HARDWARE . . . . SOFTWARE . . . . AT HOME . . . . IN BUSINESS

computing today

FOR THE BUSINESS OF MICROCOMPUTING

SEPTEMBER 1980
ISSN 0142-7210
60p

PASCAL~A FALSE IDOL?
Programmers critiqué inside

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Until You Read Our Buyers Guide

Two Data Handling Routines For Getting Down To Business

User Report On The Handheld Sharp PC1211

The Newbear Newbrain Brain~Wave Or Brain~Less?

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Design as published in Wireless World

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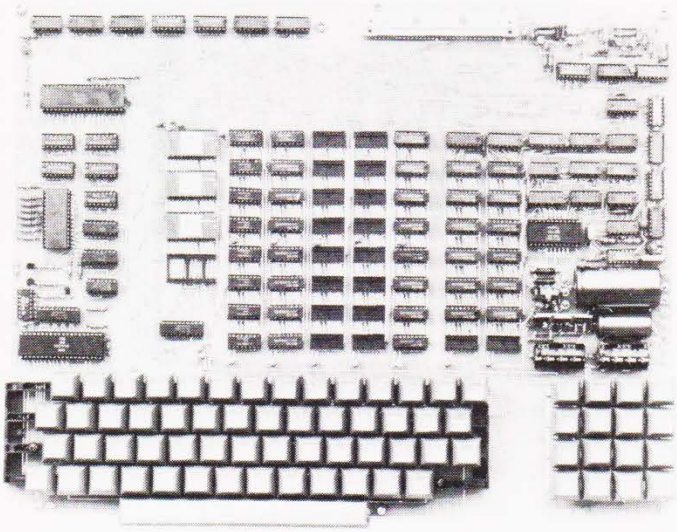
Included in the PSI COMP 80 scientific computer kit is a professionally finished cabinet, fibre-glass double sided, plated-through-hole printed circuit board, 2 keyboards PCB mounted for ease of construction, IC sockets, high reliability metal oxide resistors, power supply using custom designed toroidal transformer, 2K Basic and 1K monitor in EPROMS and, of course, wire, nuts, bolts, etc.



KIT ALSO AVAILABLE AS SEPARATE PACKS

For those customers who wish to spread their purchase or build a personalised system the kit is available as separate packs eg. PCB (16" x 12.5") **£43.20**. Pair of keyboards **£34.80**. Firmware in EPROMS **£30.00**. Toroidal transformer and power supply components **£17.60**. Cabinet (very rugged, made from steel, really beautifully finished) **£26.50**. P.S. Will greatly enhance any other single board computer including OHIO SUPERBOARD for which it can be readily modified. Other packs listed in our FREE CATALOGUE.

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Expansion up to 32K all inside the computer's own cabinet!
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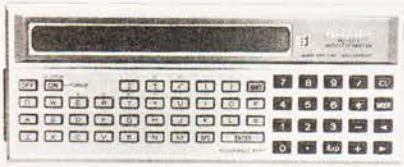

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Available now as a receive-only terminal.
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Continuously self-diagnostic.
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Organisation _____

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SHARP'S DESK-TOP BRAIN. MZ-80K FROM £480 Plus VAT

An amazing Z-80 controlled personal computer supplied with 78-key ASCII keyboard; 14K extended BASIC; VDU (40 characters × 25 lines); fast cassette facility; 4K monitor ROM; 80 × 50HR Graphics; and a choice of 20K, 32K or 48K of internal random access memory.

A 50-pin universal BUS connector allows the addition of printer, floppy discs, etc. There is also a built-in 3-octave music function.

20K System ..... £480 + VAT
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MZ80FD (twin floppies with 208K) ..... £780 + VAT
MZ80P3 Printer ..... £517 + VAT
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NASCOM-2

MEMORY ● 8K Microsoft BASIC ● 2K NAS-SYS 1 monitor ● 1K Video RAM ● 1K Workspace/User RAM ● On-board 8 sockets provided for memory expansion using standard 24-pin devices: 2708 EPROMS and MK4118 static RAM. **MICROPROCESSOR** ● Z80A which will run at 4MHz but is selectable between 2/4 MHz. **HARDWARE** ● Industrial standard 12" × 8" PCB, through hole plated, masked and screen printed. All bus lines are fully buffered on-board. **INTERFACES** ● Licon 57 key solid state keyboard (included) ● Monitor/domestic TV interface ● Kansas City cassette interface (300/1200 baud) or RS232/20mA teletype interface.

The Nascom 2 kit is supplied complete with construction article and extensive software manual for the monitor and BASIC.

EXPANSION OPTIONS
● MK4118 £10 + VAT each;
16K RAM A Board £140 + VAT;
32K RAM A Board £185 + VAT;
48K RAM A Board £230 + VAT;
16K RAM B Board £127.50 + VAT.

Nascom 2 Kit Price
£225
Plus VAT
+ P&P £2.00

NASCOM IMP PLAIN PAPER PRINTER

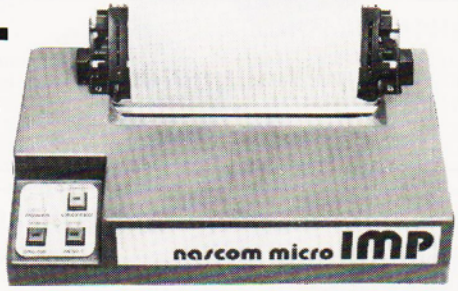
The Nascom IMP (Impact Matrix Printer) features:
● 60 lines per minute ● 80 characters per line ● Bi-directional printing ● 10 line print buffer ● Automatic CR/LF ● 96 characters ASCII set (includes upper/lower case, $, £) ● Accepts 8½" paper (pressure feed) ● Accepts 9½" paper (tractor feed) ● Tractor/pressure feed ● Baud rate from 110 to 9600 ● External signal for optional synchronisation of baud rate ● Serial RS232 interface ● Optional TRS80 interface ● Ribbon cartridge £9.90 + VAT ● 2000 sheets Fan Fold paper £18.00 + VAT.

Nascom Imp
£325
Plus VAT + P&P £2.99

NASCOM-1

12" × 8" PCB carrying 5LSI MOS packages, 16 1K MOS memory packages and 33 TTL packages. There is on-board interface for UHF or unmodulated video and cassette or teletype. The 4K memory block is assigned to the operating system and video display leaving a 1K user RAM. The MPU is the standard Z80 which is capable of executing 158 instructions including all 8080 code. **Built price £140 + VAT.**

Nascom-1 Kit Price
£125 Plus VAT
+ P&P £1.50



NEW POCKET COMPUTER FOR UNDER £100 + VAT. SHARP PC-1211

It's true! A real computer that employs the BASIC programming language and fits into a pocket!

The PC-1211 measures only 175mm wide by 70mm deep by 15mm high and weighs a mere 170g (less than 6 ounces) yet look at its features! Up to 1424 program steps, 80 character input line with full editing features, 18 user definable keys, 24 character alpha-numeric LCD display and built-in tone function are included.

An optional cassette interface is available for loading or dumping programs or data. The PC-1211 is battery operated, has an auto power off function, and maintains all programs and data in its memory even after the power has been turned off.

£91.26
+ VAT
(cassette interface: £13.00 + VAT)

NASCOM FIRMWARE IN EPROM

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NAS-DEBUG	£15.00 + VAT + 30p P&P
NAS-SYS 3	£40.00 + VAT + 30p P&P

NASCOM SOFTWARE ON TAPE

8K BASIC	£15.00 + VAT
ZEAP 2	£30.00 + VAT + 50p P&P

NASCOM HARDWARE

Motherboard	£5.50 + VAT + 50p P&P
Mini Motherboard	£2.90 + VAT + 50p P&P
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VERO DIP board	£12.50 + VAT + 50p P&P
FRAME	£32.50 + VAT + £2.00 P&P
8 Amp PSU Built	£105.00 + VAT + £2.75 P&P
Econographics	£30.00 + VAT + 50p P&P
I/O Board	£45.00 + VAT + 50p P&P
Buffer Board	£32.50 + VAT + 50p P&P
NEW NAS-BUS EPROM Board	£55.00 + VAT + 50p P&P

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We stock PET at discount prices. Sharp MZ-80K, and extensive range of electronic components including ICs, discrete semiconductors, capacitors, resistors, VERO products, OK Tools and accessories for both professional and amateur constructors.

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OAKFIELD CORNER, SYCAMORE ROAD, AMERSHAM, BUCKS HP6 6SU
TELEPHONE: 02403 22307. TELEX 837788

TEXAN MATE

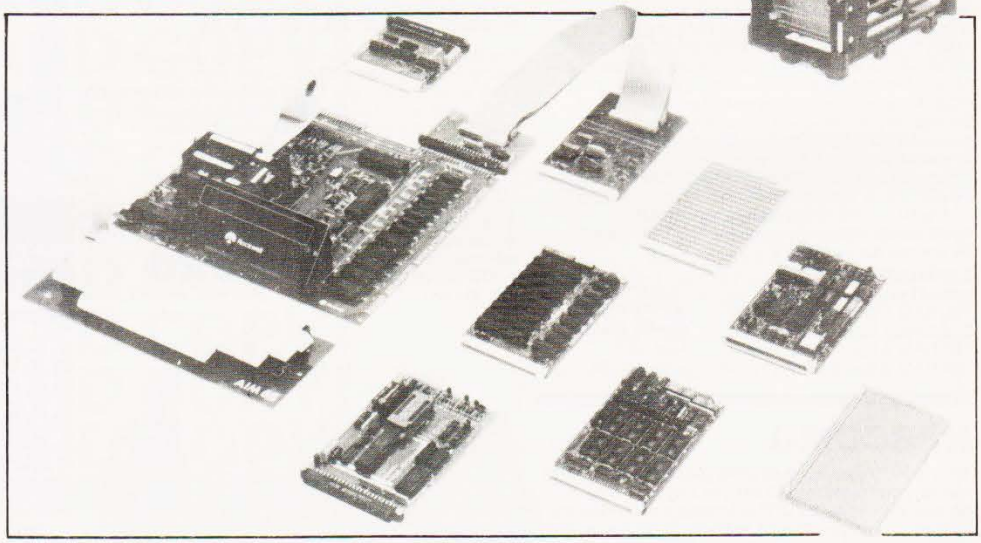
A new Command Module has been added to the range available for the Texas TI 99/4 home computer. Called Video Chess it has been produced with the assistance of David Levy, an International Master and well-known computer games person, and offers up to three levels of play, each with three levels of style. All moves are entered in the standard algebraic notation and the machine will assist at any point in the game. One interesting feature is that up to nine independent games can be played simultaneously, useful for clubs etc. Many other features are built-in including a "try again" and "freeze" facility or you can use the machine to solve standard problems. The TI 99/4 machine is currently selling for around £990 including VAT and the Chess module costs a further £44.95. The price is high compared to other systems because a US standard TV set is needed to display the colour graphics. For more information contact Texas Instruments at Manton Lane, Bedford MK14 7PA or ring on 0234-67466.

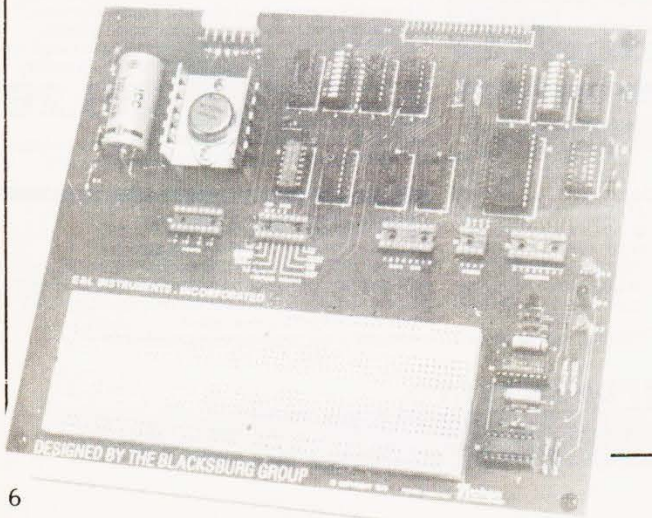
LINK-IN PROGRAMS

Owners of the Commodore PET and the Commodore discs can now take advantage of modular programming techniques with a new software package called LINKER. Produced by Dovetail Computer Systems it allows the generation of a routine library on disc and the access of these routines through the main program. All you do when writing the main program is to allocate a REM statement to each subroutine you wish to call containing the phrase "*INCLUDE". The LINKER is now run and builds the complete program. If you modify the subroutines at a later date you simply re-build the program and all the subroutines are updated. For further details of this interesting package contact Dovetail at 17 Burlington Street, Blackburn BB2 6ES or ring on 0254-665867.

SHOWTIME

Yes, it's that time again folks. Breadboard is about to make its annual appearance at the Royal Horticultural Halls between November 26 and 30. This, the third show, will be bigger and better than ever, mainly due to the fact that our group of magazines is staging it. Owing to the record crowds last year we will have a late night on Thursday November 27 and will also stay open on the Sunday so even more of you can come and enjoy the event. For further details of the show please watch these pages or if you are interested in exhibiting contact Trident International Exhibitions Ltd, 21 Plymouth Road, Tavistock, Devon PL19 8AU. Make a note of the date in your diary now and we'll see you then.





TANDY CONTROL

Owners of the TRS 80 who have a lusting for the outside world may be interested in a new interface unit called the IF-100. The box is self-powered and is based around a breadboard unit and some TTL to provide buffering of the bus signals. The other requirements are that the host machine be of level 2 type and that it has a minimum of 4K user memory available. Costs are £95 in kit form, £129 assembled and £12 for the necessary cable. All prices are less VAT and P&P. For further details contact E & L Instruments (UK) Ltd., Whitegate Industrial Estate, Whitegate Road, Wrexham Road, Wrexham LL13 8UG or ring on 0978-263030.

MORE AIM BITS

Yet more add-ons have been announced for the AIM 65 computer. The latest bits include a buffer board, card rack, 8K static RAM, 16K PROM/ROM and a dual coms interface board. Also introduced are a trouble-shooting card and a prototyper for OEM useage. Further products for the AIM 65 will also come from Tangerine whose VDU card is selling well and from other suppliers within the UK. For further information on the range contact Pelco (Electronics) Ltd., at Regency Square House, 26/27 Regency Square, Brighton, Sussex BN1 2FH or ring on 0273-722155.

EIGHTY EIGHTY

With an eye to the serious business user, and not before time too, Commodore have launched their upgraded PETs. Nicknamed the Super PET by many the machine has a new BASIC, a new 80 column screen and several other goodies worked into its little body. The price is £895 plus VAT and they are supposed to start deliveries in August. The accompanying disc drives are causing some problems apparently, the DOS is proving troublesome according to Commodore, so when these rather vital components will arrive we're not sure but they will cost you a further £895 plus VAT. They will store more than the current drives but are still 5¼" based. Commodore are intending to market the two 'PET' systems side by side and have reduced the cost of the current 32K model to £695 with the discs carrying a similar tag. They are also promising a large range of business oriented software for the Autumn. Details are available from your local computer store or direct from head office at 818 Leigh Road, Slough Trading Estate, Slough, Berkshire.

DATRON MOVE

The Datron Micro Centre in Sheffield has found itself a new home. The move was made to cope with the expanding business and will allow displays of their range of Cromemco and other machines and their new software such as Pascal for the NASCOM and engineering packages for the Sharp and Apple/ITT 2020. The new address is 2 Abbeydale Road, Sheffield S7 1FD and telephone calls should be directed to 0742-585490.

EAGER BEAVER

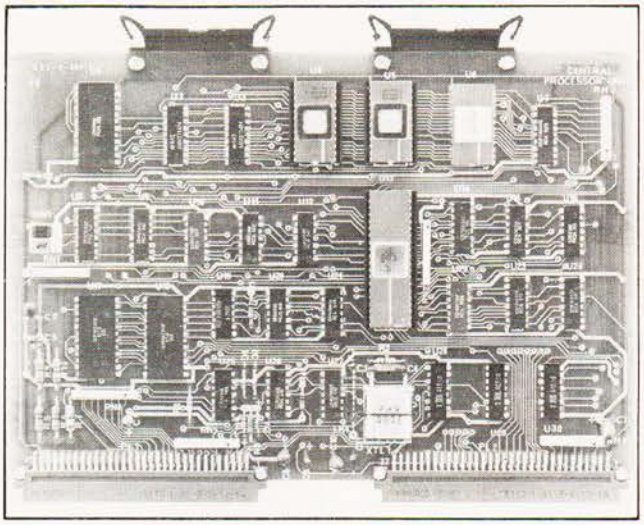
Beaver Systems have added a Renumber program for the Superboard and UK 101 to their software range. The program resides in the top 1K of system RAM and will locate in any multiple of 4K although custom versions will be supplied on request. Line steps are selectable between 1 and 255 and all references are handled. The program can be yours for the sum of £5 and if you have trouble in obtaining it, or any of the Beaver range, you can write direct to them at Norlett House, Dormer Road, Thame, Oxon OX9 3UC or ring on 084421-5020.

ON COURSE

Back to school again, or looking for an extra computer qualification? Here are some computing courses that are taking place over the next few months. If you are into Pascal you might be interested in a series of five-day courses being run by Cambridge Micro Computers. The next one is taking place between the 8th and 12th of September at the company's training centre and will cost £295 plus VAT per person. For details of this and other CMC events contact them at Cambridge Science Park, Milton Road, Cambridge CB4 4BN or ring on 0223-314666. The University of Manchester is offering a varied curriculum from "6502 Machine Code Programming" to "Microcomputer Statistics". None of them appears to cost more than £20 and full details along with an application form may be obtained from The Department Of Extra-Mural Studies, Manchester University, Manchester M13 9PL. Portsmouth Polytechnic is offering a range of introductory and special courses ranging from a one day briefing for managers and directors to a four day course for engineers. Full details are available on request from Mrs Anne Sizer, Portsmouth Polytechnic, Department of Electrical and Electronic Engineering, Anglesea Road, Portsmouth PO1 3DJ. The Manpower Services Commission are also offering a number of grant supported courses for programmers and systems analysts and full details can be obtained from the commission at Selkirk House, 166 High Holborn, London WC1V 6PF.

COSMAC CARD

RCA are launching a new variant of the 1802 COSMAC microprocessor aimed at the industrial user. Based around the double Eurocard format it will become the first in a series of boards based on this low power CPU. Others in the pipeline include a 4K CMOS RAM, a control and display board, a plant interface board and analogue and digital interfaces. For details contact RCA Limited, System Services, 9a-11a Market Place, Guisborough, Cleveland TS14 6BN.

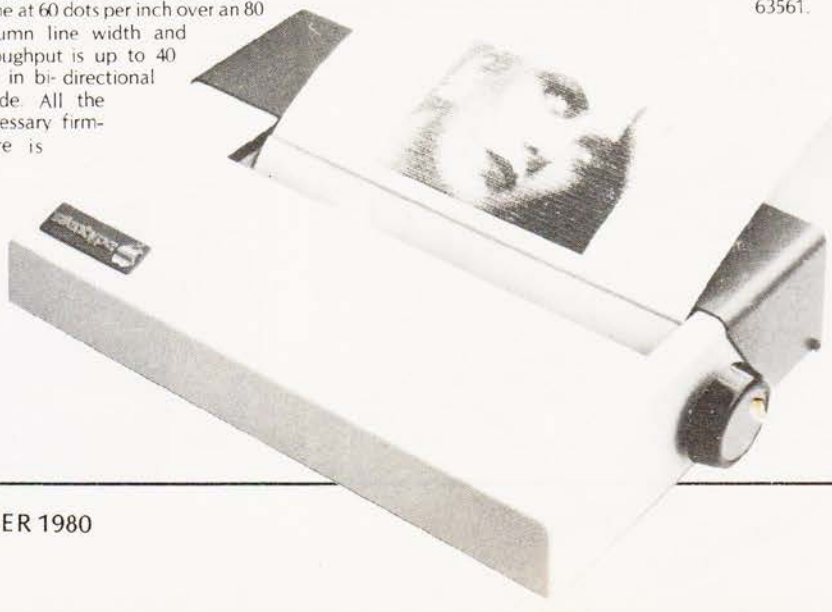


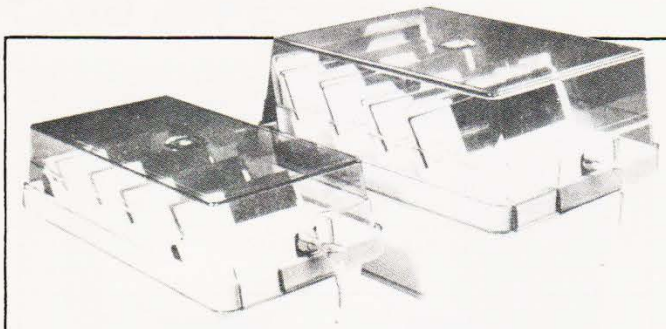
DISTRIBUTOR DEAL

Intelligent Artefacts have added yet more American goodies to their range of peripherals. This month's acquisition is the range of Seawell cards that are fully compatible with AIM, KIM and SYM computers. Among the products are two sizes of motherboard, two RAM boards and an EPROM programmer and a 6512 CPU board. Further information on these and other products including the Base 2 printer we mentioned last month can be obtained from them at Cambridge Road, Orwell, Nr Royston, Herts. Their telephone number is Arrington 689.

HOT GRAPHICS

Recently launched by Microsense, the UK Apple people, is a thermal printer called Silentype. Based on the Trendcom series of machines, it gives a direct screen copy of all text and graphics, even in the high-resolution mode. The printing is done at 60 dots per inch over an 80 column line width and throughput is up to 40 cps in bi-directional mode. All the necessary firmware is built-in and the complete system, with interface card, paper and manual costs £349 plus VAT. Extra paper is available in 80' rolls at £28 plus VAT for a box of ten. For more details on this and all the other Apple products contact Cherry Watret at Microsense Computers, Maxted Road, Maylands Avenue, Hemel Hempstead, Herts HP2 7LE or ring on 0442-63561.





DISCOVERED!

Fed up with losing your floppy discs? BFI are offering lockable floppy boxes in two sizes, A5 for 8" ones and A6 for 5¼", which are made in ABS with see-through acrylic tops. There are moveable dividers inside which allow the 70 disc capacity to be organised. Delivery is ex-stock and further details are available from Sharon Hall at BFI Electronics, 516 Walton Road, West Molesey, Surrey KT8 0QF or by phone on 01-941 4066.

ALGOL A GO GO

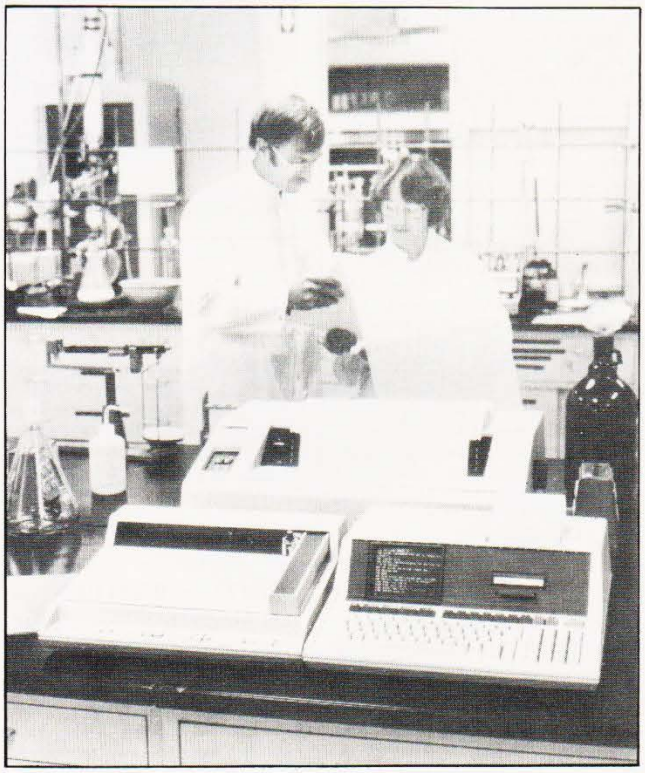
Owners of the Exidy Sorcerer who operate in scientific establishments may like to take a look at the new implementation of Algol 60. Two versions are available, both priced at £99, one of which handles low definition graphics and the other being equipped with 32 bit precision arithmetic for greater accuracy. Also announced recently by Liveport is a new Payroll package that conforms to the full Government specification on PAYE and contracted-out pensions etc. All documentation is produced automatically including P45s and payslips. For detail on both products contact Liveport at The Ivory Works, St Ives, Cornwall or ring on 0736-798157.

EYE EYE

If your Apple is giving you eyestrain then you may be interested in a new add-on that doubles your screen capacity. Called 'Doublevision' it is a simple, plug-in board that converts the screen display to 80 columns in full upper and lower case letters with 24 lines. Other facilities offered include light pen capability and programmable cursor mode. The board costs £195 plus VAT. Details from Mike Sterland at Personal Computers, 194-200 Bishopsgate, London EC2M 4NR or on 01-626 8121.

SOFT APPLES

Feeding a micro with software can be a tiresome business so it's a nice change to find a shop that sells almost nothing but Apple/ITT 2020 compatible product. The shop is Computech in the Finchley Road and among their range is the award winning Visicalc, Applewriter for WP enthusiasts, Sales, Purchase and Nominal Ledgers for business applications and Utilities for anyone who wants to use the discs to their full advantage. All the software is documented and it all seems to have been produced with the end-user in mind and is simple to work. Also stocked is a hardware interface for RS232 fast printers that can support baud rates up to 19,200 and is fully handshaking and bi-directional. Cost of the unit is £80 so it compares favourably with other units on the market. The star of the range is the Micromux 8000, a 16 port multiplexer system that allows communication between any of the 16 devices attached. Available in multiples of four ports the prices start at around £800 and the unit is suited to both business and educational markets. Drop in to the shop for further details at 168 Finchley Road, London NW3 6HP or ring on 01-794 0202.



EIGHTY-FIVE ENHANCEMENTS

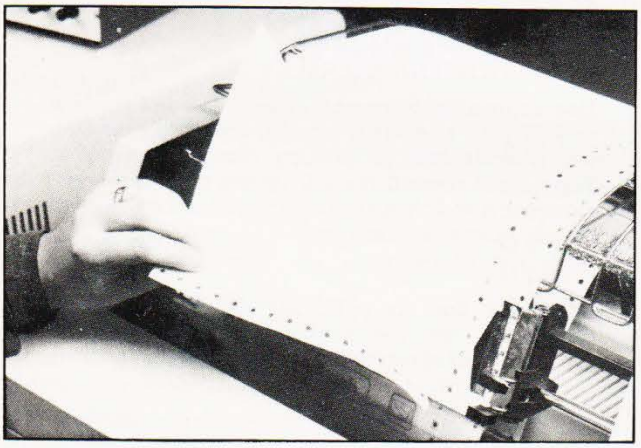
Proud owners of that original American Dream Machine, the HP 85, can now add a number of goodies. Among the recently released add-ons are an HP-IB (IEEE-488 to you) bus connector and three new special ROMs. The most awaited ROM controls a printer-plotter combination and is directly accessible through BASIC. Also introduced are a Matrix Math ROM and a general purpose I/O ROM together with a new version of the 85 called the 85F which gives direct access to the HP-IB and the I/O ROM as standard features. The new variant costs £2335 and the modules range from £237 for the HP-IB down to £87 for the Matrix Math and printer-plotter ROMs. The necessary ROM drawer is £75 and all prices exclude VAT. Further technical information may be obtained from the Advanced Products Division, Hewlett Packard Ltd., 308-314 Kings Road, Reading, Berkshire RG1 4ES or by telephone on 0734-61022.

EXPANDING TEXT

Latest in a long line of intelligent matrix printers is the model 801 from Whymark. Featuring true descenders on text characters, graphics, user definable character set, automatic centering and full forms control the unit has an impressive pedigree. The matrix head is good for 100 million characters at its 140 cps bi-directional printing speed. Intelligence is imparted by a 6502 and a variety of options like extra character buffer and Centronics interface are available. Standard interfacing is through RS232 with baud rates of 75-9600 selectable. Because of the built-in logic the printer can also output bar codes and do graph plotting to within one character position in 1000. Whymark also produce a range of 40 column printers based around their model 201 mechanism which use either tally roll paper or label rolls. These are supplied with a wide choice of interfaces including a PET compatible IEEE. For information on any of the range contact Whymark at 6 Holmesdale Road, Reigate, Surrey RH2 0BQ or telephone on 07372-21753.

INTELLIPRINT

Newly arrived on the printer scene, and just in time to squeeze into our mammoth survey, is a machine called Century. Based around the Burroughs PM 100 mechanism and equipped with head logic and bi-directional print capability it has been developed by Weyfringe. The unit is supplied with both serial and Centronics compatible interfaces and can handle communication rates of up to 9600 baud. Print format is 132 characters per line with a 3K buffer. Both tractor and friction feed are available and the ribbon is stored in a cartridge for easy changing. For a data sheet contact Weyfringe at Longbeck Road, Marske, Redcar, Cleveland TS11 6HQ or ring on 0642-470121.



SPIDERS BEWARE

If you need multiple copies of printed documents in a hurry and can't wait until your multi-part stationary has been through the burster you might like to hear about a new paper stock called Speediweb. Produced in up to six-part and in two styles, Audit and Burst, the complete form may be removed from the printer from between the sprockets directly after it has been printed. Moore Paragon, the people responsible for its introduction, will also undertake to design special forms for your company as well as supplying the standard blanks. For more literature and your samples contact Moore Paragon at the Paragon Works, London E16 1NW or ring on 01-476 3232.

CONFIGURE IT

Lifeboat, the software company that describes itself as the "Software Supermarket", are proudly offering their latest business package called Configurable Business System or CBS for short. Basically a database management package it is said to allow true transaction processing and will run on any CP/M based system with at least 48K of user RAM. The program itself costs £165 plus VAT and is supplied with full documentation and demonstration software or you can buy the documentation on its own for £30. For a more detailed description of the facilities offered contact Lifeboat Associates at 32 Neal Street, London WC2H 9PS or ring them on 01-379 7931.

DBMS 4 U

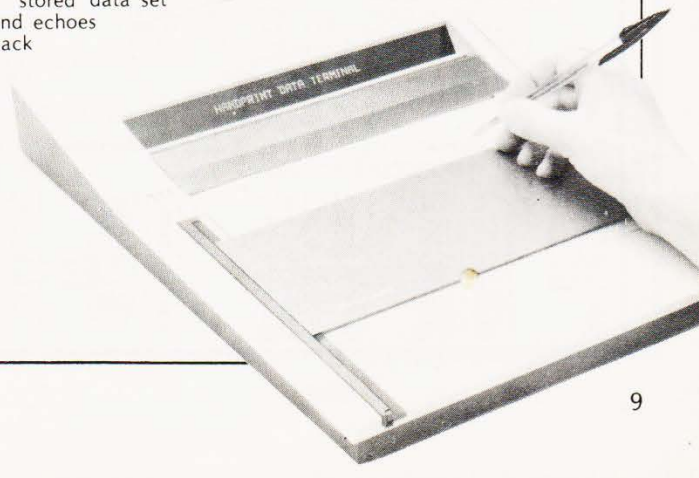
Business users of the 32K Commodore PET who find the information handling facilities limited can uprate their systems with a Data Management System from CompSoft. Recommended by Commodore the software can handle up to 5000 items per floppy disc with each item being immediately accessible by a key code of up to 16 characters. Each item may contain a maximum of 20 fields so the system is ideally suited to address and mailing lists etc. Full sort search and output options are built in along with a certain amount of numeric analysis. Potential users should contact Heather Kearsley at CompSoft, Old Manor Lane, Chilworth, Guildford, Surrey or ring on 0483-39665.

USER FRIENDLY

Crashing in at just under the £6000 mark comes a new system from LSI Computers that is aimed directly at the first time user. The new System M-One is added at the bottom of the current range of five systems and, complete with software, costs £5995. Configured around an Intel system with 8K of RAM, a VDU, a 60 cps bi-directional matrix printer and 612K of floppy disc storage the computer is ideally suited to the de-centralised organisation that wants to have the flexibility of several small machines rather than one large computer. The choice of supplied software includes Inventory Control, Invoicing and Payroll operations among others. For more detailed information contact LSI Computers at Copse Road, St Johns, Woking, Surrey.

MANUAL ENTRY

Micropad, the handwritten data entry system, is to be distributed by Scan Computers Ltd. Originally developed by a Government research team for signature vertification by computer the pad will accept alphanumeric and special characters written onto a prepared form. The computer performs the necessary character recognition from a stored data set and echoes back the recognised character to the single line display. Suitable for applications where there is a large amount of clerical work, the system is very flexible and provides direct data entry, thus saving time and mistakes. For further information contact Steve Russell at Scan Computers, Chanctonbury House, Church Street, Storrington, Sussex or ring on Storrington (09066) 4342.



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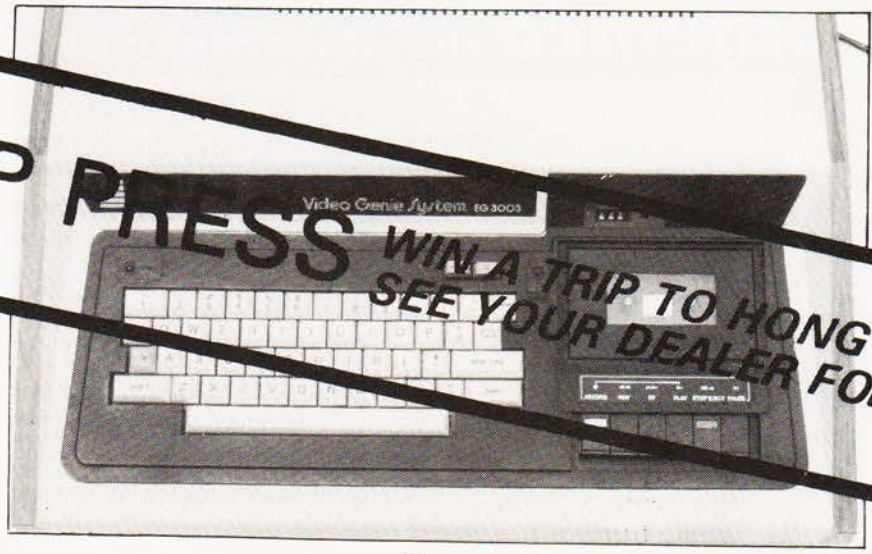

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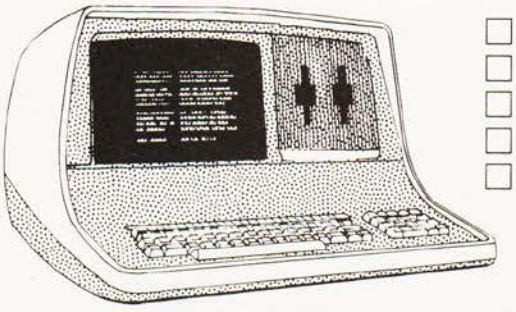

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A.P. Stephenson

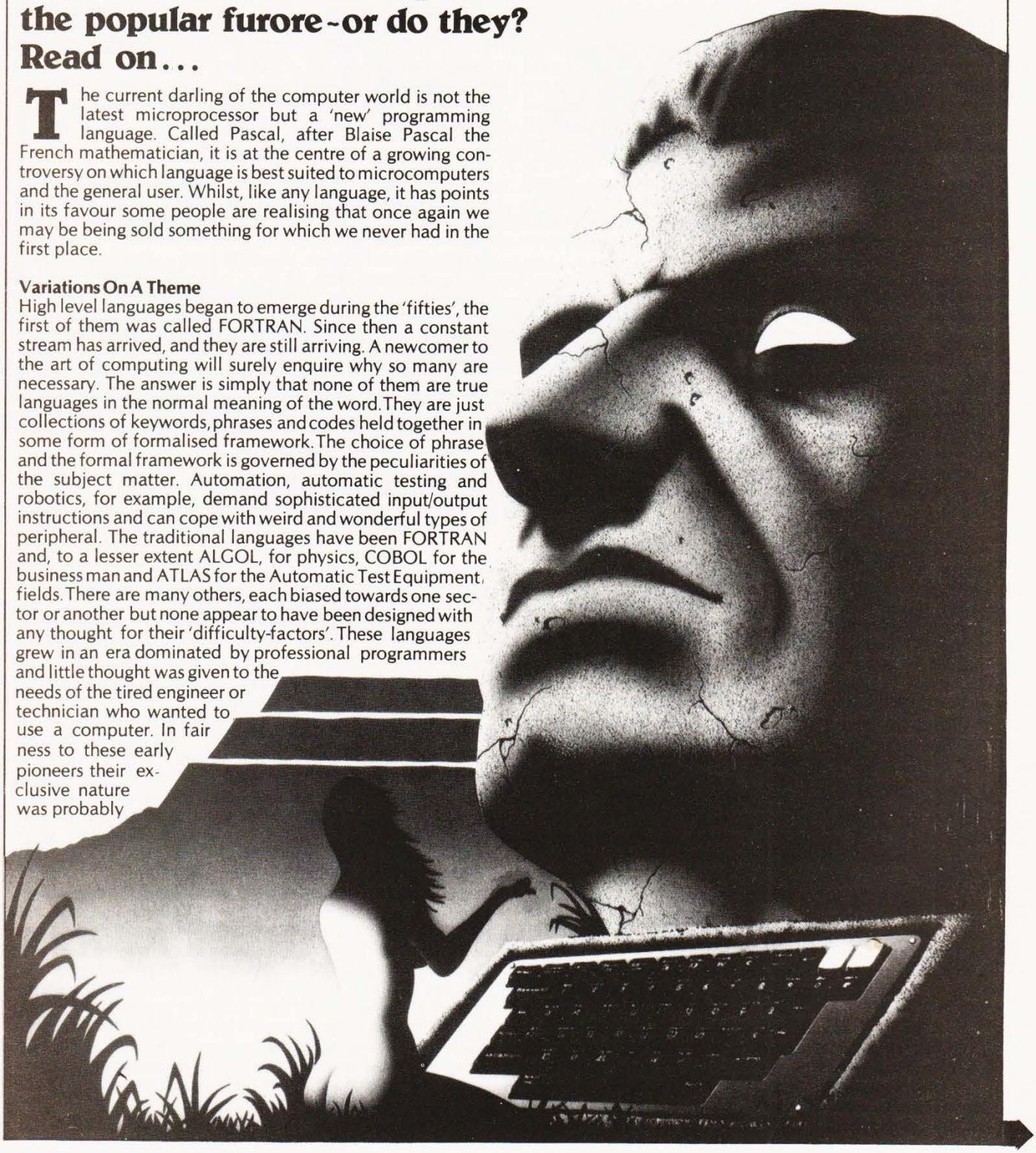
PASCAL-A FALSE IDOL?

In racing terminology there are horses for courses. Computer languages often follow the same rule despite the popular furore-or do they? Read on...

The current darling of the computer world is not the latest microprocessor but a 'new' programming language. Called Pascal, after Blaise Pascal the French mathematician, it is at the centre of a growing controversy on which language is best suited to microcomputers and the general user. Whilst, like any language, it has points in its favour some people are realising that once again we may be being sold something for which we never had in the first place.

Variations On A Theme

High level languages began to emerge during the 'fifties', the first of them was called FORTRAN. Since then a constant stream has arrived, and they are still arriving. A newcomer to the art of computing will surely enquire why so many are necessary. The answer is simply that none of them are true languages in the normal meaning of the word. They are just collections of keywords, phrases and codes held together in some form of formalised framework. The choice of phrase and the formal framework is governed by the peculiarities of the subject matter. Automation, automatic testing and robotics, for example, demand sophisticated input/output instructions and can cope with weird and wonderful types of peripheral. The traditional languages have been FORTRAN and, to a lesser extent ALGOL, for physics, COBOL for the business man and ATLAS for the Automatic Test Equipment fields. There are many others, each biased towards one sector or another but none appear to have been designed with any thought for their 'difficulty-factors'. These languages grew in an era dominated by professional programmers and little thought was given to the needs of the tired engineer or technician who wanted to use a computer. In fair ness to these early pioneers their exclusive nature was probably



unintentional but nevertheless, the text books of that time were written *by* experts *for* experts in order to show off their expertise. What was wanted was a more general purpose language orientated towards simplicity rather than efficiency. In the mid-sixties two gentlemen in the USA had the foresight to realise this and invented BASIC. The result was a great success, justifying the acronym 'Beginners All-purpose Symbolic Instruction Code'. Here at last was a language which enabled anyone of average intelligence to fight a computer keyboard with a minimum of pre-study. It was a 'conversational' language encouraging interaction between computer and operator. Editing facilities were good and the plain language error messages enabled a nervous programmer to rectify syntax errors at every stage of program development . . . an inherent property of an *Interpreter* rather than a *Compiler*. In fact BASIC has brought computing to the people . . . microprocessors have only helped to reduce the cost of the hardware! The language is well established, lavishly supported by literature and, much to the chagrin of certain iconoclasts, is likely to remain dominant for at least the next decade or even longer.

Basic Under Attack

A sinister trend appears to be developing. Achievements of man are only worthy of applause while they remain unpopular or unnoticed by the general public. A symphony of traditional merit is suddenly downgraded to 'banal' if the record sales increase beyond a respectable minimum. Stravinsky was demoted overnight when his 'Rites of Spring' was used as theme music for a Hollywood musical. Newton, Einstein and Plank have now been robbed of their former eminence because many A-Level schoolboys now understand some of their work. And now poor old BASIC is a victim of a sneering campaign in a furious attempt to popularise Pascal.

We are constantly reminded that BASIC is slow in execution, not suitable for 'structured' programming, is an interpretive rather than a compiled system, perpetuates 'old-fashioned concepts' etc etc. These criticisms are worthless because we all agree . . . they are truisms! For a start, what value do you put on the property of speed? In the majority of programs, BASIC is still fast enough to appear 'instantaneous' to *human* operators. In the cases where programs, or parts of programs, run at unacceptably slow speeds it is not too difficult to splice in a bit of machine code linked with the USR function. In fact, this requirement can be a blessing in disguise, because it provides a powerful incentive to penetrate the mysteries of the machine.

To Structure Or Not?

Now we come to the 'structured programming' fetish. In fact it is more a fetish . . . it has assumed the status of an ideology and like all ideologies it has opponents. There are many programmers of eminence who question the overall value of it. They point out that it is like programming in a straight jacket. The trouble with structured programming is its negative nature. We *mustn't* do this and it is *not wise* to do that; we *shouldn't* use IF/THEN, *neither* must we use statements of the ON/GOTO form. The cardinal sin of all, almost equivalent to painting the Kremlin blue, is to write the harmless line GOTO 500.

The basic idea behind structured programming is to facilitate team work. A team of programmers, each responsible for a separate module, can work according to the strict rules and be confident that their tested module will fit into the final framework without bugs. If one of the team falls ill (or similar irresponsible act) in the middle of his task, any other spare programmer who has been trained on structured principles can take over without time-wasting on tracing the lines of thought. There is no doubt that programs of ambitious dimensions are completed and debugged in a shorter time . . . sometimes.

But the writer and the vast majority who read this magazine do not attempt programs of ambitious proportions. Programming to us is simply an exciting pastime. Debugging a program can be fun, thinking up novel little twists can be stimulating, particularly if nobody else can fathom out how we did it! I certainly don't wish to be fettered by restrictions imposed by a set of ethics not intended for me in the first place. Those intending to enter programming as a career are of course in a different category, poor souls!

The False Idol

Now to Pascal itself. It is a general purpose language designed absolutely in accordance with the dictates of structured programming. According to the devotees, it is powerful and elegant. Frankly, I must just take their word for it because, whatever else Pascal is, it is not exactly a simple language to learn. Perhaps I am a bit thick but if Pascal had come out before BASIC as the 'general purpose language' it is doubtful if I would have bought a PET, or indeed any other 'personal' computer. Perhaps even this magazine and others like it might not have come into existence.

BASIC is adequate for my purposes and no doubt Pascal is marvellous for other people's purposes. There is no justification for promoting the new by denigrating the old . . . there is room for both. BASIC is not perfect but neither is the English language!

History Lesson

For the historical record the BASIC programming language was officially born on May 1st 1964 at Dartmouth College, New Hampshire, USA. The ideas was originally conceived by Professors John Kemeny and Thomas Kurtz in September the previous year and it was intended as a language that should be conversational, easily learnt and capable of implementation on time-sharing systems. It is interesting to note that much of the actual programming was done by students at the college. From the original Dartmouth BASIC, as it was called, have sprung an almost uncountable variations but all are based on the original concepts. There is, as yet, no official 'standard' BASIC although the American National Standards Institute have been looking at it for quite some time and are eventually expected to produce two final 'standards', one a minimal version which already exists in draft form and a second 'Extended' version which will contain all the luxury items that we have come to know and love.

As a sharp contrast to the relaxed way in which BASIC took over the world Pascal was defined in 1968 at the University of Zurich by Professor Niklaus Wirth. The published document, the Pascal User Manual and Report, written jointly with his colleague K.Jensen. The language arose out of Wirth's desire to produce a 'good' programming language which he could teach to his students as an alternative to the 'unsatisfactory' ALGOL 68. We have put the words good and unsatisfactory in quotes because these are totally meaningless to anyone other than academicians who take great delight in producing things that are theoretically correct but almost impossible to use by the average individual. The best book on Pascal for anyone interested in reading more is probably the second edition of that original text by Wirth and Jensen, it is certainly the most rigorous.

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TRS 80 UTILITY

Tony Lacy

In order to combine the convenience and ease of programming in BASIC with the power of machine code the following program can prove of great assistance to TRS 80 Disc BASIC users. Machine code subroutines are POKEd into reserved areas of memory to form a series of data statements which are accessed via the USR call. Converting the Hex values of all that machine code into decimal and then keying it in is a tedious business, just the sort of thing you bought the computer to avoid!

Information

The program, or subroutine, in machine code should be loaded into the machine using T-BUG, DEBUG or the Editor/Assembler and stored in the reserved RAM area. Now load the BASIC program and run it. This will produce a file which contains the DATA statements and this can be treated as a normal BASIC program. It should be noted that the program line 795 is complicated by BASIC's dislike of PEEK and POKE addresses greater than 32767.

The PRINT statements appear cumbersome as a result of the terminators that have to be used to obtain the correct disc image. If you use NEWDOS you can examine the file using CMD"LIST-(FILESPEC)".

Program Listing

```
 5 CLS
10 PRINT" PROGRAM FOR PRODUCING A LIST
   OF DATA STATEMENTS"
20 PRINT" FROM A HEX OBJECT LISTING
   LOCATED AT THE TOP END"
30 PRINT" OF MEMORY (PROTECTED USING
   MEM SIZE OPTION)"
35 PRINT" ADDRESSES TO CONTAIN FOUR
   BYTES"
40 PRINT:INPUT " START ADDRESS (HEX)"
   ;SA$
50 INPUT" END ADDRESS (HEX) ";EA$
60 INPUT" ENTRY POINT (HEX) ";EP$
70 INPUT" FILESPEC FOR BASIC LISTING";FB$
80 CLS
90 IF LEN(SA$)<>4 OR LEN(EA$)<>4 OR
   LEN(EP$)<>4 THEN PRINT" BAD
   ADDRESSES": GOTO 35
95 S=0
97 A$="0123456789ABCDEF"
100 H$=SA$:GOSUB 200:SA=D
110 H$=EA$:GOSUB 200:EA=D
120 H$=EP$:GOSUB 200:EP=D
130 IF S=1 THEN PRINT" BAD ADDRESS,
   NON-HEX CHARACTERS":GOTO 35
131 IF (SA>EA) OR (EP<SA) OR (EP>EA) THEN
   PRINT" ADDRESSES IN WRONG
   ORDER":GOTO 40
135 GOTO 500
200 REM HEX TO DEC CONVERSION
205 D=0
210 FOR I=LEN(H$) TO 1 STEP -1
220 D1=16(4-1)*(INSTR(A$,MID$(H$,I,1))-1)
221 IF D1<0 THEN S=1
227 D=D+1
230 NEXT I
240 RETURN
499 REM MEM SIZE SET REMINDER
500 CLS:PRINT" START ADDRESS IS ";SA;"
   DEC. HAVE YOU RESERVED
510 INPUT" SUFFICIENT MEMORY AREA ";Q$
520 IF LEFT$(Q$,1)="N" THEN CLS:GOTO 40
698 REM GENERATE A FILE
699 REM STRIP TRAILING AND LEADING SPACES
700 DEFFN N$(N)=MID$(STR$(N),INSTR(STR$
   (N)," ")+1)
709 REM OPEN THE FILE
710 OPEN"O",1,FB$
715 CLS
720 PRINT" OUTPUTTING FILE, PLEASE WAIT"
730 A=30:N=10
750 FOR Y1=SA TO EA
760 IF A=30 THEN PRINT#1,CHR$(13);FN
   N$(N);" DATA";ELSE PRINT#1,",";
780 IF A=30 THEN A=0:N=N+10
795 IF Y1>32767 THEN PRINT#1,FN
   N$(PEEK(Y1-65535));ELSE PRINT#1,FN
   N$(PEEK(Y1));
800 A=A+1
830 NEXT Y1
839 REM -1 CAN BE USED TO TERMINATE A
   DATA READ
840 PRINT#1,",";FN N$(-1)
844 REM INCLUDE USEFUL INFORMATION IN
   THE FILE
845 PRINT#1,FN N$(N);" REM START
   ADDRESS= ";FN N$(SA);" END ADDRESS=
   ";FN N$(EA);" ENTRY POINT= ";FN
   N$(EP);" DECIMAL"
850 CLOSE
860 CLS:PRINT" FILESPEC ";F$:PRINT" DATA
   LINES FROM 10 TO ";N;" IN INCREMENTS
   OF 10"
```

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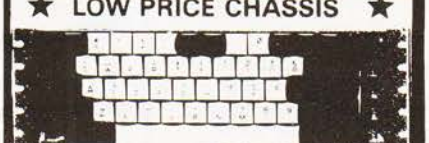

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DIALECTS IN BASIC

How to distinguish your Integers from your Extendeds and make more sense of your software.

One of the most confusing things for a first-time computer buyer must be the attempt to compare facilities in the firmware of two different systems. The various 'dialects' of BASIC in circulation today mean that often a choice is made on the basis of a comparison of the range of statements in each, bearing in mind the speed of the two systems. Most computer reviews adopt this approach but it can lead to very misleading comparisons! As an example of this I have chosen to compare the flexibility of two fairly popular dialects of BASIC which can be operated on the same computer — Apple Integer BASIC (for the Apple II) and the floating-point Applesoft BASIC.

Choice or Alternative

Firstly let it be said that for many applications it would be impossible to use Integer where Applesoft would be an ideal language by comparison — facilities such as software-selectable text print rate, Trig functions, etc., are not available in the former, for example — but the specification of the languages leaves a great deal unsaid.

By far the most useful advantage of Integer is the way that variable names can be put in where line numbers are required: for example —

```
210 PRINT "SCORE SO FAR"; SCORE
220 RESTART = 15
230 IF SCORE = 0 THEN RESTART
240 COMMENT = SCORE *10 + 1000
250 GOSUB COMMENT
260 GOTO NEWGAME
```

This example shows just some of the advantages in terms of intelligibility and program writing convenience that can be obtained as a consequence. Note also that the Applesoft ON .....GOTO and ON.....GOSUB commands are replaced in Integer by the statements on lines 240-250. Where a computed GOTO is required for a long string of possible line-numbers, this can save a good deal of typing. It has the disadvantage that it is difficult to branch to lines out of sequence, but often the lack of such a sequence at that point in a program indicates a dangerously disorganised approach to the problem to be solved anyway! In the example the variable NEWGAME would have been set to the line-number of the statement asking the operator if he/she wished to run the program again. In such a way the ease with which a programmer can check through what has been written is greatly enhanced, and the final text can look quite like a COBOL printout at times.

String Things

The next confusing feature of the language specifications is associated with string-handling. In Integer BASIC there are (shock!) no LEFT$, MID$ or RIGHT$ functions. It is also apparently impossible to pick out sections of a string for separate processing. In actual fact the INTEGER system is even easier to apply than the usual Microsoft functions.

To select the fifth through ninth characters of the string NAME$ = "APPLE COMPUTER" you type, for example, PIECE$ = NAME$(5,9) and get the result that PIECE$ = "E COM", and so forth. Consequently the equivalents of the Applesoft functions can be easily obtained and, as an added advantage, you save on typing and memory-space. Again the specification does not do justice to the dialect.

The next comparison is also connected with the relative usefulness of the two languages, and again does not appear on the list of facilities, and it concerns the operation of the IF.....THEN statement. In an Applesoft program a line starting with one such command, and with a number of other commands on the same line, when the IF.....THEN turns out to be false all other statements on the line are disregarded. In Integer the program would execute the statement *subsequent* to the one following the THEN. For example:—

```
300 A=5
310 IFZ=9 THENA=6;A=0
```

This piece of program would return A=5 in Applesoft and A=0 in Integer BASIC. Each version of the command has its own merits, but due to the difficulty of editing long program lines, as the Applesoft system encourages, and also because of the IF.....THEN.....ELSE facility that the Integer system affords (think about it) I prefer Integer. In a good many Applesoft programs I have seen the temptation to put the entire 'consequence-subroutine' on the same line, as the conditional command, has caused problems.

One other thing that can cause problems in Integer programs is the fact that the contents of arrays are indeterminate until you have set their value. In a program using a large number of array elements, setting them all to zero can take quite a while, and also lengthens the program. In Applesoft all variables are assigned the value zero once RUN is typed.

Summary

In conclusion to this short article I have tried to show how deceptive the specifications of different languages can be. Although I have taken examples from the Apple II range of languages similar, less-than-obvious (but still important) differences exist between many other personal computer languages. Often these will not show up until after a demonstration, so it is worth getting hold of someone who has used both machines before commiting yourself on the basis of a specification sheet and an hour's sales patter.

Post Script

As a logical progression to this article we will be presenting the complete set of Kilobaud Benchmarks in our next issue with full explanations on their use. We are hoping to run these tests on all computers that we have under review in future to give a numerical comparison between systems.

computing today

What to look for in the October issue on sale September 12th.

FOX AND HOUNDS

CT goes rural again, and not down the pub either. Amid scenes of pink clad men thundering across open country, the sounds of baying hounds, demure ladies in full chase and healthy fresh air we find a curious creature called the fox. No bloodshed here, this must be the only foxhunt where the fox can actually beat his pursuers at their own game. Turn on all your cunning and see how long you last against the hunters.

MIGHTY MICRON

Once again our reviewers have brought home an exclusive. This time it's an all British machine featuring the first implementation of the new 10K BASIC from Microsoft. How does the machine rate in terms of value against the established favourites like Apples and NASCOMs? Read our exposé in the October issue and make your choice.

BUSINESS BRAINS

The trend in small business machines these days is to pack all the necessary works into a neat desk-top unit. Are these really computers or just super-intelligent VDUs? Our reviewer grasps the Superbrain, a prime example of the breed, by the horns and attempts to wrestle the facts from within its cool grey exterior.

BUYERS GUIDE

In the third part of our mammoth survey of computers and equipment we turn our attention to VDUs. Once again we present the facts and figures in clear and concise form to allow you to make the best decision. Don't miss it, it's the only one there is.

SPACEWAR

Not just another version of St*r *re* but a real wargame simulation with tactical and strategic positioning. James T might find this a harder match than those Klingons he seems to have so much trouble with.

Marc Freeburg

TAPE FILE HANDLING

Cassette tapes are great for bulk storage of data, the trouble comes in finding it. Problem solved with our utility software-great for business and home!

The object of this utility program is to tell you where all your other programs are, quickly and efficiently. A file containing program names and positions on your tape counter can be set up, loaded, saved or edited. The resulting data file is stored on tape as a record.

Hardware Requirement

The utility has been written for a Research Machines 380Z with either COS 2.0 or 2.3 but will prove adaptable, within reason, to most systems that run BASIC and can handle sequential files. The program storage is around 3-4K excluding the file.

The various peculiarities of RML BASIC are explained later in the text as an aid to re-writing the program for use elsewhere.

Commands And Operation

The following segments of the program perform special functions:

FILE 0	Switches the tape transport motor off.
FILE 0,x	Further input/output will be of a sequential file with x copies of each block (for error recovery).
FILE 1, "xx"	Find and open file "xx" where xx is the filename.
FILE 2, "xx"	Send file "xx" to tape where xx is the filename.
PRINT	Send a single item to tape.
INPUT	Input a single item from tape.
EOF	If end of file found goto the specified line.
CLEAR 3000	Reserve memory area for strings and arrays.

The Ins And Outs

The I/O formatting of the lists is rather specific to the 380Z and is performed on lines 1260, 1270 and 1420. The POKE on 1260 sends all output to the printer and those on the other two lines reverse it to the VDU.

The output format is based around the 10 character filename supported by the system and clocks up a counter (in Hex) in accordance with the number of blocks in the program. A block is approximately 256 bytes. The abbreviations BL and CO in the VDU/PRINTER statements mean BLocks and COpies respectively.

Apart from the previously listed FILE commands the following exist within the program. FILE 3 sends the last buffer and EOF marker to the tape and FILE 4 turns the tape transport motor on.

Further Observations

The REMARK concept is used to describe the general contents of a side of the tape, for example TAPE SIDE 2, MACHINE CODE PROGS. This is achieved by entering the desired label before the blocks of program you wish to REMARK and then giving the previous file-number.

There are two other RML oddities buried in the program, CHR$(12) which performs the clear screen function and CHR$(17) which sets the screen into the scroll mode. These should be replaced or adjusted to suit your system.

```
1000 REM ****************************
1010 REM *** CASSETTE FILER V 3.0 ***
1020 REM ****************************
1030 CLEAR 3000:A$=CHR$(12):DIM FI$(100):
     PRINT A$
1040 FILES 0,2:WIDTH 39:PRINT CHR$(17)
1050 INPUT"OPT="G$:PRINT A$
1060 G$=LEFT$(G$,1):FP=0:FL=0:CN=1
1070 RESTORE
1080 FOR I=1 TO 15
1090 READ O$:IF G$=O$ THEN 1120
1100 NEXT I
1110 PRINT "!!!":GOTO 1050
1120 ON I GOTO 1130,1440,1480,1550,1560,1640,1730,
     1760,1910,1950,2020,2200,2340,2400,2410
1130 INPUT"WHOLE FILE";G$
1140 IF G$="YES" OR G$="Y" THEN ST=1:
     ET=NF:GOTO 1210
1150 IF G$="NO" OR G$="N" THEN 1170
1160 PRINT "!!!":GOTO 1130
1170 INPUT"FIRST FILE";ST
1180 PRINT"LAST FILE (MAX=";NF;)";
1190 INPUT ET
1200 IF ET>NF OR ST>NF OR ST>ET THEN PRINT
     "!!!":GOTO 1170
1210 INPUT"PRINTER/VDU/BOTH";OP$:PRINT A$
1220 IF OP$="PRINTER" OR OP$="P" THEN FP=1:
     GOTO 1260
1230 IF OP$="VDU" OR OP$="V" THEN 1270
1240 IF OP$="BOTH" OR OP$="B" THEN FL=1:
     GOTO 1260
1250 PRINT"!!!":GOTO 1210
1260 POKE 16401,228:POKE 16402,18:GOTO 1280
1270 POKE 16401,206:POKE 16402,17
1280 PRINT"NO. I FILENAME I POSITION I BL I CO"
1290 FOR J=1 TO 39:PRINT"-";:NEXT
1300 FOR I=ST TO ET
1310 IF LEFT$(FI$(I),6)<>"LABEL " THEN 1330
1320 PRINT:PRINT I;TAB(4);RIGHT$(FI$(I),
     LEN(FI$(I))-6):PRINT:GOTO 1370
1330 PRINT I;
1340 GOSUB 2210
1350 PRINT TAB(4);"I ";AN$(1);TAB(17);"I ";AN$(2);
1360 PRINT TAB(28);"I ";AN$(3);TAB(33);"I ";AN$(4)
1370 NEXT I
1380 IF FP=0 AND FL=0 THEN 1400
```

TAPE FILE HANDLING

```
1390 FOR I=1 TO 12:PRINT:NEXT
1400 INPUT"READY";G$
1410 IF FL=1 THEN FL=0:GOTO 1270
1420 POKE 16401,206:POKE 16402,17
1430 GOTO 1050
1440 INPUT"NUMBER OF FILE TO BE DELETED";FD
1450 IF FD=0 THEN 1050
1460 FOR I=FD TO NF-1:FI$(I)=FI$(I+1):NEXT
1470 NF=NF-1:GOTO 1440
1480 INPUT"PREVIOUS FILENUMBER";PF
1490 IF PF=0 THEN 1050
1500 PRINT"NAME(10)*POSITION XXX/XXX
     *BLOCKS*COPIES"
1510 INPUT G$
1520 GOSUB 2290
1530 FI$(PF+1)=G$:NF=NF+1
1540 GOTO 1480
1550 PRINT "NUMBER TO BE PUT ON FILE";:
     GOTO 1570
1560 PRINT "NUMBER OF ADDITIONS";
1570 INPUT NA
1580 IF NA=0 THEN 1050
1590 FOR I=NF+1 TO NA+NF
1600 PRINT "NAME(10)*POSITION XXX/XXX
     *BLOCKS*COPIES"
1610 INPUT FI$(I)
1620 NEXT
1630 NF=NF+NA:GOTO 1050
1640 INPUT"STRING TO BE FOUND";G$
1650 IF G$="" THEN 1050
1660 FOR I=1 TO NF
1670 GOSUB 2210
1680 FOR J=1 TO 4:IF AN$(J)<>G$ THEN 1700
1690 PRINT I;")":FOR K=1 TO 4:PRINT AN$(K):
     NEXT:GOTO 1710
1700 NEXT
1710 NEXT
1720 PRINT"ALL OCCURENCES FOUND":GOTO 1640
1730 FILES 4
1740 INPUT"READY";G$
1750 FILES 0:GOTO 1050
1760 INPUT"NUMBER OF FILE TO BE
     SEPERATED";I
1770 IF I=0 THEN 1050
1780 GOSUB 2210
1790 FOR I1=1 TO 4:PRINT")";:PRINT AN$(I1):NEXT
1800 INPUT"NUMBER OF CHANGES";NC
1810 IF NC=0 THEN 1050
1820 FOR I2=1 TO NC
1830 PRINT"CHANGE";I2;:INPUT"WHICH STRING";
     WC
1840 PRINT"OLD VALUE IS";AN$(WC)
1850 INPUT"NEW VALUE IS";AN$(WC)
1860 NEXT
1870 FI$(I)=""
1880 FOR I1=1 TO 4:FI$(I)=FI$(I)+AN$(I1)+
     "*":NEXT
1890 FI$(I)=LEFT$(FI$(I),LEN(FI$(I))-1)
1900 GOTO 1760
1910 INPUT"LABEL";G$
1920 INPUT"POSITION";PF
1930 D$="LABEL "+G$:G$=D$
1940 GOSUB 2290:GOTO 1050
1950 INPUT"NUMBER OF FILE TO BE REPLACED";NR
1960 IF NR=0 THEN 1050
1970 IF LEFT$(FI$(NR),6)="LABEL " THEN 2000
1980 INPUT"NEW STRING";FI$(NR)
1990 GOTO 1950
2000 INPUT"NEW LABEL";G$
2010 PF=NR:GOTO 1930
2020 PRINT A$:PRINT TAB(16);"OPTIONS":
     PRINT TAB(16);"-------":PRINT
2030 PRINT"RECOVER A FILE FROM TAPE"
2040 PRINT"SAVE A FILE ON TAPE"
2050 PRINT"MAKE A FILE"
2060 PRINT"DELETE A FILENAME"
2070 PRINT"INSERT A FILENAME"
2080 PRINT"ADD TO FILE"
2090 PRINT"FIND A GIVEN STRING"
2100 PRINT"COPY A FILE SEVERAL TIMES"
2110 PRINT"TAPE MOTORS ON"
2120 PRINT"BREAK A FILENUMBER UP"
2130 PRINT"LIST PART/WHOLE OF A FILE"
2140 PRINT"PLACE A LABEL"
2150 PRINT"KILL AND REPLACE A
     LABEL/FILEMEMBER
2160 PRINT"OPTIONS"
2170 PRINT"END PROGRAM"
2180 PRINT:PRINT:PRINT:PRINT
2190 GOTO 1050
2200 PRINTA$:END
2210 FOR I3=1 TO 9:AN$(I3)="":NEXT
2220 LS=0:C=1:FOR J=1 TO LEN(FI$(I))
2230 IF MID$(FI$(1),J,1)<>"*" THEN 2260
2240 AN$(C)=MID$(FI$(I),LS+1,J-LS-1)
2250 C=C+1:LS=J
2260 NEXT
2270 AN$(4)=MID$(FI$(I),LS+1,J- LS)
2280 RETURN
2290 FOR I=NF+1 TO PF+1 STEP -1
2300 FI$(I)=FI$(I-1)
2310 NEXT
2320 FI$(PF+1)=G$:NF=NF+1
2330 RETURN
2340 FILES 1,"FILER":INPUT # ;NF
2350 FOR I=1 TO NF
2360 INPUT # ;FI$(I):ON EOF GOTO 2380
2370 NEXT
2380 FILES 0:PRINT"FILE LOADED":GOTO 1050
2390 PRINT"!!!":GOTO 2380
2400 INPUT"NUMBER OF COPIES";CN
2410 FOR J=1 TO CN
2420 INPUT"READY";G$
2430 FOR I=1 TO 100:NEXT
2440 FILES 2,"FILER":PRINT # ;NF
2450 FOR I=1 TO NF
2460 PRINT # ;FI$(I)
2470 NEXT
2480 FILES 3:FILES 0
2490 GOTO 1050
2500 DATA L,D,I,M,A,F,T,B,P,K,O,E,R,C,S
```

The complete program listing in RML BASIC

INSTANT SOFTWARE

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CASINO II This craps program is so good, it's the next best thing to being in Las Vegas or Atlantic City. It will not only play the game with you, but also will teach you how to play the odds and make the best bets. A one player game, it requires a PET 8K. **Order No. 0015P**

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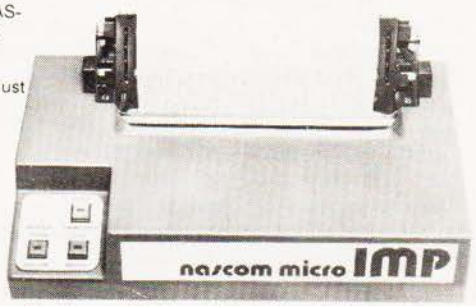

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Arrange your printout with this program and never lose track of that lady's phone number again.

The following piece of software has been designed to fill a number of needs. Although it is a 'stand-alone' program it can be easily adapted to act as a sub-routine to fit into other programs, or even turned into a standard utility package. The sole function of the program is to sort lists of names, or indeed any alphabetical information, into order.

Program Function

The software relies on the string handling facilities present in most versions of BASIC and without these cannot function as written. Indeed, if these functions are not present any sort program will run so slowly that the user will probably expire from boredom! The ability of these versions of BASIC to use mathematical operators such as >, <, = and ≠ (< >) on string functions makes life very easy for the programmer.

The system of sorting is known as a 'bubble' sort for no better reason than the similarity between bubbles rising through a liquid and the bigger entries rising through the list. It sets no records for speed but it does work and is simple to understand, a feature often worth far more. The two main segments are illustrated in Fig.1 and Fig.2. These are the input routine and the bubble sort routine and are further described later. The full program listing is divided up with REM statements, each of these segments represents a complete entity and can be amended or altered as desired, some suggestions are given later in this article.

How It Works

As previously mentioned the application of mathematical operators is crucial to the bubble sort. The BASIC allows us to simply compare two string variables and make a decision as to whether one is bigger than the other, or whether they are equal in size. These comparisons are not confined to the first letter but work their way through the entire length of the string, for example:—

> Given two strings, A$ and B$ we can say that if A$ = "A" and B$ = "B" then A$ < B$ is true. Similarily we can compare the string "JONES B G" with the string "JONES B H" and find that the first is 'smaller' than the second.

Given this facility we can sort any stored list of strings into order, either ascending or descending although the latter is more common (lists of names usually go from A to Z). This segment is illustrated in Fig.1 and is the section of the program tagged BUBBLE SORT.

The first statement simply sets up two variables, one counter and one marker. The variable S is a 'swap' marker and tells us that a change has taken place in the list, the counter T is one less than the number of entries because you can't compare the bottom entry with anything! You now start a loop going for this many counts. For each entry in the list (array A$(n)) you compare the absolute value with the entry directly below it in the list, if the first is bigger you swap them over and set the swap marker, if not you try the next pair. The changing over is done by the laborious method of putting the larger string into a spare variable, replacing it in

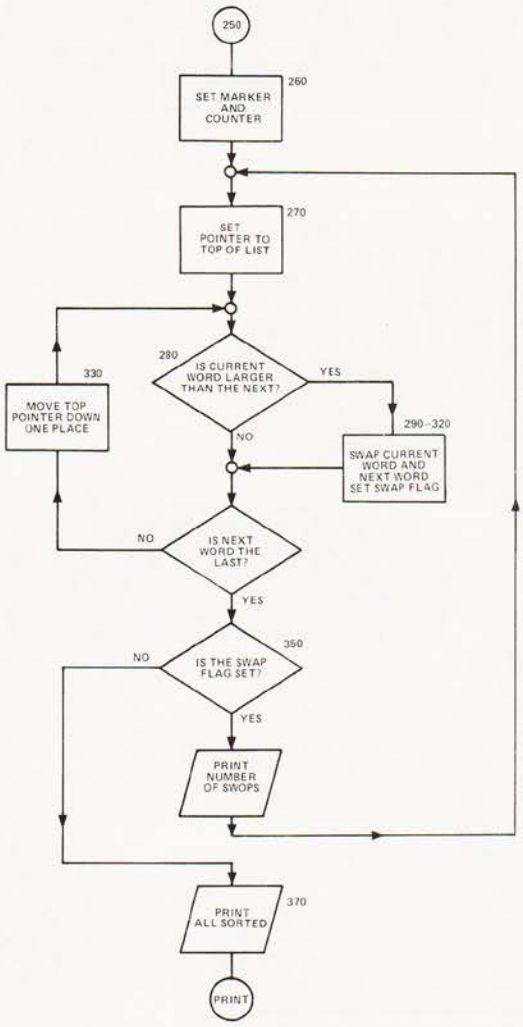

Fig.1. The routine for bubble sorting strings.

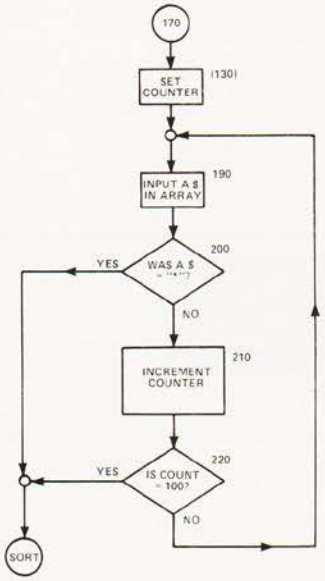

Fig.2. The input segment in greater detail.

the list with the smaller and then putting the larger one back. Owners of the Zenith Z89, or indeed anyone using a disc based BASIC with extra functions, can use the marvellous SWAP command and do the whole thing in one go. Having gone through the list once, the whole process is repeated until no swaps are recorded, the sorting process is now complete.

The input stage is also worthy of closer investigation. The maximum number of list entries is set up as 100 but this is really dependent on the amount of memory you have available. As each entry is input from the keyboard it is stored in an array at a position corresponding to its entry point. It is worth noting that the array starts at 0, a location which is often ignored or even forgotten. Entries continue until "*" is found, this terminates the routine. We now have an array full of raw data and a counter which tells us how many entries there are in the array, we may now sort it.

Getting Listed

Actually producing the final list is dead easy, you simply output the array element by element. However, if your list is longer than your screen has lines, you may like to implement a loop which outputs a set number of entries at a time, a routine is given in the program called LINE LOOP which does just this. The required number of lines is input to the program and then the routine waits for any key to be hit before outputting the first batch.

Enhancements

Some obvious goodies that can be built in are; reading data from a file, outputting to another file, outputting to a printer and doubtless others of a more specialised nature. Taking the first and second items it should not prove too difficult to open a file and read entries both from it and back to it instead of keying them in by hand. Commands such as OPEN, INPUT# and PRINT# should be recognisable to most systems running a reasonable BASIC.

Printing out lists is also a matter of calling the printer rather than the VDU, if your system supports LPRINT then life is simple indeed! All you really need to do is to call a response from the keyboard to direct the output to the required device, it is worth making life idiot-proof by having the VDU as the default option. Owners of sytems such as the PET who are using interfaces to connect to printers will have to treat the output like a file but you must remember to CLOSE it after output is complete or else all your screen prompts tend to end up in the middle of your listing.

Other possibilities for the program are multiple lists. These offer no serious difficulty, you merely choose which list you are going to sort on and then, as you swap on the chosen list, swap the others as well. It is in situations such as this that the time taken starts to mount up. If we take a sample list such as fred,john,ian,bert,harry the following swaps take place:

fred,john,ian,bert,harry
fred,ian,john,bert,harry
fred,ian,bert,john,harry
fred,bert,ian,john,harry
bert,fred,ian,john,harry
bert,fred,ian,harry,john
bert,fred,harry,ian,john

Now, if we had a parallel list of, say, their ages the swap time would have been almost doubled. The maximum number of swaps that can take place is the factorial of the number of items in the list, the actual time taken is rather machine-dependent for obvious reasons. This time will also increase in direct proportion to the number of 'columns' that you have. As mentioned earlier, the program makes no apologies for its lack of speed. It is, however, as near universal as possible.

```
100 REM**ALPHASORT 2
110 REM**INITIALISATION
120 PRINT"[CLS]":CLR
130 DIM A$(100):EN=100:CT=0
140 PRINT "PLEASE INPUT NAMES, WHEN YOU
    ARE"
150 PRINT "READY TO SORT TYPE '*' "
160 PRINT
170 REM**INPUT ROUTINE
180 PRINT "YOU HAVE ROOM FOR ";EN;" MORE
    ENTRIES."
190 INPUT A$(CT)
200 IF A$(CT)="*" THEN 250
210 CT=CT+1:PRINT"[CLS]"
220 IF CT>99 THEN 250
230 EN=100-CT:GOTO 180
240 END
250 REM**BUBBLE SORT
260 S=0:T=CT-1
270 FOR L=0 TO T
280 IF A$(L)<=A$(L+1) THEN 330
290 S$=A$(L)
300 A$(L)=A$(L+1)
310 A$(L+1)=S$
320 S=S+1
330 NEXT L
340 PRINT "[CLS]";S;" SWAPS OCCCURRED"
350 IF S>=1 THEN 260
360 PRINT
370 PRINT "ALL SORTED !"
380 REM**SIMPLE OUTPUT ROUTINE
390 PRINT
400 PRINT "HIT ANY KEY TO LIST"
410 GET R$:IF R$="" THEN 410
420 PRINT "[CLS]"
430 FOR LP=0 TO CT
440 PRINT A$(LP)
450 NEXT LP
460 END
470 REM**LINE LOOP OUTPUT
480 PRINT
490 PRINT "HOW MANY LINES ON YOUR VDU";
500 INPUT SL
510 SL=SL-1:LP=0
520 FOR P=LP TO LP+SL
530 PRINT A$(P)
540 NEXT P
550 PRINT "HIT ANY KEY TO CONTINUE"
560 PRINT " '$' WILL BREAK."
570 GET K$:IF K$="" THEN 570
580 IF K$="$" THEN END
590 IF CT-LP<SL THEN 520
600 SL=CT-LP
610 GOTO 520
620 END
```

The complete program listing, see the text for suggested enhancements.

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SKI-RUN

Practise for those hazardous days on the piste with our superb slalom simulation and pick up some useful graphics routines along the run.

The following program simulates a slalom ski run on a Sharp MZ-80 K system. In order to make the program run on other systems, flowcharts have been given and some explanation of the Sharp's peculiarities are described.

The object of the game is simple, you must reach the bottom of the course in the shortest possible time, without missing any gates and without going off the edge of the course.

Game Rules

There are two kinds of course available, a standard, pre-programmed run of quite reasonable difficulty and a randomly generated course, which is usually easier. The data statements for the standard course are stored in lines 450 to 470 and may be removed, or re-programmed, if required. In both cases you can preview your course. Instructions are given within the program for operation and should cause no problems, if you don't like the musical tune that introduces the game, or if you are converting to another system, the segment from 200 to 290 is responsible.

The game may be speeded up by inputting a number not greater than two digits larger than the number displayed in the top left hand corner. The program as listed takes around 4K of RAM and will fit into all the MZ-80 K models.

Program Notes

Although the game was originally written for the Sharp version of BASIC it should prove fairly easy to implement on any other system that has a memory mapped screen and uses an Extended BASIC such as the Apple or Superboard. The screen locations are from 53249 in the top left hand corner with a line length of 40 characters and 25 screen lines. The two POKEd codes, 202 and 0, are respectively a 'little man' graphic and a blank graphic. These are found in lines 710.

We have replaced all the potentially confusing symbols with names, the cursor controls are to our normal standards. The borders of the course are vertical hatched lines, or any graphic you prefer, and these are called 'Border' and occur in lines 610, 630 and 650, the PEEK code for these is inspected in line 740 and is, in the original case, 188. The gates are printed as strings in line 640 and consist of a circle, two left arrows and another circle for the left hand gate and a filled-in circle, two right arrows and then another filled-in circle for the right hand gate. Once again these are checked for a correct pass in lines 900 to 940, the USR(62) command causes a 'beep'.

Apart from these few graphics symbols there only remains the MUSIC command which may, or may not, be available on other systems. If you don't have the facility then simply remove the following lines from the program; 200-290. 560 TEMPO 7 from line 1900, 1910-1930, TEMPO 6 from line 2000, 2010, and MUSIC 'R9' from 4000.

We are grateful to Sharp Electronics (UK) Ltd for the provision of a printout of the game at short notice.

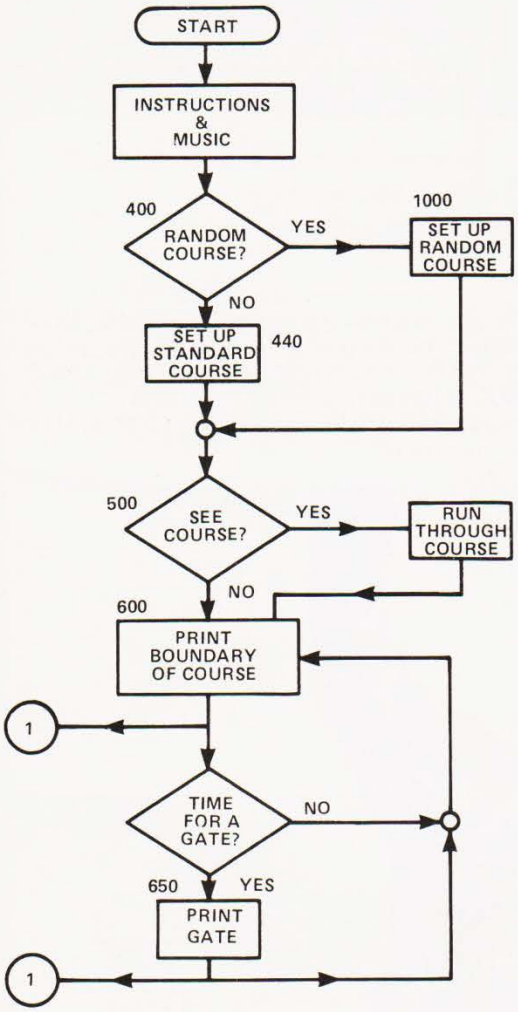
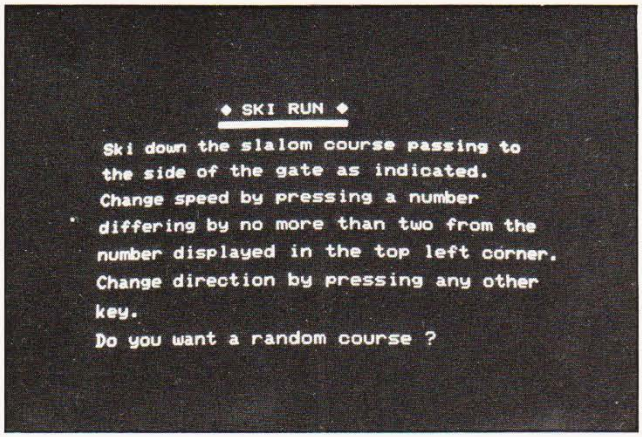


Fig 1. The first segment of the program flowchart.



The initial game display, accompanied by an awful rendition of a famous tune, we think!

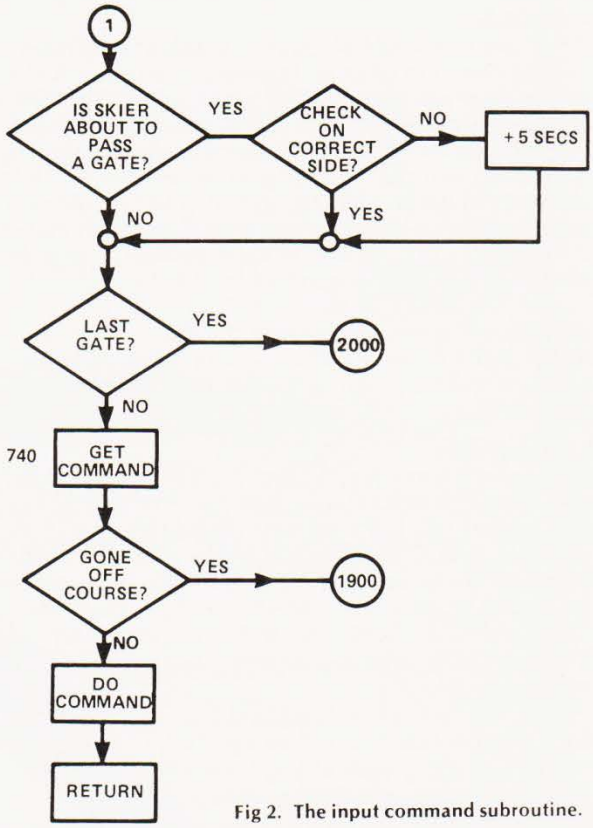


Fig 2. The input command subroutine.

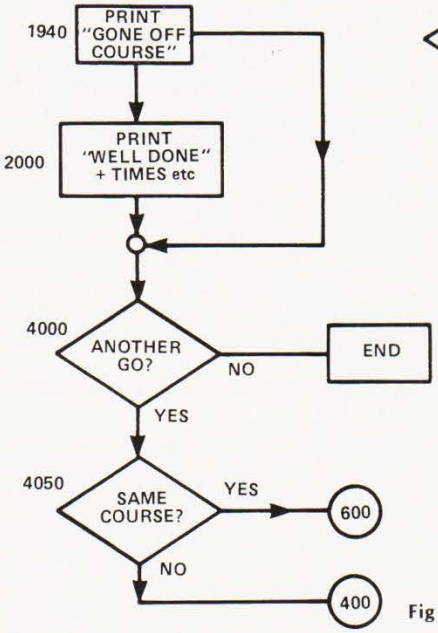
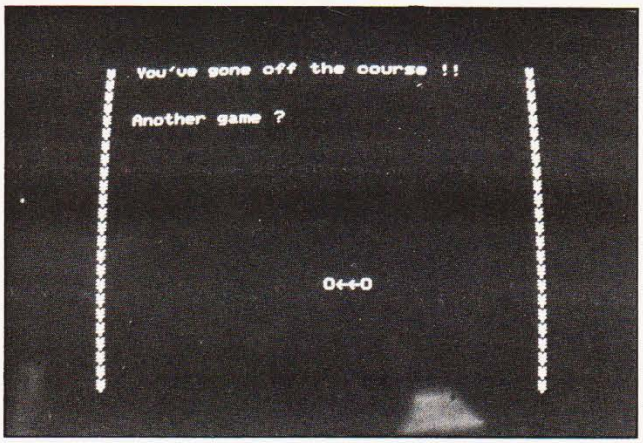
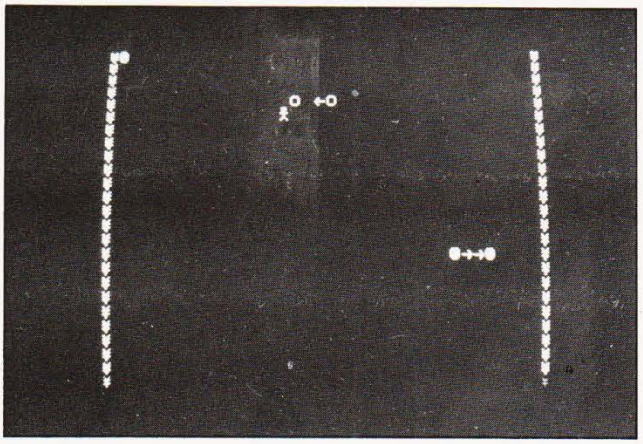


Fig 3. The 'endgame' routines.

SKI-RUN



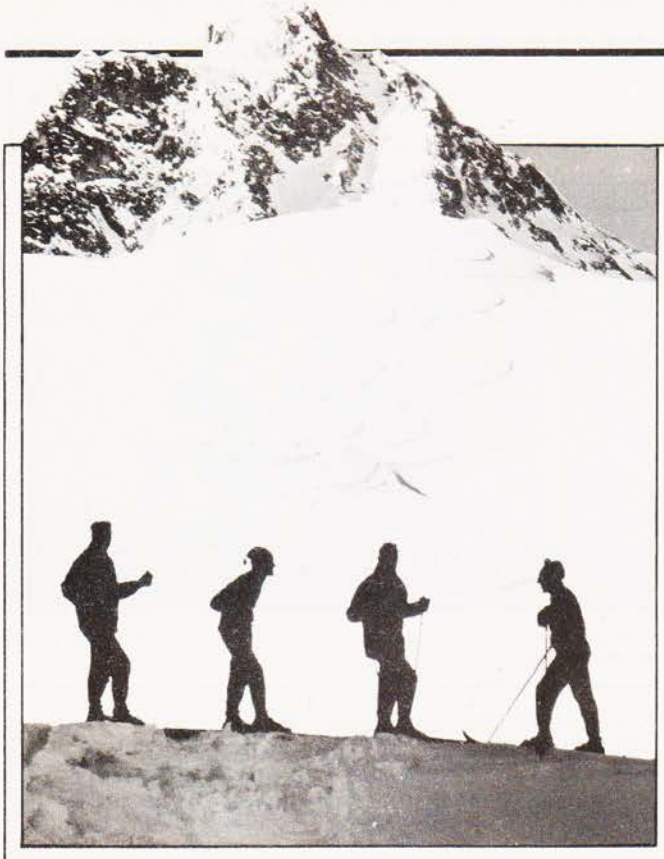
The game display after running over the edge of the course.



A mid-game picture showing the speed factor top left and the "little man" passing through a gate.

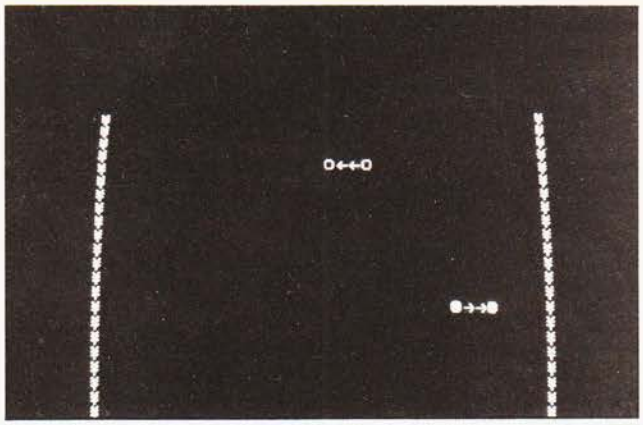
```
 20 REM !!! SLALOM SKI RUN GAME !!!
 30 REM !!  By R.L.Tucker — Jan. '80  !!
 40 REM ****************************
100 PRINT " [CLS ]" + TAB(11) + "◆ SKI RUN ◆"
110 PRINT
    TAB(11) + _____ [CD ]"
120 PRINT "Ski down the slalom course passing to
    [CD ]"
130 PRINT "the side of the gate as indicated. [CD ]"
140 PRINT "Change speed by pressing a
    number [CD ]"
150 PRINT "differing by no more than two from the
    [CD ]"
160 PRINT "number displayed in the top left corner."
170 PRINT "Change direction by pressing any
    other [CD ]"
180 PRINT "key."
200 DIM M$(9):M$(0) = "F0R0F0R0F0R2F0R0F0R0
    F0R0"
210 M$(1) = "  C0R0#A0R0  C0R0A0R0  C0R0G0"
220 M$(2) = "R0  C0R0F2R0E2R0F2R0"
230 M$(3) = "G2R0A2R0"
240 M$(4) = "F0R0E0R0D0R0F0R0C0R0F0R0_#
    A2R0_A2"
250 M$(5) = "R0_#A2R0":M$(6) = "C2R0D2R0#
    A0R0A0R0G0R0#A0"
260 M$(7) = "R0F0R0#A0R0E2R0D2R0E2R0F2"
270 M$(8) = "R0G2R0¯C0R0#A0R0A0R0G0R0A
    0R0#A0R0¯C0R0#A0R0¯C0"
280 M$(9) = "R0A0R0G0R0F0R0G0R0A0R0#
    A0R0G0R0E0R0C0R0F3"
290 TEMPO 4:FOR I=0 TO 9:MUSIC M$(I):NEXT:
    MUSIC M$(0)
299 REM*Start of run
300 CLR:DEF FNA(X) = INT(X/60):DEF FNB(X) =
    X - 60*FNA(X)
310 DIM X(30),Y(30)
400 PRINT " [CD ]Do you want a random course?";
410 GET I$:IF I$ = "" "GOTO 410
420 IF ASC(I$) = 89 THEN PRINT "Yes":GOSUB
    1000:GOTO 500
429 REM*Lay out set course
430 PRINT "No"
440 FOR I=1 TO 30:READ X(I),Y(I):NEXT:RESTORE
450 DATA20,1,30,9,17,9,27,7,21,5,27,5,21,5,27,5,21,
    5,31,8
460 DATA20,8,26,5,16,8,21,5,11,8,30,15,11,15,21,8,
    11,8,23,8
470 DATA17,5,23,5,17,5,23,5,17,5,30,10,17,9,27,8,7,
    17,20,9
500 PRINT " [CD ]Do you want to see the course
    before [CD ]":PRINT "you start?"
510 GET I$:IF I$ = " " GOTO 510
520 IF ASC(I$) = 89 THEN H=1:GOTO 600
530 IF ASC(I$) <>78 GOTO 510
540 GOTO 600
549 REM*Run proper starts here
550 PRINT " [HOM ] [2 CR ] [CD ] Now you start
    your run — good luck !" : H=0
560 TEMPO 4:MUSIC "R9"
600 PRINT " [CLS ]":M=0:N=0:PP=0:V=19:C=2:
    X=53468:N1=1:TI$ = "000000"
610 POKE X,202:FOR K=1 TO 23:PRINT
    " [Border ]";TAB(38);" [Border ]":
    NEXT
619 REM*Main control loop
620 FOR G=1 TO 30
630 FOR I=1 TO Y(G):PRINT " [Border ]";TAB(38);
    " [Border ]" :GOSUB 700:NEXT I
640 G$ = " [left gate ]":IF G/2=INT(G/2) THEN
    G$ = " [right gate ]"
650 PRINT " [Border ]";TAB(X(G));G$;
    TAB(38);" [Border ]"
660 GOSUB 700:NEXT G
670 IF H=1 GOTO 550
680 PRINT "$$";TAB(37);"$$"
690 GOSUB 700:GOTO 680
699 REM*Move skier
700 N=N+1 : IF H=1 THEN RETURN
710 POKE X-40,0:POKE X+C,202:X=X+C
720 IF N=Y(N1)+V THEN N1=N1+1:V=1:N=0:
    GOSUB 900
```

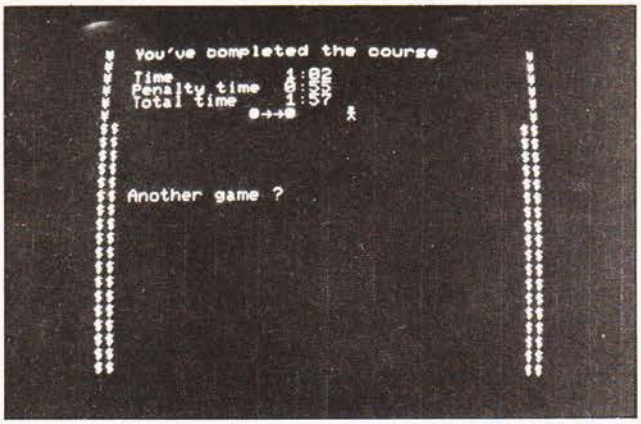
SKI RUN



```
730 IF N1=31 GOTO 2000
740 GET M$:IF (M$=" ")*(PEEK(X+C)=188) GOTO
    1900
750 IF M$=" " GOTO 790
760 IF VAL(M$)=0 THEN C=-C:GOTO 790
770 IF ABS(VAL(M$)-M)>2 GOTO 790
780 M=VAL(M$)
790 POKE 53249,ASC(STR$(M))-16
800 FOR D=1 TO 45-10*M:NEXT D:RETURN
899 REM*Passing gate
900 IF N1/2=INT(N1/2) GOTO 930
910 IF X<X(N1-1)+53450 THEN PP=PP+5
    :USR(62)
920 RETURN
930 IF X>X(N1-1)+53449 THEN PP=PP+5
    :USR(62)
940 RETURN
999 REM*Work out random course
1000 X(1)=15:Y(1)=6:X1=15
1010 FOR I=2 TO 30
1020 Y=INT(RND(1)*8)+4:Y(I)=Y
1030 IF I/2=INT(I/2) GOTO 1100
1040 X=X1-2*Y+4:GOTO 1200
1100 X=X1+2*Y-4
1200 IF X>31 THEN X=X-1:GOTO 1200
1210 IF X<4 THEN X=X+1:GOTO 1210
1300 X(I)=X:X1=X:NEXT:RETURN
1899 REM*End messages etc.
1900 POKE X,0:TEMPO 7
1910 FOR I=1 TO 3
1920 MUSIC " C0_#C0_D0_#D0_E0_#E0_F0_#
    F0_G0_#G0_A0_#A0_B0_#B0"
1930 NEXT
1940 PRINT " [HOM ] [3 CR ]You've gone off the
    course !! [3 CD ] : GOTO 4000
2000 PRINT " [HOM ] [3 CR ]You've completed the
    course [CD ]" : TEMPO 6
2010 MUSIC " B0 A0 G0 F0 E0 D0 C0 D0 E0 F0
    G0 A0 B0 A0 G0 F0 E0 D0 C0"
2020 TT$=TI$:PP$=STR$(FNB(PP)):T2$=STR$(FNB
    (VAL(RIGHT$(TT$,2))+FNB(PP)))
2030 T1=FNA(VAL(RIGHT$(TT$,2))+FNB(PP))+VAL
    (LEFT$(TT$,4))+FNA(PP)
2040 IF LEN(PP$)=2 GOTO 2060
2050 PP$="0"+PP$
2060 IF LEN(T2$)=2 GOTO 3000
2070 T2$="0"+T2$
3000 PRINT " [3 CR ]Time";TAB(16);VAL(LEFT$(TT$,
    4));":";RIGHT$(TT$,2)
3010 PRINT " [3 CR ]Penalty time";TAB(16);FNA(PP);
    ":";PP$
3020 PRINT " [3 CR ]Total time";TAB(16);T1;":";T2$:
    PRINT " [5 CD ]"
4000 PRINT " [3 CR ]Another game ?":MUSIC "R9"
4010 GET I$:IF I$=" " GOTO 4010
4020 IF ASC(I$)=89 GOTO 4050
4030 IF ASC(I$)<>78 GOTO 4010
4040 PRINT " [CLS ]": END
4050 PRINT " [CLS ] [2 CD ]Same course?";
4060 GET I$:IF I$=" " GOTO 4060
4070 IF ASC(I$)=89 THEN RUN 600
4090 PRINT "No":H=0:RUN 400
```

The complete program listing for Ski-Run. See the text for conversion notes.





Yet more game shots and the 'endgame' display.

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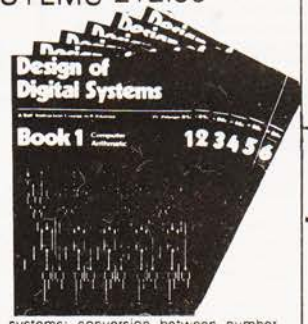

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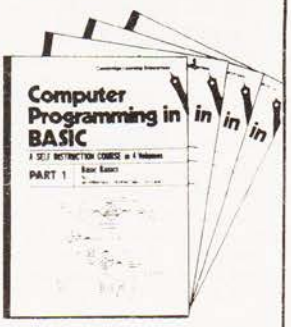

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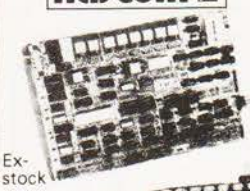
nascom-2 MICRO-COMPUTER



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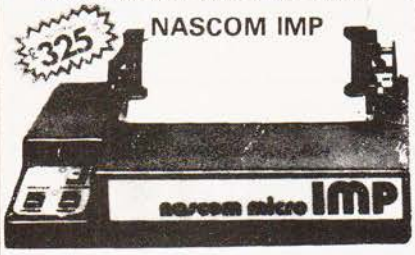

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OTHELLO!

The classic game of strategy implemented on a NASCOM.

This version of a well-known game has been written to run on an unexpanded NASCOM 1 under the control of the NAS-SYS monitor. It should be possible to convert it for other monitors.

The program should be executed from OC87. The board is displayed on the screen as a grid of 8 x 8 dots. The three questions asked should be answered by entering the initial letter of the desired response. The second question selects the level of play.

Scenario

The rules, for those who don't already know, are as follows: The player and the computer take it in turns to place one of their pieces on the board; and in doing so you must outflank one or more of your opponent's pieces in one or more directions, turning them into yours. The person with the most pieces left at the end of the game wins.

Make your moves by entering the number for the row and then the letter for the column. Illegal moves are detected and you must then make another move. If you are unable to move you must forfeit your turn by entering 8,U. At the end of the game the result is displayed and the NASCOM is halted, so to play another game you must execute the program again.

OTHELLO

A Computer Game for the NASCOM 1 (with NAS-SYS monitor)

EXECUTE FROM 0C87

```
0C80    4F 54 48 45     TITLE AS AN
0C84    4C 4C 4F        ASCII STRING
0C87    EF 0C 00        RST PRS CLEAR SCREEN
0C8A    21 80 0C        LD HL, 0C80
0C8D    11 DA 0B        LD DE, 0BDA
0C90    0E 07           LD C, 07
0C92 L1 ED A0           LDI
0C94    13              INC DE
0C95    B9              CP C
0C96    20 FA           JRNZ L1
0C98    21 9A 08        LD HL, 089A
0C9B    06 08           LD B, 08
0C9D    0E 41           LD C, 41
0C9F L2 71              LD (HL), C
0CA0    0C              INC C
0CA1    23              INC HL
0CA2    23              INC HL
0CA3    10 FA           DJNZ L2
0CA5    21 D8 08        LD HL, 08D8
0CA8    16 31           LD D, 31
0CAA    D9              EXX
0CAB    06 08           LD B, 08
0CAD L3 D9              EXX
0CAE    06 08           LD B, 08
0CB0    72              LD (HL), D
0CB1 L4 23              INC HL
0CB2    23              INC HL
0CB3    36 2E           LD (HL), 2E
0CB5    10 FA           DJNZ L4
0CB7    14              INC D
0CB8    0E 30           LD C, 30
0CBA    09              ADD HL, BC
0CBB    D9              EXX
0CBC    10 EF           DJNZ L3
0CBE    21 A0 09        LD HL, 09A0
0CC1    36 00           LD (HL), 00
0CC3    23              INC HL
0CC4    23              INC HL
0CC5    36 FF           LD (HL), FF
0CC7    21 E0 09        LD HL, 09E0
0CCA    36 FF           LD (HL), FF
0CCC    23              INC HL
0CCD    23              INC HL
0CCE    36 00           LD (HL), 00
0CD0    21 19 0B        LD HL, 0B19
0CD3    DD 21 00 08     LD IX, 0800
0CD7    22 29 0C        LD (0C29), HL
0CDA    EF              RST PRS
0CDB    42 4C 41 43
0CDF    4B 20 4F 52     BLACK OR WHITE?
0CE3    20 57 48 49
0CE7    54 45 3F 00
0CEB L5 CF              RST RIN
0CEC    FE 42           CP, 42
0CEE    CC 49 0D        CALL Z, BLACK
0CF1    28 05           JRZ L6
0CF3    FE 57           CP, 57
0CF5    CC 4D 0D        CALL Z, WHITE
0CF8 L6 20 F1           JRNZ L5
0CFA    EF              RST PRS
0CFB    1B 00           ESC
0CFD    22 29 0C        LD (0C29), HL
0D00    EF              RST PRS
0D01    42 45 53 54
0D05    20 4F 52 20     BEST OR WORST?
0D09    57 4F 52 53
0D0D    54 3F 00
0D10 L7 D7 4C           RST RCAL L11
0D12    FE 42           CP42
0D14    CC 54 0D        CALL 2, BEST
0D17    28 05           JRZ L8
0D19    FE 57           CP 57
0D1B    CC 59 0D        CALL Z, WORST
0D1E L8 20 F0           JRNZ L7
0D20    00              NOP
0D21    00              NOP
0D22 L9 CD 2A 0F        CALL LINE
0D25    EF              RST PRS
0D26    46 49 52 53
0D2A    54 20 4F 52     FIRST OR SECOND?
0D2E    20 53 45 43
0D32    4F 4E 44 3F
0D36    00
0D37    CF              RST RIN
0D38    F5              PUSH AF
0D39    EF              RST PRS
0D3A    1B 00           ESC
0D3C    F1              POP AF
0D3D    FE 46           CP 46
0D3F    CA 7C 0D        JP Z, YOU
0D42    FE 53           CP 53
0D44    CA 03 0E        JP Z COMP
0D47    18 D9           JR L9
0D49 BLACK 0E 00        LD C, 00
0D4B    18 02           JR L10
0D4D WHITE 0E FF        LD C, FF
0D4F L10 79             LD A, C
0D50    DD 77 01        LD (IX+1), A
0D53    C9              RET
0D54 BEST DD 36 00 01   LD (IX+00), 01
0D58    C9              RET
0D59 WORST DD 36 00 00  LD (IX+00),00
0D5D    C9              RET
0D5E L11 DF 62          RST SCAL IN
0D60    04              INC B
0D61    30 FB           JRNC L11
0D63    F5              PUSH AF
0D64    78              LD A, B
0D65    ED 4F           LD R, A
0D67    F1              POP AF
0D68    C9              RET
0D69    CD 2A 0F        CALL LINE
0D6C    EF              RST PRS
0D6D    49 20 46 4F
0D71    52 46 45 49     I FORFEIT
0D75    54 00
0D77    DF 5D           RST SCAL TDEL
0D79    79              LD A,C
```

```
0D7A    2F                  CPL
0D7B    4F                  LD C, A
0D7C YOU  DD 36 03 00       LD (IX+03),00
0D80 L12  CD 2A 0F          CALL LINE
0D83    EF                  RST PRS
0D84    59 4F 55 52 ]
0D88    20 4D 4F 56 |       YOUR MOVE
0D8C    45 20 00    ]
0D8F    DF 7B               RST SCAL BLINK
0D91    F7                  RST ROUT
0D92    D6 31               SUB 31
0D94    FA 80 0D            JP M 0D80
0D97    D6 08               SUB 08
0D99    F2 80 0D            JP P 0D80
0D9C    C6 08               ADD 08
0D9E    47                  LD B, A
0D9F    DF 69               RST SCAL SPACE
0DA1    DF 7B               RST SCAL BLINK
0DA3    F7                  RST ROUT
0DA4    D6 41               SUB 41
0DA6    FA 80 0D            JP M 0D80
0DA9    D6 08               SUB 08
0DAB    FE 0C               CP, 0C
0DAD    28 56               JR Z L17
0DAF    A7                  AND A
0DB0    F2 80 0D            JP P 0D80
0DB3    C6 08               ADD 08
0DB5    16 00               LD D, 00
0DB7    5F                  LD E, A
0DB8    21 DA 08            LD HL 08DA
0DBB    CB 23               SLA, E
0DBD    19                  ADD HL, DE
0DBE    11 40 00            LD DE, 0040
0DC1 L13  19                ADD HL, DE
0DC2    10 FD               DJNZ L13
0DC4    3E 2E               LD A, 2E
0DC6    BE                  CP, HL
0DC7    20 05               JRNZ L14
0DC9    CD 80 0E            CALL CHECK
0DCC    28 16               JR Z L16
0DCE L14  CD 2A 0F          CALL LINE
0DD1    EF                  RST PRS
0DD2    42 41 44 20 ]
0DD6    4D 4F 56 45 |       BAD MOVE
0DDA    00          ]
0DDB    06 E0               LD B, E0
0DDD L15  3E F0             LD A, F0
0DDF    FF                  RST RDEL
0DE0    10 FB               DJNZ L15
0DE2    18 9C               JR L12
0DE4 L16  DD 36 06 00       LD (IX+06), 00
0DE8    CD A8 0E            CALL MOVE
0DEB    00                  NOP
0DEC    00                  NOP
0DED    00                  NOP
0DEE    00                  NOP
0DEF    3E 00               LD A, 00
0DF1    DD BE 04            CP (IX+04)
0DF4    28 D8               JR Z, L14
0DF6    DD 36 06 01         LD (IX+06),01
0DFA    CD 10 0F            CALL FLASH
0DFD    CD A8 0E            CALL MOVE
0E00    CD 10 0F            CALL FLASH
0E03 COMP  18 04            JR L18
0E05 L17  DD 36 03 01       LD (IX+03),01
0E09 L18  CD 2A 0F          CALL LINE
0E0C    DF 5D               RST SCAL TDEL
0E0E    79                  LD A, C
0E0F    2F                  CPL
0E10    4F                  LD C, A
0E11    00                  NOP
0E12    DD 36 05 FE         LD (IX+5),FE
0E16    21 DA 08            LD HL, 08DA
0E19    D9                  EXX
0E1A    06 08               LD B, 08
0E1C L19  D9                EXX
0E1D    06 08               LD B, 08
0E1F L20  3E 2E             LD A, 2E
0E21    BE                  CP, HL
0E22    CC 80 0E            CALL Z CHECK
0E25    28 0F               JR Z L22
0E27 L21  23                INC HL
0E28    23                  INC HL
0E29    10 F4               DJNZ L20
0E2B    11 30 00            LD DE, 0030
0E2E    19                  ADD HL, DE
0E2F    D9                  EXX
0E30    10 EA               DJNZ L19
0E32    D9                  EXX
0E33    C3 65 0E            JP 0E65
0E36 L22  DD 36 06 00       LD (IX+06),00
0E3A    CD A8 0E            CALL MOVE
0E3D    3E 00               LD A, 00
0E3F    DD BE 04            CP, (IX+04)
0E42    28 E3               JRZ L21
0E44    CD 37 0F            CALL WEIGHT
0E47    DD 7E 04            LD A, (IX+04)
0E4A    DD 96 05            SUB (IX+05)
0E4D    FA 27 0E            JP M 0E27
0E50    28 0B               JR Z L24
0E52 L23  DD 7E 04          LD A, (IX+04)
0E55    DD 77 05            LD (IX+05),A
0E58    22 07 08            LD (0807),HL
0E5B    18 CA               JR L21
0E5D L24  ED 5F             LD A, R
0E5F    E6 40               AND 40
0E61    28 C4               JR Z L21
0E63    18 ED               JR L23
0E65    3E FE               LD A, FE
0E67    DD BE 05            CP (IX+05)
0E6A    CA 8A 0F            JP Z 0F8A
0E6D    2A 07 08            LD HL, (0807)
0E70    DD 36 06 01         LD (IX+6), 01
0E74    CD 10 0F            CALL FLASH
0E77    CD A8 0E            CALL MOVE
0E7A    CD 10 0F            CALL FLASH
0E7D    C3 79 0D            JP 0D 79
0E80 CHECK  E5              PUSH HL
0E81    FD E1               POP IY
0E83    79                  LD A, C
0E84    2F                  CPL
0E85    FD BE BE            CP (IY+BE)
0E88    C8                  RET Z
0E89    FD BE CO            CP (IY+CO)
0E8C    C8                  RET Z
0E8D    FD BE C2            CP (IY+C2)
0E90    C8                  RET Z
0E91    FD BE FE            CP (IY+FE)
0E94    C8                  RET Z
0E95    FD BE 02            CP (IY+02)
0E98    C8                  RET
0E99    FD BE 3E            CP (IY+3E)
0E9C    C8                  RET Z
0E9D    FD BE 40            CP (IY+40)
0EA0    C8                  RET Z
0EA1    FD BE 42            CP (IY+42)
0EA4    C8                  RET Z
0EA5    B4                  OR H
0EA6    C9                  RET
0EA7    00                  NOP
0EA8 MOVE  C5               PUSH BC
0EA9    E5                  PUSH HL
0EAA    E5                  PUSH HL
0EAB    FD E1               POP IY
0EAD    DD 36 04 00         LD (IX+4), 00
0EB1    06 08               LD B, 08
0EB3    11 FF 0E            LD DE, 0EFF
0EB6 L25  1A                LD A, (DE)
0EB7    67                  LD H, A
0EB8    13                  INC DE
0EB9    1A                  LD A, (DE)
0EBA    6F                  LD L, A
0EBB    13                  INC DE
0EBC    E5                  PUSH HL
0EBD    10 F7               DJNZ L25
0EBF    00                  NOP
0EC0    00                  NOP
0EC1    06 08               LD B, 08
0EC3 L26  79                LD A, C
0EC4    2F                  CPL
```

```
0EC5          FD  E5              PUSH IY
0EC7          E1                  POP HL
0EC8          D1                  POP DE
0EC9          19                  ADD HL, DE
0ECA          BE                  CP (HL)
0ECB          28  04              JR Z L28
0ECD L27      10  F4              DJNZ L26
0ECF          18  2B              JR L34
0ED1 L28      C5                  PUSH BC
0ED2          06  01              LD B, 01
0ED4 L29      19                  ADD HL, DE
0ED5          BE                  CP (HL)
0ED6          20  05              JR NZ L30
0ED8          04                  INC B
0ED9          18  F9              JR L29
0EDB          00                  NOP
0EDC          00                  NOP
0EDD L30      2F                  CPL
0EDE          BE                  CP (HL)
0EDF          28  03              JRZ L31
0EE1          C1                  POP BC
0EE2          18  E9              JR L27
0EE4 L31      DD  7E  04          LD A, (IX+4)
0EE7          80                  ADD A, B
0EE8          DD  77  04          LD (IX+4),A
0EEB          3E  01              LD A, 01
0EED          DD  BE  06          CP (IX+6)
0EF0          20  07              JR NZ L33
0EF2          FD  E5              PUSH IY
0EF4          E1                  POP HL
0EF5 L32      19                  ADD HL, DE
0EF6          71                  LD (HL),C
0EF7          10  FC              DJNZ L32
0EF9 L33      C1                  POP BC
0EFA          10  C7              DJNZ L26
0EFC L34      E1                  POP HL
0EFD          C1                  POP BC
0EFE          C9                  RET
0EFF          FF  BE  FF  C0  ]
0F03          FF  C2  FF  FE  |   TABLE OF
0F07          00  02  00  3E  |   DISPLACEMENTS
0F0B          00  40  00  42  ]
0F0F          00                  NOP
0F10 FLASH    06  03              LD B, 03
0F12 L35      36  2E              LD (HL),2E
0F14          D9                  EXX
0F15          06  20              LD B, 20
0F17 L36      3E  F0              LD A, F0
0F19          FF                  RST RDEL
0F1A          10  FB              DJNZ L36
0F1C          D9                  EXX
0F1D          71                  LD (HL),C
0F1E          D9                  EXX
0F1F          06  20              LD B, 20
0F21 L37      3E  F0              LD A, F0
0F23          FF                  RST RDEL
0F24          10  FB              DJNZ L37
0F26          D9                  EXX
0F27          10  E9              DJNZ L35
0F29          C9                  RET
0F2A LINE     21  19  0B          LD HL, 0B19
0F2D          22  29  0C          LD (0C29),HL
0F30          EF  1B  00          RST PRS ESC
0F33          22  29  0C          LD (0C29), HL
0F36          C9                  RET
0F37 WEIGHT   3E  00              LD A,00
0F39          DD  BE  00          CP (IX+00)
0F3C          C8                  RET Z
0F3D          C5                  PUSH BC
0F3E          E5                  PUSH HL
0F3F          E5                  PUSH HL
0F40          06  40              LD B, 40
0F42          11  C0  FF          LD DE FFC0
0F45          D7  0B              RST RCAL L38
0F47          E1                  POP HL
0F48          06  30              LDB, 30
0F4A          11  FE  FF          LD DE, FFFE
0F4D          D7  03              RST RCAL L38
0F4F          E1                  POP HL
0F50          C1                  POP BC
0F51          C9                  RET
0F52 L38      19                  ADD HL,DE
0F53          7E                  LD A, (HL)
0F54          E6  F0              AND F0
0F56          B8                  CP B
0F57          20  F9              JR NZ L38
0F59          D7  01              RST RCAL L39
0F5B          C9                  RET
0F5C L39      00                  NOP
0F5D          7E                  LD A, (HL)
0F5E          E6  0F              AND, 0F
0F60          FE  01              CP, 01
0F62          28  15              JRZ L40
0F64          FE  02              CP 02
0F66          28  15              JRZ L41
0F68          FE  03              CP 03
0F6A          28  15              JRZ L42
0F6C          FE  08              CP 08
0F6E          28  09              JR Z L40
0F70          FE  07              CP 07
0F72          28  09              JR Z L41
0F74          FE  06              CP 06
0F76          28  09              JR Z L42
0F78          C9                  RET
0F79 L40      3E  03              LD A, 03
0F7B          18  06              JR L43
0F7D L41      3E  FF              LD A, FF
0F7F          18  02              JR L43
0F81 L42      3E  02              LD A, 02
0F83 L43      DD  86  04          ADD (IX+4)
0F86          DD  77  04          LD (IX+4),A
0F89          C9                  RET
0F8A          1E  00              LD E, 00
0F8C          3E  01              LD A, 01
0F8E          DD  BE  03          CP (IX+3)
0F91          C2  69  0D          JP NZ 0D69
0F94          DD  7E  01          LDA, (IX+1)
0F97          D7  18              RST RCAL L44
0F99          53                  LD D, E
0F9A          2F                  CPL
0F9B          1E  00              LD E, 00
0F9D          D7  12              RST RCAL L44
0F9F          CD  2A  0F          CALL LINE
0FA2          7A                  LD A, D
0FA3          93                  SUB E
0FA4          FA  CE  0F          JP M 0FCE
0FA7          C2  D3  0F          JP NZ 0FD3
0FAA          EF                  RST PRS
0FAB          44  52  41  57      DRAW
0FAF          00
0FB0          76                  HALT
0FB1 L44      21  DA  08          LD HL, 08DA
0FB4          D9                  EXX
0FB5          06  08              LD B, 08
0FB7 L45      D9                  EXX
0FB8          06  08              LD B, 08
0FBA L46      BE                  CP (HL)
0FBB          28  0E              JR Z L49
0FBD L47      23                  INC HL
0FBE          23                  INC HL
0FBF          10  F9              DJNZ L46
0FC1          06  30              LD B, 30
0FC3 L48      23                  INC HL
0FC4          10  FD              DJNZ L48
0FC6          D9                  EXX
0FC7          10  EE              DJNZ L45
0FC9          D9                  EXX
0FCA          C9                  RET
0FCB L49      1C                  INC E
0FCC          18  EF              JR L47
0FCE          EF                  RST PRS
0FCF          49  00              I
0FD1          18  05              JR L50
0FD3          EF                  RST PRS
0FD4          59  4F  55  00      YOU
0FD8 L50      EF                  RST PRS
0FD9          20  57  49  4E      WIN
0FDD          00
0FDE          76                  HALT
```

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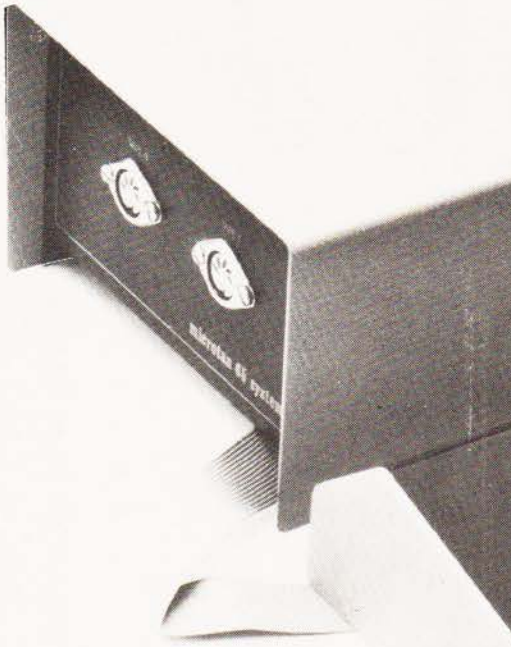

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Henry Budgett

NEW BRAIN REPORT

Cramming power into little boxes seems to be this month's speciality - another CT exclusive report!

Having seen the Newbury New Brain at a recent press launch and reported on the product in our News a couple of months ago I decided to take a much more detailed look at the machine when production started. Through the generosity of Newbear Computing Store, the Newbury subsidiary, I managed to get hold of the supposed first production prototype of the MB version. Now as this was the first machine 'out on the streets' I was prepared to make the occasional allowance for quirks but, as will soon be revealed, we seem to have obtained either a 'Friday afternoon' machine or, more likely, a demonstration model not intended for sale at all.

Potted History

Newbury Labs are one of the biggest UK manufacturers of VDUs and have a very high reputation in the professional marketplace. In many ways this sytem is a logical extension of their current product range into the field of personal computers and really represents an intelligent, hand-held terminal for professional use rather than a custom designed 'home computer'.

The original concept of the New Brain goes back several years and is probably attributable to Clive Sinclair's 'Sinclair Radionics' Model X. Indeed many of the features suggested for the computer that became the Sinclair ZX80 are to be found here. Strong indications are that the Model X project was moved, lock stock and barrel, to Newbury by the financing body. Yes, as you may have guessed, both Sinclair Radionics and Newbury have government backing. In the case of Newbury the backing comes through their parent company, Data Recording Instruments, which is wholly government owned.

Having taken the project over Newbury made a very good job of finishing it off and the system will be hard to beat when all the usual teething troubles are ironed out. Indeed the system has been adopted as a 'standard' by a large national body and will be making nationwide appearances, albeit in a slightly different guise. I can't reveal more but if the scheme works and I have no reason to believe it won't then it may prove to be one of the most spectacular educational projects ever undertaken in the UK.

Technical Briefs

The nitty gritty of the New Brain internals was rather difficult to establish as we were under oath not to open it. There are three versions being produced, Mwhich uses TV display via a modulator or straight to a monitor and has no battery power,

MB which has ten hour battery back-up and uses a one-line display system and the top of the range MBS model which has a 200 hour re-chargeable supply and the one-line display.

The housing is not much bigger than a normal keyboard unit, 261mm long by 155mm by 50mm thick at the back. The unit has a slight rake to the keyboard area and is very solidly made from ABS plastic in the 'house colours' of cream and chocolate. It is a very nicely balanced machine and can be used onehanded. The key layout is of a standard QWERTY type with all keys on a 'normal' pitch but with slightly smaller top size than your typewriter. The bottom key row contains the editing and cursor controls and, apart from one button labelled VIEWDATA all is absolutely normal. At this point we started to notice some funny little cracks in the lettering on the keytops, they were Letrasetted rather than being shot moulded, and one or two keys had legends missing.

The keyboard is complemented by a single line display system based on a gas discharge type with 14 segments in a 16 character strip. The actual line length is 80 characters and one can scroll left or right with the cursor keys. It was very unfortunate that we had seen the Sharp PC1211 in the same month because this system, although completely adequate, is no match for the superb LCD type featured on the other machine. It is totally unfair to draw comparisons between the two systems in terms of programming power but if I had to choose a display for the New Brain I'd go for the TV or video monitor output rather than the one-line.

Having described the display and keyboard it is well worth explaining how they actually work. Inside the machine is a specially programmed COPS chip from National Semi and it is this that looks after all the keyboard and display functions as well as loading inputted information into the system memory. It uses very little power, hence the battery source, and turns itself off if ignored for more than about a minute. It is only when you start to process information, typing RUN to a program for instance, that the main CPU, in the guise of a Z80A, is fired-up and takes over.

Internal memory capacity varies greatly depending on the variant you buy, the ROM memory contains the COPS program, the machine monitor and the version of BASIC you have chosen. Working memory is either static or dynamic RAM and expands to 4K in the static or 16K in dynamic. Presumably the battery powered versions use the dynamic RAM as an added power saver.

The Ins And Outs

It is in the area of I/0 that the New Brain starts to show its true origins as an intelligent data terminal. As can be seen from the rear panel photograph there are quite a number of sockets and taking them in no particular order we have: full RS 232 interface, parallel bus expansion, eight bit sampled input, eight bit latched output, serial printer drive, two video outputs, two cassette interfaces with motor control, analogue input and analogue output. Also mounted on the rear is the main power switch, you use SHIFT to re-start the machine when it times-out, the charger input and two sensitivity controls for the cassette interfaces. To complement the array of sockets a number of leads are supplied with a plug on the end where it should have had a socket so we were unable to test this facility. As an added point of frustration we were missing the eight bit output socket completely and neither of the monitor drivers seemed to work at all. We would have loved to have tested all the remaining goodies but as the BASIC manual missed several pages of text on I/O control this was rather difficult. Phone calls to Newbury elicited the information that

Well laid out keyboard with proper spacing makes the unit easy to use. Legends are missing on some keys but this will be corrected before public release in September.

the OPEN OUT and OPEN IN commands perform the trick, the cassette is controlled by the usual SAVE "" and LOAD "" using the number two port for programs and the number one port for data.

BASICALLY Speaking

The unit we had under evaluation was equipped with an approximate 8K implementation of ANSI BASIC and under test this performed well, see Table 1 for the Benchmarks. Unfortunately the manual was not complete and some functions that we think must be in there somewhere refused to show themselves, string handling being a good example. Unlike the models shown at the Press launch this did have the cassette load and dump software inside and several other device handlers too. The mathematical functions give a ten digit accuracy and there are facilities for one or two dimensional arrays, although if you try and make them too big you are politely reminded that you don't have that much memory. Error codes like this are rather impersonal numeric codes and a good deal of manual thumbing occurred at first to find the reason for that inexplicable code 21, etc.

Among the options that are to be offered for the New Brain is a 16K run-time compiling BASIC but when this will arrive, along with the promised Pascal and COBOL is unsure. There is, as yet, no access to the Z80 processor for machine code programming but an assembler is under preparation.

Despite some of the initial familiarisation problems with the BASIC the only real idiocy is the fact that you work with a one-line display. If you load up you program which, say, prints out all the numbers between 1 and 1,000 you find that 1 appears on the display and then everything stops. After a bit of experimentation you find that hitting NEWLINE gives you the next number and so on. This meant that all the Benchmarks had to print their 'S' and 'E' indicators next to each other, a quirk which kept the reviewer up till about one in the morning cursing fluently every time he forgot to put the semi-colon in! Whilst the one-line display is convenient for portability it certainly doesn't match up to the quality of some of the other one-liners that we've seen, the Sharp and the HP both being excellent examples. Obviously when the machine is being used as a remote terminal you won't want to carry a monitor around with you but many of the planned add-ons will demand the use of video so it's probably a good idea to choose

your model from either the M which relies solely on video output or the MBS which is a fully portable machine, indeed the MB appears to be rather a lonely figure in the middle of the range.

Expanding Horizons

The future in add-ons is assured for the New Brain. Among the immediately planned extras are a Viewdata module, hence the button on the front, a Teletext decoder, more memory in terms of both ROM and RAM with the latter being bank selectable for megabyte freaks. All these and the others like fast digital cassette and disc interfaces will be in matching, stackable boxes. Presumably the internal bus outlet is buffered to some extent but if not then drivers will have to be inserted at an early point in the chain.

One odd thing about all this expansion capability that was thrown around like so much confetti is that the whole concept of the New Brain is that it is a portable system for use in field situations, it is *not* a rack or bus based machine. Okay, so the New Brain may be portable but why weigh it down with all these add-ons? Perhaps the briefly mentioned idea of building New Brain into a VDU chassis is the direction to take for laboratory and engineering people and leave the hand-held types for personal field terminals and so reviewers can do their work on trains in the morning.

Applications

Just who will buy the new machine is almost impossible to guess. The obvious markets such as education and research are probably firm favourites for the first bulk orders, certainly with the versatile I/O facilities. The next areas for conquest will probably be personal use for businessmen and scientists as well as the obvious home markets. To what extent the system will move into commercial areas is impossible to estimate, it could be used as a data capture terminal for travelling reps, (the power supply is a very convenient 12V) it might make the shop floor for warehousemen checking stocks or it could even appear as a low cost, intelligent Teletext or Viewdata terminal for those with the need. Unlike the other, fast appearing, rivals in the micro sized micro market it does have an excellent and well established company behind it and with the Governmental restrictions on buying other than standard, tested and approved equipment it does seem to have been born with a silver spoon somewhere in its anatomy — at least as far as government research establishments are concerned.

Conclusions

Given the portability and expandability of the system together with the professional approach to packaging Newbury have a potential winner on their hands. Given the fact that computers are going to get smaller, the New Brain probably represents the same kind of step in data terminals that the HP 85 represents in desktop computing. It was a great disappointment to find that several of the expected functions were not implemented on our review model but doubtless because of our haste to obtain the first one we picked up a demo model.

If the event which was hinted at earlier occurs and Newbury can supply the demand from both the professional and personal market, they hope to be making around 2000 per month by the end of the year, then passengers on the Waterloo to Shepperton line can expect to see it more often.

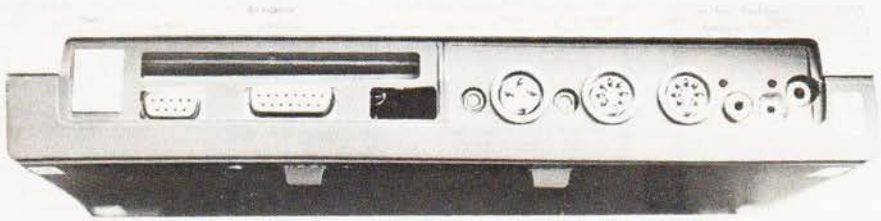
Summary Of Features

Size	261mm by 155mm by 50mm
Keyboard	Full alphanumeric on standard pitch with cursor and special function keys
Display	16 character 14 segment gas discharge (green) with 80 character buffer
Language	Supplied with 8K BASIC, optional 16K runtime compiling BASIC. No machine code access.
CPU	Z80A for processing, custom COPS for keyboard and display functions.
Memory	2K static as standard, optional 4K static or 16K dynamic.
Power	3 variants; 12 V DC, 12 V DC plus 10 hour battery back-up, 12 V DC plus full battery supply giving approx 200 hours of use (less for continuous 'running')
Program Storage	Two cassette interfaces supporting program and data files.
Data Structure	1200 Baud transfer rate, 'soft' structured.
Additional I/O	Full RS 232, two 8 bit ports, two video outputs, parallel bus port, analogue input and output.
Price	Model M £159 to model MBS at £249.

Table 1. Benchmark test results, averaged over ten trials and with specified program modifications for one-line display.

Benchmark 1.	1.70 Seconds
Benchmark 2.	7.48 Seconds
Benchmark 3.	23.95 Seconds
Benchmark 4.	21.07 Seconds
Benchmark 5.	22.52 Seconds
Benchmark 6.	24.58 Seconds
Benchmark 7.	65.46 Seconds
Benchmark 8.	7.54 Seconds

Note: All results were made with an electronic stopwatch and timed to 100th of a second, hence the two digit results.



Rear view of an MB NewBrain exposing all the various I/O connectors, the bus port and the missing socket.

Add a second CPU and double on the MK14's capability!

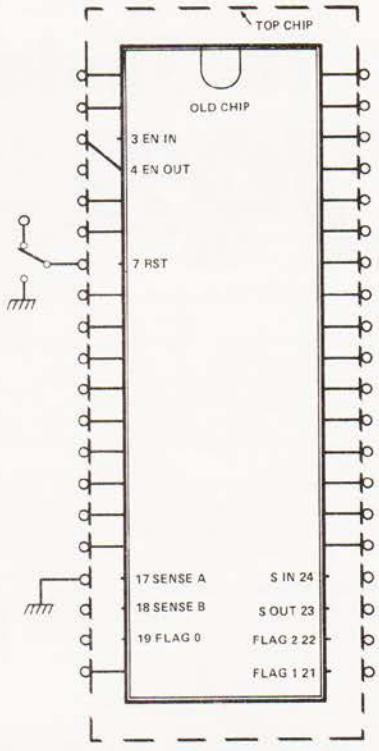
There are many times, when running programs on the Mk14, that it would be useful to keep the program running, but at the same time switch back to the monitor to see what is happening inside the machine! A good example is where a program is being loaded off cassette and you have to wait a minute for the load to finish only to find the memory filled with rubbish. The following modification to any SC/MP system, such as the trusty (or rusty) Mk14, will give the machine such a facility.

Constructional Notes

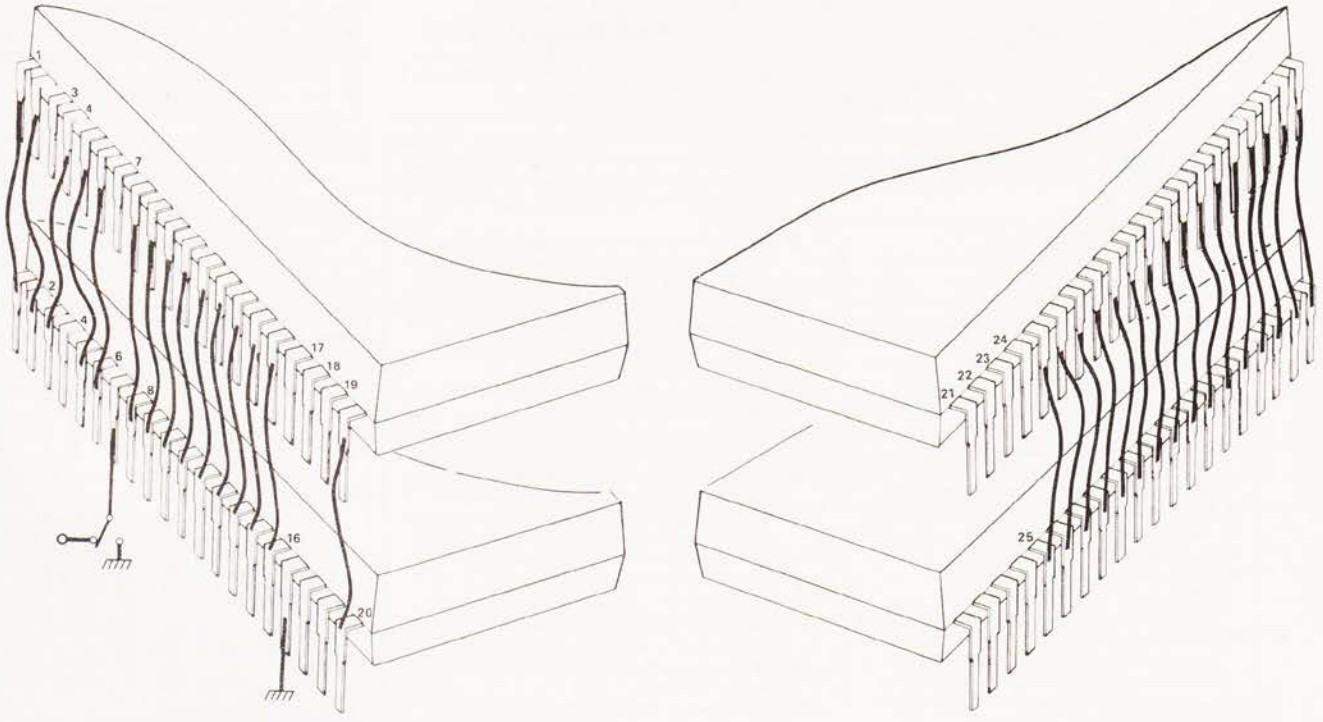
If you want your system to look neat, use ribbon cable connected at one end to all the pins on the 8060 SC/MP, the other end to a second SC/MP on a piece of veroboard.

However, as the SC/MP chip is pretty tough, I soldered the second IC onto the first, having removed it from the socket of course! Whichever way you connect the SC/MP up, parallel wire all connections to the SC/MP's with the exception of pins: 3,4,7,17,18,19,21,22,23,24. Pin 3 of the new device should be connected to pin 4 of the old SC/MP. Pin 7 of the new SC/MP should be connected to a toggle switch, so that pin 7 is at either 5 V or 0 V, turning the second SC/MP on and off. Initially set the switch to 0 V, de-selecting the second machine. Connect pin 17 to 0 V.

All the other pins, i.e. 4,18,19,21,22,23,24 can be left unconnected. When you power up, the MK14 should behave normally, providing the toggle switch is correctly positioned. If not, then you are running the monitor program on two processors, which does not work properly. A good initial test is to load a program off tape, then switch to the other machine and watch the bytes being loaded!



Top view of the two CPU chips showing pin to pin connections.



An alternate way of showing the pin interconnections, one side at a time.

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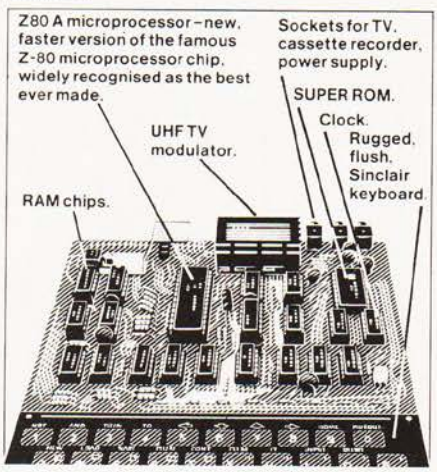

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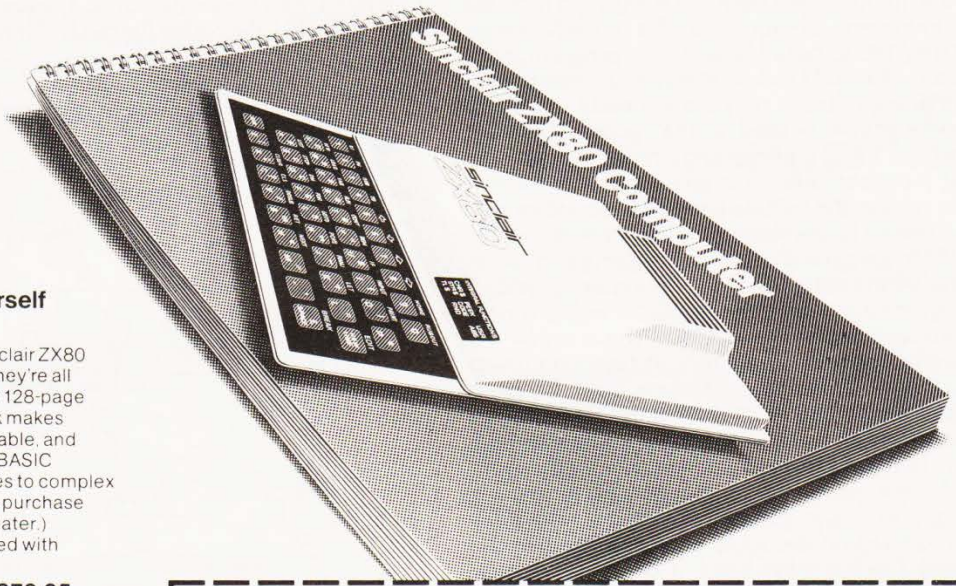

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CT/9/80

Owen Bishop

We put last month's D to A circuit to practical use in control applications.

Last time we saw how to use a digital-to-analogue IC to derive an audio output from the microprocessor. Sound is just one of many kinds of analogue quantity. Others include the brightness of a lamp, the speed of a motor, and the position of the arm of a robot. This month we see how to control analogue functions of these kinds, so that we can put our micro-system in charge of models, micro-mice or a multitude of robots. But first, here is one more circuit for the audio-freak. It could also be useful in providing sound signals for games programs.

Voltage Controlled Oscillator

When we run the audio system the MPU is engaged *full-time* in controlling the system. Obviously, such a procedure is no use if we want the MPU to be running another program at the same time. Ideally, the MPU should spend *most* of its time in running the program, pausing only occasionally to initiate whatever sound signal is needed at that point. The VCO described here (Figs 1 & 2) is cheap and simple, though adequate for most purposes. Since it is an oscillator in its own right, it does not require the MPU to issue millisecond-by-millisecond instructions. The oscillator provides its own sounds, leaving the MPU to get on with running the game and (occasionally) to signal what *frequency* of oscillation is required.

The frequency at which the oscillator works is controlled by the voltage applied to its input. This is set by the digital-to-analogue converter, which is in turn controlled from the output ports of the micro system. You also need connections from the 0 V and + 5 V lines of the microprocessor system; these too can be taken from the audio interface board. If you are building the interface specially for these circuits, you may not want the audio amplifier and its associated components and you can omit these. The VCO can be accommodated on the audio interface board in the space thus saved. On the other hand, if you have already built the audio interface, you have an amplifier available and there is no need for the amplification stage of the VCO; omit Q3 and R6 and run a wire from C20 (on the VCO board) to F26 (on the audio board). This will feed the oscillator output to the amplifier when switch 1 is closed.

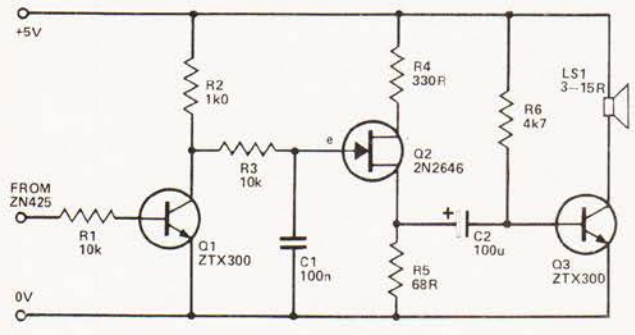


Fig.1. Circuit diagram for the VCO, the ZN425 is the D to A converter used in last month's project.

The VCO is based on a unijunction transistor, Q2. Current flows through R2 to C1, gradually charging it. The rate of charge is controlled by the output voltage of the ZN425. The lower the digital output from the MPU, the lower the voltage from the ZN425, the less Q1 is turned on, the higher the potential at the collector of Q1 and the more rapidly C1 is charged. C1 charges up to a certain potential, at which point it is suddenly discharged through Q2. The sudden flow of the current through emitter, base and R3, causes a sudden rise in potential at the base of Q1. As C1 is charged and discharged several hundred times a second, the pulsing current through R3 is amplified to produce sound of a constant pitch from the loudspeaker. The lower the digital output from the MPU, the higher the pitch of the sound.

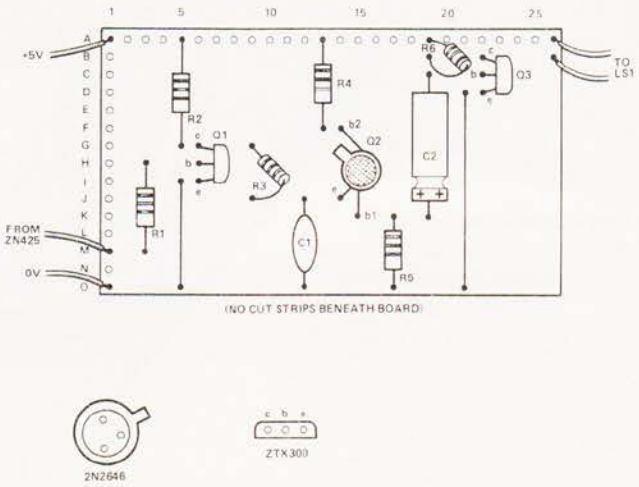


Fig.2. Veroboard layout for the VCO

PARTS LIST

Resistors all ¼ W unless specified	
R1,3	10k
R2	1k0
R4	330R
R5	68R
R6	4k7
Capacitors	
C1	100n
C2	100u electrolytic
Semiconductors	
Q1,3	ZTX300
Q2	2N2646
Miscellaneous	
LS1	3-15 R miniature loudspeaker

Control Software

To control this VCO we use short program segments similar to the test programs listed last month. At the beginning of the main program we list a segment to designate Port B as an 8-bit output, controlling the ZN425. These outputs would then normally be made allow, so that there is no sound. Later in the program, when a sound is required, we simply load accumulator with a value which will produce a sound of the required pitch, and store this value at Port B. The oscillator then emits the note required, and emits it continuously while the MPU continues with the main program. After a delay, the program may return to turn the oscillator off, or to change the pitch. The analogue output from the ZN425 can be fed to the circuit of Fig. 3, and used for controlling the brightness of a lamp, the speed of a motor, or the activity of any other voltage-sensitive system. This circuit uses an external power supply, so there is no problem with overloading the regulated supply of the micro system. The external supply may be a battery or a mains-powered DC power pack, with a voltage output up to 25 V. If you are using two ZTX300 transistors, the maximum current is 0.5A. This is enough for several small filament lamps, but greater power is generally required for running motors. If Q2 is replaced by a 2N3055 power transistor, motors requiring currents up to 15A may be controlled. The ZTX transistors can not withstand voltages greater than 25 V so, if you must use higher voltage, substitute a BC107 for Q1 and a 2N3055 for Q2, when voltages up to 45V may be used. Note that *only the OV line* is connected to the micro.

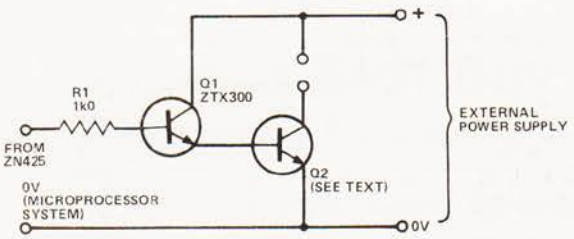


Fig.3. Circuit to control motors or brightness of lamps etc.

This circuit lets the motor lamps run at constant speed brightness for as long as the output port remains set at a given value. In the meantime the MPU can attend to other business. You can have a second ZN425 wired to Port A, and a second control circuit, like Fig. 3 wired to this. You then have independent control over two motors or other devices.

Stabilized Control For Motors

An improved circuit for controlling the speed of a motor is shown in Figs. 4 and 5. The operational amplifier acts to maintain a constant voltage across the motor terminals, no matter how much the back EMF of the motor varies with varying loads. This means that the motor runs at steady speed, even when it is suddenly required to accept an increased load. It also gives much more reliable control of the motor when running at very slow speeds. The inertia of a motor may prevent it from starting to turn at a slow speed, though once started it will turn slowly without difficulty. To overcome the inertia, the program can provide an initial burst of current, reducing this a few milliseconds later to the value required for running slowly. This initial 'kick' can be made so short as to be unnoticeable.

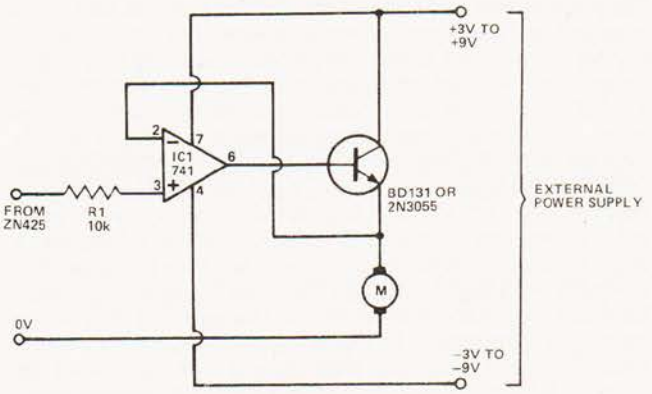


Fig.4. A more thorough circuit for motor control.

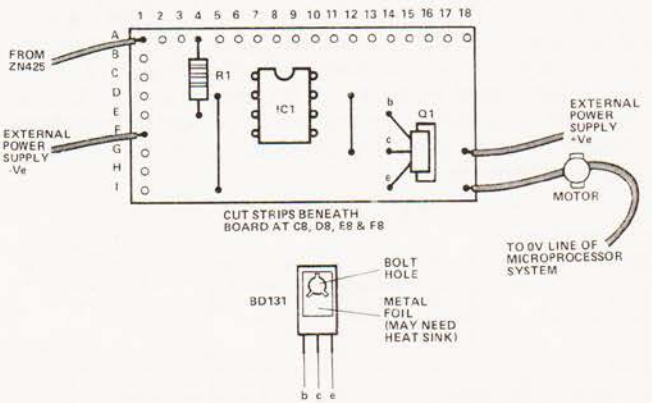


Fig.5. Veroboard layout for the motor speed controller.

Multiple Channel Control

With a robot or model of even moderate complexity there is likely to be the need to control several motors or other devices independently. Some of these may be under digital control, so may need no more than one or two ports each. Even so, with only 16 ports (A0-A7 and B0-B7) available from the I/O device one can soon run out of connecting links. Only two ZN425s can be connected, since these require 8 ports (8 bits) each. However, it is possible to economise in certain directions. For example, you may not need the fine level of control that the 8 bits provide (255 levels); perhaps only 4 bits (16 levels) will do. If so, you can run two ZN425s on Port B, leaving 8 channels for digital control on Port A. In other cases, 8-bit control may be impossible; for example, the full range of lamp brightness is obtained with values ranging from '85H' to '9CH' if we use the circuit of Fig. 3. Over this range the upper 3 bits are always '100', so we can wire the upper 3 inputs of the ZN425 to +5 V, 0 V and 0 V respectively. This frees 3 ports for other uses, such as digital control. One of the ports could be used to control a relay wired as a reversing switch. Thus you could control both the speed and direction of an electric motor. With this economical approach, programming can become rather complicated. If you can work out in advance exactly how many bits are really needed for each function, a little thought may save a lot of hardware.

Another way around the problem is to use the I/O device to drive a number of register latches, each of which is used to send data either to ZN425s or to devices under digital control. The latches act as memories external to the micro.

They remember the state of the output ports at any given moment and retain this information until they are instructed (by MPU) to forget it and remember something new. Fig. 6 shows one way of effecting this. The two registers are CD4014 ICs which each contain six D-type flip-flops. This gives us a 6-bit analogue range (64 steps) but this is usually enough. The remaining two bits are used as described below. In this application, the 'clear' input (pin 1) is wired permanently to +5 V, for it is generally more convenient to clear the register by inputting '0000' rather than taking over a special output port for this purpose. The clock input (pin 9) is normally held high (+5 V). In this state the outputs of each latch are held static, irrespective of changes that may be occurring at their inputs. To make inputs change state we first bring the clock input low; then bring it high again, and the outputs take the value on the inputs at the instant when clock goes high. For example, for Register 1, we write the program so that a new value appears at outputs B0 to B5; then we make output B6 go low, then high. At this point the new values appear at the outputs of Register 1. Similarly, to operate Register 7 we use Port 7. Since *both* registers derive their inputs from Ports B0 to B5, they can be clocked together to register the same values, or clocked separately to register different values. Try the sample program, to see exactly what happens.

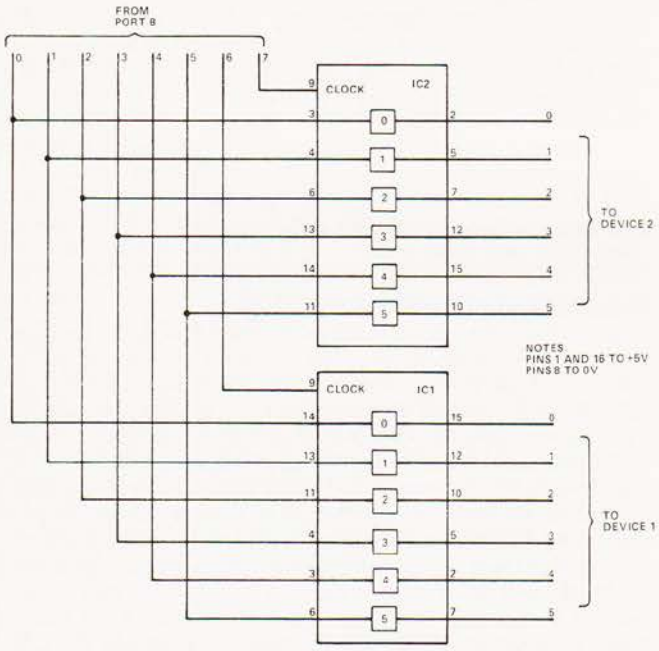


Fig.6. Latching registers used for device control.

We can run two registers from Port B alone, and two more from Port A (still with the possibility of using some bits for digital control) which gives a minimum of 4 channels, independently controlled. This is not the limit of the number of channels. Logically, the two bits B6 and B7 can be combined in four possible ways (00,01,10 and 11). Instead of connecting B6 and B7 directly to the clock inputs of the registers, we decode them first, so as to activate any one of three registers. Code '00' means that all 3 registers are inactive. A simple way to do this is to use the 4555 dual of 1-of-4 decoder (Fig. 7). This contains all the logic needed for decoding B6 and B7 on one, and A6 and A7 on the other, thus sending the clocking signal to any one of six registers.

Bidirectional Data Flow

There is another big advantage in using register latches as described above. When the ports are not in active use for transmitting data to the registers they can be redefined as inputs and used to receive data from sensors. Data from the sensors will not affect the latches on its way in to the microprocessor system. For example, we can have light triggered sensors on a robot and information from these can be fed to the MPU. This is programmed to adjust the speeds of motors accordingly. The only point to consider is that there should be no possibility of input data appearing at the ports at the same instant as the setting of the registers is to be changed. Normally this unlikely to be a problem, but it is worth thinking about while writing the program.

The field of analogue control is a vast one and we have done no more than touch upon it in this article. Yet even with fairly simple circuits and programs it is possible to exercise a surprising degree of control. Next time we turn our attention to the narrower, but vitally important, field of interfacing the system to a tape-recorder.

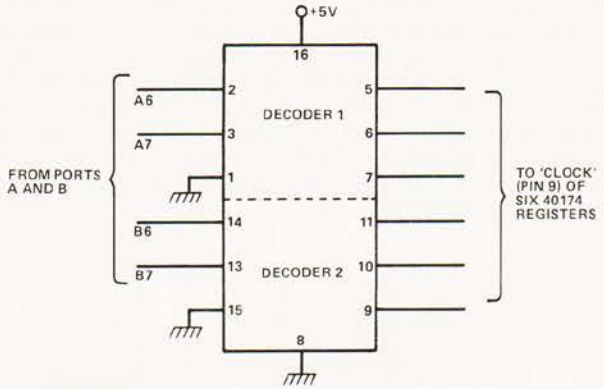


Fig.7. Using a decode circuit to control the registers.

Programs For Analogue Control

A) for SC/MP in MK-14. Segment of main program, to set Port B for output (relocatable):

```
0F20  C4 0A    LDI '0A'
0F22  35       XPAH P1      pointer P1 to I/O
0F23  C4 00    LDI '00'     device (0A00)
0F25  31       XPAL P1
0F26  C4 FF    LDI 'FF'     all port B defined
0F28  C9 23    ST P1+23     as outputs
```

The above segment need be listed once only. P1 must not be used for other functions.

Segment of program to be used whenever an analogue output is to be changed (relocatable):

```
0F2A  C4 80    LDI '80'     or other analogue out-
0F2C  C9 21    ST P1+21     put required at Port B
                            ('80' makes B7 high,
                            rest low)
```

For voltage controlled oscillator, use values between '32' and '45'. For controlling lamp brightness (Fig.3) use '85' to '9C'. For controlling motor (Fig.3) try values '87' to 'B8'. For controlling motor (Fig.4) try values '34' to '80'. The value '00' may be used for switching lamps and motors off.

B) for 6502 in Acorn. Segment of main program, to set Port B for output (relocatable):

```
0030  A9 FF     LDA# 'FF'   all Port B defined
0032  8D 23 09  STA 0DB     as outputs
```

The above segment need be listed once only.

Segment of program to be used whenever an analogue output is to be changed (relocatable):

```
0035  A9 80     LDA# '80'   or other analogue
0037  8D 21 09  STA at      required ('80 makes By
                Port B      high, rest low)
```

For values to be used in various types of control, see those listed for SC/MP, above.

Programs For 2-channel Analogue Control

A) for SC/MP in MK-14. Segment of main program, to set Port B for output — as given above, 0F20-0F29, followed by:

```
0F2A  C4 00     LDI '00'    all outputs low at
0F2C  C9 21     ST P1+21    Port B
0F2E  C9 0E     ST P1+0E    (B6)clock input
                            register 1 made low
0F30  C9 1E     ST P1+1E    (B6)clock input
                            register 1 made high;
                            data transferred to
                            register outputs (all
                            made '0')
0F32  C9 0F     ST P1+0F
                (B7)        outputs register 2 all
0F34  C9 1F     ST P1+1F
                (B7)        made low
```

Segment of program to be used whenever an analogue output is to be changed is the same as 0F2A to 0F35 above, except for the value at 0F2B, and that only one of B6 or B7 need be made low, then high.

B) for 6502 in Acorn. Segment of main program, to set Port B for output — as given above, 0030 to 0036, followed by:

```
0037  A9 00     LDA# '00'   all outputs made low
0039  8D 21 09  STA at
                Port B      at Port B
003C  8D 0E 09  STA at B6   clock input register 1
                            made low
003F  8D 1E 09  STA at B6   clock input register 1
                            made high, data
                            transferred to register
                            outputs (all made '0')
0042  8D 0F 09  STA at B7   outputs register 2 all
0045  8D 1F 09  STA at B7   made low
```

Segment of program to be used whenever an analogue output is to be changed is the same as 0037 to 0047 above, except for the value at 0038, and that only one of B6 or B7 need be made low, then high.

Malcolm Banthorpe

TOUCH TYPING TUTOR

The ability to touch type is one which few amateur programmers possess, but one which can be very useful, especially when typing in a long program from a printed listing. The program presented here was developed for an Ohio Superboard as a means of using the computer itself (via its VDU display) to train the user to associate a specific finger position with a specific alpha-numeric character. It can be successfully adapted for use on a UK 101 (see later).

Program Description

The bulk of the program (lines 105-275) is used to generate a graphic representation of a keyboard. All alpha and numeric keys are shown but control, shift and punctuation keys are not included. The next section of the program (lines 280-315) is used to randomly select a single character and blank its corresponding key as depicted on the screen. This remains blank until the user hits the same key on the keyboard. If an incorrect key is struck then the character on the correct key is momentarily flashed on the screen. Throughout the exercise the user should keep his/her eyes on the screen and not look at the keyboard. In this way the brain should gradually come to associate a given finger movement with a particular character. For preliminary information concerning which finger should be used for which key and the correct position of the hands, the user should consult one of the many available books on typing.

Enhancements

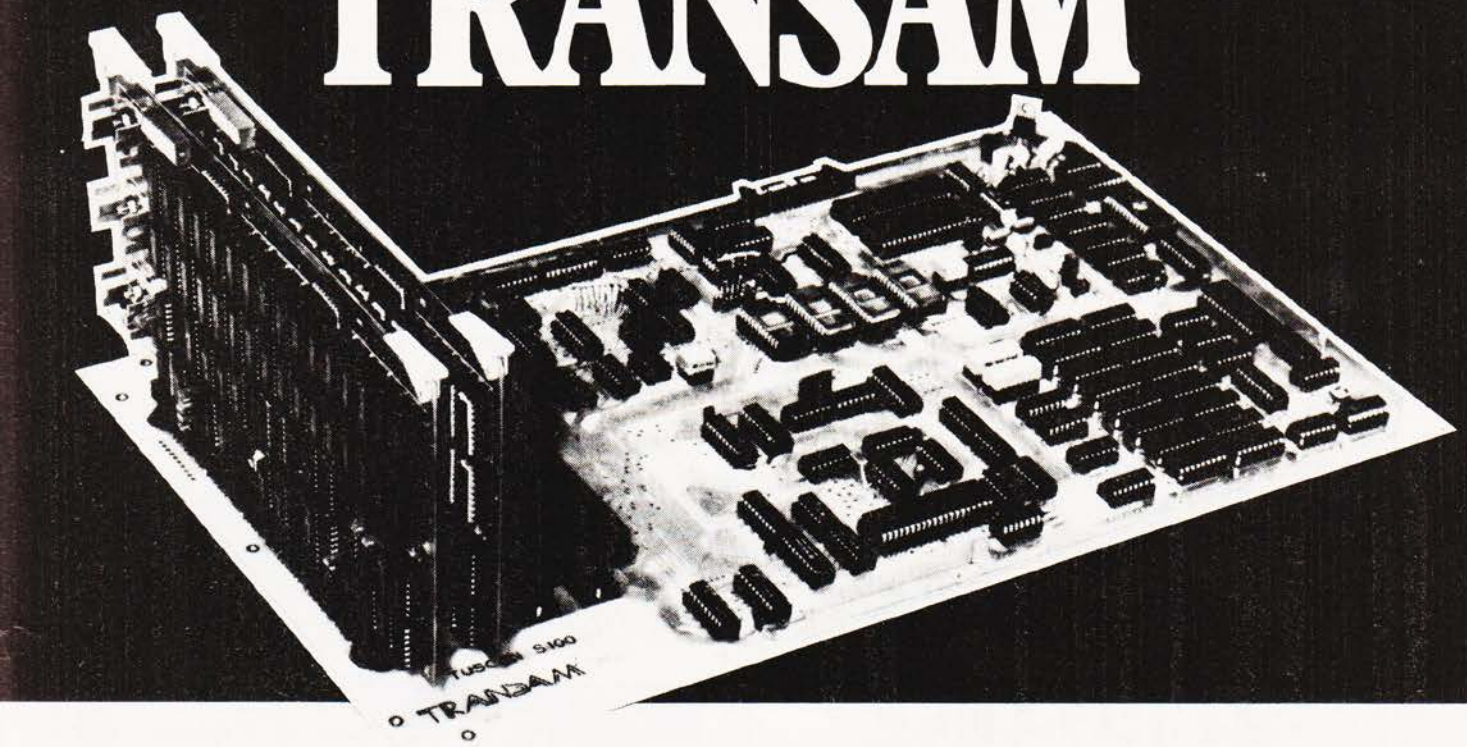
The program as presented is very basic (sic) and there is considerable scope for expanding its teaching aspect. For instance, instead of choosing a random sequence of characters it would be a simple matter to offer instead sequence which would spell out coherent sentences, either of the quick brown dog variety or preferably an interesting anecdote or joke previously unknown to the learner. This would make learning more enjoyable and provide a positive reinforcement to hitting the right keys. Another possibility would be, after some initial practice, to bias the selection of characters towards those which have been most frequently mis-keyed. These and other modifications are left to the ingenuity of the reader.

As mentioned above it is possible to convert the program to run on a UK 101 which has a similar set of graphic characters to the Superboard but which has a different screen format. Details of the changes required are not given here as most of the POKE addresses need to be changed. However any interested UK 101 user who is familiar with its graphics system will find that by running the program as presented, the resultant display will suggest the changes required.

Program Listing

```
100  REM TOUCH TYPING
105  FOR X=0 TO 29:PRINT:NEXT
110  P=53478:POKE 11,34:POKE 12,2
115  FOR X=546 TO 552:READ C:POKE X,C:NEXT
120  POKE P,221:Q=P+1
125  FOR X=1 TO 9:GOSUB 340 :NEXT
130  POKE Q,148:POKE Q+1,222
135  P=P+32
140  POKE P,149:Q=P+1
145  FOR X=1 TO 9:POKE Q,X+48:POKE Q+1,149:
     Q=Q+2:NEXT
150  POKE Q,48:POKE Q+1,149
155  P+P=32
160  POKE P,220:Q=P+1
165  FOR X=1 TO 9:GOSUB 345 :NEXT
170  POKE Q,217:POKE Q+1,215:POKE Q+2,222
175  P=P+33
180  POKE P,149:Q=P+1
185  FOR X=1 TO 10:GOSUB 350 :NEXT
190  P=P+32
195  POKE P,220:Q=P+1
200  FOR X=1 TO 9:GOSUB 345 :NEXT
205  POKE Q,217:POKE Q+1,223
210  P=P+33
215  POKE P,149:Q=P+1
220  FOR X=1 TO 9:GOSUB 350 :NEXT
225  P=P+32
230  POKE P,220:Q=P+1
235  FOR X=1 TO 8:GOSUB 345:NEXT
240  POKE Q,148:POKE Q+1,223
245  P=P+33
250  POKE P,149:Q=P+1
255  FOR X=1 TO 7:GOSUB 350 :NEXT
260  P=P+32
265  POKE P,220:Q=P+1
270  FOR X=1 TO 6:POKE Q,148:POKE Q+1,215:
     Q=Q+2:NEXT
275  POKE Q,148:POKE Q+1,223
280  C=INT(RND(1)*43+48)
285  IF C>57 AND C<65 THEN 280
290  P=53510
295  Q=P
300  IF PEEK(Q)=C THEN 315
305  Q=Q+1:IF Q-P<21 THEN 300
310  P=P+65:GOTO 295
315  POKE Q,32
320  X=USR(X)
325  IF PEEK(640)=C THEN POKE Q,161:GOSUB 355 :
     :POKE Q,C:POKE 280,0:GOTO 280
330  GOSUB 355 :POKE Q,C:GOSUB 355 :GOTO 315
335  END
340  POKE Q,148:POKE Q+1,217:Q=Q+2:RETURN
345  POKE Q,217:POKE Q+1,215:Q=Q+2:RETURN
350  READ A$:POKE Q,ASC(A$):POKE Q+1,149:
     Q=Q+2:RETURN
355  FOR X=0 TO 100:NEXT:RETURN
360  DATA32,0,253,141,128,2,96
365  DATAQ,W,E,R,T,U,I,O,P,A,S,D,F,G,H,I,J,K,
     L,Z,X,C,V,B,N,M
```

'TUSCAN' FROM TRANSAM



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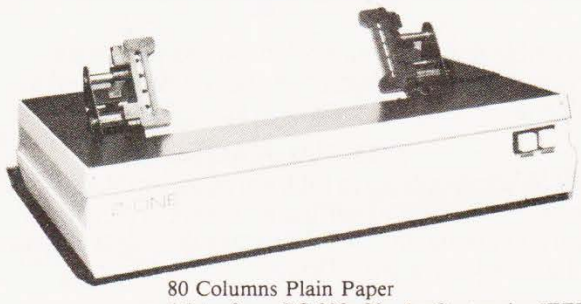

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8214	450p
8216	395p
8224	395p
8228	395p
8251	495p
8253	1125p
8255	495p
8257	1050p
8259	1325p
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Z80 CTC	595p
Z80A P10	695p
Z80A CTC	695p
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Z80A DMA	2495p
Z80 S10:1	2995p
Z80A S10:0	3495p
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FD1795 B	D/D Inverted Bus, side select	5995p
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MICRO BYTE

Dear Ed,

I enclose a letter which I sent to Mr. Clarke, (Printout, July) which I thought you would want to see, if only because I slander you therein.

Cheerfully Yours,
Iolo Davidson.

Littlefield,
Hawling,
Gloucestershire
GL54 5SZ.

Dear Mr. Clarke,

I have just read your letter in 'Computing Today' and I think I can assist you.

Pin 14 of the header socket on the NASCOM 1 is bit five (user spare output) of the keyboard port, and so the corresponding pin on the NASCOM 2 keyboard socket is pin 6. You will probably want a connection to ground as well, which could come from many places, but is pin 16 on the NASCOM 2 keyboard.

PEEKS and POKES are confusing to BASIC programmers because they are really machine code facilities, allowing machine codes to be manipulated from BASIC. Unfortunately BASIC wants its numbers in decimal, while machine codes are usually expressed in HEX. BASIC programs using these commands are only suited to the computer they were written on, as the addresses are not the same for the screen RAM, say, of the NASCOM and the PET. Sometimes a POKE is used to enable or disable a monitor facility such as printer output, (see your NASCOM BASIC manual 'Useful Routines' appendix I, page 26). In this case not only would the numbers be different, but the facility might not even exist on a different machine or monitor. To POKE an 'A' to the NASCOM screen (memory mapping) you need first to know the required address, which will be between 0800 and 0BFF (HEX), or 2048 to 3071 decimal. Let's use 0BD6 HEX, which is the start of the non-scrolling top line. This is 3030 (I think) and 'A' is 65 in decimal ASCII code, so the BASIC command 'POKE 3030, 65' should put an 'A' at the beginning of the top line. This is a trivial but hopefully clear demo of the use of POKE. PEEK is the reverse, it gets a number from the stated address and puts it into a BASIC variable. DEEK and DOKE do the same with two adjacent addresses. I fear you will need familiarity with machine code programming before you can use these commands in programming, but the main thing to know in the meantime is that no program, even in BASIC, written on one computer can be expected to run on another. Authors of programs published in CT invariably say 'this was written on a Whizbank Mk 4 but could easily be modified for any other computer' (I once saw this appended to a prog written in SC/MP machine code) and CT always print this lie, omitting only the name of the computer it does work on, and of course the authors name.

Incidentally, the NASCOM BASIC manual does not explain these or the other commands thoroughly, but assumes you understand BASIC programming, and merely outlines what their particular version has available. You need a good book on BASIC as well if you are a neophyte or even if not.

Yours,
Iolo Davidson.

Dear Sir,

While watching "Tomorrow's World" not long ago, I saw an Apple micro laboriously calculating the area of an irregular shape drawn on its screen. Determined to beat the 3-second time-lapse during the calculation, I set about finding a quicker way to work out irregular areas (i.e. other than counting the squares it covers).

I did, however, have one slight disadvantage, don't have an Apple (or a light pen). So here's the theory (and the bottom half of the program) can anyone provide the rest?

Somebody must remember the equation to find the area of a triangle on graph-paper. Well here's an adaptation of it which finds the area of any figure, given points around its perimeter:

$$\tfrac{1}{2}((y1+y2)(x2-x1)+(y2+y3)(x3-x2) \ldots\ldots +(yn+y1)(x1-xn))$$

It works by joining up the points given ((x1,y1)etc.) and finding the area of the figure so produced. But there are two hitches: the points are joined by straight lines, so the corners of curves may be cut off; and if any of the points are negative you could end up with a negative area.

A micro can overcome both these problems by reading a great many points and having the x-axis at the bottom of the screen with the y-axis on the far left.

So if anyone knows how their micro can take a great deal of readings at points along a line (say one point every millimetre vertically or horizontally) drawn on the screen, together we may be able to beat "Tomorrow's World"!

Meanwhile, you have to draw your shape on graph-paper and take the readings yourself. To get accurate results try to take as many points as you can and take them from the top of a curve. Make sure you know which units you're using and that no co-ordinates are negative. You must enter them in the same order as you would draw them (ie. as your pen passes over them as you draw the curve). And the last point must be the same as the first.

Finally, if you enter more than 25 points, don't forget to change the 'DIM' statement (line 60). All this may seem very laborious but, at the moment, your only option is to count all those little squares!

```
 10 PRINT "IRREGULAR AREA CALCULATOR"
 20 PRINT "ENTER POINTS IN ORDER. WHEN
    YOU HAVE ENTERED"
 30 PRINT "THE STARTING POINT FOR THE
    SECOND TIME, THE AREA"
 40 PRINT "WILL BE CALCULATED."
 60 LET L=1: DIM X(25), Y(25)
 70 PRINT:PRINT "X CO-ORDINATE":INPUT X(L)
 80 PRINT "Y CO-ORDINATE":INPUT Y(L)
 90 IF L=1 THEN 120
100 T=T+ (((Y(L)+Y(L-1))*(X(L)-X(L-1)))
110 IF (X(L)=X(1) AND Y(L)=Y(L-1)) THEN 130
120 L=L+1: GOTO 70
130 T=T/2: PRINT "AREA IS"; T; "SQUARE UNITS"
140 END
```

Ed Holson.

4 Dellcot Lane,
Worsley, Lancs.
M28 4PT.

Dear Sir,

I have just purchased the July edition of your magazine and having got home I had to drag myself away from my keyboard, I was so infuriated. Why oh why will you not state what BASIC dialect your programs are written in. I sat down to input Battle of Britain and having got it in and trying to run I got the error message BAD FILE MODE IN 30. At least I now know that it wasn't written for TRS-80 in MICROSOFT BASIC.

The same applies to your assembler programs, please state the processor — it does help!

Yours faithfully,
R.E. Peel.

Kiandra,
40 Culley Way, Cox Green,
Maidenhead, Berkshire

P.S. Please stop printing pretty pictures under programs and sample runs — it ruins one's eyesight. It may do wonders for your art editor's libido but does nothing to enhance your reputation as a serious computer magazine (see pages 14-15) and there have been worse examples!

Dear Sir,

I have recently acquired a Viatron System 21 together with a matching tape drive. If any of your readers have any relevant manuals they would be willing to loan or general information they could pass on regarding this and any other Viatron equipment, I would be very grateful. If there is anyone else out there struggling with one of these things perhaps we could get a Viatron users group going.

Also, is there a 6800 (specifically MEK 6800 D2) group still going somewhere?

Yours faithfully,
P.A. Dion.

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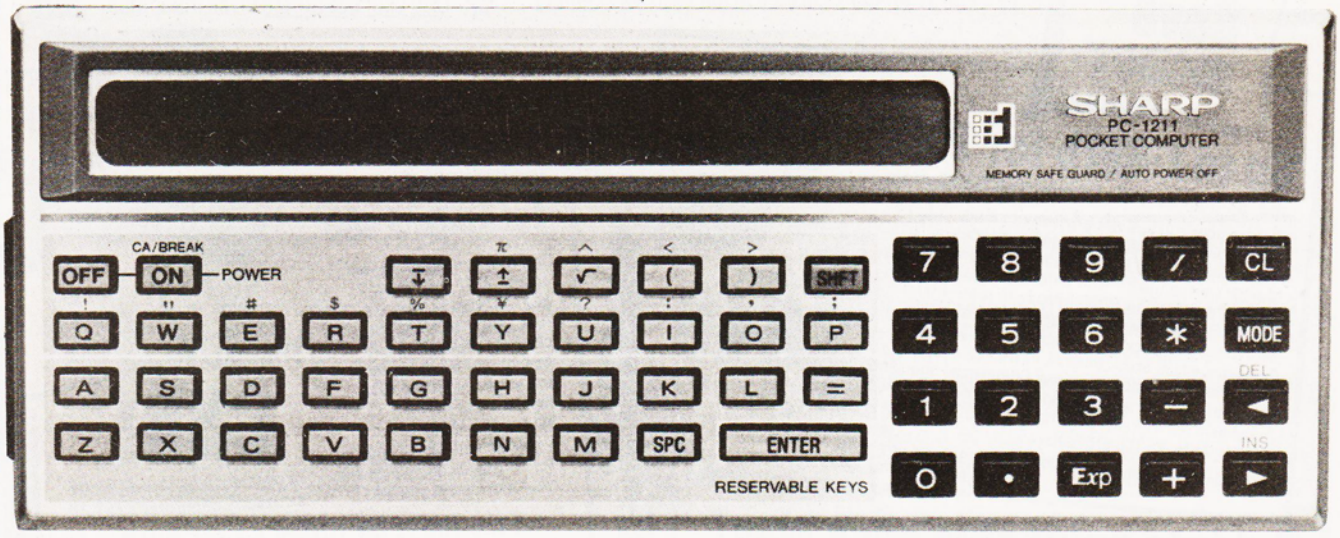


Next month, a new pocket sized microcomputer is to be launched in the UK. We present an exclusive owner report on the machine.

It is believed that within the next month Sharp Electronics (UK) Ltd will try to consolidate their position in the UK personal computing market with the launch of a pocket-sized, programmable computer working in the BASIC language.

Pocket Power

The first barrier that you have to overcome in accepting this computer is its physical size, or rather lack of it. Measuring in at 175mm long by 70mm wide and 15mm deep it is about the same dimensions as a normal chequebook and only a little fatter. By dint of this small physical size the keyboard (yes it has a full alphanumeric keyboard with additional mode and editing keys) is a little on the dainty side but at least they are proper keys and not touch sensitive. The display consists of a 24 character, 5 by 7 dot matrix LCD strip which rolls to give a maximum line length of 80 characters. The quality of the display is superb, it also gives indication of the mode in which the device is working and the method of angular notation; degrees, radians or gradians.

Just as it takes a few minutes to find your way around any new key layout you soon become familiar with this and the size of buttons are by no means 'fiddly'. The display is all in upper case and there are few departures from the expected 'shift' patterns. To the right of the main alpha keys is a numeric pad with extras such as a clear key, the mode key and a set of cursor controls. The bottom row of the alpha keys are definable in terms of numeric or string functions. The only other keys of immediate interest are the 'on' and 'off' keys where the 'on' key functions as a Clear and Break and the 'off' is actually inhibited during a program run, a very nice thought on the part of the designer.

Modus Operandi

As mentioned earlier there are four operating modes that can be selected. These are: —

DEF	Where the user defined keys are used,
RUN	for normal use
PRO	for programming the device in BASIC and
RESERVE	for programming the user definable keys.

The full set of BASIC commands and instructions is given in Table 1 and it can be seen from even cursory examination that there is little missing from even a Microsoft type of implementation. Commands worthy of note are the PAUSE statement which is used instead of PRINT when you are putting text onto the one-line display. This gives about 0.8 of a second of display time before continuing the execution. The command set is missing a RND or random statement, the only possibly objectionable omission, but makes up for its absence by providing full cassette file handling commands. Yes, you can load and save named programs with the normal CSAVE 'FRED' and CLOAD 'FRED' commands, FRED is commonly used in examples like this because it's the quickest sensible name you can type! Now for the real surprises, you don't often get these in machines 100 times the physical size. You can verify saved programs with CLOAD? 'FRED', you can write to and read from DATA files and these can be named as well and you can CHAIN programs together where the named program is loaded and run from within the existing program. Makes you feel green already doesn't it. Other goodies are a programmable BEEP, yes I *suppose* you could

play tunes, and the fact that virtually all the BASIC can be entered in abbreviated form, CS for CSAVE etc.

Oh, I nearly forgot, the icing on this particular cake is that you get a PRINT USING statement to offset the occasional problem with the one-line display and a DEBUG mode just in case your brain fails you. Impressive huh?

The Hard Stuff

At this point one must reveal that the BASIC is only capable of moderately slow operation, it is running off three silver oxide cells and uses an incredible 0.009 W. The expected life of the batteries is around 300 hours continuous use but the machine thoughtfully turns off after seven minutes if you ignore it. This brings us rapidly to the memory, no it isn't erased by this cavalier treatment but it might represent a small stumbling block to the guy who wants Star Trek. You can fit some 1424 steps of program in here but if that seems small I have yet to run out, the largest program in the manual, more of which later, uses no more than 1200 steps and that's a big program. Having said that you can get 1424 steps in doesn't mean that you can have that many lines, the BASIC supports up to line 999, and you soon become a 'tidy' programmer and work in steps of one line.

This machine, being pocket sized and looking not too unlike a conventional calculator, may appeal to school and college students as a rather powerful aid to exam success. Sharp have provided a little hole at the rear of the case which can be 'prodded' to erase all the memory contents, the point of a pencil or biro is ideal for this!

Although the cassette adapter is an optional extra in South Africa it will apparently be supplied as standard in the UK, and don't go looking at the end to see how much it costs — wait till I tell you! There have been some problems with the adapter, it appears to need to use a well set up cassette recorder and as usual it is better to use data quality tapes instead of those C90s you picked up cheap down the market. The use of a tape machine with ALC, almost a standard nowadays may cause some trouble as there is a change in output level between the header information and the actual program dump. This may be corrected by the time it reaches the UK. The built in bleeper actually sounds during load and dump operations to give some idea of what's happening.

Quite naturally the power consumption is increased when using the adapter and this can cause the battery low indicator in the display to come on rather sooner than calculated, sorry about the pun.

Included with the machine when sold in South Africa are the following books, A Beginners Guide To PC1211 BASIC, the Instruction Manual and the previously mentioned Application Manual. From a look at the manual for the current Sharp machine, the MZ-80K, it seems that the English is of a better standard and hopefully these will come in with the system in the UK. The applications manual is worth its weight in software alone, it contains little else, and is 25mm thick.

Conclusions

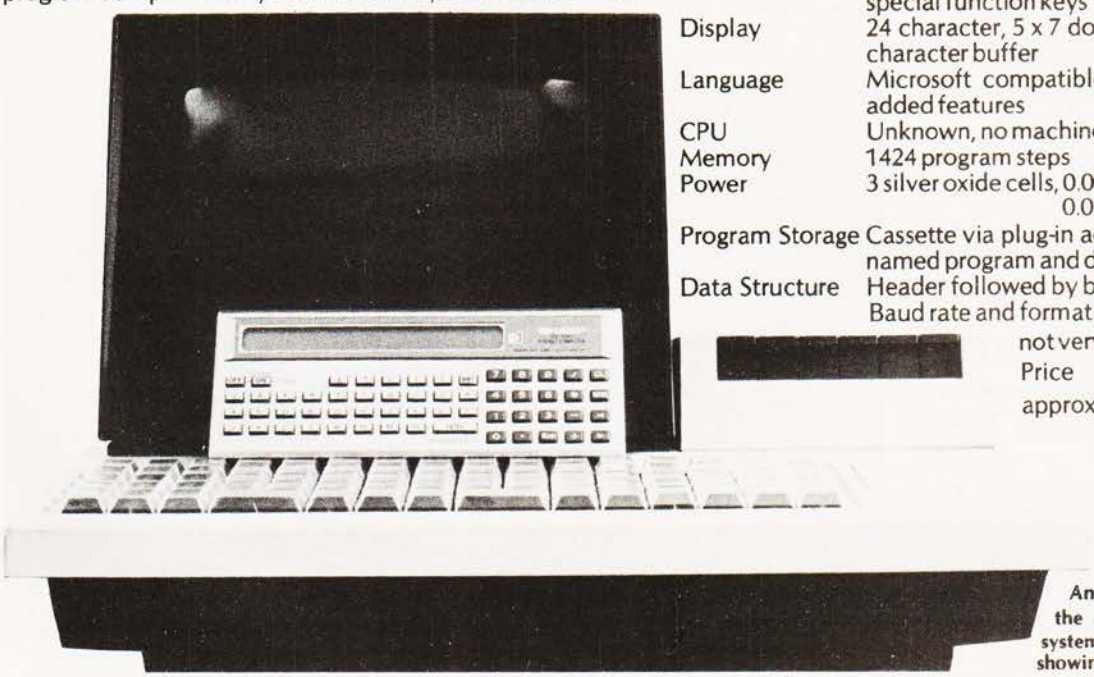
The PC1211 is easy to use, replacing the conventional 'mathematic' methods of programming calculators with the commonly accepted BASIC language may mean a huge potential market for this machine in the UK. The limited expansion facilities, cassette program and data storage and possibly a printer although this would not be confirmed by Sharp in the UK are not of supreme importance when compared with the incredible ease of programming.

Given the amazing portability, top pocket or briefcase, and the enormous power built in — it does a few things the PET won't — this machine could kill off the programmable calculator in much the same way as the old 'four function' types did for the slide rule.

Okay, how much do you think this is going to cost you? Three hundred pounds? No, the whole thing, complete with cassette adapter, is going to hit the streets in the Autumn at between £125 and £130. At that price I'd book yours now and avoid the rush.

Synopsis Of Facilities

Size	175mm by 70mm by 15mm
Keyboard	Full alpha plus numeric pad, cursor and special function keys
Display	24 character, 5 x 7 dot matrix LCD with 80 character buffer
Language	Microsoft compatible BASIC with many added features
CPU	Unknown, no machine code access
Memory	1424 program steps
Power	3 silver oxide cells, 0.009 W normal 0.011 W with cassette
Program Storage	Cassette via plug-in adapter unit, supports named program and data files.
Data Structure	Header followed by block formatted data. Baud rate and format are unknown but it's not very fast.
Price	£125-£130 approx on UK release.



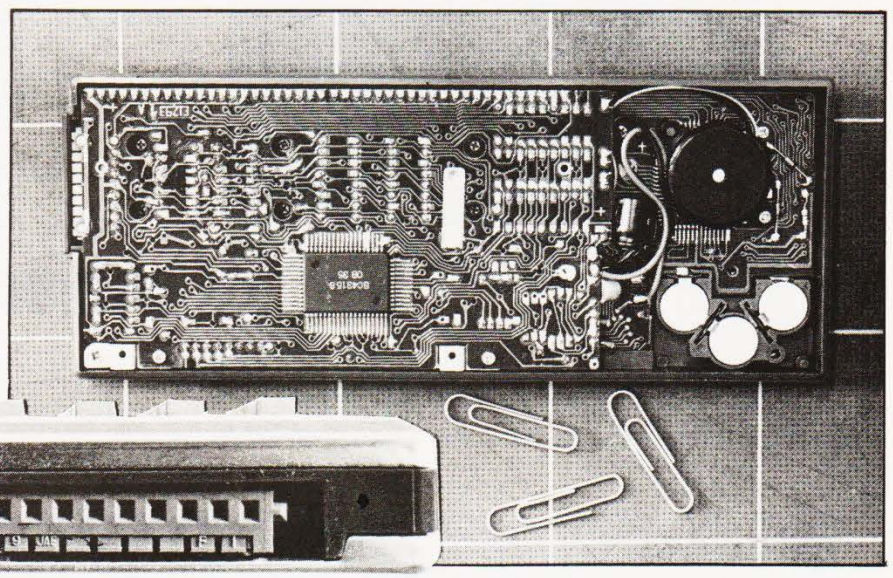
Another comparison of size, the current Sharp computer system MZ-80K with the PC1211 showing its paces.

Instruction	Abbreviation	Example	Note
DEG		A=DEG B	Conversion to decimal notation
INT		A=INT B	Obtains integer portion of B
ABS	AB.	A=ABS B	Obtains the absolute value
SGN	SG.	A=SGN B	If B>0, A=1 B=0, A=0 B<0, A=1
AREAD	A.	AREAD A	Only in the DEF mode, the contents of the display are shown before execution
BEEP	B.	BEEP A	Sound buzzer
CLEAR	CL.	CLEAR	Clears all data variables
DEGREE	DEG.	DEGREE	Sets the angle mode to DEG
END	E.	END	Terminates program
FOR	F.	FOR A=1 TO 10	Increments from A=0 to A=10, during which time program lines up to NEXT A are repeated.
GOTO	G.	GOTO 100	Jumps to line number 100
GOSUB	GOS.	GOSUB 100	Jumps to sub-routine in line number 100
GRAD		GRAD	Sets the angle mode to GRAD
IF		IF A=B	Decision instruction
INPUT	I.	INPUT A INPUT A$	Data input through keyboard
LET	LE.	LET A=10 LET A$="SHARP"	Substitute instruction
NEXT	N.	NEXT A	Used in pair with FOR
PAUSE	PA.	PAUSE A	Holds the display for 0.85 second.
PRINT	P.	PRINT A	Displays A.
RADIAN	RA.	RADIAN	Set the angle mode to RAD
REM		REM"INTEREST"	A comment statement
RETURN	RE.	RETURN	End of subroutine.
STEP	STE.		Optional increment in FOR-NEXT
STOP	S.	STOP	Suspends program

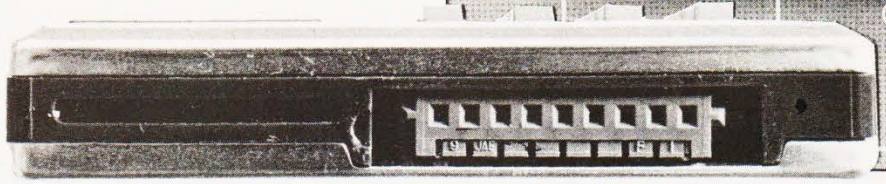
Instruction	Abbreviation	Example	Note
THEN	T.	IF...THEN 60	Written after IF instruction to indicate jump line number
USING	U.	PRINT USING "###.##";A	Designates the format in relation with PRINT instruction
CONT	C.	CONT	Normal operation is resumed from the suspended state
DEBUG	D.	DEBUG	Direct execution under debug mode.
LIST	L.	LIST LIST 100	Lists stored program
MEM	M.	MEM	Shows free memory space
NEW		NEW	Clears the program and data memories
RUN	R.	RUN	Starts program execution
CSAVE	CS.	CSAVE"File name"	Stores to tape with file name
CLOAD	CLO.	CLOAD"File name"	Program recorded is loaded
CLOAD?	CLO.?	CLOAD? "File name"	Verifies program
CHAIN	CH.	CHAIN"File name"	The program in the tape specified by the file name is transferred to the computer and executed
PRINT#	P.#	PRINT# "File name"	Stores data item
INPUT#	I.#	INPUT# "File name"	Loads data item
SIN	SI.	A=SIN B	
COS		A=COS B	
TAN	TA.	A=TAN B	
ASN	AS.	A=ASN B	
ACS	AC.	A=ACS B	
ATN	AT.	A=ATN B	
LOG	LO.	A=LOG B	Common logarithm
LN		A=LN B	Natural logarithm
EXP	EX.	A=EXP B	$A=e^B$
$\sqrt{}$		A=$\sqrt{}$	
DMS	DM.	A=DMS B	Conversion to sexagesimal notation

Table 1. The BASIC command set for the PC1211.

The internal workings, the large black circle is the bleeper in the top right corner with the three batteries below, paper clips are for scale comparison!



The cassette socket in the side of the machine, the normal covering strip is fitted onto the adaptor when in use.



Trevor Lusty

Those of you who have been throwing dice for last month's answer can solve the problem by exhaustion!

When I set the problem last month I implied that the solution would use the RND function. There is another method, but I didn't mention it in case it put everyone off. Well, here it is, and it's not as painful as it sounds.

Solution By Exhaustion.
The method here is to find all possible combinations of the dice. The score with the most combinations being the most likely to occur. As each die has six faces we have six cubed (216) possibilities to consider. Figure 1 gives the program listing and Fig 2 the output from this method. The program is written in PET BASIC but should be easily transferable. The only line which might need some thought is 1460 which is used to right justify the numbers in the printout. As you can see, there is a dead-heat for first place with scores of 15 and 17 equally likely.

```
1000 REM **DICE THROWING
1020 REM **BY EXHAUSTION
1040 DIM SC(27)
1060 FOR K=1 TO 6:READ D1(K)NEXT K
1080 FOR K=1 TO 6:READ D2(K)NEXT K
1110 FOR K=1 TO 6:READ D3(K)NEXT K
1120 DATA 1,3,5,7,9,11
1140 DATA 1,2,2,3,3,3
1160 DATA 2,3,5,7,11,13
1180 FOR D1=1 TO 6
1200 FOR D2=1 TO 6
1220 FOR D3=1 TO 6
1240 LET X=D1(D1)+D2(D2)+D3(D3)
1260 LET SC(X)=SC(X)+1
1280 NEXT D3
1300 NEXT D2
1320 NEXT D1
1340 PRINT:PRINT
1360 PRINT      "SCORE ■ TOTAL"
1380 PRINT "_____■_____"
1400 PRINT "     ■"
1420 FOR K=4 TO 27
1440 LET V=V+SC(K)
1460 PRINT RIGHT$("  "+STR$(K),3);
     "  ■  ";RIGHT$("  "+STR$(SC(K)),3)
1480 NEXT K
1500 PRINT:PRINT TAB(9);V
1520 END
```

Fig.1. Not as tiring as it sounds!

Using Random Numbers.
Now why, you may ask, do we need another method when the one above is so straightforward. Well, if we replaced the dice with spinners giving an infinite number of outcomes the method of exhaustion would be exactly that. To illustrate the point I have replaced the arrays which store the numbers on the faces of the dice with functions. These functions give discrete values, but they could just as well have been continuous.

SCORE	TOTAL
4	1
5	3
6	6
7	7
8	8
9	11
10	10
11	14
12	10
13	15
14	12
15	19
16	13
17	19
18	8
19	15
20	6
21	11
22	4
23	8
24	4
25	7
26	2
27	3
	216

Fig.2. The results never vary.

```
100  REM **DICE THROWING
110  REM **USING RANDOM.
120  DIM SC(27)
130  DEF FNA(X)=2*X-1
140  DEF FNB(X)=3-ABS(INT((-X*SGN(X-1)
     *SGN(X+1))/2))
150  DEF FNC(X)=INT(6*X)+1
160  DEF FND(X)=INT(6*X)-2
170  DEF FNE (X)=D3(X)
180  FOR K=1 TO 6:READ D3(K):NEXT K
190  DATA 2,3,5,7,11,13
200  FOR X=1 TO 5000
210  LET SC=FNA(FNC(RND(1)))
     +FNB(FND(RND(1)))+FNE(FNC(RND(1)))
220  LET SC(SC)=SC(SC)+1
```

```
230  NEXT X
1150 PRINT:PRINT
1160 PRINT "     "SCORE ■ TOTAL"
1170 PRINT "_____■_____"
1180 PRINT "     ■"
1190 FOR T=4 TO 27
1200 PRINT RIGHT$("  "+STR$(T),3);"  ■  ";
1210 PRINT RIGHT$("  "+STR$(SC(T)),3)
1230 NEXT T
1240 END
```

Fig.3. A functional program.

The random function returns a value between zero and one, and we must manipulate it to obtain the range of values we require. This is achieved by the functions FNC and FND, (see Fig3) the first returns one value from the sequence 1,2,3,4,5,6 and the second a value from the sequence -2,-1,0,1,2,3. These values are used in the other functions to generate the numbers on the faces of the dice. FNA generates a sequence of odd numbers, FNB generates the sequence 1,2,2,3,3,3 and FNE performs a simple look-up for the die with prime numbers.

SCORE	TOTAL
4	27
5	54
6	117
7	162
8	177
9	279
10	243
11	312
12	247
13	320
14	255
15	445
16	301
17	437
18	191
19	354
20	149
21	274
22	100
23	190
24	94
25	164
26	38
27	70

Fig.4. Random by consistent output.

Figure 4 gives the output from one run of the program and the output will in general differ from run to run. This contrasts strongly with the first program which will always produce the same output. We can see that the totals for 15 and 17 are no longer the same. On this sample printout 15 totals no more than 17 but another run might reverse the situation. When using the RND function you must ensure that a large enough sample is taken for results to be reliable, and it is a good idea to repeat the run so that you may check how consistent the results are.

Problem Of The Month

The following problem is quite an old one, but that makes it no less interesting. You might like to write either the shortest program or the fastest program which solves the problem, and as the problem may be solved in many different ways I will be pleased to see any solution of which you are particularly proud.

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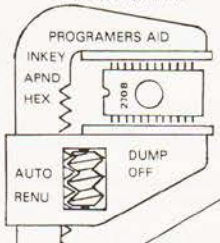

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Hard copy on hard copiers. What's available, who supplies it and how much!

ANADEX

DP-1000
Dist:- Anadex Ltd.
Dorna House, Guildford Road,
West End, Woking, Surrey
09905-6333

+ regional outlets

Face:- Dot
Interface:- RS232/20mA Centronics
Feed:- Friction
Head Size:- 5x7
Baud Rates:- 110-2400
Print Speed:- 50cps
Type Sizes:- 2
Graphics Option:- No
Price:- £400

Options:- Choice of the 3 indicated interfaces
Notes:- 40 column version of DP-8000 with slightly reduced facilities.

DP-8000
Dist:- Anadex Ltd.
Dorna House, Guildford Road,
West End, Woking, Surrey
09905-6333

+ regional outlets

Face:- Dot
Interface:- RS232/20mA Centronics
Feed:- Tractor
Head Size:- 9x7
Baud Rates:- 110-9600
Print Speed:- 112cps
Type Sizes:- 2
Graphics Option:- —
Price:- £500

Options:- Large character buffer, other interfaces
Notes:- General purpose dot matrix machine.

DP-9500
Dist:- Anadex Ltd.
Dorna House, Guildford Road,
West End, Woking, Surrey
09905-6333

+ regional outlets

Face:- Dot
Interface:- RS232/20mA Centronics
Feed:- Tractor
Head Size:- 9x9 or 9x7
Baud Rates:- 110-9600
Print Speed:- 200cps
Type Sizes:- 2
Graphics Option:- Yes
Price:- £895

Options:- Extended character buffer.
Notes:- 132 column system with expansion to 176 column with coms control. High density graphics.

DP-9501
Dist:- Anadex Ltd.
Dorna House, Guildford Road,
West End, Woking, Surrey
09905-6333

+ regional outlets

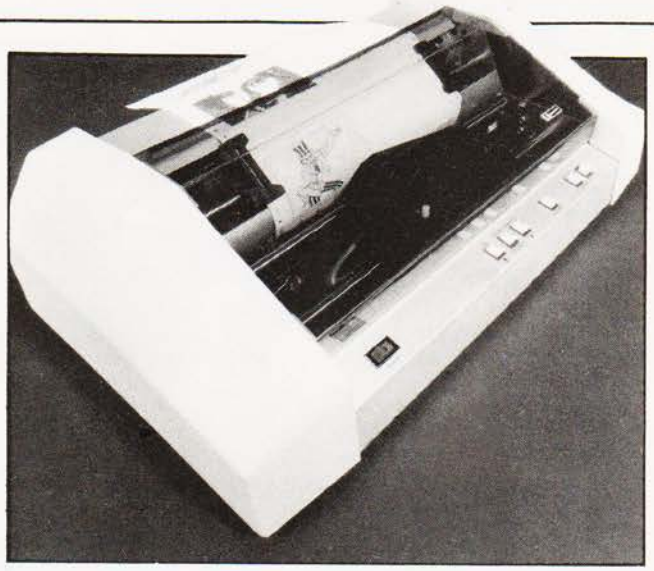
Face:- Dot
Interface:- RS232/20mA Centronics
Feed:- Tractor
Head Size:- 9x11
Baud Rates:- 110-9600
Print Speed:- 200cps
Type Sizes:- 2
Graphics Option:- Yes
Price:- £995

Options:-
Notes:- Extended carriage version of 9500 with higher density plotting.

BASE 2

Z-800
Dist:- Zero One Electronics
36 Oaklands Avenue,
Thornton Heath, Surrey CR4 7PH

Face:- Dot
Interface:- RS232/20mA Centronics/IEEE
Feed:- Tractor/Friction



Graphics is the latest option on the Anadex 9000 series, this is the 9501.

01-689 7924

Head Size:- 5x7
Baud Rates:- 75-9600
Print Speed:- 100cps
Type Sizes:- 2
Graphics Option:- Yes
Price:- £375

Options:- User definable font.
Notes:- Supplier also runs a service and repair centre and supplies ribbons and paper.

CENTRONICS

MICROPRINTER P1
Dist:- Centronics Data Computer (UK) Ltd.,
Victoria Way, Burgess Hill
Sussex RH15 9NU
04446-45011

Face:- Dot Electrostatic
Interface:- RS232/ Centronics
Feed:- Friction
Head Size:- 5x8
Baud Rates:- 1200
Print Speed:- 150 lpm
Type Sizes:- 3
Graphics Option:- —
Price:- £335 - £403

Options:- Serial interface, Teletex/Prestel interface
Notes:- CTs offer printer, software selectable line and type sizes.

MODEL 700
Dist:- Centronics Data Computer (UK) Ltd.,
Victoria Way, Burgess Hill,
Sussex RH15 9NU
04446-45011

Face:- Dot
Interface:- Centronics
Feed:- Tractor
Head Size:- 5x7
Baud Rates:- —
Print Speed:- 60cps
Type Sizes:- 2
Graphics Option:- —
Price:- £925

Options:-
Notes:- Conventional low speed matrix printer.

MODEL 701
Dist:- Centronics Data Computer (UK) Ltd.,
Victoria Way, Burgess Hill,
Sussex RH15 9NU
04446-45011

Face:- Dot
Interface:- Centronics
Feed:- Tractor
Head Size:- 5x7
Baud Rates:- —
Print Speed:- 60cps
Type Sizes:- 2
Graphics Option:- —
Price:- £1,025

Options:-
Notes:- Bi-directional version of Model 700.

BUYER'S GUIDE-PRINTERS

MODEL 702
Dist:- Centronics Data Computer (UK) Ltd.,
Victoria Way, Burgess Hill,
Sussex RH15 9NU
04446-45011

Face:- Dot
Interface:- Centronics
Feed:- Tractor
Head Size:- 7x7
Baud Rates:- —
Print Speed:- 120 cps
Type Sizes:- 2
Graphics Option:- —
Price:- £1,245

Options:-
Notes:- Faster version of 701 with extra form controls.

MODEL 703
Dist:- Centronics Data Computer (UK) Ltd.,
Victoria Way, Burgess Hill,
Sussex RH15 9NU
04446-45011

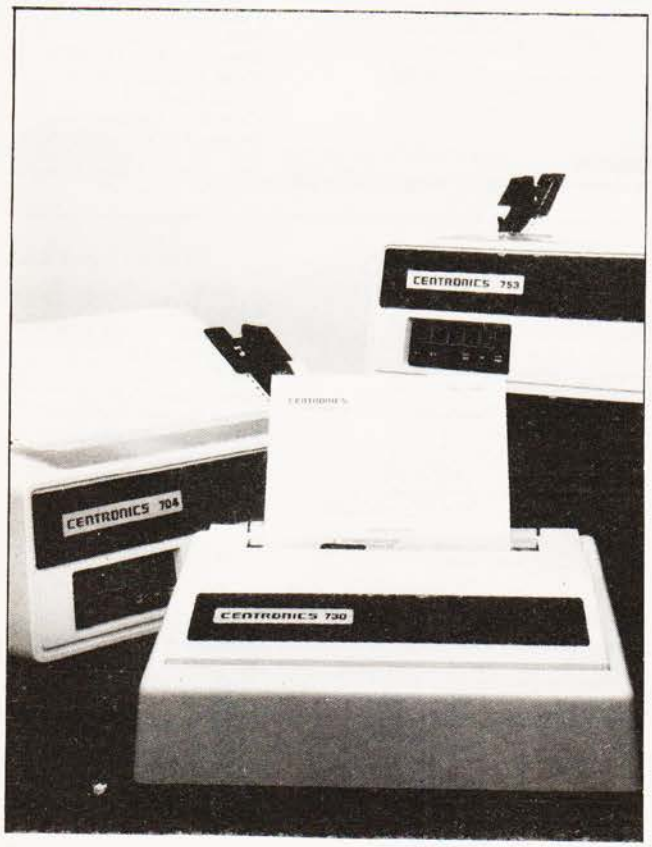
Face:- Dot
Interface:- Centronics
Feed:- Tractor
Head Size:- 7x7
Baud Rates:- —
Print Speed:- 180cps
Type Sizes:- 2
Graphics Option:- Yes
Price:- £1,625 - £1,725

Options:- Graphics plotting option.
Notes:-

MODEL 704
Dist:- Centronics Data Computer (UK) Ltd.,
Victoria Way, Burgess Hill,
Sussex RH15 9NU
04446-45011

Face:- Dot
Interface:- RS232
Feed:- Tractor
Head Size:- choice
Baud Rates:- 110-9600
Print Speed:- 180cps
Type Sizes:- 2
Graphics Option:- —
Price:- £1,570

Options:- Stand, Buffer, "hush" kit.
Notes:- Large carriage high quality matrix printer.



A selection of Centronics matrix printers from the enormous range.

730 MINIPRINTER
Dist:- Centronics Data Computer (UK) Ltd.,
Victoria Way, Burgess Hill,
Sussex RH15 9NU
04446-45011

Face:- Dot
Interface:- Centronics
Feed:- Tractor/Friction
Head Size:- 7x7
Baud Rates:- —
Print Speed:- 100cps
Type Sizes:- 2
Graphics Option:- —
Price:- £405 - £435

Options:- Serial interface (730-4).
Notes:-

737 MINIPRINTER
Dist:- Centronics Data Computer (UK) Ltd.,
Victoria Way, Burgess Hill,
Sussex RH15 9NU
04446-45011

Face:- Dot
Interface:- Centronics
Feed:- Tractor/Friction
Head Size:- Nx9 or 7x8
Baud Rates:- —
Print Speed:- 50 or 80cps
Type Sizes:- 2
Graphics Option:- —
Price:- £510

Options:-
Notes:- Unit capable of proportional spacing and justification under micro control.

MODEL 753
Dist:- Centronics Data Computer (UK) Ltd.,
Victoria Way, Burgess Hill,
Sussex RH15 9NU
04446-45011

Face:- Dot
Interface:- Centronics
Feed:- Tractor
Head Size:- Nx9
Baud Rates:- —
Print Speed:- 100-150cps
Type Sizes:- 2
Graphics Option:- —
Price:- £1,570

Options:- Stand, Various electronic options.
Notes:- Correspondence printer with proportional spacing.

MODEL 779
Dist:- Centronics Data Computer (UK) Ltd.,
Victoria Way, Burgess Hill,
Sussex RH15 9NU
04446-45011

Face:- Dot
Interface:- Centronics
Feed:- Friction
Head Size:- 5x7
Baud Rates:- —
Print Speed:- 60cps
Type Sizes:- 2
Graphics Option:- —
Price:- £725

Options:- Tractor feed.
Notes:- The original micro printer as supplied by Tandy.

MODEL 791
Dist:- Centronics Data Computer (UK) Ltd.,
Victoria Way, Burgess Hill,
Sussex RH15 9NU
04446-45011

Face:- Dot
Interface:- Centronics
Feed:- Tractor
Head Size:- 5x7
Baud Rates:- —
Print Speed:- 60cps
Type Sizes:- 2
Graphics Option:- —
Price:- £1,410

Options:-
Notes:- Heavy duty form printer handling up to 12 part stationery.

COMPRINT

COMPRINT 912
Dist:- Transam,
12 Chapel Street,
London NW1 5DH
01-402 8137

Face:- Dot Electrostatic
Interface:- RS232/Parallel
Feed:- Friction
Head Size:- 9x12
Baud Rates:- —
Print Speed:- 225cps
Type Sizes:- —
Graphics Option:- —
Price:- £370 - £385

Options:-
Notes:- Electrostatic printer with full page width printing.

EPSON

EPSON TX 80
Dist:- Westrex
152 Coles Green Road,
London NW2 7HE
01-452 5401

Face:- Dot
Interface:- Centronics
Feed:- Tractor/Friction
Head Size:- 5x7 or 6x7
Baud Rates:- –
Print Speed:- 125cps
Type Sizes:- 2
Graphics Option:- Yes
Price:- £395

Options:- Grafcom graphics, various interfaces, feed option.
Notes:- PET graphics compatible matrix printer.

FACIT

FACIT 4506
Dist:- Facit Data Products
Maidstone Road,
Rochester, Kent
0634-401721

Face:- Dot Thermal
Interface:- Parallel
Feed:- Friction
Head Size:- nx7
Baud Rates:- –
Print Speed:- 21cps
Type Sizes:- –
Graphics Option:- –
Price:- –

Options:-
Notes:- Naked thermal printhead and mechanism.

FACIT 4520/1
Dist:- Facit Data Products
Maidstone Road,
Rochester, Kent
0634-401721

Face:- Dot
Interface:- RS232/
Centronics
Feed:- Tractor/Frictior
Head Size:- 9x7
Baud Rates:- –
Print Speed:- 80cps
Type Sizes:- –
Graphics Option:- –
Price:- £641

Options:- Tractor feed (4521)
Notes:- Intelligent bi-directional printer.

FACIT 4530
Dist:- Facit Data Products
Maidstone Road,
Rochester, Kent
0643-401721

Face:- Dot
Interface:- RS232/20mA
Centronics
Feed:- Tractor
Head Size:- 5x7 or 9x7
Baud Rates:- –
Print Speed:- 200cps
Type Sizes:- Various
Graphics Option:- –
Price:- £1,628

Options:-
Notes:- Microprocessor controlled printer, can do bar codes etc.

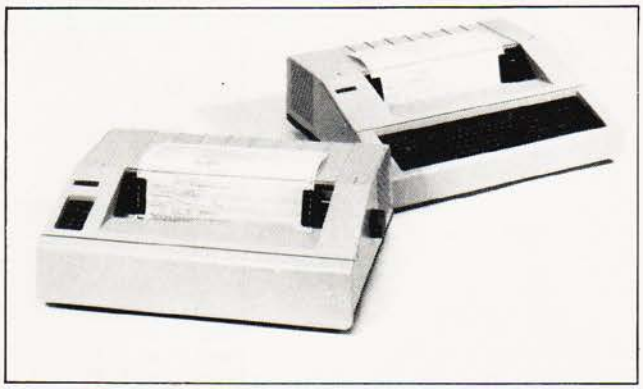
FACIT 4540
Dist:- Facit Data Products
Maidstone Road
Rochester, Kent
0634-401721

Face:- Dot
Interface:- RS232/Parallel
Centronics/IEEEE/20mA
Feed:- Tractor
Head Size:- 9x9 or 7x9
Baud Rates:- –
Print Speed:- 250cps
Type Sizes:- –
Graphics Option:- –
Price:- £2,764

Options:- Keyboard unit (4540-T)
Notes:-

FACIT 4555
Dist:- Facit Data Products
Maidstone Road,

Face:- Dot
Interface:- RS232/Parallel
Centronics/IEEE/20mA



The two variants of the HP 2631 matrix printer.

Rochester, Kent
0634-401721

Feed:- Tractor/Friction
Head Size:- –
Baud Rates:- –
Print Speed:- 60cps
Type Sizes:- –
Graphics Option:- –
Price:- –

Options:-
Notes:-

HEATH ELECTRONICS

H14
Dist:- Heath Electronics
Bristol Road, Gloucester GL2 6EE
0452-29451

+ London shop - 01-636 7349

Face:- Dot
Interface:- RS232/20mA
Feed:- Tractor
Head Size:- 5x7
Baud Rates:- 110-4800
Print Speed:- 135cps
Type Sizes:- 3
Graphics Option:- –
Price:- £413(kit)-£592(built.

Options:-
Notes:- High quality reliable printer with no frills.

HEWLETT PACKARD

HP 2631B
Dist:- Hewlett Packard Ltd.
308-314 Kings Road,
Reading, Berkshire RG1 4ES
0734-61022

Face:- Dot
Interface:- RS232/20mA
Centronics/IEEE
Feed:- Tractor
Head Size:- 7x9
Baud Rates:- 110-2400
Print Speed:- 180cps
Type Sizes:- 2
Graphics Option:- –
Price:- £2,110

Options:- Graphics copy option.
Notes:- Software selectable print densities and form sizes.

HP 2635B
Dist:- Hewlett Packard Ltd.
308-314 Kings Road,
Reading, Berkshire RG1 4ES
0734-61022

Face:- Dot
Interface:- RS232/20mA
Centronics/IEEE
Feed:- Tractor
Head Size:- 7x9
Baud Rates:- 110-2400
Print Speed:- 180cps
Type Sizes:- 2
Graphics Option:- –
Price:- £2,315

Options:-
Notes:- KSR version of 2631 with same facilities.

BUYER'S GUIDE-PRINTERS

MICROTEK

MICROTEK MT 80P
Dist:- Kingston Computers Ltd.
Scarborough House,
Scarborough Road
Bridlington, Yorkshire
0262-73036

Face:- Dot
Interface:- RS232/IEEE Centronics
Feed:- Tractor
Head Size:- 9x7
Baud Rates:- to 9600
Print Speed:- 125cps
Type Sizes:- 2
Graphics Option:- No
Price:- £495 - £550

Options:- Various interfaces, character buffer.
Notes:- 80 or 120 column matrix printer built under UK supervision.

NASCOM

IMP
Dist:- Currently available from many local outlets.
Manufacturer (Nascom) is in voluntary liquidation.

Face:- Dot
Interface:- RS232
Feed:- Friction
Head Size:- 7x7
Baud Rates:- 110-9600
Print Speed:- 60 lpm
Type Sizes:- —
Graphics Option:- Yes
Price:- £325

Options:- Tractor feed, programmable character set.
Notes:- First of a new generation matrix printers, like the BASE 2 and EPSON.

NEWBURY LABS

8300 RM
Dist:- Newbear Computing Store
40 Bartholomew Street
Newbury, Berkshire
0635-30505

Face:- Dot
Interface:- RS232
Feed;- Tractor
Head Size:- 7x9
Baud Rates:- 110-9600
Print Speed:- 125cps
Type Sizes:- 2
Graphics Option:- No
Price:- £525

Options:- Choice of character per line and buffer sizes.
Notes:- General purpose dot matrix printer.

PAPER TIGER

PAPER TIGER
Dist:- Microsense
Finway Road
Hemel Hempstead, Herts HP2 7PS
0442-48151
+ regional outlets

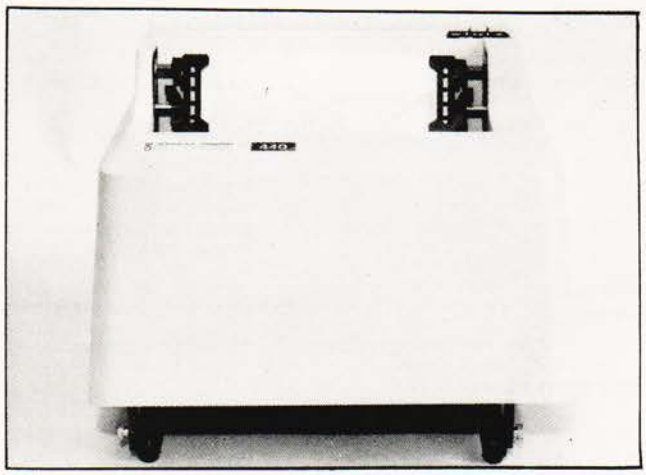
Face:- Dot
Interface:- RS232 Centronics
Feed:- Tractor/Friction
Head Size:- 7x7
Baud Rates:- 110-1200
Print Speed:- 95cps
Type Sizes:- 4
Graphics Option:- Yes
Price:- £598

Options:-
Notes:- Very versatile printer with various built-in options for line length, etc.

QUME

QUME SPRINT 5
Dist:- Access Data Communications
228 High Street
Uxbridge, Middlesex UB8 1LD
0895-30831

Face:- Daisy
Interface:- RS232/20mA Parallel
Feed:- Tractor/Friction
Head Size:- N/A
Baud Rates:- 110-1200
Print Speed:- 45-55cps
Type Sizes:- various
Graphics Option:- —
Price:- £1,995



The Paper Tiger matrix printer.

Options:-
Notes:- Daisy wheel machine giving letter quality print.

RICOH

RICOH RP1600
Dist:- London Computer Store
43 Grafton Way
London W1
01-388 5721

Face:- Daisy
Interface:- Centronics
Feed:- Friction
Head Size:- N/A
Baud Rates:- —
Print Speed:- 35cps
Type Sizes:- various
Graphics Option:- —
Price:- £1,290

Options:- Various interfaces.
Notes:- Fast commercial daisy wheel for WP and other office applications.

ROBETRON

ROBETRON 1152
Dist:- Kingston Computers Ltd.
Scarborough House,
Scarborough Road
Bridlington, Yorkshire.
0262-73036

Face:- Daisy
Interface:- Centronics
Feed:- Friction
Head Size:- N/A
Baud Rates:- —
Print Speed:- 45cps
Type Sizes:- various
Graphics Option:- No
Price:- under £1,000

Options:- Interfaces, tractor feed.
Notes:- East German RO daisy printer for high quality type.

The Qume Spirit 5 Daisy wheel printer.

SIGMA

MODEL 801
Dist:- Sigma UK
Unit 2, 106-120 Garrat Lane,
Wandsworth, London SW18
01-870 4524

Face:- Dot
Interface:- RS232/20mA
Centronics
Feed:- Tractor/Friction
Head Size:- 7x7
Baud Rates:- 110-1200
Print Speed:- 132cps
Type Sizes:- —
Graphics Option:- —
Price:- £695

Options:-
Notes:-

TELETYPE

TELETYPE 43
Dist:- Peripheral Hardware Ltd.
Armfield Close,
West Molesey, Surrey
01-941 4806
+ various regional outlets

Face:- Dot
Interface:- RS232/20mA
Feed:- Tractor/Friction
Head Size:- 7x9
Baud Rates:- —
Print Speed:- 10 or 30cps
Type Sizes:- —
Graphics Option:- No
Price:-

Options:- IEEE interface, Buffer store, Stand, ASR.
Notes:- High quality matrix terminal available as KSR, ASR or RO. Portable and TTY compatible.

TEXAS INSTRUMENTS

TI 810
Dist:- Texas Instruments
Manton Lane,
Bedford
0234-67466

Face:- Dot
Interface:- RS232
Feed:- Tractor
Head Size:- 9x7
Baud Rates:- 110-9600
Print Speed:- 150cps
Type Sizes:- 2
Graphics Option:- —
Price:- £1,450

Options:- Character sets, various interfaces, form handling.
Notes:-

An ASR Teletype Model 43 on stand.

The popular Dolphin BD80P matrix printer from Walters Microsystems.

TI 820
Dist:- Texas Instruments
Manton Lane,
Bedford
0234-67466

Face:- Dot
Interface:- RS232
Feed:- Tractor
Head Size:- 9x7
Baud Rates:- 110-9600
Print Speed:- 150cps
Type Sizes:- 2
Graphics Option:- —
Price:- £1,450 - £1,650

Options:-
Notes:- KSR bi-directional with RO option at reduced cost.

TI 825
Dist:- Texas Instruments
Manton Lane,
Bedford
0234-67466

Face:- Dot
Interface:- RS232
Feed:- Tractor
Head Size:- 9x7
Baud Rates:- 110-600
Print Speed:- 75cps
Type Sizes:- 2
Graphics Option:- —
Price:- £1,095 - £1,250

Options:-
Notes:- Slower RO or KSR matrix printer.

TI 743
Dist:- Texas Instruments
Manton Lane,
Bedford
0234-67466

Face:- Dot Thermal
Interface:- RS232/20mA
Feed:- Friction
Head Size:- 5x7
Baud Rates:- 110-300
Print Speed:- 30cps
Type Sizes:- —
Graphics Option:- —
Price:- £995 - £1,105

Options:-
Notes:- Thermal printer KSR terminal.

TI 745
Dist:- Texas Instruments
Manton Lane,
Bedford
0234-67466

Face:- Dot Thermal
Interface:- RS232
Feed:- Friction
Head Size:- 5x7
Baud Rates:- 110-300
Print Speed:- 30cps
Type Sizes:- —
Graphics Option:- —
Price:- £1,250

Options:-
Notes:- Integral modem in portable terminal.

TI 763
Dist:- Texas Instruments
Manton Lane,

Face:- Dot Thermal
Interface:- RS232/20mA
Feed:- Friction

Bedford
0234-67466

Head Size:- 5x7
Baud Rates:- 110-9600
Print Speed:- 30cps
Type Sizes:- —
Graphics Option:- —
Price:- £2,195

Options:- Expanded character store.
Notes:- Bubble memory based terminal with 20K internal storage.

TRENDCOM

TCM 100
Dist:- Personal Computers Ltd.
194-200 Bishopsgate,
London EC2M 4NR
01-626 8121

Face:- Dot Thermal
Interface:- Parallel
Feed:- Friction
Head Size:- 5x7
Baud Rates:- —
Print Speed:- 40cps
Type Sizes:- —
Graphics Option:- Yes
Price:- £240

Options:- Interfaces for various machines.
Notes:- 40 column thermal printer capable of graphics plotting.

TCM 200
Dist:- Personal Computers Ltd.
194-200 Bishopsgate,
London EC2M 4NR
01-626 8121

Face:- Dot Thermal
Interface:- Parallel
Feed:- Friction
Head Size:- 5x7
Baud Rates:- —
Print Speed:- 40cps
Type Sizes:- —
Graphics Option:- Yes
Price:- £340

Options:- Interfaces for various machines.
Notes:- 80 column version of TCM 100.

SILENTYPE
Dist:- Microsense
Finway Road
Hemel Hempstead, Herts HP2 7PS
0442-48151
+ regional outlets

Face:- Dot Thermal
Interface:- Apple
Feed:- Friction
Head Size:- 5x7
Baud Rates:- —
Print Speed:- 40cps
Type Sizes:- —
Graphics Option:- Yes
Price:- £349

Options:-
Notes:- Custom interfaced TRENDCOM printer for Apple capable of high density graphics.

WALTERS MICROSYSTEMS

DOLPHIN BD-80P
Dist:- Walters Microsystems
1 Blenheim Road,
High Wycombe, Bucks
0494-445172

+ many regional outlets

Face:- Dot
Interface:- RS232/20mA
Centronics/IEEE
Feed:- Tractor/Friction
Head Size:- 7x9
Baud Rates:- 50-19,200
Print Speed:- 125cps
Type Sizes:- 2
Graphics Option:- Yes
Price:- £525

Options:- Stand, Buffer, Coms interface.
Notes:- A standard matrix printer with excellent reliability reputation.

WEYFRINGE

MODEL 480
Dist:- Weyfringe
Longbeck Road
Marske, Redcar
Cleveland TS11 6HQ
0642-470121

Face:- Dot
Interface:- RS232/20mA
Centronics
Feed:- Friction
Head Size:- 5x7
Baud Rates:- 110-9600
Print Speed:- 110cps
Type Sizes:- 2
Graphics Option:- —
Price:- £475

Options:- Choice of indicated interfaces.
Notes:- Tally roll printer for logging applications.

CENTURY
Dist:- Weyfringe
Longbeck Road,
Marske, Redcar,
Cleveland TS11 6HQ
0642-470121

Face:- Dot
Interface:- RS232/20mA
Centronics
Feed:- Tractor/Friction
Head Size:- 7x9
Baud Rates:- 110-9600
Print Speed:- 110cps
Type Sizes:- 4
Graphics Option:- —
Price:- £945

Options:- Optional PET interface, alternate character set.
Notes:- General purpose machine with form handling facilities.

WHYMARK

WHYMARK 201
Dist:- Whymark Instruments
6 Holmesdale Road,
Reigate, Surrey RH2 0BQ
07372-21753

Face:- Dot
Interface:- RS232/20mA
Centronics/IEEE/Parallel
Feed:- Friction
Head Size:- 7x7
Baud Rates:- 110-4800
Print Speed:- 1 lps
Type Sizes:- 4
Graphics Option:- —
Price:- £410 - £490

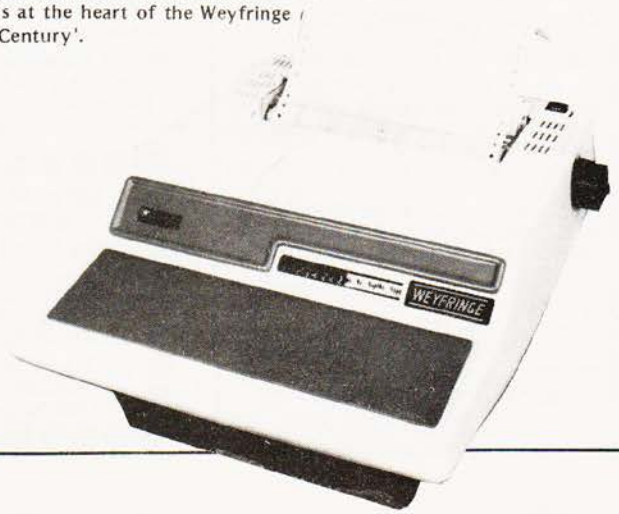
Options:- Label printer, rack mounted, interfaces to order.
Notes:- Tally roll printer with 40 character line.

WHYMARK 801
Dist:- Whymark Instruments
6 Holmesdale Road,
Reigate, Surrey RH2 0BQ
07372-21753

Face:- Dot
Interface:- RS232
Centronics/IEEE
Feed:- Tractor
Head Size:- nx7
Baud Rates:- 75-9600
Print Speed:- 140cps
Type Sizes:- 2
Graphics Option:- Yes
Price:- £750

Options:- User definable character set, stand.
Notes:- Intelligent printer with proportional control and absolute alignment.

The Burroughs PM100 mechanism is at the heart of the Weyfringe 'Century'.



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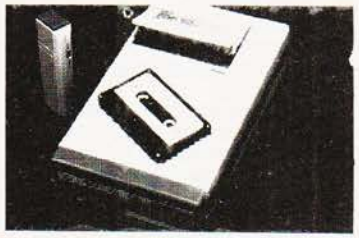

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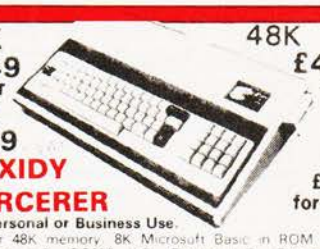

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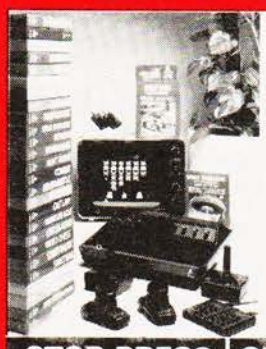

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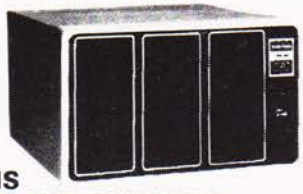

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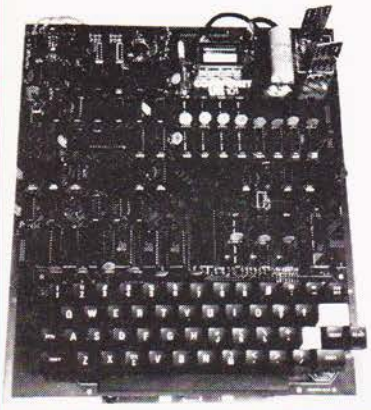

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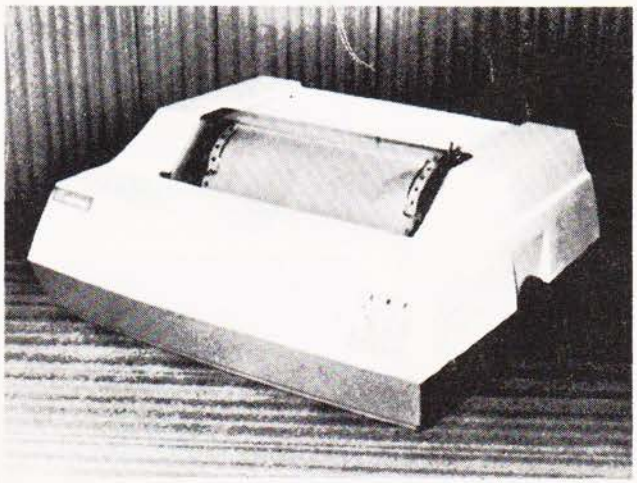

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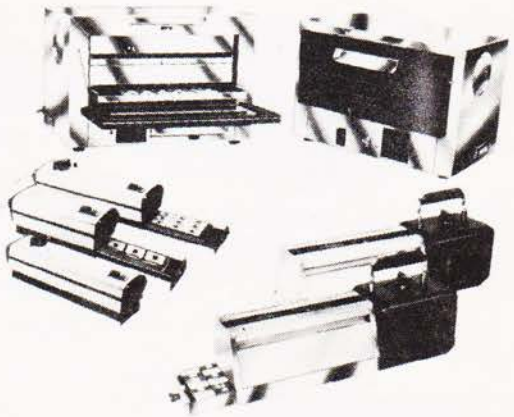

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