is far more flexible and elegant. The technique is to use byte or word indirection (uses '?' or '!' characters) as explained on pp 156, 159 of the amnual. Depending on the type of data that you wish to store, you define a starting address and then define the data. The data is then recovered and manipulated in any way you wish. An excellent example is in 'Hex character plotting' demo on p84. You may care to change the data in lines 10 and 12 and discover which bits correspond to the seven segments display.

COUNT is a function that holds the number of characters printed on the current line. To use it as a TAB to indent a message by ten spaces, do it like this:
DO PRINT'' '''; UNTIL COUNT = 10 or
DO PRINT $32; UNTIL COUNT = 10
this may be abbreviated to:
DO P.$32; U.C. = 10
followed on the next line by PRINT "message".
Alan Taylor

Troublesome terms

I am a newcomer to computing and find some of the jargon a little confusing. Two words in particular are 'compiler' and 'assembler'; where do these words fit into the pattern of things?
R W Bishop, Earlsdon, Coventry

I trust that you have read the page entitled 'Newcomers Start Here' in *PCW;* it does a lot of explaining very clearly, but omits the words you mention.

Both these words come under the heading of 'Translators' — they translate one computer language into another. Other such words are interpreter, disassembler, decompiler. The process of going from a high-level language, such as Basic, Fortran, Algol, Pascal, Cobol, into machine code requires a compiler. The process of going from a low-level (mnemonic type) language into machine code requires an assembler. An assembler is far less complicated than a compiler. Both are programs (in machine code) that translate one language (the 'source code') into another (the 'object code' which is usually, though not always, machine code). Translators are a set of rules defining the 'syntax' of the source code together with a dictionary of the words used.
SW

POKEing around

Software written in Basic often contains many POKE commands of which one may not know the function. Is there a book or other publication that lists useful POKE commands for 6502 machines?

Can the package 'SuperSort' be used from a program written with a Basic interpreter, rather than from programs compiled from Fortran or Cobol?
A R Moss, Welwyn Garden City

The trouble with POKE addresses is that they are not specific to a particular microprocessor, but to the specific implementation of operating system and language used with it. Thus, the POKE addresses for the 'old ROM' PETs are not the same as the POKE addresses for the 'new ROM' version of the same model PET! This makes it rather difficult to recommend suitable books. If you have a PET, then *'The PET Revealed'* by Nick Hampshire should help.

Yes, Micropro's SuperSort will operate with Microsoft BASIC-80, which is an interpreted version. In fact, BASIC80 is, if anything, the preferred language for use with SuperSort, although as you say, this program is very versatile as to the languages with which it will work.
P L McIlmoyle

Statistics search

I am currently trying to discover details of survey analysis/statistics packages which are commercially available for CP/M systems. I have so far found the following: SAM, SNAP, A-Stat. Do you know of any others?
P G Upton, Wirral

Statistics packages for CP/M are offered by Telesystems Ltd, P O Box 12, Great Missenden, Bucks. Ecosoft Microstat, which operates under CP/M with Microsoft Basic 80, is available from Digital Devices Ltd, 134 London Road, Southborough, Kent. The latter also offers the SoHo Group Matchmaker program, which converts North Star Basic to run under CP/M on a North Star Horizon. If you have this machine, Matchmaker would let you use the statistics programs on North Star Users Group disk NSUG 12 under CP/M.

Matchmaker works essentially by converting North Star Basic to run under CP/M rather than North Star DOS. The main gain (apart from not having to switch operating systems) is that the easier-to-use file handling facilities are available for existing North Star programs.

If you are prepared to not only change from one Basic to another, but to change to another language, then STAPL from Alan Pearman Ltd of Maple House, Mortlake Crescent, Chester, is a quite comprehensive statistics package written in APL. Of course, using this would necessitate an APL interpreter. However, APL is such a powerful language, especially for array orientated work like survey analysis, that such an interpreter might be well worth acquiring in it's own right. While APL is easier to use with a VDU equipped to show the special APL characters, the language is now available for use with ordinary ASCII characters.
P L McIlmoyle

Roll up

I have bought a Creed 7B teleprinter but cannot find a source of suitable paper. Can you help, please?
D R Beaumont, Keighley, Yorks.

I suggest you try either Inmac, Dept L, 18 Goddard Road, Astmoor Industrial Estate, Runcorn, Cheshire, or Willis Computer Supplies Ltd, P O Box 10, Southmill Road, Bishop's Stortford, Herts. Both these firms specialise in computer-related 'consumables' such as paper, ribbons, disks, etc.

Willis includes both Teletype and Teleprinter paper in its catalogue, and both of these are in turn available either with or without sprocket holes.
P L McIlmoyle

Time trouble

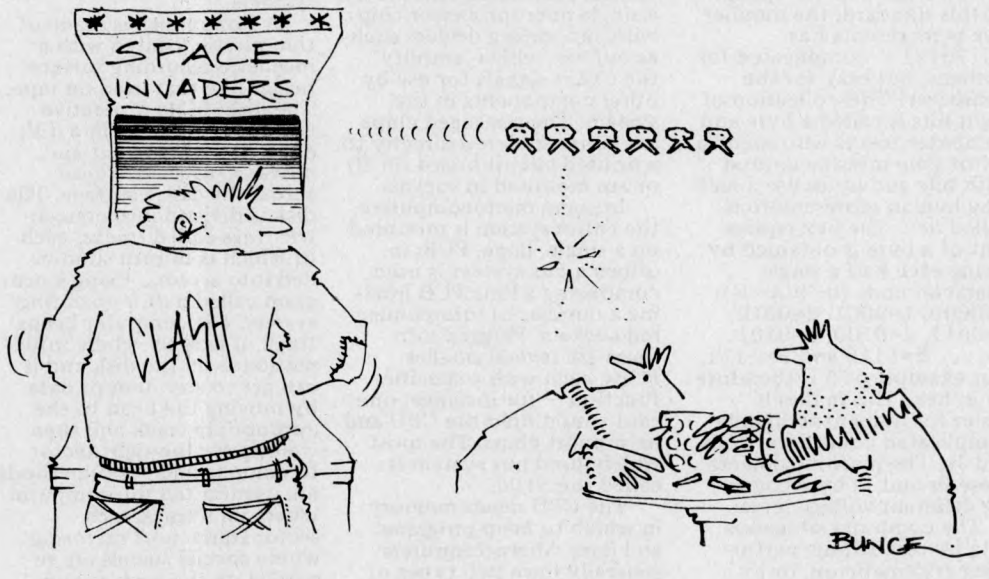
I keep on coming across the term 'Real-time' and I'm not sure that I really understand it. Could you give a clear definition please?
M Baldwin, Harrow

I can think of no better way of replying than to quote the definition included in the British Computer Society's *Glossary of Computing Terms*:

'A real-time system is one which is able to receive continuously changing data from outside sources and which is able to process that data sufficiently rapidly to be capable of influencing the sources of data'.

A central heating system could well be controlled by a microprocessor operating in real-time with the individual valves being opened or shut according to the temperature in each room.

The BCS can be found at 13 Mansfield Street, London W1M 0BP. Tel: 01-637 0471.
SW



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 are (yes, it's plural) accepted and output by the computer in 'human' form, inside it's a different story — they 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 halfway 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 them 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 microcomputers; 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 system 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.

Comart Approved Dealers

Belfast
O & M Systems
95 Dublin Road
Tel: 0232 49440

Birmingham
Byteshop Computerland Ltd
94/96 Hurst St, B5 4TD
Tel: 021 622 7149

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Cambridge Computer Stores
1 Emmanuel St, CB1 1NE
Tel: 0223 68155

Cornwall
Benchmark Computer Systems Ltd
Tremena Manor
Tremena Road
St Austell, PL25 5GG
Tel: 0726 610000

Dublin
Lendac Data Systems Ltd
8 Dawson St
Tel: 0001 372052

Glasgow
Byteshop Computerland Ltd
Magnet House
61 Waterloo St, G2 7BP
Tel: 041 221 7409

Leeds
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11/12 Rampart Road
Woodhouse St
Tel: 0532 459459

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Byteshop Computerland Ltd
324 Euston Road
London W1
Tel: 01-387 0505

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9 Macklin Street
Covent Garden WC2
Tel: 01-405 6761

Jarrogate
67 Tulsemere Road,
West Norwood,
London SE17
Tel: 01-670 3674

Manchester
Byteshop Computerland Ltd
11 Gateway House
Piccadilly Station Approach
Tel: 061 236 4737

NSC Computers
29 Hanging Ditch
Tel: 061 832 2269

Newbury
Newbear Computing Store
40 Bartholomew St
Tel: 0635 30505

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Byteshop Computerland Ltd
92A Upper Parliament St,
NG1 6LF
Tel: 0602 40576

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451 Eccleshall Road, S11 9PN
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23 Cumberland Place,
SO1 2BB
Tel: 0703 38740

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Holbrook Hall
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Tel: 0206 262319

Warwicks
Business & Leisure Microcomputers
16 The Square
Kenilworth
Tel: 0926 512127

Watford
Lux Computer Services
108 The Parade
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Comart Microcomputer dealers are located strategically throughout the country to give support, guidance and assistance. In the event of difficulty contact Comart direct.

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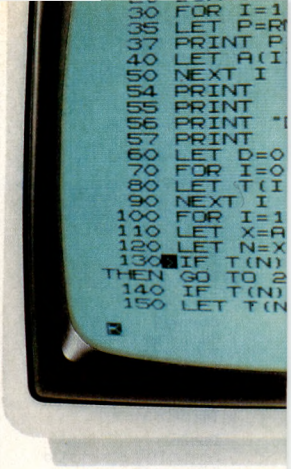
New! Sinclair ZX81 Personal Computer.



Kit: £49.95 complete

Built: £69.95 complete

Reach advanced computer comprehension in a few absorbing hours

1980 saw a genuine breakthrough – the Sinclair ZX80, world's first complete personal computer for under £100. At £99.95, the ZX80 offered a specification unchallenged at the price.

Over 50,000 were sold, and the ZX80 won virtually universal praise from computer professionals.

Now the Sinclair lead is increased: for just £69.95, the new Sinclair ZX81 offers even more advanced computer facilities at an even lower price. And the ZX81 kit means an even bigger saving. At £49.95 it costs almost 40% less than the ZX80 kit!

Lower price: higher capability
With the ZX81, it's just as simple to teach yourself computing, but the ZX81 packs even greater working capability than the ZX80.

It uses the same micro-processor, but incorporates a new, more powerful 8K BASIC ROM – the 'trained intelligence' of the computer. This chip works in decimals, handles logs and trig, allows you to plot graphs, and builds up animated displays.

And the ZX81 incorporates other operation refinements – the facility to load and save named programs on cassette, for example, or to select a program off a cassette through the keyboard.

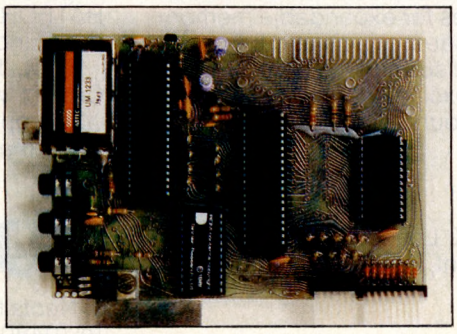
Higher specification, lower price – how's it done?
Quite simply, by design. The ZX80 reduced the chips in a working computer from 40 or so, to 21. The ZX81 reduces the 21 to 4!

The secret lies in a totally new master chip. Designed by Sinclair and custom-built in Britain, this unique chip replaces 18 chips from the ZX80!

Kit or built – it's up to you!

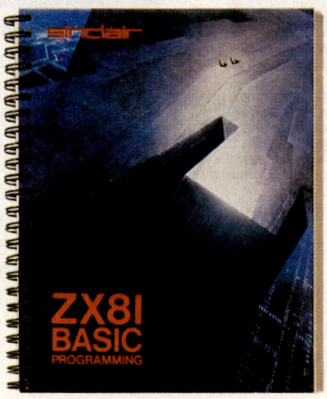
The picture shows dramatically how easy the ZX81 kit is to build: just four chips to assemble (plus, of course the other discrete components) – a few hours' work with a fine-tipped soldering iron. And you may already have a suitable mains adaptor – 600 mA at 9 V DC nominal unregulated (supplied with built version).

Kit and built versions come complete with all leads to connect to your TV (colour or black and white) and cassette recorder.

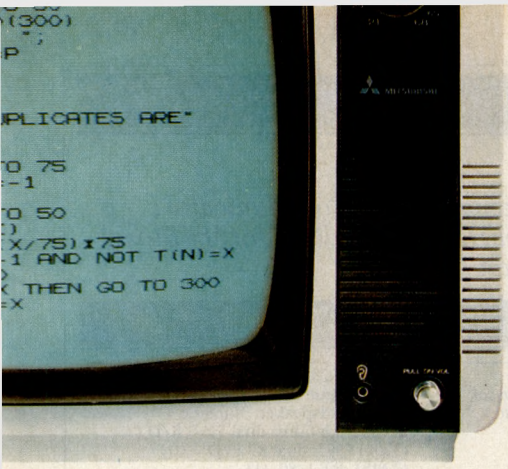


Proven micro-processor, new 8K BASIC ROM, RAM – and unique new master chip.

New BASIC manual



Every ZX81 comes with a comprehensive, specially-written manual – a complete course in BASIC programming, from first principles to complex programs.



If you own a Sinclair ZX80...

The new 8K BASIC ROM used in the Sinclair ZX81 is available to ZX80 owners as a drop-in replacement chip. (Complete with new keyboard template and operating manual.)

With the exception of animated graphics, all the advanced features of the ZX81 are now available on your ZX80 – including the ability to drive the Sinclair ZX Printer.

Coming soon- the ZX Printer.

Designed exclusively for use with the ZX81 (and ZX80 with 8K BASIC ROM), the printer offers full alpha-numerics across 32 columns, *and* highly sophisticated graphics. Special features include COPY, which prints out exactly what is on the whole TV screen without the need for further instructions. The ZX Printer will be available in Summer 1981, at around £50 – watch this space!

16K-BYTE RAM pack for massive add-on memory.

Designed as a complete module to fit your Sinclair ZX80 or ZX81, the RAM pack simply plugs into the existing expansion port at the rear of the computer to multiply your data/program storage by 16!

Use it for long and complex programs or as a personal database. Yet it costs as little as half the price of competitive additional memory.

How to order your ZX81

BY PHONE – Access or Barclaycard holders can call 01-200 0200 for personal attention 24 hours a day, every day. BY FREEPOST – use the no-stamp-needed coupon below. You can pay by cheque, postal order, Access or Barclaycard. EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option, of course. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

New, improved specification

- Z80 A micro-processor – new faster version of the famous Z80 chip, widely recognised as the best ever made.
- Unique 'one-touch' key word entry: the ZX81 eliminates a great deal of tire-some typing. Key words (RUN, LIST, PRINT, etc.) have their own single-key entry.
- Unique syntax-check and report codes identify programming errors immediately.
- Full range of mathematical and scientific functions accurate to eight decimal places.
- Graph-drawing and animated-display facilities.
- Multi-dimensional string and numerical arrays.
- Up to 26 FOR/NEXT loops.
- Randomise function – useful for games as well as serious applications.
- Cassette LOAD and SAVE with named programs.
- 1K-byte RAM expandable to 16K bytes with Sinclair RAM pack.
- Able to drive the new Sinclair printer (not available yet – but coming soon!)
- Advanced 4-chip design: micro-processor, ROM, RAM, plus master chip – unique, custom-built chip replacing 18 ZX80 chips.

sinclair ZX81

Sinclair Research Ltd,
6 Kings Parade, Cambridge, Cambs.,
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Reg. no: 214 4630 00.

To: Sinclair Research Ltd, FREEPOST 7, Cambridge, CB2 1YY. **Order**

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) (600 mA at 9 V DC nominal unregulated).	10	8.95	
	16K-BYTE RAM pack(s).	18	49.95	
	8K BASIC ROM to fit ZX80.	17	19.95	
	Post and Packing.			2.95

Please tick if you require a VAT receipt ☐ **TOTAL £** _____

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*Please charge to my Access/Barclaycard/Trustcard account no.

*Please delete/complete as applicable. Please print.

Name: Mr/Mrs/Miss _____

Address _____

FREEPOST – no stamp needed. PCW.07

DIRECT ACCESS

IN STORE

This month you will notice four additions: the Adler Alphatronic; Comart's own Communicator; NEC's PC8001 and, the subject of this month's Benchtest, Tandy's Model III. Send updates for 'In Store' to me, Dick Olney, at PCW, *14 Rathbone Place, London W1P 1DE.*

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
ABC 80 (£738)	Datormark Ltd: 97 44896	16-40k RAM; Z80A; C; 12'', 16 x 40 b&w VDU; 4680 bus; IEEE 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 System 800 (£3950)	ACT: 021-455 9898 (50)	48k RAM; dual 5¼'' F/D (800k); 12'', 30 x 64 VDU; 1 S/P; 1 P/P; Multi-screen int.	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).
Adler Alphatronic (£1550)	Adler 01-250 1717	48k RAM: Z80: 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.	Modular. Expands to 1200 Mb, 24 terminals or multiprocessor system. (E)
Altos ACS 8000 (£3398)	Logitek: 02572 66803 (33)	64k RAM; Z80; 1k EPROM; dual 8'' F/D (1 Mb); 2 x RS232 ports; 1 P/P.	CP/M; *Basic; CBasic; Cobol; Pascal; Fortran.*	Expandable to 4-user system with 58 Mb H/D. Maintenance contracts avail; BT 5/80 (S&H).
Apple II (£695)	Microsense: 0442 41191 (190)	16-48k RAM; 6502; 8 I/O slots.	OS; Basic; *Pascal; Fortran.*	280 x 192 high resolution graphics; Integer Basic in 6k ROM; Option: single 5¼'' F/D (116k) £349.
Atari 400 (£395-16k)	Ingersoll: 01-226 1200 (TBA)	8-16k RAM; 6502; C int; cartridge slot; 12 x 20 TV int; RS232C port; touchpad k/b; Opt: C £55.	OS (10k ROM); Basic (8k ROM).	High resolution colour graphics. 4-channel sound. Four games controller/light pen sockets.. BT 10/80. (I/B).
Atari 800 (£695-16k)	As above.	8-48k RAM; 6502; C int; 4 x cartridge slots; 12 x 20 TV int; RS232C port. Opt: single 5¼'' F/D (90k) £525; 16k RAM £145.	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 (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 (N/A)	2-11k RAM; 6502; Full K/B; C int; TV int; 20 I/O lines; 1 P/P.	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 System II (£8000)	Friargrove Systems Ltd: 01-572 3784 (10)	64k RAM; Z80; dual 8'' F/D (1.2 Mb); 12'' 24 x 80 VDU; 180 cps printer.	Basic; *Fortran; Cobol.*	Upgradable to multiuser system with 34 Mb H/D. Full range of business packages included software dealers TBA. (S)
BASF 7120 (£5155)	BASF: 01-388 4200 (TBA)	64k RAM; Z80A; 3 x 5¼'' F/D (480k); 12'', 24 x 80 VDU; RS232 port; P/P.	DOS; *Ex Basic; Cobol U.*	H/D available soon. Also 7110 with dual F/D £4275. Disk controller has own Z80A. BT 9/80. (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 £3000. (S).
C/09 (£3975)	SWTP Ltd: 01-491 7507 7507 (16)	56k RAM; 6809; dual 8'' F/D (2 Mb); 8'', 16 x 80 VDU; 1 S/P.	TSC FLEX; *Basic; Pascal; A; Dis A; T/E; U.*	VDU is intelligent. Option: 15 Mb H/D £3575; with dual 5¼'' F/D (350k) instead of 8'', £3000. (H)
Canon BX-1 (£3850)	Canon Business Machines (UK) Ltd: 01-680 7700.	64k RAM; 6800; Single 5¼'' F/D (65k); 12'', 25 x 80 VDU; 5 x V24 ports.	DOS; Ex Basic; A.	Also supplied with integral thermal printer instead of VDU. (S&H)
Challenger 1P & C4P (£220 & £395)	CTS: 0706 79332. Millbank Computing: 01-549 7262. Mutek: 0225 743289. U-Microcomputers: 0925 54117 (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 (£1500)	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 System B (£1950)	Clenlo Computing Systems Ltd: 01-670 4020 (TBA)	64k RAM; Z80; dual 8'' F/D (1 Mb); 3 S/P; 2 P/P.	CP/M; CBasic-2; Pearl 1; *U.*	With four 8'' F/D £2850. (S&H).
Clenlo Conqueror System D (£5150)	As above	64k RAM; single 8'' F/D (500k); 10 Mb H/D; 3 S/P; 2 P/P.	CP/M; CBasic-2; Pearl 11: *U.*	With 26 Mb and no F/D £5950.
Comart Communicator (£1995)	Comart 0480 215005	64k RAM: Z80A: daul 5¼" F/D (780k): 2 S/P: P/P.	CP/M: *Basic: Cobol: Fortran: Pascal*	With 1.5 Mb F/D £2295. Option: 18 Mb H/D. £3395 (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.

IN STORE

DIRECT ACCESS

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Compucolor II (£995)	Dyad Developments: 08446 729 (TBA)	8-32k RAM; 8080; 13" 32 x 64 8-colour VDU; single 5¼" F/D (51k); RS232 port.	DOS (ROM); Ex-Basic (ROM); A.	16k version £1078, 32k £1198. High resolution graphics. 6-month subscription to user magazine inclusive BT 9/79. (S)
Compucorp 625 (£6000)	Compucorp: 01-952 7860 7860 (17)	48-60k RAM; Z80; dual 5¼" F/D (630k); 9". 16 x 80 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 (from £5895)	As above	60k RAM; Z80; Up to 4 x 5¼" F/D (160k-2.4 Mb); 9", 20 x 80 or 12" 20 x 80 or 20" 60 x 80 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 2, System 3, System Z2H. (£2550/ £4295/£5960)	Datron: 0742 585490. Comart: 0480 215005. MicroCentre: 031-556 7354 (18)	64k RAM; Z80; dual 5¼" F/D (346k) on 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.*	All systems expandable to multi-user (max 7) £6408 Sys 2, £8304 Sys 3. Options: dual 8" F/D (996k); 11-22 Mb H/D. BT 10/79 (E).
DAI (£595-48k)	Data Applications (UK): 0285 2588 (TBA)	12-48k RAM; 8080; C int; 24 x 60 VDU int; RS232 port; over 20 industrial ints.	Basic (ROM); U.	Colour graphics up to 255 x 335; 3 notes & noise generator; PAL O/P to TV; Paddle int; H maths option. (I). ET 10/80
Diablo 3000 (£8950) (TBA)	Business Computers Ltd: 01-207 3344	32k RAM; 8085; dual 8" F/D (1.3 Mb); 12", 24 x 80 b&w VDU; 45 cps printer.	DOS; Basic; DACL; A; U.	Selection of business packages included (S).
Digital Micro-systems DSC-2 (£3525)	Modata: 0892 41555 (10)	64k RAM; Z80; dual 8" F/D (1.14 Mb); 4 x RS232 ports; EIA port.	CP/M; Basic-E; CBasic; *Cobol; Fortran; Pascal.*	14 or 28 Mb H/D available or additional F/D units (H).
Digital Micro-systems DSC-4 (£6045)	As above	128k RAM; Z80A; single 8" F/D (500k); 11 Mb H/D; 4 x 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 (£7500)	Comp Ancillaries: 0784 36455 (12)	64k RAM; 8085; dual 5¼" F/D (1 Mb); 9", 16 x 64 green VDU; 132 col 165 cps printer; N/P.	O/S; DBasic; *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 (£2300)	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 networking; CP/M inc in base price for F/D systems, MP/M for H/D systems.
Dynabyte 5200-5900 £2300	Metrotech 0895-57780 (15)	64k RAM; Z80; S100 bus; 2 ser ports; 1 par port; any com of 5¼" F/D (1.2 Mb) 9/27/45 Mb H/D, 32/64/96 Mb Cart Module Disk.	CP/Net, CBasic, MBasic Cobol, Fortran, Pascal, PL/1-80.	All systems expandable to multi-user and networking; CP/M inc in base price for F/D systems, 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; 6 x S/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).
Euroc (£7995)	Euroc: 01-729 4555 (TBA)	34k RAM; 8080A; dual 8" F/D (1 Mb); 15" 25 x 80 b&w VDU; 132 vol 140 cps printer.	CP/M; CBasic; A; U.	Financial software available. Supply of stationery included.
Executive Mini-computer (£378)	Binatone Int: 01-903 5211 (N/A)	16k RAM: Z80; 500 bps C; 32 x 64 TV int; extra C int; 1 P/P.	Basic (12k ROM); M/A; *Fortran.*	Graphics avail. F/D under development; Also 4k version called 'Oxford minicomputer'.
Exidy Sorcerer (£749)	Liveport Data Products: 0736 798147 (27)	16-48k RAM; Z80; RS232 port; 1 P/P; S100 connector; 30 x 64 VDU int.	O/S; Basic (ROM); *T/E; A; CP/M; Algol; Fortran; Basic; 80.*	High-resolution graphics capability; user programmable character set. 32k version £799; 48k £849. Option: single 5¼" F/D (316k) £600.
Gemini 801 (£1075)	Gemini: 02403 22307 (7).	64k RAM; Z80A; Single 5¼" F/D (315k); 25 x 80 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)
Haywood 3000 (£2022)	Haywood: 65 28301. (TBA)	48k RAM; Z80A; dual 5¼" F/D (800k); RS232 port; P/P. Opt: 15" 28 x 80 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", 16 x 32 VDU; C (200k): 64 cps printer; 4 P/P. Options: dual 5¼" F/D (540k) £1408; dual 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); 2x S/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); 2 x S/P; 1 P/P	CP/M; CBasic; *Cobol; Fortran; MicroCobol.*	Multi-user MVT/FAMOS available in place of CP/M. (S&H).
ITT 2020 (£867)	ITT: 0268 3040 (15)	16-48k RAM; 6502	Monitor; A; ExBasic; Dis A.	360 x 192 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); 2 x RS232 ports; 4 x P/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).

List of Abbreviations

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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)
LX-500 (£3500)	Logabax Ltd: 01-965 0061 (13)	32k RAM; Z80; dual 5¼" F/D (180k); 12" 25 x 80 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", 24 x 80 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", 24 x 80 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 & 2 (£3750 or £280 pm).	Micro APL Ltd. 01-834 2687 (TBA)	64k RAM; Z80; dual 8" F/D (1 Mb); 4 x RS232 ports.	CP/M; APL; U; *Basic; Fortran; Cobol; Wordstar; Algol; Pascal; Forth.*	Designed as timesharing replacement. (S).
Megamicro (£6080)	Bytronix: 0252 726814(5)	56k RAM; Z80; dual 8" F/D (500k); 12", 20 x 80 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" 16 x 24 VDU; 2 x C 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. (I)
Mikro 1000 (£3950)	Airamco: 0294 57755 (TBA)	64k RAM; Z80; dual 8" F/D (1 Mb); 12" 24 x 80 VDU; S100; RS232; 1 P/P	CP/M; Basic; Cobol; Fortran.	Also word processor with 44 special function keys & NEC Spinwriter printer £4450. (S&H)
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)	1k RAM; 6502; T Mint; Exp up to 277k RAM.	1k TANBUG monitor; 2k A, disassembler, cassette firm ware; *10k Microsoft Ex Basic.*	Options: bulk I/O modules, hi-def colour graphics, DOS, system racking, ASCII keyboard. (S&H)
Millbank Sys 10 (£2995)	Millbank: 01-788 1083 (6).	65k RAM; Z80; dual 5¼" F/D (700k; 12", 24 x 80 VDU; 2 x RS232 ports; RS449 port; P/P.	CP/M; *Basic; Cobol; Fortran; Pascal; PL1; W/P*	One high level lang. included. 12-month warranty. Mainframe comm. package. H/D avail. soon. (S&H)
MS5001 (£8250)	BMG Ltd: 0793 37813 (N/A)	64k RAM; 8085; dual 8" F/D (1 Mb); 12", 80 x 24 VDU; 160 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; 9" 16 x 64 b&w VDU; C int; 1 S/P; 1 P/P.	Basic; A.	Graphics & PROM programmer available (S&H)
MSI System 7 (£3500)	As above	56k RAM; 6800; dual 5¼" F/D (160k); 9", 14 x 64 VDU; 1 S/P; 1 P/P.	FDOS: Basic; A; U.	As above. Multi-user O/S avail. Options: 10 Mb H/D.
MSI System 12 (£8000)	As above	56-184k RAM; 6800; 10 Mb H/D; 9", 16 x 24 VDU; 1 S/P; 1 P/P.	SDOS; Basic; CBasic; U.	As above. Business packages avail. (H & S).
Nanocomputer NBZ80S (£420)	Midwich: 0284 701321	4k RAM; 2k ROM; Z80; C int; 8 digit LED; Calc K/B; RS232 port; 2 P/P.	Machine Language; *Basic; A; T/E.*	Designed for hardware education. Full training manuals included. Fully expandable. (E).
NEC PC 8001 (£450)	NEC(UK)	32k RAM: Z80A: RS232 port: P/P Option: dual 5¼" F/D (574k) £675	*CP/M: Basic N: Fortran Cobol: Pascal*	Colour monitor £250 (low res) or £480 (high res) both 12", 25 x 80 (E) BT 6/81
Newbrain MB £219	Newbury Labs: 021-707 7170. Newbear: 0635 30505 (N/A)	2-4k RAM; Z80A; Nat 420; 14x 16 VDU; 2 x C int; TV int; V24 port. Option: C (50k) £60.	C Basic (16k ROM)	Graphics. Battery or mains. Mains only with 16k RAM £269. (low power battery version £299). (I).
North Star Horizon (£2230)	Comart: (7) 0480 215005. Comma: 0277 811131. Equinox : 01-739 2387 (20)	48-56k RAM; Z80A; dual 5¼" F/D (360k); 15", 24 x 80 VDU; 150 cps printer; 2 S/P; 1 P/P.	DOS; Basic; CP/M; *Cobol; Fortran; Pascal.*	With 32k and single F/D £1495. Options: 18 Mb H/D.
Onyx C8000 £6850)	Onyx Dist Ltd: 0734 664345 (TBA)	64k RAM; Z80; 12 Mb Cartridge; 10 Mb H/D; RS232 port; P/P	CP/M; *Basic; Cobol; Fortran; Pascal; W/P*	C8001 with 128k RAM £8220. Multi-user version avail. using Oasis. (E) BT 3/81
Oscar (£2495)	IDS Ltd: 0908 313997 (30)	64k RAM; Z80; dual 5÷ F/D (800k); 12", 25 x 80 VDU; RS232 port; 1 P/P	CP/M; *Basic; Pascal; Fortran; Cobol; W/P; A*	Also avail. with dual 5¼" F/D (1.6 Mb) £2905 and dual 8" F/D (2 Mb) £3380. Advanced video board. (S + H).
Panasonic JD 800U, JD840U (£4275, £4950)	Panasonic Business Equipment: 01-262 3121 (10 regional dist)	56k RAM; 8085A; 2-4k PROM; dual 8" F/D JD800 U (500k), JD840U (2 Mb); 12", 24 x 80 green VDU; 3 x RS232 ports.	CP/M; Basic; *Micro-Cobol.*	Also available with 5¼" F/D; JD740U (570k) £4095. BT 3/80 (S).
Pascal Microengine (£2295)	Pronto Electronic Systems Ltd: 01-554 6222	64k RAM; MCP 1600; 2 x 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 (£3400)	Westrex Ltd: 01-405 4261 (TBA)	64k RAM; Z80A; dual 8" F/D (512k); 10", 24 x 80 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 5/81
Periflex 630/64 (from £1995)	Sintrom: 0734 85464 (5)	64k RAM; Z80; dual 5¼" F/D (630k); 2 x RS232 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. BT 6/80 (S&H)
Periflex 1024/64 (from £2750)	As above	64k RAM; Z80; dual 8" F/D (1.2 Mb); 2 x RS232 ports; 1 P/P.	As above	As above.

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IN STORE

DIRECT ACCESS

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
PET 8k, 16k, & 32k (£450, £550, £695)	Commodore: 01-388 5702 (150)	8-32k RAM; 6502; C; 9" 25 x 40 VDU; IEEE-488 port; Options: dual 5¼" F/D (353k) £695; same but (950k) £895	O/S; Basic (in 8k ROM); *Forth; Pilot; Pascal.*	Disk controller for 8k version £30. New 8032 with 80-col screen (32k). BT 12/80. £895. (I).
Powerhouse 2 (£1125)	Powerhouse Micros: 0422 48422 (TBA)	32-64k RAM; Z80A; 5" 29 x96 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", 29 x 96 VDU; RS232 port; external bus.	As above.	VDU as above. With 1.2 Mb F/D £3500. ExBasic & FDOS in 14k EPOMs £300. (H)
Raannd SP1 (£5500).	Raand: 0506 33372 (TBA)	64k RAM; MCP 1600; dual 8" F/D (2 Mb); 12", 24 x 80 VDU; RS232 port; P/P.	Pascal	Based on Microengine (with integrated P-code). BT 12/80. (S)
Rair Black Box (£2250)	Rair; 01-836 4663 (N/A)	32-64k RAM; 8085; dual 5¼" F/D (260k); 2 x RS232 ports.	CP/M; Basic; Cobol; Fortran; M/A	16k RAM expansion £250 10 Mb H/D £2500.
Research Machines 380Z (£1123)	Research Machines: 0865 49791 (N/A)	16-56k RAM; Z80A; 2 x C; RS232 port.	ExBasic; A; T/E; U; *CP/M; Fortran; Cobol; Algol; Cesil.*	Limited graphics. Many possible systems. With 48k RAM & dual 8" FD (1 Mb) £3394.
S/09 (£5350)	SWTP Ltd: 01-491 7507 (16)	128k RAM; 6809; dual 8" F/D (2 Mb); 8", 21 x 92 VDU 2 x S/P; 1 P/P	TSC FLEX; *Basic; Pascal; A; Dis A; TIE; U.*	VDU is intelligent. Expands to Option: 15 Mb H/D £3575. 60 Mb H/D multi-user system. Maintenance contracts. (S&H).
Saracen (£1925)	Bytronix 0252 726814 (TBA)	32-64k RAM; Z80; dual 5¼" F/D (800k); 2 x RS232 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: 08012 3442; C Itoh 01-353 6090 (TBA)	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 (4)	32-64k RAM; 6800; dual 5¼" F/D (160k); 9", 16 x 24 VDU; RS232 port.	DOS; Basic U; *Fortran; A; Pilot; Strubal; T/E*	Several F/D options. With 64k RAM & dual 8" F/D (1.2 Mb) about £3000. (E).
Sharp MZ-80K (£480) (22)	Sharp Electronics (UK) Ltd: 061-205 2333 (22)	6-34k RAM; Z80; C; 10" 24 x 40 VDU; Option: dual 5¼" F/D (289k) £780.	Basic (14k ROM); A.	Graphics; loudspeaker. 18k RAM version £529; 22k £549; 34k £599. BT 10/79 (B).
Sharp PC3200 (£2995)	As above	64k RAM; Z80A; dual 5¼" F/D (500k); C int; 12", 25 x 80 VDU; 70 1pm printer.	DOS; U; Basic.	CP/M may be avail. next year. Various expansion cards avail. (I&B)
Sinclair ZX81 (£50-kit, £70-built - prices inc VAT).	Sinclair: 0276 66104	1-16k RAM; Z80A; C int; TV int; full K/B; 44-pin expansion port	Basic (8k ROM).	Advanced 4-chip design. Printer avail soon. BT 6/81
Smoke Signal Chieftan (£1807)	Systems Implementation Ltd: 06924 5666 (TBA)	32-64k RAM; 6800/6809; dual 5¼" F/D (160k); 12", 24 x 80 VDU; RS232 port.	DOS; *68/FLEX; Basic; Fortran; Cobol; U.*	With dual 8" F/D (2 Mb) £2712. Designed as development system for industrial control. (H)
Solitaire 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; graphics on 11 x 13 dot matrix. (S)
Sord M100 ACE (£2259)	Midas Computer Services Ltd: 0903 814523 Exleigh Bus. Mach. 0736-66577.(10)	48k RAM; Z80; 8k ROM dual 5¼" F/D (246k): 24 x 64 green VDU; RS232 port: S100 bus; N/P	O/S; Basic; *A; Fortran; Pascal.*	Up to 4 drives possible. Colour graphics avail. (I)
Sord M223 Mk II-VI (£3489)	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; Pascal; Cobol.*	Expandable to 4 Mb F/D. 32 Mb, H/D, 5 screens, 2 printers. M243 with 192k RAM & dual 8" F/D £6871.
Sord M100 (£795)	Midas Computer Services Ltd: 0903 814523 Exleigh Bus. Mach. 0736-66577. (8)	48k RAM; Z80; 8k ROM 12" 24 x 64 green VDU; RS232 port; S100 bus; N/P.	O/S; Basic; *A; Fortran; Pascal.*	M100 ACE with single 5¼" F/D (143k) £1850. Up to 3 drives possible. Colour graphics avail. (I)
Sord M223 Mk II-VI (£3950)	As above	64k RAM; Z80; 8k ROM single 5¼" F/D (350k); 12", 24 x 80 green VDU; RS232 ports; S100 bus; N/P	*O/S;* Ex Basic; *CBasic; Multi-User Basic; Fortran; Pascal; Cobol.*	Expandable to 4 Mb F/D. 32 Mb, H/D, 5 screens, 2 printers. M243 with 192k RAM & dual 8" F/D £7000.
SPC/1 (£3770) (TBA)	Digital Data: 01-573 8854	64-1024k RAM; 8085A-2; dual 5¼" F/D (90k); 12", 24 x 80 VDU; 2 x RS232 ports; Option: single 8" F/D (1 Mb) £1090: 20 Mb H/D £7000.	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 (£1995)	Icarus: 01-485 5574 (TBA)	64k RAM; 2 x Z80; dual 5¼" F/D (320k); 12" 25 x 80 VDU; S100 bus; RS232 port.	CP/M; A; *Basic; Cobol; Fortran; APL; Pascal.*	Limited graphics, Mainframe int avail. Full range of application packages avail. Opt: dual 5¼" F/D (320k); dual 8" F/D (2.4 Mb); 8.120 Mb H/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 (£3971)	Extel: 01-739 2041 (TBA)	64-512k RAM; Z80A; dual 8" F/D (1 Mb); 12", 24 x 80 VDU; 3 x V24 ports; 1 P/P	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)

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Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
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; 8080A; single 8" F/D (250k); 12", 25 x 80 VDU; 7 x RS232 ports; printer int.	CP/M; ExBasic (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 Level 1 (£335)	Tandy: 021 556 6101 (200)	4-16k RAM; Z80; C; 12", 16 x 64 VDU	Basic (4k ROM); A.	Expandable to Level II. Many extras available. (I).
Tandy TRS-80 Level II (£408)	As above	4-48k RAM; Z80; C; 12" 16 x 64 VDU; RS232 port; 1 P/P	Basic (4k ROM); *M/A; Fortran.*	16k machine includes N/P. 4-16k upgrade £87, 48k system £620; Option: single 5¼" F/D (78k) £295, (subsequent £227), up to 4. BT 6/80 (I).
Tandy TRS-80 Model 2 (£1999)	As above	32-64k RAM; Z80A; single 8" F/D (500k); 12", 24 x 80 VDU; 2 S/P; 1 P/P; N/P.	DOS; Basic.	64k version £2249. Expandable to four F/D drives, single drive expansion £799: three drive £1589
TANDY TRS 80 Model 3 (£500-£1700).	As above	See Model 1 Levels I and II		Fully integral unit. Up to 2 integral and 2 external 5¼" F/D.
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: Basic; *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 DPS 64/1 (£3099)	Terodec (Microsystems) Ltd: 0734 664343 (8)	64k RAM; Z80; dual 8" F/D (1 Mb); 12", 24 x 80 VDU; 2 S/P; 3 P/P. Options: dual 8" F/D (1 Mb) £1149; with 2 Mb £1455.	CP/M; *Basic; Fortran; CBasic; Fortran; Algol; Pascal.*	TM Z80 enhanced model in integral workstation £5595 (with 4 Mb F/D). DPS 64/2 with 2 Mb F/D £3494. (S&H).
TI 99/4 (£750)	TI: 0234 67466 (TBA)	16k RAM; 26k ROM; 9900; 24 x 32 VDU; 2 x C int; TV int; RS232 port.	OS: Basic.	Can run 16-colour TV screen. BT 5/80 (S).
Triton L8.2 (£611)	Transam: 01-405 5240 (N/A)	32k RAM; 8080; C int; 16x64 VDU int; 1 S/P; 1 P/P.	4k monitor; Pascal (20k ROM); *CP/M; Pascal.*	Graphics; 5¼" or 8" F/D are available; L7.2 with 2k monitor and Basic (no Pascal) £409. (S&H).
UDS 3000 (£2300)	Kemitron: 0244 2187. (TBA)	64k RAM; Z80A; dual 8" F/D (500k); 2 x RS232 ports. Opt: with dual 8" F/D (2 Mb) £2500.	CP/M; *Basic; Cobol; Fortran; Pascal.*	Full range of industrial support cards. Multi-user with H/D avail. soon. (E)
Vector MZ (£2595)	Almarc: 0602 62503 (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 £3195. (E).
Vector System 2800 (£4195)	As above	56k RAM; Z80A; dual 8" F/D (2.4 Mb); 3 S/P; 2 P/P.	As above	High-res graphics. Also System 3030 with 32 Mb H/D and single 5¼" F/D £7500. (E)
VIP (£2125)	As above	64k RAM; 3k ROM; Z80A; single 5¼" F/D (315k); 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). BT 2/81
Video Genie EG3003 (£330)	Lowe Electronics: 0629 2817 (N/A)	16k RAM; Z80; 500bps C; 32 x 64 TV int; extra C int; 1 P/P	Basic (12k ROM); *M/A; Fortran*	Graphics available.
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.
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.	O/S; 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)	Micropower: 0256 54121. Memec; 084421 5471 (N/A)	64k RAM; Z80; dual 8" F/D (600k); RS232 port; MCZ 1/20A 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).
Z-Plus (from £4000)	Rostronics Ltd: 01-870 4805(16).	64k RAM; Z80A; dual 8" F/D (0.5/1 Mb); 12", 24 x 80 VDU; 4 S/P; 1 P/P	CP/M: MP/M; A; U; *Basic; Cobol; Fortran; Pascal; APL; PL/1; Algol.*	Complete with furniture. Various business packages avail. Option; 20 Mb H/D £4000. BT 12/79 (S&H).

SINGLE BOARDS

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Acorn System 1 (£65)	Acorn: 0223 312772 (10)	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.*	Kit. Programmable address linking. On-board 5 V regulator. Available assembled £79. Cn be expanded to disk-based system. (S&H)
ADS MC6809 (£250	Maclin-Zand: 01-837 1165(N/A)	2k RAM; 4-16, ROM; MC6809; RS232 port; 2 P/P; S100; 256 x memory mapped I/O ports.	ads MON (in 2716), *OS-9 Basic 09*	Has multi-user, multi tasking capabilities using 0S-9. (E).
Aim 65C (£285)	Pelco: 0273 722155(7)	1-4k RAM: 6502; 4-20k; ROM; Full K/B 2 x C; 20 char LED; 20 char thermal printer; RS232 port.	A. Dis A; T/E; 8k monitor; *Basic (8k ROM); PL65.*	Power supplies and two types of case avail. Can be expanded to disk system. (E).

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ADDRESS.

MY INTEREST IS:

SINGLE BOARDS

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
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; Pasal; A.*	Many options. Will support up to four 8'' F/D drives. BT 3/81. (E)
Biproc (£119)	B L Micros: 0494 443073. (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)
Cromemco SC (£260)	Comart: 0480 215005 (17)	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 (£60)	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 resolution graphics (high res avail). Kits or built. (H).
Explorer (£82)	As above	4-64k RAM; 8085; Hex K/B; RS232 port; S100 bus; C int; 1k video RAM.	2k monitor; *Basic CP/M.*	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 III (£152)	As above	1k RAM; 6800; VDU board	1k monitor.	Options: single 5¼'' F/D (75k) £350; PROM programmer £32. (H)
Microaxis 1 (£250)	Micro Design 0296 86866 (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 0S.*	As above.
Microtan 65 (£69)	Tangerine: 0353 3633 (6)	1k RAM; 6502; 16 x 32 TV int; Options; 64 x 6 1 Pixel graphics £6.50; 16k RAM £56.	1k monitor, *Basic*	TANEX expansion kit with 7k RAM; 4k EPROM sockets; 10k 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 (£174)	Systems Implementation Ltd: 06924 5666 (TBA)	1k RAM; 6800/6809; 10-20k EPROM; 1 S/P.	2k monitor	Many expansion boards available including 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).
Triton L5.2 (£294)	Transam: 01-405 5240 (N/A).	1-3k RAM; 8080; 1k VDU RAM full K/B; 16 x 64 VDU *or* TV int; C int; 1 S/P.	1½k monitor; 2½k Basic.	64-chair graphics. Disk int running CP/M about £200. (S&H).
Tuscan (£195)	As above	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 (£179)	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 £29.	1k monitor; 8k Basic; *Dis A; U.*	Graphics. Will run Superboard software. New monitor EPROM with enhanced U £22. (S&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).

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.

USER GROUPS INDEX

As promised, here's a revised, complete listing of user groups and clubs. The next full listing will be printed in November. Send updates to: 'User Groups', *Personal Computer World*, 14 Rathbone Place, London W1P 1DE.

INTERNATIONAL

National Personal Computer Users Association. Cassette/SAEs supplied for continuous program exchange ALL PERSONAL COMPUTERS. Subscriptions £12 (£15 overseas) with computer details to: NPCUA, 11 Spratling Street, Manston, Ramsgate, Kent.

Powertran Users Club. Annual subscription £6.50. UK membership, £8.00 for members abroad, which includes a monthly newsletter. Contact Phillip Probetts, 50 Cromwell Road, Wimbledon, London, SW19 8LZ. Tel: 01-540 3713.

Comp 80 Users Group. Monthly newsletter. Annual subscription £6.50 for UK members. £8.00 overseas members. Contact: Phillip Probetts, 50 Cromwell Road, Wimbledon, London SW19 8LZ.

European Sorcerer Club. For sample issue of newsletter contact Colin Morle at 32 Watchyard Lane, Formby, Nr Liverpool L37 3JU. Annual sub. UK £5, Europe £7, overseas £12.

ZX80/81 Users Club. Low cost software. Technical support. Newsletter. Subscription £6 UK, £10 overseas. Contact: D Blagden, PO Box 159, Kingston Upon Thames, Surrey, KT2 5UQ. (sae for further information).

International Sharp User Group — 1,400 members in 31 countries £3 sub includes MZ-80K Space Invaders Cassette and newsletters. Contact Graham Knight, 108 Rosemount Place, Aberdeen. Tel: 0224 630526.

Tangerine Users Group (International). Recently formed for users of the Microtan 65, the TUG will act as a central information clearing house, including exchange of programs etc. Annual membership is £5.00. Details from TUG at 16 Iddesleigh Road, Charminster, Bournemouth, Dorset. BH3 7JR.

Central Program Exchange. Full membership (£25 Europe, £40 overseas) provides 30 free programs pa. Small User Serivce (£10 Europe, £20 overseas) provides 10 free programs pa. Contact Mrs Judith Brown, The Polytechnic, Wulfruma St, Wolverhampton, WV1 1LY.

USCD System User Society. Exisiting special interest groups include industrial application, word processing, real time, business applications and forward planning. UK contact: John Ash, Dicoll Data Systems Ltd, Bond Close, Kingsland Estate, Basingstoke, Hants RG24 0QB

USER GROUPS INDEX

Microcomputer Users Club: recently established for program writing and exchange, emphasis on 6502/Z80 users. Contact c/o Synthetronics Microcomputers PO Box 151, 1322 Hoevik Norway.

Group/380. Recently established for information interchange on microsystems equivalent to IBM 360/370 main frames, newsletter, access to a computerised database listing relevant software. Annual sub: $10 for individuals, $25 for organisations. Contact: Mokurai Cherlin, PO Box 1131, Mount Shasta, CA96067, USA.

NATIONAL

6502 User's Club. Holds regular meetings and welcomes new members. Contact: Walter Wallenborn, 21 Argyll Avenue, Luton, Beds or Joe Manifold, 16 Bunyan Close, Pirton, Hitchin, Herts.

9900 Users Group. Contact Chris Cadogan, Dept. Computer Science, University of Manchester, Manchester M13 9PL.

Amateur Computer Club. National organisation with seminars, local group meetings. Bimonthly newsletter 'ACCUMULATOR'. 6800, Z-80, and 2650 libraries. Founded 1972. Fee £4.50 SAE Jim McDonald, 1 Carlton Court, Studley Grange Road, London, W7 2LU.

Amateur Computer Club, 2650 Library. 2650 related data and technical assistance only. No meetings, no newsletter. Contact Roger A Munt, 51 Beechwood Drive, Feniscowles, Blackburn, Lancs. BB2 5AT (0254 22341).

Apple Music Synthesis Group. Interested in ALF, Mountain Hardware, Alpha Syntauri and Soundchaser systems. Contact: Dr David Ellis, 22 Lennox Gardens, London SW1 enclosing an SAE.

Atom User Group. Quarterly newsletter, software library, technical help when possible. Some local groups. Membership £4 pa including newsletter. Contact Richard Meredith, Sheerwater, Yealm View Road, Newton Ferrers, S Devon, PL18 1AN.

Commodore Pet Users Group publishes a monthly magazine — the official voice of Commodore. For membership details contact Margaret Gulliford on Slouth 74111.

Compucolor II User Group (UK). Quarterly newsletter: Hardware and software advice: Program library and exchange; links with other CCII national groups. Contact: Bill Donkin, 19 Harwood Avenue, Bromley, Kent 01-460 2626 (eve).

FX500-P Users Association. For Casio FX501-P & FX502-P users to communicate with each other and to work together. SAE to Max Francis, 38 Grymsdyke, Gt. Missenden, Bucks HP16 OLP.

Ithaca Audio S-100 bus UK User Group. Contact: Dave Weaver, 16 Etive Place, Bumbernauld, Glasgow. G67 4JE. Phone 02867 36570.

MUSE is an organisation for coordinating activity in schools and colleges. Meetings are held regionally and nationally. Full details from Muse, Freepost, Bromsgrove, Worcs B61 0JT.

National Acorn Atom User Group. Publishes monthly program magazine. For free copy and club details send large SAE (15½p) to Alan Carr, 105 Fairhole Avenue, Gidea Park, Romford, Essex.

National RML User Group, c/o RML Ltd., PO Box 75, Oxford.

National TRS-80 Users' Group. Activities include a computerised bulletin board service (see 'Network News'). Contact: Brian Pain, National TRS-80 UG, 40A High Street, Stony Stratford, Milton Keynes, tel (0908) 566660 (office) 564271 (home).

National ZX80 and ZX81 Users Club. Publishes monthly magazine *Interface*. For free copy and club details send a large SAE (15½p) to 44-46 Earls Court Road, London W8 6EJ.

Sharp PC-1211 Users Club for all PC-1211/TRS-80 Pocket Computer users. Membership of £5 pa. includes newsletter containing programs etc. Contact: Johnathan Dakeyne, 281 Lidgett Lane, Leeds LS17 6PD.

Sharp MZ-80 Users Club. Free membership: Extensive library and facilities. Details on meetings & Newsletters (SAE please) from: Paul Chappell, Computer Centre, Yeovil College, Yeovil, Somerset. BA21 4AE.

Sharp MZ-80k User Group. Contact: Joe LP Seet, 16 Elmhurst Drive, Hornchurch, Essex RM11 1PE. Tel: 04024 42905.

TI 99/4 Users Group — TIHOME offers access to a software library and sends out a monthly newsletter. Contact: P M Dicks, 157 Bishopsford Road, Morden, Surrey.

Transducer. The club for those interested in robotics, micro's and micro hardware. Send 25p to D Stockqueler 66 Waterloo Rd, Penylan, Cardiff for sample newsletter and details.

TRS-80 Level 1 User Group. Software library and quality newsletter (write for details and free copy). £5.00 pa. N Rushton (LIUG), 123 Roughwood Drive, Northwood, Kirkby, Merseyside L33 9UG.

TRS-80 Medical & Laboratory Users Newsletter. Free quarterly newsletter detailing interests, programs & applications. Send SAE & details of interests to: Dr N Robinson, The Residency, Northwick Park Hospital, Harrow, Middx.

UK101/Superboard User Group (Computer User Aids). Newsletter, software library and technical service. Membership £4.60 inc VAT per 6 months — £5.00 overseas. Apply to Adrian Waters, 9 Moss Lane, Romford, Essex — Romford 64954.

UK Intel MDS Users Group. Contact: Lewis Hard, Space Intelligence, The Old Coach House, Court Row, Upton Upon Severn, Worcestershire. WR8 0NS.

UK Pilot Users Group — SAE for fact sheet on Pilot versions available Common Pilot Reference Manual £5. Contact: Alec Wood, Wirral Grammer School for boys, Cross Lane, Bebington, Wirral, Merseyside L63 8AQ.

National T158/9 Club: bimonthly newsletter, program exchange etc. Annual sun £5.50 or, if you include a program with your cheque then it's £3.50. Contact: R M Murphy, Dept. of Electronic Engineering, University College Swansea, S. Wales.

CP/M Users' Group (UK). Annual sub £5. S/ware library, newsletter, 'help' service. Contact: 11 Sun St, Finsbury Sq. London EC2M 22D.

British Apple Systems User Group For Apple II and ITT 2020 users. Meets 1st Tues eve & 3rd Sun afternoons monthly at The Old School, Branch Rd, Park St, St. Albans (on A5 about 2 miles south of city centre). Contact: John Sharp, Garston (09273) 75093 or David Bolton, Park Street (0727) 72917.

Mk 14 Club. Bi-monthly magazine called 'Complement and Add". Contact: Geoff Phillips, 8 Podsford Rd, London NW9 6HP.

Independent PET users Group Contact: IPUG, 57 Clough Hall Rd, Kidsgrove, Stoke-on-Trent. Staffs.

UK Apple Users Group, Contact (Keen Computers) 5 The Poultry, Nottingham. Tel: 0602 583254/ 5/6.

Cosmac Users Club (proposed). For people using the RCA 1802, Cosmac ELF, ELFII, Super ELF etc. Those interested contact James Cunningham at 7 Harrowden Court, Harrowden Road, Luton LU2 0SR (enclosed sae, please).

Ohio Scientific UK User Group. Independent of OSI, an important role will be the disentangling of poor documentation. There will be regular newsletters and membership is at present £5 per year. The group will initially be concerned with the practical aspects and applications of OSI systems — rather than with games. Contact Tom Graves at: 19a West End, Somerset, BA16 0LQ.

Compukit User Club. Details, contact P. Crabb Esq., 21 Jones Close, Yatton, Avon (0934 834808).

77/68 Users Group. Quarterly Newsletter. Free membership for 1st year if you buy the 77/68 instruction manual, £1.50 thereafter. Contact: Newbury Computing Store, 40 Bartholomew St, Newbury, Berkshire.

Compukit User Club. Details contact S H Grisvenor Esq, 11 Bernard Rd, Oldbury, Warley, West Midlands (021-422 3298)

11s Users Group. A sort of help service only. No meetings, no newsletter. Contact: Pete Harris, 119 Carpenter Way, Potters Bar, Herts, EN6 5QB. Tel: 0707 52091 or 01-248 8000 ext 7065.

REGIONAL

Central Scotland Computer Club. Meets the first and third Thursdays each month in Falkirk College of Technology, Grangemouth Road, Falkirk. Secretary, J Lyon, 78 Slamannan Rd, Falkirk, FK1 5NF 22430.

Grampian Amateur Computer Society. Meets 2nd Monday every month. New premises are in Thistle Lane, Aberdeen. Contact Alan Hird, 20 Harcourt Road, Aberdeen, Tel: 90224) 33102.

IPUG South East. Meet 7.30 3rd & 4th Thursday. Charles Darwin School, Jail Lane, Biggin Hill. Bi-monthly newsletter. Contact: M Ryan, 164 Chesterfield Drive, Sevenoaks. Tel: (0732) 53530.

MACC (Midlands Amateur Computer Club) meet every Friday evening 7.00pm onwards. . . no sub, no magazine. Contact: John or Roy Diamond Tel: Coventry (0203) 454061.

TRS-80 — North West Group, (for 6 issues). Meetings last Wednesday monthly (not Dec) Contact: Melvyn D. Franklin, 40 Cowlees, Westhoughton, Bolton, BL5 3EG. Tel: 0942 812843.

380Z User Group Northern Home Counties: inc Herts, Cambs, Oxon. Contact: Sheridan Williams, 35 St Julian's Road, St Albans, Herts AL1 2az.

6502 User's Club (Southern Region). Welcomes all 6502 Users — Acorn, Aim, Apple, Atari, Atom, Kim, Microtan, PET, SYM, Superboard, UK101 etc. Regular Newsletter. Contact: Steve Cole, 70 Sydney Road, Gosport, Hants.

Northwest Computer Club. Fortnightly meetings 25p attendance fee. No subscriptions. Contact: John Lightfoot, 135 Ashton Drive, Frodsham, Warrington, Cheshire WA6 7PU. Tel: 0928-31519.

ACC (Merseyside 380Z Users Group). Contact: Alan Pope, Paal Enterprise, 37 Stuart Rd, Crosby, Liverpool L23 0QE.

Northeast PETs. Contact: Jim Cocallis, 20 Worcester Road, Newton Hall Estate, Durham. They meet the 2nd Monday of each month for software tuition and the 3rd Monday for hardware tuition (both in addition to normal activities). They start at 7.00 pm and meet in the PET Lab, Newcastle Polytechnic, Ellison Building, Newcastle upon Tyne.

A PET group is being formed on the Sussex/Surrey border,presently centered on Crawley & Horsham. Aims to meet monthly & produce a monthly newsletter. Contact: Richard Dyer, 33 Parham Rd, Ilfield, Crawley RH11 0ET.

Southern Users of PETs Association, free membership, meet first Wed. each month. £1.50 for monthly newsletter. Contact 42 Compton Road, Brighton BN1 5AN.

North-East RML 380Z Users' Group. Meets monthly at Micro-Electronics Education Centre, The Polytechnic, Newcastle upon Tyne. Contact: M Hatfield or R Reed, Computer Unit, Northumberland Building, The Polytechnic, Newcastle-upon-Tyne NE1 8ST. Tel: 26002 ext. 268 office hours.

Manchester Computer Club (formerly the Amateur Computer Club (Northwest Group)). Meets 1st & 3rd Thursdays monthly at St Peter's Chaplaincy, Precinct Centre, Oxford Rd, Manchester. Contact: David Wade, 28 Hazel Rd, Altrincham, Cheshire WA14 1JL, tel 061-941 2486.

Anglia Computer User Group. Contact Jan Rejzl, 128 Templemere, Sprowston Rd, Norwich NR3 4EQ.

Pennine & District Computer Club. Open at both 26 and 51 Mill Hey, Haworth, W. Yorks. each Sat & Sun 10am to 10pm. Systems books, magazines, members shop. Contact: club at w/ends on Haworth 43007 or chairman, Douglas Bryant, on Bradford 569660.

Computer Education Soceity of Ireland. A voluntary organisation that consists of a national body and an expanding number of local brnches. Their brief is to monitor computer education in Ireland. *National CESI* (£3pa) — Dairmuid McCarthy, 7 St Kevin's Pk, Kilmacud, Blackrock, Co. Dublin. *Cork branch* (£1 extra) — Michael Moynihan, Colaiste an Spioraid Naomh, Bishopstown, Cork. *Dublin branch* (£1.50 extra) — Jim Walsh, CBS Naas, Co Kildare, *Limerick branch* (£1 extra) — Sr Lourda Keane, Convent FCJ, Laurel Hill, Limerick, *Waterford brnach*(£1 extra) — Mr Hugh Dobbs, Newtown School, Waterford. *Kilkenny branch* (£1 extra) Sr Helen Lenehan, Presentation Secondary School, Kilkenny.

Surrey Microprocessor Society. (SUMPS) Covering Surrey plus bits of South London and other adjacent counties. Anyone interested in joining, call Mike on 01-642 8362

COUNTY

Cornish Radio Amateur Club — Computer section meets on the second Monday of every month at the SWEB Social clubroom, Pool, Redruth. New members welcome — contact Bob Reason, 24 Mitchell Road, Camborne, Conwall TR14 7JH.

South East Essex Computer Society, holds monthly informal computer evenings plus lectures. Open to anyone over 14. Contact R Knight at Southend-on-Sea 218456.

USER GROUPS INDEX

North Kent Amateur Computer Club. Meetings first Thursday of each month, usually in Biggin Hill. New members and visitors always welcome. Contact Barry Biddles (sec), Biggin Hill 71742.

PET Users' in West Lancs, Meetings on the third Thursday of each month at Arnold School, Blackpool. Contact: David W Jowett, 197 Victoria Road East, Thornton, Blackpool. FY5 3ST. Tel: Cleveleys 869108.

LPRINT is the newsletter of the East Midlands TRS-80/VG User Group. For a FREE sample copy send large SAE to: Mike Costello, 17 Langbank Avenue, Rise Park, Nottingham. NG5 5BH.

ACC (Merseyside 380Z and BBC Atom Users Group) Contact: Alan Pope, Paal Enterprise, 37 Stuart Road, Crosby, Liverpool L23 0QE.

West Midlands Amateur CC. meet 2nd & 4th Tuesdays each month at Elmfield School, Love Lane, Stourbridge. Further details John Tracey, 100 Booth Close, Brierley Hill, West Mid. 0384 70097.

West Midlands RML User Group, c/o BECC, The Bordesley Centre, Camp Hill, Stratford Road, Birmingham B11 1AR.

South Yorkshire Personal Computing Group. Meets 7.30, second Wednesday each month. St George's Building, Mappin Street, Sheffield. Visitors always welcome. Contact: Paul Sanderson, 8 Vernon Road, Totley, Sheffield. Tel: 0742 351895.

Gwent Amateur Computer Club. Covering the Gwent and Cardiff areas, the club has its own computer room and technical library. Meetings are held once a week on Wednesdays at 10 Park Place, Newport. Contact Ian Hazell on 0633 277711 office hours.

The Thames Valley Amateur Computer Club. Meetings are on the first Thursday of every month and from November on, that will be at 'The Southcote', Southcote Lane, off the Bath Rd, Reading, Berks. Starting time, 7.00pm. Contact: Brian Quarm (Camberley 22186) OR Brian Steer (Slough 20034).

Would anyone interested in setting up an Apple Users Group in the Bucks/Berks area contact: Steve Proffitt, tel 01-759 5511 ext 7298 day, or Marlow 73074 eve or w/ends.

The Leicestershire Personal Computer Club. Meetings held the 2nd Monday in each month, at Leicester University and Loughborough University alternately. They start 7pm. Membership is £2 per annum £1 for under 16s). Contact Ms Jill Olorenshaw (Club Secretary) c/o Arden Data Processing, Minicipal Buildings, Chrles Street, Leicester (0533 22255) OR Mr Dick Foden (club chairman) at 11 Gaddesby Lane, Rearsby, Leicester.

Lincolnshire Microprocessor Society. Various meeting places. For up-to-date information contact: Hon Sec, Mr Eric Booth, Senior Common Room, Bishop Grosseteste College, Newport, Lincoln.

MACRO (Medway Amateur Computer & Robotics Organisation). Meets monthly, sub £3. Contact: Ms Christine Webster, 13 Ladywood Rd, Cuxton, Rochester, Kent. Tel: 0634 78517.

Merseyside Microcomputer Group. Several sub-groups including: 380Z Users Group (Alan Pope on 051-924 2470): Computer Education Society (Mr M Trotter on 051-652 1596): SC/MP Special Interest Group (Bob Perrigo on 051-677 6716): PET Special Interest Group: 6800 and 77/68 Special Interest Group: Apple Special Interest Group: The secretary is John Stout of the Dept. of Architecture, Liverpool Polytechnic, 53 Victoria St, Liverpool L1 6EY (051-236 0598).

North Lancs User Group. Contact John Robinson, 12 Harold Ave., Blackpool, Lancashire.

Oxford Microcomputer Club. £5.00 pa. Contact: S C Bird, 139 The Moors, Kidlington, Oxford OX5 2AF. Tel: Kidlington (08675) 6703.

Anyone interested in forming a Suffolk Computer Users' Club should contact Ian on Ipswich 831353 eve/w/ends.

West Yorkshire Microcomputer Group. Formed following an inaugural meeting on Oct 23rd, a varied diary of events has been drawn up. For details contact the Chairman, Philip Clark, Care Computers Services, 15 Wellington St, Leeds LS1 4DL (0532 450667) OR the Secretary, Keith Knaggs, Price Waterhouse & Co., Leeds (0532 448741).

TOWNS

Bournemouth Area Computer Club. Meets monthly at the Kinson Community Centre. Contact: Peter Hills, 54 Runnymede Ave, Bournemouth, Dorset. BH11 9SE. Tel Northbourne 6547.

Bristol Computing Club. £4.00 pa. Meetings 3rd Wednesday monthly. Contact: Leo Wallis, 6 Kilbirnie Road, Bristol. BS14 0HY. Tel Bristol 832453

Cheltenham Amateur Computer Club. Meetings 4th Wednesday monthly, 7.30pm start. Contact: Mr M Pullin, 45 Merestone Drive, the Park, Cheltenham, GL50 2SU (Cheltenham 25617).

Derby & District Branch of IPUG meets monthly in Derby. For details contact Raymond Davies, 105 Normanton Road, Derby DE1 2GG. Tel (day) 41025 (eve) 514016.

Derby Microcomputer Society. Meets fortnightly at Derby Lonsdale College, Uttoxeter Road, Derby. Contact: Mike Riordan, 172 Blagreaves Lane, Littleover, Derby Tel (0332) 769440.

Exeter and District Amateur Computer Club. General meetings 2nd Tuesday monthly, specialist meetings 3rd or 4th Tuesday. £7.50 adults pa. Contact: Doug Bates, 2 Station Road, Pinhoe, Exeter, EX1 3SA.

Grimsby Computer Club. Meets fornightly on Mondays at 7.30 pm. Contact: Jenson Lee, 29 Park View, Cleethorpes. Tel: 32559.

Harpenden Microcomputer Group — Informal meetings are held on alternative Monday evenings. Contact: David James, 5 Ox Lane, Harpenden, Herts. AL5 4HH. Tel: (05827) 5366 (eve).

Harrow Computer Group meets on alternate Wednesdays at 7pm in room G43 of Harrow College of Higher Education. Summer meetings in the 'Plough', Kenton. Contact B Butcher, 01-950 7068.

IOW TRS-80 Users Club: Meets last Friday in every month at 7.30pm at the London Hotel, Ryde: Contact Mr M Collins, 11 Star Street, Ryde, Isle of Wight. Ryde 614589.

East London Computer Club. Meets every Friday at 7.30 in term at North East London Polytechnic, Romford Rd Precinct, Stratford E15. Contact John Grieve, 01-553 4761.

The SOBAT Computer Club (Leyton). Meets in first week of each month at 12 Calderon Road, London E11 4EU. Anyone (inc beginners) is welcome. Membership fee only £1 pa, inc newsletter. Specialised information, and access to several different kinds of microcomputers. Contact Mr T Kayani: 01-556 5423 eve.

North London Hobby Computer Club. Workshops four evenings a week during term time. General meetings open to all last Wedensday of each month. Contact Secretary DELE, Polytechnic of North London, Holloway Road, London N7 8DB. Communications Group — interfacing personal computers with Prestel/teletext and Networks like PC Net and The Source. Every Thursday 6.30 — 9, Room 2/5, Tower Block, Holloway Road. ZX81 User Group every Monday during term-time 6-9pm. Room 3/4. Tower Block, Holloway Road.

SELMIC (South East London Microcomputer Club). Meets fortnightly at Thames Polytechnic, Woolwich. Contact: Peter Phillipps, 61 Craigerne Road, London SE3. Tel: 01-853 5829.

Manchester Computer Club. Meetings 1st and 3rd Thursday monthly in the Computer Science Building, Manchester University, Oxford Road. Contact D Wade, 28 Hazel Road, Altrincham, Cheshire, WA14 1JL. Tel: 061-941 2486.

Newcastle-upon-Tyne Personal Computer Society: meets first Tues each month in Room D103, Newcastle Polythechnic.Over 60 members sub £5.00. Several sub-groups inc. PET, TRS-80 and S100 (Last one meets weekly). Contact Pete Scargill, Secretary on 0632 573905.

Orpington ZX80/81 Computer Club. Meeting each Friday. Contact: R A Pyatt, 23 Arundel Drive, Orpington, Kent BR6 9JF. Tel: 66 20281.

Plymouth and District Amateur Computing Club. Subscription £5.00 pa. Meetings last Wednesday monthly. Contact: Mr S A Bell, Secretary, Plymouth and District Amateur Computing Club, 31 Victoria Place, Stoke, Plymouth, Devon.

Sunbury Computer Club, meets last Tuesday each month. 40p/meeting £4pa (under 18½ price) enquire to: S N Taylor, 8 Priory Close, Sunbury-on-Thames TW16 5AB.

Local IPUG Group meet other PET users and make friends. Contact G Squibb initially. 108 Teddington Pk Rd, Teddington, Middx.

Would anyone interested in joining an informal Computer Club in the Tonbridge or Tunbridge Wells area please contact either Chris Wallwork (Tunbridge Wells 37682) or Ray Szatkowski (Tonbridge 355960).

Worcester & District Computer Club. Meets 2nd Monday monthly at 8pm, Old Pheasant Inn, New Street, Worcester. Contact: D Stanton, 55 Vauxhall St, Rainbow Hill, Worcester. WR3 8PA.

York Computer Club. Meetings 8pm Mondays at Holgate WMC New Lane, Acomb, York. Further info K Thomas, York 38239.

Croydon micro/small computer group. Contact Vernon Gifford, 111 Selhurst Road, London SE25 6LH.

East London Amateur Computer Club. Meets 7—10pm on 2nd & 4th Tuesdays monthly at Harrow Green Library, Leytonstone, London E11. Contact: Fred Linge Linger, 01-554 3288.

Richmond Computer Club. Held the second Monday of each month at the Richmond Community Centre (20p per meeting), members have the use of a good range of equipment. Contact: Robert Forster, 18a The Barons, St. Margarets, Twickenham, Middx (01-892 1873).

TRS-80 Independent User Group. Recently formed in Birmingham. Contact Mike Bayliss, 021-743 7197.

Anybody interested in forming a microcomputer users club in the Towcester (S. Northants) area, please contact R J Wellsted, 20 Hampton Court Close, Abbey Chase, Towcester, Tel: Towcester 51354 eves.

Ashfield Computer Club. Meets 1st & 3rd Thurs each month at Carsic Junior School, membership £3 pa. Contact Deric Ellerby, tel 0380 75376 or Derrick Daines tel 0380 56198

Anyone interested in forming a micro group in the Doncaster area, contact Mr P Flinders, tel Doncaster 78954 or Doncaster 868 379, 6—9pm.

Shipley College Computer Group (Sorcerer/6800). They meet Tuesdays (software) and Wednesdays (hardware/advanced) between 7.00 & 9.00 pm. Contact Paul Channell on Shipley 595731.

Microsoc the Oxford University micro group holds shared meetings with the Oxford Microcomputer Club. Contact: M. Bourla, St. John's College, Oxford.

Sunbury Amateur Computer Club Club. Meets 1st Friday monthly whenever possible, 20p per meeting. Contact: S Taylor, 8 Priory Close, Sunbury-on-Thames TW16 5AB, tel Sunbury 86649.

Atom Users' Group. Meets last Tues monthly during school terms at Abraham Moss Centre, Crescent Rd, Manchester 8. Contact: Clem Rutter, 061-434 3092 (eves).

Anybody in the Warrington area interested in forming a Mattel Intellivision TV Game group to organise meetings, competitions and lay foundations for the forthcoming computer addition? Tel Warrington 62215 after 4 pm.

BAUD (Bristol Apple Users and Dabblers). Contact: Geoff Smythe, Datalink Microcomputer Systems Ltd, 10 Waring House, Redcliffe Hill, Bristol BS1 6TB, tel (0272) 213427.

Brunel Technical College Computing Club. The club divides into two sections. . . the "skilled" and the "not skilled". They share alternate Wednesdays at the College. Contact: S.W. Rabona at 18 Castle Road, Worle, Weston-Super-Mare, Avon, BS22 9JW (0934 513068).

Anyone interested in forming a computer club in Cornwall, catering mainly for PET, ZX80 and UK 101 computers should contact: M F Grove, 35 Causeway Head, Penzance, Cornwall.

Peterborough Computer Club. Recently formed, eets on first and third Mondays each month at Adult Education Centre, Brook Street, Peterborough. Contact: T Marchant, tel Peterborough 76681 after 6 weekdays, anytime weekends.

Computer Club. Business & Word Processor section meets Fridays 7.30, Scientific & Recreational Saturdays 10.00. Contact: L. Boxell, 8 Vane Terrace, Darlington. Tel: 0325 67766.

Southgate Computer Club. The club recently held its AGM and adopted a formal constitution. Annual subscription will be £2.50 from January 1981, including a club newsletter; full-time students under 18 pay half-cost. The club now has 83 members. Contact: Panos Koumi, Southgate Computer Club, 33 Chandos Avenue, London N14.

West London Personal Computer Club. Meets first Tues. each month at Willesden Technical College. Also visits, special int. groups, demos, problem surgeries. Contact: Graham Brain, 81 Rydal Cres, Perivale Middx, Tel: 01-997 8986

USER GROUPS INDEX

TRS80 User Club (Chelmsford). Now part of the National TRS80 User Club. Contact: Michael Dean, 22 Roughtons, Galleywood, Chelmsford, Essex.

A Crawley computer club has recently been formed, open to anyone interested in personal computing, with or without computing facilities.
contact either Mr J. Fieldhouse, 18 Seaford Road, Broadfield, Crawley, West Sussex (Crawley 542509) — or — Mr J. M. Clarke, 31 Hyde Heath Court, Pound Hill, Crawley, West Sussex (Crawley 884207)

Birmingham Computer Club. To be formed shortly, catering for all micro users. Fortnightly meetings planned but venue not yet fixed. Contact: Dr M Bayliss, 021-743 7197.

Southampton Amateur Computer Club. Meets 8 pm 2nd Wed each month (not July — Sept) at Medical Science Building, Bassett Cres. East, Southampton. £3 pa, OAP, & students £2. Newsletter & special int. groups; 2 yrs old, 80 members soon setting up another club in Portsmouth area. Contact: P G Dorey, Dept Physiology. The University, Southampton SO9 3TU or Andy Low, Tel: (0703) 555 605 ext 34.

Springfield Computer Club. Special interest in Sorcerer but beginners and others welcome. Meetings 1st Friday monthly. Contact: Stephen Cousins, 1, Aldeburgh Way, Springfield, Chelmsford, Essex CM1 5PB. Tel: 0245 50155.

TRS80 User Club (Chelmsford). Now part of the National TRS80 User Club. Contact: Michael Dean, 22 Roughtons, Galleywood, Chelmsford, Essex.

The Colchester Microprocessor Group. Meetings held at the University of Essex on the second and fourth Wednesdays of each month — 7.30 pm start. Membership is open to all, on payments of £5 annual sub (£1 for full-time students). Contact: the Information Centre at the University on the evening of the meeting.

TRANSACTION FILE

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TRS-80... L2 16k + VDU + tape, boxed, immaculate, hardly used £400 only, for quick sale. Tel: Brimscombe 882711 evenings, or Gloucester 28555 ext 724 day, ask for Derek.

TRS-80 16k Level 2... with VDU, CTR-80 cassette recorder and Aculab Floppy Tape Drive. Also Basic manuals and Assembler books. Lots of software (Editor Assembler Plus, Adventures, Chess, Invaders, Asteroids & many more), £650 ono. Tel: 01-946 2505.

KIM 1... standard package produced by M.O.S. Technology. Tel: 0505 842 876.

TRITON... L5.1, full memory fitted to board, going cheap. Please write with phone number to 5, Castle Grove, Stourbridge, West Midlands marking envelope 'Computer'.

SHARP MZ80K... 6 months old. 48k RAM. With Sharp Basic and Crystal Basic. Approx 50 assorted programs. As new condition, little used. £425. May deliver. R.A. Winkworth, 23, Birkbeck Road, London N12 8DZ. Tel: 01-445 1833.

PET 32k... large keyboard, external cassette recorder, dust cover, Toolkit, many programs (inc. Microchess), documentation, etc. £635. Buyer collects. Also Mektronic I/O Communicator for the above £45. Tel: Kirkby Lonsdale (0468) 71634.

NASCOM RAM-A boards... 1 off 8k £60, 2 off 16k £100 each. All complete with RAM chips and working. Tel: 0706-56824 evenings.

Aculab Floppy Tape for TRS80... perfect working order. Reliable, fast storage. Random access files. £30 worth of tapes with £200 worth of programes. Also bus double adaptor. £150 ono. Tel: Andrew, (07596) 224 (near York).

ZX80... PSU, leads & manual. Ex. cond, only £55. M. Singleton, 40 Wykeham Way, Haddenham, Aylesbury, Bucks. Tel: (0844) 291110.

UK 101... 8k, including microcase. Fully working, good condition. New compshop monitor. Much software including Invaders. £200 ono. Tel: Phil, Worthing (0903) 33236.

ZX80... factory built, all leads and operating manual. As good as new. £51 + 'breakout' program, ready to run! Tel: (01)-340 5414.

ZX80... 1k, perfect order, manual, cassette of progs, £60. Tel: Horsham (0403) 61693 eves.

PET 2001 8k... small keybrd, 3 months old, orig. packing, inc. games progs, free delivery Berkshire/W London, offers please. Tel: Bracknell 27701 after 7.

Transcendent 2000 monophonic synthesiser... contains VCO, VCF, ADSRs, slow oscillator, etc. Suitable for sound effects as well as serious use. Could be interfaced to a computer. Including foot-pedal. £260 ono. Tel: Romford (0708) 61064.

ZX80... Personal computer with leads, manual and two program books £60 ono. Tel: day 01-230 2810, after 6 01-960 1054.

Tangerine... Microtan 65, latest Tanbug, graphics, lower-case, 20-way keypad, MPS1 power supply, ± 12V kit, breakout program. Unused Tanex board, minimum configuration. Bought Jan '81, little used. Cost £220. Accept £160 ono. Tel. Worcester (0905) 830941.

NASCOM 2... 32k RAM, NAS-Sys 3, NAS-GRA, bits of PC's toolkit, high resolution fully bit map graphics (384x224), in microtype case with fan. Programmable sound board, a/d card, V & T assembler. £600. Tel: 767 1029 (eves) J. Wye.

Texas Print Cradle... PC100C for TI59/58. Perfect condition (in original packing) and little used. £80 — buyer collects, or plus postage. Stock. Tel: Windermere (09662) 2044.

Exidy Sorcerer... 32k, with vista dual, double sided, disk drives, giving 800k, development pac, word processor pac, toolkit, Revas, etc. all as new, £1300 ono...Anadex DP8000 printer, £325 ono... Sharp PC1211 pocket computer with cassette interface, £85 ... NAS-SYS one in ROM, £10. Nigel Clarke, Tel: Harlow 24416 (work), 414234 (home).

Tandy TRS 80 Pocket Computer.. plus cassette interface plus minisette 9 plus 4 cassettes (business finance and business statistics) Cost £210 nearly new. Accept £150 or negotiate. Write to A.N. Roberts, 10 Broom Lane, Whickham, Newcastle upon Tyne, NE16 4DQ.

77/68 Boards... fully socketted. C.P.U. with switches; monitor; 4k RAM, 9 amps P.U. and case. £125 ono. MEK 6800 D2 evaluation kit II with 1k RAM and P.U. £100 ono. All items with documentation.
Tel: 58-98-52 Dublin.

Superboard II... 8k RAM, 5V, P.S.U. Complete with 12'' B/W monitor built into one complete unit (like PET). Plug in games k/brd + joystick, + cassette player. Loads of Software, manuals etc. Can deliver W/Yorks, offers £335. Tel: Pontefract 72896.

Hewlett Packard 2621A VDU... brand new but not suitable for my application. Only £650. Martin Brampton, Tel: Kirkbymoorside (0751) 32286.

8k PET... old ROM, cover, progs/cassettes, little used, £300 or offers. Tel: Steve 061-740-5877 after 6 or w/ends.

UK 101... 8k RAM, perfect condition, new and old monitors, compshop case, £195. Tel: Stevenage 811708 or Welwyn Garden City 35197.

ZX80... factory built, as new. Complete with leads, mains adaptor, and manual. £65. Tel: Ruislip 32385.

Acorn Atom... 8k ROM + 12k RAM. Leads and manual + 3 amp P.S.U. £195. Tel: 0695 624350.

Centronics 730 Printer... Ex demonstration model, maintained by Centronics. New head and ribbon fitted. Excellent condition, complete with paper guides and manual. £195. Tel: David, Godstone 843302.

TRS80. . . LI 4k inc VDU cass, games, instruction tapes etc. Also instruction manual. 3 months old. As new £275.00 Tel 01-989 5358.

PET 32k. . . cassette, soundbox, toolkit, printer, dustcover, manuals, PET revealed, CPUCN's, approx 60 tapes, inc. arcade games £775 ono. Tel: London 226 8624 after 5pm.

Apple 48k: disk 3.3 b&w monitor price includes over £1,500 of software Visicalc, Applewriter Sargon, glaxiens, Odyssey and many more over 20 disks packed with utilities and the above Best offer Tel 01-405 3113.

Casio 502P. . . & FA1 cassette interface, exc cond. boxed, all manuals, £75 ono. Tel: 01-736 3596 eve.

Cased Microtan '65. . . tanex, mini-mum board, PSU inc +-12V, reset key, ASCII KBD — £180. Tel: 0684 40383.

ZX80. . . Sinc built, 5 months old, PSU, leads, manual, 2 extra books, will deliver and demo (London area), bargain £70. Tel: 01-650 0677 eve & w/ends.

Acorn Atom. . . 12k RAM + 12K ROM inc PSU & leads. Loads of software, inc Acornsoft games packs 1, 3 & 4, Atom invaders + 2 books, the lot £225. Tel day 01-435 1085, eve 01-958 6408

TRS 80... 16k L.2. with VDU cassette. Tons of software inc. games, business & beginners packs. Level 1 & 2 manuals. All perfect. £375 ono. Tel: Yateley (0252) 876775.

Superboard II... 8k RAM in metal case with external power supply switchable clock 1 or 2 MHz. In excellent working condition complete with manuals CCT diagram and numerous games tapes etc. £210 ono. Tel: Medway 0634 252845 eves after 8.30pm.

ZX80... factory built, including manual. Perfect condition. £50. A.J. van der Velde, 9 Kenton Road, Newcastle upon Tyne 3. Tel: 0632-856546 after 7pm.

ZX80... factory built, as new. All leads, PSU, Manual and book of 30 progs. £48. Tel: (0592) 872778 or write: A. Stewart, 119 Kinghorn Road, Burntisland, Fife.

Exidy Sorcerer... 16k with BASIC ROM PAC. Also development pac worth £70, and games software including Adventure, Air Controller, etc. Worth over £120. Hardly used, still in original box. Only £450. ono. Tel: 01-422 0129.

ZX80... factory built, perfect working order. Includes PSU, manual, leads, ready to run, only £65. Three months old. Tel: 249 1542 after 6pm.

TI59... prog calc, master module, mag cards, wallets, manuals, coding sheets, case, unboxed, mains adaptor. Offers. Martin Portman. Tel: Godalming (88) 28225.

Centronics Microprinter P1... Five rolls of paper included. £175. (£170 you collect). 068-4930 eves and w/ends.

CBM 3022 Printer... As new condition, used privately, low mileage. Complete with manual & in original packing. Owner has no upgraded to 4022. £375 ono, or will consider exchange (with cash adjustment) for IBM Golfball printer or similar, with PET interface. Tel: 0505-20451

SHARP MZ-80K. . . software simple word processor, personal finance, games etc — offers? Also TRS-80 printer interface £30.00ono. Also Olympus pealcorder microcassette decorder + tapes, used successfully with Sharp PC1211 computer £40.00 ono. Tel: Seaford (0323) 891755.

PET 2001. . . old ROM, sound box, over 40 games and progs can delivery locally (Bognor regis) £390. Tel: Between 4-6pm weekdays (0243) 695876.

PET 8k. . . old ROM, green perspex screen, progs, manuals, books, £295 ono. Tel: Heswall 051-342 1794 eve w/ends.

TRANSACTION FILE

ZX80. . . Sinc built, working, inc all leads, manual, adaptor, box, £70. Tel Martin, Cambridge (0223) 60760 or 62677.

DRE 8" floppy disk drive. . . New), swap for any PET add-ons/ZX80/81, interesting items or will sell cheap. Ring Reading (0734) 481670 eve or w/ends.

77/68 boards. .. all working, CPU £30, Mon2+Tbug £45, VDU £35, Bare 4k £20, 4k with 2k fitted £35, Vero rack £20, star devices MkIII keyboard £40, power supply 5V3A, —5, +12, —12 cased £35, phone 0970 828851.

UK101. . . 8k, built, cased + software worth £40, £180. Tel: 01-251 3769 after 5.

NEC. . . Spinwriter, inc several ribbons and thimbles, purchased Oct 1980, as new cond, will sacrifice at £1300 ovno. Tel: 01-599 3943.

Triton. . . fully built and cased with self contained monitor, tape recorder, keyboard and numeric pad, built-in motherboard with filled 8k RAM card, 7k scientific Basic on ROM card and complete power unit for expansion, £200. Byfleet (093 23) 42348 eve.

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Superboard. . . perfect cond, 64x32 screen with guard band, board fitted, 2/1 MHz switchable, 600/300 bauds switchable, 8k Cegmon monitor, software, modulator, all manuals, offers. Jonathan Saul, Ipswich 623582 or 94 Bell Lane, Desgrave, Ipswich, Suffolk IP5 7JJ.

TRS80 16k Level 2. . . with CTR80 cassette and Tandy VDU, instruction books, magazines and over 20 programs, 11 months old, as new £425. Ring (0530) 412525 (Ashby-de-la-Zourch).

UK101 . . . cased, 8k RAM, 8k ROM, switchable 1/2MHz, reverse video, 300/600 baud, all leads included (+ cassette lead), manual and plentyof programs on cassettes, £300 ono. Buyer collects. Phone Northwich 77871 (0606) after 6 (Sun-Fri).

PET 2001-8, Old Rom. . . nternal cassette, modified for: UHF output to TV set, reset button, interupt button (can be used to freeze operation), screen on/off switch, full circuit diagrams, diagnostics, tutorials and games programs worth over £375, PET revealed, etc, £385 ono. Tel 04218 2159.

ZX80. . . Sinc built, 4 months old in perfect working order, original boxed, leads, PSU & manual included, plus The ZX80 magic book + 30 programs for the Sinc ZX80 1k + 1k Breakout + some games on tape. Accept £75 (inc post). Phone Tony 0382 42698 Fri or Sat 6—9pm.

Casio FX 502P. . . and FA1 cassette interface, exc cond with manuals, box, program library and cassette, £60. Charles Butcher, Corpus Christi College, Cambridge

Microtan 65. . . ASCII keyboard, lower case, power supply, manual, unused, £150 ono. Tel: 01-660 4872.

Apple II Europlus 48k. . . 2 disk drives & controller, 9" Hi resolution B/W monitor, DOS 3.3 games paddles, original manuals, in mint cond £1500. Also Centronics 737 printer + parallel printer interface, £550. Tel: 01-954 1203 eve.

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TRS-80 4k LI. . . as new, with all connecting leads, power supply, domestic TV, adaptor, Tandy manual, graphics book, games pack with 8 games on cassettes, would cost £300 complete new, accept £200. Tel: 021 474 6657 after 6 or weekends.

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ZX80. . . for sale to good home, complete with many programs, will part with for £45. Tel: Allsa (0295) 213085 after 5.

UK101. . . 8k, cased, prof built, Cegmon, 2 adventures on tape, other games & Basic tutor on tape, past UK101 User Group news letter £220. Tel 01-440 1086.

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ZX80 Companion... (2nd edition) Linsac plus misc. Linsac and bug byte cassettes. As one lot, or split to first caller/best offer (won't work on my EX 81!). Tel: Chelmsford 60312.

ITT 2020. . . 48k, disk drive, control card and large quantity of software for sale. Computer £550, disk drive £320 — software

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KSR33 Teletype. . . beautiful condition — giveaway at £150. Another with slightly broken case £75. Professional green screen VDU (80x26) £75. Immaculate ASCII keyboard in case £25. Tel: 01-778 3600 eve.

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PET 2001. . . new ROM. Int cassette sound, many progs inc. M/chess, Space Invaders, etc, PET Man + PET Revealed + Sub routines + magazines. Only 8 months old £400 no offers. Can deliver within 100 miles Phone Grimsby 0472 46024.

Casio fx502P. . . + FA-1 as new with overlays, books, instructions, case, £50. Call Phil (0603) 405342.

TRANSACTION FILE

Aculab Floppy Tape... 1yr old, wafers, manuals, £100. Tel: Tim Edwards 01-578 9343 ext 4357 day, 024028-356 eve.

ZX80... Sinc built, PSU, leads, manual, 10mnth old. £65. Tel: Kings Lynn 671077.

Sharp MZ80K... 20k RAM. Used once only, complete in manufacturers box with dust-cover and games package. Two mnth old. Will accept £400 ono. Please tel Cannock (054 35) 78721.

Apple ROM... plus card and keyboard filter, documentation, hardly used, £100. Marlow 73074.

Acorn Atom... 12k RAM 6k high res graphics, Basic assembler, fp maths ROM 6522 timer via I/O sokt all leads/manuals. Sell £195. 3 Church View, Birtley, Tyne Wear.

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Sharp PC1211... + CE121, little used, excellent condition. £90 ono. Tel: 0223 59001 (Cambridge) after 6.

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Wanted

Wanted... any magazine back-numbers contining review/test of Sinc ZX80, or photocopies of such. Eg. Practical Computing July 1980. (But not Computing Today June 1980). Jem Ward, 'Ashfield', Bargates, Leominster, Herefordshire, HR6 8QX.

Back numbers... of PCW July & August 1980 (Vol 3 No 7 & 8). Urgent, will pay all expenses. Tel Chas Hardy 01-551 3581 eve after 7.

Wanted... complete set of Personal Computer World. Tel: 02576 2173.

For TRS80 Lev II... 32k interface, single/double disk drive. L Stevenson. Norbury Bank, Old Sodbury, Bristol.

Samll micro... must have full K/B, T.V/VDU int, cassette int and Basic or Tiny Basic, must be expandable to have graphics, more expansion possible, the better, will pay up to £110. Nascom 1 ideal, no ZX80s. Tel West Coker (093 586) 2609, 5 — 9pm, ask for Ivan.

Texas TI 58... in good cond with mains adaptor/charger and manual. Ring Lincoln (0522) 686883.

Apple II Europlus 32k... min, with single/dual disk drive, enthusiastic amateur will pay cash immediately, Tel any day 2 - 2.30 or after 9pm and ask for Philip; 01-657 1911.

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NETWORK NEWS

Here is a list of all British (and one Dutch) personal computer networks. As more networks appear — and as more facilities are added to existing ones — we'll report them in this section, which appears monthly.

Forum-80 Hull... Operator: Frederick Brown, tel 0482 856169. Facilities: electronic mail, software up/down loading, Forum-80 Users' Group, PET users' section, shopping list. Hours: 7 days/week, midnight-0800, Tues & Thurs 1900-2200, Sat & Sun 1300-2200.

Forum-80 London... Operator: Leon Jay, tel 01-286 6207. Facilities: electronic mail, program downloading. Hours: Tues, Fri, Sat & Sun 1900-2300.

80-NET... Operators: Leon Heller & Brian Pain, National TRS-80 Users' Group, tel 0908 566660. Facilities: electronic mail, software for downloading, newsletter, TRS-80 information. Hours: 7 days/week, 1900-2200.

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.

Forum-80 Holland... Operator: Nico Karssemeyer, tel 010 313 512 533. Facilities: electronic mail, program up/downloading, shopping list. Hours: Tues-Sat 1800-0700 nightly, continuous from 1800 Sat — 0700 Tues.

DIARY DATA

Sydney, Australia	Consumer Electronics Show. Contact: Riddell Exbn Promotions, 166 Albert Rd, S. Melbourne 3205	13 — 19 July
London	(Wembley Conf Centre) Microcomputer Show. Contact: Online. 09274 28211	13 — 19 July
London	(Cunard Int Hotel) Computer Software Exbn — SOFT. Contact: Executive Conf Organisers, 01-748 0287	2 — 4 Sept
Paris, France	Int Conf & Exbn Microprocessing and Microprogramming — Euromicro. Contact: Euromicro, 18 Rue Planchat, 75020 Paris	8 — 10 Sept
London	(Cunard Int Hotel) Personal Computer World Show. Contact: Montbuild, 01-486 1951	10 — 12 Sept
Anaheim, USA	Electronic Show & Convention — Wescon. Contact Network, 028 02 5226	14 — 16 Sept
Bristol	(Exbn Centre) West of England, Electronics Exbn. Contact: Exbns for Industry, 08833 4371.	15 — 17 Sept
Brighton	(Metropole) Int Semiconductor Exbn & Conf. Contact: Kiver Communications, 01-390 0281	22 — 24 Sept
London	(Wembley Conf Centre) Viewdata '81. Contact: Online, 09274 28211	6 — 8 Oct

PCW SUBSET

Alan Tootill presents more useful assembler — language subroutines. If you'd like to contribute your routines (for any of the popular processors), send them to: Sub Set, PCW, 14 Rathbone Place, LondonW1P 1DE.

Searching

First, we need a routine to match two strings and we have a good general-purpose one to hand from Jim Chance of Birmingham University, similar to the Z8000 CPSIR. It is our first Datasheet this month called CPSTR.

Datasheet

```
;= CPSTR — String match
;/ CLASS: 2 (not position-independent)
;/ TIME CRITICAL ? No
;/ DESCRIPTION: Tests for a match of two strings.
;/ ACTION: Compares (DE),(HL), decrements BC,
;/         increments and repeats until NZ or BC = 0.
;/ SUBr DEPENDENCE: None
;/ INTERFACES: None
;/ INPUT: DE and HL hold the addresses of the strings and BC
;/        the number of characters to be matched.
;/ OUTPUT: If strings equal — Z flag set, BC = 0, DE and HL
;/           hold addresses + 1 of last chrs, in the strings.
;/         If (HL)> (DE) — Z flag unset, S flag set.
;/         If (DE)> (HL) — Z flag unset, S flag unset.
;/ REGs USED: AF, BC, DE, HL
;/ STACK USE: None
;/ PROCESSOR: Z80

CPSTR:  LD    A,(DE)      ; get current chr of test string.   1A
        INC   DE          ; increment test string pointer.    13
        CPI               ; cf equivalent chr of other strg   ED  A1
        RET   NZ          ; return if unequal else            C0
        JP    PE,CPSTR    ; try next chr when BC not zero.    EA  YY  YY
        RET               ; return.                           C9
```

In the next Datasheet, TLOOK, from Jim Chance, CPSTR is used in looking up a particular string in a table of strings. The strings in the table may be of variable length as each string, including the one to be matched, is preceded by a byte holding a count of the number of characters in the string.

Datasheet

```
;= TLOOK — Table look up
;/ CLASS: 2 (does not save A)
;/ TIME CRITICAL ? No
;/ DESCRIPTION: Searches for a string in a table of strings of
;/              variable length.
;/ ACTION: Match test string with table string,
;/         Point to next table string address,
;/         Repeat until either match found or
;/         table exhausted.
;/ SUBr DEPENDENCE: CPSTR
;/ INTERFACES: None
;/ INPUT: A test string comprising a one-byte character count
;/        (including the count byte) and up to 254 characters.
;/        A table of variable length strings each string
;/        consisting of a one-byte character count (including
;/        the count byte) and up to 254 characters.
```


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DataStar £140

Full range S-100 by N/Star, Morrow Designs, SSM, plus Lifeboat Associates software – eg. Microsoft, Digital Research etc. available.

ALSO Apple goods, viz:
Microsoft Z80 Softcard (CP/M,M/S.Bas). £173
Microsoft 16K RAM Expansion Card. £105
For full details of above and other items contact:

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```
;/          DE = address of the test string character count.
;/          HL = address of the lowest byte of the table.
;/          BC = number of strings in the table.
;/ OUTPUT:  If string not matched – Z flag unset, DE unchanged,
;/              BC = 0, HL points to the next free byte in the table.
;/
;/          If string matched – Z flag set, BC = number in the table
;/              of the matched string counting from the highest
;/              addressed string, DE and HL hold the addresses+1
;/              of the end of the test and matched strings.
;/ REGs USED: AF, BC, DE, HL
;/ STACK USE: 6
;/ LENGTH:    23
;/ PROCESSOR: Z80

TL1:    PUSH   DE      ; save test string address      D5
        PUSH   BC      ; & number of table items.      C5
        LD     B,0     ; get length of current         06  00
        LD     C,(HL)  ; table string in BC.           4E
        CALL   CPSTR   ; match with test string.       CD  XX  XX
        ADD    HL,BC   ; point to next table string.   09
        POP    BC      ; restore no of table items.    C1
        JR     Z,TLEX  ; exit if string found else     28  08
        POP    DE      ; restore test string addr.     D1
        DEC    BC      ; decrement no of items.        0B
TLOOK:  LD     A,B     ; if more items                 78
        OR     C       ; in table                      B1
        JR     NZ,TL1  ; compare next else             20  EE
        INC    A       ; set nz for not found.         3C
        RET            ; return                        C9
TLEX:   INC    SP      ; adjust stack past             33
        INC    SP      ; test string address.          33
        RET            ; return.                       C9
```

Jim's third routine of the set, TENTER, can be used, following TLOOK, to append to the table a string not found in it thus:

```
. . . . . .
CALL TLOOK
JR Z,C1          ; jump if string found
CALL TENTER ; else add it to table
C1. . . . . .
```

Because TLOOK allows for a table of no strings, a table can be built up from scratch in this way, ensuring that no string is duplicated.

Datasheet

```
;= TENTER – Table enter
;/ CLASS: 1
;/ TIME CRITICAL ? No
;/ DESCRIPTION: Appends a string to a table
;/ ACTION: (Stack) ← BC
;/          DE ↔ HL
;/          BC ← 1st byte of string (string length)
;/          Table at (DE) ← String at (HL)
;/          DE ↔ HL
;/          BC ← (Stack)
;/ SUBr DEPENDENCE: None
;/ INTERFACES: None
;/ INPUT:  A string comprising a one-byte character count
;/         (including the count byte) and up to 254 characters.
;/         DE = address of the string character count.
;/         HL = address of the lowest byte of the string destination.
;/ OUTPUT: The string is added to the table.
;/ DE and HL hold the addresses of the ends of strings + 1.
;/ REGs USED:  F DE BC
;/ STACK USE:  2
;/ LENGTH:     10
;/ PROCESSOR:  Z80

TENTER: PUSH   BC      ; save BC                       C5
        EX     DE,HL   ; make (HL) source (DE) destn.  EB
        LD     B,+0    ; get string length             06  00
        LD     C,(HL)  ; in BC.                        4E
        LDIR           ; transfer string.              ED  B0
        EX     DE,HL   ;                               EB
        POP    BC      ; restore BC.                   C1
        RET            ; return.                       C9
```

Associative search

Here is another kind of search routine, TRAN, from Paul Zarucki of Solihull. A table of single-byte keys is searched to locate the position of 2-byte data items, the data item for a matched key being returned in HL. The table of keys and data items is set up thus:

```
  NN      ; no of data items in table
  41H     ; item key A
  42H     ; item key B
  43H     ; item key C
  44H     ; item key D
  . . . . .
  . . . . .
1010H     ; data associated with A
1515H     ; data associated with B
2020H     ; data associated with C
2525H     ; data associated with D
  . . . . .
  . . . . .
```

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If 42H is presented in A, 1515H is returned in HL or if 44H is given in A, 2525H is returned in HL.

This method is used partly for speed of execution since, using a block search instruction, the single-byte keys can be searched far more speedily than the 2-byte items.

Datasheet

```
;= TRAN — Associative search
;/ CLASS: 1
;/ TIME CRITICAL; No
;/ DESCRIPTION:  Searches a table of 1-byte key values for a
;/               match with the value in A. If a match is found,
;/               the corresponding entry from an associated table
;/               of 2-byte data values is returned.
;/ ACTION: 1.  1. Stack ← BC
;/             2. BC ← (HL)
;/             3. HL ← HL+BC
;/             4. Perform block search leaving Z flag set if
;/                successful, else cleared
;/             5. If no match go to step 7
;/             6. HL ← corresponding data item
;/             7. BC ← Stack
;/ SUBr DEPENDENCE: None
;/ INTERFACES: None
;/ INPUT: A = 8-bit search key
;/        HL = address of associative table
;/        Associative table — in order of ascending memory addresses:
;/        (a) 1-byte specifying number of entries.
;/            Value 0 indicates 256 entries.
;/        (b) Table of 1-byte search key values.
;/        (c) Table of 2-byte data values each associated with
;/            byte in the corresponding position of the search
;/            key table.
;/ OUTPUT: (a) MATCH FOUND — Z flag set, HL = 2-byte data value
;/         (b) NO MATCH — Z flag clear.
;/ REGs USED:  AF HL
;/ STACK USE: 6
;/ LENGTH: 31
;/ PROCESSOR: Z80
TRAN:   PUSH  BC        ; save BC                          C5
        LD    B,0       ; initialise BC to table length.   06  00
        PUSH  AF        ; save search key.                 F5
        LD    A,(HL)    ; if table length byte = 0         7E
        CP    B         ; set                              B8
        JR    NZ,A1     ; BC                               20  01
        INC   B         ; to 256.                          04
A1:     LD    C,A       ;                                  4F
        POP   AF        ; restore search key               F1
        ADD   HL,BC     ; point HL to top of key table.    09
        PUSH  HL        ; save table start address.        E5
        CPDR            ; search for matching key.         ED  B9
        POP   HL        ; restore table start addr.        E1
        JR    NZ,EXIT   ; exit if no match.                20  0B
        PUSH  DE        ; save DE                          D5
        PUSH  AF        ; and flags.                       F5
        INC   HL        ; point HL to data list & add      23
        ADD   HL,BC     ; offset of required entry.        09
        ADD   HL,BC     ;                                  09
        LD    E,(HL)    ; load 16 bit data into DE         5E
        INC   HL        ;;and put it into HL.              23
        LD    D,(HL)    ;                                  56
        EX    DE,HL     ;                                  EB
        POP   AF        ; restore flags.                   F1
        POP   DE        ; restore registers.               D1
EXIT:   POP   BC        ;                                  C1
        RET             ; return                           C9
```

Using FOWIA

In case there is anyone who doesn't buy *PCW* every month, FOWIA consists of the two instructions POP HL and JP (HL) so that, after it has been called, the current instruction's address is in HL. It is a way of getting the value of the program counter into an accessible register.

Simon Sellick of Pershore writes of an interesting extension of this idea, which he uses in a program that performs various checks on equipment under test. As his program is carrying out the tests, it saves the latest test starting point so that, when a fault is detected, it can be corrected and the program restarted at the relevant test routine. Immediately prior to the start of each routine whose address is to be saved, the program CALLs SAVPOE:

```
;SAVPOE: POP   HL
         LD    (STORE),HL
         (HL)
```

To restart the program at the latest routine, the following code is executed:

```
LD      HL,(STORE)
JP      (HL)
```

Paul Jenner of Southampton points out that, since he has his relative call rou-

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tine, RCAL (January 81) at the 0010H restart address, he can do FOWIA by D7 00 E1 in the main code, ie:

```
RST   RCAL
DEFB  00H     ; zero displacement
POP   HL
```

So no separate routine is needed. Any of our relative calls with zero displacement and followed by a POP HL will leave us in the main program at nnnn with nnnn-1 in the HL register.

J S Linfoot from Oxford sends his routine, SAY, to put out messages in situ in the code thus:

```
CALL  SAY
DEFB  "Hello|
```

Having the text of output messages within the body of the code, at the place where they are invoked, makes programs more readable. Here is the routine:

```
SAY:   POP    HL
SLP:   LD     A,(HL)
       INC    HL
       CP     "|        ; end of message chr.
       JR     Z,EXIT
       CALL OUT        ; to output a chr.
       JR     SLP
EXIT:  JP     (HL)
```

Roger Hargrave of Crawley is intrigued by the scope offered by FOWIA for self-modifying code. Here is a routine he has devised, LIXORY, which loads A from either a table pointed to by IX if the carry is set, or otherwise from a table pointed to by IY. The displacement within the table is passed to the routine in C. It depends on modifying the instruction at label LXRY1 to contain the required displacement and to be either DD or FD to load from either IX+d or IY+d.

```
LIXORY:  CALL   FOWIA
         PUSH   AF
         LD     DE,+15
         ADD    HL,DE
         LD     (HL),C
         POP    AF
         JR     C,LXRY1
         DEC    HL
         DEC    HL
         SET    5,(HL)
LXRY1:   LD     A,(IX+nn)
         RES    5,(HL)
         RET
```

Self-modifying code is fun, though I don't approve of it, so I won't give too much help with this one.

LEISURE LINES

by J J Clessa

Sorry we got the puzzle numbers mixed up; in future, we'll classify the puzzles by the month in which they are set, rather than by a number. The May puzzle was very easy and attracted almost 200 entries, 14 of which came from overseas — Denmark, Holland, Eire, Switzerland, Austria, Germany, France, Canada and even Abu Dhabi. The random winner selector, however, kept the prize in the UK — it went to Mr Richard Scott of Crediton, Devon, whose solution (as was most entries) was:

X = 64321
Y = 5

giving E = 19,856,844,651.

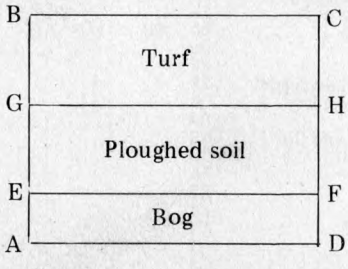
Several readers pointed out that by using decimals and/or negative signs, a greater value of E could be achieved since that was not the intention, we considered the above answer to be correct. Congratulations, Mr Scott, your Faber Castell pensil will be on its way asap.

Quickie

As usual, no answers, no prizes, no difficulty. Two trains approach each other from opposite directions. One is travelling at 50mph, the other at 70mph. How far apart are they 15 minutes before they meet?

August prize puzzle

Here's a puzzle which can be solved by micro but you may find an easier way.



The diagram represents a square field with 600ft sides. In the field are three types of surface: turf, ploughed soil and bog. The rectangular section AEFD is bog — AE is 100ft wide. The section EGHF is ploughed soil — EG is 200ft wide. The remaining section, GBCH, is turf — BG is, of course, 300ft.

A farmer starts at point A to get to C. He can travel at 2½ft/sec in bog, 5ft/sec on ploughed soil and 10ft/sec on turf. What is the shortest time (to the nearest second) in which the farmer can get to C?

Answers on a *postcard* please, to arrive no later than 31 August, to: August Prize Puzzle, *PCW*, 14 Rathbone Place, London W1P 1DE.

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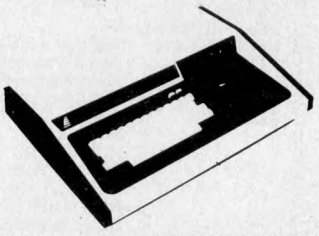

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PROGRAMS

ZX80 Othello

by I Williams

This program needs just over 1k to run so you'll need an expanded '80. Note that, in the listing, spaces are denoted by '%' in cases where the number of spaces is critical. If a player can't move, he must enter 0; the game ends when neither player can move. At the end, type 99 for another game or 'END' to stop.

```
5   REM COPYRIGHT CDS MICRO SYSTEMS
10  LET B=61
20  LET W=52
30  DIM M(8)
40  LET M=0
50  LET A=0
60  LET T=0
70  CLS
80  PRINT "%%12345678"
90  PRINT
100 FOR I=1 TO 8
110 PRINT I;"%--------"
120 NEXT I
130 PRINT
140 PRINT "%%TURN%%%%"
150 LET Z$="75ISRTG6"
160 FOR I=1 TO 8
170 LET M(I)=CODE(Z$)-45
180 LET Z$=TL$(Z$)
190 NEXT I
200 GOSUB 660
210 POKE M+62,B
220 POKE M+51,W
230 POKE M+63,W
240 POKE M+52,B
250 LET P=B
260 GOSUB 660
270 POKE M+102,P
280 INPUT N
290 IF N=99 THEN RUN
300 IF N=0 THEN GOTO 350
310 LET X=N
320 IF X < 11 OR X > 88 THEN GOTO 280
330 GOSUB 680
340 GOTO 400
350 LET T=T+1
360 LET P=W
370 IF (T/2)*2=T THEN LET P=B
380 GOSUB 660
```


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```
390  GOTO 270
400  LET E=0
410  FOR K=1 TO 8
420  LET C=X
430  LET C1=X
440  LET V=X
450  LET V=V+M(K)
460  GOSUB 660
470  LET L=PEEK(M+V)
490  IF L=B OR L=W THEN GOTO 510
500  GOTO 620
510  IF L=P THEN GOTO 540
520  LET C=C+M(K)
530  GOTO 450
540  IF C=X THEN GOTO 620
550  IF C1=C THEN GOTO 600
560  GOSUB 660
570  POKE M+C1,P
580  LET C1=C1+M(K)
590  GOTO 550
600  POKE M+C,P
610  GOTO 630
620  LET E=E+1
630  NEXT K
640  IF E< 8 THEN GOTO 350
650  GOTO 280
660  LET M=PEEK(16396)+256*PEEK(16397)
670  RETURN
680  LET H=X/10
690  LET X=H*11+X-(H*10)+3
700  GOSUB 660
710  RETURN
```

Easter Sunday

by John Waddell

The calculation of the date of Easter Sunday is quite a complicated process. It was laid down, at the Council of Nicaea in 325 AD, that Easter Sunday was to be the Sunday which followed the full moon which occurred on, or next after, the day of the spring equinox. Thus it depends on the motions of both the sun and the moon, and not even on the real motions of these, since they are not absolutely regular, but on the motions of a fictitious mean sun and mean moon.

Other considerations, religious and political, made the issue even more complicated but it has all been reduced to a set of formulae. You can read all the details in the book *Puzzles and Paradoxes* by T H O'Beirne, chapter 10, 'Ten Divisions Lead to Easter'. The formulae given there are used in this program. I have restricted the dates to after 1582 (calendar reform) and before 4000, since the rules will require changing

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With the Toolkit fitted you can use commands like RENUMBER, FIND, DELETE and AUTO to help you edit your program. Then when you're satisfied, just type !A to assemble your code. Don't worry, if you've made a silly mistake you will get an appropriate message!

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PROGRAMS

before that date.

The spring equinox is always on 21 March, which makes 22 March the earliest possible date for Easter. The latest possible date is 25 April. Neither happens very often. Using this program, you can find out when they next occur but it will require a little patience! By then it is likely that Easter will be calculated in some much simpler manner. The program should run on most machines.

```
10 PRINT TAB(9)"E A S T E R  S U N D A Y"
20 PRINT:PRINT
30 INPUT"What year to start";X$:X=VAL(X$)
40 IF X>1582 AND X<4000 THEN 60
50 PRINT "Not in my range":GOTO 30
60 PRINT:INPUT"What year to finish";Z$:Z=VAL(Z$)
70 IF Z-X>=0 AND Z-X<20 THEN 90
80 PRINT "End year out of range":GOTO 60
90 PRINT:PRINT
100 PRINT TAB(7)"Year",,"Easter Sunday"
110 PRINT
120 A=X-19*INT(X/19):B=INT(X/100):C=X-100*B
150 D=INT(B/4):E=B-4*D
170 G=INT((8*B+13)/25)
180 F=19*A+B-D-G+15:Z1=INT(F/30)
190 H=F-30*Z1
200 M=INT((A+11*H)/319)
210 I=INT(C/4):K=C-4*I
230 Q=2*E+2*I-K-H+M+32:Z2=INT(Q/7):L=Q-7*Z2
240 R=H-M+L+90:N=INT(R/25)
250 Z3=INT((H-M+L+N+19)/32)
270 P=H-M+L+N+19-32*Z3
280 PRINT TAB(6);X,,
300 IF N<>3 THEN PRINT "  April ";P:GOTO 320
310 PRINT "  March ";P
320 X=X+1:IF X <= Z THEN 120
330 END
```

Apple Mondrian

by Stephen W Barrow

Written in Integer Basic, this program simulates the work of the Mondrian school of art in which rectangles are filled with pastel colours. Apart from its almost hypnotic effect, you could use it as a talking point when debating the 'is it art?' question. The author holds no views — he just wrote the program.

Eurocolour Apples will require slight modifications in lines 1000 to 1090.

```
10 DIM X(6): DIM Y(6)
15 GOSUB 6000
22 CALL -936
25 GR
27 POKE -16302,0
28 FOR MO=1 TO MM
30 COLOR=15
32 GOSUB 8000
37 COLOR=0
40 HLIN 0,39 AT 0: HLIN 0,39 AT 47
```

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PROGRAMS

```
  50 VLIN 0,47 AT 0: VLIN 0,47 AT 39
 100 FOR I=1 TO 6:X(I)=39: NEXT I
 110 FOR I=1 TO 6:Y(I)=47: NEXT I
 120 I= RND (5)+1
 130 FOR J=1 TO I
 140 X= RND (30)+2
 160 X(J)=X
 170 NEXT J
 172 X(1)=0
 175 GOSUB 3000
 177 FOR J=1 TO 6: VLIN 0,47 AT X(J): NEXT J
 180 I= RND (5)+1
 190 FOR J=1 TO I
 200 Y= RND (38)+2
 220 Y(J)=Y
 230 NEXT J
 232 Y(1)=0
 235 GOSUB 4000
 237 FOR J=1 TO 6: HLIN 0,39 AT Y(J): NEXT J
 240 FOR I=1 TO 5
 250 FOR J=1 TO 5
 270 GOSUB 2000
 280 NEXT J
 290 NEXT I
 300 FOR IJ=1 TO 1000: NEXT IJ
 400 REM
 410 IF PEEK (-16287)>127 THEN 410
 415 NEXT MO
 420 POKE -16301,0
 450 TEXT : CALL -936
 460 VTAB 20
 470 PRINT "WOULD YOU LIKE ANY MORE PATTERNS (Y/N) ";
 480 INPUT ANS$
 490 IF ANS$="Y" THEN 15
 495 IF ANS$="N" THEN 500
 497 PRINT : PRINT "                    TWIT"
 498 GOTO 460
 500 CALL -936: END
1000 REM  COLOR SELECTION WITHOUT EURO COLOR CARD
1005 C= RND (8)-3: IF C>0 THEN 1020
1010 COLOR=15: GOTO 1090
1020 IF C>1 THEN 1040
1030 COLOR=1: GOTO 1090
1040 IF C>2 THEN 1060
1050 COLOR=8: GOTO 1090
1060 IF C>3 THEN 1080
1070 COLOR=4: GOTO 1090
1080 COLOR=11
1090 RETURN
2000 IF X(I)=39 THEN 2100
2010 IF Y(I)=39 THEN 2100
2020 IF X(I)=X(I+1) THEN 2100
2025 IF X(I+1)-X(I)<=2 THEN 2100
2030 IF Y(J)=Y(J+1) THEN 2100
2035 IF Y(J+1)-Y(J)<=2 THEN 2100
2037 GOSUB 1000
2040 FOR L=Y(J)+1 TO Y(J+1)-1
2050 HLIN X(I)+1,X(I+1)-1 AT L
2060 NEXT L
2100 RETURN
3000 FOR K=1 TO 6
3010 Z=X(K)
```


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PROGRAMS

```
3020 FOR N=1 TO 6
3030 IF X(N)<=Z THEN 3050
3040 Z=X(N):X(N)=X(K):X(K)=Z
3050 NEXT N
3060 NEXT K
3080 RETURN
4000 FOR K=1 TO 6
4010 Z=Y(K)
4020 FOR N=1 TO 6
4030 IF Y(N)<=Z THEN 4050
4040 Z=Y(N):Y(N)=Y(K):Y(K)=Z
4050 NEXT N
4060 NEXT K
4080 RETURN
6000 CALL -936
6005 POKE 50,255
6010 VTAB 13
6020 PRINT "THIS PROGRAM GENERATES PATTERNS"
6030 PRINT
6040 PRINT "SIMILAR TO MONORIAN PAINTINGS"
6050 PRINT
6060 PRINT "HOW MANY PATTERNS WOULD YOU LIKE ";
6070 INPUT MM
6080 CALL -936
6090 VTAB 13
6100 PRINT "IF YOU WISH TO HOLD ANY PATTERN ON"
6110 PRINT : PRINT "THE SCREEN"
6115 PRINT : PRINT "THEN PRESS BUTTON ON GAME CONTROL 0"
6120 PRINT : PRINT : PRINT : PRINT
6130 PRINT "PRESS GAME CONTROL 0 TO CONTINUE"
6140 IF PEEK (-16287)<=127 THEN 6140
6150 RETURN
8000 FOR I=47 TO 0 STEP -1
8010 HLIN 0,39 AT I
8020 NEXT I
8100 RETURN
```

Sharp MZ-80K Duck Shoot

by B Phillips

```
1 REM **DUCK SHOOT** SOUTHERN SOFTWARE **1980
2 PRINT"■DUCK SHOOT**** DO YOU WANT INSTRUCTIONS":PRINT"  'Y/N'"
3 GETK$:IFK$=""THEN3
4 IFK$="Y"THEN8000
5 IFK$="N"THEN10
6 GOTO3
10 PRINT"■          ****DUCK SHOOT****■"
15 TI$="000000"
20 DIMS(10):FORI=1TO10:READS(I):NEXT
30 REM M LINE START=54048:BL=3494:M=54068:TEMPO7:MUSIC"R0":HI=1:AA=53367
40 PRINT"■■■■■■■■■■■■■■■■■■■■":BB=53727
45 PRINT"/\\\/\/\/\\\\/\///////\\\\\/\//\\\\\"
50 PRINT"%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%"
60 PRINT"┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬"
```


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PROGRAMS

```
100 USR(BL):POKEM,202
200 SD=232:DM=39: DS=INT((10-1)*RND(1)+1)
201 IFVAL(RIGHT$(TI$,5))>300THEN9000
202 IFRND(1)>.8THENGOSUB3000
205 IFRND(1)>.6THEN300
220 FORI=S(DS)TOS(DS)-39STEP-1
225 IFRND(1)>.6THEN MUSIC"_C"
230 USR(BL):POKEI,232:P=I
235 GOSUB1010:USR(BL):POKEI,0
240 IFU=1THENU=0:D=D+1:HI=HI+1:GOTO200
250 NEXT:D=D+1:GOTO200
300 SD=231:DM=41:DS=INT((10-1)*RND(1)+1)
305 IFRND(1)<.6THEN200
310 FORI=S(DS)-39TOS(DS)
315 IFRND(1)<.4THENMUSIC"G"
320 USR(BL):POKEI,231:P=I
330 GOSUB1010:USR(BL):POKEI,0
340 IFU=1THENU=0:D=D+1:HI=HI+1:GOTO300
350 NEXT:D=D+1:GOTO300
1010 REM SHOOT ENABLE ROUTINE
1020 GETK$:ML=M
1025 IFM>54085THENM=M-1
1026 IFM<54049THENM=M+1
1030 IFK$="G"THENM=M-1:W=PEEK(M):POKEML,W:USR(BL):POKEM,202
1040 IFK$="J"THENM=M+1:W=PEEK(M):POKEML,W:USR(BL):POKEM,202
1070 IFK$="H"THENGOSUB2000
1080 RETURN
2000 REM FIRE AT TARGET
2005 POKEM-40,221:POKEM-40,183:POKEM-40,118:POKEM-40,121
2010 FORJ=M-80TOM-18+40STEP-40
2020 USR(BL):POKEJ1,0
2030 USR(BL):POKEJ,46:J1=J
2035 IFJ=PTHENU=1:POKEJ,0:POKEM-40,0:GOTO4000
2036 IFJ=DDTHENPOKEDD,207:MUSIC"^C^C^CA^A":UU=1:SS=SS+1:POKEM-40,0:GOTO7000
2040 NEXT:USR(BL):POKEJ1,0:USR(BL):POKEJ,0:MUSIC"_C_C_C_C_C"
2045 POKEM-40,0
2050 RETURN
3000 REM RANDOM SUN
3010 DD=INT((BB-AA)*RND(1)+AA):POKEDD,206
3020 FORI=1TOINT((200-1)*RND(1)+1)
3030 GOSUB1010
3040 IFUU=1THENUU=0:GOTO3060
3050 NEXTI
3060 POKEDD,0:DD=AA:RETURN
4000 FORX=JTOM+40STEPDM:E=RND(1)
4001 IFE>.7THENX=X+1:SD=233
4002 IFE<.5THENX=X-1:SD=234
4003 IFE<.3THENX=X+4:SD=235
4005 USR(BL):0=PEEK(X)
4010 USR(BL):POKEX,0:USR(BL):POKEX,SD
4020 MUSIC"G":USR(BL):POKEX,0:NEXTX
4030 C=C+1:IFC=39THENGOTO6000
4040 FORL=54208TO54248-(C+1)
4050 USR(BL):POKEL,232:USR(BL):POKEL,0
4060 NEXTL:POKEL,232
4090 GOTO2050
5000 DATA53367,53407,53447,53487,53527,53567,53607,53647,53687,53727
6000 PRINT"G":
6010 PRINT"    ▒    ▒   ▒▒▒▒▒   ▒    ▒"
6020 PRINT"    ▒  ▒ ▒   ▒   ▒   ▒    ▒"
6030 PRINT"     ▒▒▒    ▒   ▒   ▒    ▒"
6040 PRINT"      ▒     ▒   ▒   ▒    ▒"
6050 PRINT"      ▒     ▒   ▒   ▒    ▒"
6060 PRINT"      ▒     ▒▒▒▒▒   ▒▒▒▒▒▒"
6070 PRINT
6080 PRINT"▒▒▒▒▒ ▒▒▒▒  ▒▒▒▒  ▒▒▒▒  ▒▒▒▒▒"
6090 PRINT"▒   ▒ ▒   ▒ ▒   ▒ ▒   ▒ ▒   ▒"
6100 PRINT"▒   ▒ ▒   ▒ ▒   ▒ ▒   ▒ ▒   ▒"
6110 PRINT"▒▒▒▒▒ ▒▒▒▒  ▒▒▒▒  ▒▒▒▒  ▒▒▒▒▒"
6120 PRINT"▒   ▒ ▒ ▒   ▒   ▒ ▒   ▒ ▒   ▒"
6130 PRINT"▒   ▒ ▒  ▒  ▒   ▒ ▒   ▒ ▒   ▒"
6140 PRINT"▒▒▒▒▒ ▒   ▒ ▒   ▒ ▒   ▒ ▒   ▒"
6150 PRINT"GYOU HAVE KILLED";HI-1;" Poor little ducks !"
6155 B=(HI-1)*10:B1=SS*25:B2=B1+B:B2=B*+((HI-1)/5)*15)
6160 PRINT"GBUT FORTUNATLY";D-HI;" Got away !"
6170 PRINT"GYOU HAVE PUT OUT THE SUN ";SS;" TIMES !"
6175 PRINT"GYOUR score is.";B2
6180 PRINT"GAny key for another go."
6190 GETK$:IFK$=""THEN6190
6200 RESTORE:CLR:GOTO10
7000 FORL=54168TO54207-(SS+1)
7010 USR(BL):POKEL,107:USR(BL):POKEL,0
7020 NEXTL:POKEL,107.
7030 GOTO2050
```

PROGRAMS

```
8000 PRINT"■** DUCK SHOOT ...Instructions."
8010 PRINT"■This is a wicked game of skill at"
8020 PRINT"Duck shooting."
8030 PRINT"You are stomping through the marsh-"
8040 PRINT"-land waiting for the poor unsuspecting"
8050 PRINT"duck to fly over."
8060 PRINT"Every duck you shoot is layed on the"
8070 PRINT"ground beneath you,in order that you"
8080 PRINT"may count your spoils."
8090 PRINT"When the sun comes out,the ducks do"
8100 PRINT"not fly.You may then take a potshot at"
8110 PRINT"the sun to gain extra points."
8115 PRINT"Every 5 ducks earns extra 15 points."
8116 PRINT"Every sun earns 25 points."
8120 PRINT"■Keys 'G','J' move you around."
8130 PRINT"Key 'H' fires your gun."
8140 PRINT"YOUR TIME IS LIMITED.So shoot carefully."
8150 PRINT"Any key to start."
8160 GETK$:IFK$=""THEN8160
8170 GOTO10
9000 PRINT"■"
9010 PRINT"▒▒▒▒▒  ▒▒  ▒▒  ▒▒▒▒▒▒"
9020 PRINT"▒▒  ▒▒  ▒▒  ▒▒    ▒▒"
9030 PRINT"▒▒  ▒▒  ▒▒  ▒▒    ▒▒"
9040 PRINT"▒▒▒▒▒   ▒▒▒▒▒    ▒▒"
9060 PRINT"■■OF TIME !!!!!!"
9070 PRINT"■■■THE SUN HAS RISEN AND THE DUCKS ARE"
9080 PRINT"■AWAY ON THE WATER."
9090 FORI=1TO5000:NEXT:GOTO6000
```

PET Gomoku

by Bob Chappell

This runs on any 8k PET and is reputedly unbeatable. The game is a touch on the slow side, taking up to a minute for the early moves. The RUN/STOP key is disabled during the game and re-enabled just before the end.

```
1 REM*GOMOKU**BOB CHAPPELL*14/2/81*BASED ON ALGORITHM OF J.CROUCH,USA*
2 POKE59468,14
3 IFPEEK(65E3)=254THENOZ=1:POKE144,49:GOTO16
4 POKE537,136:OZ=2:GOTO16
5 FORJ=1TO3:S(J)=0:NEXT:FORJ=-2TO2
6 P=B(Y+J*XX)+1:S(P)=S(P)+1:NEXT
7 S2=S(2):S3=S(3):IFS2=0ORS3=0THEN9
8 RETURN
9 IFS2=5THENJ$=W$:GOTO74
10 IFS3=4THENFF=1
11 IFS2=0THENL=K(S3+1):GOTO13
12 L=W(S2+1)
13 FORJ=-2TO2:A=Y+J*XX:IFB(A)<>0THEN15
14 Q(A)=Q(A)+L
15 NEXT:RETURN
16 J=0:XX=0:D=0:S2=0:S3=0:FF=0
17 DIMB(100),Q(100),W(5),K(5):MV=1
18 W(1)=4:W(2)=12:W(3)=30:W(4)=90:W(5)=10000:K(1)=4:K(2)=12
19 K(3)=30:K(4)=100:K(5)=100000
20 B1$="  ■                                "
21 C$="■■■■■■■■■■■■■■■■■■■■■■■■■"
22 TH$="■■      THINKING"
23 W$="■■■ YOU WIN!"
24 MW$="■■■ I WIN!"
25 E$="■■■ILLEGAL MOVE"
26 F$="■■■ALREADY USED"
27 YM$="■■■ YOUR MOVE "
28 D$="■■■ A DRAW!"
29 MM$="■■■  MY MOVE  "
30 PRINT"■■■■■■■■■■■■■■■■■■■
```

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PROGRAMS

```
35 M=1:IFA$="Y"THENM=0:GOTO37
36 IFA$<>"N"GOTO34
37 GOSUB76:IFM=1GOTO53
38 FORJ=1TO10:GETA$:NEXT:J$=YM$:GOSUB126
39 GETR$:IFR$=""THEN39
40 IFASC(R$)=13THEN39
41 MG$=E$:R=VAL(R$):PRINTC$"■"TAB(22)R$
42 IFR$<"0"ORR$>"9"GOTO44
43 GOTO45
44 GOSUB130:GOTO38
45 GETCL$:IFCL$=""THEN45
46 IFASC(CL$)=13THEN45
47 C=VAL(CL$):PRINT"□■"TAB(33)CL$
48 IFCL$<"0"ORCL$>"9"GOTO44
49 PRINT"■■"TAB(36)R$;"■ ■"CL$
50 R=R+1:C=C+1:FORJ=1TO100:Q(J)=0:NEXT:Q(55)=1:A=(R-1)*10+C
51 IFB(A)<>0THENMG$=F$:GOTO44
52 B(A)=1:GOSUB97
53 J$=TH$:GOSUB129:IFMV=1THENMV=0:GOSUB134:GOTO66
54 FORR=1TO10:H=(R-1)*10:FORC=1TO10:D=0:Y=H+C
55 IFC<3ORC>8THEN57
56 D=1:XX=1:GOSUB5
57 IFR<3ORR>8THEN59
58 D=D+1:XX=10:GOSUB5
59 IFD<2THEN61
60 XX=11:GOSUB5:XX=9:GOSUB5
61 NEXT:NEXT:GOTO62
62 XX=1:Q0=0:FORJ=1TO100:IFQ0>Q(J)THEN64
63 XX=J:Q0=Q(J)
64 NEXT
65 IFQ0<4THENJ$=D$:GOTO74
66 B(XX)=2:R=INT((XX-1)/10)+1:C=XX-10*(R-1):R=R-1
   C=C-1:J$=MM$:GOSUB126
67 R$=MID$(STR$(R),2,1):CL$=MID$(STR$(C),2,1)
68 PRINTC$"■"TAB(22)R$
69 PRINT"□■"TAB(33)CL$
70 PRINT"■"TAB(36)R$;" "CL$
71 R=R+1:C=C+1:GOSUB97
72 IFFF=0THENGOSUB104:GOTO38
73 J$=MW$
74 GOSUB129:FORJ=1TO5000:NEXT:PRINT"■";:IF0Z=1THENPOKE144,46:END
75 POKE537,133:END
76 REM**DRAW BOARD***
77 POKE59468,12:X=0
78 PRINT"□ ■    0  1  2  3  4  5  6  7  8  9 "
79 PRINT" ■ ┌──────────────────────────────────┐"
80 FORN=0TO9:PRINT"■■■■";
81 FORN1=0TO9:PRINT"■   |";:NEXT:PRINT"| ";:PRINT"■■■■";
82 FORN1=0TO9:PRINT"___|";:NEXT:PRINT"| ";:NEXT:X=-1
83 PRINT"■■":FORN=0TO99STEP10
84 X=X+1
85 PRINT" ■   |"
86 PRINT" ■";X;"| |" NEXT
87 PRINT" ■ └──────────────────────────────────┘"
88 PRINT"■■■■";TAB(37);"G"
89 PRINT"■■";TAB(37);"O"
90 PRINT"■■";TAB(37);"M"
91 PRINT"■■";TAB(37);"O"
92 PRINT"■■";TAB(37);"K"
93 PRINT"■■";TAB(37);"U"
94 PRINT"■■■"
95 PRINTB1$:PRINTB1$;"■":RETURN
96 REM**UPDATE BOARD***
97 PRINT"■■":FORN=1TO100STEP10
98 PRINT"■■■■■■";
99 FORN1=NTON+9
100 IFB(N1)=0THENPRINT"■■■";
101 IFB(N1)=1THENPRINT"O■■";
102 IFB(N1)=2THENPRINT"●■■";
103 NEXT:PRINT"■":NEXT:RETURN
104 FORN=1TO1000:NEXT:RETURN
105 PRINT"■ (TYPE Y FOR YES OR N FOR NO) "
106 GETA$:IFA$=""THEN106
107 RETURN
108 REM**INSTRUCTIONS**
109 PRINT"□          ■          ":PRINT"          ■ |□□/| "
110 PRINT"          ■          ":PRINT"■|HE OBJECT IS
    TO BE THE FIRST TO GET
111 PRINT"FIVE OF YOUR STONES IN A ROW -
```

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PROGRAMS

```
112 PRINT"HORIZONTALLY,VERTICALLY OR DIAGONALLY.
113 PRINT"■DU PLAY  THE WHITE STONES
114 PRINT"■ET PLAYS THE BLACK STONES.
115 PRINT"■■ET PLAYS IT'S FIRST MOVE IMMEDIATELY
116 PRINT"BUT THEREAFTER TAKES ABOUT 60 SECONDS,
117 PRINT"DECREASING BY ONE SECOND A MOVE.
118 PRINT"■■HE PREVIOUS MOVE IS DISPLAYED AT THE
119 PRINT"TOP RIGHT HAND SIDE OF THE SCREEN
120 PRINT"(WHITE BACKGROUND IF YOURS).
121 PRINT"■■NTER YOUR MOVE BY TYPING THE ROW AND
122 PRINT"COLUMN WHEN ASKED - [illegible].
123 PRINT"■■■RESS ■■■ TO START "
124 GETA$:IFA$=""ORA$<>" "THEN124
125 RETURN
126 REM**MESSAGE BOARD**
127 PRINTC$;B1$:PRINT"■ ";J$;
128 PRINTTAB(16)" ROW ■■ ■■ COLUMN ■■ ■":RETURN
129 PRINTC$;B1$:PRINT"■ ";J$:RETURN
130 REM**MESSAGES**
131 PRINTC$;MG$"■":GOSUB104:RETURN
132 GETA$:IFA$=""THEN132
133 PRINTASC(A$)
134 XX=55:IFB(XX)=0THENRETURN
135 XX=56:RETURN
```

MZ-80K Football

by Andrew Webster
and Tony Reddiough

A touch on the slow side, but a splendid effort by these two young men.

```
1 REM FOOTBALL.  19/1/81.
2 REM BY--A.WEBSTER(13)/T.REDDIOUGH(13)
3 K$="CEGE1R1E1R1E1R1E1FGEDEFDEFD1R1D1R1D1R1D1FR1FDCDER1EGE1R1ER1E1R1E1R1E1"
4 KK$="GR1GEFGAR1AB▀CR1▀CBA▀CGR1GAGFEDC"
5 PRINT"■■■■■■■FOOTBALL"
6 PRINT"■■■■▀▀▀▀▀▀▀▀▀▀▀▀"
7 PRINT"■■■■■■■■■■What is your team..";
8 INPUTQ$:IFLEN(Q$)>9THENPRINT"■■■■TOO LONG":MUSIC"▀C9▁C5":GOTO5
9 TEMPO3:MUSICK$,KK$:TEMPO7
10 PRINT"■■■■■■Welcome to Match of Today."
11 PRINT"■■■■Today we see ";Q$;" In action."
12 PRINT"■■■■Do you require instructions (Y/N)."
14 GETL$:IFL$=""THEN14
16 IFL$="Y"THEN20
18 IFL$="N"THEN89
19 GOTO14
20 PRINT"■■■■■■■■■■■■■■INSTRUCTIONS"
21 PRINT"■■■■■■■■■■■■■▀▀▀▀▀▀▀▀▀▀▀▀▀▀"
22 PRINT"■You are the man who starts at the"
24 PRINT"half way line.The object is to get to"
26 PRINT"the box,shoot and score.You have two"
28 PRINT"minutes to score as many goals as you"
30 PRINT"can.If the defence tackle you,you "
32 PRINT"lose possession and have a goal taken "
34 PRINT"away and you are sent back to the       half-way line."
36 PRINT"Movement is controlled by the keys:-"
38 PRINT"              U              "
39 PRINT"              ↑              "
40 PRINT"           H←┼→K          J=SHOOT"
41 PRINT"              ↓              "
42 PRINT"              M              "
44 PRINT"When the pitch is displayed start right"
```


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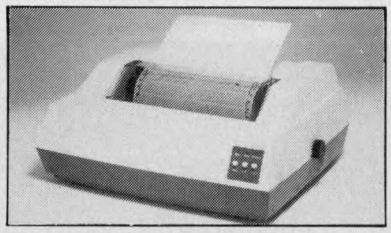

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PROGRAMS

```
 46 PRINT"away.Good luck."
 47 PRINT"■      PRESS ANY KEY TO START"
 48 GETR$:IFR$=""THEN48
 89 TEMPO7:M$="C5R0C5DEFEDG6R2G5R0G9":U$="C4D4E4D4C4C4D4":H$="C5R1C6R1"
 90 X=53410:S=0:L=0:VV=0
 91 E=53676:F=53624:G=53865:H=53789:I=53387:J=53380:K=53630
100 PRINT"■"
105 TI$="000000"
110 GOSUB 1000
120 GETA$:IFA$=""THENPRINT"■■■
```

PROGRAMS

```
678 POKEJ-40,206:POKEJ,0:J=J-40
680 IFPEEK(K-40)=120THEN120
681 IFPEEK(K-40)=202THENX=53410:S=S-1
682 POKEK-40,206:POKEK,0:K=K-40
687 PRINT"■■■
```

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PATTERNS

Continued from page 112

```
100 X=50
110 Y=50
120 M=0.2
130 MOVE @1:X,Y
140 X=X+(RND(1)-0.5)*M
150 Y=Y+(RND(1)-0.5)*M
160 DRAW @1:X,Y
170 GO TO 140
```

Program B

MICRO CHESS

Continued from page 115

Since it was my company, Philidor Software, which produced the Chess Champion Mark V, I was disappointed by the result. However, it was a grand struggle and illustrates several of the most important, and difficult, problems still to be overcome before a program can challenge any of the world's top 100 humans.

Forthcoming tournaments: 2nd European Micro Championship 10-12 September at the *PCW* Show, 2nd World Micro Championship 21-29 September in Travemunde and Hamburg, 12th North American Computer Championship (with many micros) 8-10 November in Los Angeles and then the Stockholm micro tournament sometime in December.

SECRETS OF SYSTEMS ANALYSIS

Continued from page 69

programming. The pleasure of solving the intellectual puzzle is less immediate, but it does have the attraction that the problems being solved are real ones. Even where a program is to do a real job, the programmer still sees life at one remove. Of course, the analyst and programmer must work together; both must work with the manufacturers on the one hand and users on the other, to bring the marvels of modern technology to the service of us all.

Good luck.

This brings us to the end of Lyn's series on systems analysts, design and implementation. Look out for a PCW *Special book in September which will incorporate this series and lots of other related goodies.*

BLUDNERS

Well, this is just asking for trouble, but we're not aware of any enormous goofs in last month's issue. Naturally, the moment this appears in print, we'll be flooded with 'phone calls pointing out the mistakes we missed!

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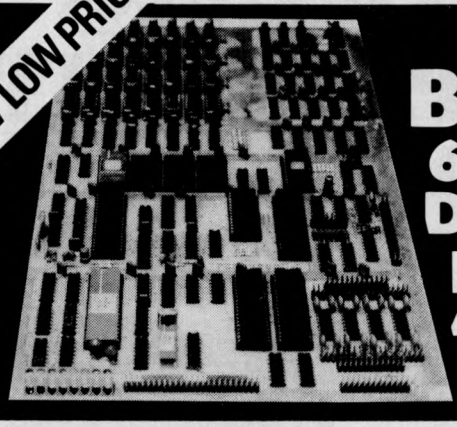

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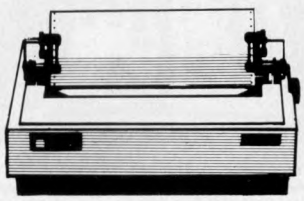

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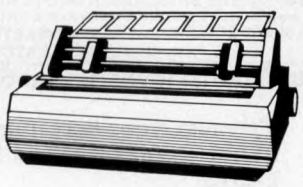

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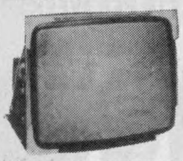

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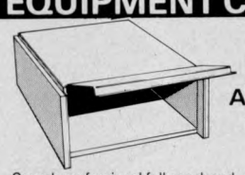

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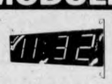

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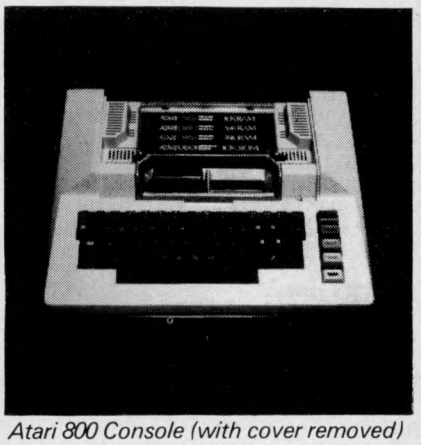

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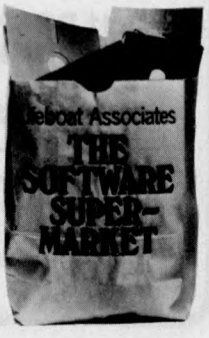

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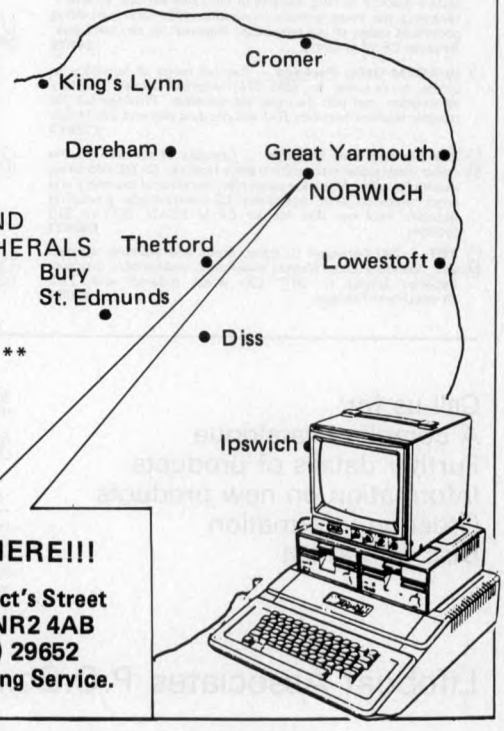

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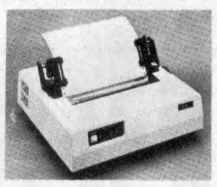

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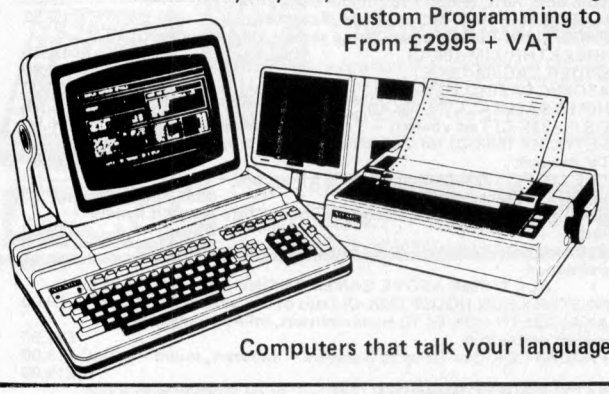

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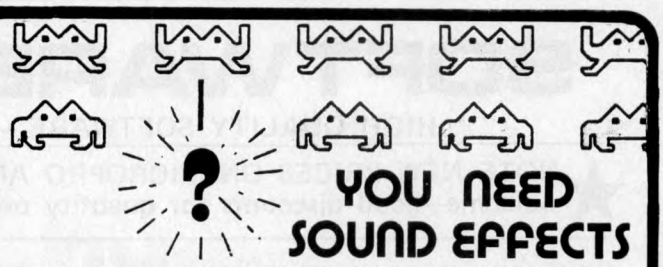

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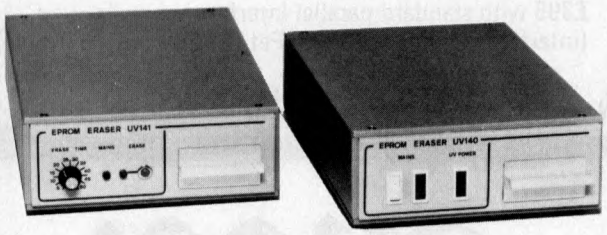

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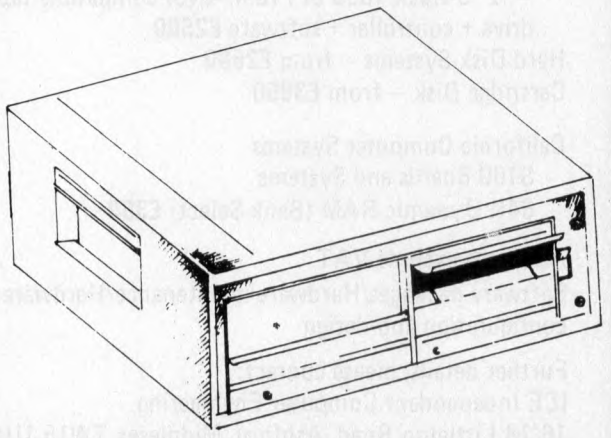

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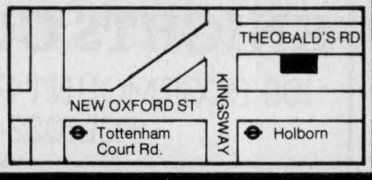

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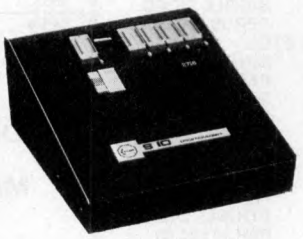

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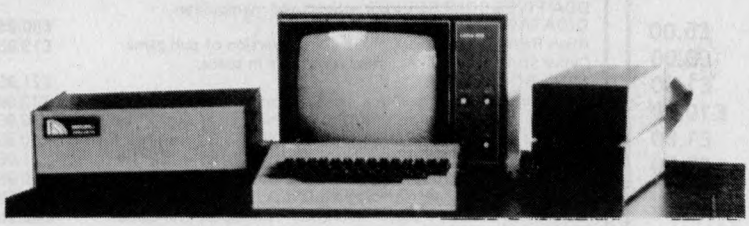

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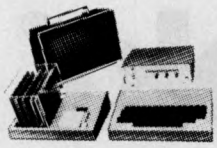

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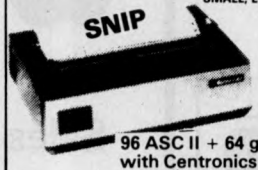

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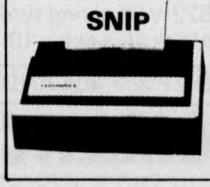

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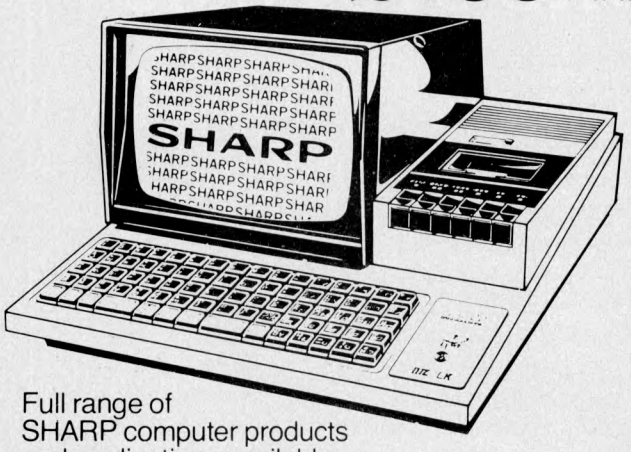

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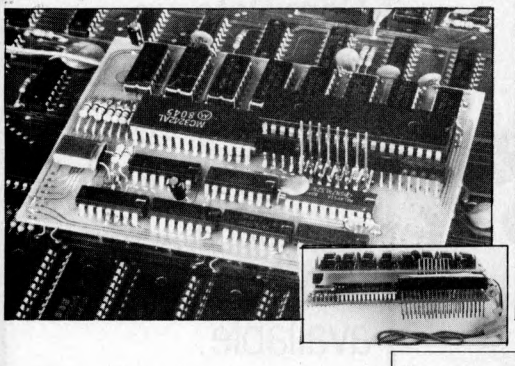

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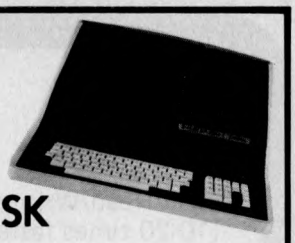

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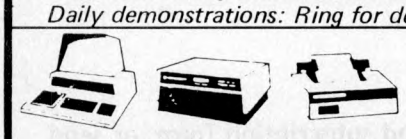

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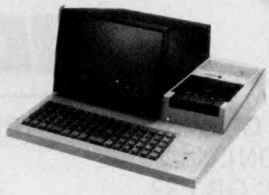

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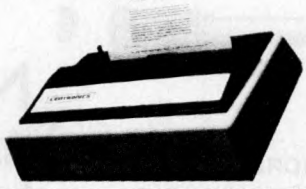

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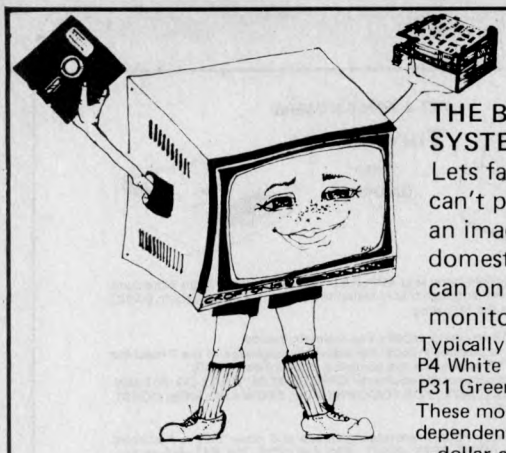

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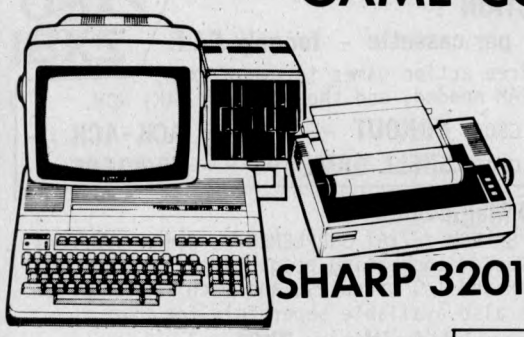

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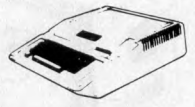

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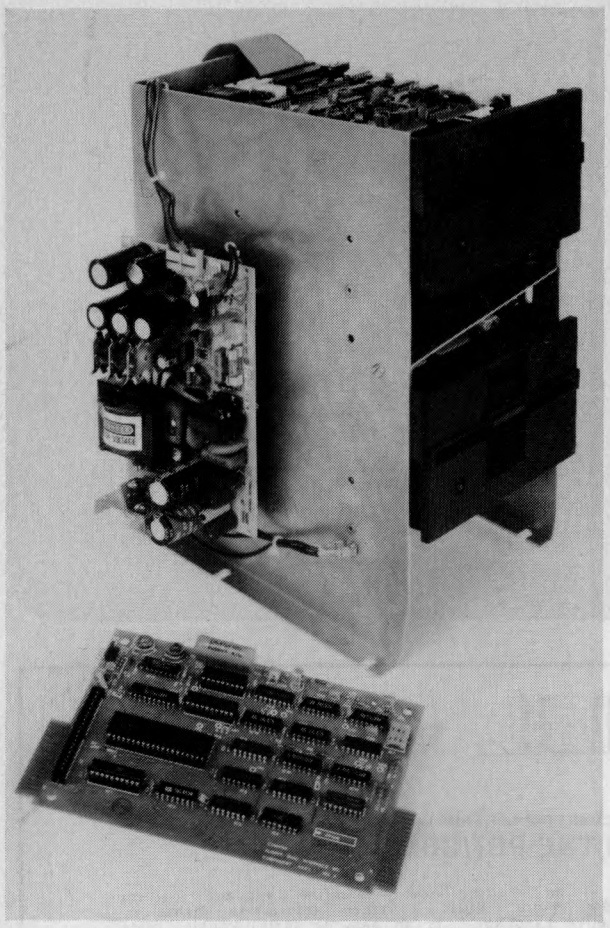

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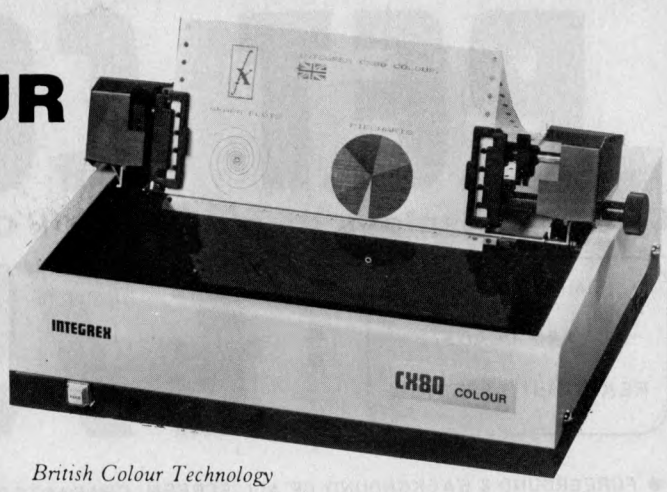

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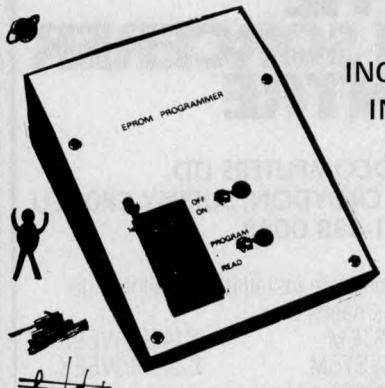

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Get in sync

SYNC magazine is different from other personal computing magazines. Not just different because it is about a unique computer, the Sinclair ZX80 (and kit version, the MicroAce). But different because of the creative and innovative philosophy of the editors.

A Fascinating Computer

The ZX80 doesn't have memory mapped video. Thus the screen goes blank when a key is pressed. To some reviewers this is a disadvantage. To our editors this is a challenge. One suggested that games could be written to take advantage of the screen blanking. For example, how about a game where characters and graphic symbols move around the screen while it is blanked? The object would be to crack the secret code governing the movements. Voila! A new game like Mastermind or Black Box uniquely for the ZX80.

We made some interesting discoveries soon after setting up the machine. For instance, the CHR$ function is not limited to a value between 0 and 255, but cycles repeatedly through the code. CHR$ (9) and CHR$ (265) will produce identical values. In other words, CHR$ operates in a MOD 256 fashion. We found that the "=" sign can be used several times on a single line, allowing the logical evaluation of variables. In the Sinclair, LET X=Y=Z=W is a valid expression.

Or consider the TL$ function which strips a string of its initial character. At first, we wondered what practical value it had. Then someone suggested it would be perfect for removing the dollar sign from numerical inputs.

Breakthroughs? Hardly. But indicative of the hints and kinds you'll find in every issue of **SYNC**. We intend to take the Sinclair to its limits and then push beyond, finding new tricks and tips, new applications, new ways to do what couldn't be done before. **SYNC** functions on many levels, with tutorials for the beginner and concepts that will keep the pros coming back for more. We'll show you how to duplicate commands available in other Basics. And, perhaps, how to do things that can't be done on other machines.

Many computer applications require that data be sorted. But did you realize there are over ten fundamentally different sorting algorithms? Many people settle for a simple bubble sort perhaps because it's described in so many programming manuals or because they've seen it in another program. However, sort routines such as heapsort or Shell-Metzner are over 100 times as fast as a bubble sort and may actually use less memory. Sure, 1K of memory isn't a lot to work with, but it can be stretched much further by using innovative, clever coding. You'll find this type of help in **SYNC**.

Lots of Games and Applications

Applications and software are the meat of **SYNC**. We recognize that along with useful, pragmatic applications, like financial analysis and graphing, you'll want games that are fun and challenging. In the charter issue of **SYNC** you'll find several games. Acey Ducey is a card game in which the dealer (the computer) deals two cards face up. You then have an option to bet depending upon whether you feel the next card dealt will have a value between the first two.

In Hurkle, another game in the charter issue, you have to find a happy little Hurkle who is hiding on a 10 X 10 grid. In response to your guesses, the Hurkle sends our a clue telling you in which direction to look next.

One of the most ancient forms of arithmetical puzzle is called a "boomerang." The oldest recorded example is that set down by Nicomachus in his *Arithmetica* around 100 A.D. You'll find a computer version of this puzzle in **SYNC**.

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SYNC is a Creative Computing publication. **Creative Computing** is the number 1 magazine of software and applications with nearly 100,000 circulation. The two most popular computer games books in the world, *Basic Computer Games* and *More Basic Computer Games* (combined sales over 500,000) are published by Creative Computing. Creative Computing Software manufactures over 150 software packages for six different personal computers.

Creative Computing, founded in 1974 by David Ahl, is a well-established firm committed to the future of personal computing. We expect the Sinclair ZX80 to be a highly successful computer and correspondingly, **SYNC** to be a respected and successful magazine.

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Needless to say, we can't fill up all the pages without your help. So send in your programs, articles, hints and tips. Remember, illustrations and screen photos make a piece much more interesting. Send in your reviews of peripherals and software too—but be warned: reviews must be in-depth and objective. We want you to respect what you read on the pages of **SYNC** so be honest and forthright in the material you send us. Of course we pay for contributions—just don't expect to retire on it.

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Below you will find a table comparing PERSONAL COMPUTER WORLD's circulation with that of PRACTICAL COMPUTING for the period 1 July to 31 December 1980.

After all the claims and counter-claims during the past few months it makes interesting reading. The most important facts to emerge are, firstly, that within the UK, PERSONAL COMPUTER WORLD outsold PRACTICAL COMPUTING by an average of 5,966 copies per issue*. Secondly, PERSONAL COMPUTER WORLD is also the clear market leader in overall circulation, despite the high percentage of copies (14%) distributed abroad by PRACTICAL COMPUTING.

The question to ask oneself, of course, is just how useful to an advertiser are copies sold abroad?

Further, these figures should be studied in the light of *present* sales patterns and print runs. The June 1981 print run of PERSONAL COMPUTER WORLD was just over 70,000 copies. That of PRACTICAL COMPUTING was around 55,000 copies. We fully expect the UK sales difference to rise to over 10,000 copies between PERSONAL COMPUTER WORLD and PRACTICAL COMPUTING in the next audit period which will cover the months of January 1981 through June 1981.

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Chip Chat

Remember Henry Budgett's horror at finding *PCW* but not *Toady* on sale in Greece last summer? Well, he's had his revenge. Deputy Editor Rodwell was strolling down a street in Madrid recently when he came across a stall selling imported mags, including, yes, *Toady* but not *PCW*!. . . Quote from a glossy Commodore brochure: 'There is also a lighter side to the research and creativity carried on by Commodore International. You may be hearing it soon: the world's first musical greeting card.' Funny; we remember musical cards, incorporating a clockwork music-box mechanism, from way back. . . We see from its latest edition that *Printout* has an editor and an associate editor with exactly the same name. . . *PCW* Benchtester Steve Withers recently sent off one of those reader inquiry cards from another magazine, requesting information on a product which he'd recently Benchtested. Back came a reprint of his Benchtest. . . Our June cover reminded Mike Sterland of his visit to the Systime stand at last year's Compec, where a group of chimps were cavorting around John Gow. 'Nice to see you've got the rest of the board with you, John!' said Mike. John's reply is unprintable. . . Why has Editor Tebbutt developed a walrus fetish? Not only is his desk festooned with walrus posters and models, but he's even taken to calling himself 'The Walrus' when phoning people. . . Finally, we goofed in last month's Chip Chat. The letterhead we printed was once the property of Alistair *Kelman*. (We printed *Nelman*.)

Why are floppy disks so called? Because they're floppy, that's why. Editor Tebbutt, attending a preview of the Thames TV programme 'Living in the future' was horrified to see presenter Sally James folding a disk to demonstrate this. A few days later, this photo of the crime arrived, courtesy of Malcolm Peltu.

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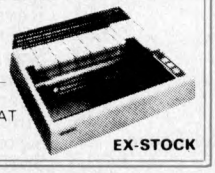

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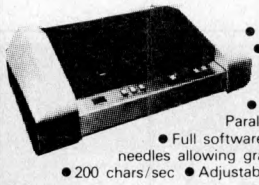

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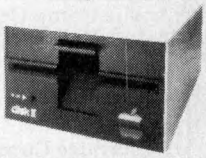

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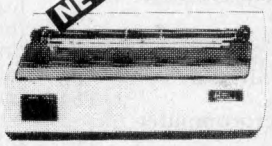

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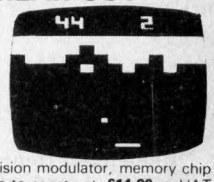

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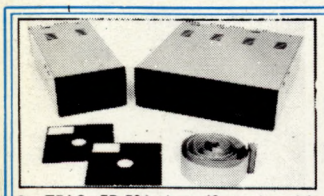

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