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FOR THE BUSINESS OF MICROCOMPUTING

OCTOBER 1980
ISSN 0142-7210
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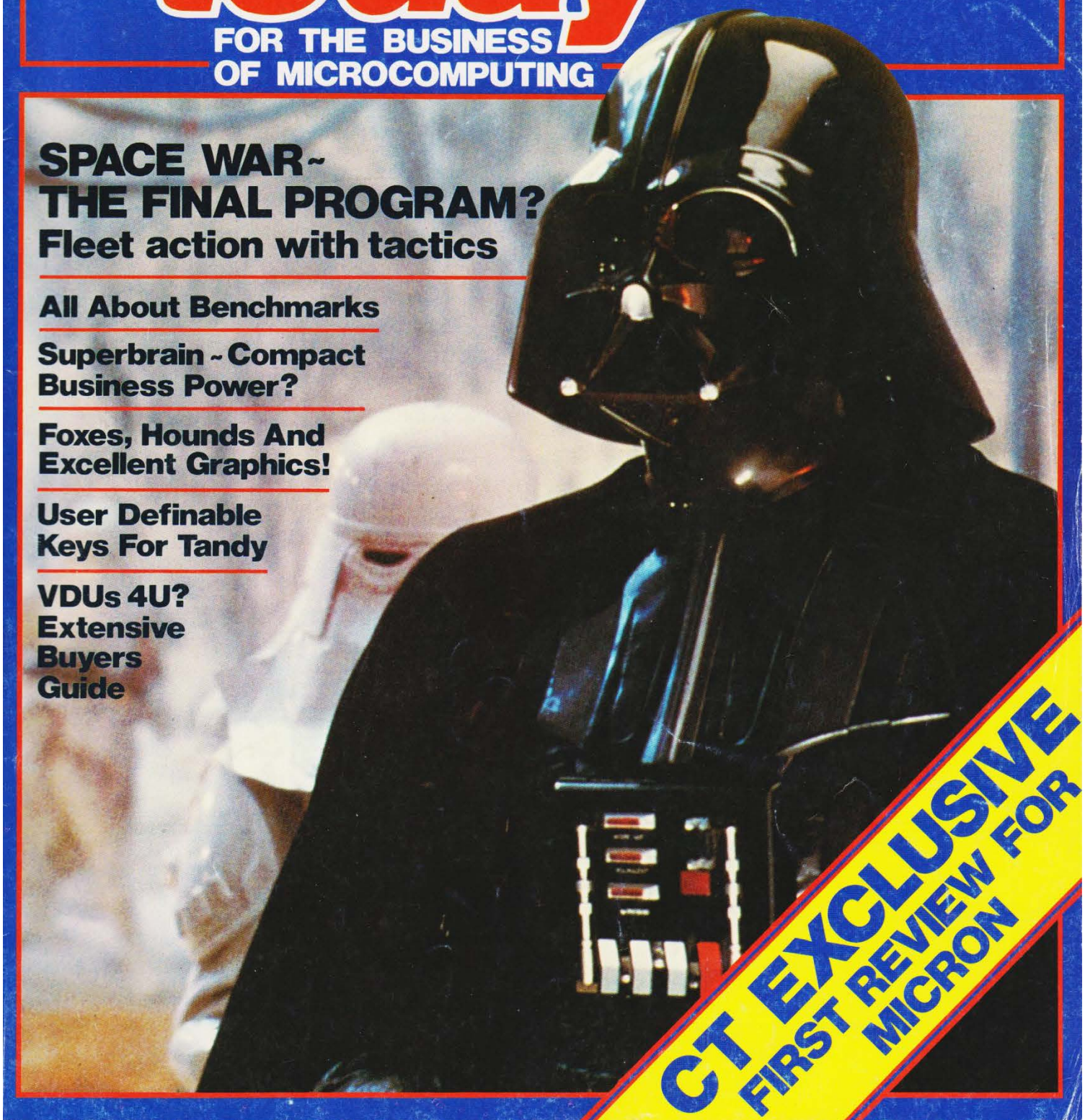

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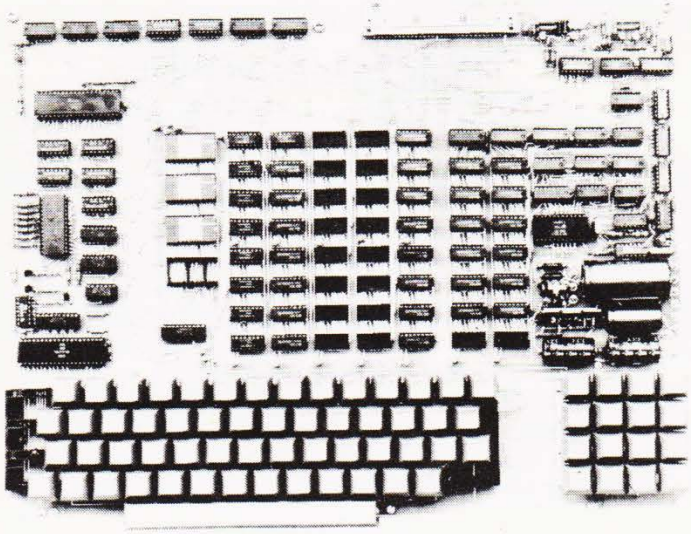

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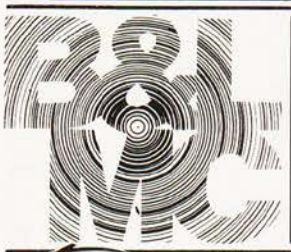

Some new introductions by the Midlands Computer Centre...

We celebrate our first birthday with news of new introductions available from the Micro Computer Centre.

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Input/Output Board. PIO Kit. Counter Timer Kit. UART Kit. (Colour Board Programmable Character Generator Board. Floppy Disc System (Single Drive) available in September). Nas-Pen Text editor. ZEAP 2.0 in EPROM or on Tape. Nas- Sys 3 Enhanced version of Nas-Sys 1. Nas-Dis – Disassembler. Debug – Dynamic Debugger.

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6505	795p
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Z80	795p
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6532	895p
6551	1095p
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6820	425p
6821	425p
6850	425p
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8214	450p
8216	395p
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8228	395p
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8253	1125p
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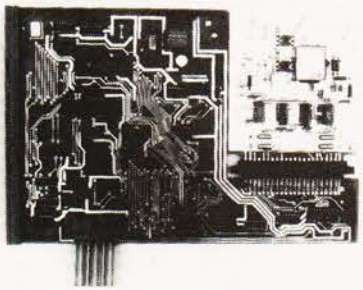

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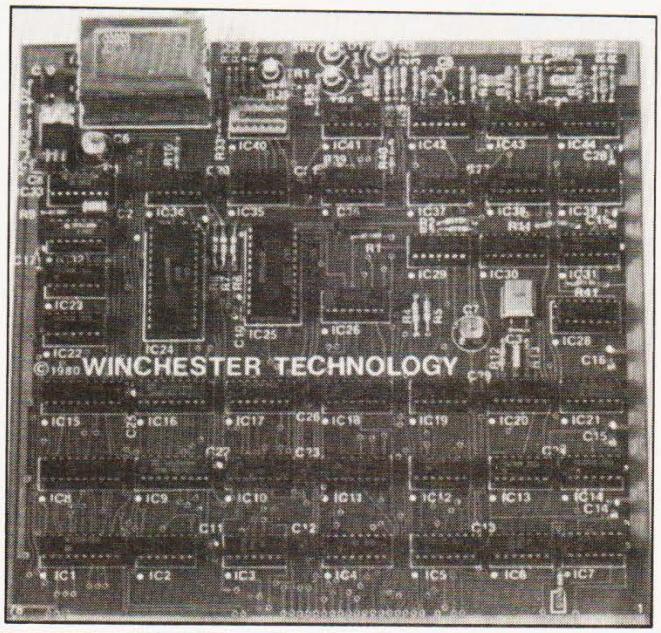


NASTEXT?

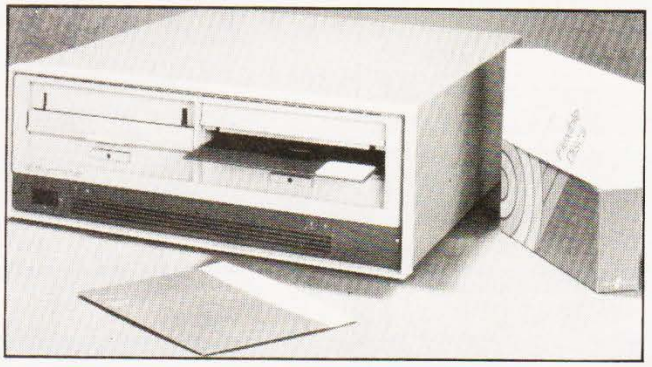
Latest in a long line of NASBUS compatible boards from independent manufacturers is a colour, Teletext compatible graphics unit from Wintec. Supplied as a complete unit at £136 it is capable of addressing some 5760 individual cells in any one of 13 colours. Other Teletext facilities offered include flashing and double height characters. All the necessary software to control the board is built into a 2708 and the routines may be called from machine code or BASIC programs. Because of the capability to define points by either absolute or relative addressing you can define a point once and then display it anywhere by simply changing the co-ordinates. Further information on the product is available from Winchester Technology, PO Box 26, Eastleigh, Hants SO5 5YY or ring on 04215-66916.

FORTH FOR FREE

An unusual computer course is being started in North London at the Willesden College of Technology. The course will last for a year on Wednesday afternoons and costs about £35. The concept is to offer a syllabus around a give-away implementation of FORTH. All you need is a micro with keyboard and VDU and about 8K of RAM, the object of the whole exercise is to get this up and running and then to learn how to program in the language. Owners of 8080, Z80, 6800, 6809 or 6502 processors will also get a full source listing for their machine. Enrolment will take place Tuesday 9th to Thursday 11th September at the college and the course will start 1st October. Contact Bill Stoddart at the Science Department, Willesden College of Technology, Denzil Road, London NW10 2XD, or ring on 01-549 0147.

MEGA HORSE POWER

If you use HP equipment and feel the need for floppy disc storage then 1.18 Mb per drive may be music to your ears. The newly announced HP 9895 unit is fitted with twin double sided, double density discs that offer a total of 2.36Mb. This capacity may be doubled by adding a further twin drive slave unit that hangs on the back. The unit interfaces through the HP-IB bus system and is suitable for the HP



1000 series, the HP85 and the System 25, 35 and 45 desk-top machines. Because of an in-built intelligent controller the unit can read single sided media prepared on the HP 9885 or 9885S drive systems and exchange data with IBM 3740 formatted discs. You can order the unit in a variety of configurations and a twin drive with controller will cost £3,810 on a ten week delivery time. For further technical information contact the Computer Systems Group at King Street Lane, Winnersh, Wokingham, Berks or ring on 0734-784774.

CASE TWO

Single board computer fans who hate the thought of their precious hardware getting dusty can now box their Superboard/UK101 and NASCOM 1 and 2s. Microtype, who produced the Series 80 case, have just launched a new version for the NASCOM 2 owner with an interchangeable key cutout for Superboards. Build-your-own fans can order the product with a blank panel. The box is made in black ABS and has room for a number of expansion boards and has a flat top for standing a monitor or TV on. The cost is £24.50 and further information can be had from Microtype at PO Box 104, Hemel Hempstead, Herts HP2 7QZ.

CLUB CALL

Computeers in the Northwest may be interested to learn of a computer club in their area. Meetings are held Wednesdays fortnightly and instead of a membership fee, they charge 25p per session. They have their own homebrewed system and anyone interested should contact John Lightfoot, the Secretary, at 135 Ashton Drive, Frodsham, Warrington, Cheshire WA6 7PU. Crossing the Pennines we find the Northeast TRS-80 Users Group who are a sub-group of the Newcastle upon Tyne Personal Computer Society. They meet every third Wednesday in Room A102 at the Newcastle Poly and are interested in both hard and soft aspects of the machines. Interested parties should contact Stan Tetlow at 3 Highbury Close, Springwell, Gateshead NE9 7PU. Owners of the ZX 80 who wish to access a national software bank can contact the ZX 80 Users Club, PO Box 159, Kingston upon Thames, Surrey KT2 5UQ. Annual membership is £6 for the UK and they hope to provide a bi-monthly newsletter. Further information is available from the above address but enclose an SAE. The final information comes from Southend where a group of enthusiasts have formed a club based around the facilities offered at the College of Technology. Further information from R Knight, 128 Lt Wakering Road, Southend on Sea, Essex.

SUPER SOUNDS

Owners of the UK101 and Superboard II computers with a penchant for noisy programs can now make life unbearable with a sound box unit from John Mortimer Electronics. Available as either ready built or in kit form it comes complete with instructions and a free sample game on cassette. Prices are £14.95 for the kit or £19.95 for the ready built version. For further details send an SAE to the company at PO Box 71, Norwich NR6 7JE.

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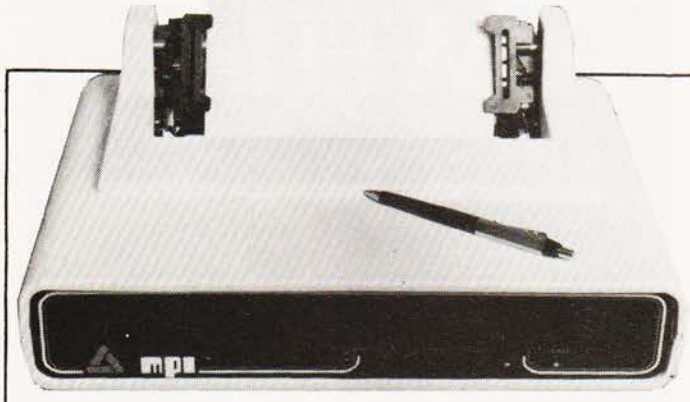


MICRO IMPACT

Missing our mammoth printer survey by only a few hours comes the Impectron Model 88T. Designed for use with small business and personal micro systems it can use fan-fold or plain paper and prints at up to 100 CPS bi-dire .ectable There are three print densities of 80, 96 and 132 columns and double width characters are software selectable for each of these with the added bonus of allowing intermixing on a line. The full 96 character ASCII set can be printed using a 7 x 7 matrix head and an easily replaceable cartridge ribbon. Interfaces supplied are RS 232 or 20mA or Centronics compatible parallel with a standard two line buffer. For more details of the device and prices contact Impectron at Foundry Lane, Horsham, West Sussex RH13 5PX or phone Charles King on 0403-50111.

WHAT A PICTURE

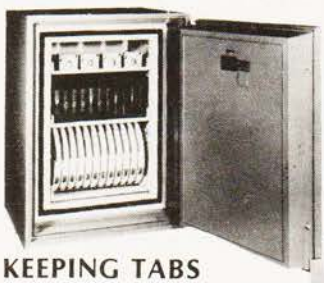
Cheap screen copies are often taken with a Polaroid camera but up till now these have been open to reflections and glare from the ambient or room lighting. GDS Graphic Display Systems have expanded the range of camera hoods to allow an Alpha SX-70 camera to take full screen VDU pictures without any of the previous problems. Because the camera is automatic no exposure calculations are required, just press the button and four minutes later you have your picture. The cost of the complete outfit with hood, camera and two packs of colour film is around the £150 mark depending on the size of your VDU screen. Seven standard sizes are made from 10" to 20" diagonal and specials will be made to order. For more information and a quotation contact Polaroid (UK) Ltd, Ashley Road, St Albans, Herts AL1 5PR or ring on 0727-59191.

NAME GAME

The nice thing about using a general purpose microcomputer as a word processing system is that you can still use it as a computer when you need it. The latest packaged system from Southwest Technical Products is called Autotext and allows you to do just this. Designed for handling names, addresses and all kind of business text such as standard letters, it uses the 6809 based S/09 computer and comprises a 56K processor with the CT-82 VDU, mini floppies and a printer. The package will sell for around £5000 and other software for accounting and business functions is available from stock. Storage capacity of the mini floppy is around 700 names and addresses but hard discs are available for those with larger mailing lists. For more detailed information contact SWTP at 38 Dover Street, Piccadilly, London W1 or telephone on 01-491 7507.

TOUCHABLE

Midas Computer Services have launched a hard disc business system based around the SORD M200 micro. The hardware configuration is a Z80A CPU with the AMD9511 Arithmetic unit, 64K of RAM, 8K of ROM, an extended ASCII character set terminal with business graphics, a 350Kb mini floppy and an 8Mb Winchester hard disc. The software available is fairly impressive too, you can have three versions of BASIC plus a multi-user version, FORTRAN IV and COBOL, along with a wide range of business software packages. Price for a typical system is around the £10,000 mark and maintenance contracts can be arranged. For a brochure and more technical information contact Andrew Jackson at Midas Computer Services, 2 High Street, Steyning, Sussex or ring on 0903-814523.



KEEPING TABS

Computer operations require specialised equipment to process all those reams of one-part that spew from the back of line printers and news of an alternative stockist is always welcome. Lawtons Ltd who are already supplying stationery and filing systems have added the Cave Tab range of computer media handling equipment to their stocks. Among the product is the series of free-standing or table-top decollators and the mini burster featured some months ago in these pages. Other specialised equipment includes fire-proof safes, security cabinets and all the usual range of binders, manual covers and magnetic media. For further information contact Lawtons Limited at 60 Vauxhall Road, Liverpool L69 3AU or ring on 051-227 1212.

BUG BYTES

Confessional time over the August issue. Although we do not quite understand how, we suspect a typescript eating gremlin, there are a number of mistakes in the articles as published. Towers of Brahama contains several references to line 800, there is no line 800 and if you change all the references to line 840 your program will run. In the Photographers Aid program line 270 should read PRINT FNA (G*1/((L+E)*F)) "FEET". The Multipurpose Records program contains a bug in line 2540 which should read PRINT TAB(8+8*C)A$(R,C). The Life program dies owing to a trauma. Cure is effected by changing the following; Line 350, CS should =226, Line 410 EX=1 not XE=1, Line 490 G$=STR$(G): L=LEN(G$), Line 680 should start IF FC > 2 and in Line 990 the two X7s should be X8s. In the article on Systematic Programming Line 6110 should go to 6999 and not 6990 and in the CONLAN article Line 2320 should end P=J(I)-1. We also neglected to thank Transam for the loan of the discs for photography at their shop which illustrated the Floppy Disc article. Apologies to all who may have suffered undue brain damage through these little quirks!

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Nascom-1 Kit Price
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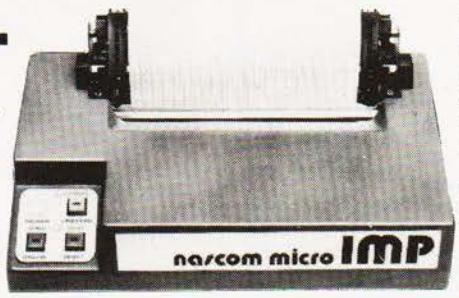

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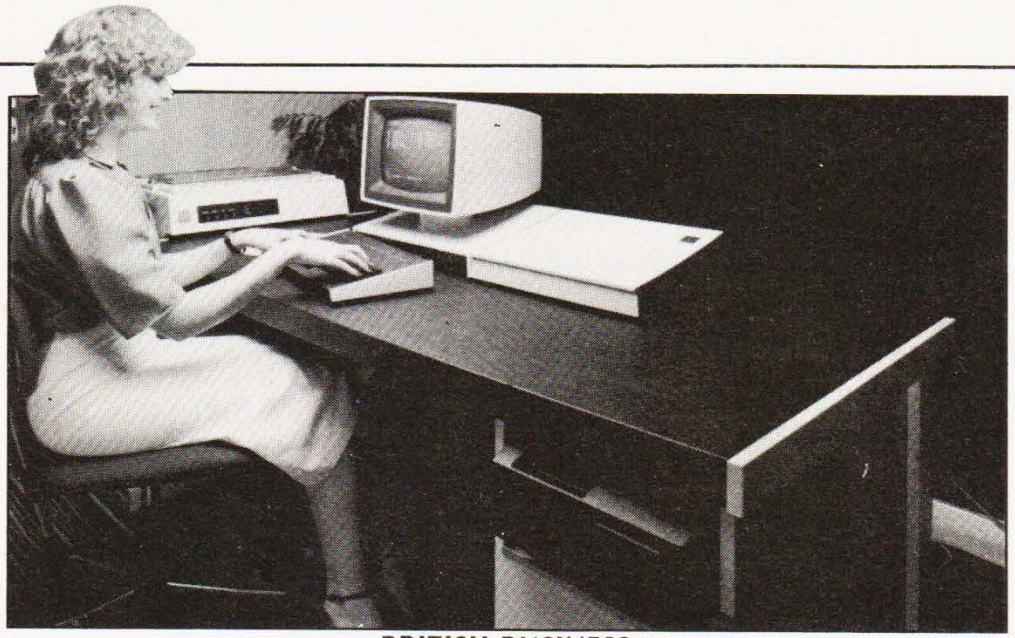

BRITISH BUSINESS

Complete small business systems seem to be all the rage nowadays so it usually takes a fairly special machine to make our heads turn. This latest offering from BMG Microsystems is based around an Intel 8085A processor with a VDU and floppy disc but is expandable to a multi-user, multi-tasking system with 20Mb of exchangeable disc storage.

Future plans include the use of the 8086 sixteen bit micro and yet more disc storage capacity, all within the same desk unit. The operating system is the usual CP/M and the language range includes CIS COBOL, FORTRAN, PL/1 and BASIC. All the usual range of business and word processing software will be available plus any software that executes under CP/M. Prices for a typical installation are around £27,000 and full hardware and software backup are offered as part of the deal. For more detailed information on this new British machine contact Tony Eldridge at BMG. The address is Micro House, Hawksworth, Swindon, Wiltshire SN2 1DZ or ring them on 0793-37813.

PROM POWER

Chiptech Ltd of Welwyn Garden City have announced an intelligent EPROM programmer system under the name Pecker 1. Based on a Z80 CPU it can blow a wide range of common memories up to 32K bits in size and allows full data entry and editing of the stored data before commitment. An optional I/O card allows downloading from a host or from paper tape and has extra sockets which allow the insertion of pre-programmed EPROMS containing assemblers, debuggers or even BASIC. Details from Chiptech at Unit One, Tewin Court, Welwyn Garden City, Herts AL7 1AU or ring them on 07073-33260.

KEY WORDS

Owners of the Wordstar word processing package may like to take advantage of a new keyboard unit developed specially for ease of use of the system. Produced by Elbit Data Systems it is designed to be used either on its own or with their DS 1920 and DS 2000(A) VDUs. Unfortunately we have no further information at this stage but the address of the company is 295 Aberdeen Avenue, Slough, Berkshire SL1 4HQ or telephone Slough 26713.

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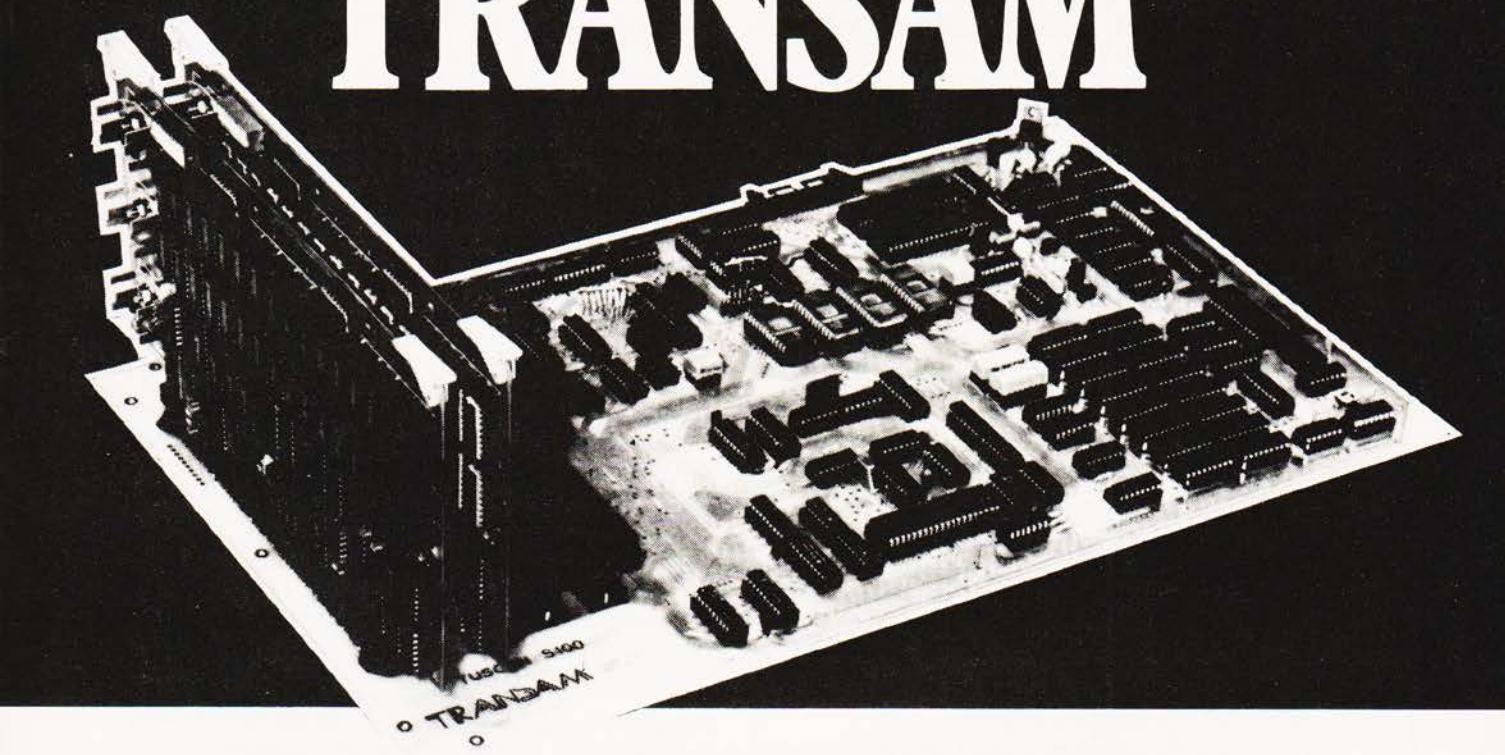
ASR 33 TELETYPE: Good condition, with tape-punch/reader. £350

BUSINESS EXPANSION

We often hear about 'small business' system and we all know about the giant mainframe computers, but what about the middle of the range business whose needs stretch a conventional 'small' computer and yet isn't big enough to justify a mainframe. Well MAI, the makers of the Basic Four range have introduced a 'middle of the range' system which appears to meet these needs. The starting system has a single terminal and 40Mb of disc and a printer. The storage can expand to 300Mb and all the software used is fully compatible with the existing range, some 8000 of which are installed worldwide. Prices start at £16,500 for the bottom model 200 and go through the new System 510 at £35,500 up to the biggest at £60,000. For information on either the new 510 or the complete range contact MAI (UK) Ltd, Black Arrow House, Chandos Road, London NW10 6NF.

'TUSCAN' FROM TRANSAM



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TUSCAN offers the user the choice of system monitor, editor, resident 8k basic, resident Pascal compiler or full CP/M disk operating system. All options are upwards compatible and fully supported with applications software. Both 5¼" and 8" drives are supported in double density.

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We take a look at the first machine with the 10K Microsoft BASIC, and examine its suitability for business and home.

MICRON they called it. Lord only knows why. Nowhere *at all* in the copious documentation I received with the system does the word MICRON even appear. I looked long and hard, but to no avail. C'est la guerre I suppose.

Having decided that this fluorescently packaged piece of citrus computational machinery was not, after all, a MICRON it only remained to be decided exactly what Tangerine (in their infinite wisdom) *had* supplied.

A Microtan 65, Tanex board with latest X-BUG, 7K of user RAM, ASCII keyboard, 10K Microsoft BASIC, PSU and 32 parallel I/O lines! . . . . (cassette interface and an RS232C serial port too!)

At this point I realised that they had to call it *something* and as PET, NASCOM and TANDY have all been used before, MICRON is as good as anything else.

The basic concept behind Tangerine's system is of non-redundant expandability. A good phrase that — and one which puts across the idea. You can start with either a MICRON, or the even more basic MICROTAN 65 and continue adding onto your system, up to a possible full disc/tape (and bank selectable RAM) business capable monster! (TANRAM is the next board to come and will hold some 40 (decimal) K of mixed static/dynamic RAM).

Along the way nought will be wasted, save maybe an out-moded monitor or two. The MICRON is the system complete to date and is meant to represent Tangerine's entry into the complete home system market. At £395 it is considerably cheaper than its possible competitors.

The aim of this review is to examine the MICRON system for its suitability as a home computer, giving some indication of the power of its 10K BASIC in the process.

On The Inside

A machine like this will stand or fall in the end upon the strength of its language, if you'll pardon the expression. After all, that is all most users will be directly using.

Switch it on — GE2ED: RETURN — and into Microsoft BASIC. End of story really. A shame.

Even though I would never be classed as a machine code fan myself, I can appreciate the elegance of the monitor present in MICRON. Loading programs in code is made very easy indeed and deserves a mention here.

There is a command to call up the contents of a given location, ie M100 opens, and displays contents of, location 100. You can now modify if you so desire, or a "LINE FEED" command will close the location and OPEN and DISPLAY the next location ready for modification.

```
eg      M100, 0E, FF <LF>
        M101, FF,  awaiting next data!
```

Anyway, on to higher levels.

Speak To Me Only With Thine BASIC

With Microtan powered up, your keyboard GE2ED'ed and TV suitably monopolised, BASIC will ask you to specify MEMORY SIZE and TERMINAL WIDTH. A carriage return to both will set up all available continuous memory upwards from the start of RAM, and determine the line width for PRINT statements as 72 characters. You can limit BASIC's use of memory — to allow machine code subroutines for example — by typing in the highest address you wish it to have access to, instead of the carriage return.

The Microsoft manual is very well presented, containing just about all you ever needed to know about BASIC but were afraid to ask. There is even a little section on converting programs between dialects of BASIC. Nice touch that.

Left: Tangerine's keyboard unit for MICRON. The two untitled keys are Alpha Lock (top right) and Shift Lock (centre left). The former makes program entry much smoother, as the number pad on the right remains numerical in operation, thereby providing all the symbols 'on key' with no shift operations required.

What can I say about a 10K BASIC that has not been said before? It is powerful and flexible, possessed of versatile string handling capability and does everything bar make the tea!

This is definitely the place to teach yourself BASIC! Forget the PETs and NASCOMs et al, — you may as well start with the best implementation around — and this is it. Experienced operators of the RUN key will appreciate the sense of ease that such a beast engenders too. For the price this is good value indeed.

Outside Chance

Now for the moan. Well, life would be boring if all was sweetness, light and 10K BASICs would it not?

Having been suitably eulogising about the Microtan, Tanex, etc for the last few pages, I must slip the knife between the ribs ever so slightly here, hidden beneath the smile of praise I hope.

Tangerine have produced an excellent system here, but they have gone out of their way to stop anyone using it!

Firstly there is no mains switch. You could spend many a happy hour searching the acres of metal in vain.

Secondly both the keyboard and UHF output leads connect to sockets on the PCBs *inside* the box. No front panel connection.

The UHF lead is virtually impossible to get on and off without seriously straining the PCB and will not fit with a standard plug — it is too near the panel.

The keyboard lead is about a foot long. Yep. Twelve inches. Not thirteen, or even twelve and a half. Twelve.

Which means that you have to keep the box and the keyboard that close together.

Fine in an office, or on the kitchen table maybe, but in a living room? I would have though the most civilised way of using the MICRON would be enthroned(!) in an armchair in front

Board : Microtan 65
Features : 6502, 1K RAM, 1K ROM, 6 I/O ports
Options : Pixcel graphics, lower case alphas, address bus buffers.
Need to run : TV, Hex keypad, 5 V PSU @ 1 A

Board : Tanex
Features : 1K RAM, 16 parallel I/O, TTL serial I/O, cassette I/O, 2 by 16 bit counter timers, full memory map, data bus buffers.
Options : 6K RAM, 4K ROM, X-BUG Monitor, 10K Microsoft BASIC, double above I/O plus RS232/20 mA serial with full modem control.
Need to run : ASCII keyboard, ± 12 volts.

Board : Tanram
Features : 40(decimal)K mixed static and dynamic RAM

Board : Tandisc
Features : control of four drives

Extras : Motherboard, case, power supply, Hex keypad, ASCII keyboard.

Table 1. The various system configurations for Microtan, MICRON is a Microtan 65 + full Tanex + power supply and ASCII keyboard.

Monitor command	Function
M(add)(term)	Modify memory locations, terminator type allows step through, cancel or jump out.
L(add),(numb)(term)	Lists the contents of specified memory locations in tabular form.
G(add)(term)	Sets internal registers and executes program at address given. NB cursor disappears.
R	Sets memory modify command to register mode. Allows the 6502s internal registers to be altered.
S	Sets single step mode, see P and N
N	Resets to normal mode from single step
P	Causes monitor to execute next instruction, can be set to execute n instructions. Gives display of all registers and returns to monitor.
B(add),(numb)(term)	Sets breakpoint at specified address, up to eight are allowed. All registers are displayed and P command may be used to continue.
O(branch add)(dest add)(term)	Calculates offsets between specified addresses for use in branch arguments.
C(start add)(end add)(start add dest)(term)	Copies memory locations and blocks.

NB (term) can be CR, LF or SP.

Table 2. The available monitor commands on Tanbug, X-BUG offers cassette file handling and gives a line-by-line assembler and a line-by-line disassembler.

of the TV, with the keyboard sat sitting on your knee and the orange weight on the floor next to your chair. After all it is supposed to be a HOME computer.

Come on, ye men of Ely, let's have a screened connector betwixt keys and CPU — at least a yard or so in length and some front panel connectors. OK, so it will put a few bob on the price, but it will make the machine infinitely easier to use. Money well spent.

Summary

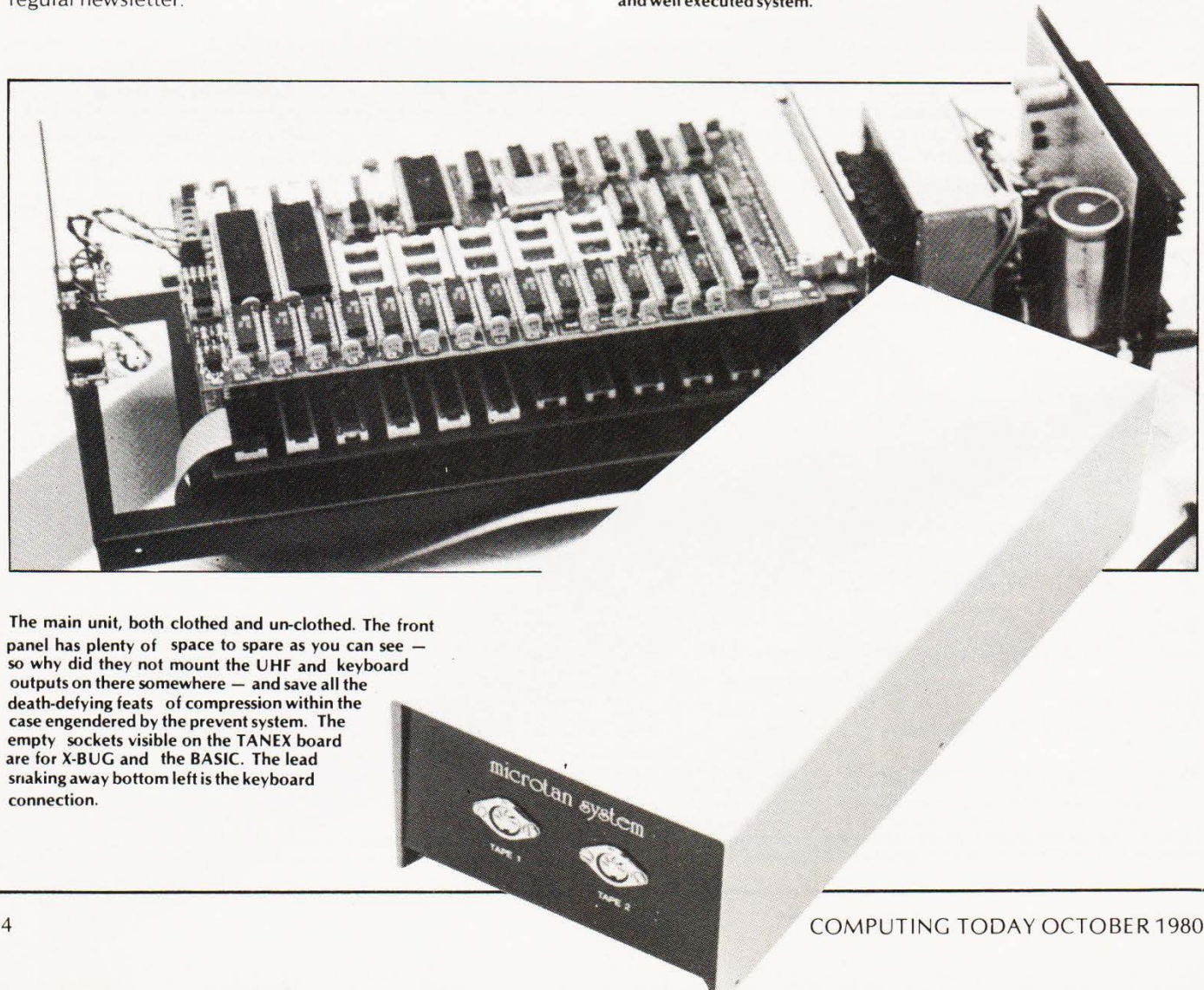
A well thought out system overall — minor quibble on the case notwithstanding — and one which will answer a great many people's needs. Personally I would have liked to see a video take-off point to allow a dedicated video monitor to be employed but accept that, for a home system, using the TV is a more sensible answer.

Frankly I can't see how they can fail with this one at all and we await the expansion boards with interest.

Any users out there who would care to submit programs for Micron for CT — now is the hour. With the system being new we have had virtually none yet, but will run the best as and when we receive it. Meanwhile owners and potential area club secretaries can contact the International Tangerine Users Group c/o Bob Green, 3/22 Donoughmore Road, Boscombe, Bournemouth, Dorset, who has undertaken the monumental task of arranging discounts, etc and is currently preparing a regular newsletter.

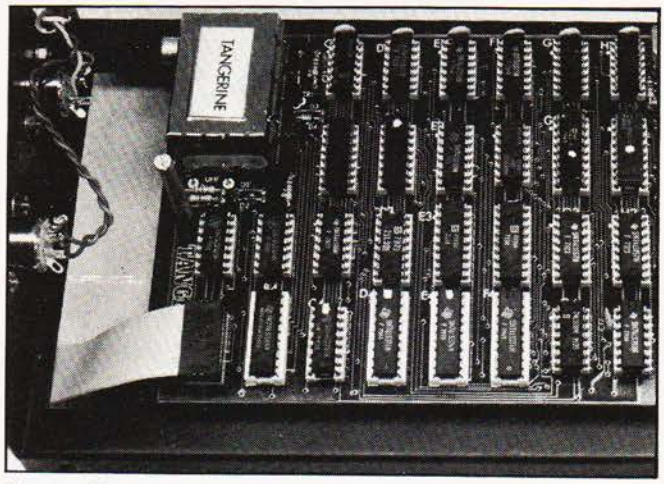
FOR	AGAINST
VDU very steady	Keyboard — main unit interconnection impossibly short
Keyboard 'Alpha-Lock' means easy program entry.	No mains on/off switch
Expandability	Impossible positioning of UHF output
Excellent documentation	Pixel graphics ("chunky" indeed! Huh!)
10K Microsoft BASIC — good string handling, etc.	No graphics characters "on-key" for games use
Memory mapped display	No video take-off point to run dedicated monitor
Excellent value for money	
Good technical back-up	
Cassette file handling with named programs, etc at a choice of 2400 or 300 baud.	
Versatile I/O including real time clock and full RS232	
Good monitor	

Table 3: MICRON summary. Overall a definite 'yes' to a well thought out and well executed system.



The main unit, both clothed and un-clothed. The front panel has plenty of space to spare as you can see — so why did they not mount the UHF and keyboard outputs on there somewhere — and save all the death-defying feats of compression within the case engendered by the prevent system. The empty sockets visible on the TANEX board are for X-BUG and the BASIC. The lead snaking away bottom left is the keyboard connection.

MICRON REVIEW



Close up of the Microtan board, with Tanex removed. You can see clearly how close the modulator output is to the panel. Note the keyboard DIL connector.

MEMORY ADDRESS	FUNCTION
FFFF FC00	1K ROM (TANBUG)
FBFF F800	(TANBUG REFLECTED – 1K)
F7FF F000	4K ROM ON TANEX
EFFF E800	
E7FF E000	
DFFF D000	10K BASIC INTERPRETER ON TANEX
CFFF C000	
BFFF	BFF0..BFFF MICROTAN 65 I/O
BC00	SPARE I/O PORTS
BBFF 2000	40K RAM TANRAM
1FFE 0400	7K RAM ON TANEX
03FF 0000	1K RAM ON MICROTAN 65

Table Four: The full memory map given when the Tanex does the address decoding. The 40K of Tanram is decimel, 39K of normal.

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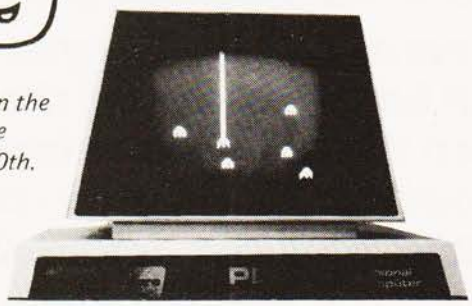
What to look for in the November issue on sale October 10th.



We present the definitive article on just how all those graphics games make things move around. All the programs given are specially designed to allow their use as examples on any memory mapped system provided you know a couple of details. How do you find these details? Read our companion article of course. . . . . .

INTERACTIVE GRAPHICS

GRAPHIC DETAILS CT starts an ongoing situation with a set of standard graphics maps for many popular machines together with vital details as to their screen layouts etc., so you can change games from system to system by looking up a simple code. Couldn't be easier, could it?

We present a general purpose plotting program for Apple owners. Display your functions using this powerful and adaptable piece of software. Owners of other systems that allow high resolution plotting such as the 380 Z might pick up a trick or two as well.

GRAPH PLOTTER

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As a companion to our series on interfacing techniques we present a high quality analogue to digital converter suitable for connection to any system with an eight bit parallel port. Sample programs for the PET are given along with full circuit and functional descriptions.

THE REAL WORLD

All articles mentioned herein are in an advanced state of preparation. However, circumstances may dictate changes to the final contents.

Ian Powell

Users of disc based systems will be well aware of the vital need to copy their valuable programs for security - this utility program under CP/M makes the job that much easier.

The program 'FCOPY' was designed to copy files from one disk to another on a TRITON computer supporting a CP/M operating system with only one disk drive. It can copy a file larger than the available computer memory. This is done by copying the file in blocks — the largest that can fit into the current computer memory. Each block is transferred by prompting the user to insert the source and destination disks alternately in the drive, the return key being pressed to indicate the completion of ech action.

Operation Requirement

The program is written for a 16K CP/M system and uses the maximum possible block size for the transfer. However, the program can be changed easily for other sizes of CP/M system, see program text. It should also be reasonably easy to alter the program to run on other computers based on an 8080 or Z80 microprocessor and supporting CP/M.

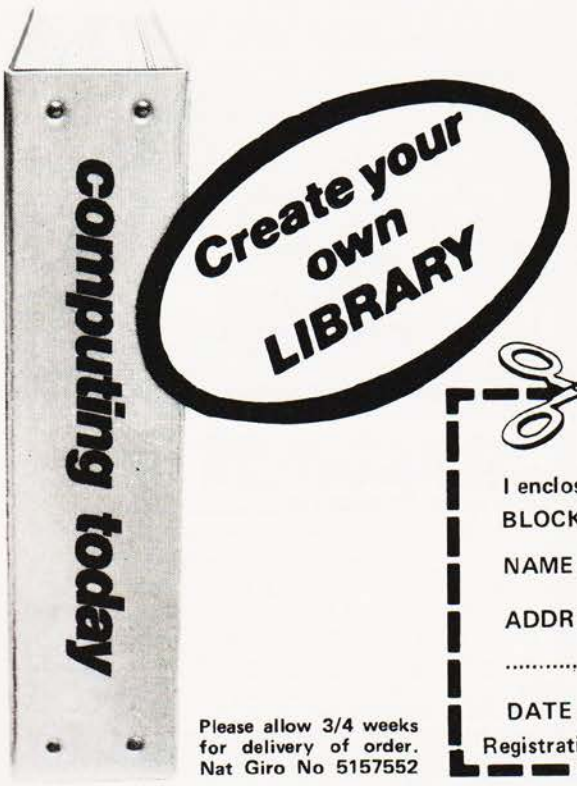
To implement the program, the listing given in here should be entered on to the CP/M disk, assembled and loaded. The program is run by typing 'FCOPY FILENAME' and following the program prompts. If a large file requiring several insertions of the source and destination disks is copied, it is wise to write protect the source disk in case it is accidentally inserted at the wrong time and thus corrupted.

(CP/M is a Digital Research trade mark.)

```
        ORG     100H
        JMP     START
BDOS    EQU     5               ;DOS ENTRY POINT
CPM     EQU     2900H           ;FOR 16K CPM
FCB     EQU     5CH             ;READ FILE CONTROL BLOCK ADDRESS
FCB2:   DS      32              ;WRITE FILE CONTROL BLOCK ADDRESS
        NON GRAPHIC CHARACTERS
CR      EQU     0DH             ;CARRIAGE RETURN
LF      EQU     0AH             ;LINE FEED
FALSE   EQU     0
TRUE    EQU     0FFH
START:  ;SET UP STACK
        LXI     H,0
        DAD     SP
ENTRY STACK POINTER IN HL FROM THE CCP
        SHLD    OLDSP
SET SP TO LOCAL STACK AREA (RESTORED AT FINIS)
        LXI     SP,STKTOP
        LXI     D,SIGNON
        CALL    PRTMSG
        LXI     D,FCB           ;COPY READ FCB TO WRITE FCB
        LXI     B,FCB2
        MVI     H,32
LOOP:   LDAX    D
        STAX    B
        INX     B
        INX     D
        DCR     H
        JNZ     LOOP
        LXI     H,FCB           ;SET FCB ADDRESS AND OPEN FILE
        SHLD    FCBADD
        CALL    OPEN
        CALL    HEAD
READ N BLOCKS
STREAD: LXI     D,SRCMSG        ;PRINT LOAD SOURCE MESSAGE
        CALL    PRTMSG
        LXI     H,FCB
        SHLD    FCBADD
        CALL    LIFT
WAIT:   CALL    INCONS          ;WAIT FOR RETURN KEY
        CPI     CR
        JNZ     WAIT
        LXI     D,DATA          ;ADDRESS OF FIRST RECORD
        MVI     B,0             ;RECORD COUNTER
        MVI     A,TRUE
        STA     EOFM
READLP: CALL    SETDMA          ;READ LOOP
        CALL    READ
        ORA     A
        JNZ     WRITBL          ;LAST RECORD
        MOV     A,E
        ADI     128             ;INDEX DATA ADDRESS
        MOV     E,A
        MOV     A,D
        ACI     0
        MOV     D,A
        INR     B
        MOV     A,B
        CPI     MAX             ;CHECK FOR DATA AREA FULL
        JM      READLP
        MVI     A,FALSE
        STA     EOFM
WRITE NEXT N BLOCKS
WRITBL: LXI     D,DSTMSG        ;PRINT LOAD DESTINATION DISK
        CALL    PRTMSG
        LXI     H,FCB2
        SHLD    FCBADD
        CALL    LIFT
WAIT2:  CALL    INCONS          ;WAIT FOR RETURN KEY
        CPI     CR
        JNZ     WAIT2
        LDA     FBLK            ;TEST FOR FIRST BLOCK OF RECORDS
        CPI     FALSE
        JZ      WR2
        CALL    INITAL          ;DELETE OLD FILE AND CREATE NEW ONE
        CALL    DELETE
        CALL    CREATE
        CALL    HEAD
        CALL    CLOSE
        MVI     A,FALSE
        STA     FBLK
WR2:    CALL    INITAL          ;OPEN WRITE FILE
        CALL    OPEN
        LXI     D,DATA
WR3:    CALL    SETDMA          ;WRITE LOOP
        CALL    WRITE
        ORA     A
        JNZ     ERROR
        MOV     A,E
        ADI     128             ;INDEX DATA ADDRESS
        MOV     E,A
        MOV     A,D
        ACI     0
        MOV     D,A
        DCR     B
        JNZ     WR3
        CALL    CLOSE           ;CLOSE WRITE FILE
        LDA     EOFM
        CPI     FALSE
        JZ      STREAD
        LXI     D,ENDMSG
        CALL    PRTMSG
        JMP     FINIS
ERROR:  LXI     SP,STKTOP
        CALL    PRTMSG
FINIS:
        END OF FILE COPY, RETURN TO CCP
        (NOTE THAT A JMP TO 000H REBOOTS)
        LHLD    OLDSP
        SPHL
        STACK POINTER CONTAINS CCP'S STACK LOCATION
        RET             ;TO THE CCP
        SUBROUTINES
INCONS: ;CONSOL INPUT ROUTINE
        PUSH H  PUSH D  PUSH B
        MVI     C,1
        CALL    BDOS
        POP B   POP D   POP H
        RET
PRTMSG: ;PRINT MESSAGE ROUTINE
        PUSH H  PUSH D  PUSH B
        MVI     C,9
        CALL    BDOS
        POP B   POP D   POP H
        RET
FILE ROUTINES
FCBADD  DS      2               ;CURRENT ADDRESS OF FILE CONTROL
                                BLOCK
INITAL: ;INITIALIZE BDOS
        PUSH H  PUSH D  PUSH B
        MVI     C,13
        CALL    BDOS
        POP B   POP D   POP H
        RET
CREATE: ;CREATE FILE
        PUSH H  PUSH D  PUSH B
        LHLD    FCBADD
        XCHG
        MVI     C,22
        CALL    BDOS
        CPI     255
        JNZ     CREA2
        LXI     D,#+6
        JMP     ERROR
        DP      CR,LF,'CREATE ERROR #'
CREA2:  POP B   POP D   POP H
        RET
HEAD:   ;SET TO HEAD OF FILE
        PUSH H  PUSH D  PUSH B  PUSH PSW
```

```
        LHLD    FCBADD
        LXI     D,32
        DAD     D
        MVI     M,0
        POP PSW POP B POP D POP H
        RET
OPEN:   ;OPEN FILE FOR READ
        PUSH H PUSH D PUSH B
        LHLD    FCBADD
        XCHG
        MVI     C,15
        CALL    BDOS
        CPI     255
        JNZ     OPE2
        LXI     D,# +6
        JMP     ERROR
        DB      CR,LF,'FILE NOT FOUND #'
OPE2:   POP B POP D POP H
        RET
WRITE:  ;WRITE DISK FILE RECORD
        PUSH H PUSH D PUSH B
        LHLD    FCBADD
        XCHG
        MVI     C,21
        CALL    BDOS
        ORA     A
        JZ      WRI2
        LXI     D,# +6
        JMP     ERROR
        DB      CR,LF,'FILE WRITE ERROR #'
WRI2:   POP B POP D POP H
        RET
READ:   ;READ DISK FILE RECORD
        PUSH H PUSH D PUSH B
        LHLD    FCBADD
        XCHG
        MVI     C,20
        CALL    BDOS
        CPI     2
        JM      REA2
        LXI     D,# +6
        JMP     ERROR
        DB      CR,LF,'FILE READ ERROR #'
REA2:   POP B POP D POP H
        RET
SETDMA: ;SET DMA ADDRESS
        PUSH H PUSH D PUSH B
        MVI     C,26
        CALL    BDOS
        POP B POP D POP H
        RET
CLOSE:  ;CLOSE DISK FILE
        PUSH H PUSH D PUSH B
        LHLD    FCBADD
        XCHG
        MVI     C,16
        CALL    BDOS
        CPI     255
        JNZ     CLO2
        LXI     D,# +6
        JMP     ERROR
        DB      CR,LF,'FILE CLOSE ERROR #'
CLO2:   POP B POP D POP H
        RET
DELETE: ;DELETE DISK FILE
        PUSH H PUSH D PUSH B
        LHLD    FCBADD
        XCHG
        MVI     C,19
        CALL    BDOS
        POP B POP D POP H
        RET
LIFT:   ;LIFT DISK HEAD
        PUSH H PUSH D PUSH B
        MVI     C,12
        CALL    BDOS
        POP B POP D POP H
        RET
        FIXED MESSAGE AREA
SIGNON: DB      CR,LF,'FILE COPY PROGRAM VERSION 9.1 #'
SRCMSG: DB      CR,LF,'INSERT SOURCE FILE AND PRESS RETURN #'
DSTMSG: DB      CR,LF,'INSERT DESTINATION DISK AND PRESS RETURN #'
ENDMSG: DB      CR,LF,'END OF FILE TRANSFER #'
        VARIABLE AREA
OLDSP:  DS      2               ;ENTRY SP VALUE FROM CCP
FBLK:   DB      TRUE            ;FIRST BLOCK OF RECORDS
EOFM:   DB      FALSE           ;END OF FILE MARKER
        STACK AREA
        DS      128             ;RESERVE 32 LEVEL STACK
STKTOP:
DATA:
MAX     EQU     (CPM - # )/128  ;CALCULATE MAXIMUM NUMBER OF
                                RECORDS IN DATA AREA
        END     100H
```


A real bind



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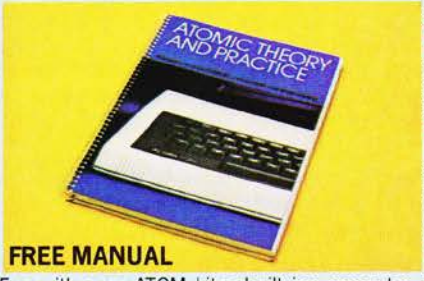

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Free with every ATOM, kit or built, is a computer manual. The first section explains and teaches you BASIC, the language that most personal computers and the ATOM operate in. The instructions are simple and learning quickly becomes a pleasure. You'll soon be writing your own programs. The second section is a reference manual giving a full description of the ATOM's facilities and how to use them. Both sections are fully illustrated with example programs.

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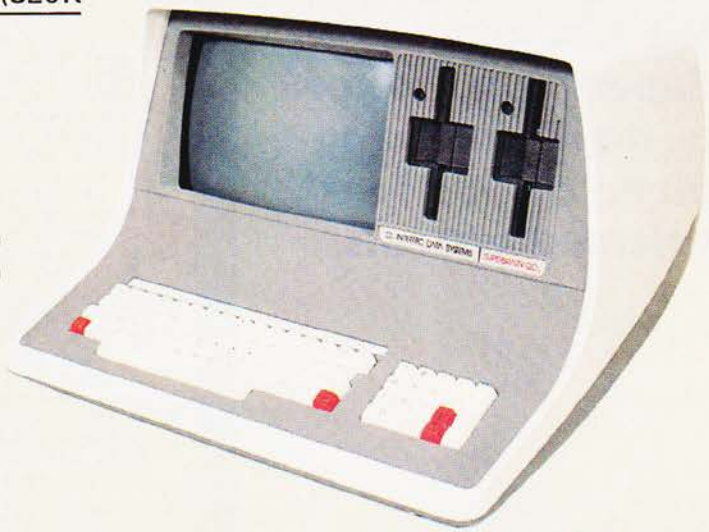

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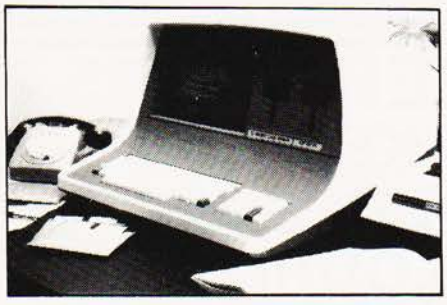


At home on the office desk with our article being prepared under Wordstar.

Superbrain Report by Henry Budgett

Set Copy O 10 M 21picas J
S/H O 10 B Init Caps
Para indents 1 1/2 picas, 3 line drop cap start.

Ease of use and operator convenience must rate high on the list of anyone thinking of buying a small business computer in this day and age. The power emanating from small boxes is impressive to a degree, and comparing the price against that of a 'conventional' office computer system one not only obtains a better deal but considerably more flexibility to boot.

A classic example of the kind of system that a businessman might be offered is the subject of this report. The Superbrain is currently available in this country through many distributors who offer a wide range of deals and packages. Our review machine was borrowed from a relatively new distributor, Sun Computing Services of Feltham, to whom we are exceedingly grateful.

System Concept

The Superbrain is a logical extension of the intelligent VDU manufactured by Interec Data Systems, the Intertube. There are two configurations available, the DD which offers standard double density 5 1/4" drives and the QD which offers quad density drives. There is also a variantof the DD which is equipped with only 32K of memory but this is only likely to be available on request as the standard 64K is more than a little useful.

The idea of packing as much intelligence into a VDU type of console is by no means new, indeed we reviewed the Zenith Data Systems Z89 not so very long ago, but there is a limit to which you can realistically stretch this process using the current generation of processors. I say currently because if you make the jump to the 16 bit processors one is faced with machines like the DEC VT103 which packs an LSI 11. This is rather like comparing the Dreadnought with the Dismark in that one is the ultimate extension of the other.

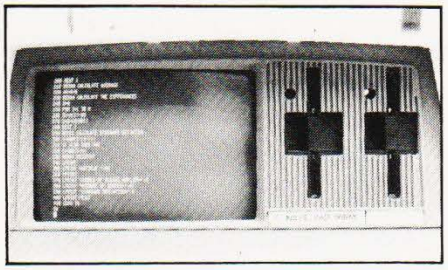
Quite apart from the hardware considerations there is a good and currently expanding range of business oriented software available. We tested the Wordstar text processing system and were fortunate enough to obtain a high quality printer as part of the package. This meant that all our text could be prepared using this printer and as such this article is a demonstration of the power that the system posseses.

An often quoted phrase in the jargon of computer salespeople is 'User Friendly'. What this means in real terms is that the machine can prevent to some extent mistakes made by an operator. Take as an example the first thing that happens when the machine is turned on. On the screen appears the text 'INSERT DISKETTE INTO DRIVE A'. The operator will then, presumably, get it right. At this point let me say that there is no visible marking to tell the operator which is DRIVE A (apart from a glowing LED) so perhaps a little more thought could have been used. The other trap, which I fell straight into, is that all the diskettes go in 'upside down' (to my way of thinking). After several minutes of frustration I resorted to the manual and solved that little problem but I'm still convinced that it's wrong. Ident labels are provided so you can quickly see just what is on the disc, you would expect them to be visible as soon as you open the drive gate but unless your head is mounted on a very long and flexible neck you get a severe crick trying to look at them.

What You Get

Inside the box, which is nice and easy to get into, you find a superbly laid out set of component parts. All the individual areas are clearly set out and it must be one of the few machines that servicemen can enjoy working on. Full marks to the designer for layout. The design of the internal hardware (as opposed to the circuitry which I can't really comment on) is of a very professional nature. All possible conflicting elements such as transformers and video circuits are well shielded and physically separated, a very slight wobble appears on the VDU at turn on but as soon as the system is 'booted' and running the display is rock steady.

Along with the basic system disc which runs under CP/M, more of which later, comes a manual of terrifying weight. Whoever decided to put all the language manuals into the same book as the operating system manual really ought to have been shot, it makes the whole thing very unwieldly. There is rather less than expected in the book, probably because the volume leads one to expect more, but there are no really glaring errors that I could find despite the ominous warning that this was 'PRELIMINARY' stamped across the front cover. I would definitely like to see the book split into separate volumes for each of the languages and the CP/M and the addition of a 'Get You Going' booklet for quick and easy reference. The latter section as contained in the manual is not aimed at the naive or business user who, generally(?), knows little about the twiddly bits. As an example, the process of copying one's system diskette could be explained far better in layman's language and one might need a degree in Computer Technology to unravel the section on system configuration, although this is obviously going to be done for you by the engineer who commissions the system. Let's not misunderstand that the manual is superbly produced for the likes of systems analysts and programmers or field engineers but to Joe Public it might make little sense.



A good crisp display which was remarkably steady was only marred by the lack of true descenders on the lower case letters.

Ware Of The Soft

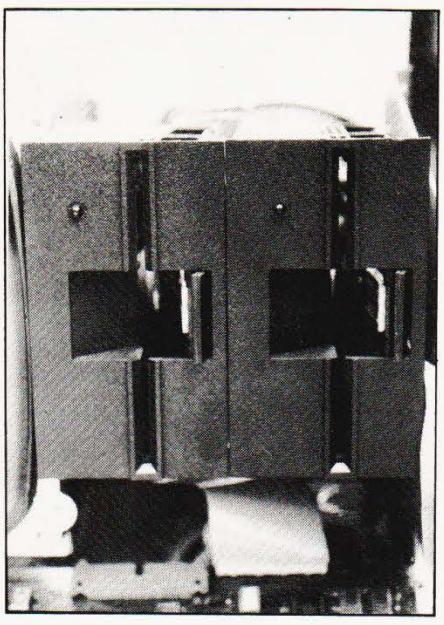
At this point in the review I must admit a certain slight bias, I am not very fond of the CP/M operating system. The reasons for this are many and varied but stem from many years of using DEC minicomputers and a subsequent attraction to the various DOSs based around them. The version of CP/M that was supplied with the Superbrain was 2.2, considerably better than some that I have had the misfortune to blunder around in but I still have one severe complaint. The whole idea of providing an allegedly standard DOS is that the user will be able to transfer his or her previously gained knowledge to the new system. With CP/M however one tends to find that although one keeps the same basic names for the various functions tags are added with gay abandon. A classic example is that the manual is telling you all about this wonderful thing called FORMAT whereas the file on disc is called FORMAT30. Stupid little quirks like this can cause a large amount of frustration and instill unreasoned hatred. The simple solution is to quietly re-name all the files so that they correspond to the names given in the manual!

One of the very well thought out concepts behind the Superbrain is the CONFIG capability. Using this allows you to set up the various interface specifications to suit whatever equipment you have purchased. In the case of this review it allowed us to connect the line printer directly to the machine, re-configure the port to comply and re-boot the system. The drivers for the various I/O devices can also be set to the user's specific requirements in a similar manner. One tiny problem arose when we tried the Wordstar package in that we couldn't get the printer to work. The reason was ludicrously simple, we had been using the main RS 232 port, logically we thought, and the output driver was happily sending all the text to the auxiliary port!

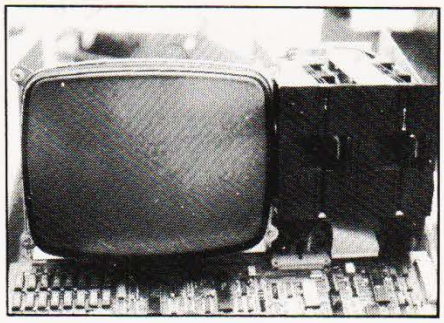
Overall the operating system is perfectly adequate and has gone some way to removing my total dislike of CP/M, convincing arguments may be sent on the back of twenty pound notes to our offices. The strongest suggestions I have to make to any owner is that when they copy their precious system diskette (the first thing they do, or ought to do) they tailor the names of the various files so that they do correspond to the manual. It is generally a matter of removing the spurious digits stuck on the end.

Parlez Vous

If you want a comprehensive version of BASIC then the Microsoft MBASIC that so many manufacturers have adopted as a 'standard' is probably as good as many and better on the whole than most. The only two functions that I missed were DATE and TIME, useful to those who are seriously developing software. The facilities of direct access to line printers for listings and printout caused a little trouble in that the system was using the AUX port again but once re-configured all worked exceedingly well. I give the results of the various Benchmark tests a little later but there are no apparently serious deficiencies to note.



A quick close-up of the drive gates, it's a pity that they are fitted in upside-down.



The naked truth about how you need to screen your discs from your monitor.

Words On Words

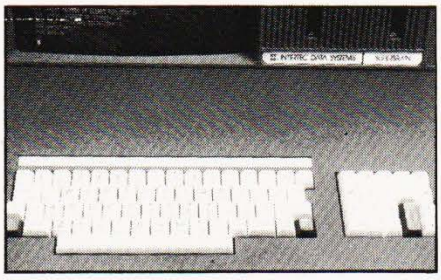
The draft of this report was prepared as a document file on the Wordstar textprocesing system and then transferred to the high quality Spinwriter printer for setting. It was then merely dumped straight onto the page as a fully justified, typeset document! One of the most impressive things built into the textprocessor is the ability to display the justified text on the screen, albeit not proportionally spaced. This allows one a preview of the 'look' of the final document before actually committing it to print.

If the rest of the business software available for the Superbrain is up to the quality of this then that will be an excellent selling point in its favour.

Expansion

As mentioned a little earlier one can expand the system as supplied in a number of ways. There are the QD discs and a variety of hard disc units will arrive in the not too distant future but the most exciting arrival is the Compustar distributed processing system which allows either (modified) Superbrains or the standard terminals to access a common data base.

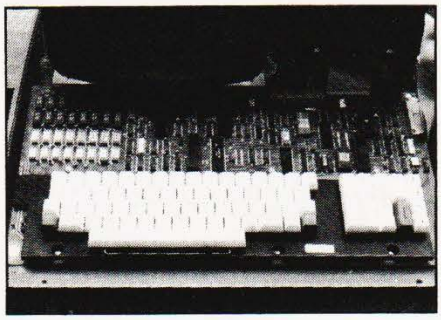
This, together with the advent of good software supplies, will probably make the future of the system secure. All that is needed is good technical support and service facilities in the UK and then you're really talking in terms of a good business market.



Close up on the keyboard. Pity there is no repeat or auto-repeat function. We never really fathomed out the function keys either.

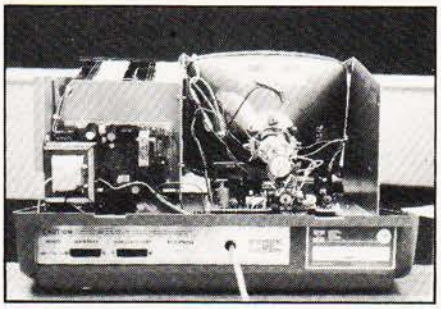
Summary Of Features

CPU	Twin Z80As running at 4MHz, one handles the processing and screen functions and the other handles all the disc I/O functions.
Memory	64K dynamic RAM as standard, 32K version optional. 1K bytes of static RAM act as scratchpad area. 2K of ROM for the bootstrap loader which is 2708 compatible and may be re-programmed.
Bulk storage	Twin 5 1/4" floppy discs having 350K as standard on DD model, 700K available on quad density model. Data transfer at 250K bits / second. Optional 20-96Mb hard disc.
Display	12" integral VDU displaying 25 lines of 80 columns. Characters made up of 5*7 on an 8*8 field. Full cursor control and programmable function keys. Direct cursor addressing by x,y co-ordinates.
I/O	Main interface is fully RS232 compatible up to 9600 baud. Auxiliary interface is simple RS232 with a parallel option. All baud rates and interface signals are fully programmable under CP/M.
System expansion	System expansion via S100 bus adaptor, one board space inside case. Full Z80A bus expansion port.



This is a single board computer! The large area of chips in the top left is the 64K of dynamic RAM.

DOS	CP/M 2.2
Languages	ANSI FORTRAN 80 ANSI COBOL 80 Microsoft MBASIC 80 with full disc file handling.
Applications software	Various business packages, Wordstar wordprocessor.
Physical size	14 5/8" by 21 3/8" by 23 1/8"
Weight	45 pounds



A parting view revealing the rear panel sockets and the PSU and monitor boards.

Benchmark Results

The following results were obtained on test with the standard set of programs. For further details on these see the article elsewhere in this issue. Two sets of tests were run, the standard real variable versions and an integer only version.

Benchmark	MBASIC (Real)	MBASIC (Integers only)
1	1.43	0.99
2	5.20	4.01
3	13.82	14.01
4	13.69	13.33
5	14.56	14.21
6	26.02	22.58
7	42.97	35.72
8	6.62	6.63

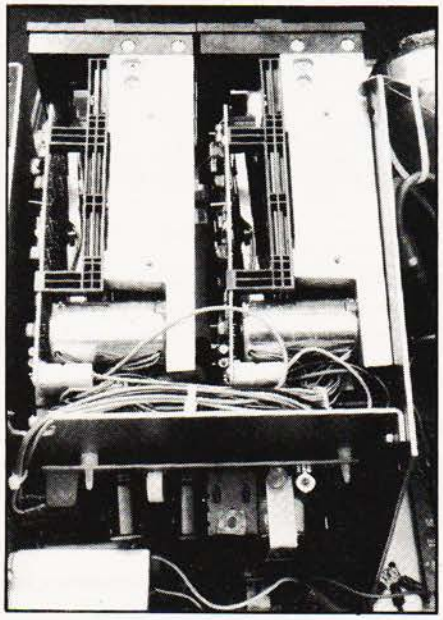
As expected the Integer only tests run slightly faster with the exception of BM3 where the variable has to be continually re-defined as an integer making the execution time slightly longer. In BM8 it will not make any appreciable difference whether you use integers or real numbers because you aren't doing anything with them!

Conclusions

The strongest overall impression is that the system is of good professional quality and that as long as the distributors can continue to support the hardware and software it will become a popular small business machine. The introduction of a distributed processing system will probably enhance the machine in the eyes of those people who don't feel that one small computer will provide the required power whereas four or five linked into one data base might well do the trick.

The machine certainly has some lovely touches at the hardware level with its idiot-proof reset and the small amount of user prompting given. There are certain things that need tidying up, labelling the drives and inverting them so they are the 'right way up' are the main hardware moans. Dividing the manual is a must, it weighs nearly as much as the computer in its present form, and supplying a starting guide is probably vital too.

I certainly found no serious bugs lurking in the depths of the machine but without trying all the various combinations of software this is not very surprising, faults are not going to be common on a machine of this nature. I can't help comparing it to some extent with the Zenith Z89 although that is slightly unfair as the Zenith is a more flexible machine in terms of the hardware configurations and it does have the choice of two operating systems. Undoubtedly the Superbrain is the more businesslike of the two, I don't know of much business software for the Zenith, and the twin discs are essential for a commercial environment. It should be said that dual discs are available for the Zenith to avoid any possible suggestion that it is unsuited to a business environment.



Rear view of the discs showing still more screening twixt PSU and the drives.

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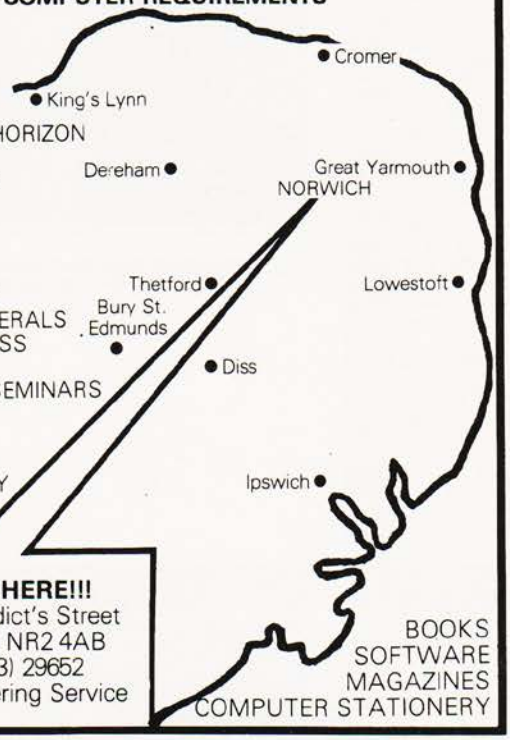

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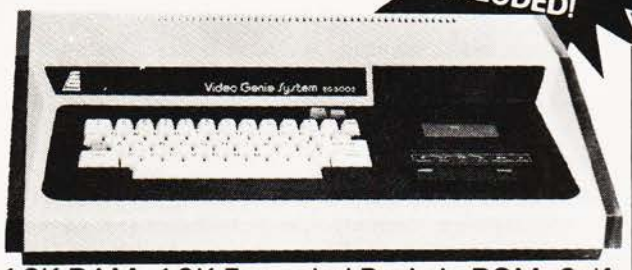

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Paul Williams

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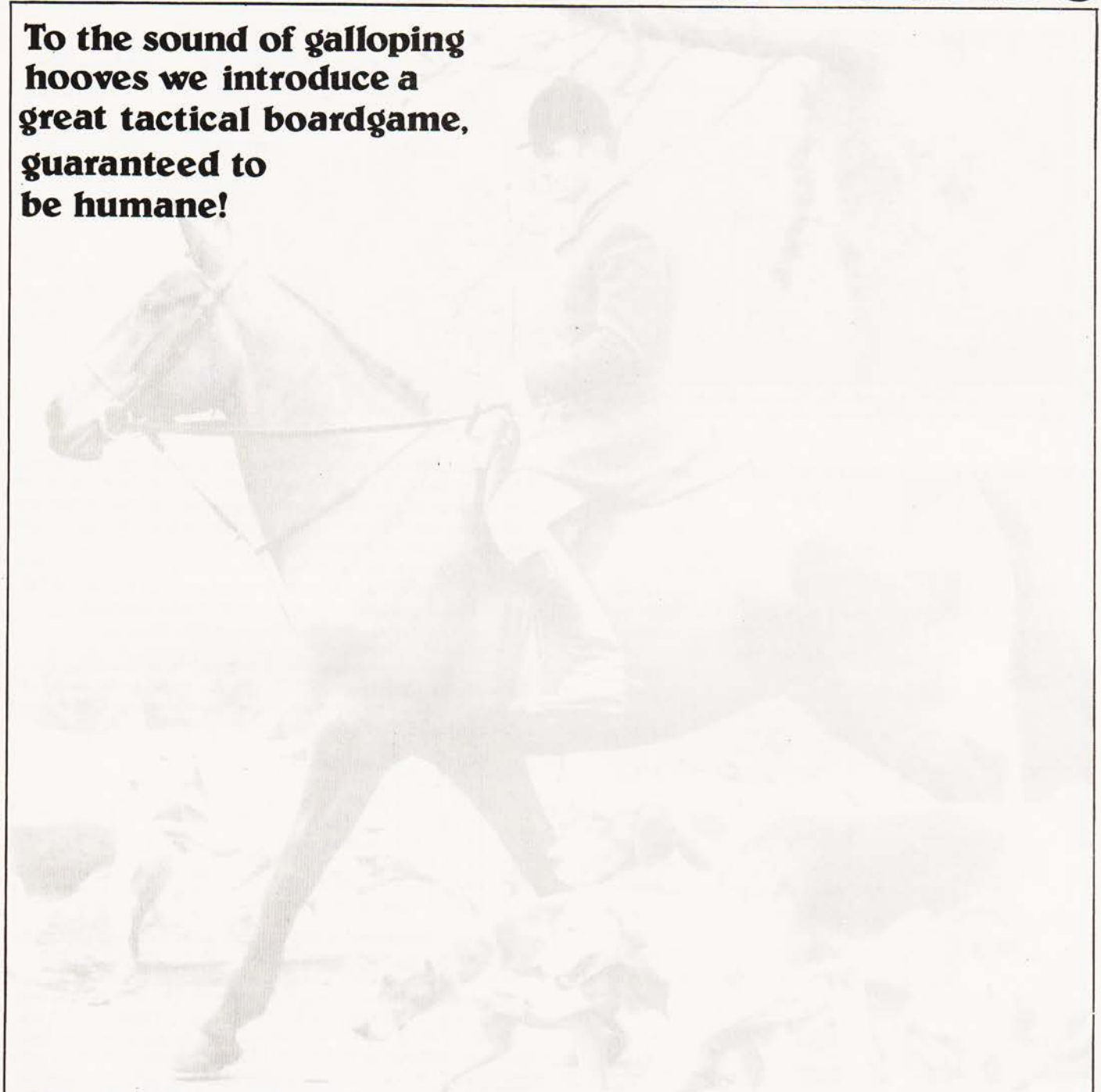
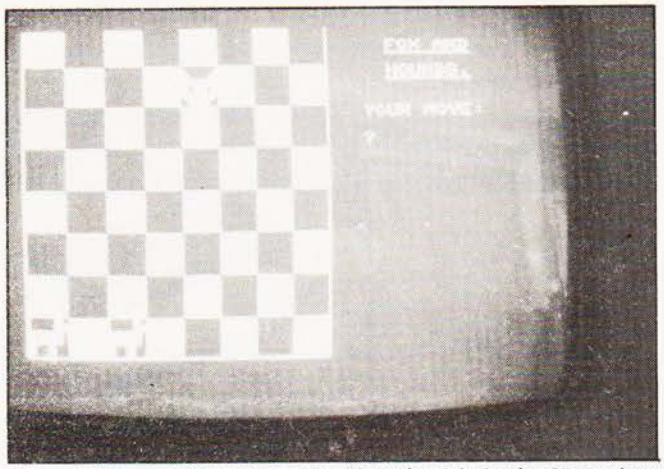


Fox and Hounds is a game of strategy played on a chess board grid displayed on the computer's VDU. The sole object of the game is to trap the fox, operated by the computer, with your hounds. The fox starts from the top of the board and the hounds at the bottom. If the fox reaches the bottom row of the board before being trapped it has 'won'. All the pieces on the board move as in the game of draughts, diagonally by one square at a time. The difference in this game is that although the fox can move both forwards and backwards the hounds may move only forwards.

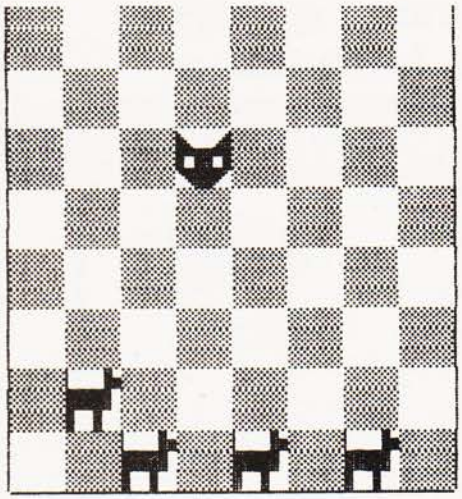
You can win by surrounding the fox with the hounds so that it cannot move or by trapping it into a corner or against the side of the board.

Moving About

After the board has been constructed on the screen you must wait for the cursor to appear in the top right hand corner. At this point the program is waiting for you to input a set of co-ordinates that relate to the piece you wish to move. The input string is expected to be a four character code with the first two characters being the current square reference and the second two being the destination square reference. The input is terminated with 'RETURN' and the computer will then move your hound to the selected square. The computer checks all entered moves for validity and if the move requested is illegal the input string is deleted and you must try again.



Above: VDU screen format, reproduced on the right by the CBM printer. Some more games shots are given on the far right.



```
FOX AND
HOUNDS.

YOUR MOVE:
? 1122
```

NORMAL		REVERSE FIELD	CHARACTER KEY
95		223	[↑←]
105		233	[↑)]
108		236	[↑,]
123		251	[↑;]
124		252	[↑<]
101		229	[↑%]
103		231	[↑']
102		230	[↑&]
99		227	[↑#]

BLACK IS THE PORTION THAT APPEARS WHITE WHEN DISPLAYED IN NORMAL FORM. REVERSE SPACE, CODE 160 IS A SOLID WHITE SQUARE.

Table of POKE codes and what they produce on the PET.

As an example of the move input we could input the string 1122. This indicates that we wish to move from the bottom left hand square to the one up, one in position. All the moves are indexed from the bottom left hand corner, this being 11 and the co-ordinates being taken along and then up.

The game may be terminated at any point by typing the input string STOP. The algorithm used by the computer is fairly ruthless, it will not step into any traps that it can spot.

System Configuration

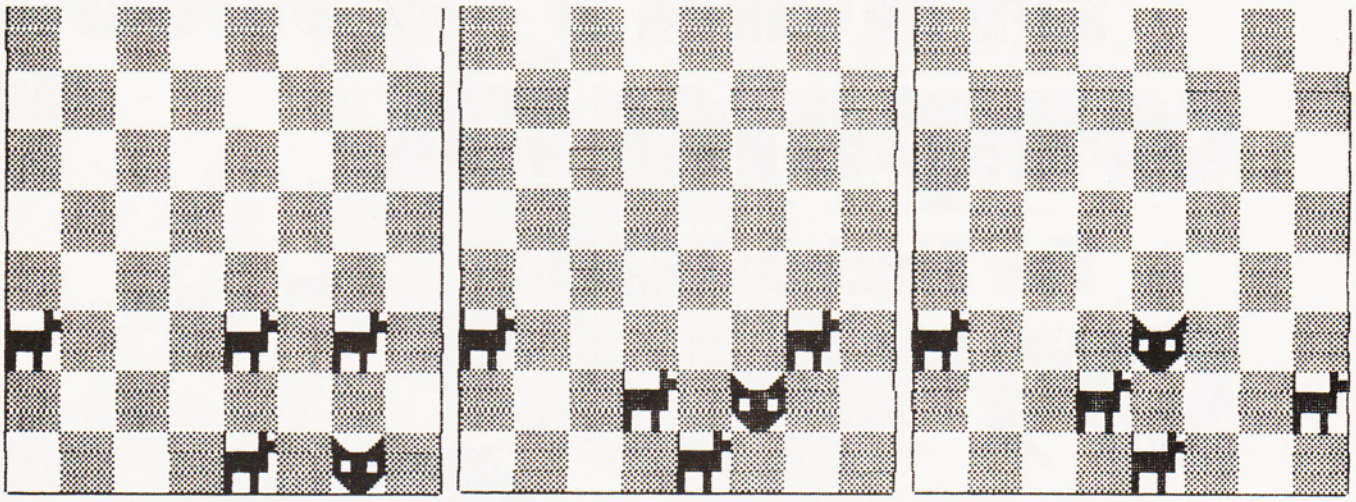
The game was originally designed for, and written on, a 'New ROM' Commodore PET. All the usual funny symbols relating to cursor movements have been removed and replaced with the standard codes which are as follows:

[CD]	Cursor Down
[CU]	Cursor Up
[CR]	Cursor Right
[CL]	Cursor Left
[HOM]	Cursor Home
[CLS]	Clear Screen
[REV]	Reverse Video On
[OFF]	Reverse Video Off

All these codes are enclosed in square brackets and should be replaced during entry with the ones specific to your computer. There are a few other PET oddities lurking in the program and these are also shown in square brackets. The first of these occurs in line 30 and is coded as [1]. This is a string of SPACE, SPACE, Shifted SPACE and should not be omitted, the REM gives the CT coding as [2 SPC] [↑ SPC] for those of you who are more familiar with the system. The second use of graphic characters is in line 70 where the code [3↑&] indicates three 'grey' squares as shown in the photos and the printed example. In the next line we find [↑'] and [↑%] which are a vertical left border and a vertical right border, again refer to the photos and drawings for example.

In line 100 we find a POKE statement where the locations are as shown on the screen drawing and the code is [↑#]. These POKE codes for screen locations are also used in later statements and the sample output is tagged to indicate the characters that the codes will produce. The [7↑#] code in lines 120 and 130 is a horizontal line across the top of the character space, once again this is shown in the screen drawing. The INPUT string in line 380 indicated as [2] is made up

FOX & HOUNDS



of SPACE SPACE Shifted SPACE SPACE SPACE SPACE or to use the codes given in the REM [2 SPC][↑SPC][3 SPC]. Please note that the codes are only put in brackets to avoid potential misunderstandings, you should type in the corresponding characters without any brackets or spaces *unless* these are indicated within square brackets.

Because the game sets up and uses its own array for the board there are no PEEKs made to the screen so you will get a steady display. It also means that the game is adaptable onto machines such as UK101s, Superboards, NASCOM 2s etc. The only statement that is likely to cause any real trouble is line 560 and it is highly recommended that you substitute:

```
560  PRINT"[8CD]PRESS ANY KEY TO RESTART"
570  GET X$:IF X$=""THEN 570
580  RUN
```

The function of the existing statement is risky if it is mistyped as it inspects the internal clock of the PET and may never reappear if wrongly keyed!

```
 10 PRINT "[CLS][12 CD][12 CR]FOX AND HOUNDS[HOM]":
    FOR X=1 TO 700:NEXT
 20 PRINT "[CLS][11 CD][9 CR]HOW MANY HOUNDS[CD]"
 29 REM ** CODE [1] IS [2 SPC][^SPC] SEE TEXT FOR
    DETAILS
 30 INPUT "[5 CR](2 TO 4;TYPE 1 FOR RANDOM)[1]
    [3 CL]";A$
 40 Q=VAL(A$):IF Q<1 OR Q>4 OR Q<>INT(Q) THEN 30
 50 IF Q=1 THEN Q=INT(RND(TI)*3)+2
 60 Q=Q*2-1
 70 A$="[3 ^&]":B$="[3 SPC]":C$="[HOM][8 CD]":
    DIM A(10,10),B(27):PRINT "[CLS]"
 80 FOR A=1 TO 4:FOR B=1 TO 3:PRINT "[^']"
    A$B$A$B$A$B$A$B$"[^%]":NEXT
 90 FOR B=1 TO 3:PRINT "[^']"
    B$A$B$A$B$A$B$A$"[^%]":NEXT:NEXT
 99 REM ** SEE TEXT FOR LOCATIONS, CODE 99=[^#]
100 FOR A=33729 TO 33752:POKE A,99:NEXT
109 REM ** LOAD GRAPHICS INTO ARRAY B
110 FOR A=1 TO 27:READ B(A):NEXT
120 PRINT "[HOM][CD]"TAB(30)"FOX AND":
    PRINTTAB(30)"[7 ^#]":PRINTTAB(30)"HOUNDS."
130 PRINTTAB(30)"[7 ^#]":PRINTTAB(28)"[CD]YOUR MOVE:[CD]"
140 PRINTTAB(28)"?[HOM]"
149 REM ** LOAD MATRIX WITH SELECTED NUMBER OF HOUNDS
150 FOR A=1 TO 8:FOR B=1 TO 8:IF (A+B)/2=INT((A+B)/2)
    THEN A(A,B)=9
160 NEXT:NEXT:FOR A=1 TO Q STEP 2:A(8,A)=-1:NEXT:A(1,4)=1
170 X=1:Y=4:Z=1:GOSUB 460:X=8:FOR Y=1 TO Q STEP 2:Z=10:
    GOSUB 460:NEXT
179 REM ** START OF BOARD CHECK ROUTINE
180 FOR X=1 TO 8:FOR Y=1 TO 8:IF A(X,Y)<>1 THEN NEXT:NEXT
190 C=(INT(RND(TI)*2)*2)-1:D=-C
200 E=X+1:F=Y+C:GOSUB 330:IF G=1 THEN 230
210 IF (A(X,F+C)=-1 OR F+C<1 OR F+C>8) AND
    (A(E+1,F+C)=-1 OR F+C<1 OR F+C>8) AND X<7 THEN 540
220 IF A(E,F)=0 THEN 360
230 E=X+1:F=Y+D:GOSUB 330:IF G=1 THEN 260
240 IF (A(X,F+D)=-1 OR F+D<1 OR F+D>8) AND
    (A(E+1,F+D)=-1 OR F+D<1 OR F+D>8) THEN 520
250 IF A(E,F)=0 THEN 360
260 E=X-1:F=Y+C:GOSUB 330:IF G=1 THEN 280
270 IF A(E,F)=0 THEN 360
280 E=X-1:F=Y+D:GOSUB 330:IF G=1 THEN 300
290 IF A(E,F)=0 THEN 360
300 IF A(X+1,Y+D)=0 AND X<8 AND Y+D>0 AND
    Y+D<9 THEN E=X+1:F=Y+D:GOTO 360
310 IF A(X+1,Y+C)=0 AND X<8 AND Y+C>0 AND
    Y+C<9 THEN E=X+1:F=Y+D:GOTO 360
320 PRINT "[CLS][8 CD][10 CR][REV]YOU WIN!!
    [OFF][8 CD]":GOTO 560
330 G=1
340 IF E>0 AND E<9 AND F>0 AND F<9 THEN G=0
350 RETURN
359 REM ** TAG SWAPPED POSITIONS
360 A(E,F)=1:A(X,Y)=0:Z=19:GOSUB 460:
    X=E:Y=F:Z=1:GOSUB 460
370 IF A(8,1)=1 OR A(8,3)=1 OR A(8,5)=1 OR
    A(8,7)=1 THEN 490
379 REM ** CODE [2] IS [2 SPC][^SPC][3 SPC] SEE TEXT
380 PRINT C$ TAB(28);:INPUT "[2][6 CL]";X$:
    IF X$="STOP" THEN PRINT "[CLS][8 CD]":END
390 IF LEN(X$)<>4 THEN 380
400 A=VAL(LEFT$(X$,1)):B=9-VAL(MID$(X$,2,1))
410 C=VAL(MID$(X$,3,1)):D=9-VAL(RIGHT$(X$,1))
420 IF A<1 OR A>8 OR B<1 OR B>8 OR C<1 OR C>8 OR
    D<1 OR D>8 THEN 380
430 IF A(B,A)<>-1 OR A(D,C)<>0 OR B-D<>1 OR
    ABS(A-C)<>1 THEN 380
440 A(B,A)=0:A(D,C)=-1:X=B:Y=A:Z=19:GOSUB 460
450 X=D:Y=C:Z=10:GOSUB 460:GOTO 180
459 REM ** FOR POKE LOCATIONS SEE TEXT
460 P=32769+((X-1)*120)+((Y-1)*3)
470 POKE P,B(Z):POKE P+1,B(Z+1):POKE P+2,B(Z+2):
    POKE P+40,B(Z+3):POKE P+41,B(Z+4)
480 POKE P+42,B(Z+5):POKE P+80,B(Z+6):
    POKE P+81,B(Z+7):POKE P+82,B(Z+8):RETURN
490 FOR R=1 TO 600:NEXT:PRINT "[CLS][8 CD][5 CR]
    [REV]I WIN!![OFF][8 CD]":GOTO 560
499 REM ** FOR DATA CODES SEE TEXT ILLUSTRATIONS
500 DATA 223,32,233,236,160,251,95,160,105,101,32,
    252,160,160,97,97,225,32
510 DATA 32,32,32,32,32,32,32,32,32
520 IF A(E+1,F+C)=-1 AND X<7 THEN 260
530 GOTO 250
540 IF A(E+1,F+D)=-1 THEN 230
550 GOTO 220
559 REM ** BEWARE THE WAIT STATEMENT, SEE TEXT!!!!
560 PRINT "[8 CD]PRESS 'SPACE'...":WAIT 59410,4,4:RUN
```

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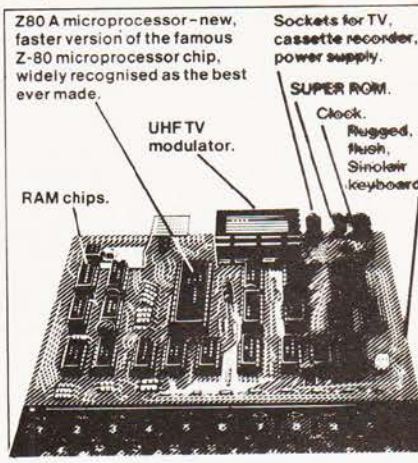

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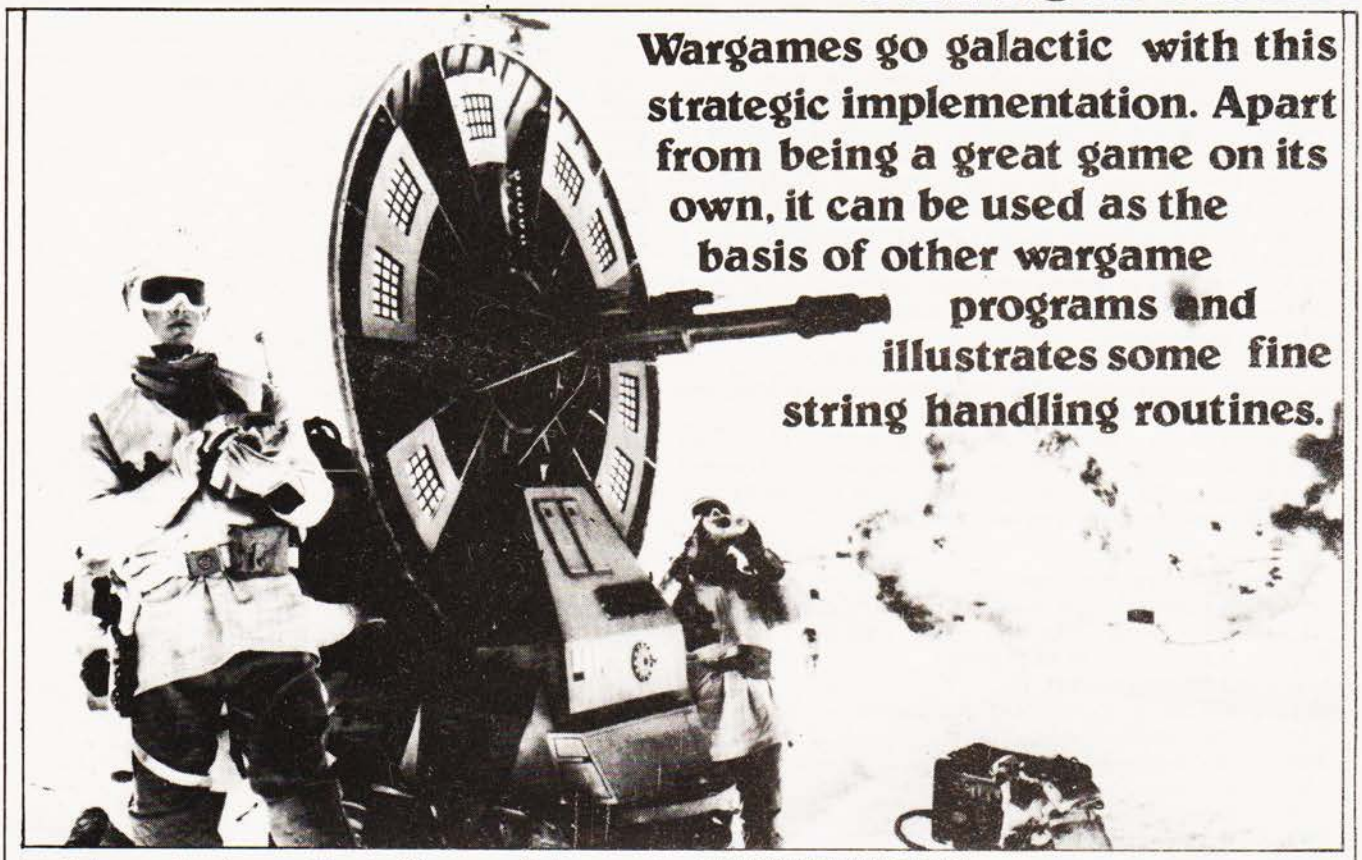
SPACEWAR

Thomas Shepherd



Wargames go galactic with this strategic implementation. Apart from being a great game on its own, it can be used as the basis of other wargame programs and illustrates some fine string handling routines.

This game has been written to fill a gap which occurs in the type of programs commonly published in magazines. These programs are usually written on popular machines such as the PET using commands such as POKE. However many keen programmers do not own a machine but have access to computers in work or at study. Although they may be powerful for their designated function they are often without graphics or memory-mapped VDU. Thus many interesting games cannot be enjoyed, or have to have the visually appealing displays removed. Battle has been written on the Data General Nova 210 which is a fairly common minicomputer with a reasonably simple BASIC.

```
YOU COMMAND A BATTLE FLEET
COMMANDS AVAILIABLE ARE :- MOVE, PHASERS, STATUS, BOMB, RULES
YOU MAY MOVE TWO OR ATTACK FROM ONE VESSEL
TURNS ALTERNATE BETWEEN PLAYERS. BLACK(X,Y,* & ETC) AND WHITE

TYPE OF SHIP   MAX MOVE      ENERGY        BOMBS        PHASERS
STARSHIP       8 UNITS       500 UNITS     NONE         YES
(A,B,C,D  X,Y,Z,W)
CRUISER        10 UNITS      300 UNITS     NONE         YES
(<,>  *,#)
BOMB LAUNCHER  6 UNITS       300 UNITS     3            NONE
(1,2,3  7,8,9)

ENERGY USE DURING MOVEMENT IS BOMB LAUNCHER 3 STARSHIP 3 CRUISER
PHASER RANGE IS TWELVE
BOMB RANGE IS UNLIMITED
```

Fig.1. Copy of the display of 'Rules'.

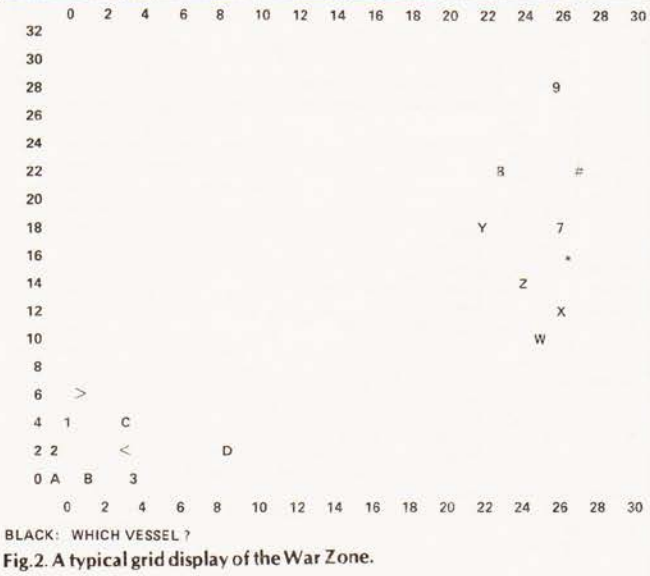


Fig.2. A typical grid display of the War Zone.

Scenario

The program gives a reasonable 2D representation of a war zone using only print statements and loops. Although a lengthy procedure, the effect is superior to a mere numerical list of co-ordinates. The war zone is bounded by co-ordinate axes, which allow for targeting of weaponry, and the vessels making up two opposing fleets are spread over the zone represented by single symbols. As there seems to be a lack of published wargames, this program is designed for two players to do battle. Although this version is set in futuristic space, the basic theme can be applied to different areas of interest. For example the different classes of spaceship could be replaced by a naval fleet or tanks and rocket launchers. The essential skills are in the deployment of the different types of vessel which are suited to different roles;- the lumbering fusion bomb launchers which are effective long range weapons but are vulnerable to close-in attack; the cruisers which are light and fast but lack protection and punch; the starships which are effective at close range but lack speed. Thus each type must be used to supplement the others.

Weaponry

As well as the 'standard' phasers which are simply aimed at target vessels, the weaponry available also includes fusion bombs. These can be launched towards a particular set of coordinates and detonated on the way by pressing the Escape key. The precise location of the blast is determined by the time elapsed between launch and detonation with *all* vessels (friend or foe) being destroyed or damaged within a radius of 2.25 units. This weapon can be particularly nerve racking if the use of watches is banned and the desired target is close in — press to early and you destroy yourself, too late and you overshoot.

The energy store of a vessel determines both the maximum distance moveable, (movement is by vectors), and the maximum phaser power available.

As well as Move, Phasers and Bomb, the other commands available are Status, which displays your current fleet status, and Rules, which displays a brief summary of the different vessel capabilities and symbols.

Variables And Routines

N	is the total number of vessels in the game
A$	is the string containing vessel symbols
E(I)	is the energy of each vessel
G(I)	is the destruction flag
X(I) Y(I)	are the positional co-ordinates
130	the initialisation routine
390	the display routine
1460	command input
1570	move subroutine
1800	B is the maximum move range variable
1950	phasers subroutine
2340	fleet status subroutine
2570	bomb launch subroutine
4000	rules subroutine

```
0040 DIM D$[10]
0050 DIM K[20]
0060 DIM X[20],Y[20],G[20],E[20],B[20],Z[20],
     D[20],H[20],U[20]
0070 DIM C$[20]
0080 DIM B$[20]
0090 DIM A$[20]
0100 DIM E$[2]
0110 RANDOMIZE
0120 DEF FNR(Z)=INT((Z)*RND(0))
0121 PRINT "DO YOU WANT INSTRUCTIONS";
0122 INPUT C$
0123 IF C$="YES" THEN GOSUB 4000
0130 LET A$="ABCD><123WXYZ*#?89"
0140 LET N=18
0150 LET B9=N/2
0160 LET P=0
0170 LET W9=N/2
0180 FOR I=1 TO INT(N/2)+1
0190   LET X[I]=FNR(10-I+4)
0200   LET G[I]=1
0210   LET Y[I]=FNR(10-I+4)
0220   LET E[I]=500
0230   IF I>4 THEN LET E[I]=300
0240   LET B[I]=0
0250   IF I>6 THEN LET B[I]=3
0260 NEXT I
0270 LET W=-1
0280 FOR I=INT(N/2)+1 TO N
0290   LET X[I]=FNR(I/2)+22
0300   LET G[I]=1
0310   LET Y[I]=FNR(I/1.5)+I
0320   LET E[I]=500
0330   IF I>INT(N/2)+4 THEN LET E[I]=300
0340   LET B[I]=0
0350   IF I>INT(N/2)+6 THEN LET B[I]=3
0360 NEXT I
0380 LET B=1
0390 FOR T=1 TO N
0400   FOR I=1 TO N-T
0410     IF ABS(Y[T]-Y[T+I])>1 THEN GOTO 0460
0420     IF X[T]=X[T+1] THEN GOTO 0440
0430     GOTO 0460
0440     LET X[T]=X[T]+1
0450     LET B=0
0460   NEXT I
0470 NEXT T
0480 IF B=0 THEN GOTO 0380
0490 FOR I=1 TO N
0500   LET Z[I]=X[I]
0510 NEXT I
0520 FOR T=1 TO N
0530   LET D[T]=41
0540   FOR I=1 TO N
0550     IF Z[I]>D[T] THEN GOTO 0610
0560     LET D[T]=Z[I]
0570     LET P=I
0580     LET H[T]=G[I]
0590     LET B$[T,T]=A$[I,I]
0600     LET U[T]=Y[I]
0610   NEXT I
0620   FOR I=1 TO N
0630     IF P<>I THEN GOTO 0650
0640     LET Z[I]=100
0650   NEXT I
0660 NEXT T
0670 PRINT "    0   2   4   6   8  10  12  14
               16  18  20  22  24  26  28  30"
0680 FOR J=0 TO 16
0690   LET A=0
0700   FOR T=1 TO N
0710     LET K[T]=100
0720     IF H[T]=0 THEN GOTO 0760
0730     IF J<>16-INT(U[T]/2) THEN GOTO 0760
0740     LET A=1
0750     LET K[T]=(2*D[T])
0760   NEXT T
0770   PRINT 32-(2*J);
0780   IF A=1 THEN GOTO 0810
0790   PRINT
0800   GOTO 1000
0810   LET V=0
0820   LET P=0
0830   LET D=0
0840   LET Q=0
0850   LET B=0
0860   FOR T=1 TO N
0870     IF K[T]=100 THEN GOTO 0970
0880     LET B=B+1
0890     LET P=K[T]-B-D
0900     LET D=P+D
0910     LET V=V+P+B
0920     FOR S=0 TO P
0930       PRINT " ";
0940     NEXT S
0950     IF Q=18 THEN GOTO 0990
0960     PRINT B$[T,T];
0970     LET Q=Q+1
0980     IF Q=18 THEN PRINT
0990   NEXT T
1000 NEXT J
1010 PRINT "   0   2   4   6   8  10  12  14
              16  18  20  22  24  26  28  30"
1260 PRINT
1270 IF W<0 THEN GOTO 1320
1280 LET D$="WHITE"
1290 LET P=1
1300 LET Q=INT(N/2)
1310 GOTO 1350
1320 LET P=INT(N/2)+1
1330 LET Q=N
1340 LET D$="BLACK"
1350 PRINT D$;" WHICH VESSEL";
1360 INPUT E$
1370 LET B=0
1380 FOR I=P TO Q
1390   IF A$[I,I]=E$ THEN GOTO 1410
1400   GOTO 1430
1410   LET A=I
1420   LET B=1
1430 NEXT I
1440 IF B=0 THEN GOTO 1260
1450 PRINT
1460 PRINT "COMMAND";
1470 INPUT C$
1480 IF C$="MOVE" THEN GOSUB 1570
1490 IF C$="RULES" THEN GOSUB 4000
1495 IF C$="RULES" THEN LET W=-W
```

```
1500 IF C$="PHASERS" THEN GOSUB 1950
1510 IF C$="STATUS" THEN GOSUB 2340
1520 IF C$="BOMB" THEN GOSUB 2540
1530 IF W9=0 THEN GOTO 3100
1540 IF B9=0 THEN GOTO 3100
1550 LET W=-W
1560 GOTO 0380
1570 FOR D=1 TO 2
1580   PRINT
1590   IF D=1 THEN GOTO 1760
1600   PRINT "DO YOU WISH TO MOVE ANOTHER SHIP";
1610   INPUT C$
1620   IF C$="YES" THEN GOTO 1650
1630 NEXT D
1640 RETURN
1650 PRINT "WHICH SHIP";
1660 INPUT E$
1670 FOR I=P TO 0
1680   IF A$[1,I]=E$ THEN LET B=I
1690 NEXT I
1700 IF B=A THEN GOTO 1720
1710 GOTO 1750
1720 PRINT "THIS VESSEL HAS JUST BEEN MOVED"
1730 NEXT D
1740 RETURN
1750 LET A=B
1760 PRINT "VECTORS";
1770 INPUT S1,S2
1780 LET R1=((S1)^2+(S2)^2)^.5
1790 LET B=6
1800 IF A<P+6 THEN LET B=10
1810 IF A<P+4 THEN LET B=8
1820 IF R1>B THEN GOTO 1860
1830 IF B=10 THEN LET B=20
1840 IF E[A]-(R1*(18-B))<=0 THEN GOTO 1880
1850 GOTO 1900
1860 PRINT "BEYOND RANGE"
1870 GOTO 1760
1880 PRINT "ENERGY IS ONLY ";E[A];"TERAJOULES"
1890 GOTO 1760
1900 LET X[A]=X[A]+S1
1910 LET Y[A]=Y[A]+S2
1920 LET E[A]=E[A]-(R1*(21-B))
1930 NEXT D
1940 RETURN
1950 PRINT
1960 IF A<P+6 THEN GOTO 1990
1970 PRINT "NO PHASERS ON  BOMB LAUNCHERS.      NEXT MOVE"
1980 RETURN
1990 PRINT "WHICH VESSEL IS THE TARGET";
2000 INPUT E$
2010 FOR I=1 TO N
2020   IF E$=A$[I,I] THEN LET C=I
2050 NEXT I
2060 IF G[C]=0 THEN GOTO 1990
2070 LET R1=((X[A]-X[C])^2+(Y[A]-Y[C])^2)^.5
2090 IF R1<12 THEN GOTO 2120
2100 PRINT "OUT OF RANGE ....NEXT MOVE"
2110 RETURN
2120 PRINT
2130 PRINT "RANGE IS ";R1;" PHASER ENERGY";
2140 INPUT P8
2150 IF E[A]-P8>0 THEN GOTO 2190
2160 PRINT "ENERGY IS ONLY ";E[A];" TERAJOULES"
2180 RETURN
2190 LET P7=(P8/((R1*.7)+.05))*(200/E[C])
2200 LET E[A]=E[A]-P8
2210 IF FNR(P7)<17 THEN GOTO 2280
2220 LET G[C]=0
2230 PRINT "VESSEL ";E$;" DESTROYED"
2240 IF C>INT(N/2) THEN LET B9=B9-1
2250 LET W9=W9-1
2260 GOSUB 2510
2270 RETURN
2280 PRINT "BEAM DEFLECTED ....."
2290 LET L=FNR(5*P8/((R1*.8)+.05))+INT(100/((R1*.5)+1))
2300 PRINT "ENERGY DRAIN ON TARGET OF ";L;" TERAJOULES"
2310 LET E[C]=E[C]-L
2320 IF E[C]<=0 THEN GOTO 2220
2330 RETURN
2340 PRINT "..........";D$;" FLEET STATUS"
2350 PRINT " VESSEL","POSITION","ENERGY","BOMBS"
2360 FOR I=P TO 0
2370   IF I=P THEN PRINT "STARSHIPS...."
2380   IF I=P+4 THEN PRINT "LIGHT CRUISERS ....."
2390   IF I=P+6 THEN PRINT "BOMB LAUNCHERS....."
2400   IF G[I]>0 THEN GOTO 2430
2410   PRINT A$[1,I];" DESTROYED....."
2420   GOTO 2440
2430   PRINT A$[1,I],X[I],Y[I],E[I],B[I]
2440 NEXT I
2450 PRINT
2460 PRINT
2470 PRINT "ARE YOU READY";
2480 INPUT D$
2500 RETURN
2510 FOR G=1 TO 1000
2520 NEXT G
2530 RETURN
2540 IF B[A]>0 THEN GOTO 2570
2550 PRINT "NO BOMBS ON  BOARD....."
2560 RETURN
2570 PRINT "WHAT ARE TARGET COORDINATES";
2580 INPUT S1,S2
2590 LET R1=((X[A]-S1)^2+(Y[A]-S2)^2)^.5
2600 LET S1=S1-X[A]
2610 LET S2=S2-Y[A]
2620 PRINT "ESTIMATED TIME TO CORDINATES IS ";R1/2;" SECONDS"
2630 PRINT "PRESS 1 TO LAUNCH, ESC TO DETONATE ";
2640 INPUT E
2650 IF E<>1 THEN RETURN
2660 LET I=1
2670 LET I=I+1
2680 ON ESC THEN GOTO 2760
2690 GOTO 2670
2760 LET R2=R1*(I/(R1*95))
2765 ON ESC THEN STOP
2770 LET S1=INT(S1*(R2/R1))
2780 LET S2=INT(S2*(R2/R1))
2790 LET S1=X[A]+S1
2800 LET S2=Y[A]+S2
2810 LET B[A]=B[A]-1
2820 PRINT " BURST CENTRED ON ";S1;S2
2830 LET F=0
2840 FOR I=1 TO N
2850   IF G[I]=0 THEN GOTO 3050
2860   LET B=((X[I]-S1)^2+(Y[I]-S2)^2)^.5
2870   IF B>2.25 THEN GOTO 3050
2880   LET F=1
2890   IF FNR(10*B)<=4.5 THEN GOTO 2970
2900   PRINT "STARSHIP ";A$[1,I];" IN BURST"
2910   LET L=FNR(225/(B+.05))
2920   PRINT "ENERGY DRAIN OF ";L;" TERAJOULES"
2930   LET E[I]=E[I]-L
2940   IF E[I]<0 THEN GOTO 2970
2950   GOSUB 2510
2960   GOTO 3050
2970   PRINT "VESSEL ";A$[1,I];" DESTROYED      "
2980   GOSUB 2510
2990   LET G[I]=0
3000   IF I>INT(N/2) THEN LET B9=B9-1
3010   IF I<=INT(N/2) THEN LET W9=W9-1
3040   GOSUB 2510
3050 NEXT I
3060 IF F=1 THEN GOTO 3080
3070 PRINT " NO VESSELS IN BURST RADIUS"
3080 GOSUB 2510
3090 RETURN
3095 PRINT "<15>"
3100 IF W9=0 THEN LET D$="BLACK"
3110 IF B9=0 THEN LET D$="WHITE"
3120 PRINT "VICTORY TO THE ";D$;" FLEET !!!!"
3140 PRINT "TRY AGAIN";
3150 INPUT D$
3160 IF D$="YES" THEN GOTO 0130
3170 STOP
4000 PRINT
4005 PRINT "YOU COMMAND A BATTLE FLEET ....."
4010 PRINT "COMMANDS AVAILIABLE ARE:- MOVE,PHASERS,
     STATUS,BOMB,RULES"
4020 PRINT "YOU MAY MOVE TWO OR ATTACK FROM ONE VESSEL"
4030 PRINT "TURNS ALTERNATE BETWEEN PLAYERS, BLACK
     (X,Y,8,*,ETC) AND WHITE"
4035 PRINT
4040 PRINT "TYPE OF SHIP",,"MAX MOVE",,"ENERGY",,,
     "BOMBS",,"PHASERS"
4050 PRINT "STARSHIP","8 UNITS","500 UNITS","NONE","YES"
4060 PRINT "(A,B,X,Y,ETC)"
4070 PRINT "CRUISER","10 UNITS","300 UNITS","NONE","YES"
4080 PRINT "<,>,*,#"
4090 PRINT "DREADNOUGHT","6 UNITS","300 UNITS","3","NONE"
4100 PRINT "1,2,8,9,ETC"
4110 PRINT
4120 PRINT "ENERGY USE DURING MOVEMENT IS DREADNOUGHT >
     STARSHIP > CRUISER"
4140 PRINT "PHASER RANGE IS TWELVE"
4142 PRINT "BOMB RANGE IS UNLIMITED !"
4145 PRINT
4200 PRINT "ARE YOU READY";
4210 INPUT D$
4230 RETURN
```

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Sharp Pocket Computer

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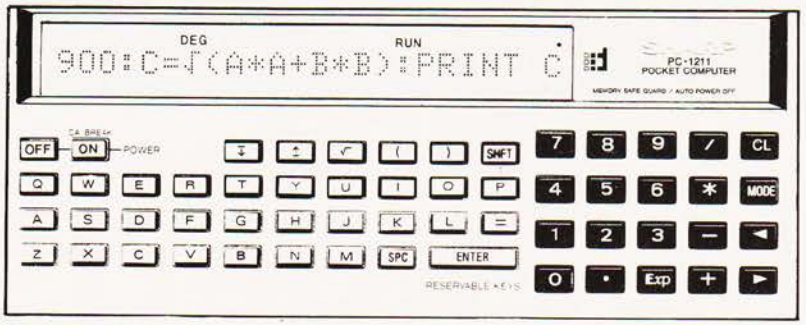

Adoption of Basic Language

For Programming, the PC-1211 employs the BASIC language, used widely from beginners to professionals. This simple programming method can easily be carried out by referring to the flow chart. Moreover, formulas can be entered as they are normally written. These innovative functions are designed with ease of operation in mind.

The PC-1211 also serves as an ideal "stepping stone" to professional computers.

Dot matrix display – up to 24 digits with rolling writer.

Characters as well as numerals are displayed with the dot matrix display enabling the operator, to communicate with the unit. The BASIC language can be used to its full potential. The display panel makes it possible to display portions of the program (line by line) visual instruction asking for data and showing calculation results.

Program capacity 1424 steps. 26 memories with memory safe guard.

The PC-1211 has a large memory capacity in spite of its slim, compact body. Due to the memory safe guard circuit, information in memory is maintained even after the power is turned off.

Programming is by an efficient "one-command, one-step" system. According to your needs, steps can also be used as a memory.
(8 steps is equivalent to 1 memory).

Reservable key and definable key systems.

*The reservable key system makes it possible to reserve a key for a function or command which is used frequently. It can easily be recalled by the touch of a key when putting in a formaula either during manual calculation or programming.

*The definable key system defines 18 programs for each key. Whenever you need a certain program, you can recall and run it with the touch of the proper key.

Programs and data can be saved in and loaded from a tape recorder.

The cassette tape recorder can be used as an external memory device.
(Cassette interface CE-121 is optional)

By saving programs or data on a cassette tape, the information can be loaded whenever necessary. It is also possible to search the saved program data automatically by file name or load it for use during the program calculation.

Other features

* Long-life operation, Auto power-off function.
* Playback function enables correction by displaying the formula with a single touch of a key.
* Effective tone function is designed to identify the program. (A beep sound can be input during programming.)

Price	Nett	Vat	Total
PC-1211 Pocket Computer	84.00	12.60	96.60
CE-121 Cassette Interface	12.00	1.80	13.80

Specifications SHARP POCKET COMPUTOR

Model:	PC-1211	Editing functions:	and logical calculations. Cursor shifting (>,<) Insertion (INS) Deletion (DEL) Line up and down (↑,↓)
Number of calculation digits:	10 digits (mantissa) + 2 digits (exponent)		
Calculation system:	According to mathematical formula (with priority judging function)		
Program system:	Stored system	External memory Function:	By using the optionally available cassette interface (CE-121), program, reserve program, and data memory can be saved or loaded to or from cassette tape recorder.
Program language:	BASIC		
Capacity:	Program memory; Max. 1424 steps Data memory; Fixed memory . . . 26 pcs. Flexible memory (common) 178 pcs.	Memory protection:	CMOS battery back-up
		Display:	24-digit alphanumeric dot matrix liquid crystal display.
	Reserve memory; Max. 48 steps (reserve PROGRAM: Max. 18 kinds)	Component:	CMOS LSI, ETC.
	Input buffer; 80 characters	Power supply:	● Alkaline manganese battery (LR-44) x 3 (built-in) Approx. 100 hours ● Silver oxide battery (G-13 or S15 type) x 3 Approx. 300 hours
Stack:	For data; 8 stacks For function: 16 stacks (in parentheses, 15 levels)	Power consumption:	4.5V . . . (DC): 0.009W 4.5V . . . (DC): 0.011W (with CE-121)
	For subroutine; 4 stacks For FOR-NEXT statement; 4 stacks	Operating temperature:	0°C 40°C (32°F 104°F)
		Dimensions:	175(W) x 70(D) x 15(H)mm 6-7/8"(D) x 19/32"(H)
Calculations:	Four arithmetic calculations, power calculation, trigonometric and inverse trigonometric functions, logarithmic and exponential functions, angular conversion, extraction of square root, sign function, absolutes, integers,	Weight:	Approx. 170g (0.37 lbs.)
		Accessories:	Hard case, battery x 3 (built-in), applications manual, beginner's textbook for "BASIC", template x 2

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Sharp MZ-80K

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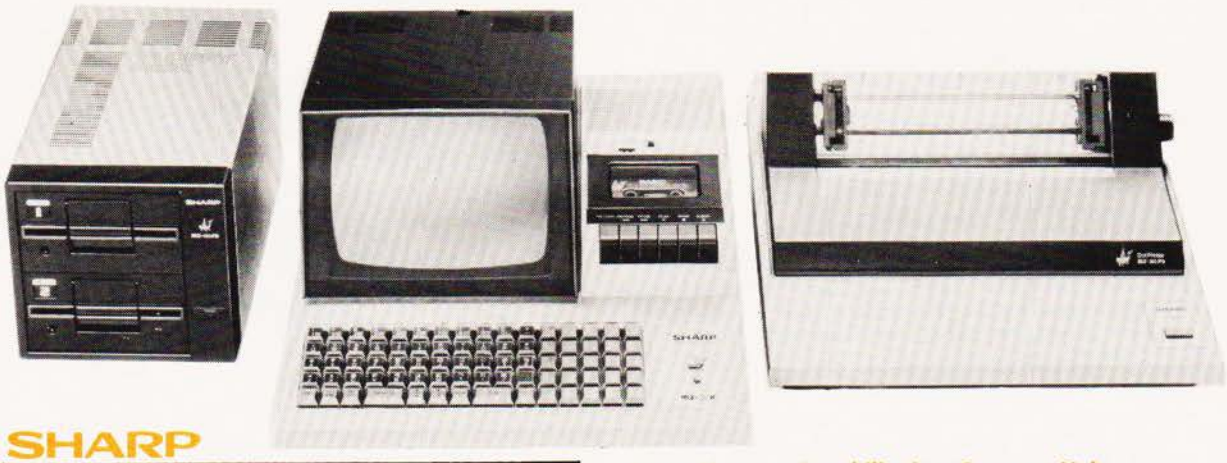

SHARP

New Low prices	Net	Vat	Total
MZ-80K Computer 48K RAM	500.00	75.00	575.00
MZ-80FD dual disk drive	780.00	117.00	897.00
MZ-80P3 printer	500.00	75.00	575.00
MZ-80I/O interface unit	84.00	12.00	96.60
MZ-80FDK extra disk drives	680.00	102.00	782.00
MZ-80T20C machine language	18.00	2.70	20.00
MZ-80TU assembler	38.00	5.70	43.70

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Fast loading
Cassette interface runs at 1200 bps.

Other features – 79 keyboard up to 48K RAM, on screen editing, real time clock 256 different characters, 10 inch video display 80 x 50 bit mapped graphics.

The Basis of System Expansion Interface Unit MZ-801/0

The MZ-801/0 interface unit connects the central processing unit (CPU) with other terminal units and makes possible further expansion of the system.

The interface unit can hold up to five different interface cards and utilizes its own built-in power source.

Fast and Legible Printing of Characters and Graphics Dot Printer MZ-80P5

By parallel data input, the MZ-80P3 prints charcters on ten-inch wide paper, 80 characters to the line, at a speed of approximately 1.2 lines per second. The "tractor feed" system prevents paper slipping and produces clear print at high speed. A variety of characters can be printed by the MZ-80P3, including both upper and lower case letters, numerals and graphics.

Large Memory Capability in a Compact Unit Floppy Disc MZ-80FD

Memory capacity up to 280K bytes can be accessed quickly and easily from dual driven standard 5.25 inch floppy discs.

Specifications

MZ-801/0

Interface system:	Parallel interface
Signal:	TTL level
Usable interface card:	Up to 5 sheets Printer interface card, Floppy Disk interface card, Colour display interface card, Universal interface card, etc.
Power consumption:	45W
Power Supply:	Local voltage, 50Hz
Operating temperature:	0 to 35°C
Storage termperature:	−15 to 60°C
Dimensions:	205(W) x 320(D) x 130(H)(mm)
Weight:	5kg

MZ-80FD

Memory capacity:	143K bytes/drive (286K bytes/unit)
No. of tracks:	70
No. of sectors:	16 (per track)
Working conditions:	4 to 25°C, 28 to 80% (relative humidity)
Rated voltage:	Local Voltage, 50Hz
Power consumption:	40W
Outer dimensions:	205(W) x 320(D) x 200(H)(mm)
Weight:	7.9kg
Option:	
Floppy interface card:	MZ-80FI/O included in price
Disk BASIC:	MZ-80FMD included in price
Flat cable for connection	MZ-80F15, included in price

MZ-80P3

Printing method:	Serial dot matrix method
Feed method:	Tractor feed method
Printing capacity:	80 characters/line 40 characters/line (Double size character display)
Kinds of printed characters:	226 kinds excluding the space code
Character make-up	6 x 7 dots 12 x 7 dots (Double-size character display)
Size of character:	Width: 2.2mm Height: 3.1mm
Printing speed:	About 1.2 lines/sec (at 25°C)
Line-to-line space	2.54mm (in normal mode)
Head sweep direction	Left Right
Operation switches	Power supply & paper feeding
Interface:	Conforming to Bandminton interface
Print recording paper:	(1) Kind: Fanfold paper (2) Size: (Width) 102 to 254mm (4 to 10 inches) Note: In the case of printing 80 characters per line, use paper of 254mm width. Copy possible
Ink ribbon:	(1) Colour: Single (Black) (2) Size: 13mm(W) x 11,000mm(L) (3) Life: About 2 million letters
Power supply:	Local voltage, 50Hz
Power consumption:	85W
Working temperature:	5 to 40°C
Working humidity:	10 to 80% (No dew-condensation)
Storage temperature:	−20 to 50°C
Storage humidity:	5 to 85% (No dew-condensation)
Outer dimensions:	410(W) x 385(D) x 198(H)(mm)
Weight:	10.6kg

*Specifications and design subject to change without notice.

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- Colour Graphics
- High Resolution Dot Graphics
- Sound Synthesis
- Analog Inputs

Apple understands product support: documentation, software, accessories; and the system capacity to take advantage of them. Additionally, more than 60 other companies produce hardware and software products for Apple II, making the system an industry standard.

The Apple II Computer features

Apple II is a state-of-the-art personal computer. It is not a toy or a video game, but a sophisticated system for the person who appreciates quality tools. It's worth more, because its unique features help you do more.

Colour Graphics

Apple's colour graphics permit applications ranging from business charting to architectural design. They make any presentation more effective.

Sound Synthesis

A built-in loudspeaker lets you explore audio applications from computer music to synthesized human speech.

Languages

Apple speaks BASIC, so you can use the programs already available in hundreds of publications. We offer a powerful scientific BASIC, with all the string and mathematical functions a programmer could want. We also offer assembly language and PASCAL for advanced users. More languages are under development.

Expansion Capacity

Apple II can handle complex applications, with up to 48k bytes of user memory space. And it can expand as your needs do, with a hefty power supply and eight connector slots for disks, printers, and other peripheral interfaces.

Apple is a system, not just a computer. It offers the peripherals and accessories the professional looks for. Whether you want printers, voice recognition, telecommunications, or high-density floppy disks. Apple can meet your needs.

The Apple system offers smart peripherals, so you can use them immediately without developing special control programs. They let you expand the capability of your system without adding boxes and power supplies.

Apple helps you learn, with the most complete documentation on the market. Whether you're an engineer designing computer interfaces or a beginner curious about programming, you'll find the information you need in our detailed manuals.

Floppy Discs.

Gives your system immediate access to large quantities of data. The subsystem consists of an intelligent interface card, a powerful Disk Operating System and one or two mini-floppy drives.

Features

- Storage capacity of 116K kilobytes/diskette. (140K with Pascal).
- Data transfer rate 156K Bits/second.
- Individual file write protection.
- Powered directly from Apple II.
- Full disk capability with systems as little as 16K bytes of RAM.
- Fast access time – 600 m sec (max) across 35 tracks.
- Powerful disk operating software.
- Load and store files by name.
- BASIC programs chaining.
- Random or sequential file access.

Prices	Nett	Vat	Total
Apple II 16k + free offer	695.00	104.25	799.25
Disk system	349.00	52.35	401.35
Second disk drive	299.00	44.85	343.85

Latest Apple II plus model with floating point BASIC and Autostart ROM.

Colour output optional – requires Eurocolour card.

Parallel Printer Interface

The Parallel Printer Interface Cards are available to allow the use of parallel printers with your APPLE computer.

Features

— Built-in Firmware Allows Printing With Simple BASIC Commands
— Prints up to 255 Char/Line for format flexibility
— High Speed—up to 5000 Char/Sec (3700 LPM @ 80 Char/Line
— Easy to Use with Most Popular Printers (Axiom, Centronics, SWTP, Selectric conversions).

Specifications

PARAMETER	DESCRIPTION
Data and Control Signals:	7-8 Parallel Data Bits, STROBE and ACKNOWLEDGE
Print Line Width:	40-255 Char/Line. Automatic formatting of BASIC listings.

Price	Nett	Vat	Total
Parallel	104.00	15.60	119.60
Centronics	130.00	19.50	149.50

Communications Interface Card

The Communications Interface Card is available separately to allow you to connect your APPLE to modems, CRT terminals, and other devices employing a serial RS-232C interface. The card's built-in intelligence lets you control these devices easily, in BASIC.

Features

—Firmware Control Programs
—No Software to Write
—Easily Controlled from BASIC using simple commands
—Communicates at 110 or 300 Baud, Half- or Full-Duplex
—RS-232C-compatible Serial Interface

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Apple II

sets the standards.

Specifications

PARAMETER	DESCRIPTION
Signal level:	EIA RS-232C
Data Word Format:	1 start bit, 1 or 2 stop bits, 7 or 8 data bits; odd, even or no parity

	Nett	Vat	Total
Price	130.00	19.50	149.50

Serial Interface

The Serial Interface Card allows an APPLE computer to exchange data with computers, printers, and other devices in serial format (one bit at a time). It is intended for use (in place of the Communications Interface Card) in applications that:
—Use data rates other than 110 or 300 baud (10 or 30 char/sec)
—Involve serial printers that don't require "handshake".

Features

—Permits BASIC Control of High-Speed Printers and Plotters
—Quickly Transfers Large Blocks of Data by Telephone (through a modem), or Directly to Local Equipment
—Handles Half-Duplex Communication from 75-19.2K Baud
—Programs Easily with Switch-Selectable Preset Conditions for Speed, Line Length, Auto Line Feed and Carriage Return Delay

Specifications

PARAMETER	DESCRIPTION
Signal Level:	EIA RS-232C or 20mA current loop
Data Word Format:	1 start bit, 1 or 2 stop bits, 5-8 data bits; odd, even, or no parity. Checksum is optional.
Character Handling Options:	Lower-case characters optionallly converted to upper-case or passed through unmodified and displayed in inverse video.

	Nett	Vat	Total
Price	113.00	16.95	129.95

Eurocolour Card Produces PAL colour signals to drive colour video monitor or with a Black & White modulator drives a colour T.V.

	Nett	Vat	Total
Price	79.00	11.85	90.85

Language System

This package includes the Language Card, which allows APPLE users to take immediate advantage of the powerful PASCAL language as well as the Integer and Applesoft BASIC interpreters. The Language Card's 16K bytes of RAM memory electrically replace the ROM firmware built into each APPLE. Upon start-up, this RAM memory is automatically loaded from disk with the user's choice of languages, then electrically protected from change. The loading is controlled by the AUTO-START ROM, also contained on the card. The complete system also includes diskettes containing a language selection "Hello" program, PASCAL, Applesoft BASIC, and Integer BASIC. The reference manuals for all the above languages are also included.

	Nett	Vat	Total
Price	299.00	44.85	345.85

Apple Fortran

Apple FORTRAN is "ANSI Standard Subset FORTRAN 77." These latest computer industry standards provide significant additions and enhancements over previous 66 standards (FORTRAN IV). An example of this is the expanded "IF" statements that have been added to traditional FORTRAN statements.

Apple FORTRAN operates in the Apple Pascal Language system offering the same comprehensive software development environment provided to our Pascal programmers. The Editor, Linker, Filer and Assembler can all be used with the Apple FORTRAN compiler, which, like Pascal, produces 'P' code.

	Nett	Vat	Total
Price	120.00	18.00	138.00

Graphics Tablet

The Graphics Tablet is an image input device that allows the user to enter pictorial information directly (by sketching or tracing) from:
—maps and photographs
—logic diagrams and schematics
—histograms
—architectural drawings
—fine art

Tracing a shape on the tablet surface converts the image to digital values. This information is displayed on the video monitor and may be stored on disk for later processing by the Apple.

	Nett	Vat	Total
Price	462.00	69.30	531.30

Appletel

The Appletel package provides the means to bring the Apple II computer and the Prestel service together. The power of the Apple microcomputer makes the Appletel terminal much more than a simple Prestel receiver. You have the facility to store pages from Prestel in the computer and examine them later at leisure (saving telephone bills). You can automatically call up a sequence of pages of information you regularly need and/or store them. You can use the Appletel terminal to put your own information onto Prestel. Appletel has local editing facilities to help you do this. The fact that you have a full keyboard means that you can make good use of the Prestel facility for sending messages.

	Nett	Vat	Total
Price	595.00	89.25	684.25

Alf music synthesiser card Three part harmony – plugs into domestic Hi-Fi up to three cards which gives nine parts harmony. Total controls of envelope shape.

	Nett	Vat	Total
Price	180.00	27.00	207.00

Clock/ Calendar Card

This plug-in card provides a 388-day calendar and clock, with resolution to 1/1000 second. The clock is crystal controlled to yield .001% accuracy. A built-in rechargeable battery keeps the clock on time up to four days without system power, and external batteries may be used for longer periods. Optional interrupt capability simplifies control applications. Supplied with complete operating instructions and rechargeable battery.

	Nett	Vat	Total
Price	128.00	19.20	147.20

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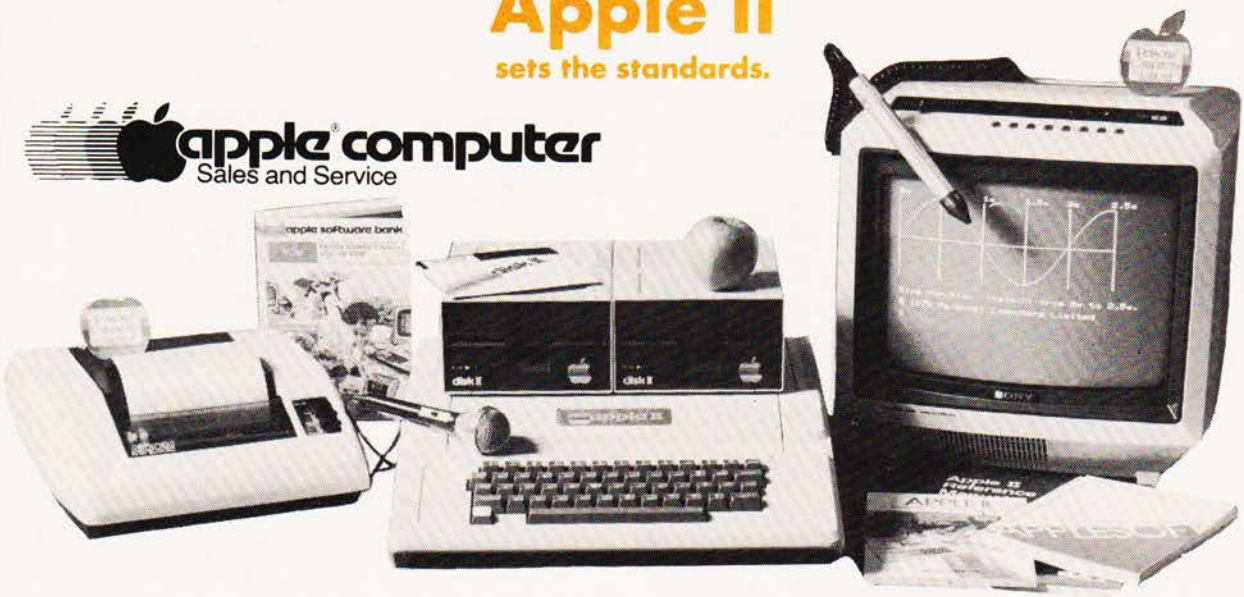
Apple II

sets the standards.

apple® computer
Sales and Service



ROM Plus card

ROMPLUS + provides six sockets to accept individually addressable 2K ROM's or EPROM's. Keyboard Filter a 2K ROM program, comes installed on the ROMPLUS + board and adds many useful features to your Apple, including:

- Upper and lower case letters. The only system that offers keyboard input and standard shift key operation.
- Multipe user-defined charactor sets.
- Coloured or inverse-coloured letters.
- Keyboard macros – two key-stroke, automatic typing of multiple, user-defined words or phrases. Including BASIC and DOS commands.
- Mixed text and graphics.
- Improved cursor control.
- STOP LIST and END LIST.

	Nett	Vat	Total
Price	105.00	15.75	120.75

Hobby/ Prototyping Card

Create your own APPLE interface boards with this wire-wrap card. The 2¾" x 7", double-sided circuit board includes a hole pattern (on 100-mil centres) that accepts all conventional IC's and passive components. It plugs directly into any APPLE expansion connector, and fits entirely within the computer case. Supplied with complete bus documention to aid the interface designer. (Order No. A2B0001).

	Nett	Vat	Total
Price	15.00	2.25	17.25

Apple Pilot

PILOT is a high level, easy-to-use language which was designed for educators and courseware developers. Since 1968 many teachers and trainers have been using PILOT to create Computer Aided Instruction (CAI) programs. In fact, PILOT is available on more computers than any other CAI language. This means, a large number of potential customers and a large number of existing PILOT programs, most of which will run on the Apple PILOT system.

Apple PILOT has been designed to take full advantage of the Apple's unique features and at the same time offer a superior easy to use CAI system. Through the use of graphics and sound, the instructor can prepare lessons utilizing the full capabilities of the Apple II. Apple PILOT offers the courseware designer a total support system.

System Requirements

- Apple II or II PLUS with 48K memory
- One disk drive for "LESSON" mode or two disk drives for both "AUTHOR" and "LESSON" modes.
- DOS 3.3 or The Apple Language System.

Price on application

DOS 3.3

Apple's new DOS, DOS 3.3, contains two significant improvements for the Apple owner. It creates a compatible environment so that the Apple owner can easily and efficiently use his Applesoft, Integer, and Pascal programes on one set of hardware. The second benefit for the user is that the disk space available is increased 23%. Under the old operating system, approximately 103,000 bytes where available to the user. With the new DOS, 126,976 bytes will be available for user programs.

Included with the new DOS is a utility to convert programs from the old disk format to the DOS 3.3 format, a fast single or double disk drive file copying program, a diskette to allow you to run unconverted software from the old disk format, and a flexible new file utility program. Also included in the package is a new DOS manual, and,of course, the necessary PROMs to change your Apple to the new disk format.

	Nett	Vat	Total
Price	39.00	5.85	44.85

Other Prices

	Nett	Vat	Total
Applesoft Firmware Card – for integer Apples	116.00	17.40	133.40
Integer Card – For applesoft apples	116.00	17.40	133.40
IEEE 488 interface card	212.00	31.80	243.80
Vinyl carrying case	16.00	2.40	18.40
Speechlab – speech input	127.00	19.05	146.05
Supertalker – speech output	136.00	20.40	156.40
Sup 'R' Terminal – 80 column card	253.00	37.95	290.95
A.I.O., Serial and Parallel card	120.00	18.00	138.00
Appleset 16 channel 8 bit A-D	166.00	24.90	190.90
CCS 3¾ digit BCD A-D	80.00	12.00	92.00
Templeman dual 8" disk system – 1M byte	1550.00	232.50	1782.50
Numeric keypad	125.00	18.75	143.75

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Apple III

Size: 17.5 inches wide (44.45 cm)
18.2 inches deep (46.22 cm)
4.8 inches tall (12. 2 cm)
Cast aluminium base with moulded plastic cover.

Weight: 26 pounds (11.8 kilos)

Processor: Apple designed processor utilizes 6502A as one of its major components. Other circuitry provides extended addressing capability, re-locatable stack and zero page, and memory mapping.

Emulation Mode: Provides hardware emulation of 48K byte Apple II or Apple II Plus. Allows most Apple II programs to run without modification.

Clock Speed: 1.8 MHz with video off, 1.4MHz average 1.0 MHz in emulation mode.

Main Memory: 96K (98,304) eight-bit bytes minimum
128K (131,072) bytes maximum
Dynamic RAM memory

Rom Memory: 4K (4,096) bytes used for self-test diagnostics

Power Supply: High-Voltage switching type
+5, –5, +12, –12 volts

Mass Storage: One 5.25 inch floppy disk drive built-in
140K (143,360) bytes per diskette
Up to 3 additional drives can be connected by daisy-chain cable (572K bytes on-line storage)

Keyboard: 74 keys (61 on main keyboard, 13 on numeric pad). Full 128 character ASCII encoded. All keys have automatic repeat.
Three special keys: SHIFT, CONTROL, ALPHA LOCK. Two user-definable "Apple' keys. Four directional arrow keys with two-speed repeat. Four other special keys: TAB, ESCAPE, RETURN, ENTER.

Screen: Three upper/lower case text modes:-
80 column, 24 line black-and-white,
40 column, 24 line 16 colour foreground and background
40 column, 24 line black-and-white.
All text modes have a software-definable 128 character set (includes upper and lower case) with normal or inverse display
Three graphics modes:
280 x 192, 16 colours (with some limitations)
140 x 192, 16 colours
560 x 192, black-and-white
plus Apple II Modes.

Video Output: RCA phono connector for NTSC black-and-white composite video. DB-15 type connector for:
NTSC black-and-white composite video
4 TTL outputs for generating RGB colour.
Composite sync signal. NTSC colour composite video. +5, –5, +12, –12 volt power supplies
Colour signals appear as 16-level grey scale on black-and-white video outputs.

Audio Output: Built-in 2 inch speaker. Miniature phone-tip jack on back of Apple. Driven by six-bit digital/analog converter or fixed-frequency "beep" generator

Serial I/O: RS-232C compatible, DB-25 female connector. Software selectable baud rate and duplex mode.

Joysticks: Two DB-9 connectors for two joysticks with pushbuttons.

Printer: One DB-9 connector (shared with second joystick) for Apple Silentype printer.

Clock: Can be set and read from programs. Powered by long-life replaceable watch batteries. Keeps track of month, date, day of week, and exact time to 1/1,000th of a second.

Expansion: Four 50-pin expansion slots inside the cabinet

SOS: Sophisticated Operating System handles all system I/O SOS can be configured to handle standard or custom I/O devices and peripherals by adding or deleting "device drivers"
All Languages and Application programs access data through the SOS file system.

Languages: Apple Business BASIC, PASCAL, FORTRAN

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Apple Software

	Nett	Vat	Total
Payroll I			
Weekly/Monthly. Up to 200 employees. Weekly/Tax, National Insurance and Pension. Up to 20 departments.	375.00	56.25	431.25
Payroll II			
Weekly/Monthly. Up to 99 employees. Less detailed reports as in above. Excellent value.	200.00	30.00	230.00
LEDGERS			
Sales			
500 accounts, 1600 transactions, Credit limit check. 100 Analysis codes, aged debtors analysis.			
Program	295.00	44.25	339.25
Manual	3.00		3.00
Purchase			
500 accounts, 1600 transactions Turnover aggregated for each customer.			
Program	295.00	44.25	339.25
Manual	3.00		3.00
General			
Trial Balance/Accumulated profit/Loss on demand. 1000 named accounts, 1700 postings.			
Program	295.00	44.25	339.25
Manual	3.00		3.00
Optional Applications Manual			
Uses for incomplete records, group consolidation branch accounts, etc.	10.00		10.00
Inventory Control			
Probably the most powerful package on the market. 1250 items/disk, 600 suppliers. Automatic re-order routine. Fully documented, easy to use, well proven in the field.			
Program	225.00	33.75	258.75
Manual	3.00		3.00
Other Applications: Point of sale stock control Licensed trade stock control.			
Visicalc			
Visicalc and Apple do to the calculator what word processing has done to the typewriter. Plan budgets, rate of returns, financial statements, tax effects, sales forcasting, "What if?" Uses are endless and visicalc is limitless.			
Visicalc	95.00	14.25	109.25
Mailing List			
Company name/address/contact/ telephone no. 375 records/disk. Add, amend, delete. Print all/selected records. Print self adhesive labels.	27.00	4.05	31.05
Apple Desktop/Plan			
A business planning and analysis system designed to aid development and analysis of business plans such as budgets, sales forecasts, cash flow planning, profit and loss predictions and many other similar types of analysis	64.00	9.60	73.60
Applewriter			
Most probably the best word processing system avilable on a microcomputer for the price. Features include: high speed versatile cursor control, moving blocks of text, delete by character, word and paragraph, left, right, centre justifications, upper and lower case, very easy to use, well documented.	42.00	6.30	48.30
Credit Control			
An ideal aid for the business who needs tight control on their debtors. Holds up to 850 accounts. Informs you if any order exceeds the credit limit. Easy to use.	75.00	11.25	86.25
Sales Control			
Gives breakdown of sales per client over the last 3 years and each month this year. Shows number of unconverted enquiries, reports, on printer between user development parameters on area product turnover to date, turnover this month. Many other valuable reports.	150.00	22.50	172.50

FOR FURTHER DETAILS PLEASE RING

	Nett	Vat	Total
Programming Aids and Tutorials			
Applepie (Integer)	30.00	4.50	34.50
Assembler Editor (Machine Code)	45.00	6.75	51.75
Data Base (Integer)	23.50	3.53	27.03
Disk magic (Integer)	16.00	2.40	18.40
Hi Resolution Character Generator (Applesoft)	16.50	2.48	18.98
Appleforth (Integer)	39.95	5.99	45.94
large Character (Integer)	16.00	2.40	18.40
Lisa (Integer)	28.50	4.28	32.78
Master Catalogue (Applesoft)	14.00	2.10	16.10
Shape Builder (Applesoft)	17.00	2.55	19.55
Step by Step (Applesoft)	37.50	5.63	43.13
Talking Disk (Integer)	14.95	2.24	17.19
Three D Animation (Integer)	12.95	1.94	14.89
Tiny Pascall (Integer)	40.00	6.00	46.00
Business Programs			
Active Filter (Applesoft)	15.00	2.25	17.25
Audio Engineer(Applesoft)	15.00	2.25	17.25
Index File (Integer)	16.00	2.40	18.40
Statistics (Applesoft)	19.95	2.99	22.94
Games and Simulations			
Games Pack 1 (Integer)	12.00	1.80	13.80
Games Pack 2 (Integer)	12.00	1.80	13.80
Games Pack 3 (Integer)	12.00	1.80	13.80
Games Pack 4 (Integer)	12.00	1.80	13.80
Games Pack 5 (Integer)	12.00	1.80	13.80
Games Pack 6 (Integer)	12.00	1.80	13.80
Games Pack 7 (Applesoft/Integer)	12.00	1.80	13.80
Alien Encounters (Applesoft)	8.00	1.20	9.20
Alien Invasion (Machine Code)	8.00	1.20	9.20
Apple Invaders (Integer)	12.00	1.80	13.80
Battlefield (Applesoft)	8.00	1.20	9.20
Biorhythm (Applesoft)	10.00	1.50	11.50
Breakthrough (Machine Code)	8.50	1.28	9.78
Bulls and Bears (Integer)	12.00	1.80	13.80
Datestones of Ryn (Applesoft)	12.95	1.94	14.89
Death Race (Integer/Machine Code)	10.95	1.64	12.59
Earth Quest (Integer)	11.50	1.73	13.23
Galactic Battle (Integer)	8.00	1.20	9.20
Guided Missiles (Machine Code/Integer)	10.95	1.64	12.59
Invasion Orion (Applesoft)	18.00	2.70	20.70
Laser Blast (Machine Code/Integer)	12.00	1.80	13.80
Lunarlander (Machine Code/Integer)	9.25	1.35	10.64
Phasor Zap (Integer)	10.00	1.50	11.50
Saucer War (Applesoft)	9.95	1.49	11.44
Space Traders (Applesoft)	12.95	1.94	14.89
Space Wars (Machine Code/Integer)	12.95	1.94	14.89
Speedway (Integer)	10.00	1.50	11.50
Star Voyager (Integer)	15.95	2.39	18.34
Strato Laser (Applesoft)	10.95	1.64	12.59
Stunt Cycle (Machine Code)	10.50	1.58	12.08
Super Dungeons (Integer)	12.95	1.94	14.89
Super Starwars (Machine Code/Integer)	11.25	1.69	12.94
Starfleet Orion (Integer)	18.00	2.70	20.70
Temples of Apshai (Applesoft)	22.95	3.44	26.39
U.F.O. (Machine Code/Integer)	8.50	1.28	9.78
War Lords (Integer)	12.00	1.80	13.80
Educational, Mathematical and Scientific Programs			
Function Pilot (Applesoft)	18.50	2.78	21.28
Planets (Applesoft)	15.00	2.25	17.25
Sirus (Applesoft)	15.00	2.25	17.25

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Video Genie

Value and TRS 80 compatibility

20 free Microdigital quality Cassettes with each Genie

The Video Genie is a complete computer system, requiring only connection to a domestic 625 line TV set to be fully operational; or if required a video monitor can be connected to provide the best quality display.

The system case contains the Central Processor Unit (CPU), 16,000 bytes RAM memory, the cassette system, a 12,000 byte operating system and BASIC interpreter in ROM, and a full size keyboard, in a stylish case, at a price that makes the Video Genie better value than some "kit" computers.

Keyboard

The Video Genie has a 51 key typewriter style keyboard, which features a 10 key rollover. This makes it very easy for experienced and inexperienced typists alike to enter programs and data into the machine.

Applications

The Video Genie System has many uses in all spheres of life, the easy to use BASIC language means that programs are easily written for specific applications, and pre-recorded program tapes are available in great variety.

The system has great scope in the home, sophisticated games programs can introduce the computer age to all the family, who can then progress to writing their own programs in BASIC or even machine code. Software is continuously being developed to aid home budgeting and education.

In a school or college the machine can be used with a large screen TV to allow a whole class to be taught at once.

The powerful Extended BASIC interpreter makes the solution of complex scientific problems simple, and the graphics allow pictorial displays of results.

Extended BASIC

— Single, double and integer – precision numeric variables, as well as string variables.

— multi-character variable, with the first two characters significant.

— program lines, logical lines and string variables up to 255 characters long.

— includes all scientific functions.

— numeric accuracy up to 16 significant digits, with intrinsic functions at 6-digit accuracy.

— formatted, printing, program editing (with extensive editing subcommands), error trapping, named files, program tracing, automatic line numbering, multi-statements per line, and keyboard rollover allowed.

— multi-dimension arrays, and complete string manipulation.

— direct memory inspection, and input/output commands provided.

— direct graphic commands.

— allows access to machine language subroutine.

— many other advanced features, all included in the detailed programming manuals.

Cassette Unit

The Video Genie has an integral cassette system which can save information on standard tape cassettes. An interface is also provided to connect an external audio cassette unit for greater storage flexibility.

Accessories

The Video Genie is supplied with the following accessories:-
BASIC demonstration tape.
Video lead
Second cassette manual

Manuals

Users manual
BASIC manual
Beginners programming manual

These manuals provide an an excellent course of instruction for the beginners to computing. They take the user gently through the subject, explaining the concepts of computing with the Video Genie.

Software

The Video Genie utilises the same renowned extended BASIC interpreter as the TRS-80. Most software for the TRS-80 will run on the Video Genie so an enormous range of software is available.

	Nett	Vat	Total
Price	330.00	49.50	379.50

Price does not include T.V./monitor

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Printers

Tally/Mannesmann M80/77/MC

A printer for the professional user. This new printer from T/M offers fast, dependable and cost effective hard copy data processing for the business man. Its high speed, 200 c.p.s., bi-directional print mechanism will ensure that your printer is not tied up all day. We are able to offer this printer at a price that includes a 1K character buffer and 132 column print option included in the price. Serial or parallel campatible.

We feel that this printer will fulfill the requirements of the most demanding user, whether it be Payroll, Ledgers or Stock-control, the M80 will handle the application with minimum fuss for the User.

Price	Nett	Vat	Total
Tally/Mannesmann M80/77/MC	1000.00	150.00	1150.00
Includes 1K Buffer, 132 Print Option			

Oki Microline 80

Quality and reliability at a price that makes it available for business, educational and home-user applications. The features and specifications of this small lightweight printer are those of models costing many times more.

80 characters per second
80 and 132 columns program selectable
Full 96 character set with graphics printing facility
Long life 9 x 7 print head matrix parallel and serial compatible.
Friction and Pin Feed as standard.

Price	Nett	Vat	Total
Microline 80	499.00	74.85	573.85
Tractor Feed Option	35.00	5.25	40.25

Microhush 200

This, the latest in the line of thermal printers, offers all the high performance features of the Microhush 100, plus an 80 column printing capacity and the ability to reproduce the whole screen of a 'Apple' high resolution image, utilising a 60 dots per inch definition.

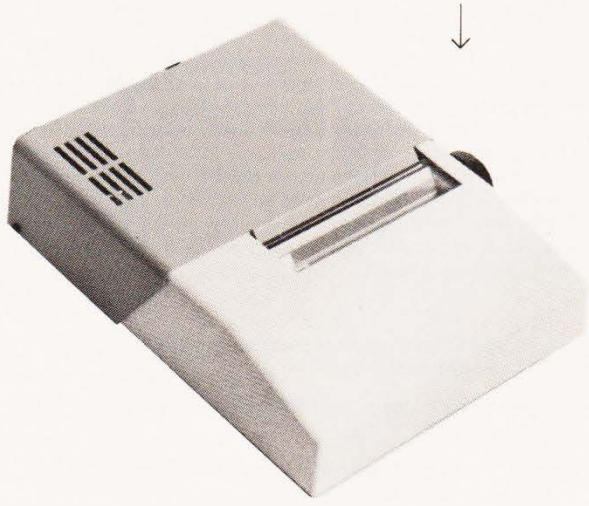
Price	Nett	Vat	Total
Microhush 200	349.00	49.35	398.35

Microhush 100

A fast reliable thermal printer offering the user a high definition 96 character set created by a 5 x 7 print head. Its 40 characters per second, bidirectional look-ahead printing and extremely quiet operation, ensures a high performance at low cost.

Interfacable to most microprocessor systems including Apple, Sorcerer and RS 232.

Price	Nett	Vat	Total
Microhush 100 including 'Apple' interface	299.00	44.85	343.85



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Atom

Prices	Nett	Vat	Total
Atom Kit 8K + 2K	120.00	18.00	138.00
Atom Ass 8K + 2K	150.00	22.50	172.50
Atom Kit 12K + 12k	220.00	33.00	253.00
Atom Ass 12k + 12K	250.00	37.50	287.50
1K RAM sets	9.50	1.43	10.93
4K Floating Point ROM	20.00	3.00	23.00
Printer driver	11.50	1.73	13.23
Mains Power Supply	8.00	1.20	9.20

The Basic Atom

Elegantly designed and injection moulded in heavy duty polystyrene, the Atom meaures only 15" long x 9½" deep and 2½" high fitting snugly inside a normal briefcase.

And yet it still contains a full sized keyboard laid out in a conventional typewriter way. The full travel, light pressure keys give a positive reliable action, better for both the amateur and experienced typist.

To use the Atom immediately you just connect the power supply and a cable into the aerial socket of a television set. Any UHF colour or monochrome set will do – the Atom doesn't harm them at all.

The Atom has an initial 2K of RAM and 8K of ROM but of course this can be boosted enormously. The standard computer has Basic and Assembler (machine code) graphics and sound output, with direct cassette and TV interface. (See further for list of specifications.) Basic is the language used by Atom and is indeed the language used by most personal computers. The Basic used has all the normal functions you would expect plus many powerful extensions making it easier for you to operate and write your own programs. In personal computer terminology 'powerful' means the machine works harder cutting down the amount of information that you would otherwise have to type in.

How your Acorn Atom grows

Internally

Both screen and program memory can be expanded in 1K blocks up to 12K total, and the fixed memory can be added to in two blocks of 4K. One is the 4K floating point arithmetic package. The printer interface requires the addition on board of a 6522 and buffers.

The PAL encoder module when fitted allows full colour output to a domestic colour TV although a simple modification allows direct connection to a colour monitor without a PAL encoder.

Externally

The most exciting addition however is the communication module which fits inside the case and allows high speed communication to other systems which can be anything from an Acorn System One to an IBM 370 and what's more any number of other Atoms. Designed for classroom use where, for example, twenty Atoms may be linked both to each other and to the teacher's system. The teacher can take control of any keyboard and display for instruction purposes, and can link any pupil to a printer or disc storage facility. In the home or laboratory however, this module may be used to control substations such as System I with any of the Acorn interface modules.

nb. Existing owners of Acorn systems may use the tape interface as a simple communication line to and from the Atom.

Technical Description — Hardware

Memory: From 2K to 12K RAM on board (in steps of 1K) up to 40K including external memory. From 8K to 16K ROM (two 4K additions).
Processor: 6502 with 1 Mc/s clock.
Video Display Generator: 6847 generates video signals for 8 different modes including: high resolution graphics (256 x 192), Red, green, and blue graphics up to resolution of 128 x 192, and mixed ASCII characters and semigraphics.
PIA: 8255 provides keyboard scan, cassette I/O port (one used for printer output) plus a wide range of serial I/O functions and dual timers.
Cassette Interface: CUTS 300 baud, involves minimum hardware (zero crossing detector input and output from timer) to allow user to redefine tape routine to virtually any speed or standard.
Loudspeaker: Driven from 8255 via buffer allowing software tone generation of any frequency.
B/W Video Output: To monitor.
UHF Modulator Output: Channel 36 domestic T.V.
Bus Output: Fully buffered address and data bus plus internal connections for one Acorn Eurocard.
Power Requirement: Minimum system: 8 volts @ 800mA (from Atom power unit feeding internal regulator). Maximum system: 5V @ 1.8A from external regulator supply.

Technical Description — Software

Atom basic: 32-bit arithmetic (±2,000,000,000), High speed execution, 43 standard and extended BASIC commands, Variable length strings (up to 256 characters), String manipulation functions, 27 32-bit integer variables, 27 additional arrays, Random number function, PUT and GET bytes, words and strings to and from files, WAIT command for timing, DO-UNTIL construction, Commands may be abbreviated for economy, Multiple statements per line, Logical operators (AND, OR, EX-OR), LINK to machine code routines, Numbers can be input and printed in hexadecimal, Symbolic labels for fast branches and subroutine calls, Powerful indirection operators (?,!), Graphics facilities to draw points and lines, 16 PLOT commands, MOVE and DRAW.
Assembler: Mnemonic Assembler for machine code programming, Formatted listing, Assembler and BASIC may be combined. Standard 6502 mnemonics, Provides symbols, automatic resolution of forward references, Macro-facilities, Breakpoints may be inserted for debugging.
VDU: 32 characters x 16 lines, Inverted characters, Automatic scrolling, Paged/Non paged modes, All control codes can be generated, Screen editing.
Operating System, CUTS cassette routines with checksum, Filenames up to 12 character, LOAD and SAVE BASIC and assembler programs or text files, Search (catalogue) routine, Software hook to optional disc drive and communication loop modules, Printer drive routines.
Optional Maths Software: Floating point maths functions to 9 digit accuracy including arithmetic, trigonometric and hyperbolic functions.
Optional Communication Software: Allows high speed bi-directional interface to other Atoms or peripherals, Allows transfer of control or data to other modules in loop.
Optional Utility ROM: Such as the ONLIBASIC extension for real time control of laboratory experiments.

Cassettes/Disks

Disks

High Performance Mini Floppy disks

- Made by Kybe corporation
- Anti static envelopes
- soft sectored
- single sided, single density
- free library cases (with 10 or more disks)
- labels and write protect tabs supplied

Prices	Nett	Vat	Total
one disk	3.00	0.45	3.45
ten disks	22.00	3.30	25.30
fifty disks	100.00	15.00	115.00
one hundred disks	180.00	27.00	207.00

Cassettes

Quality Microcomputer Cassettes.

- C15 Agfa Tape
- Special Labels
- Cellophane wrapped
- Precision transport mechanism
- Leaderless
- Insert Cards
- Screw fixing case
- Proven performance

Prices	Nett	Vat	Total
one cassette	0.80	0.12	0.92
box of ten cassettes	5.20	0.78	5.98
fifty cassettes	25.00	3.75	28.75
one hundred cassettes	45.00	6.75	51.75

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BOOKS

SYBEX BOOKS

Introduction to Personal and Business Computing by R. Zaks 4.90
A comprehensive yet simple introduction to the micro computer world for the potential user whether it be for home or business use.

Microprocessors – From Chips to Systems by R. Zaks 6.95
The basic text on micros for everyone with a technical or scientific background. This book teaches all the fundamentals of microprocessors step by step.

Microprocessor – Interfacing Techniques by R. Zaks 9.90
This comprehensive book introduces the basic interfacing concepts and techniques, then presents the implementation details from hardware to software.

Programming the 6502 by Rodnay Zaks 7.90
This book is an educational text designed to teach programming, using the 6502. It does not require any prior programming knowledge, yet can be used to advantage by anyone wishing to familiarize himself with the 6502. An invaluable book for owners of the PET, Apple, Kim etc.

6502 Applications Book 7.90
This book presents practical applications techniques for the 6502 ranging from a complete home alarm system to an industrial control loop for temperature control. Also includes analog to digital conversion and simple peripherals from paper-tape reader to micro printer.

Programming the Z-80 8.90
Another in the highly successful Sybex Series by Rodnay Zaks. This book combines the function of a teaching text, that Sybex do so well, with an extensive reference section. The book is much more than an introduction to the Assembly Language syntax of the Z-80.

SCELBI BOOKS

Understanding Micros by N. Wadsworth 7.90
If you are at all curious about small computers you must own this no-nonsense text which explains all the fundamental concepts behind the operation of virtually all microcomputers.

Calculating with BASIC 7.90
Here's a variety of programs in BASIC to help apply the language to practical problems. The book covers problems in finance, statistics, engineering, mathematics and electronics. Good descriptions and examples are provided with each program listing.

PIMS Personal Information Management System 7.45
This book is really a ready to use data base system in Microsoft BASIC with full instructions. An excellent starting point for your home applications.

OSBORNE BOOKS

Z-80 Assembly Language Programming 8.10
These books are assembly language primers in the "classical sense" – they treat assembly language as a means of programming a microcomputer system and are full of simple programming examples.

6502 Assembly Language Programming by Leventhal 8.20
Another fine manual in the Osborne Assembly Language series to join the best selling 8080, 6800 and Z-80 books.

PET and the IEEE 488 Bus (GPIB) by Fisher & Jenson 9.90
A book for instrument designers, scientists, programmers and hobbyists – which shows how you can have a low-cost versatile system that may be interfaced to any of hundreds of electronic instruments.

Introduction to Microcomputers by A. Osborne –Volume 0: The Beginners Book 5.90
If you know nothing about computers this is the book to begin with. It explains what computers are and describes their components.

Introduction to Microcomputers by A. Osborne –Volume 1: Basic Concepts 6.25
This book describes application techniques common to all microprocessors yet specific to none. All the basic hardware and software concepts are explained simply.

Introduction to Microcomputers – Osborne (September 1978 Edition) Volume 2 – Some Real Microprocessors 14.90
This 9" x 7" loose leaf format book covers every major microprocessor on the market. 4 bit to 16 bit in detail and analyses more than 20 CPUs. Includes new sections on the most recent entries into the microprocessor market. Describes support devices for use with only one microprocessor.

Volume 3 – Some Real Support Devices – loose leaf 10.90
A companion volume to volume 2. This describes the micro support devices which can be used with more than one microprocessor – including system buses.

Some Common BASIC Programs 7.90
Includes 76 short programs covering financial, mathematical, statistical and general interest subjects, all of which have been tested.

Z-80 Programming for Logic Design 6.25
These books describe the implementation of sequential and combinational logic using assembly language. They describe the meeting ground of the programmer and the logic designer and are written for readers in both fields.

ADDISON – WESLEY BOOKS

Artificial Intelligence by Winston 13.75
Artificial intelligence is concerned with extending the application of computers and gaining an understanding of the principles that make intelligence possible. This book designed for use in a course on artificial intelligence should prove invaluable to the newcomer to the topic as well as to the experienced as a reference text. Part one covers an introduction to the key ideas in the subject such as representation, symbolic constraint exploitation, search and control. Part two covers the LISP programming language and its use. The book is profusely illustrated.

Problem Solving and Structured Programming in BASIC by Koffman and Friedman 8.90
The book reflects the view that good problem solving and programming habits should be introduced at an early stage. Three separate phases of the solution are used:-
1) Specification of the algorithm using flow diagrams.
2) Analysis of the problem.
3) Implementation of the problem solution.

The Little Book of BASIC Style by Nevison 5.70
Structure style and correctness and maintainability are the attributes of good programming – they are getting much attention as well they should. When one considers what we invest in programs their manageability and efficiency become very important. In this book these concepts are explained along with 19 rules and many examples in BASIC to help improve your programming style.

A Guide to BASIC Programming by Spencer 8.80
A first course in BASIC for Scientists, Business people and Engineers. The book illustrates the application of the language with numerous examples which will be useful later in your BASIC programming career.

Introducing System Design by Squire 9.65
This book assumes some knowledge of computers and from this builds a review of the techniques used in system design through data base, security of the system and top down design. An important book for the student of business use of computers.

Software Tools by Kernigan and Plauger 8.15
This text is designed to emphasie Structured Programming and Top Down Design. It deals with filters, formatting, files, sorting, text patterns, editing and macro-processing.

BASIC and the Personal Computer by Dwyer & Critchfield 9.70
The authors provide a detailed presentation of BASIC and extended BASIC Included are many applications possible on any microcomputer. Readers are encouraged to think about personal computing in its widest sense, write programs and research new applications. A selection of projects appears at the end of each chapter. The book may be used as a self-study text or a course book.

Problem Solving and Structured Programming in FORTRAN by Friedman & Koffman 9.90
This book is designed for a short first course in computer programming. This book introduces the techniques of structured programming at a very early stage. The authors emphasize three distinct phases of problem solving. 1) the analysis of problem 2) the specification of an algorithm and 3) the language implementation of the algorithm.

A Course in APL with Application by Grey 9.70
This introductory text may be used by either the experienced computer user familiar with at least one general purpose language, or by the beginner with no previous programming experience. The presentation aims to show that APL is a refinement and enhancement of mathematics. Emphasis is placed on the use of APL as an ideal language for formulating and developing algorithms.

Programming in PASCAL by Grogono 6.90
This introductory language manual is an excellent start to one of the fastest growing programming languages today. The book is arranged as a tutorial containing both examples and exercises to increase reader proficiency with the language. Besides a chapter on procedures and files there are sections on dynamic data structures such as trees and linked lists. These concepts are put to use in an example of bus service simulation.

Programming a Microcomputer (6502) by Foster 7.20
This book will teach you how to program a microcomputer in machine language. Although designed specifically for the 6502 microprocessor used in the Kim 1, PET and the Apple. The basic principles involved apply to all computers.

The Computer – An Everyday Machine by Squire 8.40
This text puts the data processing computer in perspective, introduces it as a tool that can be used and understood by anyone. The approach is to take a simple problem, analyse it and then solve it using a hypothetical language and a computer consisting of the simplest possible units. The book is an excellent introduction to the computer as used by large scale businesses. The author is a systems engineer with IBM Canada and provides her own interesting perspective. The book is widely used by business management students as their first introduction to computers.

The Art of Computer Programming Volume 1 – Fundamental Algorithms by Knuth 9.90
This is the first book in this world wide best selling series and thought by many as the best books of their type available. Volume 1 begins with a thorough review of the mathematical techniques used, although it does not assume mathematics above high school level in the reader. It goes on to review assembly level programming and ends with a 200 page review of information structures. The book contains numerous exercises.

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The Art of Computer Progamming Volume 2 – Semi-Numerical Algorithms by Knuth 16.40
This book covers random numbers, random sequences, statistical tests, floating point arithmetic, multiple precision arithmetic, polynomials etc. This book offers a comprehensive interface between existing knowledge of computer programming and numerical analysis including a substantial amount of complexity and number theory statisics. It assumes 'A' level mathematics capability.

The Art of Computer Programming Volume 3 – Searching and Sorting by Knuth 20.40
This text is by far the most comprehensive survey of these computer techniques ever published. The material is presented such that the general principles are applicable to a wide range of problems. Some knowledge of computer techniques and elementary calculus is assumed.

CREATIVE COMPUTING BOOKS

BASIC Computer Games by Daivd Ahl 5.45
The first collection of games all in BASIC. Contains both a complete listing and a sample run of each game along with a descriptive write up.

More BASIC Computer Games by David Ahl 5.45
This is the sequel to the best selling "BASIC Computer Games". 84 fascinating and entertaining games for solo or group play. All games are complete with a program listing in BASIC, a sample run and a description. Standard Microsoft BASIC is used throughout and the programs are simple to use with almost all microcomputers.

WELLER BOOKS

Practical Microcomputer Programming with the Z-80 by Weller 19.50
18 chapters of solid accurate programming information. Debugging techniques, interrupt modes, array and table handling, number base conversation, floating point arithmetic, programmed input/output stackpointer usage. The book includes an editor assembler listing for Z-80 and 8080. If you return the coupon at the back of the book you receive either paper tape or TRS 80 cassette of the object code for the assembler.

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Written for the beginner in the computer field. All the basic concepts and characteristics of microcomputers are explored and explained.

Getting Acquainted with Micros by L. Frenzel 6.90
Learn about microcomputers in an effective low cost manner. The essential information contained in this book has been compiled especially for Engineers, Technicians and Scientists but is equally invaluable to the layman.

Computer and Programming Guide for Engineers by D. Spencer 9.10
Written specifically for the Engineer or Scientist, this book explains what a computer is, how it works and how it can be used to the best advantage. Details FORTRAN and BASIC programming.

TTL Cookbook by D. Lancaster 7.10
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A comprehensive guide to low cost television display of alpha-numeric and graphics data for microprocessor systems word processing, TV titling and video games.

Cheap Video Cookbook by D. Lancaster 4.90
A complete guide to super low cost alphanumeric and graphic microprocessor based video displays – this book picks up where the TV Typewriter Cookbook ended.

How to Program Micros by W. Barden Jnr. 6.90
Explains assembly language programming of microcomputers based on the 8080, 6800 and 6502 microprocessors. Basic concepts, number systems and operations, computer operation and codes are examined.

Z-80 Microcomputer Handbook by W. Barden Jnr. 6.90
This book provides essential information on Z-80 technology and is organised into three sections: Hardware, software and microcomputers built around the Z-80.

Microcomputers for Business Applications by W. Barden Jnr. 7.10
This book will prove invaluable to a potential buyer of a business microcomputer system – helping him to select the best system for his particular needs. The micros discussed range from spin-offs of hobbyist computers to complete "turnkey" systems with customised software.

The S-100 and Other Micro Buses by Poe and Goodwin 5.10
This book is about buses and after acquainting the reader with bus basics moves on to detail the eleven most widely used bus systems.

BASIC Primer by Waite and Pardee 6.90
This book is exactly what it says it is – on top of this it also includes 7 appendices to help you optimise your code for speed or memory use. Finally at the back is a reference card which you will keep in your pocket during the rest of your BASIC programming career.

Z-80 Microprocessor Programming and Interfacing Volume 1 by Nichols and Rony 7.70
This book is the first of a two volume series on the Z-80. It covers programming at the assembly and machine language level for the Z-80. Book 2 will cover interfacing. The books are laboratory oriented texts. The strong emphasis is on learning through experiment. This book requires no background in computers.

Z-80 Programming and Interfacing Book 2 by Nichols and Rony 8.45
Address interfacing digital circuits with the Z-80 CPU, PIA and CTC chip and progresses on from Book 1 (Interfacing) assuming the reader is familiar with the topics covered in Book 1.

Industrial Process Control System by Patrick and Fardo 8.90
Process control procedures, system concepts, components, industrial applications and study questions in a logical text book.

TRS-80 Interfacing by J. A. Titus 6.90
Requiring a good understanding of Level II BASIC, this book describes the signals available in the TRS-80 computer and their applications to the control of external devices. Experiments in the construction and use of some typical interfaces are included.

The Howard W. Sams Crash Course in Microcomputers by L. E. Frenzel 10.60
Written in a teach yourself format with study questions, this book provides a solid background in microcomputers quickly and effectively. All aspects from fundamentals and operating systems to programming and peripherals.

Computer Graphics Primer by M. Waite 8.90
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6502 Software Design by L. Scanlon 7.90
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A solid introduction to the Z-80 microcomputer and the EZ-80 chip. Simple construction of the EZ-80 microcomputer and several applications.

BUTTERWORTH BOOKS

Basic BASIC by J. Coan 6.45
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FORTRAN Fundamentals – A Short Course by Jack Steingraber 3.40
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Programming for Microprocessors by Andrew Colin (hardback) 3.40
This book has been written for those converting from other disciplines to the use of microprocessors. It is designed to allow fast progress to a useful working understanding of the application of microprocessors and includes sections on number representation.

Sargon: A Computer Chess Program by Dan and Kathe Spracklen 9.45
Here is the computer chess program that won first place in the first chess tournament at the 1978 West Coast Computer Faire. It is written in Z-80 assembly language using the TDL macro assembler. It comes complete with block diagram and sample printouts.

The Systems Analyst by J. Attwood (Hardback) 7.45
From the initial decisions whether or not to use a computer for a specific problem, to the actual installation of the completed system, the book covers the strategies, skills and techniques needed. Written without complex maths it is a step by step guide for people developir:g systems for the business world.

How to build a Computer-Controlled Robot by Tod Loofbourrow 5.90
Every step of the construction of "Mike" is explained with photographs and diagrams to direct you through the construction. The complete control programs for a robot are clearly written out. You may use the directions exactly as they are set forth in the book or as a basis for developing your own design. "Mike" can be built within the budget of the average hobbyist and the only technical requirement for building him as the ability to read and understand a circuit diagram.

How to Profit from your Personal Computer – Professional, Business and Home Applications by T. G. Lewis 5.45
Written for business people and computer hobbyists contemplating business applications, it shows how to put your computer to work for you. It describes common business applications such as accounting, handling payroll, managing inventory, sorting mailing lists and many others.

FORTRAN with Style 4.70
A little book to allow you to write professional and well laid out FORTRAN programs.

BASIC with Style 3.90
This type of book is sorely needed by us all as we develop our understanding of BASIC, so that we may adopt some of the disciplines needed to make robust readable programs.

Game Playing with BASIC by D. Spencer 5.45
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Problems for Computer Solution 5.10
821 problems are arranged by topic ranging from mathematical disciplines to science and business.

DILITHIUM BOOKS

Instant BASIC by G. Brown 7.15
Here for the microcomputer enthusiast is finally a book to teach you BASIC which slowly introduces new ideas in a non-mathematical context. Interspersed with amusing graphics this book is fun to use.

Beginning BASIC by P. Chirlian 7.45
An introduction to BASIC for beginners written in response to the author's children's needs for a really basic BASIC.

Starship Simulation by R. Garrett 5.40
Simulation is the name of the game and it can be done on a small computer.

32 BASIC Programs for the PET Computer by Rugg & Feldman 9.70
32 BASIC programs for the PET computer is precisely that. 32 fully documented programs that are ready-to-run on your Commodore PET 2001 computer. You also have the option of making a number of changes, as suggested, to these programs if you wish.

Introduction to TRS-80 Graphics by D. Inman 6.40
For some time now, graphic displays on microcomputers have been out of the reach of hobbyists because of their complexity and high cost. In this book the author will show you how, with a minimal knowledge of the BASIC computer language and your TRS-80 computer, you can create graphic displays that only a few years ago were the exclusive turf of the big computer owners. The book begins with the basics and works from line drawings through geometrics and right on up to moving figure animation and more advanced operations. A great handbook on computer graphics for microcomputer owners at all levels of experience.

How to make money with your Microcomputer by Townsend & Miller 5.70
The microcomputer system can be used as a "lever" to multiply your income and it is a tool of great power. It can do many jobs the individal cannot do at all also process routine jobs in much less time that you could do them by hand. The possibilities only limited by your own creativity. This book will give a start with dozens on money making ideas.

MICROSOFT (TM) BASIC by Knecht 6.70
A tell it all book for TRS 80 users. It presents an introduction and tutorial on programming in MICROSOFT BASIC. The concepts presented are illustrated with examples that actually run. By starting with the simplest and most commonly used commands and then progressing onto the more complex instructions. The author illustrates how the more powerful versions of the BASIC language can save time and effort. Only an understanding of Computer fundamentals is required for the users of this book and the language is applicable to most small systems including the Apple and the PET.

Peanut Butter and Jelly Guide to Computers by Jerry Willis 6.15
This book is a welcome relief from the jungle of jargon and technical terms which seem to thrive like twitch grass in the garden of personal computing. It is a book rich with details you need to know and written in a style which is easy to understand. It is an important book for the beginner to be read first. It also has a wealth of information for the expert.

COMPUSOFT BOOKS

Learning Level II BASIC by David Lien 11.00
This is the second excellent book by Compusoft Publishing in California. No TRS-80 owner can afford to miss this one.

The BASIC Handbook by David Lien 11.00
This is a machine independent reference text for the BASIC on most personal computers. It also shows the syntax for the new ANSI standard BASIC. It is the only book of its kind in print at present.

MISCELLANEOUS

Best of Micro – Volume I 5.45
Micro is the best known and most widely read of the specialist journals dealing with the 6502 microprocessor as used in the PET, Apple, Aim, OSI, Computhink Minimax, etc. "Best of Micro" is a bound version of the first six issues.

Best of Micro – Volume 2 6.45
This is the bound version of the second six issues of Micro up to mid 1979.

The Mighty Micro by Chris Evans 5.75
This is the book written out of the well-known ITV series giving a more positive view perhaps than Adam Osborne's book.

SIGMA BOOKS

Computer Programs that Work by Lee, Beech and Lee 3.95
This book contains twenty four programs in BASIC in the areas of biology, mathematics, chemistry and physics and includes simulations of real-life situations and popular games.

Z-80 Instant Programs (Nascom) 7.50
These machine code routines can be entered in to a Z-80 system etc. and are applicable to even the smallest machines. The routines average 1000 instructions.

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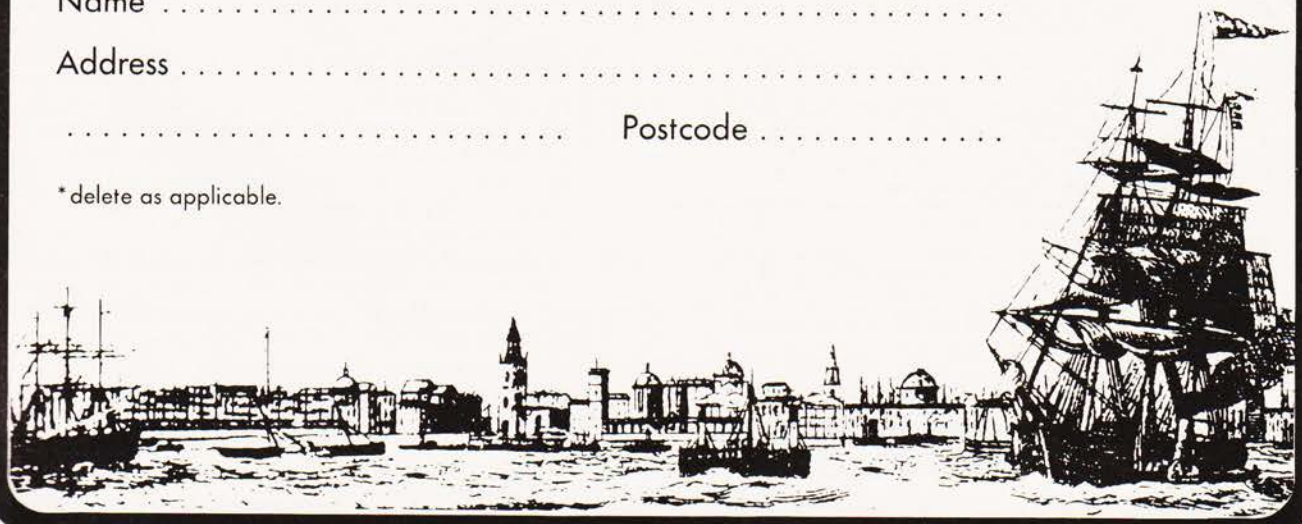

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Tony Lacy

USER KEYS FOR TRS-80

Save Tandy typing time! Pre-define your keys for single key programming.

User definable keys can be a great labour saver when typing in vast screeds of program. This utility is designed for the TRS 80, Level 2 with 16K and allows the user to call up strings of characters by a single keystroke. The main areas of relief will be in BASIC programming where there are GOTOs, DATAs etc. and the user is not a 'touch typist'.

Program Operation

To load the software into a Level 2 machine you should answer the 'MEM SIZE' query with 32031 and then get into SYSTEM mode. Now load the tape and press the 'slash' symbol (/) followed by ENTER. A ready prompt will now appear and you may carry on as normal until you wish to define a key.

If your system is disc based, load and run the program as a CMD file. When the DOS ready appears you can enter BASIC mode and specify the memory size as 32031 and then carry on as normal.

Key Definition

Having reached this stage you may now define one or all of the following shifted keys; Z, X, C, V, B, N, M. To initiate the process type shifted @ and the following prompt will appear:-

[Z →

This means that the shifted Z character may now be defined. You may now enter a string of characters, GOTO, CLOAD etc., or even a whole line of program if it appears often enough. Up to 63 characters may be included in the string but the only editing available is backspacing and re-typing so be careful.

When you have finished type shifted @ again and the 'define end' prompt ( ]) will appear. Also displayed will be the next character define prompt ([X→). If you have reached the end of your list of required strings simply keep hitting the shifted @ until you get back to the normal BASIC mode. Although it may sound a little complicated it is actually very easy to do, and well worth the effort. You can use the ENTER as a character with care, it appears as a down arrow (↓) but it is suggested that you use it as the last item in a string. RUN and INPUT commands may also be used but similar care must be taken in their input or funny things will happen.

Key Use

To extract the pre-defined function from a programmed key simply press shift and the required key. The previously stored function will now appear as though you had just typed it. If it is a line of program and ends with the ENTER key it will automatically become part of the program being entered. If the system is in COMMAND mode and the last character is ENTER then the function will be executed immediately. For example try the function given below.

[Z→FOR X=1 TO 50:PRINT"TEST";:NEXT ↓]

To execute simply press shifted Z.

Getting The Utility In

Both a full assembler listing and a Hex dump are given, if you have only T-BUG then this can be keyed in using the M command and the dump. If you are using Level 2 BASIC remember to change the exit from INIT. You can now produce a system tape with the command P-7D00-7DF2-7D00-KEYDEF

If you have an Editor/Assembler you can type in the full source listing and produce a system tape or you can reassemble to a different location to suit your needs. Don't forget though that the program needs about ½ K of RAM as a storage area. Fortunate owners of the APPARAT disc based Editor/Assembler will be able to reverse disassemble into a CMD file.

Program Notes

Although the source code listing is well commented, here are a few more. The INIT segment takes the current keyboard operation and stores it in KBRD to allow normal functioning when the program is running. If you manage to overwrite this you have problems because the keyboard vector will be lost and the only way out is RESET! The rest of the program can be divided into three main blocks: —

NORMAL gets a keyboard character and tests it for either a define command (shifted @) or a defined character (shifted Z-M).

DEFUSR looks at TABPTR to see which key is to be defined and then calls POINT to get the associated buffer location into BUFFPT. It then inputs characters from the keyboard into this buffer via INBUFF until either shifted @ is entered or the buffer limit is reached.

START is the opposite of DEFUSR, it looks up the defined key in TABLE and calls POINT to find out where the appropriate string is located. It keeps looping and outputting characters until either an end of string or an end of buffer marker is found. The routine then returns to normal keyboard operation

That is basically all there is to the program, doubtless modifications can be made to suit individual requirements but that's half the fun of utility programs!

```
7D00                    00010           ORG   7D00H:NO NEED TO PROTECT
                        00020                 :INIT WITH MEM SIZE
                        00030                 :SINCE IT IS ONLY USED
                        00040                 :ONCE.
7D00 2A 16 40           00050   INIT    LD    HL,(4016H):REVECTOR
                                              KEYBOARD
7D03 22 E1 7D           00060           LD    (KBRD+1),HL:DRIVER BLOCK
7D06 21 21 7D           00070           LD    HL,START
7D09 22 16 40           00080           LD    (4016H),HL
7D0C 0E 07              00090           LD    C,7:NOW STAKE OUT THE
                                              BUFFER
7D0E 21 F1 7D           00100           LD    HL,BSTART:BUFF,ADDRESS
7D11 06 3F              00110   LOOP2   LD    B,63:AREA
7D13 AF                 00120   LOOP3   XOR   A
7D14 77                 00130           LD    (HL),A:FILL IT WITH NULLS
7D15 23                 00140           INC   HL
7D16 10 FB              00150           DJNZ  LOOP3
7D18 3D                 00160           DEC   A:A=0FFH
7D19 77                 00170           LD    (HL),A:END BUFFER MARKER
7D1A 23                 00180           INC   HL
7D1B 0D                 00190           DEC   C
7D1C 20 F3              00200           JR    NZ,LOOP2
7D1E C3 2D 40           00210           JP    402D:FOR DOS, 1A19H FOR
                        00220                 :L2 BASIC
                        00230                 :RESERVE MEMORY FROM HERE
                                              ON
7D21 3A EB 7D           00240   START   LD    A,(STATUS):DUMPING A
                                              STRING?
7D24 B7                 00250           OR    A
7D25 28 14              00260           JR    Z,NORMAL:NO SO AS NORMAL
```

USER KEYS FOR TRS-80

```
7D27 2A EE 7D   00270          LD   HL,(BUFFPT):TO GET NEXT CHR
7D2A 7E         00280          LD   A,(HL):INTO A
7D2B B7         00290          OR   A:AT THE END?
7D2C 28 09      00300          JR   Z,STREND:OF THE STRING
7D2E 3C         00310          INC  A:END OF BUFFER?
7D2F 28 06      00320          JR   Z,STREND
7D31 3D         00330          DEC  A:RESTORE ITS VALUE
7D32 23         00340          INC  HL:FOR NEXT ONE
7D33 22 EE 7D   00350          LD   (BUFFPT),HL
7D36 C9         00360          RET  :WITH THE CHR TO BE PRINTED
7D37 32 EB 7D   00370 STREND   LD   (STATUS),A: BACK TO NORM
7D3A C9         00380          RET  :WITH A NULL
7D3B CD E0 7D   00390 NORMAL   CALL KBRD:GET A CHR
7D3E FE 60      00400          CP   96:IS IT A DEF USR?
7D40 28 2A      00410          JR   Z,DEFUSR
7D42 E5         00420          PUSH HL
7D43 C5         00430          PUSH BC
7D44 21 E3 7D   00440          LD   HL,TABLE
7D47 01 07 00   00450          LD   BC,7:SET UP RGS FOR LOOKUP
7D4A ED B1      00460          CPIR :IS IT IN THE TABLE
7D4C 2B         00470          DEC  HL:ADJ FOR CPIR
7D4D CC 53 7D   00480          CALL Z,POINT
7D50 C1         00490          POP  BC
7D51 E1         00500          POP  HL
7D52 C9         00510          RET  :NOT IN TABLE SO CARRY ON
7D53 B7         00520 POINT    OR   A:THIS SUBR. CONVERTS FROM
7D54 01 E3 7D   00530          LD   A BC,TABLE:TABLE INDEX INTO
7D57 ED 42      00540          SBC  A HL,BC:BUFFER POINTER
7D59 06 06      00550          LD   B,6
7D5B 29         00560 LOOP     ADD  HL,HL
7D5C 10 FD      00570          DJNZ LOOP
7D5E 01 F1 7D   00580          LD   BC,BSTART
7D61 09         00590          ADD  HL,BC:STRING ADDR IN HL
7D62 3E 01      00600          LD   A,1:CHANGE STATUS FOR
7D64 32 EB 7D   00610          LD   (STATUS),A:A STRING DUMP
7D67 22 EE 7D   00620          LD   (BUFFPT),HL:INDEX INTO BUFF
7D6A AF         00630          XOR  A:RET WITH A NULL
7D6B C9         00640          RET
7D6C 21 E3 7D   00650 DEFUSR   LD   HL,TABLE:FIRST CHR IN TABLE
7D6F 22 EC 7D   00660          LD   (TABPTR),HL:TABLE POINTER
7D72 CD 53 7D   00670 DEF2     CALL POINT:TO FIRST CHR
7D75 3E 0D      00680          LD   A,13:LINE FEED CARRIAGE RET
7D77 CD 33 00   00690          CALL 33H:DISPLAY IT
7D7A 3E B7      00700          LD   A,183:START DEF PROMPT
7D7C CD 33 00   00710          CALL 33H
7D7F 2A EC 7D   00720          LD   HL,(TABPTR):FOR DISPLAY
7D82 7E         00730          LD   A,(HL)
7D83 CD 33 00   00740          CALL 33H
7D86 3E 5E      00750          LD   A,94:LITTLE ARROW
7D88 CD 33 00   00760          CALL 33H
7D8B 2A EE 7D   00770          LD   HL,(BUFFPT):FOR BUFFER LOAD
7D8E E5         00780 GETONE   PUSH HL:GET CHR FROM KBRD
7D8F C5         00790          PUSH BC
7D90 CD E0 7D   00800          CALL KBRD
7D93 C1         00810          POP  BC
7D94 E1         00820          POP  HL
7D95 B7         00830          OR   A
7D96 28 F6      00840          JR   Z,GETONE:NULL SO GET
                               ANOTHER
7D98 FE 08      00850          CP   8:BACKSPACE?
7D9A 28 25      00860          JR   Z,BACK
7D9C FE 60      00870          CP   96:IS IT A TERMINATER?
7D9E 20 28      00880          JR   NZ,INBUFF:LOAD THE BUFFER
7DA0 7E         00890          LD   A,(HL)
7DA1 3C         00900          INC  A:END OF BUFFER?
7DA2 28 02      00910          JR   Z,FIN:NO END MARKER THEN
7DA4 AF         00920          XOR  A:ZERO:END OF STRING
                               MARKER
7DA5 77         00930          LD   (HL),A
7DA6 3E BB      00940 FIN      LD   A,187:END DEF PROMPT
7DA8 CD 33 00   00950          CALL 33H
7DAB 2A EC 7D   00960          LD   HL,(TABPTR)
7DAE 23         00970          INC  HL:FOR NEXT DEFINITION
7DAF 22 EC 7D   00980          LD   (TABPTR),HL
7DB2 7E         00990          LD   A,(HL)
7DB3 FE FF      01000          CP   0FFH:END OF TABPTR MARKER
7DB5 20 BB      01010          JR   NZ,DEF2
7DB7 3E 0D      01020          LD   A,13
7DB9 CD 33 00   01030          CALL 33H
7DBC AF         01040          XOR  A:NULL
7DBD 32 EB 7D   01050          LD   (STATUS),A:NOT A DUMP
7DC0 C9         01060          RET
7DC1 2B         01070 BACK     DEC  HL
7DC2 7E         01080          LD   A,(HL)
7DC3 3C         01090          INC  A:IS IT A BUFFER
7DC4 28 17      01100          JR   Z,FORWRD:DELIMITER?
7DC6 2B         01110          DEC  HL:BACK AGAIN
7DC7 3E 08      01120          LD   A,8:TO DISPLAY THE
                               BACKSPACE
7DC9 18 0D      01130          JR   VID
7DCB 4F         01140 INBUFF   LD   C,A:NOW LOAD THE CHR
7DCC 7E         01150          LD   A,(HL):TEST FOR END OF BUFF
7DCD 3C         01160          INC  A:IS IT 0FFH?
7DCE 28 BE      01170          JR   Z,GETONE:IF SO BUFFER FULL
7DD0 79         01180          LD   A,C:GET CHR TO BE LOADED
7DD1 77         01190          LD   (HL),A:INTO A
7DD2 FE 0D      01200          CP   13:IS IT AN ENTER?
7DD4 20 02      01210          JR   NZ,VID:NO SO DISPLAY AS
                               NORM
7DD6 3E 5C      01220          LD   A,92:SUBSTITUTE DOWN
                               ARROW
7DD8 E5         01230 VID      PUSH HL
7DD9 CD 33 00   01240          CALL 33H
7DDC E1         01250          POP  HL
7DDD 23         01260 FORWRD   INC  HL:BUMP POINTER
7DDE 18 AE      01270          JR   GETONE
7DE0 C3 00 00   01280 KBRD     JP   0:JUMP PUT HERE BY INIT
7DE3 7A         01290 TABLE    DEFB 122:THIS IS A TABLE OF USER
7DE4 78         01300          DEFB 120:DEFINABLE CHARACTERS
7DE5 63         01310          DEFB 99
7DE6 76         01320          DEFB 118
7DE7 62         01330          DEFB 98
7DE8 6E         01340          DEFB 110
7DE9 6D         01350          DEFB 109
7DEA FF         01360          DEFB 0FFH:END MARKER
7DEB 00         01370 STATUS   DEFB 0:NORMAL=0, DUMP=1,
                               START AT 0
7DEC 00 00      01380 TABPTR   DEFW 0:DEFINE@ CHR CURRENTLY
                01390          :BEING LOADED OR DUMPED
7DEE F1 7D      01400 BUFFPT   DEFW BSTART:BUFFER POINTER
7DF0 FF         01410          DEFB 0FFH
7DF1 00         01420 BSTART   DEFB 0
                01430          :THIS IS WHERE THE USER
                               DEFINITIONS
                01440          :ARE STORED
                01450          :A NULL AT START OF EACH
                01460          :BUFFER AND 0FFH BETWEEN
7D00            01470          END  INIT
00000 TOTAL ERRORS
```

The complete source code for the utility program.

Routine Start Locations

```
BACK    7D C1   01070 00860
BSTART  7D F1   01420 00100 00580 01400
BUFFPT  7D EE   01400 00270 00350 00620 00770
DEF2    7D 72   00670 01010
DEFUSR  7D 6C   00650 00410
FIN     7D A6   00940 00910
FORWRD  7D DD   01260 01100
GETONE  7D 8E   00780 00840 01170 01270
INBUFF  7D CB   01140 00880
INIT    7D 00   00050 01470
KBRD    7D E0   01280 00060 00390 00800
LOOP    7D 5B   00560 00570
LOOP2   7D 11   00110 00200
LOOP3   7D 13   00120 00150
NORMAL  7D 3B   00390 00260
POINT   7D 53   00520 00480 00670
START   7D 21   00240 00070
STATUS  7D EB   01370 00240 00370 00610 01050
STREND  7D 37   00370 00300 00320
TABLE   7D E3   01290 00440 00530 00650
TABPTR  7D EC   01380 00660 00720 00960 00980
VID     7D D8   01230 01130 01210
```

```
7D00 2A 16 40 22 E1 7D 21 21 7D 22 16 40 0E 07 21 F1
7D10 7D 06 3F AF 77 23 10 FB 3D 77 23 0D 20 F3 C3 2D
7D20 40 3A EB 7D B7 28 14 2A EE 7D 7E B7 28 09 3C 28
7D30 06 3D 23 22 EE 7D C9 32 EB 7D C9 CD E0 7D FE 60
7D40 28 2A E5 C5 21 E3 7D 01 07 00 ED B1 2B CC 53 7D
7D50 C1 E1 C9 B7 01 E3 7D ED 42 06 06 29 10 FD 01 F1
7D60 7D 09 3E 01 32 EB 7D 22 EE 7D AF C9 21 E3 7D 22
7D70 EC 7D CD 53 7D 3E 0D CD 33 00 3E B7 CD 33 00 2A
7D80 EC 7D 7E CD 33 00 3E 5E CD 33 00 2A EE 7D E5 C5
7D90 CD E0 7D C1 E1 B7 28 F6 FE 08 28 25 FE 60 20 2B
7DA0 7E 3C 28 02 AF 77 3E BB CD 33 00 2A EC 7D 23 22
7DB0 EC 7D 7E FE FF 20 BB 3E 0D CD 33 00 AF 32 EB 7D
7DC0 C9 2B 7E 3C 28 17 2B 3E 08 18 0D 4F 7E 3C 28 BE
7DD0 79 77 FE 0D 20 02 3E 5C E5 CD 33 00 E1 23 18 AE
7DE0 C3 00 00 7A 78 63 76 62 6E 6D FF 00 00 00
```

A Hex dump for quick reference, and people without an Editor/Assembler.

Note:- Change 7D1F from 2D to 19 and change 7D20 from 40 to 1A if using Level 2 BASIC. It should also be remembered that at least ½ K of RAM is needed after the program end for string storage.

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WEYFRINGE

T.L. Lusty

Solving the riddle of Hardy's Taxi leads to permutation and hashing!

Looking at the title of a newly published book, 'Computer Programming for the Complete Idiot' led me to wonder if we computer enthusiasts do ourselves justice. After all the author of APL (A Programming Language) could hardly be accused of over-selling the product, and LISP does not conjure up a picture of crystal clear communication! Would the current controversy over BASIC be as heated if it had been called BEST (Beginners Easy Symbolic Translator). Having said all that I now find myself in the position of hoping that you made a 'hash' of last month's problem. Perhaps I should run a contest on euphemisms!

An Extravagant Solution

The problem is not basically difficult, the computer can easily calculate cubes and combining these with previously generated values also poses few problems. All we must do is to find an efficient way of discovering whether or not a value has occurred before. The number of combinations rises dramatically as the number of cubes increase, as the following table shows:-

Number of cubes	Number of combinations
1	1
2	3
3	6
4	10
5	15

The sequence in the right hand column is our old friend the triangle numbers, assuming that we are able to combine a cube with itself. One possible way of solving our problem would be to compare each new combination with all those previously generated, but the time for this task increases as the list gets longer. Can we find a search routine where the time for each search remains constant?

The answer is that we can but that it only works if we have an inexhaustible supply of RAM. We must define an array with dimensions twice the size of the largest cube we intend to test and with all locations initially set to zero. Each time we generate a sum of two cubes we set the corresponding location to one unless it is already one when we know that a double has occurred. (eg. 3**2+5**2=9+25=34 set A(34)=1). Figure 1 shows the program for this method but note that, although it finds the solution in under 2 S, most of the array locations are still zero.

```
 99 REM** HARDY'S TAXI
130 DIM T%(5000),C(20)
140 S2=20000:C(1)=1:C(2)=8:C(3)=27:C(4)=64:
    C(5)=125
150 FOR N=6 TO 14:T=N*N*N:C(N)=T:IF T>S2
    THEN 180
160 FOR N1=1 TO N-1:C=T+C(N1):IF T%(C)=0
    THEN T%(C)=1:NEXT N1:NEXT N:END
170 S2=C:NEXT N1:NEXT N:END
180 PRINT S2;"IS THE NUMBER OF HARDY'S TAX-
    I":END

    1729 IS THE NUMBER OF HARDY'S TAXI
```

Fig.1. Superfast but vast!

Hashing

A technique which avoids much of this wasted space is known as "hash coding", which reduces the size of the gaps between entries. Hash coding may be defined in two stages.

1) Calculate an address from a suitable rule for the data used.

2) Try the specified location, and if it is already occupied move to the next location and try that.

The effectiveness of hash coding depends on the rule used to allocate a location. As far as possible the values are spread uniformly over the available locations. Then, whenever the location given by the rule is already occupied, the serial search needed to find an empty location will be quite short. As our values are numeric a simple rule is to use the remainder after division. If there are n locations available, we divide the value for the sum by n and then take the remainder. The remainder can then be used as the index to a location.

As an example, let's imagine that we have just 12 locations available, and that these locations are numbered 0 to 11. The following table shows how the first four cubes will combine and the index which our rule generates:-

Cubes	Total	Rem. mod 12
1+1	2	2
8+1	9	9
8+8	16	4
27+1	28	4
27+8	35	11
27+27	54	6
64+1	65	5
64+8	72	0
64+27	91	7
64+64	128	8

The diagram below gives the state of the array just before the fourth entry. The remainder for 28 is 4, the same as that for 16, and the position in the array is already occupied. We therefore move on to the first unoccupied location and put 28 in location 5.

Location 0	0
Location 1	0
Location 2	2
Location 3	0
Location 4	16
Location 5	0
Location 6	0
Location 7	0
Location 8	0
Location 9	9
Location 10	0
Location 11	0

28

Figure 2 gives the flowchart for the algorithm to enter a number into the table, and you would be well advised to follow it with the other numbers if you are unsure of the method. The second program (Fig.3) shows a BASIC solution to the problem. I have made few attempts to keep it efficient as I wanted to extend the results to show the way hashing works as the problem progresses. Note the lines which effectively join the bottom of the array to the top, and the check which is included to ensure that the array has not been filled.

The speed of the hashing process depends on the amount of space allocated. The sparser the array the faster the method works. If the array becomes full then the method is as slow as the linear search, but used correctly it is a useful programming aid.

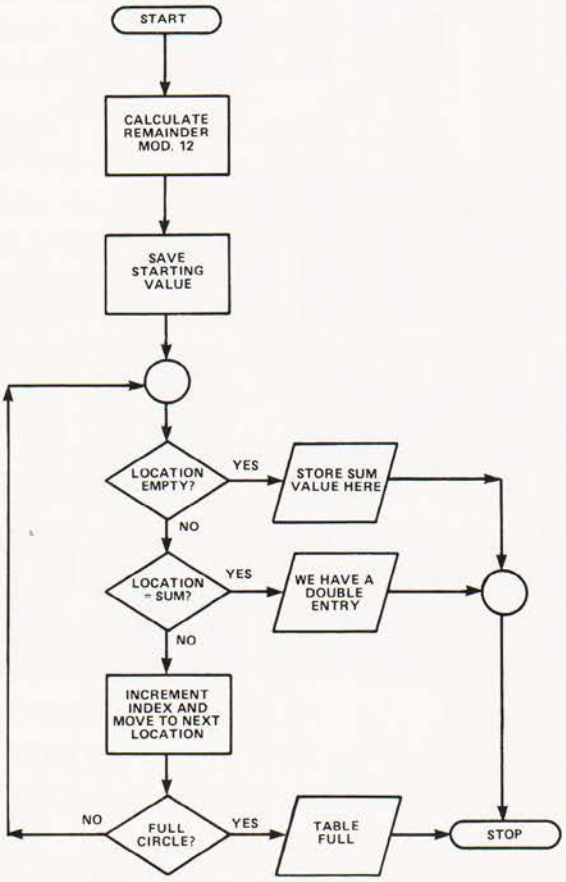

Fig.2. 'Entering a value' flowchart.

```
  1 REM **HARDY'S TAXI
  2 REM **ARRAY H IS THE HASH TABLE
  3 REM **ARRAY'S R1 & R2 STORE THE
  4 REM **FACTORS OF NUMBERS IN H.
  5 REM **ARRAY C STORES THE CUBES.
100 DIM H(1000),R1(1000),R2(1000),C(100)
110 PRINT "[CLS][REV]HARDY'S TAXI [OFF]":
    PRINT
120 PRINT "SUM OF    FIRST SET    SECOND SET"
130 PRINT "CUBES. OF FACTORS OF FACTORS":
    PRINT
139 REM **SET UP THE EASY CUBES
140 C(1)=1:C(2)=8:C(3)=27:C(4)=64:C(5)=125
149 REM **WORK THROUGH SUBSEQUENT CUBES
150 FOR N=6 TO 30:T=N*N*N:C(N)=T
158 REM **TEST SUM OF CURRENT CUBE
159 REM **WITH PREVIOUS VALUES
160 FOR N1=1 TO N:S=T+C(N1)
169 REM **CALCULATE HASHING VALUE
170 S1=INT(1000*(S/1000-INT(S/1000))+.5):
    S2=S1
179 REM **IS HASH LOCATION EMPTY
180 IF H(S1)=0 THEN H(S1)=S:R1(S1)=N1:R2(S1)
    =N:GOTO 250
188 REM **MOVE TO NEXT LOCATION
189 REM **IN HASH TABLE
190 IF S=H(S1) THEN 230
200 S1=S1+1:IF S1>1000 THEN S1=0
210 IF S1<>S2 THEN 180
220 PRINT "TABLE FULL":END
229 REM **PRINT A POSSIBLE VALUE
230 PRINT S;TAB(10);N1;"X";N;
240 PRINT TAB(23);R1(S1);"X";R2(S1):PRINT
249 REM **CONTINUE WITH NEXT CUBE
250 NEXT N1:NEXT N:END
```

SUM OF CUBES.	FIRST SET OF FACTORS	SECOND SET OF FACTORS
1729	1 X 12	9 X 10
4104	2 X 16	9 X 15
13832	2 X 24	18 X 20
20683	10 X 27	19 X 24

Fig.3. A rank of Taxis.

Permutation Problems

One of the problems which programmers often face is the job of debugging other people's software. I often come across interesting pieces of programming, and when I do I put them aside for further investigation. I can't remember where I picked up the following but it certainly proved interesting to analyse. The program finds all the permutations of the numbers 0 to 7. Can you:-

1) Find out how it works.

2) Improve the program by making it faster.

Please, please don't send in your answers to us as we only intend these as ideas for you to try at home. We reckon that we know the answers!

```
 99 REM** PERMUTATIONS.
150 DIM P(7,7),I(7)
160 LET N=7:M=1:P(0,0)=0
170 I(M)=0
180 FOR J=0 TO I(M)-1
190 P(J,M)=P(J,M-1)
200 NEXT J
210 P(I(M),M)=M
220 FOR J=I(M)+1 TO M
230 IF J>M THEN 250
240 P(J,M)=P(J-1,M-1)
250 NEXT J
260 IF M=N THEN 280
270 M=M+1:GOTO 170
280 FOR IZ=0 TO N
290 PRINT P(IZ,N);
300 NEXT IZ:PRINT
310 IF I(M)=M THEN 330
320 I(M)=I(M)+1:GOTO 180
330 IF M=1 THEN 350
340 M=M-1:GOTO 310
350 END
```

```
7 6 5 4 3 2 1 0
6 7 5 4 3 2 1 0
6 5 7 4 3 2 1 0
6 5 4 7 3 2 1 0
6 5 4 3 7 2 1 0
6 5 4 3 2 7 1 0
6 5 4 3 2 1 7 0
6 5 4 3 2 1 0 7
7 5 6 4 3 2 1 0
5 7 6 4 3 2 1 0
5 6 7 4 3 2 1 0
```

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James Bamber

As virtually every traditional game is computerised the reaction game of Snap has been no exception. Can you match the deft digits of your CPU?

This program is based on the INKEY$ function, which is I believe only found in the TRS-80 Level II BASIC. It will *not* be suitable for other BASICs. The INKEY$ function allows a character to be read from the keyboard whilst a program is running. The most usual use is in an infinite loop, e.g.

```
10 A$=INKEY$
20 IF A$<>""GOTO 40 ("" = Null String)
30 GOTO 10
40 (Continue program)
```

Program Usage

Using a FOR-NEXT loop to limit the time available to make an input, has obvious advantages for programmers of "real time" games. And of course the use of a random variable (line 2020) gives the chance effect required in a game like Snap.

```
10 FOR A=1 TO 1000
20 A$=INKEY$
30 IF A$<>""GOTO (Win or test routine)
40 NEXT A
50 (Continue with lose routine)
```

Late inputs are stored by the keyboard and would give the player an automatic win situation later in the game, if they were not trapped by a dummy INKEY$, Line 2010 for example.

The remainder of the program simulates the game of Snap using a standard pack of playing cards. It puts numbers 1 to 52 into Array A, shuffles them into Array B and deals them into Arrays C & D.

As the game progresses the "cards" are moved between Arrays, C,D & T, using variables YU, ME & T as counters.

Subroutine 1000 converts the numbers held by the arrays into strings A & B to give a presentable display, and allows comparison in line 2000. To adjust timings, "Snap" reaction time is line 2020 and the time each card is shown is the FOR-NEXT loop in 2070.

Note

It should be possible to use the GET command on systems that support it as a replacement for INKEY$. The major changes needed will then be the codes used in CHR$ statements to suit whatever code set is implemented on your computer.

```
 10 GOSUB 2250
 20 DIM A(52), B(52), C(52), D(52), T(52)
 30 [CLS]: PRINT CHR$(23) "SHUFFLING DECK":
    FOR A=1 TO 52
 40 A(A)=A
 50 NEXT
 60 P=52:N=1
 70 V=RND(52)
 80 IF A(V)≠0 GOTO 70
 90 B(N)=A(V)
100 A(V)=0
110 P=B-1:N=N+1
120 IF P<>0 GOTO 70
130 FOR A=0 TO 25
140 C(A+1)=B(A*2+1):D(A+1)=B(A*2+2)
150 NEXT
160 YU=26:ME=26:T=0
170 [CLS]:PRINT CHR$(23)
180 PRINT @ 0, "CARDS ON TABLE,";:PRINT
    @32,T;
190 PRINT @ 464, "OF"; :PRINT@494, "OF";
200 Y=16:FOR X=14 TO 54
210 SET (X,Y) SET (X+61,Y)
220 SET (X,Y+12):SET(X+61,Y+12)
230 NEXT
240 FOR Y=16 TO 28
250 SET(16,Y):SET(56,Y):SET(76,Y):SET(116,Y)
260 NEXT
270 PRINT@226,"YOU"; :PRINT@296, "ME";
280 PRINT@644, "CARDS LEFT";:PRINT @674,
    "CARDS LEFT";
290 PRINT @664, YU; :PRINT @694, ME;
300 IF YU=52 PRINT @832, "YOU WIN!! ";
302 IF YU=0 PRINT @832, "YOU'RE OUT OF
    CARDS!! I WIN.": GOTO 2210
304 IF YU=52 GOTO 2210
306 D=C(YU):GOSUB 1000
310 T(T)=C(YU):YU=YU-1:T=T+1
320 PRINT @ 522, A$;:PRINT @ 394, B$;:PRINT
    @ 664, YU;:PRINT @ 32,T;
330 GOSUB 2000
340 IF ME=52 PRINT @ 832, "I WIN!! ";
342 IF ME=0 PRINT @ 832, "I'M OUT OF CARDS!!
    YOU WIN. ": GOTO 2210
344 IF ME=52 GOTO 2210
346 D=D(ME):GOSUB 1000
350 T(T)=D(ME):ME=ME-1:T=T+1
360 PRINT@552, A$;:PRINT@424, B$;:PRINT@694,
    ME;:PRINT @ 32,T;
370 GOSUB 2000
380 GOTO 300
980 END
990 REM** STRING ASSIGN SUBROUTINE (DASHES
    INDICATE SPACES)
1000 E=INT(D/13)
1010 IF E=0 A$="-SPADES-"
1020 IF E=1 A$="-HEARTS-"
1030 IF E=2 A$="-CLUBS--"
1040 IF E=3 A$="DIAMONDS"
1050 IF E=4 A$="-SPADES-"
1060 F=D-E*13
1070 IF F=1 B$="--ACE---"
1080 IF F=2 B$="--TWO---"
1090 IF F=3 B$="-THREE--"
1100 IF F=4 B$="--FOUR--"
1110 IF F=5 B$="--FIVE--"
```

```
1120 IF F=6 B$="--SIX---"
1130 IF F=7 B$="-SEVEN--"
1140 IF F=8 B$="-EIGHT--"
1150 IF F=9 B$="--NINE--"
1160 IF F=10 B$="--TEN---"
1170 IF F=11 B$="--JACK--"
1180 IF F=12 B$="-QUEEN--"
1190 IF F=0 B$="--KING--"
1200 RETURN
1990 END:REM**VARIABLE SNAP ROUTINE
2000 IF B$<>C$ GOTO 2070
2010 D$=INKEY$
2020 I=25+RND(50)
2030 FOR A=1 TO I
2040 T$=INKEY$
2050 IF T$<>"" GOTO 2150
2060 NEXT:GOTO 2080
2070 C$=B$:FOR N=1 TO 350:NEXT:RETURN
2080 Z=T:C$=""
2090 PRINT@832, "I WIN";T;"CARDS!! ";
2100 FOR A=ME+T TO ME+1 STEP -1
2110 D(A)=T(Z)
2120 Z=Z-1
2130 NEXT:ME=ME+T:T=0:PRINT@32,T;
     :PRINT@694, ME;
2140 GOTO 340
2150 PRINT@832, "YOU WIN"; T; "CARDS!!";
     :Z=T: C$=""
2160 FOR A=YU+T TO YU+1 STEP -1
2170 C(A)=T(Z)
2180 Z=Z-1
2190 NEXT:YU=YU+T:T=0:PRINT@32,T;
     :PRINT@664,YU;
2200 GOTO 300
2210 FOR A=1 TO 500:NEXT:PRINT:INPUT"WOULD
     YOU LIKE ANOTHER GAME";D$
2220 IF D$ = "YES" RUN 20
2230 END
2240 REM **INSTUCTION ROUTINE
2250 [CLS]:INPUT"DO YOU NEED
     INSTRUCTIONS";D$
2260 IF D$<>"YES"GOTO 2340
2270 PRINT"THE OBJECT OF THE GAME IS TO PICK
     UP ALL THE CARDS,"
2280 PRINT "OR TO HAVE YOUR OPPONENT (THE
     COMPUTER), TO BE THE FIRST"
2290 PRINT "WITH NO CARDS LEFT. YOU WILL
     HAVE A LIMITED TIME,"
2300 PRINT "(OF VARIABLE LENGTH) TO PRESS THE
     SPACE BAR. WHEN BOTH"
2310 PRINT "CARDS HAVE THE SAME VALUE. IF
     YOU HIT THE SPACE BAR IN"
2320 PRINT "TIME, THE CARDS ON THE TABLE WILL
     BE ADDED TO YOUR HAND"
2330 INPUT "PRESS ENTER TO BEGIN"; D$
2340 RETURN
```


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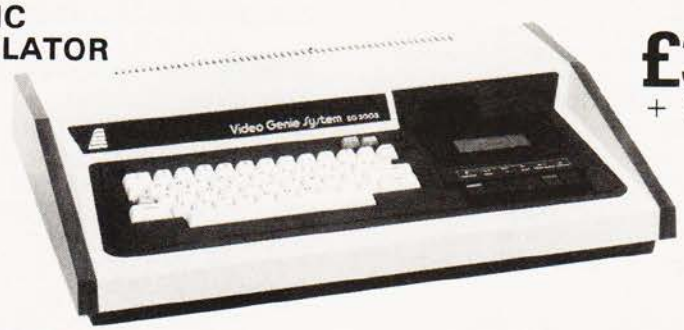

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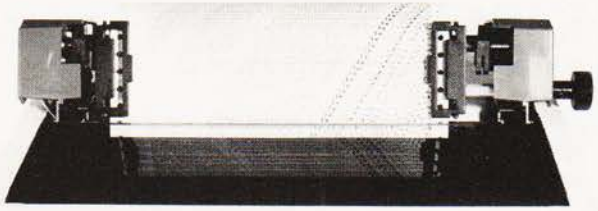

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Reviewing the attributes of a computer system occupies a considerable amount of time and effort. The main problems are to arrive at not only a judgement on how the system appears to the user, a subjective analysis, but also to find out what the processor is doing inside and the efficiency of these processes, the objective analysis. There are many ways to establish the efficiency of the computer and these are commonly called 'benchmarks'. Each set of these standard tests will try out some function or functions of the computer and produce a numeric measure of the operational efficiency.

In the microcomputer world the most commonly used tests are those introduced in 1977 by Kilobaud magazine in the States. Whilst they are by no means the most rigorous they do offer a quick and simple solution to the problem. In this article I shall present the tests and explain the various workings of the routines and also attempt to show why the results that you get are not always what you might have expected.

The Storage Problem

The series of Benchmark tests is designed to establish how quickly a micro, or indeed any computer, performs certain fundamental tasks whilst running the BASIC language. As there are many variations on the language these tests are completely non-specific, they should run on any version of BASIC. But not only do the various manufacturers use different dialects of the language they also use different methods of storing the variables that these programs use. This may not appear to be too much of a problem at first but if you look closer you can find just how much of a problem it is. Take, for example, two versions of the same computer that run two completely different versions of the language. The Triton in Level 4.1 (no longer available) runs an Integer BASIC whose numeric capacity is ±32767, a fairly common limit with these Integer only dialects. These numeric variables are stored as sixteen bit numbers, in other words they occupy two memory locations each. If we look at the level 7.1 version of BASIC that is offered with the machine we find the numeric range is $\pm 10 \times 10^{38}$ and these are stored as real numbers with a storage requirement of some five bytes each.

Without a great deal of mental effort it is obvious that the more bytes a variable occupies the longer it is going to take to process the information stored. The problems really arise when one is using what one imagines to be whole numbers on a machine that allows this kind of precision. What actually happens inside that friendly chunk of silicon is that you get rounding errors in the arithmetic because you are using more precision than you need, this can sometimes be seen with pocket calculators when you ask for the log and then the antilog of a large number. The human operator automatically removes these without thinking, the machine does not and so instead of manipulating nice whole numbers that occupy a small area of memory you start, without even realising that it's happening, to use decimal (real) numbers that take twice as much memory space and thus proportionately longer to process.

How does this affect you? Quite simple really because unless tests are done in a standard manner the results will not be comparable between one system and another. The classic example of the "problem machine" is the superb Hewlett Packard 85 which offers three stages of precision in its arithmetic and caused more than a few headaches.

The Processor Problem

This is a function of two factors, both intimately related. Obviously the speed of processing is dependent on the speed of the microprocessor's clock so that a Z80, for example, running BASIC at 2 MHz will be half as fast as the same program running on a Z80 at 4 MHz. As a rider to this problem we often find that the versions of BASIC, although they offer exactly the same facilities as each other, are written in different ways. Take for example an implementation of the Microsoft 8K BASIC written in Intel 8080 code. This will also run quite happily on a Z80 processor as the machine code is upwards compatible. If the language was re-written in Z80 code, however, it would be in a more efficient code and hence would probably run faster despite being apparently identical to the user.

These little quirks are the main causes of published results for any given machine being slightly different to other published results for the same machine. As I explain each test I shall try to define the way in which it should be run, or to be more exact the way in which we run them so that at least all our results are consistent with each other if not with other people's!

The Tests

There are eight Benchmarks in the series, the first seven should run on any system but the eighth does require the presence of mathematical functions and hence the ability of the machine to handle floating point (decimal) numbers. Each test should be run and timed ten times, we use an electronic stopwatch, and then averaged. Running a series of these tests soon proves that reviewers don't just spend an evening looking at the machine before writing the article, for example the New Brain results took some two and a half hours to do.

The first test is a simple loop program that sets up a FOR. . .NEXT loop of 1000 counts. The execution starts by printing an 'S' on the display and ends by printing an 'E'. This action is repeated throughout all the tests and the program line numbers are allocated to make the input of each a simple edit to the previous program. Timing is started when the S appears and finished when you get the E. These first three programs should all use integer only numbers and it is worth physically allocating the variables as integers as a test of the accuracy of the floating point BASIC but this should be done as a check and *not* as a series of results unless this is specified.

```
100  PRINT"S"
200  FOR K=1 TO1000
300  NEXT K
500  PRINT"E"
600  END
```

The intrinsic FOR. . .NEXT function incorporates a compare for the variable K being equal to 1000 and this program will run very quickly. As a direct comparison we have the second test which uses the comparison statement IF. This will execute more slowly because the function is not intrinsic, in other words it has to process the information on each loop rather than having the capability of look-ahead that FOR. . .NEXT has.

```
100  PRINT"S"
200  K=0
300  K=K+1
310  A=K/K*K+K-K
400  IF K < 1000 THEN 300
500  PRINT"E"
600  END
```

Our third test in the series simply adds a numeric calculation to the loop. The result of the calculation is assigned to a second variable, the time difference between these two is a direct function of the time taken to perform simple arithmetic.

```
100  PRINT"S"
200  K=0
300  K=K+1
310  A=K/K*K+K-K
400  IF K < 1000 THEN 300
500  PRINT"E"
600  END
```

Our next test uses numeric constants instead of variables. This test should run slightly faster than the previous one because there is less variable retrieval needed.

```
100  PRINT"S"
200  K=0
300  K=K+1
310  A=K/2*3+4-5
400  IF K < 1000 THEN 300
500  PRINT"E"
600  END
```

Benchmark five introduces a phantom subroutine call. The time of execution is dependent on the efficiency of the machine code implementation in that the return line address must be stored in order to allow execution to return to the right place. Bad implementations of the language will run this test slowly. On a good system the extra time taken should be minimal.

```
100  PRINT"S"
200  K=0
300  K=K+1
310  A=K/2*3+4-5
320  GOSUB 700
400  IF K < 1000 THEN 300
500  PRINT"E"
600  END
700  RETURN
```

Our sixth program introduces a delay into the subroutine call as well as initialising a DIMensioned array. Specifying memory requirements takes a certain time, dependent once again on the way in which the variables are to be stored.

```
100  PRINT"S"
200  K=0
250  DIM M(5)
300  K=K+1
310  A=K/2*3+4-5
320  GOSUB 700
330  FOR L=1 TO 5
340  NEXT L
400  IF K < 1000 THEN 300
500  PRINT"E"
600  END
700  RETURN
```

Our last 'universal' Benchmark reverts to using the array set up in the last test and fills this during the delay time. This program takes the longest to run of all the tests and it is well worth running a couple of dummy tries first or you might fall asleep!

```
100  PRINT"S"
200  K=0
250  DIM M(5)
300  K=K+1
310  A=K/2*3+4-5
320  GOSUB 700
330  FOR L=1 TO 5
335  M(L)=A
340  NEXT L
400  IF K < 1000 THEN 300
500  PRINT"E"
600  END
700  RETURN
```

The final test in the series was introduced as a test of the various numeric functions of the Interpreters. Because of this it may not run on certain machines equipped with only a Tiny BASIC. The timing results on this test are a direct function of the way in which the language programmer has produced the routines. A badly written logarithm calculation may cause the result time to appear very slow and it is worth testing each function that is available on the machine separately to establish both its accuracy and speed of operation.

```
100  PRINT"S"
200  K=0
300  K=K+1
330  A=K↑2
340  B=LOG(K)
350  C=SIN(K)
400  IF K < 100 THEN 300
500  PRINT"E"
600  END
```

Possibilities

Whilst every attempt is made to ensure that these programs will run on the majority of machines it is quite possible that some variants of BASIC will reject them. It is also reasonable to expect that there are other programs that will perform more rigorous tests of the language. The original Kilobaud tests are now some three years old and if anyone has a set of suggested replacements we would be glad to see them.

Suggestions as to the Benchmarking of individual CPUs have been made in the past but this is not a realistic task owing to the speeds of clocks and the many and varied instruction sets with their various pros and cons.

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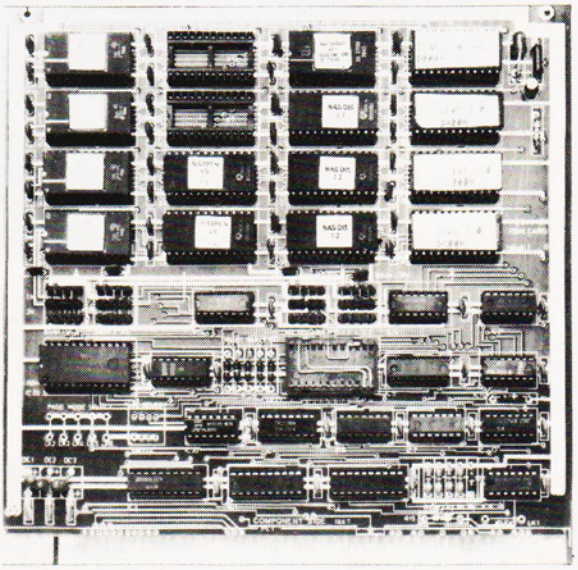

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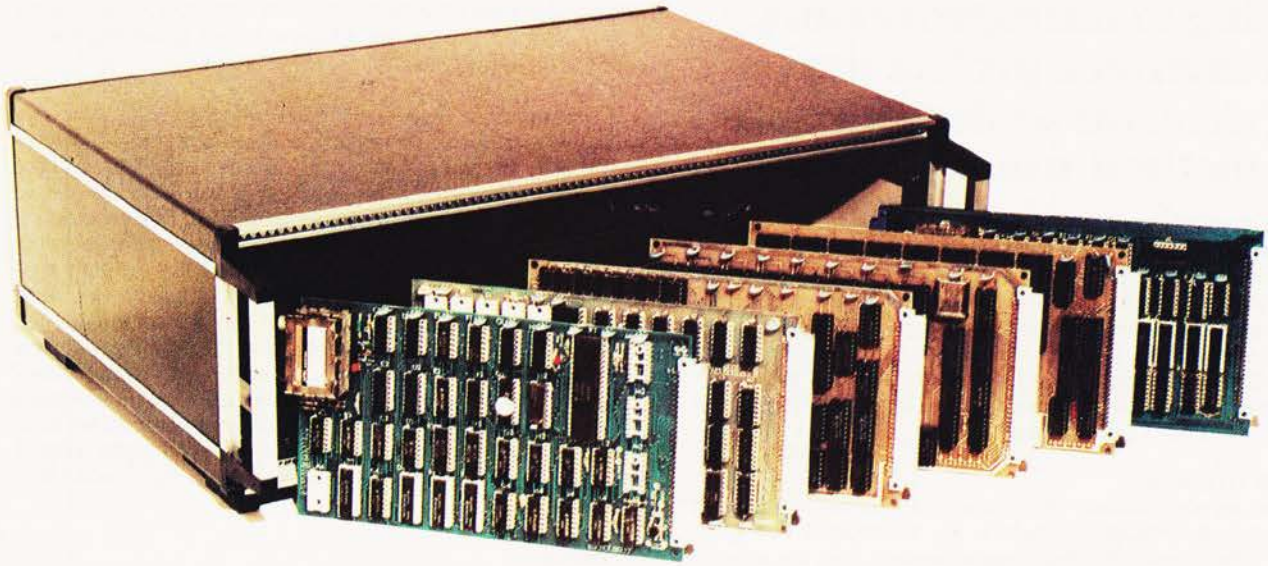

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Interruption is an often misunderstood method of talking to microprocessors. Our interface project uses a gas detector to demonstrate the method used.

This month we see how to construct an input interface based on the TGS gas sensor and show how this, and other input interfaces, can be made to interrupt the microprocessor while it is carrying out a program. The gas sensor is sensitive to a wide range of inflammable gases including coal gas, natural gas, hydrogen, acetylene, propane and butane. It is also sensitive to many inflammable vapours such as those of alcohols, petroleum and kerosene. Since it is also sensitive to inflammable gases in smoke, it can be used as a fire detector too.

The TGS Device

The sensor consists of a piece of specially prepared semiconductor material in which are embedded two electrodes. When combustible gases are present, they are adsorbed onto the semiconductor and its resistance decreases. The device has a heater filament incorporated to drive off adsorbed gases, so allowing the device to respond to changes in the amounts of gas present. Various types of sensor are available with differing sensitivities to different groups of gases.

Gas Interface

The circuit (Fig 1) shows the sensor wired in series with resistor R1. The heater had a separate power supply because the current it requires would almost certainly overload the voltage regulator of the microprocessor. The sensor used in the prototype operated on 1 — 1V5. Other types operate on higher voltages (e.g. 5 V). It is important to check the description in the supplier's catalogue to find the correct filament voltage. In tests, the heater can be powered from a dry cell or battery, but, if it is intended to use this interface as part of an alarm system, a mains-powered supply rated at 1A should be used.

When inflammable gases are present the resistance of the sensor falls and the falling voltage at A is fed to the non-inverting input of the operational amplifier (IC1). The inverting input is at a voltage determined by the setting of RV1; this is set fractionally less than the steady voltage at A when no combustible gases are present. As soon as gas is detected the voltage at A begins to fall. Since the '+' input now has lower voltage than the '−' input, the output of the op amp begins to fall. This falling output voltage is fed back to the '+' input, causing further fall. This positive feedback means that the output of the op amp falls very sharply at the slightest fall of voltage at point A. As output voltage falls, the LED turns off and Q1 is turned off. This causes the output to SC/MP to rise sharply from 0 V to +5 V. If the device is to be interfaced to a 6502, an additional transistor is required. Detection of gas causes this transistor (Q2) to be turned on, in effect grounding the interupt line on the MPU board.

Construction

The interface can be quickly built on a rectangle of stripboard (Fig 2). Remember to cut the copper strips beneath the board, where indicated. The amplifier is a CMOS device, so observe the usual precautions while handling it. Before soldering in the gas sensor refer to the supplier's catalogue or data sheet to check the pin arrangement. Some have 4 pins (like the early type used in the prototype), in which the filament acts as an electrode. In this case, one 'electrode' connection can be omitted (dashed line, Fig 2). Types 812 and 813 have 6 pins, the filament being entirely separate, and each end of each electrode has a pin. Figure 2 also shows how this type should be connected. Figure 3 shows the layout for interfacing to Mk-14. The additional transistor for interfacing to Acorn is shown in dashed lines. If this transistor is fitted, *omit* the wire link from P36 to S36 and insert a link from O36 to S36 instead.

Testing

Do this *before* connecting the output of the interface to the microprocessor system. Switch on the 5 V supply and the filament supply. If the sensor is new or has not been in use for some time, it will need to be heated for several minutes before its output voltage becomes steady. Now find the setting for RV1 so that the LED is on, but the slightest anti-clockwise turn makes it go off. Next take a piece of paper tissue moistened with 2 or 3 drops of lighter fuel, or kerosene (or even whisky) and hold it beside the sensor. After a few seconds the LED should go out, indicating that the circuit has been triggered. At the same time the voltage at the collector of Q1 should change from 0 V to +5 V. Remove the paper tissue and a few tens of seconds later the LED should go on again. The sensor may also be tested by turning on a 'butagas' camping stove for a second or two (unlit — so beware of the fire risk). If there is any difficulty in getting the circuit to change state, either one way or the other, this will probably be because the voltage at A is normally too high or too low. Altering the value of R1 should cure this. It may be reduced in steps to 2k2 or increased above 10k, as appropriate.

Interrupting SC/MP

The output of the interface can of course be fed to SENSE A, SENSE B, or an input port of the I/O device, and used in the same way as the light sensor or sound sensor described in previous parts of this series. The programs required are given in earlier issues. This month we will examine another way of making the system respond to an input. The interface is made to cause an interrupt. This facility is seldom used in published programs and the handbooks tend to make it all sound rather more difficult than it really is. This being so, we will look at the interrupt procedures for both the Mk-14 and Acorn in some detail.

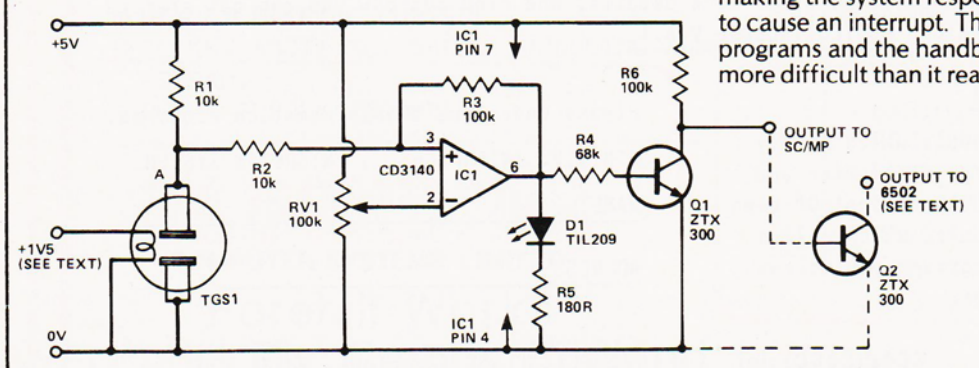


Fig.1. The circuit diagram for the gas sensor interface.

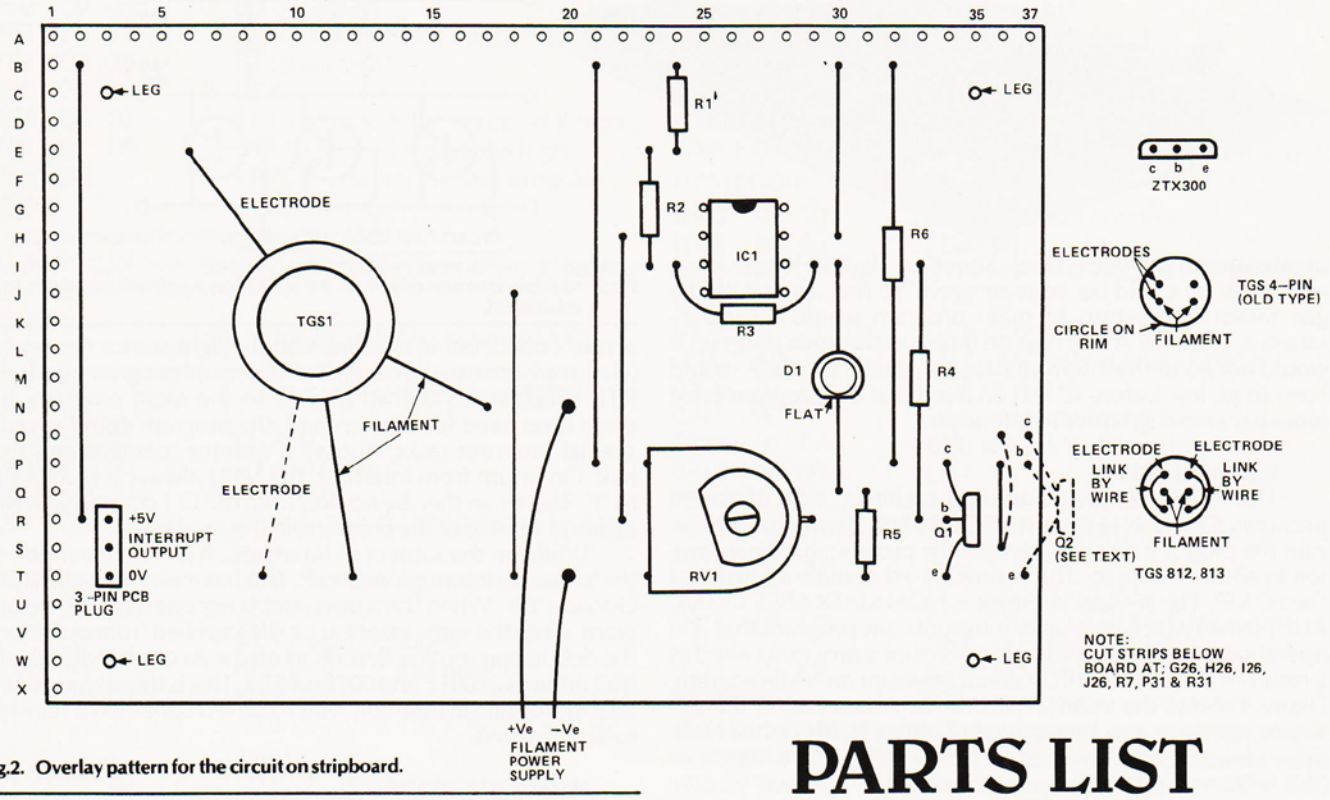


Fig.2. Overlay pattern for the circuit on stripboard.

The SENSE A input of Mk-14 doubles both as an ordinary input port and as an interrupt port. Its action is decided by the value of the third bit in the Status register, the Interrupt Enable (IE). This is normally '0' and SENSE A acts as an ordinary input. If IE is '1', a high input to SENSE A automatically causes an interrupt. When this happens the CPU automatically stops doing whatever it was doing at the time and jumps to an interrupt program or routine, stored elsewhere in memory. After this it may halt execution, or it may return to its original activity, depending on what it is programmed to do. The best way of making all this clear is to run the demonstration programs given here. The main program is a short one (to save you time in getting things going) which simply flashes Flag 1. You can use the LED interface (CT, February 1980) to monitor this flag. The 'interrupt' part of this program (0F16—0F1F) can be put in front of any other program, provided the program does not use Pointer 3. In this program we are flashing the LED by loading '0' or '1' into bit 1 of status register, so it is convenient to set IR at the same time. IE can also be enabled by Opcode '05' (IEN) and disabled by '04' (DINT) in other programs. Thus you can decide in which parts of your programs an interrupt may be permitted.

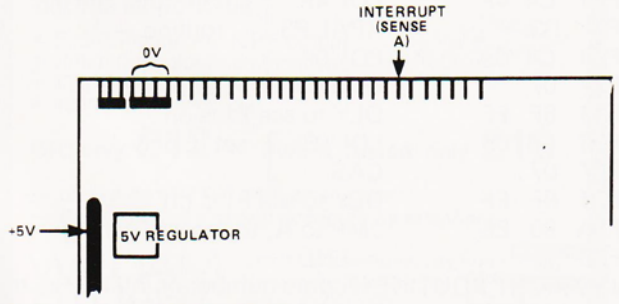


Fig.3. How to connect it to the Mk-14.

PARTS LIST

Resistors, All ¼W, 5% unless indicated.

R1,2	10k
R3,6	100k
R4	68k
R5	180R

Potentiometers

RV1	100k miniature horizontal preset

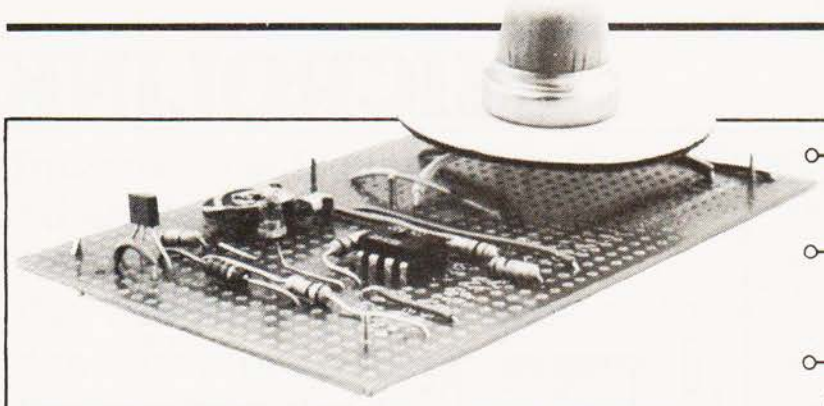
Semiconductors

IC1	CD3140
Q1,2	ZTX300
TGS1	Gas sensor type 812 or 813.

BUYLINES

The majority of the components are easily obtainable but in the event of difficulty in obtaining the TGS Gas sensor try Watford Electronics, 33/35 Cardiff Road, Watford, Herts WD1 8ED.

Load the main program and interrupt program in memory. Press 'GO', '0F16', and 'TERM'. The F1 light should flash repeatedly. Now trigger the interface by bringing a petrol soaked tissue close to the sensor. The flashing stops as the interrupt occurs. The MPU jumps to 0F50, increments the counter and then waits until the interrupt is over. Then it returns to the main program and flashing resumes. Since the gas sensor takes an appreciable time to recover, the interruption of the main program is appreciable too. If you use the light sensor (CT March 1980) to cause the interrupt, there is no apparent change in the rate of flashing of F1. Only when you check the value in 0F60 do you see that the interruptions had been counted. The system could be counting the number of passers-by in the street while you are involved in an apparently



uninterrupted game of 'Duck Shoot'. A slightly longer interrupt program could be 'edge sensitive' so that, even with the gas sensor, the return to main program would be instantaneous. If SENSE A was high on return to the main program it would *not* go to the interrupt program again. SENSE A would have to go low before IE was enabled and the program once more became responsive to interrupts.

Interrupting 6502

This CPU has two interrupt facilities, with different priorities. One is INTERRUPT REQUEST (IRQ) which can interrupt the program only if and when the program has been written to allow it to do so. This is similar to the single interrupt of the SC/MP. The second interrupt is NON-MASKABLE INTERRUPT (NMI) which invariably interrupts any program that is in operation at the time. It can also interrupt a program called as a result of IRQ, but an IRQ cannot interrupt an NMI program. Figure 4 shows the connections to the Acorn board, the gas sensor interface can be connected either to IRQ or to NMI, depending on priorities. Connection is by way of a transistor (this is Q2 on Fig 1) and any number of interfaces may be connected, as shown in Fig 5. When any one of these interfaces is triggered, an interrupt occurs.

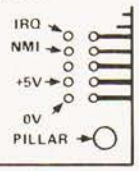


Fig.4. Connection to the Acorn needs an extra transistor, see the text for details.

The demonstration program illustrates how to arrange for interrupts at the two levels. The addresses of the NMI and IRQ routines are loaded in 001C to 001F. This can be done when loading the programs, or by instructions within the program (allowing NMI and ICQ addresses to be modified at different stages of the program). Here we load the addresses '0300' and '0350' when loading the program. The main program is an LED flashing routine, operating through Port B and using the LED interface (CT, February 1980). Just before the end of the main program, there is a CLI instruction. This clears the interrupt disable flag (I) in Status Register. Normally, this flag has the value '1', which prevents interrupts by IRQ. Op code CLI clears this '1', and an IRQ can be effective. Since CLI is at the end, this program runs through once before any IRQ interrupt is possible. As its name implies, NMI does not depend on the state of I.

When an IRQ or NMI occurs, the processor sets I. This prevents an IRQ program from being interrupted again if the IRQ line stays low. It also prevents an NMI program from being interrupted by an IRQ. If the NMI line stays low after an interrupt, this does not cause a further interrupt: the NMI line must go low and then go high again to cause the next interrupt. We say the NMI is 'edge sensitive'.

The interrupt programs given here provide a series of 10 flashes on B0 or B2. You can experiment with the effects of interrupts and with interrupting interrupts, if you have the gas

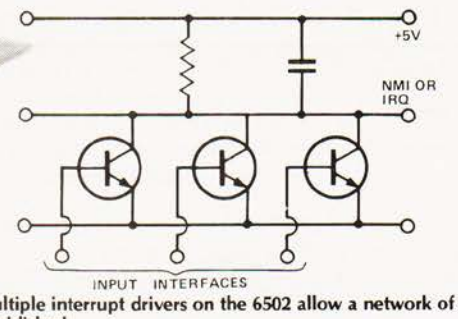


Fig.5. Multiple interrupt drivers on the 6502 allow a network of sensors to be established.

sensor connected to one line and the light sensor connected (via a transistor) to the other. Both interrupt programs end with RTI, which sends the MPU back to the main program, but there is no need for this. Instead, the program could execute special interrupt tasks, display a warning message and then halt. On return from interrupt, the MPU always sets the I flag to '1'. There can then be no IRQ until the CLI command is met again (at the end of the program, in this example).

While on the subject of interrupts, it is worth mentioning the 'software interrupt' or break. This has memmonic BRK and Opcode '00'. When this command is encountered in the program, it has the same effect as an IRQ applied from outside. In the debugging routine described on the Acorn handbook, the IRQ address at 001E and 001F is FFB3. This is the address of the BREAK routine in monitor, which caused contents of registers to be displayed.

Locating The Sensor

After playing with the sensor and finding out how it can generate interrupts, instal it where it is most likely to be effective. The circuit board is located close to the CPU. The sensor can be at a distance, connected by a three core lead. The exact position of the sensor is important. For example, if the main purpose of the sensor is to detect leakage of butane gas, the sensor should be placed close to the floor in the lowest part of the room as this is where the gas usually collects. To detect smoke and low-density vapours, the sensor should be placed high, near the ceiling. A good position is at the head of a stairway, for there it can cover two or more floors. Several sensors can be located in various parts of a building and each is connected to the NMI or IRQ lines by way of a transistor.

Demonstration Programs For SC/MP in Mk-14

MAIN PROGRAM (Sets up interrupt preconditions: flashes Flag 1)

```
0F16  C4 00      LDI'00'                ]  clear
0F18  C8 47      ST at counter (0F60)   ]  counter
0F1A  C4 0F   A: LDI'0F'                ]
0F1C  37         XPAH P3                ]  P3 to
0F1D  C4 4F      LDI '4F'               ]  interrupt
0F1F  33         XPAL P3                ]  routine — 1
0F20  C4 0A      LDI '0A'               ]
0F22  07         CAS                    ]  Set IE and F1
0F23  8F FF      DLY to see F1 is on
0F25  C4 08      LDI '08'               ]  set IE only
0F27  07         CAS                    ]
0F28  8F FF      DLY to see F1 is off
0F2A  90 EE      JMP to A, to repeat flashing
0F2B             = END
```

INTERRUPT ROUTINE (counts number of interrupts, then returns MPU to main program)

```
0F50  C0 09        LD old count
0F52  EC 01        DAI '01' increment count
0F54  C8 08        ST new count
0F56  06        B: CSA
0F57  D4 10        ANI '01' to see if interrupt still high
0F59  9C FB        JNZ to B, if interrupt still high
0F5B  3F           XPPC P3 return to main program
0F60               = counter
```

Demonstration Programs For 6502 In Acorn

MAIN PROGRAM (Sets up interrupt preconditions: flashes B0 + B2 alternately with B1)

```
001C  00   ]
001D  03   ]  address of NMI routine (0300)
001E  50   ]
001F  03   ]  address of IRQ routine (0350)
0200  A9 07        LDA '07'
0202  8D 23 09     STA at 0DB
0205  A9 02     A: LDA '02'
0207  8D 21 09     STA at Port B (B1 high,'B0 and B2
                   low)
020A  A0 30        LDY '30': setting loop counter
020C  20 CD FE  B: JSR to WAIT
020F  88           DEY counting loops
0210  10 FA        BPL to B, if Y still positive
0212  A9 05        LDA '05'
0214  8D 21 09     STA at Port B (B1 low, B0 and B2
                   high)
0217  A0 30        LDY '30' restoring loop counter
0219  20 CD FE  C: JSR to WAIT
021C  88           DEY counting loops
021D  10 FA        BPL to C, if Y still positive
021F  58           CLI allows interrupts
0220  4C 05 02     JMP to A to repeat sequence
```

NMI ROUTINE (Flashes B0 sixteen times, then returns to main program)

```
0300  A2 10        LDX '10' flash counter
0302  A9 00     D: LDA '00'
0304  8D 21 09     STA at Port B (B0, B1, B2 all low)
0307  A9 01        LDA '01'
0309  8D 21 09     STA at Port B (B0 high)
030C  A0 30        LDY '30': setting loop counter
030E  20 CD FE  E: JSR to WAIT
0311  88           DEY counting loops
0312  10 FA        BPL to E, if Y still positive
0314  A9 00        LDA '00'
0316  8D 21 09     STA at Port B (B0 low)
0319  A0 30        LDY '30' restoring loop counter
031B  20 CD FE  F: JSR to WAIT
031E  88           DEY counting loops
031F  10 FA        BPL to F, if Y still positive
0321  CA           DEX counting flashes
0322  10 DE        BPL to D if X still positive
0324  40           RTI return to main program
```

IRQ ROUTINE (Flashes B2 sixteen times, then returns to main program) 0350—0324, as above + 50 memory steps except that ninth byte is '04', to make B2 high instead of B0

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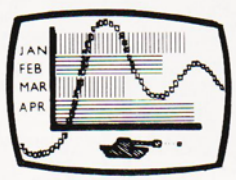

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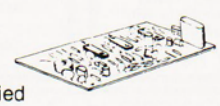

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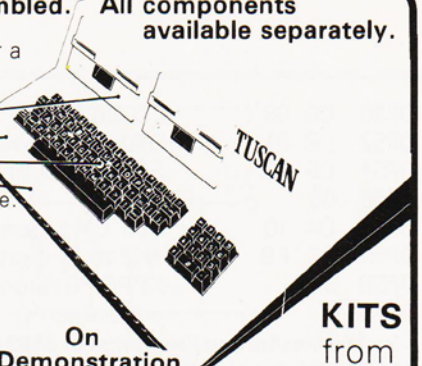

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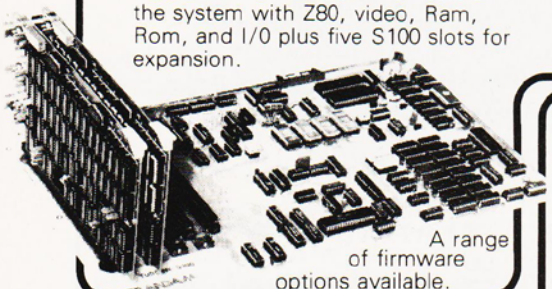

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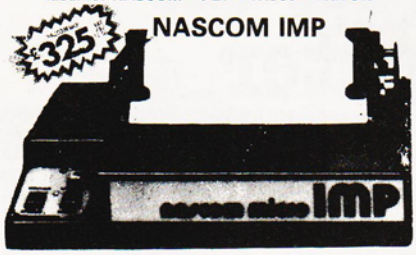

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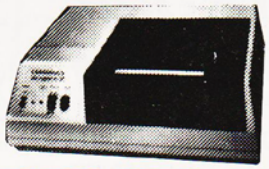

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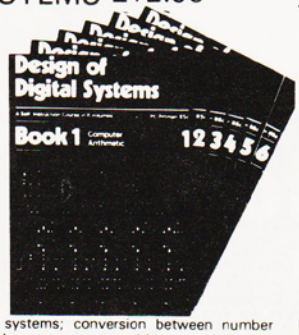

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The cursor is moved around the screen by the Hex keypad using a "Joystick" layout (see Fig.1). The cursor is a "+" giving the impression of a crosshair target, much more fun than a question-mark!

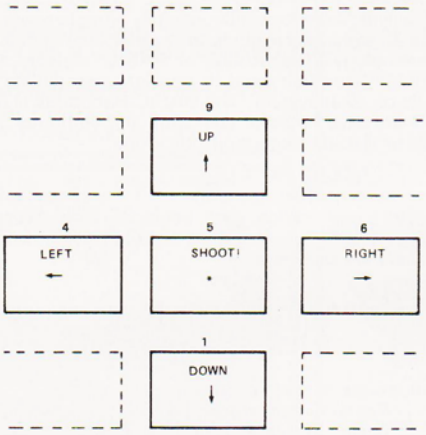

Fig.1. Life Gun 'Joystick' Keyboard Layout

The Program

VDULO and VDUHI are used as a sixteen bit pointer to indicate which line on the screen the cursor is at, Index register Y is used to show the position on the line. The monitor routine OUTCR is used to clear the screen, this simply outputs sixteen carriage returns and thus scrolls the contents of the screen off the top of it. The various pointers are then initialised and a command is solicited from the keyboard. The cursor is then moved in the appropriate direction. If the command was LEFT or RIGHT the Y register is checked for being within 0 to 20 (Hex), thus keeping it on the same line. In the same way a check is kept on the vertical position by ensuring that VDULO and VDUHI are between 200 and 3F0, which are the addresses of the top and bottom lines respectively. If SHOOT or any invalid commands are received, an asterisk is stored at the present cursor position. The command "L" will bring the whole screen to "LIFE". This routine could easily be modified to run any type of "target" game by replacing the main life routine with any other desired game program.

Running The Program

Enter the program into memory from the listing, followed by the main life routine from the manual (this is entered from 011E) or to test the program as a stand-alone routine remove the jump at 00CD by replacing it with NOPs. Begin execution from 00A3. The program should then run as described, note that to start "LIFE" just enter "L". A useful modification is to go through both programs and change every occurrence of '2A to '4F, this will change the *s to 0s, which look much more cell-like.

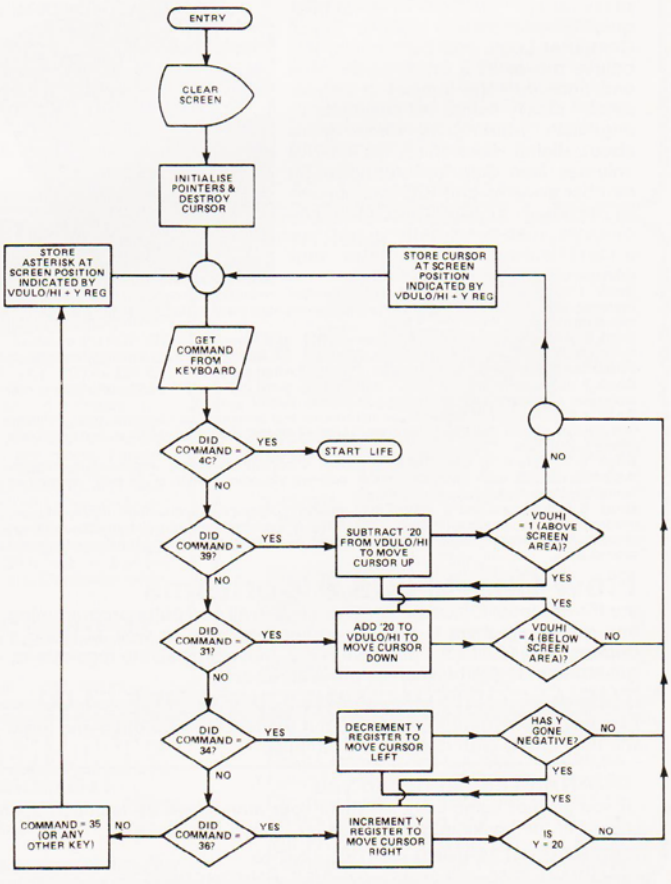

Fig.2. Life Gun Flowchart

```
00A0  00                    BYTE VDULO  ] Pointer to line that contains
00A1  00                    BYTE VDUHI  ] the cursor.
00A2  00                    BYTE
00A3  A0 0F                 LDY #F      ]
00A5  20 73 FE   ROUND      JSR OUTCR   ] Clear the screen using
00A8  88                    DEY         ] monitor routine.
00A9  10 FA                 BPL ROUND   ]
00AB  A9 E0                 LDA #E0     ]
00AD  85 A0                 STA VDULO   ] Initialise cursor pointer
00AF  A9 02                 LDA #2      ]
00B1  85 A1                 STA VDUHI   ]
00B3  A0 0F                 LDY #0F     ] Delete cursor left from monitor
00B5  A9 20                 LDA #20     ] routine and set up 'Y' with
00B7  8D E0 03              STA 03E0    ] new cursor position
00BA  D0 3B                 BNE STORE   ] Direct jump
00BC  8A         COMMAND    TXA         ]
00BD  48                    PHA         ] Save environment
00BE  98                    TYA         ]
00BF  48                    PHA         ]
00C0  20 FA FD              JSR POLLKB  ] Scan Keyboard
00C3  68                    PLA         ]
00C4  A8                    TAY         ] Restore Environment
00C5  68                    PLA         ]
00C6  AA                    TAX         ]
00C7  91 A0                 STA (VDULO),Y  Put back original contents of
                                           screen position.
00C9  A5 01                 LDA ICHAR   ] Get keyboard character
00CB  C9 4C                 CMP #4C (L) ]
00CD  F0 4F                 BEQ LIFE    ]
00CF  C9 39                 CMP #39     ]
00D1  F0 13                 BEQ UP      ]
00D3  C9 31                 CMP #31     ] Check which command and
00D5  F0 29                 BEQ DOWN    ] execute it.
00D7  C9 34                 CMP #34     ]
00D9  F0 38                 BEQ LEFT    ]
00DB  C9 36                 CMP #36     ]
00DD  F0 37                 BEQ RIGHT   ]

00DF  A9 2A      SHOOT      LDA #2A     ] Put asterisk onto screen
00E1  91 A0                 STA (VDULO),Y ] at cursor position
00E3  AA                    TAX         ]
00E4  D0 D6                 BNE COMMAND ]
00E6  A5 A0      UP         LDA VDULO   ]
00E8  38                    SEC         ]
00E9  E9 20                 SBC #20     ] Move cursor up one line. If
00EB  85 A0                 STA VDULO   ] cursor goes off screen, go
00ED  B0 02                 BCS CONT    ] to DOWN to bring it back
00EF  C6 A1                 DEC VDUHI   ]
00F1  A5 A1      CONT       LDA VDUHI   ]
00F3  C9 01                 CMP #1      ]
00F5  F0 09                 BEQ DOWN    ]
00F7  B1 A0      STORE      LDA (VDULO),Y ]
00F9  AA                    TAX         ] Put cursor on screen at
00FA  A9 2B                 LDA #2B     ] location specified by VDULO
00FC  91 A0                 STA (VDULO),Y ] + Y register
00FE  D0 BC                 BNE COMMAND ]
0100  A5 A0      DOWN       LDA VDULO   ]
0102  18                    CLC         ]
0103  69 20                 ADC #20     ] Move cursor down one line.
0105  85 A0                 STA VDULO   ]
0107  90 EE                 BCC STORE   ]
0109  E6 A1                 INC VDUHI   ]
010B  A5 A1                 LDA VDUHI   ]
010D  C9 04                 CMP #4      ]
010F  F0 D5                 BEQ UP      ]
0111  D0 E4                 BNE STORE   ]
0113  88         LEFT       DEY         ] Move cursor left, make
0114  10 E1                 BPL STORE   ] sure still on screen.
0116  C8         RIGHT      INY         ]
0117  C0 20                 CPY #20     ] Move cursor right. If too
0119  F0 F8                 BEQ LEFT    ] far jump to LEFT.
011B  D0 DA                 BNE STORE   ]
011D  EA                    NOP         ]
011E                        START OF MAIN LIFE ROUTINE (AS IN MANUAL).
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*Speedy 112 ch/s bidir. *Fits A4 page – up to 80 cols. *Up to 4 copies. *Precision form-filling with sprocket feed. *Special headings using double-width chars. *Modern paper format to match A4 filing systems. *Other paper sizes with adj. sprocket. *Full punctuation, U/L case, £ sign, 96-ch. set. *Reliable – strongly built, 100 M.ch. head.

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Apple **£45**

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(8K RAM New large keyboard)

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2001 – 16N (16K RAM and new large keyboard) **£590**
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PRINTOUT

Dear Sir,

A.P. Stephenson in "PASCAL — A FALSE IDOL?" (Computing Today, September 1980) seems to think that "BASIC has brought computing to the people. . . microprocessors have only helped to reduce the cost of the hardware!". In fact, BASIC only became widely known when hardware costs started to plummet. Before then, it was confined to Universities and was little known outside the USA. "Anyone of average intelligence" can now be applied to those willing to buy a microcomputer. BASIC was certainly not designed for them. It was, on the contrary, designed for university students.

The article contains facts twisted to suit the author's opinions, viz: "BASIC took over the world". BASIC has not, and never will, take over the world. It was designed as a beginner's all-purpose symbolic instruction code, and when used in that guise has performed admirably. PASCAL, likewise, was designed for teaching university students computer programming. It was the implementation at the University of California at San Diego which eventually resulted in widespread adoption of PASCAL for microcomputers, since UCSD implemented the interpreter on a variety of small computers, including microcomputers.

Until recently, perhaps, most computer programmers have been professionals with human foibles no doubt, but for all that, with a vested interest in not learning new programming languages. The fact that PASCAL has become so popular is not because BASIC has been denigrated, but simply because PASCAL is better suited to advanced programming.

It is unfortunate that your contributor should vent his spleen against Pascal, which he has not learnt, and against "academics who take great delight in producing things that are theoretically correct but almost impossible to use by the average individual". Without those academics, there would be no BASIC, no PASCAL, and indeed, no microcomputers to play with.

While it is true that some of us have objected to structured programming, it is not the technique, per se, but its indiscriminate application which concerns us.

To date, I have not learned to use Pascal, although I read it tolerably well. However, my company will shortly be purchasing a proprietary compiler and I shall learn to use it as well as I already use BASIC, COBOL, PL/I, Algol 60 and Algol 68.

A little knowledge. . . . . .

Yours sincerely,
J. Hamilton.
M.Director.

Datavise Ltd.,
Hartley Farm,
Upper Swainswick,
Nr. Bath, Avon.
BA1 8AF.

Dear Sir,

I should be most obliged if you would mention to your readers the fact that I have moved and that my new address is as below.

We hold our meetings on the first Wednesday of each month at the Mona Hotel in James Street, Liverpool and we believe that we now have the largest group of Nascom owners in the country.

I would personally like to thank all the Nascom owners who purchased either our book of software or the EPROM board that we have produced and any wishing further information of these projects and others is requested to drop me a line.

Anyone living within travelling distance of Liverpool, 200 miles or so, is strongly recommended to visit us on one of our club nights when I can assure them of a very productive and interesting evening.

Lastly could I request that other Nascom club secretaries contact me with a view for joint co-operation on various projects.

My thanks to Computing Today for all that they have achieved over the last 18 months.

Yours faithfully,
Graham W. Myers.

Merseyside Nascom User group,
5 Beechwood Drive,
Wincham, Northwich,
Cheshire.

Dear Sir,

May I offer the following addition to 'Basic Life' by Paul Evans which appeared in the August issue of CT:-

```
795  IF DP=1 GOTO 850
```

This corrects an elusive bug which I discovered when a symmetrical colony became unsymmetrical (impossible!).

The explanation is that if at line 790 DP=1, then there have been no deaths in the colony and the loop 800-820 should not be obeyed. Without line 795 this loop is obeyed once, if DP=1.

Thanks for an excellent magazine.

Yours faithfully,
Nick Higham.

90 Half Edge Lane,
Eccles M30 9BA,
Manchester.

Dear Sir,

Please find enclosed a copy of my daughter's (aged 7) "news" which was written in school. She is referring to the SHARP PC-1211 pocket computer. This may be of interest to your readers and is proof that even seven year old children can benefit from computers.

Yours faithfully,
Harold B. Berkley.

11, Breeze Mount,
Prestwich,
Manchester. M25 8AH.

Monday 14th July 1980
Suzanne Berkley. AGE 7yrs

On Friday my daddy bought a computer. It looked like a calculater. But it could type and when he put a game in it my sister had a go. The game was called Memory test and you type run then you press enter and it says digits. So I put 5 in then I pressed enter again and then it beeped a 5 numbers were there for a few seconds then they went then you write it down then you got the hole line right it beeps 3 times when youve had 3 mistakes on 3 lines it writes beyond your faculty when you have finshed it says some funny things if you do under digits it says idiotic we were playing with it for about 2 hours then I put it away.

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74LS11	.20	74LS54	.18	74LS123	.72	74LS165	.72	74LS242	2.08	74LS352	1.04
74LS12	.20	74LS55	.18	74LS124	1.39	74LS166	1.65	74LS243	2.08	74LS353	.92
74LS13	.37	74LS73	.33	74LS125	.36	74LS168	1.71	74LS245	2.50	74LS362	4.21
74LS14	.65	74LS74	.30	74LS126	.36	74LS169	1.71	74LS247	1.09	74LS365	.55
74LS15	.20	74LS75	.40	74LS132	.60	74LS170	1.72	74LS248	1.09	74LS366	.55
74LS20	.20	74LS76	.27	74LS133	.39	74LS173	.81	74LS249	1.09	74LS367	.55
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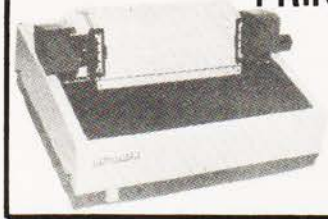
74LS27	.20	74LS86	.27	74LS145	.97	74LS188	2.75	74LS258	.92	74LS393	.84
74LS28	.22	74LS90	.57	74LS151	.81	74LS189	2.08	74LS259	1.39	74LS668	1.17
74LS30	.20	74LS91	.97	74LS153	.52	74LS190	.86	74LS261	4.50	74LS670	1.71
74LS32	.26	74LS92	.69	74LS154	1.30	74LS191	.86	74LS266	.37		

PRINTERS



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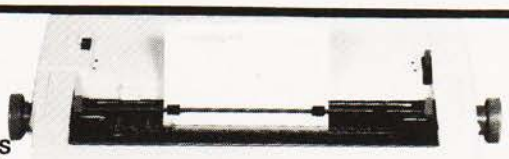

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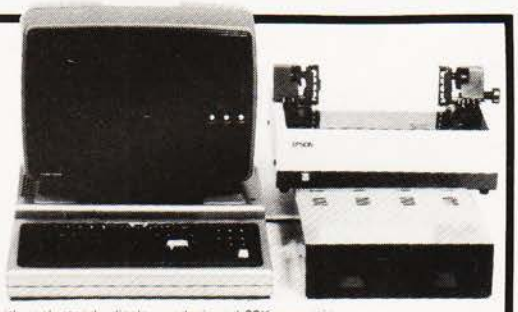
FAST, heavy duty commercial DIASY WHEEL printer, with high quality printout, coupled with low noise necessary for office environment. Nationwide service by NEXOS. 90 day warranty provided at your premises.
124 char: upper/lower case ● 10/12 chars: per inch giving 126 or 163 columns ● 15 inch wide frintion platen ● /reverse
Top of the form, BOLDING, underline, and host of other features ● Centronics type parallel interface as standard. options: serial interface 60 ● APPLE interface 75.



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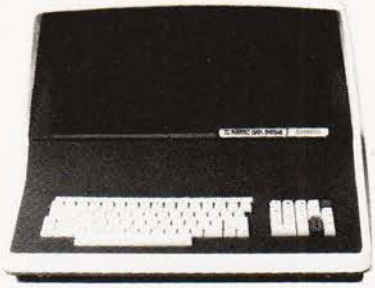

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BUYER'S GUIDE-VDUs

An eyeball to eyeball confrontation with the current UK available VDUs. Check your statistics against our survey.

Does surveying VDUs lead to eyestrain? Well, judging by the vast quantities of manufacturers' data sheets that were perused to glean this information the answer is a definite YES! Owing to the incredible diversity of VDUs that are available it is inevitable that several machines are really made by the same company and then marketed under a different label, so we have tried to eliminate all these and list only the original manufacturer, although, doubtless, prices will vary from source to source.

The information is presented in our usual table format but some points are worthy of note. The size of the screen is measured diagonally in all cases, the character size is the equivalent to the dot matrix size of the printer survey last month, in that it tells you the format of display, for example a 5 x 7 display will not be able to show true descenders, whereas a 7 x 9 display will. The entry labelled CA is referring to the ability of the VDU to directly address any cursor position on the screen, sometimes called x,y addressing, this is the VDU equivalent of a POKE if you like.

Special characters are provided on some models. If this is so then the Sp. Char. entry will be marked accordingly. These are usually line graphics for use in constructing business forms, etc. The colour entry refers to the display colour, traditionally white on black, but many now offer green on black as standard. The rest of the entries should be fairly self-explanatory, but it is worth noting that CCITT V24 and RS232 are, to a large degree, compatible interfaces — we have quoted the manufacturer in each case.

One final point of note is the 25th line available on some VDUs. This is, almost without exception, used for displaying system status information and is *not* available to the user for textual display, hence it does not appear in the Lines x Cols. entry. If we have neglected any devices that are readily available in the UK, (not graphics terminals please), all details should be sent, together with end user prices and photographs if available, to the Buyers Guide Compiler at our usual address.

BURNT HILL ELECTRONICS

BH 711
Manuf. Burnt Hill Electronics
19 Holder Road
Aldershot
Hampshire GH12 4RH
0252-313701

Screen size:-12"
Char. size:- 7 x 5
Lines x Cols:- 16 x 64
CA:- —
Colour:- Green
Sp. Char.:- —
No. of keys:- N/A
Numeric pad:- N/A
Cursor keys:- N/A
Interface:- CCITT V24, 20mA
Baud rates:- 75-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £656

Options:- Control and keyboard function re-assignment
Notes:- Rack mounting VDU for use with remote keyboards such as the BH 722 @ £204 or the BH 723 @ £173

BH 720
Manuf. Burnt Hill Electronics
19 Holder Road
Aldershot
Hampshire GH12 4RH
0252-313701

Screen size:-12"
Char. size:- 5 x 9
Lines x Cols:- 25 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- Yes
No. of keys:- 75
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- CCITT V24, 20mA
Baud rates:- 75-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £892

Options:- Control and keyboard function re-assignment
Notes:- Free standing terminal with a number of pre-defined control functions built in.

BH 721
Manuf. Burnt Hill Electronics
19 Holder Road
Aldershot
Hampshire GH12 4RH
0252-313701

Screen size:-12"
Char. size:- 5 x 9
Lines x Cols:- 25 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- Yes
No. of keys:- N/A
Numeric pad:- N/A
Cursor keys:- N/A
Interface:- CCITT V24, 20mA
Baud rates:- 75-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £862

Options:-
Notes:- Rack mount display terminal for use with remote keyboards such as the BH 722 or the BH 723

BH 912
Manuf. Burnt Hill Electronics
19 Holder Road
Aldershot
Hampshire GH12 4RH
0252-313701

Screen size:-12"
Char. size:- 7 x 10
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 84
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 75-19,200
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £695

Options:-
Notes:- Micro controlled intelligent editing terminal

BH 920
Manuf. Burnt Hill Electronics
19 Holder Road
Aldershot
Hampshire GH12 4RH
0252-313701

Screen size:-12"
Char. size:- 7 x 10
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 103
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 75-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £895

Options:-
Notes:- Extended version of the BH 912 with a two page display memory

CIFER SYSTEMS

MODEL 2602
Manuf. Cifer Systems Limited
Avro Way
Bowerhill
Melksham
Wiltshire SN12 6TP
0225-704502

Screen size:-12"
Char. size:- 7 x 11
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green optional
Sp. Char.:- Optional
No. of keys:- 62
Numeric pad:- No
Cursor keys:- Yes
Interface:- CCITT V24
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £728

Options:- Extra page memory, 20mA current loop interface
Notes:- Versatile medium priced VDU

MODEL 2603
Manuf. Cifer Systems Limited
Avro Way
Bowerhill
Melksham
Wiltshire SN12 6TP
0225-704502

Screen size:-12"
Char. size:- 7 x 11
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green optional
Sp. Char.:- Optional
No. of keys:- 62
Numeric pad:- No
Cursor keys:- Yes
Interface:- CCITT V24
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £745

Options:- As Model 2602
Notes:- Extended version of 2602 with visual highlighting and double size and flashing character capability

MODEL 2604
Manuf. Cifer Systems Limited
Avro Way
Bowerhill
Melksham
Wiltshire SN12 6TP
0225-704502

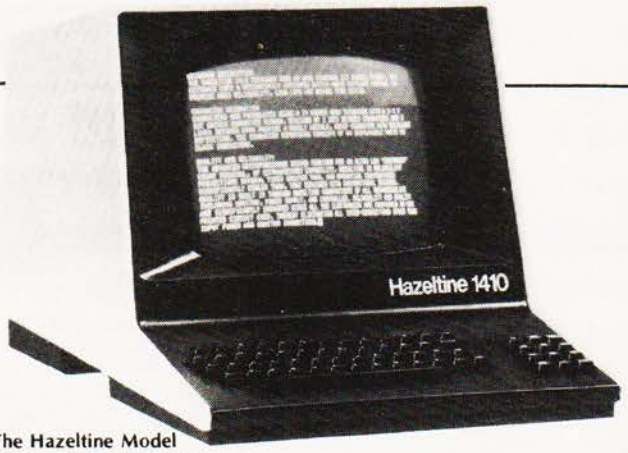
Screen size:-12"
Char. size:- 7 x 11
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green optional
Sp. Char.:- Yes
No. of keys:- 62
Numeric pad:- No
Cursor keys:- Yes
Interface:- CCITT V24
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £762

Options:- As Model 2602
Notes:- Extended version of the 2603 with overstrike graphics giving line drawing facilities

MODEL 2605
Manuf. Cifer Systems Limited
Avro Way
Bowerhill
Melksham
Wiltshire SN12 6TP
0225-704502

Screen size:-12"
Char. size:- 7 x 11
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green optional
Sp. Char.:- Optional
No. of keys:- 102
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- CCITT V24
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £829-862

Options:- Extra screen memory, 20mA current loop interface
Notes:- Full feature editing terminal with 25th status line display and a variety of display options



The Hazeltine Model 1410 with 'no frills' VDU.

MODEL 2632
Manuf. Cifer Systems Limited
Avro Way
Bowerhill
Melksham
Wiltshire SN12 6TP
0225-704502

Screen size:-12"
Char. size:- 7 x 11
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green optional
Sp. Char.:- Optional
No. of keys:- 100
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- CCITT V24
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £997

Options:-
Notes:- Semi intelligent on or off-line editing terminal with a wide selection of pre-programmed functions

MODEL 2652
Manuf. Cifer Systems Limited
Avro Way
Bowerhill
Melksham
Wiltshire SN12 6TP
0225-704502

Screen size:-12"
Char. size:- 7 x 11
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green optional
Sp. Char.:- Optional
No. of keys:- 100
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- CCITT V24
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £963

Options:-
Notes:- Fully DEC VT52 compatible unit with several extra features taken from the 2605

DACOLL

MODEL 242-3
Manuf. Dacoll Engineering Services
Dacoll House
Gardners Lane
Bathgate
West Lothian, Scotland
0506-56565

Screen size:-12"
Char. size:- 8 x 7
Lines x Cols:- 25 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- —
No. of keys:- 82
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- CCITT V24, 20mA
Baud rates:- 110-9600
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £600

Options:- 132 columns. Second page memory, Full editing
Notes:- Versatile unit capable of being configured for a number of systems such ast VT52 or VIP 7250

MODEL 246
Manuf. Dacoll Engineering Services
Dacoll House
Gardners Lane
Bathgate
West Lothian, Scotland
0506-56565

Screen size:-12"
Char. size:- 8 x 7
Lines x Cols:- 25 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- —
No. of keys:- 94
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- Special
Baud rates:- —
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £1,100

Options:-
Notes:- A slave VDU designed to operate with the 245 controller which allows up to 8 units to emulate a specified protocol

ELBIT

DS 1920
Manuf. Elbit Data Systems,
295 Aberdeen Avenue
Slough,
Berkshire SL1 4HQ
Slough 26713

Screen size:-12" or 15"
Char. size:- 5 x 8
Lines x Cols:- 28 x 40
CA:- —
Colour:- —
Sp. Char.:- —
No. of keys:- 63 or 95
Numeric pad:- —
Cursor keys:- —
Interface:- CCITT V24
Baud rates:- 110-9600
Printer port:- —
Light pen:- —
Other fonts:- —
Price:- £ — unknown

Options:- 20mA current loop interface, 7 x 8 character matrix
Notes:- Basic glass Teletype with some editing functions and a detachable keyboard

HAZELTINE

MODEL 1410
Manuf. Hazeltine Ltd.
292 Worton Road
Isleworth
Middlesex TW7 6EL
01-568 1851

Screen size:-12"
Char. size:- 5 x 7
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 65
Numeric pad:- Yes
Cursor keys:- No
Interface:- RS 232
Baud rates:- 110-9600
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £490

Options:-
Notes:- Bottom of the range, no frills VDU, ideally suited to the remote user or micro owner.

MODEL 1420
Manuf. Hazeltine Ltd.
292 Worton Road
Isleworth
Middlesex TW7 6EL
01-568 1851

Screen size:-12"
Char. size:- 5 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 78
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 110-9600
Printer port:- No
Light pen:- No
Other fonts:- Optional
Price:- £675

Options:- 20mA current loop interface, Printer port
Notes:- Terminal aimed specifically at the small business and word processing end of the market. Character set has true descenders.

MODEL 1421
Manuf. Hazeltine Ltd.
292 Worton Road
Isleworth
Middlesex TW7 6EL
01-568 1851

Screen size:-12"
Char. size:- 5 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 78
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 110-9600
Printer port:- No
Light pen:- No
Other fonts:- Optional
Price:- £675

Options:- 20mA current loop interface
Notes:- Lear Siegler ADM 3A compatible version of the 1420.

MODEL 1500
Manuf. Hazeltine Ltd.
292 Worton Road
Isleworth
Middlesex TW7 6EL
01-568 1851

Screen size:-12"
Char. size:- 7 x 10
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 74
Numeric pad:- Yes
Cursor keys:- No
Interface:- RS 232, 20mA
Baud rates:- 110-19,200
Printer port:- No
Light pen:- No
Other fonts:- Optional
Price:- £785

Options:-
Notes:- Unit supplied with an auxiliary port that could be used for a printer and also permits remote editing of screen data.

MODEL 1510
Manuf. Hazeltine Ltd.
292 Worton Road
Isleworth
Middlesex TW7 6EL
01-568 1851

Screen size:-12"
Char. size:- 7 x 10
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 81
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 110-19,200
Printer port:- No
Light pen:- No
Other fonts:- Optional
Price:- £880

Options:-
Notes:- Screen format mode, Memory protect, Reverse video selectable and remote editing capability.

MODEL 1520
Manuf. Hazeltine Ltd.
292 Worton Road
Isleworth
Middlesex TW7 6EL
01-568 1851

Screen size:-12"
Char. size:- 7 x 10
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 81
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 110-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £1,050

Options:- Auxiliary output port.

Notes:- Full microprocessor controlled, buffered data entry terminal with integral local printer interface.

MODEL 1552
Manuf. Hazeltine Ltd.
292 Worton Road
Isleworth
Middlesex TW7 6EL
01-568 1851

Screen size:-12"
Char. size:- 7 x 10
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- Yes
No. of keys:- 81
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 110-9600
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £975

Options:-
Notes:- DEC VT52 compatible terminal with several extra features.

EXECUTIVE 80-20/30
Manuf. Hazeltine Ltd.
292 Worton Road
Isleworth
Middlesex TW7 6EL
01-568 1851

Screen size:-12" or 15"
Char. size:- 7 x 10
Lines x Cols:- 25 x 80 or 132
CA:- Yes
Colour:- Green
Sp. Char.:- —
No. of keys:- 108
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232/449, 20mA
Baud rates:- 110-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £ — TBA

Options:- Separate or integral keyboard, user programmable font
Notes:- Ergonomically designed VDU with audio or tactile feedback, smooth scrolling, 2 page screen memory, etc, etc.

IBM (UK) LTD.

3101
Manuf. IBM (UK) Ltd.
PO Box 41
North Harbour, Portsmouth
Hampshire PO6 3AU
0705-694941

Screen size:-12"
Char. size:- 7 x 14
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- —
No. of keys:- 87
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232/422, 20mA
Baud rates:- to 9600
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £ — TBA

Options:- A wide variety of interface options, 3102 printer
Notes:- Very high quality ergonomically designed VDU made up in three discrete units with matching printer.

LEAR SIEGLER

ADM-3A
Dist. Penny and Giles Ltd.
Computer Peripherals Division
Mudeford
Christchurch
Dorset BH23 4AT
04252-71511
UK Importer,
many other local outlets.

Screen size:-12"
Char. size:- 5 x 7
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Optional green
Sp. Char.:- —
No. of keys:- 59
Numeric pad:- No
Cursor keys:- No
Interface:- RS 232, 20mA
Baud rates:- 75-19,200
Printer port:- No
Light pen:- No
Other fonts:- Optional
Price:- £492

Options:- Remote numeric data entry pad, Auto repeat, Lower case
Notes:- Basic VDU with standard upper case only.

ADM-3A +
Dist. Penny and Giles Ltd.
Computer Peripherals Division
Mudeford
Christchurch
Dorset BH23 4AT
04252-71511
UK Importer,
many other local outlets.

Screen size:-12"
Char. size:- 5 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Optional green
Sp. Char.:- —
No. of keys:- 73
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 75-19,200
Printer port:- No
Light pen:- No
Other fonts:- Optional
Price:- £552

Options:- Auto repeat
Notes:- De-luxe version of the ADM-3A with true lower case and integral keypad.

ADM-31
Dist. Penny and Giles Ltd.
Computer Peripherals Division
Mudeford
Christchurch
Dorset BH23 4AT
04252-71511
UK Importer,
many other local outlets.

Screen size:-12"
Char. size:- 7 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Optional green
Sp. Char.:- Optional
No. of keys:- 90
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 50-9600
Printer port:- Yes
Light pen:- No
Other fonts:- Various
Price:- £737

Options:- Direct polling of cursor position
Notes:- Two page memory device with micro control, full editing capability and programme personality.

ADM-42
Dist. Penny and Giles Ltd.
Computer Peripherals Division
Mudeford
Christchurch
Dorset BH23 4AT
04252-71511
UK Importer,
many other local outlets.

Screen size:-15"
Char. size:- 7 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Optional green
Sp. Char.:- Optional
No. of keys:- 118
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 50-9600
Printer port:- No
Light pen:- No
Other fonts:- Optional
Price:- £1,170

Options:- 8 page memory, Printer port, Bus interface, etc, etc.
Notes:- Three part VDU with virtually every option possible, lives up to the name of American Dream machine, hence the initials!

LYME

MODEL 4002
Manuf. James Scott
Electronic Developments
2 Avenue Court,
Farm Avenue
London NW2
01-452 0490

Screen size:-12"
Char. size:- 12 x 7
Lines x Cols:- 24 x 80
CA:- —
Colour:- Green
Sp. Char.:- —
No. of keys:- 90
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 75-9600
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £625

Options:- See Models 4003-4006
Notes:- Two page memory terminal with integral programmable functions.

MODEL 4003
Manuf. James Scott
Electronic Developments
2 Avenue Court,
Farm Avenue
London NW2
01-452 0490

Screen size:-12"
Char. size:- 12 x 7
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- —
No. of keys:- 90
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 75-9600
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £625

Options:- See other models in range
Notes:- Enhanced version of 4002 with extra status line display and DEC VT52 compatability.

MODEL 4004
Manuf. James Scott
Electronic Developments
2 Avenue Court,
Farm Avenue
London NW2
01-452 0490

Screen size:-12"
Char. size:- 12 x 7
Lines x Cols:- 24 x 80
CA:- —
Colour:- Green
Sp. Char.:- —
No. of keys:- 90
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 75-9600
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £625

Options:- See other models in range
Notes:- Teletype or two page editing terminal configuration with block and line transmission capability.

MODEL 4005
Manuf. James Scott
Electronic Developments
2 Avenue Court,
Farm Avenue
London NW2
01-452 0490

Screen size:-12"
Char. size:- 12 x 7
Lines x Cols:- 24 x 80
CA:- —
Colour:- Green
Sp. Char.:- —
No. of keys:- 90
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 75-9600
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £625

Options:- See other models in range
Notes:- Data General 6053 compatible version of the 4003.

MODEL 4006
Manuf. James Scott
Electronic Developments
2 Avenue Court,
Farm Avenue
London NW2
01-452 0490

Screen size:-12"
Char. size:- 12 x 7
Lines x Cols:- 24 x 80
CA:- —
Colour:- Green
Sp. Char.:- —
No. of keys:- 90
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 75-9600
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £625

Options:- See other models in the range
Notes:- Hazeltine 1410 compatible version of the 4003.

MICRO TERM

ACT-V
Dist. Strumech
Portland House
Coppice Side, Brownhills
West Midlands
05433-4321

Screen size:-12"
Char. size:- —
Lines x Cols:- 24 x 80
CA:- —
Colour:- —
Sp. Char.:- Yes
No. of keys:- 77
Numeric pad:- —
Cursor keys:- —
Interface:- RS 232
Baud rates:- 110-9600
Printer port:- —
Light pen:- —
Other fonts:- —
Price:- £ — unknown

Options:-
Notes:- Screen display can be re-configured to 48 x 39.

NEWBURY LABORATORIES

MODEL 7000
Manuf. Newbury Laboratories
King Street
Odiham
Hampshire RG25 1NN
025-671 2910
Regional dealer network

Screen size:-12"
Char. size:- 7 x 5
Lines x Cols:- 24 x 80
CA:- —
Colour:- Green
Sp. Char.:- —
No. of keys:- 63
Numeric pad:- No
Cursor keys:- No
Interface:- CCITT V24
Baud rates:- 50-19,200
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £495

Options:- 20mA current loop interface, Model 7000C with addressable cursor and page mode @ £545.
Notes:- Microprocessor based "Glass Teletype".

MODEL 7002
Manuf. Newbury Laboratories
King Street
Odiham
Hampshire RG25 1NN
025-671 2910
Regional dealer network

Screen size:-12"
Char. size:- 7 x 5
Lines x Cols:- 24 x 80
CA:- —
Colour:- Green
Sp. Char.:- —
No. of keys:- 74
Numeric pad:- Yes
Cursor keys:- No
Interface:- CCITT V24, 20mA
Baud rates:- 50-19,200
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £595

Options:- Model 7002C with addressable cursor and page mode @ £645.
Notes:- More sophisticated version of the 7000 with several extras like video output and numeric keypad.

MODEL 7007
Manuf. Newbury Laboratories
King Street
Odiham
Hampshire RG25 1NN
025-671 2910
Regional dealer network

Screen size:-12"
Char. size:- 6 x 8
Lines x Cols:- 24 x 80
CA:- —
Colour:- Green
Sp. Char.:- —
No. of keys:- 91
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- CCITT V24, 20mA
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £795

Options:- 25th display line, Field protect, Extra page memory
Notes:- Full editing terminal with numerous features.

PERICOM DATA SYSTEMS

6801
Manuf. Pericom Data Terminals
1-3 Burners Lane, Kiln Farm
Milton Keynes
Bucks MK11 38A
0908-564747

Screen size:-15"
Char. size:- 7 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- Optional
No. of keys:- 87
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 75-9600
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £985

Options:- Extra page of screen memory.
Notes:- Ergonomically designed simple editing terminal.

6802
Manuf. Pericom Data Terminals
1-3 Burners Lane, Kiln Farm
Milton Keynes
Bucks MK11 38A
0908-564747

Screen size:-15"
Char. size:- 7 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- Optional
No. of keys:- 131
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 75-9600
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £1,085

Options:- Extra screen memory.
Notes:- Extended version of 6801 with 24 pre-defined function keys.

6803
Manuf. Pericom Data Terminals
1-3 Burners Lane, Kiln Farm
Milton Keynes
Bucks MK11 38A
0908-564747

Screen size:-15"
Char. size:- 7 x 9
Lines x Cols:- 24 x 132
CA:- Yes
Colour:- Green
Sp. Char.:- Optional
No. of keys:- 87
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 75-9600
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £1,285

Options:- Extended keyboard as fitted to the 6802.
Notes:- Designed for use in the word processing market with the wide screen display which can be reset to 80 columns.

6807
Manuf. Pericom Data Terminals
1-3 Burners Lane, Kiln Farm
Milton Keynes
Bucks MK11 38A
0908-564747

Screen size:-15"
Char. size:- 7 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- Optional
No. of keys:- 84
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 75-9600
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £1,350

Options:- Extended keyboard.
Notes:- Fully VT100 compatible terminal with four different character formats available.

PERKIN ELMER

BANTAM 550
Manuf. Perkin Elmer Data Systems
227 Bath Road
Slough, Berks SL1 4AX
0753-34511

Screen size:-12"
Char. size:- 5 x 9
Lines x Cols:- 24 x 80
CA:- —
Colour:- —
Sp. Char.:- —
No. of keys:- 66
Numeric pad:- Yes
Cursor keys:- No
Interface:- RS 232
Baud rates:- 110-9600
Printer port:- No
Light pen:- No
Other fonts:- Optional
Price:- £550

Options:- 20mA current loop interface, Printer port.
Notes:- Glass Teletype VDU.

SUPER OWL 1245/51
Manuf. Perkin Elmer Data Systems
227 Bath Road
Slough, Berks SL1 4AX
0753-34511

Screen size:-12"
Char. size:- 7 x 11
Lines x Cols:- 24 x 80
CA:- —
Colour:- Optional Green
Sp. Char.:- Yes
No. of keys:- 82 or 98
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 110-9600
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £1,250

Options:- Two types of detached keyboard, Light pen.
Notes:- Block mode editing terminal with special business form character set and 25th status line.

SOROC

IQ 120
Dist. Strumech
Portland House
Coppice Side, Brownhills
West Midlands
05433-4321

Screen size:-12"
Char. size:- 5 x 7
Lines x Cols:- 12 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 74
Numeric pad:- —
Cursor keys:- —
Interface:- RS 232
Baud rates:- 75-19,200
Printer port:- —
Light pen:- —
Other fonts:- —
Price:- £ — unknown

Options:- Block mode, Printer port.
Notes:- Functional basic editing terminal.

SOUTHWEST TECHNICAL PRODUCTS

CT-82
Manuf. Southwest Technical Products
38 Dover Street
London W1
01-491 7507

Screen size:-8"
Char. size:- 7 x 12
Lines x Cols:- 16 x 82
CA:- Yes
Colour:- Green
Sp. Char.:- Yes
No. of keys:- 68
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 50-38,400
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £700

Options:- Light pen option, Various screen formats.
Notes:- Full editing terminal for use with the SWTP micros or as a stand-alone device.

TELERAY

MODEL 10
Dist. Teleprinter Equipment Ltd.
Akeman Street
Tring, Herts HP23 6AJ
044282-4011

Screen size:-12"
Char. size:- 7 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 98
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 50-9600
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £680

Options:- Emulators for VT52, Data General and Prism.
Notes:- In common with the rest of the range the VDU has a choice of four casing options including rack-mount.

MODEL 11
Dist. Teleprinter Equipment Ltd.
Akeman Street
Tring, Herts HP23 6AJ
044282-4011

Screen size:-12"
Char. size:- 7 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- APL set
No. of keys:- 98
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 50-9600
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £680

Options:-
Notes:- The unit is supplied with the full APL character set including all the overstrike codes.

MODEL 12
Dist. Teleprinter Equipment Ltd.
Akeman Street
Tring, Herts HP23 6AJ
044282-4011

Screen size:-12"
Char. size:- 7 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 98
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 50-9600
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £870

Options:- 20mA current loop interface.
Notes:- De-luxe version of the "10" with extra programmable function space and a two page memory.

TELEVIDEO

TV1-912
Dist. Wilkes Computing Ltd.
Bush House
72 Prince Street
Bristol BS1 4HU
0272-25921

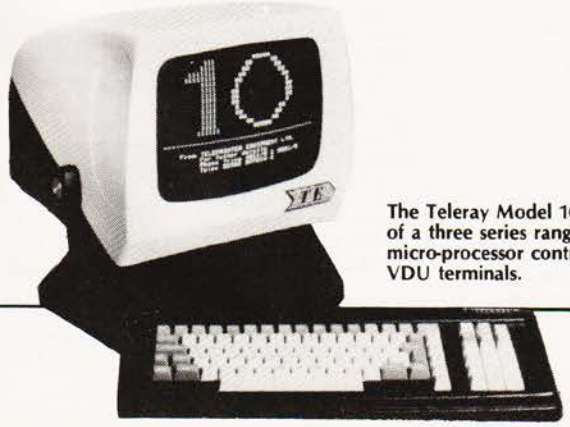
Screen size:-12"
Char. size:- 7 x 10
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 84
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 75-19,200
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £585

Options:- 2 page memory, Printer port, VT52 emulation.
Notes:- Intelligent editor with standard features like Block mode and memory protect.

TV1-920
Dist. Wilkes Computing Ltd.
Bush House
72 Prince Street
Bristol BS1 4HU
0272-25921

Screen size:-12"
Char. size:- 7 x 10
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 105
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 75-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £685

Options:-
Notes:- Full feature editing terminal with remote editing capability.



The Teleray Model 10, one of a three series range of micro-processor controlled VDU terminals.

VISUAL TECHNOLOGY

VISUAL 200
Dist. Wilkes Computing Ltd.
Bush House
72 Prince Street
Bristol BS1 4HU
0272-25921

Screen size:-12"
Char. size:- 7 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 93
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 110-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £795

Options:-
Notes:- Full feature editing VDU which is programmable to emulate Hazeltine 1500, ADDS 520, ADM-3A or DEC VT52 machines.

ZENITH DATA SYSTEMS

ZENITH Z19
Manuf. Zenith Data Systems
Bristol Road
Gloucester GL2 6EE
045Z-29451
London shop — 01-636 7349

Screen size:-12"
Char. size:- 5 x 9
Lines x Cols:- 25 x 80
CA:- Yes
Colour:- —
Sp. Char.:- Yes
No. of keys:- 84
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 110-9600
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £851.25

Options:- 20mA current loop adaptor.
Notes:- Z80 based full editing terminal. The unit is also available as a 'Heathkit' for the DIY constructor.

GLASGOW

TRS 80

Keyboards, Systems, Discs, Printers etc.

VICTOR MORRIS

TANDY DEALER

340 ARGYLE ST.
GLASGOW G2
Tel. 041 221 8958 Telex 779874

TRITON L7.2 COMPUTER. Full BASIC on motherboard, auto repeat, 6K RAM, EPROM programmer, manuals and tapes, cased. £550. Telephone Watford 42887 (evenings) for more details.

TRITON 10K RAM L7.2 (2MHz) monitor 8K extended BASIC, manuals, new cassette/TV £550. Also Centronics 101 printer + RS232 interface £350 ono 7" uncased 12V monitor £20. Haverhill (0440) 61207 evenings.

"SINCLAIR ZX80, Assembled and tested, £75 including sample programs on tape. For sale because of new PET. Telephone 0444 57286. 181 Hoblands, Haywards Heath, Sussex."

ZX80 PROGRAMS. Wide selection of low-cost games programs for your ZX80 now available. S.A.E. for details to: Tim Hartnell, 44-46 Earls Court Road, LONDON, W8.

MODULEC announce the end of expensive PET software. Cassette or disk based business programmes bespoke work undertaken. Games include Startrek as you've never played before. SAE to MODULEC Ltd, 211, Corporation Road, Newport, Gwent.

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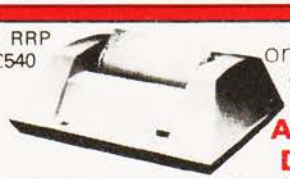

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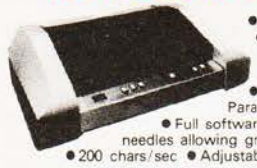

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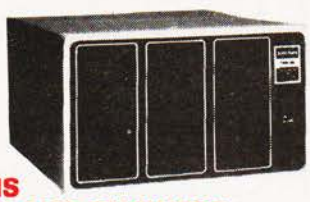

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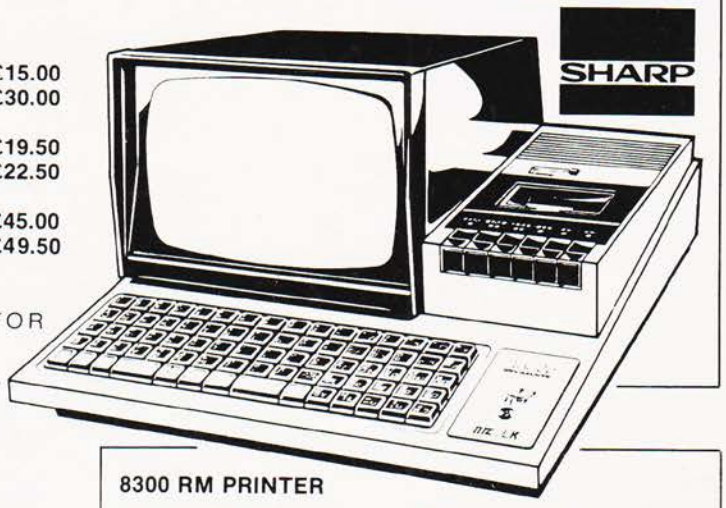

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