

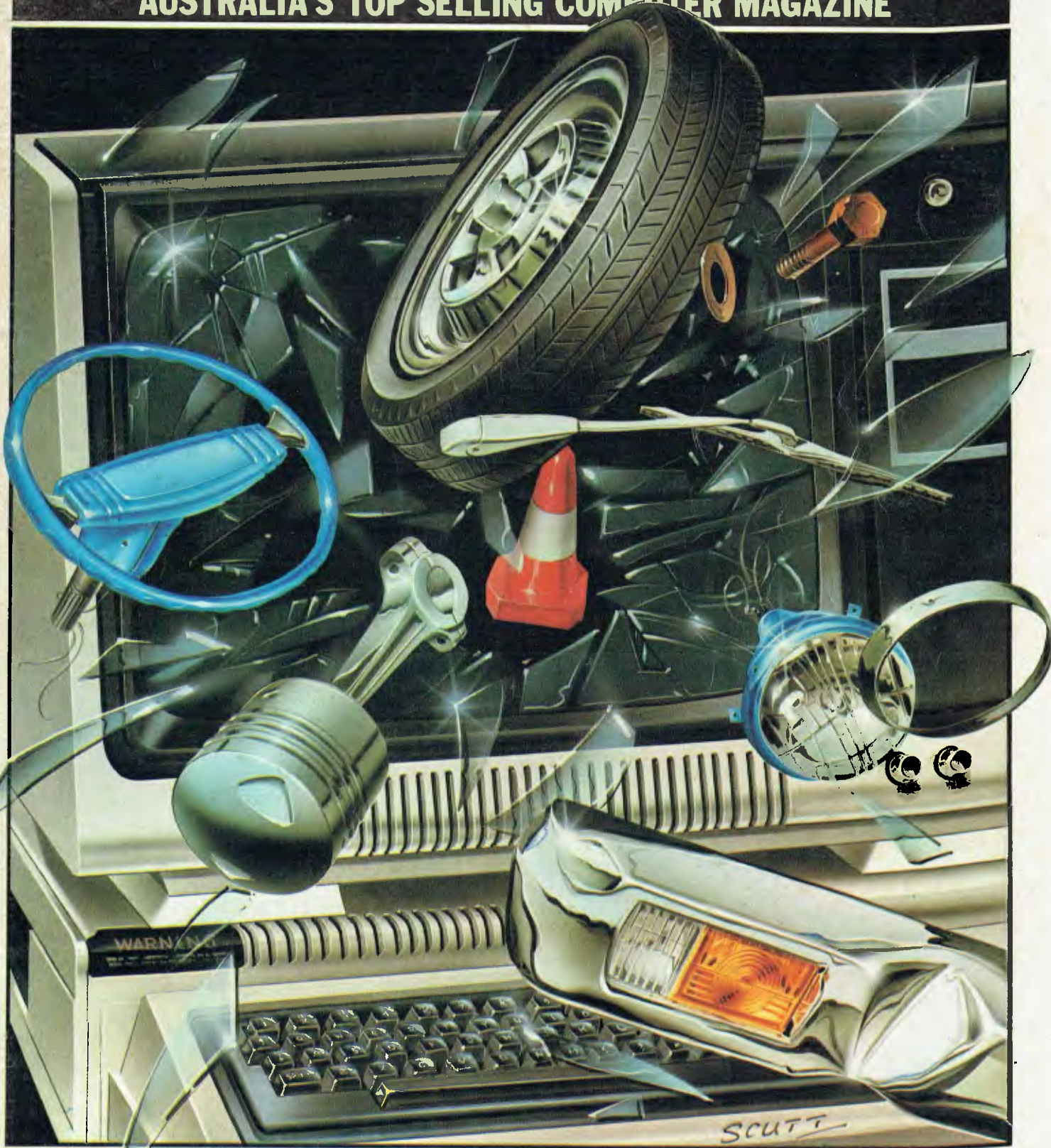
# Australian Personal Computer

APPLE II  
GAMES REVIEWED

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\$2.50\*

AUSTRALIA'S TOP SELLING COMPUTER MAGAZINE



**DRIVING YOUR COMPUTING DOLLAR FURTHER:  
SHARP'S POCKET PC 1500 BREAKS THE SCREEN BARRIER**



# THANKS AUSTRALIA

Things are changing fast in the Microcomputer market, and HITACHI is leading that change. Superior features and value to any alternative have been recognised by hundreds of new PEACH owners each month. For those of you who have not "seen the light", use the following chart:

PEACH STANDARD FEATURES	"BRAND X" AVAILABILITY AND COST
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Upper and Lower Case	
40 and 80 Columns	
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8 Expansion Slots	
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Centronics Connection	
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Australia's Best Micro Software Availability (only on PEACH)	
Major Competitor's Software Availability	

\* Offer closes 30 August 1982



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# 1 The 1st Australian Personal Computer Show

Centrepoint Sydney  
10-12 March 1983

1250 Malvern Road  
Malvern Victoria  
Australia 3144

Telephone (03) 20 1208  
Telex AA 39329

13 July 1982

RECEIVED 15 JUL 1982

Mr S Howard  
Howard Productions  
462 Burwood Road  
Hawthorn  
Vic 3122

*Dear Sean,*

As you know, for nearly 10 years I have been involved in the establishment of new exhibitions in a variety of locations ranging from New York to Bahrain. I can honestly say that I have never experienced such a positive response to the announcement of a new show as I have with The 1st Australian Personal Computer Show. No doubt at least part of this response can be attributed to the sponsorship provided by your Australian Personal Computer magazine.

Since launching the exhibition on 21 May 1982 with a selective mailing to both Australian and overseas companies we have received what I can only describe as a remarkable response. Nearly every major name in the personal computer field has applied for a stand in the exhibition. With more than 7 months before the show takes place, we are in the extremely strong position of having allocated precisely 76 per cent of the available space at Centrepoint.

Yesterday I briefed the designer to prepare plans for the Grand Hall Balcony. By using the Balcony, which I previously thought would be well in excess of our requirements, we shall be able to offer a further 270 square metres of good quality exhibition space, making a total area of more than 1,700 square metres (17,136 square feet).

There is little doubt in my mind that we are well on the way to staging a highly successful event. Having received what amounts to unqualified support for the exhibition it is imperative that our buyer promotion campaign produces the right buyers in the right numbers for the exhibition. I shall look forward to finalising our promotional plans with you when we next meet.

Kind regards



Graeme Selby  
Director

Sponsored by the Australian Personal Computer and Australian Business Computer magazines  
 Organised by Australian Exhibition Services Pty Ltd





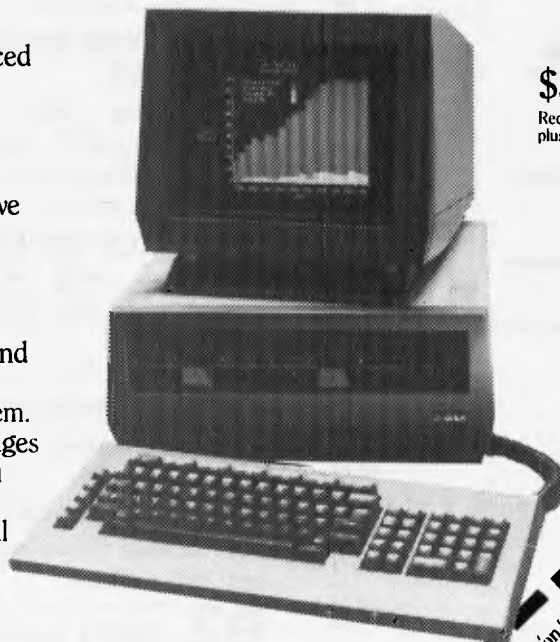
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To Barson Computers Pty. Limited, 86 Nicholson Street, Abbotsford, Vic., 3067  
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Title \_\_\_\_\_  
Company \_\_\_\_\_  
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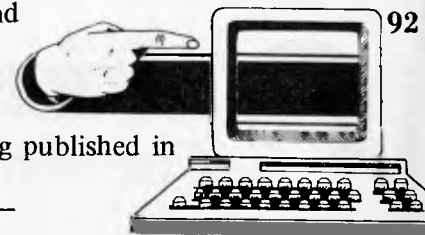
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# Who holds all the aces in

# HiSoft

When it comes to software for the Hitachi Peach computer, we believe in dealing an unbeatable hand.

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### ProCalc.

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# HITACHI software?

# oft.\*

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Features a full range of arcade and assorted games, music, etc...

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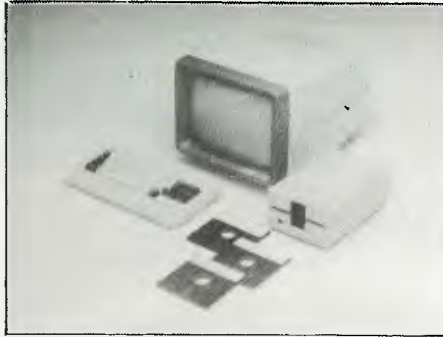
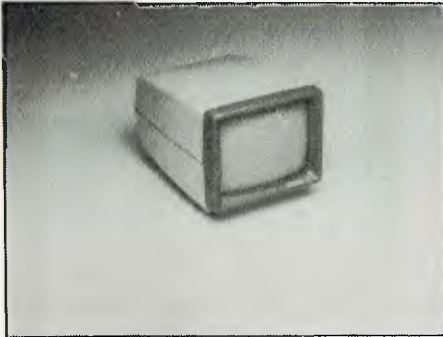


# HiSoft.™

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St. Kilda 3182.  
Ph: (03) 534 0383.



APC reports on the latest news from the world micro scene.



## Cromemco C-10

Elsewhere on this page is our first photograph of Cromemco's new personal computer range called C-10 and mentioned last month in Printout. Three configurations are shown, the first, at US\$995, being the basic unit comprising processor (Z80A), 64k of RAM, a hefty 24k of ROM and a VDU. The next level is priced at US\$1785 and includes a keyboard, 390kbyte capacity 5¼in floppy drive and an estimated US\$1000 worth of software. The last configuration shown has additionally a 12.5 cps daisy-wheel printer and swivel stand for the VDU and sells for a total price of US\$2875.

Of particular interest is the cheapness of the printer which must be valued at around a thousand dollars, at a quick calculation.

Mr Gatt of Adaptive Electronics says the most popular configuration for the C-10 should be the special Super Pack referred to as the C-10SP. This system configuration consists of the basic

C-10 keyboard, 390k capacity 5¼in floppy drive, along with a CP/M compatible operating system, 32k structured Basic, word processing and financial spread sheet software.

Australian prices have yet to be announced but the second level configuration will sell in Australia for approximately \$2500 (including software).

For more information phone Adaptive Electronics on (03) 267 6800.

## Compak V2

Following the successful response to their fully built up System and their new Apple-compatible slimline 5 inch disk drives, the Compak Computer Shops are again adding to their Apple compatible range.

New products now include the SVA 8 inch disk controllers, 256k byte of Cache memory with dual disk simulation, and a new range of interface cards.

Most significant though is the planned introduction of

their Compak V2 system which will run all Apple software. Their Orange system will continue and will be priced about two hundred dollars under the Compak V2 system.

This will give them three price breaks – from the low priced Orange up to the standard Apple pricing.

For more information contact Compak Computer Shops at Brighton (03) 592 8343 or Dandenong (03) 793 5701.

## Sutherland Revisited

The birthplace of Australia, Sutherland Shire, has now entered the computer age with the advent of The Computer Connection of 629 The Kingsway, Miranda. When Capt James Cook landed in the shire at Kurnell on Botany Bay, he could not have envisaged the size and complexity of today's Sutherland Shire.

The population of the shire, which now numbers 170,000, covers the whole spectrum

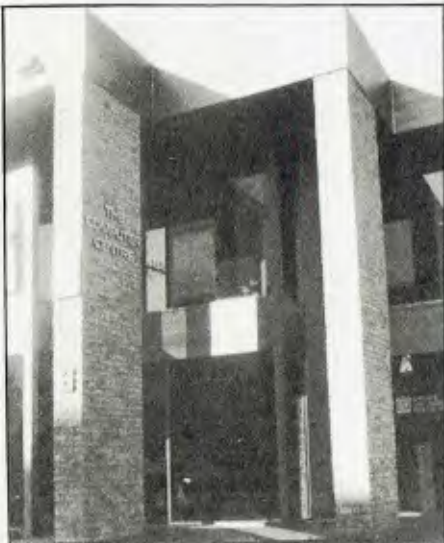
from large companies to families and The Computer Connection endeavours (pun intended) to cater to all their requirements in this modern computer age.

Franchises available include Apple, Atari, Osborne, Panasonic, T.I., and the many peripherals and programs available for these products.

Tim Harvey, the proprietor, has been active in helping the local schools to bring computer knowledge to the many children in the shire – essential for their future.

Some of their clients have been scientific people from the Lucas Heights Atomic Research Station and the C.S.I.R.O. at Cronulla, as well as businessmen, teachers, students, hobbyists and families wanting to learn about the wonders of computers.

Earlier this year Tim arranged for the Federal, State and local government members to be present whilst they communicated with Sutherland's sister city Lakewood, Colorado, U.S.A. via The Source.



Pictured is Geelong's newest and most prestigious micro store, The Computer Centre. Damar Management are responsible for the construction of the building, situated across the road from a planned major shopping development. The store, at 5 Yarra Street, was officially opened on July 7 at a reception which prominently featured Hewlett Packard and Barson Computer representatives, and will be retailing (naturally enough) the new Sirius 1 microcomputer and a range of Hewlett Packard machines. APC wishes Damar well with their venture.



# PRINTOUT

## Euro show

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

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

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

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

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

## "Smart" printer range

The first two products in a new range of intelligent matrix printers have been released to the Australian market by CASE Communication Systems. Manufactured for CASE in the UK, the initial range constitutes the BD 136 with 240 cps capability and the WM 2000 with a speed of 120 cps.

Both printers offer a bi-directional logic seeking mechanism for maximum throughput speed and to minimise printhead movement.

A 9 x 9 dot matrix provides high quality print and the ballistic printhead has proven to give reliable long-life, according to CASE.

Both units include dot addressable and character graphics as well as user-programmable characters. The BD 136 has an alternative 96 character set, user-definable and capable of printing with a resolution of 60 dots per inch

horizontally and 72 per inch vertically. Large buffers are standard features of both machines, with 10,000 characters on the BD 136 and a possible 1800 on the WM 2000.

The BD 136's data formatting functions include centre justification, shift to right margin, decimal point and comma alignment, underlining, expanded characters, proportional spacing and right margin justification.

Other features include full forms control with horizontal and vertical tabbing, and the ability to define additional non-standard characters as well as down loading complete character sets.

Interfaces available with both models include Centronics parallel, RS 232, Current Loop and IEEE.

The introduction of the new range of printers, to be augmented in the near future, marks a move by CASE to enter larger market segments than currently covered by its CX 80 colour matrix model, managing director Barry Foster said.

## Opening in Perth

Computer Choice, a franchise of the Computer Country group of Melbourne, has opened in Perth.

Computer Choice is now offering a wide range of micro-computer systems which includes the Apple, the Hitachi Peach, the Osborne, the NEC PC-8000, the Atari, the Northstar, Micromation, CEC, Casio FX 9000P, and OKI IF 800. Besides having hardware and software for the previously mentioned systems, Computer Choice will also be offering software and peripherals for systems such as the TRS 80.

Computer Choice is a full service company which not only offers both hardware and software sales and consulting abilities, but also offers after sales service.

Computer Choice has also been appointed the prime Western Australian dealer for the Australian Beginning system. Australian Beginning is Australia's first microcomputer information service. Computer Choice will have responsibility for servicing all Australian Beginning accounts in Western Australia as well as holding periodical seminars for Western Australian users of the Australian Beginning system.



# IMAGINEERING

your software professionals

## Presents

## Memory Expansion for Apple®

### VC-EXPAND™ MEMORY EXPANSION FOR VisiCalc®

Expand memory available to Personal Software's 16 sector VisiCalc®. Add 32K, 64K, or even 128K to your present workspace (even if you already have a 16K card in use!) with this program plus one or more Saturn boards.

#### ■ 128K RAM

Saturn's newest product. Fully compatible with Saturn's 32K RAM board, 16K RAM cards and language card.

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4. PSEUDO-DISK for CP/M®
5. PSEUDO-DISK for PASCAL

#### ■ 64K RAM

A medium range memory expansion board which can be upgraded to 128K at a later date. Includes all 5 software packages offered with the 128K board.

#### ■ 32K RAM

The old favourite for Apple users. Includes the first 3 software packages (above) with CP/M® and PASCAL pseudo-disks now offered as options.

ON RELEASE NOW  
at your local Apple dealer and our dealer of the month —  
R. Devere — Computerland Melbourne (03) 862 2133  
— Imagineering (02) 358 3011



These seminars will acquaint Western Australian users with new services as they eventuate and also show Australian Beginning users how to get the most out of their system.

Computer Choice is situated at 1297 Hay Street, West Perth WA 6005, ph: (09) 322 5651.

## No CP/M-68K this year

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

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

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

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

## At last

The cover story of the March, 1981 issue of *APC* proclaimed

the arrival of the first commercially available code generating program. And now in July '82 we're pleased to announce the Australian launch of "The Last One".

Without going into any details about the program (refer to the "Back Issues" section for an order form for March '81), it is available from System Concepts, (09) 381 5611 for \$600.

## Computer insurance

Computer Country has announced what it calls an "incredible new insurance policy against computer breakdown".

Computer Country has now combined with David Hornidge Insurances of 422 Collins Street, Melbourne to provide a new insurance policy for computer owners against accidental damage and breakdown.

For an annual premium of \$135 customers are automatically covered for accidental damage and breakdown of a computer system which includes software. The policy includes the full cost of repair or, in the event of total loss, complete replacement of the system. There is an excess clause in this policy which means that the first \$100 in each claim must be paid by the insured. Information is available from David Hornidge Insurances, ph: (03) 67 8583, or through any Computer Country franchise office. Any repairs or replacement occurring under the policy can be done through Computer Country.

## Shrinking disks

When you and I get to buy a disk, it costs two or three or even four times what it costs to buy it in large batches from the factory but even so,

the new factory price of around \$120 for a two-thirds height minifloppy from Shugart would mean that microsystems should soon get a bit cheaper as well as a bit smaller.

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

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

## Cycom service

Cycom Computer Systems has introduced a unique service to assist with the evaluation of CP/M software.

The company has demonstrated versions of popular software packages for hire. These packages include data base managers, word processors, spelling verifiers, critical path analysers, financial modellers, medical and office management systems and an application development language.

All hiring charges may be applied to the cost of the package if it is subsequently purchased from Cycom, which is located at 178 High Street, Windsor, 3181. Telephone: (03) 529 3029.

## Micro software battle

Computer Power's Micro-Products software range is aiming to replace CP/M as the business system software standard for microcomputers.

Probably better known by its former name of MicroCobol, the software system is now available on nearly 50 different computers.

Authors of the product range, MicroProducts Software Ltd., (MPS) of London, released an improved version of its Business Operating System (BOS/5) about seven months ago. This is now installed in nearly 100 user sites in Australia.

## Joint effort

The Australian Beginning and Sigma Data Corporation have combined to offer a new low cost computer equipment package, from as low as \$20 a week, to enable computer users to have the services of The Australian Beginning computer network.

This computer package will include a cheap, easy to operate desk top terminal, an acoustic coupler, an Australian Beginning lifetime membership, and a prepaid block of 60 computing hours.

The package will be available for around \$20 a week over 5 years.

The Australian Beginning is closely linked to a Melbourne retailing group, Computer Country.

## The Big Event!

The Big Event is scheduled for March 10 - 12, 1983. What, you may ask, is the Big Event?

The Big Event is the 1st Australian Personal Computer Show, sponsored by APC. The exhibition, which will be held at Sydney's Centrepont, will display the wares of those competing for a share of the multi-million dollar Australian personal computer market.

Following recent displays staged by both Apple and Tandy, it is hardly surprising

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that a large scale specialised exhibition is being planned for the personal computer market. Now, in one visit, at one location and at one single exhibition, businessmen, professional people, educationalists and home users will have the opportunity to see and compare the largest and most comprehensive display of personal computer hardware, accessories, software, literature and services ever assembled in Australia. Isn't it enough to make you shiver with anticipation!

In an industry characterised by rapid technological development and frequent new product announcements, The 1st Australian Personal Computer Show will provide manufacturers, importers, distributors and retailers with a firm base for marketing their products and services to an audience estimated to be worth in excess of \$50 million per annum. This, of course, includes APC's beloved readership.

The 1st Australian Personal Computer Show has impressive credentials. It is organised by the international management team responsible for Europe's largest and most successful microcomputer exhibition, The Personal Computer World Show. It is sponsored by APC, which, as you know, is the leading personal computer publication in this country, and its sister publication, Australian Business Computer. We will bring you more news on this Australian "first" in coming months.

Further details on the exhibition are available from Australian Exhibition Services Pty Ltd, 1250 Malvern Road, Malvern, Victoria, Australia 3144; Tel: (03) 20 1208. Telex: AA 39329.

## Storage story

Durango Systems has released what it calls the first desk top system featuring a fully integrated winchester disk drive.

The Durango 900 series offers up to 15Mb of online storage, with an auxiliary disk drive adding another seven or 14 Mb.

The new series consists of two models, the 900 and 900XR, the difference being the printer. For data processing and internal correspondence, the 900 provides bidirectional dot matrix printing at up to 200cps. The 900XR has a dual

mode printer with a high resolution mode for letter quality printing.

The processor has built-in diagnostics and error detection; and user memory is expandable from a standard 64k to 196k.

Two types of disk are used. Applications programs reside on a single 5¼ inch floppy with one Mb of capacity. Mass storage of information is on a "micro-winchester", with a capacity of seven or 14 Mb.

Durango is at 21 Chapel Street, Marrickville, NSW 2204; Tel: (02) 517 1300.

## New DS Modem

Dick Smith Electronics has released a new product — one which it expects to trigger off an enormous surge in data communications in Australia. Called the "Dataphone", the new unit is a high performance data modem which will sell for less than half the price of any modem currently available in Australia.

As entrepreneur Dick Smith explains, his company decided to develop the new low-cost modem because they realised existing modems were far too expensive to be of interest to the growing army of personal computer owners:

"Until now, people have had only two choices. One was to lease a modem from Telecom, but this costs about \$800 a year. This is more than the price of many personal computers! The other option was to buy an acoustic-coupling modem — but these still cost around \$400 — far too expensive. It was obvious that the communications revolution wasn't going to get under way in Australia until people could buy a really low cost modem. So we decided to make it happen!"

The new Dataphone modem is not an acoustic coupled type, but a directly connected modem which offers full duplex operation at the standard 300-baud switched-network communications rate. It has been designed by DSE's technical director Jim Rowe.

As Jim Rowe explains, he selected the direct-connect approach for the Dataphone because it offered the only way to achieve high performance and reliability at low price:

"The problem with acoustic couplers is that no matter how good they are, the end result still depends heavily on the rather antiquated carbon-



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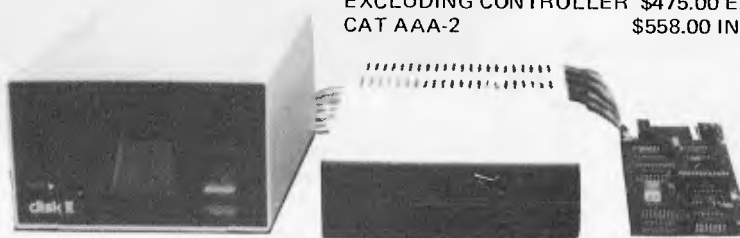
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# PRINTOUT

granule microphone used in most Australian telephones. To get even acceptable results, you have to go to a lot of trouble and expense. Direct connection bypasses the carbon mike altogether, and makes it much easier to provide the level of performance and reliability."

The only problem was that when DSE began work on the Dataphone, Telecom Australia were not yet prepared to accept privately-owned direct connect modems of the discrete type, for authorisation as a "Permitted Attachment", so DSE began negotiating with Telecom in parallel with the technical development, to see if official policy could be updated. This two-pronged approach paid off, because the Dataphone became the first — and currently the only — direct-connect discrete modem to be given Telecom authorisation.

Some of the features claimed are:

- \* Designed and manufactured in Australia
- \* Very easily connected — just plugs in

- \* Standard RS-232C interface — so it can be used with almost any personal computer or data terminal
- \* Fully complies with both Telecom regulations and CCITT Recommendation V.21 — hence it is not only legal, but also fully compatible with other standard modems. (Telecom Authorisation No. C82/37/557)

- \* Operates in either Answer or Originate mode.
- \* Has a Phone/Modem switch.
- \* Carrier detect signal output and indicator, for circuit monitoring.

The Dataphone modem is priced at a low \$169.00 retail at all DS stores.

## BBC Chosen

The Acorn BBC Microcomputer has been selected by the Education Department of Western Australia as the only equipment which may be purchased with Government funding assistance by Primary Schools.

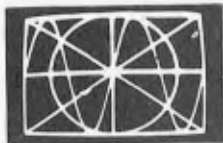
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See "New DS Modem".

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(CAI) the Department, supported by the W.A. Government Computing Policy Committee, has specified the BBC microcomputer as "the best available computer" for that need.

The minimum configuration Model A computer, which costs \$1150, has 16k of user memory, a 16k operating system plus a 16k structured Basic and assembler. The user memory can be expanded to 32k, while up to 48k of software in read only memory (ROM) may be added. Programs may also be loaded via the speech synthesiser ROM sockets. The high quality keyboard includes ten programmable function keys and excellent editing facilities. High quality colour graphics are included and disks, complete with a powerful disk operating system, are available.

The Model B computer sells for \$1450 and may be expanded to support a variety of operating systems including CP/M in one of its multi-processor configurations.

As well as supporting RGB and composite video colour monitors, the BBC Microcomputer can interface to a domestic TV set, RS232 compatible devices, teletext receiver, analogue devices and the Acorn Econet Local Area Network.

For more information phone Barson Computers, (03) 419 3033 or visit BBJ Computer Shop.



*Pictured here is the ICL Personal Computer Model 6402.*

## ICL Micro

International Computers have released the ICL Personal Computer which is available in four different models.

The basic entry level machine is the Model 10 equipped with 64k bytes of RAM memory, twin 500k mini-floppy disk drives and two I/O ports for peripherals.

The largest model in the range is the Model 32 which comes with 256k bytes of RAM, a 5 megabyte Winchester fixed disk, 500k bytes of mini-floppy storage and eight I/O ports. All the ports are standard RS232C compatible. Matrix and correspondence printers may be attached to the system.

The visual display unit is a 30cm diagonal green screen, has a moveable keyboard and an extensive array of function keys to support such applications as word processing.

The machine runs under CP/M and MP/M-2 will be

introduced in August, both of which support Microfocus Cobol and Microsoft Basic.

It will be sold through Traderpoint dealers at a basic price of \$7,000.

Mr David Dearman, corporate marketing manager of ICL, said: "Although the personal computer market is highly competitive, we believe we have a winner with the ICL Personal Computer. It is one of the few micros around with working 5 megabyte Winchester disks.

"Being a true multi-screen system the ICL Personal Computer is well placed to capture the multiple user segment of the micro computer market, particularly as it is able to support two printers.

"One user may be using the machine for processing data while another may be using the word processing facilities.

"Quite apart from the technicalities of the machine, buyers of the ICL Personal

Computer will have the benefit of extensive ICL back up. We have offices Australia wide which are ready to provide engineering and technical support."

For more information contact International Computers Limited in Sydney on (02) 438 4440, or Melbourne on (03) 267 2433.

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# PRINTOUT



See MultiShare System.

## Multishare system

Dicker Data Projects introduced its largest microcomputer system to date — a multi-user, multitasking 32 Megabyte Winchester disk system that can support up to five workstations.

Designated the 5032 MultiShare, the system's new features include a 6MHz Z-80B processor which speeds up processing time by 15 to 25 percent over a 4 Mhz system, and RAM memory expanded to 128k which provides 56k per terminal for user applications and still leaves room for a new and extended version of a CP/M operating system.

The 5032 MultiShare System utilises a 32-megabyte 8-inch Winchester hard disk which provides 32 million characters of storage. Business software written for the 5032 can handle the largest files allowed by the CP/M system — 8 million characters in length, which also makes it the ideal system choice for developers of custom applications software, according to Fiona Dicker, Marketing Manager of Dicker Data.

An integral 630-kb floppy disk provides compatibility with programs and data from any other floppy disk Vector microcomputer.

Both the 5032's hard and floppy disks utilise Vector's Dual Mode disk controller with automatic error detection and correction.

Full system back-up is available with an optional new Vector tape drive, a four-track 15Mb cartridge tape unit.

Other standard 5032 software in addition to extended CP/M includes Microsoft Basic, Scope editor and ZSM assembler.

Basic Vector 5032 MultiShare System hardware includes a video console and keyboard, MegaStor chassis with independent power supply.

8-inch Winchester hard disk drive and a floppy disk at a cost of \$14,500.00. Each additional terminal is priced at \$1995.00. The backup tape drive is priced at \$3,695.00.

## Moving House

John Guidice, owner of The Microcomputer House, has moved after 14 months in Regent Street, to much larger premises at 116-120 Abererombie Street, Chippendale, Sydney.

This move has been made necessary due to the increase in sales of business systems and home computer systems. The new Microcomputer House has two showrooms so that business system sales can be separated from home computers.

With the increase in size, John will be expanding his range of products and his already extensive range of software. John is a dedicated 'micro' man who will write software packages for the individual businessman and has an extensive range of support peripherals.

## Peninsula Store

Frankston now has a specialist computer showroom. It is owned and run by Brian Prince who has been in computing for 16 years in the U.K. and in Australia.

Most of his experience has been on mainframes until two and a half years ago when he bought his first micro, an Apple II. For the past 2 years, his business has been operating from an office at Tyabb on the Mornington Peninsula.





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# SHARP PC1500

By Dick Pountain

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



## Hardware

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

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

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

The 1500 has, like the 1211, four modes of operation, but the ergonomics have been considerably improved. The MODE key toggles between RUN and Program mode. The DEF mode now has its own key and the top keyboard



row has Basic reserved words permanently assigned; 18 of the other keys are available to have user programs assigned. The RESERVE mode now operates on the six function keys under the display and allows 18 commands (including carriage returns) to be assigned to them and used in RUN or PRO mode. This is achieved by a key  $\diamond$  which selects one of the three definition sets flagged as I, II and III in the display. Each command may be labelled with a string, and the RCL key displays the six labels over their respective keys. Reserve assignments are stored in 198 bytes of protected memory just below the Basic program area and can be saved to tape. The arrangement works very well, unlike that on the 1211 which was too fiddly to bother with. The editor is

the same as the 1211's with full four-way movement through the program and insertion and deletion.

## Basic

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



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# NOT CALCULATOR CORNER

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

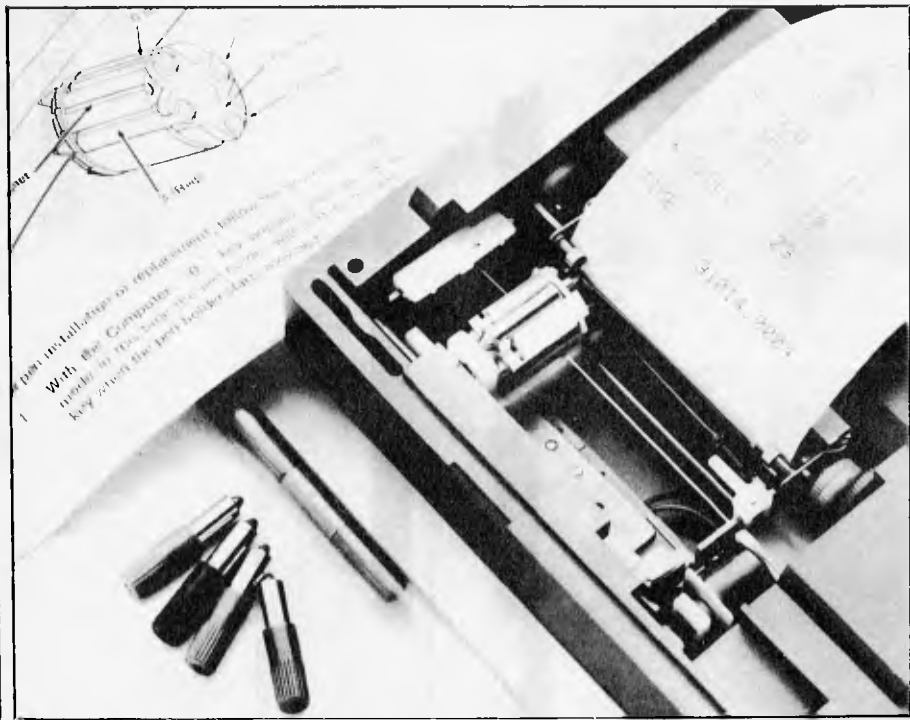
number] to incorporate data into programs.

A real time clock-calendar is built in which displays in the rather unwieldy [monthdayhour.minutesecond] format when summoned by **TIME**. Together with the built-in beeper (programmable

words and ASCII for the rest). A command called **STATUS** returns the number of bytes remaining (**STATUS 0**) and used (**STATUS 1**) as well as the address of the top of program and the bottom of variables (2 and 3). Basic begins at 16582, immediately above the reserve area, and variables are stored from 22528 down.

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

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



## Printer & Cassette Interface

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

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

The device is a true plotter in that it draws continuous lines, not dots; and the paper is moved in both directions. The set of plotting commands provided would shame machines at ten times its price.

## Future Expansion

A 'Software Board' is due to be released at the time of writing which is an external pressure sensitive glass plate. It provides a matrix of 140 (14 x 10) flat user definable keys for easier date entry than the necessarily small keyboard proper. Six plastic overlays are provided for the 'Software Board' of which two already have application characters printed on them and four are blank and available for specific user applications.

In the pipe-line is an RS-232C interface to allow direct communication with devices such as acoustic couplers. Sharp expects this to be available in about six weeks.

### MEMORY MAP

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

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

for pitch, volume and duration), this can be used as an alarm or to date-stamp printouts.

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

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

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

No, your eyes are not deceiving you, I said hex. Not only does the 1500 allow hex (prefixed by an **&**) to be used in any expression but it has **PEEK**, **POKE** and **CALL** as well! You will look in vain for any reference to these in the manual (a Sharp spokesman tells me that a new manual, which covers machine code operation, will follow in time) but they work. With the help of **PEEK** I was able to uncover some of the labyrinthine twists of the 1500's memory map (also not in the manual) and to dump Basic programs and hence discover the system of tokens used for storage (two-byte codes beginning with 240 or 241 decimal are used for key-



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# SCREENPLAY

This month Dick Olney & co

review games for the Apple II.



This month I've been playing some of the games available for the Apple II microcomputer. Although this machine is rather different from most of those I've previously covered, and is not marketed as a games machine, there is a considerable volume of such software available for it. Apple itself produces very little in this area, but this is made up for by dozens of (mostly American) software publishers. The configuration I used was a 48k Apple II Europlus with a single mini disk drive and the Applesoft ROM with an automatic boot feature. The machine was fitted with a colour card and UHF

modulator so that I could plug it directly into my television.

Apple will supply a set of games paddles for \$35, but for most of the games I used a sort of universal joystick with dual buttons and paddle-emulating slide switches as well as the stick itself. This is manufactured in Texas by TG Products, and is undoubtedly the best-designed games controller I've used. The price of the system would be \$2490 (incl. Sales Tax) for the machine and

extras with an additional \$60 for the joystick. This is clearly more than most people would be willing to pay just to play games, but I'm sure there are plenty of people with Apples who spend at least some of the time doing just that.

All of the games were of course supplied on 5¼in disks. Although I have concentrated here on real time arcade-type games I should point out that this machine is also notable for the many Adventure games available for it. Note that star ratings are based on a maximum of eight and reflect those qualities most appropriate to the nature of the game.



**GAME:** Firebird  
**PRICE:** \$39.95  
**SUPPLIER:** Gebelli Software

Although this game has a very familiar feel about it I can't actually remember seeing anything quite like it. The scenario is a building, made up of 72 rectangular rooms, which is under attack from a firebird racing through

the sky and dropping incendiary eggs at random. The latter set fire to a room, eventually destroying it and forcing its occupant to leap from the building. You can put the fire out (if you're quick enough) by positioning 'Piggo the fire-fighting pig' next to the room and dousing it with water; failing this you must attempt to catch the unfortunate occupant before he falls to his death. Moving Piggo and his ladder and squirting water are all controlled by the keyboard, and specific keys can be re-defined to best suit your play.

If you manage to catch one of the falling victims you must take him to the top of the ladder where he will eventually be rescued by a circling helicopter. You should do this quickly since Piggo can only carry one person at a time, and cannot squirt water with his hands full. For each person saved the helicopter will replace one room; dropping it onto the top of the smallest column. The only hazard you encounter

is if one of the people falls directly on top of Piggo, in which case he will topple off the ladder. He has three lives and the game ends when these have been used up or (more often the case) when two complete columns of rooms have been destroyed. If you manage to save the entire bottom row when all other rooms have burnt down you start a new frame.

It takes some time to get used to this game, though it is well worth the effort. Firebird is well thought out and professionally presented, and should certainly provide plenty of entertainment. It is a little surprising that there is no joystick option, though the keyboard controls are satisfactory (they give incremental rather than continuous motion) so this shouldn't put you off.

**USE OF GRAPHICS:** \*\*\*\*\*  
**ADDICTIVE QUALITY:** \*\*\*\*\*  
**RESPONSE TIMES:** \*\*\*  
**VALUE FOR MONEY:** \*\*\*\*\*



**GAME:** Olympic Decathlon  
**PRICE:** \$29.95  
**SUPPLIER:** Microsoft

This glossy athletics simulator from Microsoft is likely to receive a mixed welcome from gamers. The manual

insists that paddles or a joystick are necessary -- these are in fact only used in two of the events; the shot put and the hurdles (neither of which were exactly my forte!). Mostly the game demands rapid finger movement over the keyboard, often literally using two fingers as legs as if running. Up to six players can take part, each entering their names into the computer, and there is the opportunity for unlimited practice before the decathlon proper. Each event is heralded by a little fanfare, and full instructions are displayed throughout with the option to look at the scoreboard at any time. The graphics and presentation are flawless, but the general pace of the game is rather slow because of the low percentage of the playing time during which you are active. The long and high jumps were my favourite events, closely fol-

lowed by the pole vault. I must admit I found the frantic finger pumping in the track events rather boring and tending to cause severe knuckle cramp; but I suppose this mirrors reality in some ways! Essentially this is ten quite simple games neatly compiled into an exclusive games package (they are even accessed from disk individually). Although the actual 'events' are, in themselves, rather trivial and unlikely to stimulate the hyperactive Defender freak or intrepid Star Trekker, Olympic Decathlon should appeal to the family audience where it would undoubtedly provide many hours of amusement.

**USE OF GRAPHICS:** \*\*\*\*\*  
**ADDICTIVE QUALITY:** \*\*\*  
**PRESENTATION:** \*\*\*\*\*  
**VALUE FOR MONEY:** \*\*\*\*\*



**GAME: Epoch**  
**PRICE: \$37.50**  
**SUPPLIER: Sirius Software**

Written by Harry Miller (not THE H. Miller), this game is a true real time interpretation of Star Trek in which all movement and firing is controlled by the joystick or games paddles. Though it lacks the complexity found in more traditional games of this genre (there are no charts, scans or textual commands) the excellent use of graphics and control

precision made it a joy to behold. You are under attack by four different types of enemy craft which can only be destroyed by a direct hit at the centre of their mass. To achieve this you position the crosshair sights over the alien ship before firing your missiles. These crosshairs dictate direction of motion as well as aim, and though of course they actually always remain in the centre of the screen, the impression of three-dimensional movement is surprisingly effective. One of the controller buttons gives acceleration and the other deceleration, and pressing them both together achieves self-repeating fire power. As well as alien ships there are stationary enemy bases which can again only be destroyed by accurate central hits.

The constraints upon your degree of destruction are fuel, ammunition and time — the game ends if any one of these runs out. The amount of fuel decreases steadily during any change of speed (though not while in stable motion) and also drops if you are hit by alien fire. Ammunition level, of course,

depends on how many shots you fire. Both of these can be completely replenished by driving through the porthole of a friendly base, requiring careful navigation. Time is lost at a steady rate whatever you do and can only be regained by travelling through the centre of a time portal. These are great fun, involving steering the ship through a colourful corridor of gateways.

The fundamental principles of this game resemble the real time section of Atari's Star Raiders, though saying this does not do it justice. It is certainly one of the best games of this type that I've come across. If you've got an Apple II with a colour set up then you need Epoch.

**USE OF GRAPHICS: \*\*\*\*\***  
**ADDICTIVE QUALITY: \*\*\*\*\***  
**RESPONSE TIMES: \*\*\*\*\***  
**VALUE FOR MONEY: \*\*\*\*\***



**GAME: International Grand Prix**  
**PRICE: \$32.95**  
**SUPPLIER: Riverbank Software**

Given the front view from a racing car your task in this game is to use the paddle or joystick to drive as quickly as possible around a racetrack (no surprises here!). The interesting thing about this game is the number of options. Firstly there are five international circuits to choose from, each of which has all the elements of its real life counterpart. You can choose the number of laps, amount of fuel on board and difficulty level (zero to seven determines road surface skid potential) as well as manual or automatic transmission. The button on your paddle or joystick is used to accelerate the car. For manual transmission, taking your finger off the button for a second changes gear and

with automatic you can stabilise your speed using the cruise control (space bar). The array of options and crisp presentation cannot however conceal the uninspired and rather dull nature of this game.

**USE OF GRAPHICS: \*\*\*\***  
**ADDICTIVE QUALITY: \*\***  
**RESPONSE TIMES: \*\*\*\*\***  
**VALUE FOR MONEY: \*\*\***

**GAME: Fly Wars**  
**PRICE: \$21.79**  
**SUPPLIER: Sirius Software**

It's you (the spider) against the flies (unfair advantage to you), caterpillars which appear as each fly is eaten (a slight advantage to you — they drop bombs, of a substance I don't care to think about) and cocoons which appear as each caterpillar is destroyed (an easy target for any spider) and bug spray,

which is a most unfair weapon to bring into what is otherwise a good, clean ecological game. The bug spray is instant death to the spider.

The game is best played with joysticks although the keyboard will do. It involves moving the spider around the screen to form a web which entraps as many flies as possible. Having captured its victims, the spider must then chase flies and caterpillars and eat them. As cocoons appear they must be pushed to the top of the screen where they explode and it is during this

effort that the bug spray appears more frequently.

I'm not a great fan of this type of game, but personal preferences differ and if you're looking for something quite different from the normal shoot-them-before-they-shoot-you game then this would certainly be worthwhile.

**USE OF GRAPHICS: \*\*\*\***  
**ADDICTIVE QUALITY: \*\*\***  
**RESPONSE TIMES: \*\*\*\***  
**VALUE FOR MONEY: \*\*\*\***

**GAME: Jellyfish**  
**PRICE: \$21.79**  
**SUPPLIER: Sirius Software**

Another game which really requires joysticks, Jellyfish can be played by two people against each other or one against the computer. The object of the game is to guide a submarine over a nuclear waste canister (obviously left there by an inconsiderate twentieth

century society) while avoiding collision with giant jellyfish, octopi and squid and taking pot shots at your opponent who should also be attempting to recover canisters.

It is interesting that your primary mission is supposed to be to recover canisters, which has a score value of 1,000 points, while 5,000 points are awarded to bumping off your opponent. The games I played quickly degraded into a hide and kill match among the

giant jellyfish.

Jellyfish has good graphics and colour and is good value for money. It's really two games in one: if you're playing against an opponent, canisters are left rotting on the seabed while submarines fight it out.

**USE OF GRAPHICS: \*\*\*\*\***  
**ADDICTIVE QUALITY: \*\*\*\***  
**RESPONSE TIMES: \*\*\***  
**VALUE FOR MONEY: \*\*\*\***



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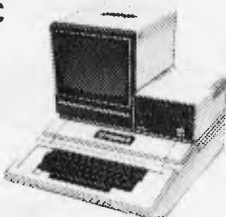
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## SCREENPLAY

**GAME: STAR BLAZER**  
**PRICE: \$35.78**  
**SUPPLIER: BRODERBUND SOFTWARE**

The name of this game is slightly inaccurate in that all play takes place within several hundred feet of the ground, moving up and down and from left to right in an attempt to bomb enemy installations.

The WWII aircraft fires "pulse

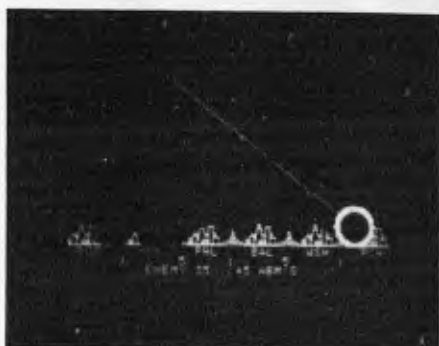
cannons" at oncoming missiles in levels beyond the initial scenario in which the aircraft has to destroy enemy radar installations in order to proceed to the next level. One possible criticism is a feeling of some lack of control because the firing button shoots either the "pulse cannons" or bombs, depending on the aircraft's altitude. This prevents the aircraft from conducting a bombing raid at high altitudes during lulls in enemy attack.

Five scenarios are provided with successively increasing levels of

difficulty. The last mission is to wipe out the "Bungeling headquarters". This proved to be extremely difficult so the game certainly offers a challenge.

In summary: very good response time and excellent graphics, but should only be played with a joystick.

**USE OF GRAPHICS: \*\*\*\*\***  
**ADDICTIVE QUALITY: \*\*\*\*\***  
**RESPONSE TIMES: \*\*\*\*\***  
**VALUE FOR MONEY: \*\*\*\*\***



**GAME: ABM**  
**PRICE: \$29.95**  
**SUPPLIER: Muse Software**

As you may have guessed, this is a variant of the popular Missile Command, Atari's version of which I covered in April. It is in fact virtually identical except that you have five missile bases firing two different sizes of missile. Your task is, of course, to shoot down approaching nuclear warheads in an attempt to protect the east coast of the USA from its impending (and indeed inevitable) demise. Paddles or the joystick are used to guide the target sight and ABMs are sent ploughing towards its position at the press of a button. The precise action of the control unit can be customised at beginning of play, though apparently only once. In the original game the sight would leave

a marker immediately you fired, whilst remaining active, allowing you to launch missiles as frequently as you wished. In ABM, however, the sight disappears while your missile is in flight and thus you can only launch them one at a time, a serious defect as it entirely changes the nature of play. The bombers and formidable 'smart missiles' seen in Missile Command are also sadly lacking in this game. I must admit that I like it anyway, so although I rate this 'cover version' a poor copy I should add that it's a good substitute.

**USE OF GRAPHICS: \*\*\*\*\***  
**ADDICTIVE QUALITY: \*\*\*\*\***  
**RESPONSE TIMES: \*\*\*\*\***  
**VALUE FOR MONEY: \*\*\*\*\***

## Conclusion.

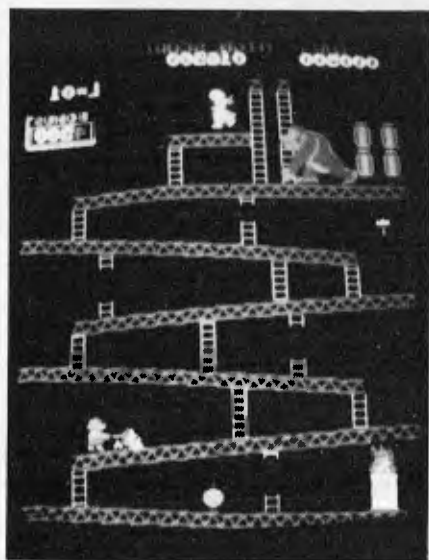
As I mentioned in the introduction, the Apple II is neither designed nor marketed as a games machine. Despite this, the quality of the graphics and lack of memory limitations make it an admir-

able instrument for such pursuits. The games I have seen are varied and colourful and often of a quality much closer to that of their dedicated arcade peers than on smaller machines. Any Apple II users currently restricting their machine to more serious pursuits would be well advised to investigate its leisure potential.

*Our thanks to Bob Shattock of ComputerLand South Melbourne (37 Albert Road, Ph: (03) 266 8647) for the loan of the Apple computer and joystick.*

*All software reviewed this month is distributed in Australia by Imagineering (Ph: (02) 358 3011) and is available from all Apple dealers.*

## ARCADE ACE



This month I have chosen a game whose variety has always impressed me, despite my inability to really master it. The oddly named Donkey Kong sets you the task of rescuing a maiden from an enraged gorilla. At the outset the gorilla carries his victim to the top of the screen and, using a four-way joystick, you control a little 'jumpman' who must ascend the various levels to save her. The problem is that our oversized primate is not too happy about your presence and spends his time rolling heavy barrels down at you. Luckily you have the ability to leap over these as they approach — but the timing of this is critical. There are a couple of mallets dotted around and if you manage to grab one of these you have a limited period of time in which you can smash the barrels before they reach you. To add further to your problems, as time passes

increasing numbers of fireballs arrive to chase you.

The first frame is a simple configuration of girders and ladders with the main problems being the barrels and fireballs. If you manage to get to the top Kong makes off, carrying his reluctant victim to a new vantage point, and as the game progresses the scenarios become increasingly complex with lifts, conveyor belts and boiling vats to be negotiated. When you have successfully completed four screens the girl is finally released and the game starts again with increased ferocity. Donkey Kong combines simple controls with an interesting selection of game tasks. This, together with its colourful graphics, makes it almost as much fun to watch as to play and puts it at the forefront of the current move away from space shootouts.

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## THE MICRO-PROFESSOR

by Steve Withers.

### Introduction

Back in the days before Commodore launched the PET, the word 'micro-computer' conjured up an image of a circuit board with a couple of kilobytes of memory and a processor. Input and output consisted of seven-segment displays and a funny little keyboard that looked like a refugee from a calculator factory. Sometimes a cassette interface was included, sometimes you had to build your own. Such a micro would cost a few hundred dollars, and that didn't include a power supply.

Since then, microcomputers have become increasingly sophisticated. Generally speaking, manufacturers have offered 'more for your dollar', rather than 'the same for less'. Of course, there are exceptions, and after allowing for inflation, micros have become cheaper. This is to the consumer's benefit: I know people whose hobby computers include disk drives and high-quality printers, as well as colour graphics — 4 or 5 years ago, an acquaintance in similar financial circumstances had a system with 16k of RAM, a home-made video board driving a modified TV, and a Basic interpreter that took 5 minutes to load from cassette.

So the good old days (!) weren't that good, but people did learn a lot from those early machines, including the fact that programming in machine code can be very tedious. For all their advantages, I believe modern 'appliance'

systems have two drawbacks. The first is that after spending a significant amount on a computer, one needs both skill and confidence to undertake the construction of hardware add-ons, if an interest develops in such projects. Secondly, the availability of increasingly sophisticated software can act as a disincentive to investigate machine code/assembly language, even if the idea is appealing.

These two points reinforce each other when the possibility of using a microcomputer for control purposes is raised. Consider a model railway enthusiast, who thinks it may be interesting to use a micro to automate some aspects of his or her system. Such a person is unlikely to spend much on a computer (trains are the main interest), and in any case most of the frills are unnecessary. The 'old fashioned' micro, with some extra I/O lines would be just the job.

### The Micro-Professor

The Micro-Professor fills this gap very nicely, being both cheap and simple. The main ics are a Z80 processor, a 6116 2k RAM chip, a 4k EPROM (2532) containing the monitor program and a tiny Basic interpreter, and a 8255 parallel I/O chip. There's also a baby's handful of discrete components and 74 series TTL, but that's about it.

Input and output are correspond-

ingly simple. A 36 key calculator style keyboard (with a surprisingly positive action) is software-scanned, allowing the key functions to be redefined. In fact, a cardboard overlay is provided for use with Basic, giving single-key entry of all keywords. Half a dozen seven-segment displays form the main output channel, backed up by a small speaker from which a variety of beeps and buzzes emerge. For example, each key depression is accompanied by a short bleep, but if this irritates you or your loved ones, it may be disabled by changing the contents of a single byte. A green LED glows in parallel with the speaker, while a red one indicates when the processor is HALTed.

The cassette interface has a data rate of 165 baud, but this may be increased or decreased to suit the recorder's performance. Unfortunately the parameters are stored in the EPROM, so programming facilities are needed to change them. An interesting feature is that when loading a file the software automatically adjusts to the speed at which it was recorded. Using a Sony recorder, saving and loading worked first time, every time, without any fiddling with the volume or tone controls. Incidentally, files are numbered, making it easier to store several on one cassette. Signals in both directions are monitored by the on-board speaker.

Provision has been made for expansion in several ways. At the

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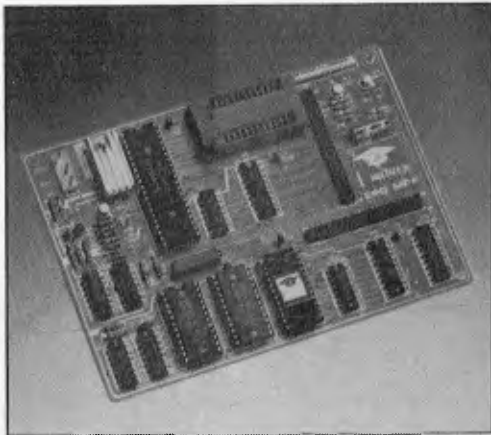
lowest level there are sockets for the Z80 PIO and CTC chips (all the relevant lines are brought out through a 40 way connector, as are the CPU lines), and for one additional memory IC. This may be a 2 or 4k EPROM, or another 6116 RAM (if a 2732 or 6116 is fitted, some cutting of traces and jumpering is necessary). There is also a small (33 x 85mm) wire-wrapping area for home-brewed circuits. A small range of add-on boards are available: a speech synthesiser, an EPROM programmer, a 20 column thermal printer, and a wire-wrap prototyping board. Any two boards will fit into the Micro-Professor's case, and they are connected by 40-way ribbon cables in a daisy-chain fashion.

The speech synthesiser and EPROM programmer boards were supplied for inspection, although I was unable to test the latter as it was fitted with a European style mains plug. It is said to be capable of programming any 5 volt, 1, 2, or 4k EPROM, and comes complete with on-board software, keyboard overlay, a Textool zero insertion force socket, and 4k of RAM which acts as a buffer during programming.

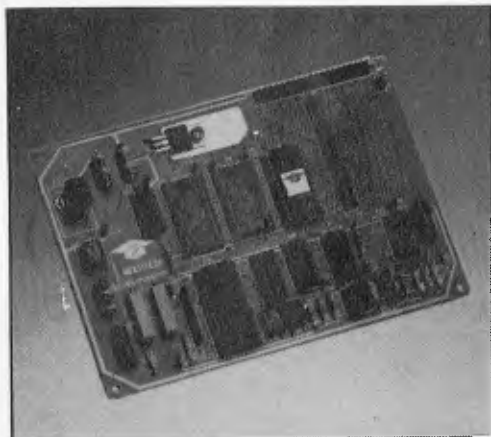
The speech synthesiser is based on the well-known Texas Instruments' chip and works quite well, although some utterances are less than clear (e.g. 'afternoon' comes out like 'afterloo'). The standard EPROM contains a 'talking clock' program and the appro-

prate vocabulary, as well as a couple of utility routines. Sockets are provided for two additional EPROMs as well as one TI Voice Synthesis Memory (a mask programmed 128k-bit RAM). Eight extra EPROMs are listed, unfortunately seven of them appear to be designed for use as a set) the first goes from 'A' to 'DOUBLE', the second from 'DONE' to 'HAS', and so on). Most of the words and phrases appear useful, but why would anyone want a machine to say 'Leon thinks it abnormal for a giraffe to roll on the ground'.

All the boards examined were well made, the only problem being dirty contacts on the speech synthesiser's power connector. My only real



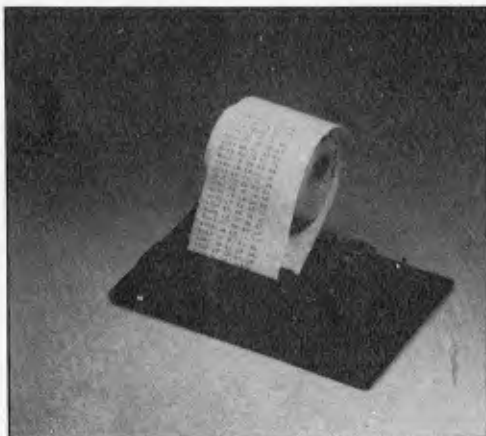
EPROM Programmer Board



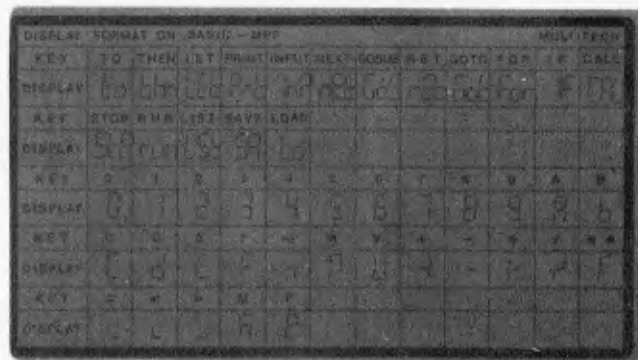
Speech Synthesiser Board



Pictured here are the Micro-Professor keyboard overlays. They fit neatly over the standard keyboard to alter the function of each key.



Thermal Printer



The chart above shows the sometimes difficult to interpret LED display characters.



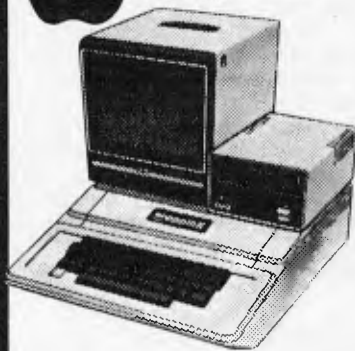


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criticisms concern the power supplies. An appropriate 'plug pack' adaptor comes with each board, but this means that an expanded system requires two or more mains sockets (the common 2-way adaptor cannot be used due to the size of the power packs). Although this reduces the cost of the basic system, it makes add-ons more expensive and is rather inconvenient. My main concern is that the voltage regulator's heat sink gets very hot, very quickly. The manual warns that a temperature of 70C is normal, and that the user should avoid touching the heat-sink, but I do not think that this is adequate in an 'open-plan' machine.

I was impressed by the documentation, which rivals that supplied with computers costing ten times as much. There are three large (258 x 189mm) manuals totalling 318 pages. The first is a user's manual which describes the use of the monitor program and its most useful subroutines, the hardware (full circuit diagrams are included), and programming summaries for the CPU, PIO, and CTC chips. A book of 18 'experiments' aims to give a grounding in the principles of assembly language programming. The first half covers the basics (arithmetic, branching, etc), while the remainder are projects like our old favourites, the digital clock and a music box. The third manual contains the complete annotated source listing of the monitor. The standard of English is very good compared with some south-east Asian products (the Micro-Professor is actually made in Taiwan), although there is the occasional quaint expression.

The monitor provides the usual facilities, allowing registers and memory locations to be examined or changed, breakpoints may be set or cleared, areas

of memory saved or loaded, and programs may be run directly or single-stepped. Extra functions allow the interruption of a running program, block transfers and the addition or deletion of a byte, and the calculation of relative addresses. Since a key is dedicated to each function, the monitor could hardly be made easier to use.

## 'LEON THINKS IT ABNORMAL FOR A GIRAFFE TO ROLL ON THE GROUND'

In addition, the hex keys are also labelled with register names — to display the contents of the HL register, simply press 'REG' followed by 'HL'.

The tiny Basic interpreter only allows 16-bit integer variables (i.e. the range of -32767 to +32727), but all the important keywords are included (see Table 1).

Although PEEK, POKE, INP, and OUT are absent, their functions are provided by extensions to the LET statement. A number preceded with 'M' indicates a memory location, while port numbers are prefixed with the letter 'P'. Thus LET M1000=23 is equivalent to POKE 1000,23 and LET A=P255 replaces A=INP(255).

The seven-segment display is naturally a limitation. The keywords are recognisable (e.g. G~~O~~T for GOTO and P~~R~~I~~N~~T for PRINT), but some of the operators are harder to remember (like ~~+~~ for \*). Right-to-left scrolling is used during program entry and listing.

While entering a line a limited

amount of editing is possible — left and right arrows move the 'cursor' (actually the display scrolls from side to side) and then a character may be deleted or a new one inserted. When listing, pressing the left arrow redisplay the current line, while the up and down arrows list the adjacent lines. It may be far from ideal, but this system makes the most of the limited hardware. If you want a cheap computer in order to learn Basic, the ZX81 would be a better choice (but it does cost nearly twice as much). Think of the Micro-Professor's Basic as a bonus, and you won't be disappointed.

## Conclusion

Overall, I was very impressed by the Micro-Professor, and the low prices of the basic unit and accessories make it very hard to criticise this product. I believe it will be attractive to several distinct groups. First of all, there are those who wish to learn about micro-processors (as opposed to microcomputers). Some purchasers will be individuals, the rest will almost certainly include educational establishments. It may also prove popular with people who already own computers, but do not want to risk their pride-and-joy when constructing and experimenting with hardware projects. Finally, the Micro-Professor could attract those looking for an inexpensive building block for control systems.

Prices (excluding Sales Tax)	
Micro-Professor	\$115
Speech Synthesiser	\$135
EPROM Programmer	\$145
Printer	\$ 95

Commands	Statements	Operators
RUN	PRINT	+ -
LIST	INPUT	* /
LOAD	LET	** =
SAVE	CALL	< >
CONTINUE	GOTO	NOT AND
NEW	GOSUB	OR

Table 1: The Micro-Professor Tiny Basic.



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**POWER SUPPLY** - A 9V, 0.6A Adaptor is optional  
**USER'S AND EXPERIMENT MANUAL** - Complete self-learning text with experiments and applications  
**BASIC-MPF** - 2K tiny BASIC interpreter (BASIC-MPF) has been provided to Micro-Professor users for learning BASIC language programming. It is supplied on 2516 EPROM and can be plugged directly into the expansion memory socket of Micro-Professor. The commands and statements of BASIC-MPF include: CONTINUE, CALL, FOR, NEXT, GOTO, GOSUB, INPUT, IF, THEN, LET, LIST, LOAD, NEW, PRINT, RETURN, RUN, SAVE, STOP

**KEYBOARD:** 36 keys including 19 function keys, 16 hex-digit keys and 1 user defined key.  
**RS-** Reset the system.  
**ADDR-** Set memory address and display memory content.  
**DATA-** Input data to memory or register.  
**PC-** Recall program counter.  
**REG-** Select register and display contents of register.  
**+-** Display content of next memory address or register.  
**-** Display content of last memory address or register.  
**STEP-** Single step execution of user's program.  
**SBR-** Set break point of user's program.  
**CBR-** Clear break point of user's program.  
**MONI-** User's program break and return to monitor.  
**GO-** Execute the user's program.  
**INS-** Insert data of the address followed by the current display address.  
**DEL-** Delete data of the current display address.  
**MOVE-** Move memory block in the RAM.  
**RELA-** Relative address calculation, calculates and stores relative address.  
**TAPE WR-** Store data to the cassette tape.  
**TAPE RD-** Load data from the recorder.  
**INTR-** Maskable interrupt.  
**USER KEY-** User defined key.  
**O-F-** Hex-digits or register selection.

### OPTIONS:

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 MPF-4KROM : Blank 4 K Bytes EPROM TMS2532, 12732 or equivalent.

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# APC-80

Version 7

*APC-80 continues this month with a selection of Basic PEEKs and POKEs for TRS-80s and System 80s.*

It is the policy of APC-80 not to provide assembly language routines for any functions which can be implemented adequately under Basic. APC-80 routines are created purely for actions which are either not possible in Basic, or would run too slowly. For example, we often receive requests for a PAUSE routine, but decline to put it in APC-80 since the same effect can be achieved using a dummy FOR loop. This month APC-80 provides a number of handy PEEKs and POKEs which can be put to use in Basic programs.

## RE-DIRECTING SCREEN OUTPUT

It is quite common in programs that produce data as output to provide the option of directing output to either the printer or the screen. The usual way of doing this is to set a flag depending on the desired output destination, and then prefix every PRINT statement with IF flag THEN PRINT . . . . ELSE LPRINT . . . .

This is not only tedious but also wasteful of memory. A much more satisfactory solution is to be able to declare that all screen output should be re-directed to the printer. This can be achieved simply by knowing the addresses of the vectors that point to the device drivers. The double byte at 16414 points to the screen driver and 16422 points to the printer driver. Knowing these addresses, it is a

simple matter to issue a couple of statements to direct screen output to the printer. These statements are  
POKE 16414, PEEK (16422)  
POKE 16415, PEEK (16423)

In order to reset the condition so that screen output takes place normally, it is necessary to know the original setting of the screen vector. This value may change depending on what Basic you are running. Therefore, one of the first lines of your program should be

```
LET SV = PEEK (16414) + PEEK  
(16415) * 256
```

It is now a simple matter to reset screen output by executing the statements

```
POKE 16415, SV / 256  
POKE 16414, SV - PEEK (16415) x  
256
```

It is essential that the LET statement used to set the variable SV be executed before any output redirection is performed, otherwise it will not be possible to resume normal output operation.

## PRINTER STATUS

In any programs that make use of a printer, it is often a good idea to be able to check if the printer is actually connected and if it is ready to receive data. Adding these types of tests to your programs makes them more robust to

external conditions.

Printer status can easily be tested by PEEKing memory location 14312. The various values which can be returned from this location will depend on the printer that you are using, so a certain amount of experimentation is required to find out which status codes your printer supports.

## DYNAMIC MEMORY SIZE

As many of you will already be aware, it is a simple matter to alter the memory size of your machine without reverting to a power-up state. This can be done while a program is residing in memory and even while the program is executing.

The current memory size is stored in the double byte at address 16561. To alter the memory size to the value in variable MS, simply execute the following statements

```
POKE 16561, MS / 256  
POKE 16562, MS - PEEK (16561) * 256  
CLEAR
```

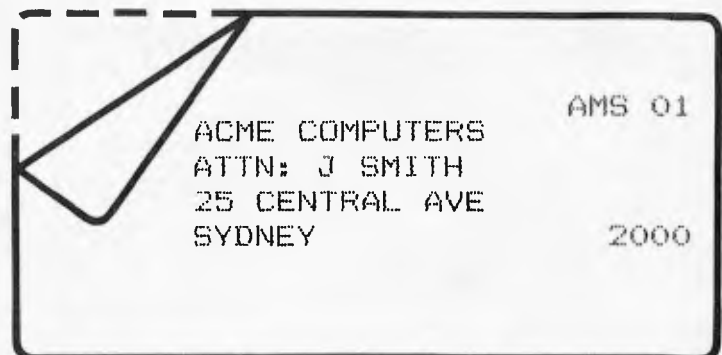
Note that MS does not have to be a variable, you can substitute any value you like. The CLEAR statement is necessary to repair the Basic variable area.

## NEXT MONTH

APC-80 will continue next month with a stand-alone source maintenance utility.

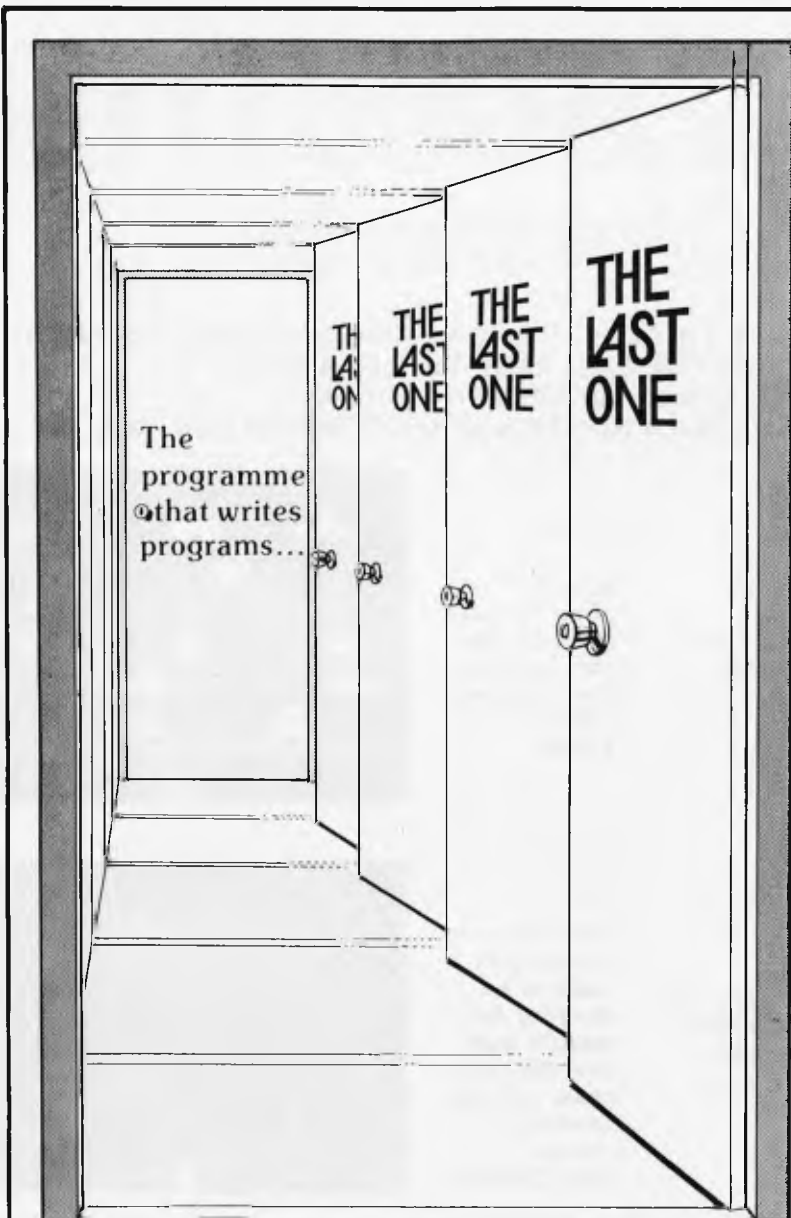
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Hawthorn, Vic. 3122.

## IncomPETable

Why will cassette programs written for the 80-column PET not run on my VIC-20?

W P Scott,

There are two possible causes. Firstly, if the program contains machine-dependent items such as PEEK or POKE addresses or machine code, then these will probably need some alteration in order to work as intended.

Secondly, if the program is Basic throughout, when it loads into the VIC it is re-located. In so doing the pointers that link one Basic line to the next will need to be corrected. You can force the VIC to do this by entering a dummy line at the beginning, such as 0 REM then deleting it.

R D Geere

## Arming the VIC

Is there any way in which I could get my VIC-20 to operate a robotic arm of some sort without having to spend a lot of money?

Philip Richardson,

It depends what you call a lot of money! Presumably the arm movements are to be controlled by electric motors, either conventional or stepper motor type, and to drive these you will need an interface connected to the user port. Design of this interface will depend to a large extent on the details of the motors. Alternatively, an increasing number of companies are advertising robot arms ready built and tested, some of which will connect direct to the VIC-20.

R D Geere

## Quick cursor

I need a fast routine for positioning the cursor anywhere on the screen of my 8000 series PET. The two standard methods of using loops with cursor movements and POKEs with

calculations are too slow. Can you help?

David James,

The following hex code can be placed into locations 0384 to 03AB and be called via Basic using SYS 900,X,Y, where X and Y are the column and row for the cursor.

```
0384 20 F5 BE 20 98 BD 20 2D
038C C9 A5 11 29 1F 85 D9 20
0394 F5 BE 20 98 BD 20 2D C9
039C A5 11 29 7F 85 C6 78 A5
03A4 D9 85 D8 20 67 E0 58 60
```

I hope this solves your problem - it is quite fast.  
- Ed.

## Compatible compiler?

I am developing a package on a microcomputer system running under CP/M and MBasic. I have two requirements that I cannot solve and wonder whether the Microsoft Basic compiler would help; is it compatible with MBasic? The problems are that first I cannot disable the 'Control-C' break into Basic; and second, I cannot provide enough protection from people looking at the program listing.

D Johnson,

I have not found how to trap the 'Control-C' break-in to Basic, when running under MBasic. However this is disabled when the program has been compiled. One way to provide some means of protection against prying eyes is to use the 'P' option when saving the program; (ie SAVE "PROG 1", P). The real way to do it is to use the compiler, though. This leaves no copy of the source once you have compiled and erased it.

The Microsoft Basic Compiler is as compatible as is reasonable with MBasic. As long as you haven't used dynamic arrays or the ERASE statement, then you are unlikely to encounter any problems. A few points are worth considering if you are writing with a compiler in mind:

1. Use integer variables as much as possible as they will speed up the running, and keep the size of the object code to a minimum. This is hardly true when using an interpreter.
2. You can liberally scatter REMark lines around as these are ignored by the compiler. Indent loops as well as this makes the code easier to read.
3. Use long (descriptive) variable names, as again the compiler codes these.

The compiler will also check all your syntax for you, and find unassigned statements. I had an interpreted Basic program running without errors for two years; when I compiled it I found two unassigned GOTOs. Finally, the Microsoft Basic compiler produces object code which is disappointingly slow - it is only about twice as fast; so don't expect startling improvements, especially as most time might be spent on file access anyway.

While on the subject of compilers, I get many enquiries asking about the speed improvement of compilers. I think this is often over-emphasised. If your program spends much of its time accessing files or printing, then a compiler will not make any noticeable improvement, especially if it runs using CP/M which will slow it down anyway.

## Fearsome factors

In response to your 'Factors Freak' in the May 1982 'Communications' columns, I suspect that the answer is, 'not in a million years'. The reason for this (and I quote): 'Multiplying is easy for a computer, but factoring is extremely difficult. For example, whereas two 100-bit factors can be multiplied electronically in a fraction of a second, the reverse process of factoring them might take a million years, even with a one-microsecond instruction time.' ('Electronic Cryptography' - Wireless World, 9/80.)

The article I quote from is

a discussion on methods of Data Encryption, where the security of the system relies on the above-mentioned facts; ie, knowledge of the factors involved permits the decipherment of text enciphered by the result of such a multiplication. The cipher 'keys' are easy to create and use, but without the factors being known the 'code' is well-nigh impossible to break - I wonder if that's why D Hunter wants his 150-digit number factorised?

The commonest methods of factorisation are Exhaustive Search, whereby the factors of a number N are found by testing each integer from 1 to N in turn and noting down those which produce no remainder when divided into N (which is the rigorous mathematical definition of a Factor), and an optimised version of the Exhaustive Search which I tend to call Exhaustive Reduction. This works in a similar manner, except that only prime numbers are tested and as each factor of N is found, it is divided into N and the quotient factorised instead.

This method produces the Prime Factors of N, from which all factors on N may be produced by cross-multiplication. For numbers with a lot of factors this method works exceptionally well, and since it is a recursive process (of sorts), it proves rather easy to program onto a computer. The difficulties arise if the number is exceptionally large, and has relatively few factors.

If the 150-digit number you published is 'rich' in (low) prime factors, and a table of prime numbers is available, or can be produced easily by your computer (mine reeled off the first 1000 or so in about 15 minutes) then the task of factorisation merely requires a standard computing 'trick' to con the computer into doing 150-digit arithmetic for you. (Divisions are, unfortunately, the hardest to program!) It will also require a mass of machine time, though the judicious use of multiple processors should speed this considerably.

If, as I suspect, this number only has a very few

# COMMUNICATIONS

large factors and a handful of smaller ones, then even using a Cray 1 mainframe dedicated to the task might take a lifetime (or several).

*A W Bain*

## VIC voice

I read with interest your reply in May APC to Mr P Richardson who enquired whether or not it was possible "to get his VIC to speak". Your answer was a bald "... forget it".

Your answer is incorrect. - At Edible Electronics we have developed a program which produces speech via the CB2 pin on any Commodore Computer. Hardware requirements are simply a normal Commodore cassette drive and a user port socket; 32k of RAM stores up to thirty seconds of speech. Interested readers should contact us at Edible Electronics.

Hoping this is of interest.

*Joel Gotlib*

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A popular exercise in computer graphics is to take a design already represented in store and displayed on the screen, and to make a reverse copy of it alongside, making a pair of mirror images.

I set out to write a short note on how to do this, illustrating it with the particular code for my computer, but along the route I was waylaid by an intriguing series of numbers which themselves give rise to some interesting patterns. It turns out that the central bit of processing necessary to reverse an image on a micro involves reversing the order of bits in a byte. This is because the screen map for graphics cannot afford the luxury of eight or even 16 bits for each cell on the screen that is possible on larger systems. Bits have to be packed into one or two bytes representing several cells on the screen. More of that later.

First I give four ways of reversing the bits in a byte, a kind of theme and variations in programming; then some patterns based on the values of reversed bytes, and lastly the problem that started all this, reversing an image on the screen.

## Reversing bits

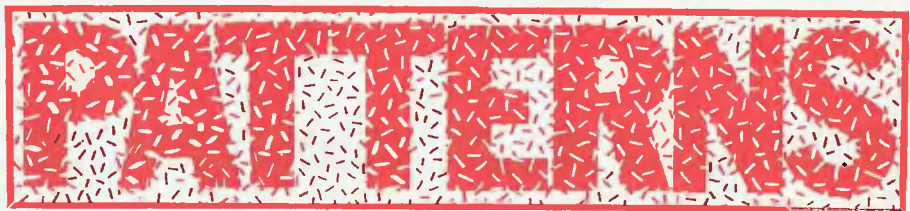
The process of taking a byte and reversing the bits in it is a single valued function of one argument. Like SIN(X) and LOG(Z), it takes one value and returns one value.

The first thing to decide in programming a function like this is whether the value is to be computed each time one is called for, or whether it is possible to compute the values once for each value that the argument can take and then store the results in a table. This is not practicable for functions like SIN and LOG, as there are far too many possible values. However, for our function there are only the 256 possible values of a single byte 0 to 255. The advantage of using a table is increased speed when the function is used, since the only cost is a single reference to an array. The price is the computation of all the values at the start of the program and the store needed for the array of 256 elements. This is the method used for the following.

Now we come to the far less important but much more interesting question, from the point of view of computing efficiency, of just how the reversed values are to be calculated. You might think of doing it by hand and storing the 256 values explicitly in DATA statements. Here is part of the table to show how the values go, in both binary and decimal:

00000000	0	0	00000000
00000001	1	128	10000000
00000010	2	64	01000000
00000011	3	192	11000000
00000100	4	32	00100000
00000101	5	160	10100000
-----			-----
11111110	254	127	01111111
11111111	255	255	11111111

But that way is cowardly cheating — I have a computer to perform precisely this kind of task. So here is the brute force computer method. Each bit is extracted from the byte by ANDing it logically with the appropriate power of



## Alan Sutcliffe continues his thought-provoking series.

2 and then shifting it right or left the correct number of places, which is easily done by division or multiplication. For example, (I IAND 2)\*32 picks out the second lowest bit and moves it up to the second highest position in the byte. Program A shows the whole code. The calculation is split into two lines simply to avoid having too long a line. On my computer, all eight expressions in one statement produced the error message LINE TOO COMPLEX, so you might have a similar problem on your machine.

## Second method

Now this program is correct and the fact that it is a bit slow hardly matters since it only takes a few seconds anyway, and it is only five lines. But I have this mean temperament that drives me to look for ways of saving a second here and there, no matter what the cost, plus a slight obsession with programming elegance.

The first method I thought of was a mixture of the two I have described so far, the manual and the brute force. It uses a table of the 16 reverse values for the 4-bit nibble or half-byte calculated by hand to set up the main table in a double FOR loop. This is Program B. You can easily confirm that the values in the DATA statements are correct by completing the following table for 4-bit reversals.

0000	0	0	0000
0001	1	8	1000
0010	2	4	0100
-----			-----
1111	15	15	1111

Statement 70 uses this table stored in array B to take the top nibble, reverse it and put it at the bottom and contrarilywise with the other half of the byte.

Although this takes more than twice as many statements it is very little longer in number of characters to be stored, and very much faster to run. A quick and rough way to compare two pieces of code like these for speed is to count the number of elementary operations in the inner loops. In each case this loop is obeyed 256 times. In program A there are, for example, four multiplications while in program B there are only two. A simple table shows the comparison, where ( ) is the number of references to an array element, an operation that may cost an addition and a multiplication.

	+	*	/	( )	=	IAND	Total
A	7	4	4	1	2	8	26
B	2	2	0	3	1	0	8

The total may be misleading if the differences are for very different kinds of operation: IAND is very much

quicker than an array reference. Since Basic is interpreted, the cost of this can be approximately compared by counting the number of characters, or more correctly the number of tokens, a variable name and a reserved word, each being a single token. Using these two measures Program B runs three or four times faster than program A. The overheads in program B for setting up the array B and for having two loops make hardly any difference. They have one sixteenth the effect they would have inside the inner loop.

## Algorithmic method

The table below shows the reversal values for each number of bits up to four.

0	0								
1	0	1							
2	0	2	1	3					
3	0	4	2	6	1	5	3	7	
4	0	8	4	12	2	10	6	14	1 9 ...

From this, a clear pattern of how the series for n bits can be obtained from that for n-1 bits may be seen. The first half of the series is doubled, and the second half is the first with 1 added to each item. If  $T_r$  is an item in the list for n bits, and  $S_r$  is an item for n-1 bits, the rule is:

$$T_r = 2 * S_r \quad \text{for } r=0 \text{ to } N-1$$

$$\text{and } T_r = 2 * S_{r-N} + 1 \quad \text{for } r=N \text{ to } 2*N-1$$

$$= T_{r-N} + 1$$

where  $N = 2^{n-1}$ .

Program C implements this algorithm recursively, so that the table for each number of bits up to eight is computed in turn. Notice that the rule even works going from zero bits to one bit, so that the only data that needs to be supplied is to set the first element of A to zero.

The attraction of this method is its elegance and its generality. Given an array big enough, Program C will compute the table for any number of bits: one more than the number given as the upper limit in the FOR loop, statement 40.

From the point of view of speed, however, there is a penalty. The inner loop is not executed 256 times as in the other programs, but  $1+2+4+8+\dots+256 = 511$  times — virtually twice the cost. It contains ten elementary operations to eight in Program B, but there are no multiplications so each time round the loop is probable faster.

Three very different looking programs. Interesting that they all produce the same result. Here is just one more — that uses another pattern in the construction of the series.

The first value is set to zero. Then the series for one bit is generated, but



this time in the positions it will occupy in the final table for eight bits: 0 is already in place, and the 1 goes in cell 128. Next the values that will make the series for two bits are added: 2 in cell 64 and 3 in cell 192. And so on.

Program D does all this. It is not obvious, perhaps, just looking at it how it works, but it is easy to obey the first few steps with pencil and paper — and its operation then becomes clear. It is more efficient than any of the others. The inner loop is obeyed 256 times and it contains five operations, with no multiplications.

It also makes a good test of program comprehension. Ask a friend who hasn't read the story so far to work out without a computer what this little program does and why. I would be very impressed by anyone who could figure this out without benefit of writing anything down.

But enough of numbers for a while and on to some graphics — graphics based on these numbers, that is. Program E is simply a histogram of the table for six bit reversals, made pretty with a little flower at the top of each stalk. Array A is already loaded with the values. Figure 1 shows the result, and maybe you can tell that I am doing this just before Christmas.

One or two small points about this program. I used the 6-bit table with 64 values rather than 128 or 256 values simply to get a more bold effect. The first and last values in the table, A(0) and A(63), are left out because the petals of the flowers, if that's what they are, would go off the screen for these two extreme values. It also makes for a more compact picture. It is necessary to plot the lines in descending value of I because otherwise the longer lines plotted later would obliterate petals on the shorter stems next to them. A pretty pattern, simple certainly, but effective I hope.

Program F uses the eight bit values to plot overlapping rectangles. Figure 2 shows the output, reminiscent of a design from the 1920s. The first FILL statement draws a rectangle and the second one draws another one row of cells smaller along each side, so the effect is of a rectangle with a border. That is unless the random function which is used to determine the colour in each case gives the same colour for both rectangles in a pair, when the border is invisible. Different effects can be obtained by using different values for the STEP in statement 520.

For both graphics I changed the colours to one more suitable for photographing once the design was on the screen. This is done by a single COLORG statement.

## Taking photos

A few words about my experiences in taking photographs from the screen. I am now using a monitor with RGB input, so that the pictures on the screen are crisp and clear. I have found it pays to take great care in positioning the monitor and camera. For the pictures shown here I used a Polaroid SX-70.

My tips are these. Make sure both the screen and camera lens are as near vertical as possible. Get the camera in line with the centre of the screen. Obvious stuff, but it is worth taking

```
10 DIM A(255)
20 FOR I=0 TO 255
30 B=(I IAND 10*128+(I IAND 2)*32+(I IAND 4)*8+(I IAND 8)*2
40 A(I)=B+(I IAND 16)/2+(I IAND 32)/8+(I IAND 64)/32(I IAND 128)/128
50 NEXT I
```

N.B. IAND is the instruction for a bitwise AND in this Basic.

```
10 DIM A(255),B(15)
20 FOR I=0 TO 15
30 READ B(I)
40 NEXT I
50 FOR I=0 TO 15
60 FOR J=0 TO 15
70 A(16*I+J)=B(I)+16*B(J)
80 NEXT J
90 NEXT I
100 DATA 0,8,4,12,2,10,6,14
110 DATA 1,9,5,13,3,11,7,15
```

Program B

```
10 DIM A(255)
20 A(0)=0
30 M=1
40 N=128
50 FOR I=0 TO 7
60 FOR J=0 TO 255 STEP N+N
70 A(J+N)=A(J)+M
80 NEXT J
90 M=M+M
100 N=N/2
110 NEXT I
```

Program D

measurements to ensure this. Otherwise there will not only be more depth of field than need be and so more problems of uniform focus, but also verticals and horizontals at the edges of the screen will be curved. At little over a foot away from the screen there is still a problem with more light in the centre than at the edges, particularly obvious in Figure 2.

## Reversing a picture

Now to use the byte reversing array A to give the mirror image of a graphic on the screen. It is necessary to say something about the screen map which is shown in Figure 3. My example is for four colour mode in low resolution,

```
10 DIM A(255)
20 A(0)=0
30 N=1
40 FOR I=0 TO 7
50 FOR J=0 TO N-1
60 B=A(J)
70 A(J)=B+B
80 A(J+N)=B+B+1
90 NEXT J
100 N=N+N
110 NEXT I
```

Program C

```
200 MODE 2
210 COLORG 0 1 2 3
220 FOR I=62 TO 1 STEP -1
230 B=A(I)
240 DRAW B,0 B,I 1
250 DOT B,I 2
260 DOT B-1,I 3
270 DOT B+1,I 3
280 DOT B,I-1 3
290 DOT B,I+1 3
300 NEXT I
```

Program E

```
500 MODE 6
510 COLORG 0 1 2 3
520 FOR I=0 TO 127 STEP 3
530 B=A(I)
540 C=A(255-I)
550 FILL I,B 255-I,C RND(4)
560 FILL I+1,B+1 254-I,C-1 RND(4)
570 NEXT I
```

Program F

GOTO page 78



# DR. DOBB'S JOURNAL

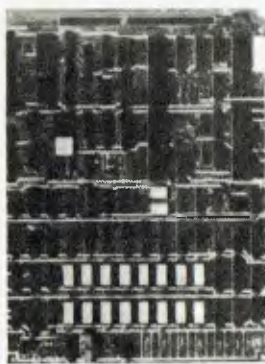
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Phone: (02) 997 4495

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116-120 Abercrombie Street,  
Chippendale. N.S.W. 2008.  
Phone: (02) 698 7866/7076

B.S. Microcomp,  
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Melbourne. VIC. 3000.  
Phone: (03) 614 1433

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Southern Information & Robotics,  
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Fulham Gardens. SA. 5024.  
Phone: (08) 356 3400

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Suite 1, 25 Hamilton Street,  
Subiaco. WA. 6008.  
Phone: (09) 381 4398

Computerworld Darwin,  
Smith Street,  
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You're probably solving this sort of problem by pulling out an analysis pad and drawing up a spreadsheet by hand – taking your budget and recalculating every value in a series of columns – then checking them. If you're lucky you have a programmable calculator to help.

Here's what you should be doing: Multiplan running on a personal computer replaces pencils, paper, erasers, calculators and endless manhours in modelling, estimating and planning activities. Like the example here: if your sales tax rate is 17.5%, you simply put that figure at the top of the sales tax column – Multiplan calculates each product's sales tax value. If a price changes or the tax rate changes, you change one number – Multiplan changes the rest. You see all the results on a spreadsheet 63 columns wide, 255 rows deep and pages thick.

Multiplan is a computer program for non-computer people. Multiplan lets you assign names to cells or areas such as 'sales' or 'expenses', then lets you refer to that name in future formulas. On Multiplan you

# Mr Howard increases sales tax by 2%.

## How does this affect your company's profits?

### 15 seconds to answer.

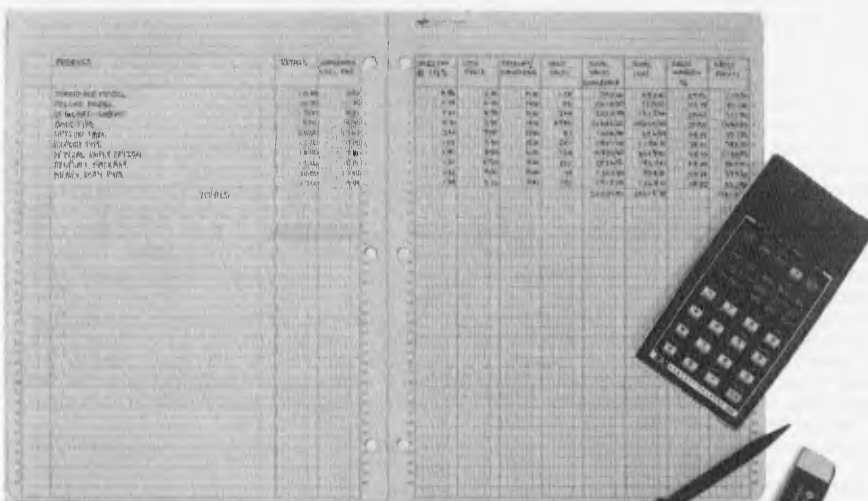
can have a formula like:  
 $Profit = Sales - Expenses$   
 On other spreadsheet programs that would look more like:  
 $Profit = R1C3 - R5C12$   
 Multiplan is also the only

spreadsheet program capable of colour operation and there are none of the problems with forward reference handling that can cause other programs to give completely spurious answers. Multiplan lets you access data on other spreadsheets and allows multiple windows on the screen so you can see the effects of new entries on other parts of the sheet.

**A friendly system.** Multiplan is specifically designed to eliminate the routine and tedious tasks associated with forecasting, modelling and planning. In designing the program, Microsoft, the world's largest producers of personal computer software, aimed to provide users with an easy-to-use tool which maximizes executive thinking time while minimizing the time required to learn and use the system productively.

Multiplan is available right now for use on Apple™ computers, and will soon be available for use on the Osborne 1™ and standard 8" CP/M™ computers. Versions for other computers are under development.

Call into your nearest computer store and see Multiplan in action – your next forecast need only take you 15 seconds instead of hours.



Change this number to see the effect of a sales tax change

All dependent variables are automatically calculated to your formula

PRODUCT	RRP	W	SALE	S.TAX	COST	FRT	UNIT	TOTAL	TOTAL	GROSS	GROSS
			INC	TAX	PRC		SALES	W E	COSE	MARGIN	PROFIT
STD MODEL	10.00	5.00	.86	3.00	.25	1.20	703.20	493.20	29.86	210.00	
DELUX MOD	20.00	11.75	1.75	6.00	.50	.86	1010.50	709.50	29.78	301.00	
STD-CHROME	15.00	8.81	1.31	4.50	.30	2.64	2325.84	1613.04	30.65	712.80	
BASE TYPE	8.00	4.70	.70	2.80	.10	69.46	32646.20	25005.60	30.55	7640.60	
OPTION PI	30.00	17.62	2.62	9.00	.60	.57	1004.34	696.54	44.19	307.80	
EXPORT TYPE	12.00	7.05	1.05	3.00	.20	2.81	1981.05	1194.25	39.71	786.80	
SPEC INPUT	16.00	9.40	1.40	4.80	.25	7.24	6805.60	4663.60	45.73	2175.00	
DISPLAY PKG	15.00	8.81	1.31	4.50	.30	3.22	2836.82	1967.42	44.19	869.40	
HEAVY DUTY	30.00	17.62	2.62	9.00	.60	.74	1303.88	904.28	44.19	399.60	
SPEC DISPL	17.00	9.99	1.49	5.20	.42	1.92	1918.08	1365.12	28.82	552.96	
TOTALS							52455.51	38618.75		18816.76	

Column widths are individually variable

Simulated screen

# Multiplan

from MICROSOFT

Apple II version: \$295 + tax

For the name of your nearest Microsoft dealer or more information on Multiplan contact:

**Wiser-Microsoft**  
**PO Box 95, Forestville 2087. Ph (02) 451 9445**

Multiplan is expected in stock and the price is correct at time of going to press.

# NEWCOMERS START HERE

*This is our unique quick-reference guide, reprinted every month to help our readers pick their way through the most important pieces of (necessary) jargon found in APC. While it's in no way totally comprehensive, we trust you'll find it a useful introduction. Happy microcomputing!*

or hex (**machine code** programming), the usual method is to have a special program which translates English or near-English into machine code. This speeds programming considerably; the nearer the programming language is to English, the faster the programming time. On the other hand, program execution speed tends to be slower.

The most common microcomputer language is **Basic**. Program instructions are typed in at the keyboard, to be coded and stored in the computer's memory. To run such a program the computer uses an **interpreter** which picks up each English-type instruction, translates it into machine code and then feeds it into the **processor** for execution. It has to do this each time the same instruction has to be executed.

Two strange words you will hear in connection with Basic are **PEEK** and **POKE**. They give the programmer access to the memory of the machine. It's possible to read (**PEEK**) the contents of a byte in the computer and to modify a byte (**POKE**).

Moving on to **hardware**, this means the physical components of a computer system as opposed to **software** — the programs needed to make the system work.

At the heart of a microcomputer system is the central processing unit (**CPU**), a single microprocessor chip with supporting devices such as **buffers**, which 'amplify' the CPU's signals for use by other components in the system. The packaged chips are either soldered directly to a printed circuit board (**PCB**) or are mounted in sockets.

In some microcomputers, the entire system is mounted on a single, large, PCB; in others a **bus system** is used, comprising a long PCB holding a number of interconnected sockets. Plugged into these are several smaller PCBs, each with a specific function — for instance, one card would hold the CPU and its support chips. The most widely-used bus system is called the **S100**.

The CPU needs memory in which to keep programs and data. Microcomputers generally have two types of memory, **RAM** (Random Access Memory) and **ROM** (Read Only Memory). The CPU can read information stored in RAM — and also put information into RAM. Two types of RAM exist — **static** and **dynamic**; all you really need know is that dynamic RAM uses less power and is less expensive than static, but it requires additional, complex, circuitry to make it work. Both types of RAM lose their contents when power is switched off, whereas ROM retains its contents permanently. Not surprisingly, manufacturers often store interpreters and the like in ROM. The CPU can only read the ROM's contents and cannot alter them in any way. You can buy special ROMs called **PROMs** (Programmable ROMs) and **EPROMs** (Erasable PROMs) which can be programmed using a special device; EPROMs can be erased using ultraviolet light.

Because RAM loses its contents when power is switched off, **cassettes** and **floppy disks** are used to save programs and data for later use. Audio-type tape recorders are often used by converting data to a series of audio tones and recording them; later the computer can listen to these same tones and re-convert them into data. Various methods are used for this, so a cassette recorded by one make of computer

won't necessarily work on another make. It takes a long time to record and play back information and it's difficult to locate one specific item among a whole mass of information on a cassette; therefore, to overcome these problems, **floppy disks** are used on more sophisticated systems.

A floppy disk is made of thin plastic, coated with a magnetic recording surface rather like that used on tape. The disk, in its protective envelope, is placed in a disk drive which rotates it and moves a **read/write head** across the disk's surface. The disk is divided into concentric rings called **tracks**, each of which is in turn subdivided into **sectors**. Using a program called a **disk operating system**, the computer keeps track of exactly where information is on the disk and it can get to any item of data by moving the head to the appropriate track and then waiting for the right sector to come round. Two methods are used to tell the computer where on a track each sector starts: **soft sectoring** where special signals are recorded on the surface and **hard sectoring** where holes are punched through the disk around the central hole, one per sector.

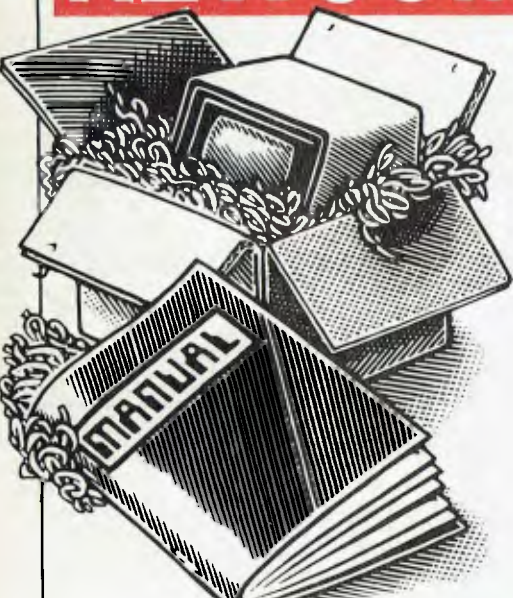
Half-way between cassettes and disks is the **stringy floppy** — a miniature continuous loop tape cartridge, faster than a cassette but cheaper than a disk system. **Hard disk** systems are also available for micro-computers; they store more information than floppy disks, are more reliable and information can be transferred to and from them much more quickly.

You, the user, must be able to communicate with the computer and the generally accepted minimum for this is the visual display unit (**VDU**), which looks like a TV screen with a typewriter-style **keyboard**; sometimes these are built into the system, sometimes they're separate. If you want a written record (**hard copy**) of the computer's output, you'll need a **printer**.

The computer can send out and receive information in two forms — **parallel** and **serial**. Parallel input/output (**I/O**) requires a series of wires to connect the computer to another device, such as a printer, and it sends out data a byte at a time, with a separate wire carrying each bit. Serial I/O involves sending data one bit at a time along a single piece of wire, with extra bits added to tell the receiving device when a byte is about to start and when it has finished. The speed that data is transmitted is referred to as the **baud rate** and, very roughly, the baud rate divided by ten equals the number of bytes being sent per second.

To ensure that both receiver and transmitter link up without any electrical horrors, standards exist for serial interfaces; the most common is **RS232** (or **V24**) while, for parallel interfaces to printers, the **Centronics** standard is popular.

Finally, a **modem** connects a computer, via a serial interface, to the telephone system allowing two computers with modems to exchange information. A modem must be wired into the telephone system and you need Telecom's permission; instead you could use an **acoustic coupler**, which has two obscene-looking rubber cups into which the handset fits, and which has no electrical connection with the phone system — Telecom isn't so uppity about the use of these.



Welcome to the confusing world of the microcomputer. First of all, don't be fooled; there's nothing complicated about this business, it's just that we're surrounded by an immense amount of necessary jargon. Imagine if we had to continually say 'numbering system with a radix of 16 in which the letters A to F represent the values ten to 15' when instead we can simply say 'hex'. No doubt soon many of the words and phrases we are about to explain will eventually fall into common English usage. Until that time, APC will be publishing this guide — every month.

We'll start by considering a microcomputer's functions and then examine the physical components necessary to implement these functions.

The microcomputer is capable of receiving information, **processing** it, storing the results or sending them somewhere else. All this information is called **data** and it comprises numbers, letters and special symbols which can be read by humans. Although the data is accepted and output by the computer in 'human' form, inside it's a different story — it must be held in the form of an electronic code. This code is called **binary** — a system of numbering which uses only 0s and 1s. Thus in most micros each character, number or symbol is represented by eight binary digits or **bits** as they are called, ranging from 00000000 to 11111111.

To simplify communication between computers, several standard coding systems exist, the most common being **ASCII** (American Standard Code for Information Interchange). As an example of this standard, the number five is represented as 00110101 — complicated for humans, but easy for the computer! This collection of eight bits is called a **byte** and computer freaks who spend a lot of time messing around with bits and bytes use a half-way human representation called **hex**. The hex equivalent of a byte is obtained by giving each half a single character code (0—9, A—F): 0=0000, 1=0001, 2=0010, 3=0011, 4=0100, 5=0101 . . . . E=1110 and F=1111. Our example of 5 is therefore 35 in hex. This makes it easier for humans to handle complicated collections of 0s and 1s. The machine detects these 0s and 1s by recognising different voltage levels.

The computer processes data by reshuffling, performing arithmetic on, or by comparing it with other data. It's the latter function that gives a computer its apparent 'intelligence' — the ability to make decisions and to act upon them. It has to be given a set of rules in order to do this and, once again, these rules are stored in **memory** as bytes. The rules are called **programs** and while they can be input in binary



# FMS SOFTWARE AND HARDWARE FOR CP/M BASED SYSTEMS

Agent for: Lifeboat Associates, Sigma International, Compuvision, Westico, Memtech, Anderson Digital Equipment, AWA.

## Software Available

New products appear in red.

### System Tools:

BUG and uBUG  
DESPOOL  
DISLOG  
DISTEL  
EDIT  
EDIT-80  
FILETRAN  
IBM/CPM  
MAC  
MACRO-80  
MINCE  
PASM  
PLINK  
PLINK II  
PMATE  
RAID  
Reclaim  
SID  
TRS-80 Model II Customization Disk  
Unlock  
WordMaster  
XASM: 05, 09, 18, 48, 51, 65, 68, F8, 400  
XMACRO-86  
ZAP80  
ZDT  
Z80 Development Package  
ZSID

### Telecommunications:

BSTAM  
BSTMS  
MicroLink-80  
RBTE-80

### Languages:

ALGOL-60  
APL/80  
BASIC Compiler  
BASIC-80

baZic II  
BD Software C Compiler  
CBASIC-2  
CIS COBOL (Standard)  
CIS COBOL (Compact)  
COBOL-80  
FORTRAN-80  
KBASIC  
muLISP/muSTAR-80  
Nevada COBOL  
JRT Pascal  
Pascal/M  
Pascal/MT  
Pascal/M +  
Pascal/Z  
PLI-80  
STUFF UPPER LISP  
S-BASIC  
Tiny-C  
Tiny-C Two  
UCSD Pascal  
Whitesmiths' C Compiler  
XYBASIC

### Language and Applications Tools:

BASIC Utility Disk  
DataStar  
FABS  
FABS II  
Form 1 for CIS COBOL  
Form 2 for CIS COBOL  
MAGSAM III  
MAGSAM IV  
MSORT for COBOL 80  
PSORT  
OSORT  
STRING/80  
STRING BIT  
SUPERSORT  
ULTRASORT II  
VISAM

### Word Processing Systems and Aids:

Benchmark  
MicroSpell  
Letterright  
Magic Wand  
Spellguard  
TEX  
Textwriter III  
WordIndex  
WordStar  
WordStar Customization Notes

### Data Management Systems:

CONDOR  
HDBS  
MDBS  
MDBS-DRS, QRS, RTL  
dBASE II  
PRISM/LMS  
PRISM/MS  
PRISM/ADS

### General Purpose Applications:

CBS  
Selector III-C2  
Selector IV

### Mailing List Systems:

Benchmark Mailing List  
Postmaster  
Mailing Address  
MailMerge for WordStar  
NAD

### Financial Accounting Packages:

BOSS Financial Accounting System  
Peachtree Financial Packages

Structured Systems Group Financial Packages  
GLector

### Numerical Problem-Solving Tools:

T/MAKER II  
IPI  
IPI AN80  
Analyst  
Microstat  
muSIMP/muMATH  
Statpak

### Professional And Office Aids:

Ampel  
American Software Property Management Package  
Cornwall Apartment Management  
Datebook  
ESQ-1  
Guardian  
Professional Time Accounting  
Property Management  
PAS 3 Medical  
PAS 3 DENTAL  
Sales Pro  
Univar 9000 Series Family Medical Management  
Univar 9000 Series Family Dental Management  
Univar 9000 Series Insurance Agency Management  
Univar 8000 Medical Management  
Univar 8000 Dental Management  
Wiremaster

### Books, Periodicals, Accessories

APL - An Interactive Approach  
Accounts Payable and Accounts Receivable-CBASIC  
The CP/M Handbook (with MP/M)  
The C Programming Language  
8080/Z80 Assembly Language Techniques For Improved Programming  
Fifty BASIC Exercises  
General Ledger-CBASIC  
H.W.Sams Crash Course in Microcomputing  
Introduction to Pascal  
Lifelines  
Pascal User Manual and Report  
The Pascal Handbook  
The Pascal Primer  
Payroll with Cost Accounting -CBASIC  
Structured Microprocessor Programming  
Using CP/M - A Self-Teaching Guide  
Smartmodem  
DC Data Cartridges  
Floppy Disk Kit  
Floppy Saver  
Diskette Drive Head Cleaning Kits  
Vari Clean Cleaning Kit

### Disk Operating Systems

Software Bus Family  
SB-80  
CP/M-80  
MP/M

### Hard Disk Integration Modules

## Media and Formats

These are diskette, cartridge disk and cartridge tape format codes, to be specified when ordering software for listed computer or disk systems. All software products have specific requirements in terms of hardware or software support, such as MPU type, memory size, support operating system, or language.

New formats appear in red.

ADDS Multivision ..... RT  
Altair 8800 ..... B1  
Altos ..... A1  
Apple CP/M-80 13 Sector ..... RG  
Apple CP/M-80 16 Sector ..... RR  
BASF System 7100 ..... RD  
Blackhawk Micropolis Mod II ..... Q2  
California Computer Sys 8 in ..... A1  
CDS Versatile 3B ..... Q1  
CDS Versatile 4 ..... Q2  
Columbia Data Products 8 in ..... A1  
Columbia Data Products 5.25 in ..... S4  
COMPAL 80 ..... Q2  
Computer Ops N C HO ..... S2  
CPT 8000 ..... A1  
Cromemco System 3 ..... A1  
Cromemco System 2 SD/SS ..... R6  
Cromemco System 2 DD/SS ..... RX  
Cromemco System 2 DD/DS ..... RY  
CSSN Backup ..... T1  
Datapoint 1550/2150 ..... A1  
DEC V118X ..... SD  
Delta Systems ..... A1  
Digi-Log Microterm II ..... RD  
DTC Micro 210A ..... SC  
Durango F-85 ..... RL  
Dynabyte DB8/? ..... R1

Dynabyte DB8/4 ..... A1  
Exidy Sorcerer + Lifeboat CP/M-80 ..... Q2  
Exidy Sorcerer + Exidy CP/M-80 5.25 in ..... RW  
Exidy Sorcerer + Exidy CP/M-80 8 in ..... A1  
EXO ..... A1  
Findex ..... P6  
Heath H8 + H47 ..... A1  
Heath H89 + Magnolia CP/M-80 ..... P7  
Heath H89 + Heath CP/M-80 ..... P7  
Helios II ..... B2  
Hewlett-Packard 125 5.25 in ..... SB  
Hewlett-Packard 125 8 in ..... A1  
IBEX 7100 ..... RQ  
iCOM 2411 Micro Floppy ..... R3  
iCOM 3712 ..... A1  
iCOM 3812 ..... A1  
IMSAI VDP-40 ..... R4  
IMSAI VDP-42 ..... R4  
IMSAI VDP-44 ..... R5  
IMSAI VDP-80 ..... A1  
Industrial Microsystems 5000 ..... RA  
Industrial Microsystems 8000 ..... A1  
Intel MDS SD ..... A1  
Intelec Superbrain DOS 0.1 ..... R7  
Intelec Superbrain DOS 0.5-2.x ..... RJ  
Intelec Superbrain DOS 3.x ..... RK  
Intelec Superbrain QD ..... RS  
ISC Intecolor 8063/8360/8963 ..... A1  
Lextron V11303 DSDD ..... S8  
Lexor Alphasprint Model S1 ..... S1  
Meca Delta-1 5.25 in ..... P6  
Micromation ..... A1  
MicroMeja 85 ..... SC  
Micropolis Mod I ..... Q1  
Micropolis Mod II ..... Q2  
MITS 3200-3202 ..... B1  
Morrow Discus ..... A1  
Mostek ..... A1  
MSD 5.25 in ..... RC  
MULTI-TECH I ..... Q2  
MULTI-TECH II ..... Q2  
Nascom (Gemini drives) ..... R3  
NCR 8140/9010 ..... A1  
NEC PC-8001 ..... P6  
NNC-80 ..... A1  
NNC-80W ..... A1  
North Star SD ..... P1  
North Star DD ..... P2  
North Star OD ..... P3  
Nylac Micropolis Mod II ..... Q2  
Ohio Scientific C3 ..... A3  
OKIIF-800 ..... RZ  
Osborne I ..... SA  
Pertec PCC 2000 ..... A1  
Processor Technology Helios II ..... B2  
Quay 500 ..... RQ  
Quay 520 ..... RP  
RAIR DD ..... RE  
Research Machines 5 25 in ..... RH  
Research Machines 8 in ..... A1  
Sanco 7000 5 25 in ..... RQ  
SD Systems 5 25 in ..... R3  
SD Systems 8 in ..... A1  
Spacebyte ..... A1  
Tarbell 8 in ..... A1  
TEI 5.25 in ..... R3  
TEI 8 in ..... A1  
Televideo DD/DS ..... S5  
T.I.P. (Alloy Engineering, Inc.) ..... T3  
Toshiba T200 ..... SF  
TRS-80 Model I Standard ..... M-R2  
TRS-80 Model I + Shuffleboard 8 in ..... A1  
TRS-80 Model II ..... A1  
Vector MZ ..... Q2  
Vector System 2800 ..... A1  
Vector System B ..... Q2  
Vector VIP ..... Q2  
Vista V-80 5.25 in SD ..... R8  
Vista V200 5 25 in DD ..... P6  
Wangwriter ..... SE  
XEROX 820 5.25 in ..... S6  
XEROX 820 8 in ..... A1  
Zenith Z89 + Magnolia CP/M-80 ..... P7  
Zenith Z89 + Zenith CP/M-80 ..... P7

### COMING SOON!

ARCHIVES 1  
AVL Eagle II  
Commodore CBM/Pet 2000/3000/4000 Series  
Commodore CBM/Pet 8000 Series  
Dysys ESC 4500  
EXO  
Heurikon  
Heuristics  
MULTI-TECH III, IV  
Nascom/Lucas  
NCR 2950  
Northern Telecom 503  
Pet/CBM 2000/3000/4000 Series  
Pet/CBM 8000 Series  
Philips P2000 with MMU  
Solid State Technology  
Toshiba T250  
TRS-80 Model III  
Zeda 580  
Single-sided single-density disks are supplied for use with double-density and double-sided 8" soft sector systems.  
IMSAI formats are single-density with directory offset of zero.  
A media surcharge will be added to orders for the following: Tape formats T1 and T3  
The list of available formats is subject to change without notice. In case of uncertainty, call to confirm the format code for any particular equipment

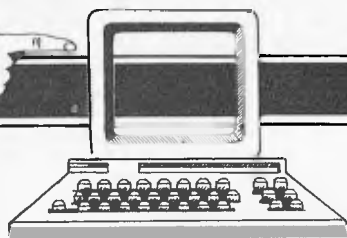
Note that Lifeboat programs have specific hardware and memory requirements but will run on most CP/M machines with 48 KByte available.

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# MICROMARKET



More than once a day, our office receives a call regarding machine specifications or availability or requests for advice on software, so we've decided to release an updated version of **MICROMARKET** and complement its bi-monthly appearance with a new section called **PACKAGES**. The first appearance of **MICROMARKET** will be in the September issue of **APC** followed by **PACKAGES** in October, each being published thereafter in alternate months.

**MICROMARKET** will be a comprehensive list of all microcomputers available in Australia including single board micros, and kits. There will be five main headings under which the most important specifications of each machine will be listed.

For space reasons it would be impossible to list all prices and con-

figurations of available microcomputers, so the minimum configuration and its price will be listed. Where disk drives, speech synthesiser or graphics cards, for example, are available, they will be listed in the "Miscellaneous" column with the relevant price.

A number of abbreviations are to be

used and they are listed in the table below.

The following example shows the order in which components, options and software will be listed. We ask that companies submitting information do so in the standard form shown, using abbreviations wherever possible.

MACHINE (PRICE FROM)	MAIN DISTRIBUTOR/S (NO. OF DEALERS)	HARDWARE	SOFTWARE	MISCELLANEOUS (DOCUMENTATION) (BENCHTEST DATE)
Full Name of Basic Machine (Minimum Retail)	Name of Main Australian Distributor (No. of Dealers Including Franchised Dealers)	RAM : PROM : EPROM Processor/s: C : Disks (Capacity) (either F/D or H/D if standard : TV Int : P/P (incl. no. of ports) : S/P (incl. no. of ports) : G/c : Tone Generator	Standard Languages : Optional Languages (listed in italics)	The contents of this section will be left largely up to the supplier. (One of the following abbreviations will be used to describe the general level of documentation : E, H (i.e. hardware details included), I S (i.e. Details of ROM included). BP - Date of full APC test).

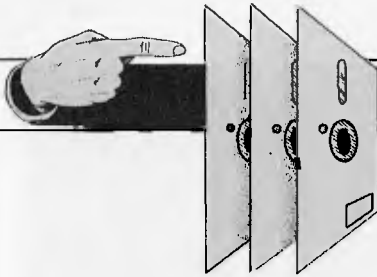
## List of Abbreviations

A Assembler	G/C Graphics Card	M/A Macro Assembler	S Software
BT Bench Tested	H Hardware	N/A Not available	S/P Serial port
C Cassette	H/D Hard disk	N/P Numeric pad	T/E Text editor
E Extensive	I Introductory	O/S Operating system	TBA To be announced
F/D Floppy disk	Int Interface	P/P Parallel port	U Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are inclusive of Sales Tax.

This is an example of how an entry will appear in **MICROMARKET**:

MACHINE (PRICE FROM)	MAIN DISTRIBUTOR/S (NO. OF DEALERS)	HARDWARE	SOFTWARE	MISCELLANEOUS (DOCUMENTATION) (BENCHTEST DATE)
Tandy TRS-80 Color (\$599)	Tandy Electronics (02) 638 6633 (200)	4-16k RAM : 6809 : 8-16k ROM : C : 16 x 32 TV int : RS232 port	Color Basic : Extended Color Basic	With 16k RAM, 16k ROM & Extended Color Basic \$250 (I). BT 1/82
TRS-80 Level I (\$499)	Tandy Electronics (02) 638 6633 (200)	4-16k RAM; Z80; C; 12", 16x64 optional: B/W VDU	Basic: Games: A	Basic in 4k ROM; upgradeable to Level 2 (I)



# PACKAGES

This software directory will be confined to business packages which have been in use for at least six months in a minimum of five sites.

The layout has been designed to allow you to discover which packages are available for the application you have in mind and to show you which packages are available for your computer if you already have a machine. In either case the code enables you to look up the supplier's name and telephone number in a separate table.

So, the directory will be divided into two sections. The first will index

software packages according to application. If you require a program to provide credit control, then under this heading you'll find a list of machines for which this software is available and a code referring to the package's supplier.

The second section will be an alphabetic list of microcomputers. Under each machine will be a list of available software packages and supplier code, so that if you are contemplating the purchase of a machine or already own a computer, it will be easy to identify available software.

Producers of packages which fall within the first mentioned constraints should send details to PACKAGES, APC, P.O. Box 115, Carlton, 3053. We require only the category of application, computer for which the package is intended, price, supplying company name and telephone number.

Below is a suggested list of applications (CP/M and other widely used operating systems are listed as separate "microcomputers" because of the large amount of software written specifically for them).

## Applications

Appointments Planner  
 Assembler dev  
 Bank accounts  
 Bill of materials  
 Bonds/pension quotations  
 Budgeting package  
 Bureau de change  
 Cash flow  
 Cash register  
 Company secretary  
 Container accounting  
 Contract costing  
 CP/M & utilities  
 Credit control  
 Customer file  
 Database management/  
   Information retrieval  
 Dental Records  
 Disk operating system  
 Estate agent

Equipment lease/rent/HP  
 File Handling  
 Financial modelling  
 Financial planning  
 General ledger/NL  
 Hotel management  
 Incomplete records  
 Industry Factory loading  
 Industry work study  
 Integrated accts  
 Investment portfolio  
 Invoicing  
 Job costing  
 Job order control  
 Legal precedents  
 Letter writer  
 Lotteries  
 Mailing List  
 Mail shot  
 Membership accting  
 Motor Dealer  
 Order entry/invoicing

Order processing  
 Office admin  
 Pad to plotter systems  
 Payroll  
 Perpetual Inventory  
 Personnel records  
 Petaid report generator  
 Planning/Maintenance  
 Postal advertising  
   response package  
 PR/advertising package  
 Price lister  
 Printers job control  
 Production analysis  
 Prof appts groups  
 Prof appts individ  
 Prof client billing  
 Programming aids  
 Property management  
 Purchase ledger  
 Quotation estimating  
 Sales ledger

Salesman  
 Sales Tax analysis  
 S/L, P/L & stock control  
 Solicitor's complete  
   record accounting  
 Solicitor's package  
 Statistics  
 Stock control/recording  
 Surveying  
 Text file librarian  
 Time/cost recording  
 Travel agency accts  
 Travel Agents Diary  
 Travel Ticket Sales  
 Utilities  
 Utility set  
 Various engineering  
 Vet package  
 Video message  
 Warehousing  
 Word processing  
 Work in Progress

# MICRO VISIONS

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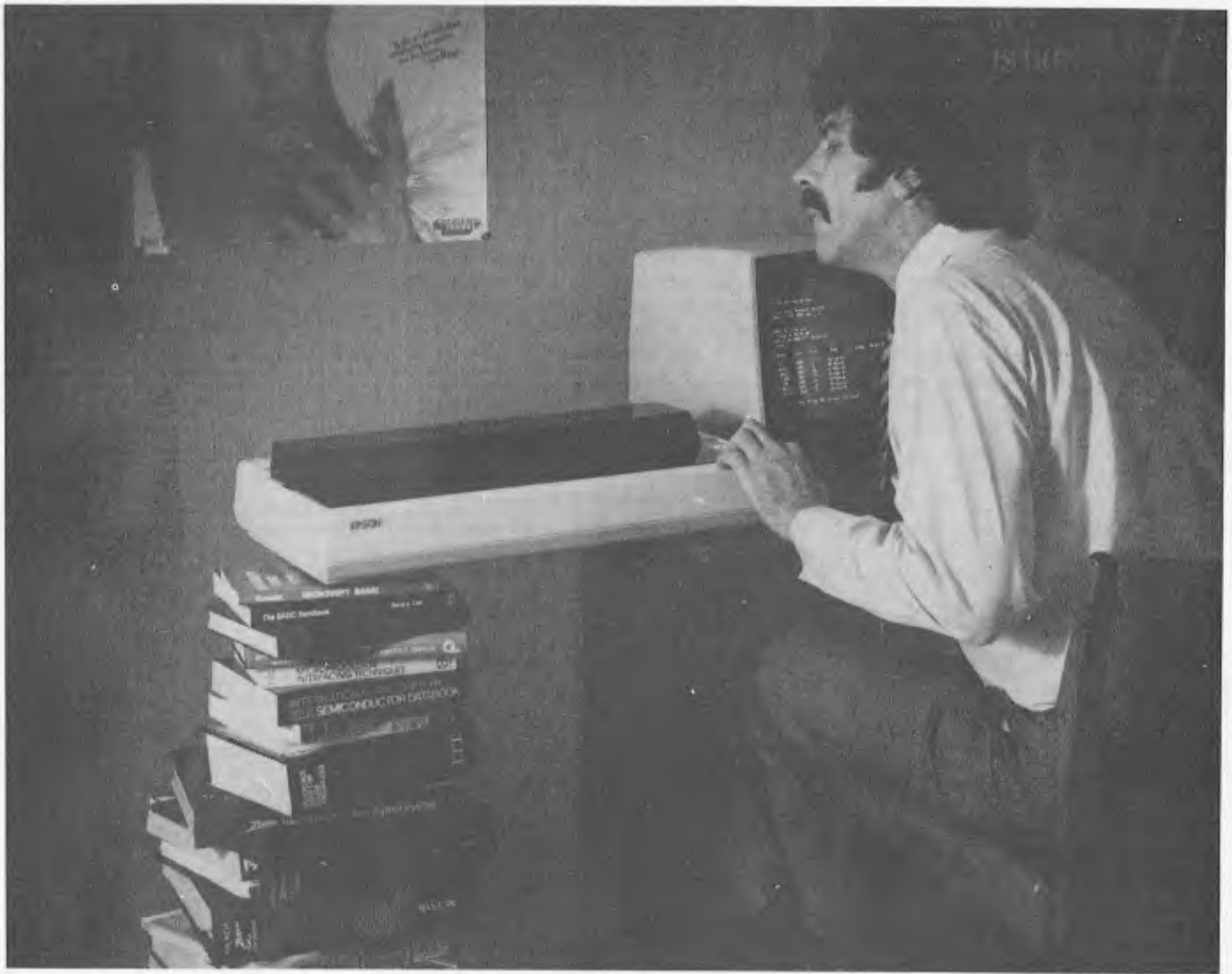
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# MICRO VISIONS



# The MX-100. Not just better. Bigger

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Needless to say, the specs on this machine are practically unbelievable. But there's something about the MX-100 that goes far beyond just the specs; something about the way

it all comes together, the attention to detail, the fit, the feel. Mere words fail us. But when you see an MX-100, you'll know what we mean.

All in all, the Epson MX-100 is the most remarkable printer we've ever seen in Australia to date. How can you not afford to consider the new MX-100, even if you have to buy a bigger desk!



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- AUCKLAND N.Z. (09) 50-4458 ● WELLINGTON N.Z. (04) 69-3016



# FRAMES OF REFERENCE



## A DP MANAGER'S GUIDE TO MICROS

By Alan Wood

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

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

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

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

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

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

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

The disadvantages of micro-computers in the hands of users can be described as:

1. Publicity greater than performance... microcomputers do not equal mainframe computers; the cost of a system does not equal the cost of the hardware — personal computers are good as super-calculators but not as file processors.

2. Users are not disciplined enough to have own computers... floppy disks get lost/disorganised, data backup is not taken regularly if at all, hardware is abused with dust, coffee and crumbs.

3. Hardware and software limitations not understood... a little knowledge leads to doing dangerous things, DP departments adopt a 'not invented here' attitude and refuse to get involved/help until the user is humbled by mistakes.

## PART 6: PUTTING YOUR MICRO TO WORK

4. Surreptitious microcomputing... micros sneaked in by users, little, no or fallacious justification, self-indulgence in doing interesting things in computing (previously the prerogative of DP people only!).

### Applications

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

The computer manufacturers of the '50s and '60s found an eager market in the commercial and industrial companies whose operation and expansion was inhibited by manual systems. The first systems they installed were a computer replication of what was there already. Then the systems became more

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

### Personal and company systems

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

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

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



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

## Fertile areas for micros

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

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

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

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

The trend began with tools like Visicalc, a rows-and-columns program providing a matrix of 64 columns by 200 rows, automatic re-calculation facilities and a variety of mathematical formulae. Visicalc is much friendlier than timesharing programs which do not provide screen interaction. It has been followed by a variety of other aids — Micro

Modeller for financial modelling, Micro-Planner for critical path applications, Optimiser for linear programming. More management aids and personal productivity programs will follow. The 16-bit desktop micros with these programs will eat further into timesharing spend. Using micros for front-end data entry is also an economic extension of your timesharing service, so that you keep connect costs and phone bills down. The added facilities that the micro provides off-line combined with use as a terminal are valid justification.

In some departments dedicated word processors are required, eg, updating from a typing to a word processing pool. In others, the general-purpose microcomputer with word processing software provides an economic and versatile solution. At today's prices, \$9000 buys a high-quality micro with a daisywheel printer and word processing software. The software is not as friendly or as feature full as the specialist word-processors, but the fancy features for which those machines are bought are seldom used. Applications combining data processing, word processing, information processing and number processing are ideally satisfied by microcomputers. A small bonus (or hazard, depending on your point of view) is the extension of keyboard skills in the organisation and the dispersal of some typing to two-fingered word processing users.

## Data processing on micros

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

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

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

companies is executive payroll — often a tedious job for the company secretary or financial controller.

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

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

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

## Multi-function applications

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

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

## Multi-user and multi-tasking

There are two solid justifications for large computers for multi-user work. The first is where a vast amount of data has to be stored and manipulated. The second is where many people must share data and have access to it at the same time; the classic example is airline reservation systems.



# FRAMES OF REFERENCE

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

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

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

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

On 16-bit micros with Unix derivatives or own operating systems, the limit is 16 users and the typical load is 6-12. On these machines input/output is a greater limitation than processor capacity since most typically operate with only one disk channel. They are well suited to multi-user information management and word processing tasks where all operators must share the same files but where transaction levels on

individual records are not very high.

To improve resilience and efficiency and to capitalise on microprocessor costs, tomorrow's special and general-purpose machines are being built on a honeycomb of microprocessors, with each cell performing or duplicating a function, all intricately interconnected.

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

## More radical thinking

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

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

The costs of personal computers are comparable to the costs of quality electric typewriters. A network of microcomputers providing calculating power also facilitates inter-office communication. The choice for the larger organisations lies between allowing a piecemeal approach or developing a rational architecture for the 80s which will fully employ new technologies linked to existing computing.

## The sixth commandment of microcomputing

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



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



# BENCHTEST

COMPUTER SYSTEM

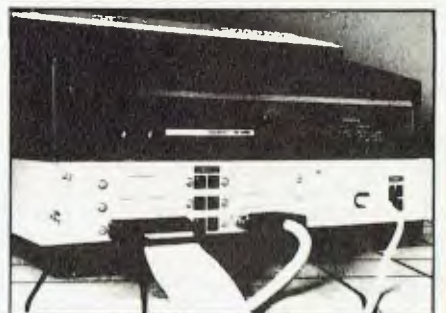


# JACK OF ALL TRADES, MASTER OF MOST...

Dick Pountain finds the Sharp MZ80B lives up to its 'general purpose' tag

Way back in December 1980, APC looked at Sharp's first entry into the world micro scene, the MZ-80K. Developments have moved quickly since then. The MZ-80K was not released in Australia; it was replaced by the MZ-80A, which also was not released in Australia. Both of these machines were aimed at the low-cost end of the market.

The only Sharp micro to reach Australia in the past has been the PC 3201. But now the company is making amends with the release of the MZ-80B, a more "up-market" product than the earlier models in the series. Dick Pountain investigates.



# Calcutronic & Sharp get together

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MZ-80B**

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The MZ80B opens up a new world of graphic display potential, more flexible data storage and retrieval, and ease of operation.

Here is the computer from the future. Available today.

## Stunning Graphic Display

Seeing is believing. The large-screen high-focus, green-face incorporated in the MZ80B gives you high resolution graphics of 320 x 200 dots.

An additional graphic RAM is included which allows another 320 x 200 dot resolution pattern to be displayed.

This dual high-resolution graphic ability is especially useful for stimulating and displaying a dynamic picture, it can display 40 characters x 25 lines or 80 characters x 25 lines via software switching.

In addition, there are facilities for full, on-screen editing, reverse video, partial scrolling and a full range of graphic symbols.

## Character and Graphic Printer

This fast, quiet printer will reproduce your graphic displays and, of course, print-out upper and lower case letters and symbols. A tractor/friction feed version is also available.

## Data Storage/retrieval

The MZ80B has a remarkable memory. 64K of RAM. And that constitutes all the memory area, giving flexible storage of

any computer language and its software.

The cassette deck is electromagnetically-controlled, with a data transfer speed of 1800 bits/sec. combined with a unique programme search facility to make data storage and retrieval super-fast.

## Software

Software includes Basic compiler, PASCAL, COBOL, FORTRAN and numerous accounting applications.

## Floppy Disk Drive

A twin Floppy Disk Drive unit can be added which will give you 560K bytes of storage on double-sided, double-density disks.

## Comprehensive Documentation

Each MZ80B comes complete with a full set of documentation including an

owners' manual giving full circuit diagrams, a monitor reference manual and programming manuals.

## Interfaces

RS232C and IEEE Interfaces are available allowing the MZ80B to communicate with scientific instruments and other peripherals.

## CP/M\* 2.2

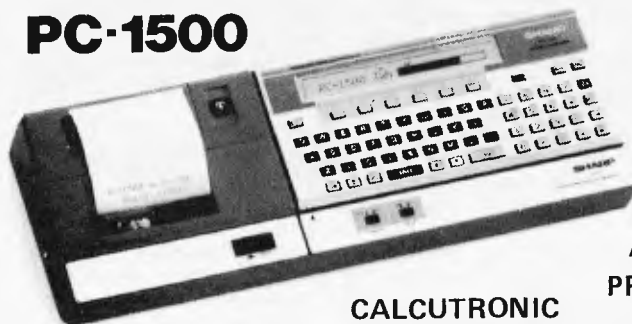
CP/M\* is also available making a wide range of packages immediately available including wordprocessing, financial modelling, data base management to mention but a few. CP/M\* also increases the disk capacity to 680K bytes.

(CP/M\* is a Trade Mark of Digital Research Ltd.)

## FREE

**CASSETTE — BASIC**  
with every purchase of the  
**SHARP MZ80b**

## PC-1500



ROM: 16K bytes  
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0.9K bytes. User area:  
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Module (Optional)**  
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My deepest impression after a few hours with the MZ-80B is that this is probably the machine that Sharp's design team wanted to make when they worked on the 80K. All the compromises inherent in that design, presumably to bring it in at a price acceptable to the PET buyer, have been abandoned and the result is an integrated system, rather than a computer plus afterthought peripherals. In external appearance, the 80B shows evidence of Sharp's hi-fi connections along with a distinctly Italianate line far removed from the rounded Star Wars look which is the current Japanese vogue. This long low look is assisted by the 9in rather than 12in CRT and the absence of on-board disk drives.

The base/keyboard unit is of pressed steel (to help shield RF emissions?) with a hi-fi style shot-blasted finish, while the pedestal containing the VDU and cassette-drive is in ABS plastic cunningly metallised to an identical finish. This pedestal swings up and forward on removing two screws to yield access to the internals and has a car-bonnet-like support to keep it open. A peek inside reveals a neatly packed array of nicely finished boards with much use made of nylon clip fasteners and ribbon cable connectors. The CPU (a Z80A running at 4MHz), PIO and various support chips are socketed, but the 32k of dynamic RAMs (4116s) on the CPU board are soldered. The expansion RAM is all socketed. At the rear right of the case is a six-slot bus expansion cage with six corresponding ports for I/O connector sockets. Two of these were occupied on the test machine by the interface cards and sockets for the disk drive and printer (which uses Sharp's own 8-bit parallel interface); RS232 and Centronics will be available in due course, but at present the '80B only accepts Sharp's own MZ-80P5 printer. A third slot is taken up by the optional second graphic memory card.

The full-size typewriter keyboard has a standard layout with extra control keys, a separate numeric pad and good pitch and feel. In addition to a proper space bar, a small TAB key is provided alongside for fast table entry. Break, Insert/Delete and Clr/Home are on the main keyboard with three levels of shift; Shift gives lower case, Grph gives 30 graphic symbols and Rev gives reverse field characters (but not for the graphics). The two latter keys and Shift lock have built-in red LEDs to warn that they are engaged. For touch typing, the Shift can be altered by the Basic command CHANGE to give upper case. Above the main keyboard are ten user-definable keys, four cursor control keys and four cassette control keys. On booting up Sharp Disk Basic, the user-defined keys default to ten Basic commands whose repertoire can be inspected by KLIST. In fact most of the keyboard is software-defined; in Sharp Basic there is no repeat on any keys except the cursor controls, but under CP/M all keys repeat, while in Wordstar the user and numeric pad are assigned to control characters as well.

The 9in green screen display is software-switchable between 40 and 80 characters per line by 25 lines; the characters are 8x9 and have true descenders. At 80 per line, text is quite legible but marginally harder on the eye than

40. The screen is memory-mapped three times over; a 2k video RAM provides for the display of the ASCII characters echoed from the keyboard in normal fashion. In addition, there are two 8k graphics RAMs (the second is optional) which independently map the screen as a 320x200 high resolution dot-addressable display; all three of these video stores reside outside the 64k of user RAM and are switched in and out of the memory map by a Z80A PIO (parallel I/O controller) device. The 'character RAM' is always enabled but either or both of the graphics RAMs may be written to — or displayed under — program control. The screen can be thought of as having a foreground of characters and pixel graphics and two separate 'backdrops' of hi-res graphics, the combination of which allows some very fancy displays.

As you might expect, this facility complicates the memory management of the '80B more than somewhat, but the resulting juggling of page addresses is handled in a user-transparent fashion by the PIO and a PPI (programmable peripheral interface) device so that you always see 64k of contiguous RAM starting at 0000H. Switching between character RAM and graphics RAM 1 is performed by the PIO and between graphics 1 and 2 by OUT port F4H. Should a program access graphics RAM while lying in that part of RAM (above D000H) which would normally be disabled by the PIO, there's no problem; the graphics RAM addresses are changed to begin at 5000H. A similar conjuring trick is performed by the Initial Program Loader on boot-up to allow the boot ROM into the memory map. The result is an unprecedentedly 'clean' machine with all 64k available to the user. The graphics are not particularly fast, which is hardly surprising considering the amount of interrupting that must be going on. It takes six seconds to SET 1000 points.

There is no resident software other than a 2k bootstrap loader in ROM. If a system disk or cassette is present then booting follows automatically on power-on or by pressing the 'IPL' button on the back of the case. Next to this is a separate RESET button which puts you into the monitor without clearing the Basic text area; very handy for recovering from a crash. Booting Disk Basic or CP/M is satisfactorily quick at four seconds and tape Basic is quicker than one expects (105sec) since the cassette drive transfers at a fast 1800 bits/sec. All the tape functions, including FFwd, Rewind and Eject, can be under program control and searching is performed at FFwd speed. Folk of nervous disposition may suffer a nasty turn, however, when the cassette hatch pops open of its own volition in the middle of a program!

Aural stimulation is catered for by an audio amplifier and loudspeaker set in the fascia below the cassette hatch. The volume is controllable by a knob at the rear and goes up to well past annoyance level. A music 'language' is incorporated in the Basic which allows programming of pitch and duration but not of volume or envelope.

The dual double-sided disk drive is the same hardware introduced for the

MZ-80K but, thanks to a new controller card on board the 80B, it no longer requires an interface box and provides twice the capacity (280k per drive under Basic, 340k under CP/M) through double density. It worked without a hiccup during the test even when fed supposedly single-sided disks.

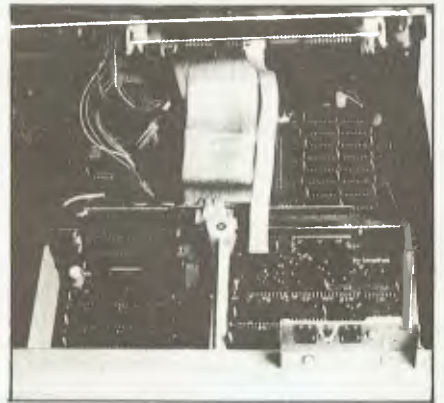
The printer supplied was the new MZ-80P5 which looks and acts remarkably like an Epson MX-80 in Sharp's own case, which is sharply (sic) styled to match the computer. Attached through a 24-pin connector cable, it can print all the graphics including user-defined symbols as well as half- and double-width text. It uses fan fold paper from 4 to 10in and ribbon cassettes.

All the necessary connectors are supplied, including braided earthing wires between units. Each unit requires its own mains lead which is a nuisance; a firm that also makes racked hi-fi ought to have found a neater solution.

## Software

The 80B was supplied with two Basic interpreters (single and double precision) on disk and one on cassette, Pascal on cassette and Sharp's FDOS operating system together with demonstration programs including stock control, word processing and various fancy graphics demos. In addition to this rather overwhelming plethora of Sharp's own software, the machine came with a sample of its implementation of CP/M 2.2 for the machine, along with Wordstar and Datastar.

The single precision disk Basic, SB-6510, is not compatible with versions for the MZ-80K, though a converter program is available so you can run '80K software. It takes up 21k and is booted up automatically along with the 4.5k monitor by the IPL system, in about four seconds. It consists of a 'kernel' of commands which are a fairly standard, though by no means luxurious, implementation of the language together with extensions which



The expansion cards



Fig 1



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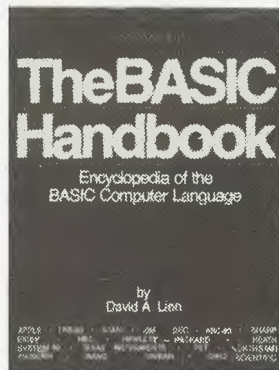
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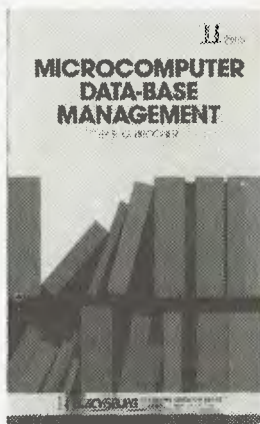
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## MICROCOMPUTER DATA BASE MANAGEMENT

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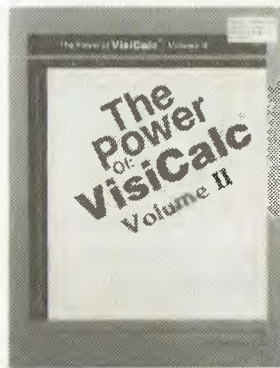
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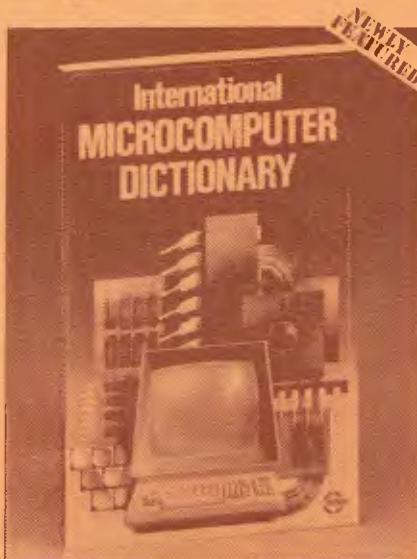
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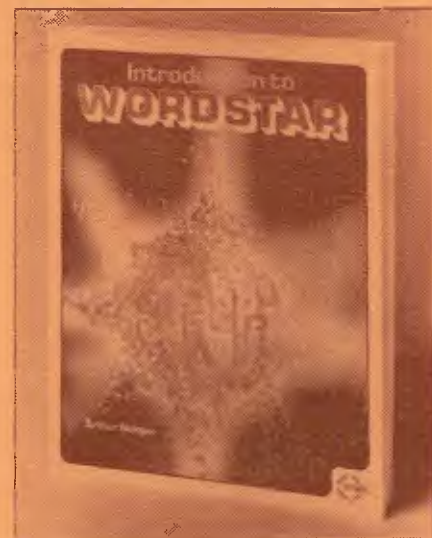
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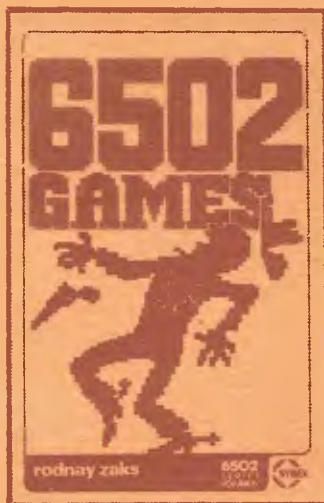
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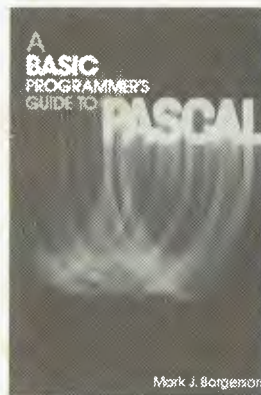
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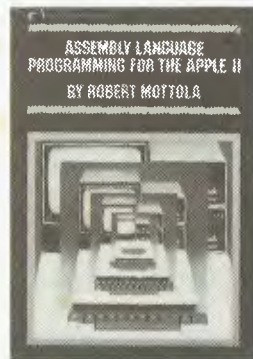
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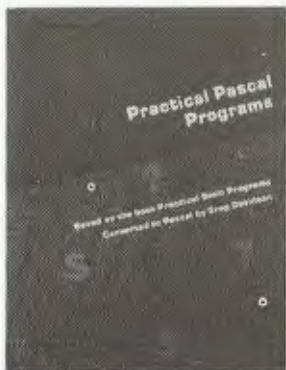
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# BENCHTEST

## COMPUTER SYSTEM

control the special hardware features, such as the hi-res graphics, the music, the cassette drive and the 'soft' keys. No 'structured' extensions, such as ELSE or DO. . . WHILE, are supported. Full screen editing is provided and AUTO line numbering but not RENUMBER or DELETE (the latter facility mysteriously enough is included in the Double Precision version). Syntax checking is only performed after RUN and the error messages, although copious (there are 44 of them) are annoyingly of the form 'Error 53 in line 40' which necessitates keeping the look-up chart at your elbow. To be fair though, the descriptions on the chart are usefully detailed. No HELP is given by cursor position during debugging but the cursor controls will go into quickstep when depressed after SHIFT, which speeds editing considerably.

Variable names may be any length, although only the first two characters are significant; surprisingly, integer variables are not supported.

String variables are 255 chars maximum and in addition to the usual string functions there are CHARACTER \$(x,y) which returns a character from that screen position, STRING \$(x\$,n) which gives n repetitions of the first character of x\$, and SPACE \$x, which gives a string of x spaces. Arrays of one or two dimensions only are permitted and scientific users will, alas, find no matrix-handling functions.

The precision of the arithmetic is 8-digit over the range 10E-19 to 10E19 with error trapping of overflow and underflow.

Both sequential and random access files are supported by the WOPEN and XOPEN statements; sequential files must not exceed 64k and the maximum number of files on a disk is 64, up to ten of which may be simultaneously open. The other file control statements include LOCK, UNLOCK, RENAME, IF EOF THEN, KILL, CHAIN and SWAP; the latter is a handy way of calling in a Basic program file from disk as a subroutine to a running program in memory, which is saved while the SWAPPED routine is running and then resumed. All variables are passed unharmed to and from the SWAP routine. Random access files have a fixed record length of 32 bytes, which made it impossible to run the APC disk Benchmarks in a meaningful way. Reading from and writing to files is a straightforward process using INPUT# or PRINT# and a string or numeric variable; a buffer number follows the '#', defining which open file is referred to. Machine language files may be saved on disk through Basic only by first saving to tape and then invoking a machine code utility called CMT on the master disk, which transfers from tape to disk. Another such utility formats disks, taking one minute to do so. All in all, file handling is simple and effective, if not hypersophisticated.

The picture becomes a bit more exciting when we come to the special graphics control statements. Screen

control in the character mode is achieved through CONSOLE statements which can reverse the whole screen, define a scrolling window and set the display to 80 or 40 columns. CURSORxy puts the cursor at any desired position on the screen and saves its coordinates in two system variables, CRSH and CRSV. Control of the hi-res graphics is at three levels, the lowest of which is addressing of a single dot on the 320 x 200 grid by SETx,y and RESETx,y which blacks the dot out again. The page of video RAM in which this occurs is chosen by the GRAPH statement which selects page 1 or 2 and sets it in input or output mode or clears it, eg, GRAPH 012 sets both areas in output mode.

The next level is that of vector graphics, using LINEx1, y1, x2, y2, x3, y3, . . . which connects the pairs of points specified in its parameters by lines; a whole polygon can be drawn with a single LINE statement. BLINE draws a black line, ie, it resets a line in the same fashion. The third level is that of user-defined pixels through PATTERN n,X\$, which defines an 8 by n dot pattern. Each line of eight dots in the pattern is set to match the eight bits of the binary ASCII code for the corresponding character in string X\$. This pattern can be displayed at any screen location by specifying POSITION x,y. Each graphics area has its own position pointer whose current coordinates are found in system variables POSH and POSV.POINT (x,y) is a function which flags whether or not x,y is set in either or both areas.

In combination, these various facilities amount to a very powerful and economical graphics package though you will probably find PATTERN rather mindbending to use at first. It seems a bit churlish in the circumstances to say that I would have liked shape table graphics as well; certainly these graphics will satisfy most scientific and technical users as well as providing neat screen formatting for business programs.

Printer control is achieved through PRINT/P,LIST/P and DIR/P, in addition to which COPY/P dumps the screen contents to the printer (see Figure 1) and IMAGE/P defines a shape in the same way as PATTERN, but horizontally and on the printer.

The remaining special statements include FAST and REW for the cassette drive, DEF KEY to program a user key and KLIST which lists the key assignments. Multiple statements can be put on one key and may be defined to execute immediately or merely be displayed.

The music feature is controlled by MUSIC, followed by string data, and although the square-wave tones produced are hardly suitable for serious computer music, I found the feature useful for writing little recognisable sequences as audible error messages; these tunes can be accessed by ON ERROR GOTO branches and allow you to relax with a drink while some lengthy procedure is being performed. When a bad sector crashes your program, a little snatch from Siegfried's 'Funeral Music' will summon your attention or the 'Eroica' announce successful completion.

The Monitor is entered by the MON

command or by RESET. It provides the minimal facilities for listing blocks of hex, changing the contents of a location and jumping to a specified address as well as saving, verifying and loading hex files on tape. It has its own manual which includes a complete assembler source listings and Z80 mnemonics.

I've dwelt at length on Disk Basic 6510 because the cassette Basic, which comes free with the machine, is merely a subset of it, minus the file handling, and the Double Precision Basic is Disk Basic with 16-digit accuracy (10E+76) minus the trig log and exponential operators and with DELETE and PRINT USING added. All three Basics are compatible where they overlap. The set of compromises adopted is rather curious since scientific users will require the maths functions and are thus condemned to single precision; business users will certainly need the double precision if they wish to count the cents as well as the dollars. All three Basics are fast (see Benchmarks), the single precision being as fast as any we've tested.

## CP/M

An attraction of this machine for business and sci/tech users must be its ability to run the CP/M operating system. It's a full and well-conceived implementation with various tweaks to make use of the special hardware features of the '80B. Some of these are extra transient commands including BACKUP, a fast copy utility for files and system tracks, .CMT which copies between disk and tape allowing all 80B file types and full recorder control, CONSOLE which imports these commands (see above) into CP/M, and COPY which dumps screen contents to the printer. The keyboard is configured with n-key rollover, auto repeat, SHIFT for caps and 60 user-defined keys (all

ABS	IMAGE/P	REM
ASC	INP	RENAME
ATN	INPUT	RESET
AUTO	INPUT#	RESTORE
BLINE	INPUT/T	RESUME
BOOT	INT	RETURN
CHAIN	KILL	REW
CHANGE	KLIST	RIGHTS
CHARACTERS	LEFTS	RND
CHRS	LEN	ROPEN#
CLOSE	LET	ROPEN/T
CLOSE#	LIMIT	RUN
CLOSE/T	LINE	SAVE
CLR	LIST	SAVE/T
CONSOLE	LIST/P	SET
CONT	LN	SGN
COPY/P	LOAD	SIN
COS	LOAD/T	SIZE
CSRH	LOCK	SPACES
CSRV	LOG	SQR
CURSOR	MIDS	STEP
DATA	MON	STOP
DEF FN	MUSIC	STRS
DEF KEY	NEW	STRINGS
DELETE	NEXT	SWAP
DIM	ON	TAB
DIR	OUT	TAN
DIR/P	PAGE/P	TEMPO
END	PATTERN	THEN
ERL	PEEK	TIS
ERN	POINT	TO
ERROR	POKE	UNLOCK
EXP	POSH	USR
FAST	POSITION	VAL
FOR	POSV	VERIFY
GET	PRINT	WOPEN#
GOSUB	PRINT#	WOPEN/T
GOTO	PRINT/P	XOPEN#
GRAPH	PRINT/T	
IF	READ	

Table 1 reserved words of Disk Basic SB-6510



# First time on Earth.



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Seeing is believing. The large-screen high-focus, green-face display incorporated in the MZ80B gives you high resolution graphics of 320 x 200 dots.

An additional graphic RAM can be added which allows another 320 x 200 dot resolution pattern to be displayed.

This dual high-resolution graphic ability is especially useful for stimulating and displaying a dynamic picture. It can display 40 characters x 25 lines or 80 characters x 25 lines via software switching.

In addition there are facilities for full, on-screen editing, reverse video, partial scrolling and a full range of graphic symbols.

## Character and Graphic Printer

This fast, quiet printer will reproduce your graphic displays and, of course, print-out upper and lower case letters and symbols. A tractor/friction feed version is also available.

## Data Storage/retrieval

The MZ80B has a remarkable memory. 64K of RAM. And that constitutes all the memory area, giving flexible storage of

any computer language and its software.

The cassette deck is electromagnetically-controlled, with a data transfer speed of 1800 bits/sec. combined with a unique programme search facility to make data storage and retrieval super-fast.

## Software

Software includes Basic compiler, PASCAL, COBOL, FORTRAN and numerous accounting applications.

## Floppy Disk Drive

A twin Floppy Disk Drive unit can be added which will give you 560K bytes of storage on double-sided, double-density disks.

## Comprehensive Documentation

Each MZ80B comes complete with a full set of documentation including an

owners' manual giving full circuit diagrams, a monitor reference manual and programming manuals.

## Interfaces

RS232C and IEEE Interfaces are available allowing the MZ80B to communicate with scientific instruments and other peripherals.

## CP/M\* 2.2

CP/M\* is also available making a wide range of packages immediately available including wordprocessing, financial modelling, data base management to mention but a few. CP/M\* also increases the disk capacity to 680K bytes.

(CP/M\* is a Trade Mark of Digital Research Ltd.)

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# BENCHTEST

## COMPUTER SYSTEM

the printer. The keyboard is configured with n-key rollover, auto repeat, SHIFT for caps and 60 user-defined keys (all the soft, cursor, tape and numeric pad keys, plus their shifts). On boot-up, these default to CP/M commands plus emulation of a Lear-Siegler ADM3A terminal; reprogramming is possible to emulate the control codes of Super-Brain, the MZ-80B itself and other terminals to facilitate software transfer. I was supplied with Wordstar, which made full use of these keys and on which this review was written. The hires graphics and music (except for BELL) are not directly available under CP/M but I am told there is a suite of subroutines called EXPAND which allow access to both, and the cassette recorder through Microsoft Basic or any other language under CP/M which uses the Microsoft Calling sequence.

## FDOS and Pascal

Sharp's own FDOS operating system includes a Z80 assembler, linker, editor, symbolic debugger and PROM formatter and is quite 'CP/M-like' in its command structure.

Sharp Pascal has the almost unique distinction of being interpreted rather than compiled and comes on tape together with its own monitor. Not

being a qualified Pascal nut, I merely entered a couple of programs from 'Pascal Programs for Scientists and Engineers' and perused the manual. It is a fully interactive interpreter with screen-oriented editing, as in Basic, combined with line editing to insert and delete since line numbers are provided automatically and consecutively. The interpreter performs a certain amount of formatting, such as converting reserved words to lower-case and adding '0' to integer reals, then syntax-checking is performed on entering G FOR GO. The reward, for a novice such as myself, is usually a rich crop of syntax errors. The main limitations of this Pascal seem to be that it can only handle tape, not disk files, that procedure declarations may not be tested, parameters are passed only by value, and no data structures more complex than an array are allowed in. On the plus side, it includes all the graphic and music control statements from Sharp Basic as well as colour control statements for a future colour enhancement, which the Basic doesn't have. The user keys come up with Pascal reserved words which goes some way toward mitigating the verbosity of the language. It would seem to be handy for learning Pascal if not for serious applications; hopefully, a Disk Pascal will emerge in due course.

## Potential

Sharp's claim that the MZ-80B is a 'general purpose personal computer' is not without justification. Running CP/M, the full system compares favourably with currently popular small business systems in its price range (around \$6300, tax included), especially if it gets discounted. The screen size is not a problem; it can display 80 chars/line of legible text and is quite acceptable for word processing.

The graphics and plotting abilities, together with the availability of Fortran, Lisp, Pascal, Forth, and good machine code development utilities under FDOS, make it attractive for scientific and technical use or as a tool for software houses. The only qualm I have here concerns the Disk Basic (see above).

The biggest question mark hangs over its appeal to hobbyists. The bare '80B with its built-in cassette would make a splendid hobby machine but, at \$2515, one strictly for the wealthy or the dedicated.

## Documentation

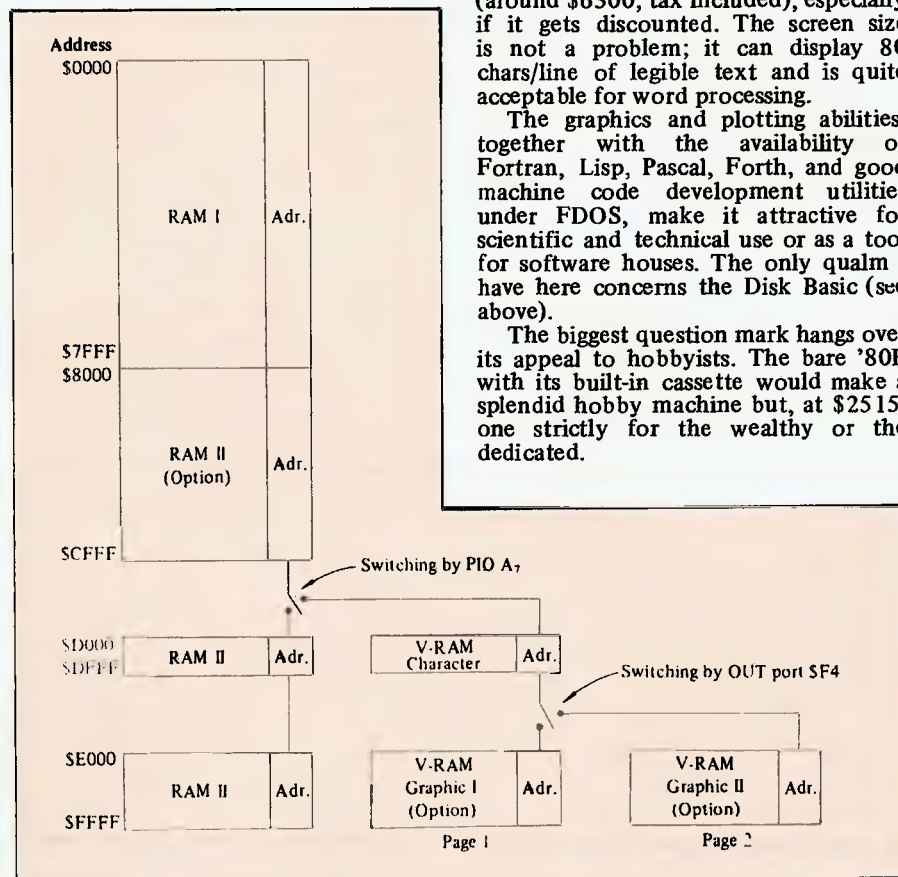
The MZ-80B came with a whole bookshelf full of manuals, a user and a service manual for each hardware item and one for each language. Sharp ran into some flak for the 'kiddies guide to computing' approach taken in the MZ-80K manual and has veered to the other extreme for the '80B Owner's Manual. After 20 pages of basic introduction to the keyboard and operations, it launches into 100-plus pages of detailed hardware discussions including the memory management, PIO control codes and processor architecture, all of which will delight the experienced and terrify the first-time user. The various Basic language manuals consist of very full definitions of the reserved words (with examples) and little more; they inevitably overlap considerably. An experienced Basic user will find them quite adequate for reference. The Pascal manual is rather more ambitious and includes a readable and well-structured beginner's course in Pascal, while the FDOS manual is a massive loose-leaf binder containing an excellent and detailed account of all the facilities plus a detailed description of assembler programming with all relevant listings. All manuals are well produced on good paper though the standard of translation varies from manual to manual and occasionally sinks to the obscure. The upshot is that none of the manuals save the Pascal will be of much use to the total novice, but they contain all the information that an experienced user will need to exploit the system.

## Expandability

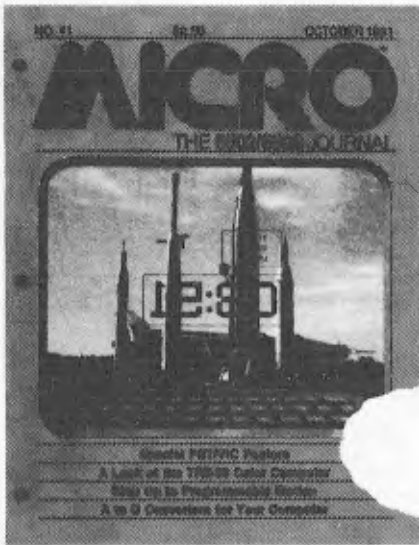
The standard spec for the '80B in Australia comes with the 64k RAM, one of the graphics RAMs and tape Basic. The system can be further expanded using RS232, Centronics and IEEE ports so that daisywheel printers, plotters and other instruments can be hooked up. Sharp itself has a friction/tractor version of the tested printer, designated P6. Sharp has planned a hard disk controller and a colour card for use with a separate monitor.

## Conclusions

There is nothing in the spec of the MZ-80B which breaks new ground as we enter the era of the 16-bit processor; rather, it's a refined example of well-established concepts, a Volvo among micros. It's a versatile and likeable machine which shows evidence of much thought in its design, particularly in the era of user conveniences. It could be equally happy as a high class home computer, a useful small business system or a laboratory instrument. After-sales service should be above average, given that Sharp has an Australian operation. It is already supported by more software than most machines have on launch and more will follow from independent houses as well as the manufacturer. It remains to be



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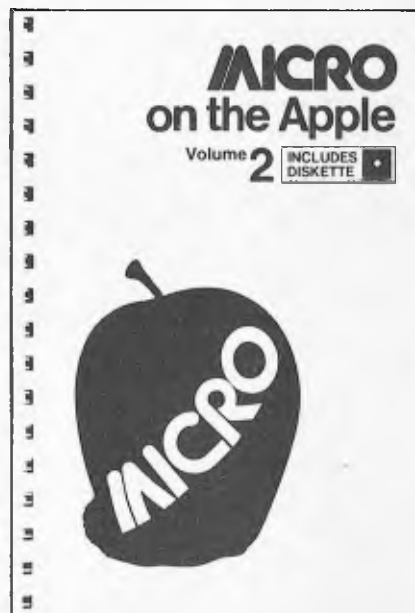
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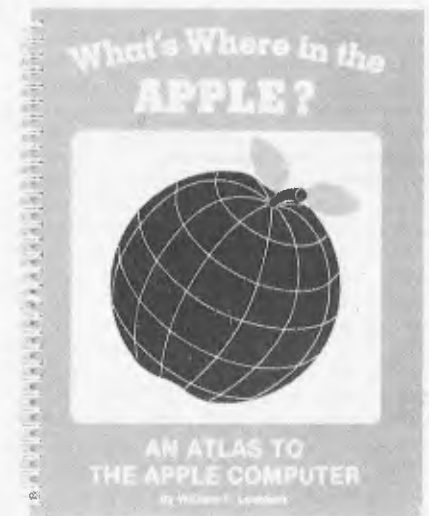
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# SHARP MZ80B

seen how many high level languages will be available which can utilise its excellent graphics potential. Sharp has done most of it right with this product and I wish it well.

## Prices

MZ-80B (inc tape Basic and manuals)	\$2515.00
Expansion port	145.00
Graphics RAM 2	included
Printer (inc interface card and cable)	1199.00
Disk Basic	75.00
Hardware system as tested	6300.00

## Benchmarks:

(Timing in seconds)

	Single Precision Basic	Double Precision Basic
BMI	0.6	0.7
BM2	4.5	5.0
BM3	8.5	12.0
BM4	11.5	19.0
BM5	13.0	20.0
BM6	19.0	27.5
BM7	27.5	38.0
BM8	5.0	—

## Technical specifications

CPU:	Sharp LH0080A (Z80A) 4 MHz.
Memory:	64k dynamic RAM, 10k Video RAM (expandable to 18k), IPL in 2k ROM, character generator in 2k ROM
Keyboard:	92 keys inc numeric, function, cursor and cassette controls, ASCII standard typewriter main keyboard.
VDU:	9in diagonal, green-on-black CRT, 25 lines x 40 or 80 chars, 320x200 dots in graphics mode.
Cassette:	Audio cassette tape, 1800 bits/sec, fast search facility, all functions programmable.
Disk drives:	Sharp MZ-80FD twin double density double-sided 5in 280k per drive, 560k per unit, up to 2 units (4 drives)
Printer:	Sharp MZ-80P5 9x8 dot matrix, 80cps. 40, 68, 80 or 136 chars/line.
Ports:	Optional RS232C, IEEE-488, Sharp Universal I/O
System software:	Optional CP/M, Sharp FDOS
Languages:	Basic, Basic Compiler, Pascal.

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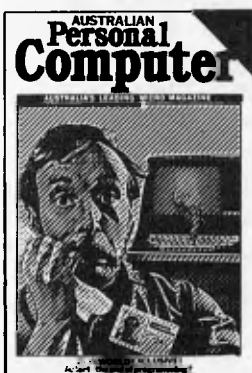
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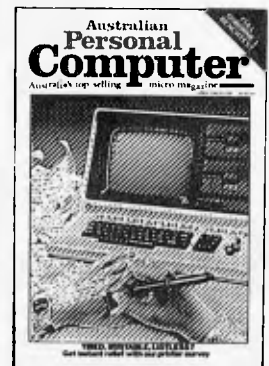
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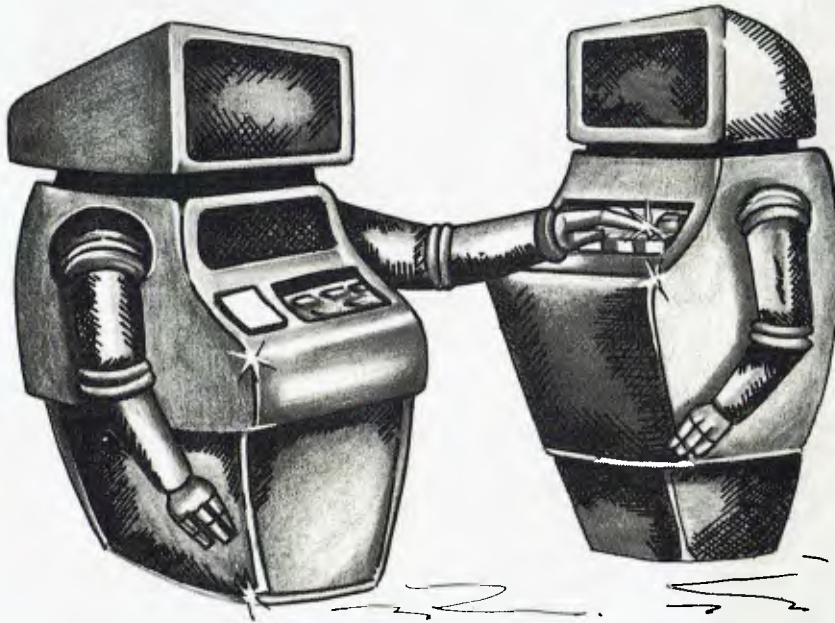
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# HOW COMPUTERS COMMUNICATE.



Part IX

## CHARACTER CODES

by Hewlett-Packard's Steve Leibson

Language is quite possibly the most powerful component of civilisation. Humans could not purposefully organise without shared language. Furthermore, the roots of all major human languages are verbal rather than visual.

Speech, our verbal use of language, would not be possible without the evolutionary heritage humans share that has produced our marvelously complex vocal tract, with lips, teeth, tongue, larynx and other organs we need to produce sound which others may understand. But the hardware of speech is not sufficient for shared understanding - a common language is also required.

### COMPUTER'S ALPHABET

This series has been discussing the hardware components with which computers are built, allowing them to communicate with other machines. It is now time to discuss the languages computers use to communicate with other machines, rather than the equipment they use to do it.

### WANTED: STANDARD CODE

As covered previously, digital computers use a binary language for their internal communication. There are several methods for representing data internally in a computer, however, and it would be advantageous if there were some standard language that computers could use for communicating with other equipment.

In addition, it is important that such a language be compatible with human communications, since some of the devices that the computer will be communicating with are intended to interact with people. Printers and CRT terminals are examples of this type of equipment.

### HISTORY OF CODES

The problem of creating a code, or computer language, that corresponds to an alphabet existed prior to the advent of computers. Even before electricity was harnessed for communications, man-made devices such as flags and semaphores were used to

send messages.

Samuel Morse perfected the first code for electric data transmission, the Morse code. This set of dots and dashes is capable of representing the English alphabet and Arabic numerals so that intelligible messages may be interchanged between remote stations.

Early in this century, interest developed in replacing human telegraph operators with machines. Morse code was too difficult to mechanically decode, due to its variable length per character.

But the idea of standardised code was retained. The dots and dashes evolved into the concept of bits. Each bit could either be a "1" or "0", represented by either the presence or absence of an electrical signal.

The first code to use bits for machine communications used five bits to encode the alphabet. Five bits allowed 32 characters to be represented. Since the English alphabet has 26 characters, and at least ten numerals also need to be represented, it seemed that there would be a problem. There were not enough codes to go around.

### SHIFT CODES

The problem was solved by having two special codes that did not represent characters. Instead, these codes were shift codes. One code, called Letters, caused all following codes to be interpreted as letters of the alphabet. The other code, called Figures, caused all following codes to be interpreted as numerals and punctuation marks.

Such special codes were called shift codes because they shifted between different character sets. There were two five-bit codes that were in wide use, called Baudot and Murray.

These codes were very similar in concept, but varied in some assignments of codes to characters. The existence of two competing codes led naturally to the first I/O incompatibility problems.

### A FLAW

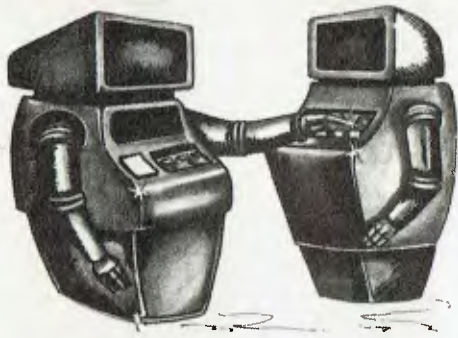
Character codes that relied on shift characters for proper operation were troublesome, because the interpretation of the incoming codes relied on the previous history of the message. Unless the receiving device knew which character set to use, there was a 50% chance of erroneous decoding.

Clearly, five bits were not enough. A code that could represent all the printable characters, and which did not rely on previous transmissions for unambiguous decoding, was needed. In addition, some sort of expandability was desired to prevent another dead end system.

### MODERN CODES

By the time the need for this new code was felt, and the technology which could handle more complex codes became feasible, many manufacturers were involved in constructing electronic equipment which might also use the code. Whenever the need arose for such





**Just as differences in language can create communication problems for humans, character code incompatibility can render an otherwise operable interface useless.**

standardisation, there were two methods of satisfying it.

A single manufacturer could simply go out and invent a solution and expect the rest of the industry to follow. This was the route taken by IBM, which invented the EBCDIC (Extended Binary Coded Decimal Interchange Code) character code. EBCDIC is an eight-bit code allowing 256 characters to be represented. Since there aren't that many printable characters, there are some unused codes in EBCDIC.

## ASCII

The other method of obtaining a standard was through compromise in a committee. Other manufacturers did meet in order to develop a national standard called ASCII (American Standard Code for Information Interchange).

ASCII is a seven-bit code allowing 128 characters to be represented. This includes the alphabet, both upper and lower case, the numerals 0 through 9 and punctuation marks such as the period and the question mark.

In addition, several codes exist to control the operation of the device receiving the message. Codes representing Carriage Return and Line Feed are evident to anyone who uses a type-

writer. Other control codes include Form Feed, Bell and Horizontal and Vertical Tabs. These codes are clearly for control of various printing devices, although manufacturers of some products have used these codes for other machine dependent actions.

Finally, there are codes used to control how the receiving device will interpret subsequent data. There are two shift characters, called Shift In and Shift Out, used to switch between character sets (English letters aren't the only kind, you know). There are also control codes that delimit text. STX (Start of Text) and ETX (End of Text).

ASCII has been a very successful character code. Thousands of instruments and computer-related products use this code for I/O. Even IBM now offers equipment that uses ASCII. Several interfaces have been covered in this series, and all except the BCD interface may be used to transmit and receive ASCII code.

## PLANNING THE ESCAPE

The planners of ASCII tried to foresee as many different applications as possible. That is the reason for including the various control codes. They recognised that technology's advance could not be totally predicted and therefore gave themselves an escape clause.

One of the ASCII characters is called the "escape" character. This

character designates that the characters following have a special meaning.

The intent in creating the escape sequence was to extend the range of the character sets by selecting from a range of available sets. Graphics, nationalised character sets, and special application sets have been developed for selection with certain escape sequences. Escape character sequences allow for a much richer variety of characters than the simple shift in/shift out scheme of the five-bit codes.

The now common CRT terminal has provided the escape sequence its widest application, however. The inclusion of microprocessors in terminal design has greatly augmented CRT capabilities. The serial communications link to these terminals has not been changed in years. One data channel to the host computer is all that is available.

Ordinarily, any characters that are received via this channel are printed on the terminal screen. But capability for character and line deletion, display enhancements such as inverse video and underlining, and even control of tape drives in the terminal does not exist in ASCII standard. The escape sequence allows for these new capabilities.

## CREATIVITY

Manufacturers of CRT terminals are now adding increased performance to their products via escape sequences. Unfortunately, since the actual effect

Bits	b <sub>7</sub> b <sub>6</sub> b <sub>5</sub>				COLUMNS											
	b <sub>4</sub>	b <sub>3</sub>	b <sub>2</sub>	b <sub>1</sub>	0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1				
ROW	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	NUL	DLE	SP	0	@	P	\	p				
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q				
0	0	1	0	2	STX	DC2	"	2	B	R	b	r				
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s				
0	1	0	0	4	EOT	DC4	\$	4	D	T	d	t				
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u				
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v				
0	1	1	1	7	BEL	ETB	/	7	G	W	g	w				
1	0	0	0	8	BS	CAN	(	8	H	X	h	x				
1	0	0	1	9	HT	EM	)	9	I	Y	i	y				
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z				
1	0	1	1	11	VT	ESC	+	;	K	[	k	l				
1	1	0	0	12	FF	FS	,	<	L	\	l					
1	1	0	1	13	CR	GS	-	=	M	]	m	}				
1	1	1	0	14	SO	RS	.	>	N	^	n	~				
1	1	1	1	15	SI	US	/	?	O	_	o	DEL				

Mnemonic and Meaning <sup>1</sup>	Mnemonic and Meaning <sup>1</sup>
NUL Null	DLE Data Link Escape (CC)
SOH Start of Heading (CC)	DC1 Device Control 1
STX Start of Text (CC)	DC2 Device Control 2
ETX End of Text (CC)	DC3 Device Control 3
EOT End of Transmission (CC)	DC4 Device Control 4
ENQ Enquiry (CC)	NAK Negative Acknowledge (CC)
ACK Acknowledge (CC)	SYN Synchronous Idle (CC)
BEL Bell	ETB End of Transmission Block (CC)
BS Backspace (FE)	CAN Cancel
HT Horizontal Tabulation (FE)	EM End of Medium
LF Line Feed (FE)	SUB Substitute
VT Vertical Tabulation (FE)	ESC Escape
FF Form Feed (FE)	FS File Separator (IS)
CR Carriage Return (FE)	GS Group Separator (IS)
SO Shift Out	RS Record Separator (IS)
SI Shift In	US Unit Separator (IS)
	DEL Delete

In this table of ASCII characters, the most significant three bits are shown at the head of each column, in both binary and hexadecimal. The least significant four bits are shown for each row. To determine the ASCII code for an upper case H, use the most significant three bits of column four, 100; and the least significant four bits from row eight, 1000; to form the binary code 1001000. Columns 0 and 1 are non-printing control characters. The rest are printable except for the last character, DEL, which is the delete character.

of these sequences is not covered in the ASCII standard, the terminal designers have felt free to create their own standards.

For example, one major feature now found on most CRT terminals is cursor positioning. The ability to place a cursor anywhere on the screen directly is important for many types of form-filling applications. There are about as many escape sequences for performing this task as there are CRT terminal manufacturers.

They all work similarly. The host computer sends the terminal an escape character. This is followed by a second character indicating that the escape sequence is for cursor positioning. Two more characters follow, giving the X and Y positions for the cursor. Usually the sequence is self-terminating, meaning that four characters including the escape are all that the computer need send.

After receipt of the fourth character, the terminal performs the action requested and prints any further characters received. Note that the ASCII characters in the escape code sequence are not interpreted as printing characters, but as control characters. The escape character has the effect of temporarily converting all ASCII characters to control.

## CODE CONVERSION

The majority of computer equipment uses ASCII character representation today. Unfortunately, some of the older

equipment still in use may not.

Interfacing to these devices requires that the ASCII characters the computer would like to send must be converted to characters that the peripheral would like to receive. Here we are assuming the hardware interfacing requirements have already been met.

In addition, some modern peripherals may have odd requirements that can be met only through code conversion. An example is a printer that automatically inserts line feeds whenever it receives a carriage return. Unless the application calls for double spacing, the printout won't be as desired, since many computers send both carriage return and line feed to denote the end of a line of text.

One solution to this problem is to have the computer convert all line feeds to non-printing characters, such as "nulls". Most peripheral devices ignore the null character, which is the ASCII zero.

Character codes are yet another source of incompatibility in the world of I/O. Just as differences in language can create communication problems in humans, character code incompatibility can render an otherwise operable interface useless.

Fortunately, if the computer has a language that is rich in I/O capability, even this language barrier can be overcome.



Steve Leibson joined the Calculator Products Division (now the Desktop Computer Division) of HP in June, 1975. Since then he has worked on a variety of hardware and software products, all relating to interfacing of desktop computers. His products include the 9878A I/O Expander, the 98036A Serial Interface, the 98224A Systems Programming ROM for the 9825A and the I/O backplane for the System 45.

In 1980 Steve co-authored a book: *The Great Small Business Computer Ripoff* with a close friend, Bill Scott. He has published the book himself by forming a small company called Data Press.

Steve now works for the Auto Trol Technology Corporation of Denver, Colorado.

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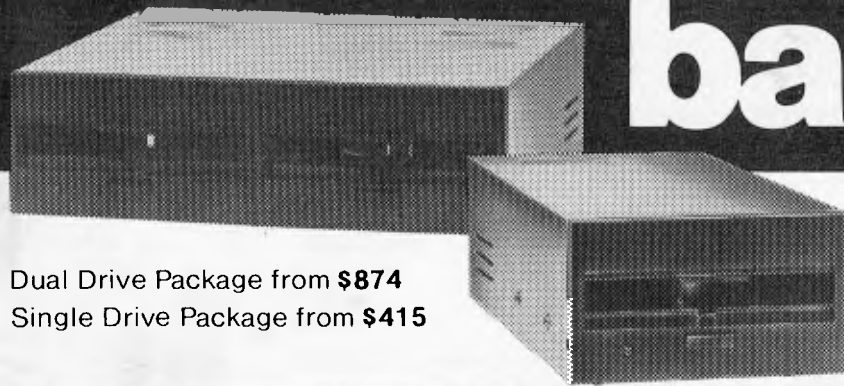
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that is MODE 2. The screen has 72 by 65 cells in this mode. Each line of cells is represented by 24 bytes made up of two control bytes, two bytes for a left margin which cannot be plotted, 18 bytes for the 72 cells, and two more bytes for the right margin. Moving left to right across the screen, these bytes are in descending order in store. The upper control byte for the top line is always at store location # BFEF, so the top left of the plottable screen is stored in #BFEB. the top right (71, 64) at #BFEB-17, and the bottom left (10, 0) at #BFEB-64\*24.

Each block of eight cells is represented by two bytes, two bits per cell. The top bit in each byte determine together the leftmost cell in the block, and so on down the two bytes. The value of the two bits together give which of the four possible colours is to be used - how these four colours are chosen from the total of 16 is set in the control bytes for the line.

Program G1 copies an area of 32 by 20 cells from the bottom left of the screen to the bottom right, and reverses it. SCRIN reads the colour of the cell at the stated coordinates. This method is slow because each call to SCRIN causes two bytes to be fetched from store and the appropriate bit unpacked from each of them, while DOT entails setting a bit in each of two bytes. It does not use the array A.

Program G2 using the reversing array A runs about four times faster. There is no packing and unpacking of bits to do. The bits in each byte are reversed and pairs of bytes along a line are reversed in order so that bytes a b c d e f g h become g h e f c d a b. Once again the price of speed is a more complicated program. This can easily be adapted to work in other modes - higher resolution and 16 colours. I have chosen the simple case where the edges of the areas to be copied to and from, line up with the blocks of eight cells corresponding to a pair of bytes. Clearly if the edges pass through the middle of a block of eight, there will have to be some packing and unpacking, but this will be once or twice for each byte rather than for every bit, and the program will still be two or three times faster than the method using SCRIN and DOT.



Fig 1



Fig 2

# PATTERNS

```

200 MODE 2
210 COLORG 0 1 2 3
220 FOR I=0 TO 19
230 FOR J=0 TO 31
240 DOT 71-J,I SCRIN(J,I)
250 NEXT J
260 NEXT I
Program G1
    
```

```

200 MODE 2
210 COLORG 0 1 2 3
220 B= BFEF-64*24
230 FOR I=0 TO 19
240 FOR J=0 TO 7 STEP 2
250 POKE B+J-16,A(PEEK(B-J))
260 POKE B+J-17,A(PEEK(B-J-1))
270 NEXT J
280 B=B+24
290 NEXT I
Program G2
    
```

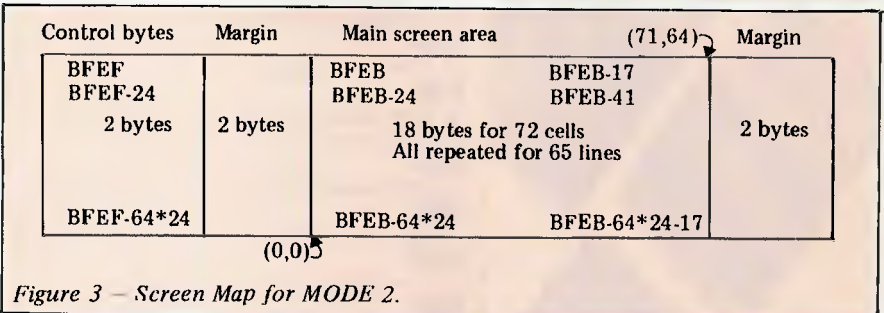


Figure 3 - Screen Map for MODE 2.

Next month, if I keep to my plans, I shall show some patterns based on a simple program to generate octagons - and write about deciding in 3-D graphics

which lines and planes are behind which others - the famous hidden surface problem.

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## PET COMPUTED RESTORE

Listed below is a routine which allows the user to perform RESTORE to a line number. After running the appropriate Basic loader program for new or old ROMs (Basic 4 and VIC owners will have to make their own alterations), SYS RE, X will RESTORE to line X. The next time DATA is required the Basic interpreter will start searching from line X as if nothing had happened.

This function can be useful in reading information from a table of DATA statements too large to be copied into an array. Considerable memory space is saved with only a slight loss in speed.

The following example

uses the routine to get close to the required item, then READs consecutive items until the right one is reached. To READ the Nth string into D\$ from the program's own DATA use:  
SYS RE, 100 + 10 \* INT(N/8);  
FOR X = 0 TO N AND 7:  
READ D\$ : NEXT

Remember to check that N lies within 0-29 and that RE = 1031. Note that the INT(N/8) and N AND 7 bits refer to the number of items on a DATA line, ie, 8.

The routine is POKE0 into the REM statement on line 0, so once the program has been run only lines 0 and 10 are required. Alternatively the routine can

be located elsewhere by changing the value of RE, although I find that having the code in a REM statement is more convenient.

An 'ILLEGALQUANTITY ERROR' will occur if the line number is not in the range 0 - 65535 and an 'UNDEF'D

STATEMENT ERROR' if the line does not exist. The latter of these may be disabled by changing the JMP instruction to BIT (line 110 - replace 4C with 2C), causing RESTORE to the line following.

David McKeran

### COMPUTED RESTORE

```
0 REM"RESERVED FOR MACHINE CODE....."
10 RE=1031
100 DATA 20,F8,CD,20,8B,CC,20,D2
110 DATA D6,20,2C,C5,B0,03,4C,EB
120 DATA C7,A4,5D,A6,5C,D0,01,88
130 DATA CA,86,3E,84,3F,60
200 FORM=0TO29:READ I$:DD#=MID$(D$,2)
210 POKE RE+X,16*(ASC(D$)-9*(D$)="A")AND15)+(ASC(DD$)-9*(DD$)="A")AND15)
220 NEXT
READY.
```

### OLD ROM DATA

```
100 DATA 20,11,CE,20,A4,CC,20,D0
110 DATA D6,20,22,C5,B0,03,4C,DB
120 DATA C7,A4,AF,A6,AE,D0,01,88
130 DATA CA,86,90,84,91,60
READY.
```

## APPLESOFT FORMATTER

In many programming applications it is important to produce nice-looking tables which can be used and understood with pleasure. To make this task easier some dialects Basic and most of the more sophisticated languages have formatters built into them which handle the presentation of numeric output. Unfortunately, Applesoft has no such feature and it is the purpose of this note to offer a flexible formatting subroutine for use in Applesoft programmes.

The subroutine is listed in Fig 1 where it will be seen that, despite its simplicity, it has the following powerful features:

All rounding is correct and symmetric for both posi-

tive and negative numbers.

Numbers are presented right justified in a field of specified width. Furthermore they are located so that when printed in columns they line up correctly.

Decimal points are suppressed in whole numbers.

Zeros are replaced by blank space or, if preferred, by a specified string.

Numbers which are too large for the field width are replaced by a specified string and do not throw adjacent fields out of alignment.

A prefix or suffix can easily be added to numbers.

Negative numbers need not be denoted by a minus sign but could use, eg, brackets.

Commas are inserted between thousands in large

numbers.

The symbol used to denote the decimal point or to separate thousands can easily be changed.

An example program, listed in Fig 2, shows how simple it is to use the subroutine in a program.

The most obvious improvement is to shift lines 10010-10040 to the calling program. This will ensure that they are only repeated when absolutely necessary and not every single time the subroutine is called. Furthermore, since the calculation of DD would be particularly slow it may be worth taking some extra trouble with this to gain more speed. One possible approach would be to set up an array D with D

(I)=INT(10/I+.5) and subsequently to use DD=D(D) instead of the actual calculation.

A couple of further speed improvements are possible because of specific characteristics of Applesoft. The first of these is to replace all the integer constants by variables of equivalent value because, surprisingly enough, evaluating (L1+1) would be slower than evaluating (L1+Z). The second improvement would be to renumber the subroutine so that it resides as early in the program as possible.

If speed continues to be a problem after these steps have been taken it is possible to gain a little more by deleting line 10090. Commas would, of course, no longer be inserted but otherwise there would be no effect on the operation of the program.

The only significant shortcoming of the formatter is its inability to handle more than nine significant figures. The reason for this is that beyond nine figures the Applesoft function STR\$ returns the number in exponent form. However, if that would be acceptable in a particular application the subroutine may be appropriately modified by replacing the right hand side of 10050 by X\$=STR\$(X):L1=LEN(X\$):GOTO 10120.

Michael J Barron

```
10000 REM ***SUBROUTINE*** FORMAT
Requires X (real number) ; FW (field width) ; D (decimal places)
Returns X$ (formatted number)

10010 DD = INT (10 ^ D + .5) : REM Calculate scale factor
10020 S$ = " " : REM Enough spaces to accommodate the widest field width
10030 SS$ = RIGHT$(S$,FW) : REM Set string for X$ when X is zero
10040 SNS$ = RIGHT$(S$ + "N/A",FW) : REM String for X$ when X is too large for the field width
10050 XX = ABS (X) * DD : IF XX > 999999999 THEN X$ = SNS$ : RETURN
10060 IF XX < .5 THEN X$ = SS$ : RETURN
10070 X$ = STR$(INT (XX * .5)) : IF XX < DD THEN X$ = RIGHT$( "000000" + X$,D + 1)
10080 L1 = LEN (X$) : L2 = D + 3
10090 IF L1 > L2 THEN X$ = LEFT$(X$,L1 - L2) + "," + RIGHT$(X$,L2) : L1 = L1 + 1 : L2 = L2 + 4 : GOTO 10090
10100 IF D > 0 THEN X$ = LEFT$(X$,L1 - D) + "." + RIGHT$(X$,D) : L1 = L1 + 1
10110 IF X < 0 THEN X$ = "-" + X$:L1 = L1 + 1
10120 IF L1 > FW THEN X$ = SNS$ : RETURN
10130 X$ = RIGHT$(S$ + X$,FW)
10140 RETURN
```

Fig 1

```
10 REM PROGRAM TO ILLUSTRATE FORMAT
20 FW = 10 : D = 2 : REM Set FW (field width) and D (decimal places)
30 BUFFER$ = "" : REM Empty the buffer
40 FOR I = 1 TO 4 : INPUT "NUMBER ? "; X : GOSUB 10000 : BUFFER$ = BUFFER$ + X$ : NEXT
50 PRINT : PRINT BUFFER$
60 GOTO 30
70 END
```

Fig 2



## ZX81 MEMORY MANAGEMENT

This subroutine was designed for use with the ZX81 plus 16K expansion board, to show how much memory has been used by a main program for each of the four main RAM areas — 'Program', 'Display', 'Variables' and 'Spare capacity'. The start and finish addresses are also printed under each subheading, and the memory utilisation is printed at the bottom of the screen as a percentage of the total available.

String variables A\$ and B\$, suitably sliced and added to 16000, generate the PEEK addresses of the RAM boundaries. E\$ is an array containing subheadings. The loop 9610 to 9700 carries out all functions except for printing the percentage utilisation, which is undertaken by 9710. Statements 9650, 9730 and 9740 generate the first RAM address which is not available as a PEEK function. The first three characters in B\$ are dummies.

The subroutine could be extended to give information about the GOSUB stack, etc, by adding additional addresses into A\$ and B\$, enlarging E\$ to include additional subheadings, and increasing the number in the FOR-NEXT statement, but the format would have to be reorganised to prevent screen overflow. Remember also that the subroutine detracts from the total usable memory available for the main program, so don't overdo it!

If the subroutine is loaded from tape before keying in the main program, it will be SAVED again whenever the main program is saved and will therefore always be avail-

able to keep tabs on the memory situation. When the bottom line says 'MEMORY UTILISATION = 98%' — don't panic. Just erase the subroutine and release a few more bytes.

Any machine code subroutines used in the main program after RAMTOP should not affect the accuracy of the 'Memory status' statement, but any bytes POKED between STKEND and ERR SP will reduce the spare capacity available without being detected by the subroutine. The machine stack will usually also occupy a few bytes in this area. No attempt has been made to quantify these sources of error because they are normally relatively small, but purists may wish to take the matter further themselves.

The choice of names of the string variables used in the listing was made to avoid ambiguity with those in a specific main program; others may be more suitable for readers' applications.

It might be possible to use the subroutine on a 1k memory provided the centre parentheses of 9710 were changed to 1 — (JA-JB)/1024 and some of the frills were removed. Statements 9500-9600 could be omitted for minimisation after the variables A\$, B\$ and E\$ have been set up and SAVED onto tape, provided the RUN button is avoided. Any advantage gained by using this routine on a 1k memory should be balanced against the amount of precious memory it uses up itself.

G E Coucher

```

9500 REM MEMORY MANAGEMENT
9510 LET A$ = "396400404386"
9520 LET B$ = "509396400412"
9530 DIM E$(4,10)
9540 LET E$(1) = "PROGRAM"
9550 LET E$(2) = "DISPLAY"
9560 LET E$(3) = "VARIABLES"
9570 LET E$(4) = "SPARE CAP"
9580 CLS
9590 PRINT TAB 9; "MEMORY STATUS"
9600 PRINT TAB 9; "... "
9610 FOR E=1 TO 4
9620 LET J1=VAL A$(3*E-2 TO 3*E) + 1600
9630 LET J2=VAL B$(3*E-2 TO 3*E) + 1600
9640 LET JA=PEEK J1+256*PEEK (J1+1) - 1
9650 IF E=1 THEN GOTO 9730
9660 LET JB=PEEK J2+256*PEEK (J2+1)
9670 PRINT AT 4*E, 0; E$(E); TAB 12; (JA-JB)/1000;"KBYTE"
9680 PRINT "STARTING ADDRESS"; TAB 26; JB
9690 PRINT "FINISHING ADDRESS"; TAB 26; JA
9700 NEXT E
9710 PRINT AT 21,3; "MEMORY UTILISATION=";
INT (.005+(100*(1-(JA-JB)/16384)));"P.C."
9720 RETURN
9730 LET JB=16509
9740 GOTO 9670
    
```

# STOP

(Read this now!)

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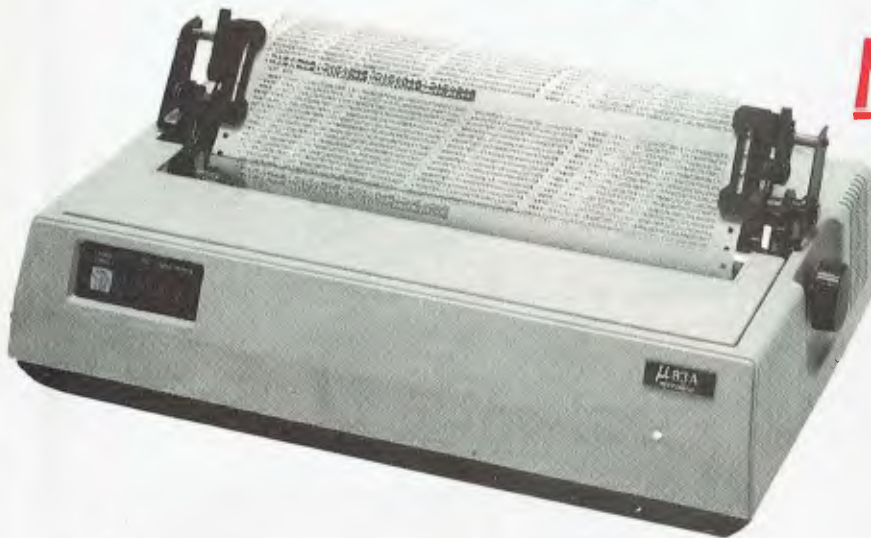


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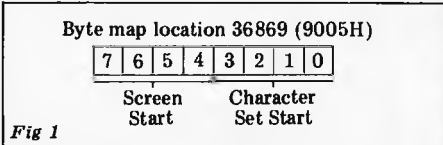


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# VIC USER-DEFINED CHARACTERS



Value representation of lower four bits of location 36869 (9005H)

Bit	Value if set	Value if not set
0	1024 (0400H)	0 (0000H)
1	2048 (0800H)	0 (0000H)
2	4096 (1000H)	0 (0000H)
3	0 (0000H)	32768 (8000H)

eg,

BITS	VALUE
0110	6144 (1800H)
1101	37888 (9400H)

Fig 2

To find current character set start

```
CT = PEEK (36869) AND NOT 240
TS = (1 - INT ((CT AND NOT 7)/8)) * 32768 + (CT AND NOT 8) * 1024
CT = Lower four bits of location 36869 (9005H)
TS = Address of current character set
```

Fig 3

To set character set start

```
CT = ( - INT (TS/32768)) * 8 + INT (TS - INT (TS / 32768) * 32768) / 1024
POKE 36869, PEEK (36869) AND NOT 15 OR CT
CT = Lower four bits of location 36869 (9005H)
TS = Address of current character set
```

Fig 4

Start address	Description
32768 (8000H)	Upper case & Graphics (1k)
33792 (8400H)	Reversed upper case & reversed graphics (1k)
34816 (8800H)	Lower/upper case & graphics (1k)
35840 (8C00H)	Reversed upper/lower case & reversed graphics (1k)

From character set (4k) = 32768 - 36863 (8000H - 8FFFH)

Fig 9

VALUE IS SET								POKE	LOC'N
								24	7618
								126	7619
								126	7620
								126	7621
								60	7622
								24	7623
								126	7624
								255	7625
								255	7626
								189	7627
								189	7628
								189	7629
								189	7630
								189	7631
								189	7632
								60	7633
								60	7634
								60	7635
								60	7636
								60	7637
								60	7638
								60	7639
								126	7640
								231	7641
								0	7642
								0	7643
								0	7644
								0	7645
								0	7646
								0	7647
								0	7648
								0	7649
								0	7650

Fig 5

## Example of programming the character set

```
10 POKE 56, 28, CLR
30 TS = 7168
40 CT = (1 - INT (TS/32768)) * 8 + INT (TS - INT (TS / 32768) * 32768) / 1024
50 POKE 36869, PEEK (36869) AND NOT 15 OR CT
60 FOR I = TS TO TS + 31: READ J: POKE I, J: NEXT
70 FOR I = 64 TO 67: A$ = A$ + CHR$(I) + CHR$(17) + CHR$(157): NEXT
80 FOR I = 1 TO 4: A$ = A$ + CHR$(145): NEXT: A$ = A$ + CHR$(29)
90 PRINT TAB (10); A$
100 DATA 24, 126, 126, 126, 60, 24, 126, 255, 255, 189, 189, 189, 189, 189, 189, 60
110 DATA 60, 60, 60, 60, 60, 60, 126, 231, 0, 0, 0, 0, 0, 0, 0, 0
```

Fig 6a

I have used A\$ as a type of defined shape. It uses cursor commands to print one part of the man below another then the cursor is moved to the next printing position.

## Changes to part a to use an 8 x 16 matrix

```
20 POKE 36867, 33: POKE 36865, 22
70 FOR I = 64 TO 65: A$ = A$ + CHR$(I) + CHR$(17) + CHR$(157): NEXT
80 FOR I = 1 TO 2: A$ = A$ + CHR$(145): NEXT: A$ = A$ + CHR$(29)
```

Fig 6b

## Ordered plan of steps involved when programming the VIC character set.

1. Draw shapes on paper (see fig 5)
2. Work out POKE values (see fig 5)
3. Work out memory requirements and where to locate the shapes.
4. Write program:-
  - a) reserve memory
  - b) clear strings and variables
  - c) if necessary change screen/character size
  - d) set location 36869 (9005H) to character definition start (see figs 1, 2, 4)
  - e) Read data lines containing POKE values and POKE into reserved memory.

Fig 7

## Some CHR\$, PEEKs and POKEs

- CHR\$(17) - Cursor down
- CHR\$(29) - Cursor right
- CHR\$(145) - Cursor up
- CHR\$(157) - Cursor left
- CHR\$(8) - Disable Commodore & SHIFT
- CHR\$(9) - Enable Commodore & SHIFT
- CHR\$(14) - Switch to lower case
- CHR\$(142) - Switch to upper case
- 55-56 (37H - 38H) - Top of memory pointer
- 646 (286H) - Current colour code (try POKEing this to a value in the range of (8 - 15)
- 36869 (9005H) - Lower four bits are character set start

Fig 8

In the adverts for the VIC you are told that it is possible to program the character set, but the manual does not tell you how to do this. Programming your own characters would, however, improve your games and animated displays drastically. Once you know how to do this you will have a lot of control over what comes on the VIC screen.

The characters on the VIC can be placed in either of two areas of memory. The starting addresses of these areas are: 0 - 7168 (0000H - 1C00H) inclusive (RAM); 32768 - 39936 (8000H - 9C00H) inclusive (ROM).

The start of the character set in ROM is 32768 (8000H). The address at which the character set starts must be a multiple of 1024. This means that the character set has a minimum movement of 1k (1024 bytes).

Location 36869 (9005H) contains the address of the start of the character set in the memory. This byte also contains some of the screen pointers (the start of the

screen RAM if you want to know). When moving the character set we must not alter these. Fig 1 shows a plan of the byte. Fig 2 is a table of values representing the lower four bits which denotes the starting address of the character set.

Once I had worked out how this byte worked I wrote two small programs to find the character set start address and relocate the start of the character set to your own requirements. These programs are Figs 3 and 4 respectively.

You have a choice of an 8 x 8 character matrix or an 8 x 16 matrix when making your shapes. If you use 8 x 8 characters then you need not reset anything. If you require 8 x 16 characters then you should use the following line in your program to convert the VIC to 16 lines of 8 x 16 characters:

```
POKE 36867, 33:
POKE 36865, 22
```

You will notice that the size of the screen suddenly grows when you use this

routine. The bottom line will be off the screen.

Once you have selected the size of character to use you must reserve yourself some memory in which to store your shapes. Memory locations 55 - 56 (37H - 38H) will contain this. The top of memory is usually set to 7680 (1E00H). If you moved the top of memory down to 7168 (1C00H) then you would have 512 (200H) reserved bytes (Note: 7168 is a multiple of 1024). This could give you 64 8 x 8 characters or 32 8 x 16 characters, because 8 x 8 characters take up 8 bytes and 8 x 16 characters take up 16 bytes. Use the following line to reserve this space:

```
POKE 56, 28 : CLR.
```

If you reserve this space then you can start your character set at location 7168(1C00H).

To actually make your character I will explain with an example of a small man. You should set out a table for your characters like the one in Fig 5. To work out the

POKE value you should add up the values of the bits where a point is to be plotted.

Once you have the POKE values worked out you should POKE them into your reserved memory. This is done by starting at the top of your list of POKE values and POKEing them one after the other into your reserved memory. The first value will be stored at the start of this memory and the second at the start + 1 and so on. Fig 6a shows a program to store my small man using four 8 x 8 characters. Fig 6b shows the changes required to use two 8 x 16 characters.

Fig 7 is an ordered plan of the steps involved when creating a character set. The ordering of it is different to the ordering of my explanations because after setting the top of memory you must clear all strings and variables. If this step is done first then you will not lose any of the character set addresses.

Kevin Irving



# APOC SUBSET

by Ian Davies

Continuing last month's series of routines for assembly language enthusiasts, SUB-SET presents a selection of numeric utilities for a number of processors.

## 6502 32-BIT ARITHMETIC

This month's numeric special kicks off with a couple of

### Datasheet

```

SNEG46 - Negate 4 bytes
CLASS: 2
TIME CRITICAL?: No
DESCRIPTION: Negates (2's complement) 4 bytes in zero page
              with the Cy copying the sign of the result
ACTION:      Byte count ← 4
              Byte pointer ← 0
              Cy ← 1
              Loop until byte count zero
              Byte ← 0 - byte - Cy
              Byte pointer ← byte pointer + 1
              Byte counter ← byte counter - 1
              Loop end
              Cy ← sign of result

SUBr DEPENDENCE: None
INTERFACES: None
INPUT:         Locations M1 - M4 contain a signed 32-bit number with
              the most significant byte in M4 and the least
              significant in M1
OUTPUT:        Locations M1 - M4 are negated and the carry is set
              to the resultant sign
REGs USED:    A, X, P, M1 to M4 and ME
STACK USE:    None
LENGTH: 20
T STATES: 92
PROCESSOR: 6502
    
```

```

SNEG46:  LDA  £4      ; byte count          A9 04
          STA  ME      ; to memory.          85 ZZ
          LDX  £0      ; RAM point.          A2 00
          SEC          ; set carry initially. 38
SNG1:    LDA  £0      ; subtract byte      A9 00
          SBC  M1,X    ; from zero and    F5 ZZ
          STA  M1,X    ; store back to RAM. 95 ZZ
          INX          ; point to next byte. E8 ZZ
          DEC  ME      ; all done?          C6
          BNE  SNG1   ; jump if not.       D0 F5
          ASL  A        ; cy = sign.        0A
          RTS          ;                    60
    
```

### Datasheet

```

SBAD46 - 32-bit binary to ASCII-Decimal conversion
CLASS: 2
TIME CRITICAL?: No
DESCRIPTION: Converts a signed 32-bit binary number to an
              ASCII-Decimal string.
ACTION:      Make value absolute.
              If negative put "-" to RAM.
              Divide number by ten
              put remainder onto stack
              increment number of digits
              repeat until number = 0.
              Pop digit off stack
              convert to ASCII and load into RAM.
              Decrement number of entries
              repeat until number of entries = 0.
              Put ASCII CR into RAM for terminator.
SUBr DEPENDENCE: SNEG46
INTERFACES: None
    
```

routines for 32 bit manipulation on a 6502 based machine. The first routine, SNEG46, simply negates a 32 bit quantity. Not a spectacular operation in itself, but extensive use of this routine is made in the other numeric routines. The second routine is called SBAD46 and performs a 32 bit binary to ASCII decimal conversion.

These routines make use of the mnemonics M0 through to M4. These refer to a working storage area which may be assigned to any five contiguous bytes within page zero. This set of routines will continue next month with multiplication, division and ASCII to binary conversion.

```

INPUT:       M1-M4 contains the signed 32-bit number for conversion
              with the least significant byte at M1 and the most
              significant at M4.
OUTPUT:      MA,MB contain the RAM start address of the result.
              MA,MB are unchanged.
              The ASCII string equivalent is in RAM starting at
              the address given in MA,MB.
REGs USED:   A, X, Y, P, M0 to M4, MA and MB.
STACK USE:   10 maximum.
LENGTH: 73
T STATES: 13,007 maximum
PROCESSOR: 6502

SBAD46:  LDY  £0      ; RAM point.          A0 00
          BIT  M4      ; test sign.          24 ZZ
          BPL  SBD1   ; skip if positive    10 08
          LDA  £3D    ; else put "-"      A9 2D
          STA  (MA),Y ; to RAM.          91 ZZ
          INY          ; point to next RAM  C8
          JSR  SNEG46 ; and negate number  20 XX XX
          STY  M0      ; save RAM point.    84 ZZ
          LDY  £0      ; number of digits = 0. A0 00
          LDX  £32    ; bit count = 32.    A2 20
          LDA  £0      ; zeroise accumulator A9 00
          ASL  M1     ; shift              06 ZZ
          ROL  M2     ; number             26 ZZ
          ROL  M3     ; left               26 ZZ
          ROL  M4     ; into              26 ZZ
          ROL  A      ; accumulator        2A
          CMP  £10    ; is acc less than 10? C9 0A
          BCC  SBD4   ; skip if so, else    90 04
          SBC  £10    ; subtract ten       E9 0A
          INC  M1     ; and set a result bit. E6 ZZ
          DEX          ; repeat            CA
          BNE  SBD3   ; 32 times.         D0 EC
          PHA        ; save digit.         48
          INY        ; increment no of digits. C8
          LDA  M4     ; check              A5 ZZ
          ORA  M3     ; if number          05 ZZ
          ORA  M2     ; is zero           05 ZZ
          ORA  M1     ; and               05 ZZ
          BNE  SBD2   ; repeat if not.     D0 DC
          TYA        ; transfer            98
          LDY  M0     ; Y to X.           AA
          LDY  M0     ; restore RAM point.  A4 ZZ
          PLA        ; pop digit off stack. 68
          CLC        ; convert it         18
          ADC  £30    ; to ASCII          69 30
          STA  (MA),Y ; and put into RAM.  91 ZZ
          INY        ; increment RAM point. C8
          DEX        ; get next          CA
          BNE  SBD5   ; digit, else       D0 F6
          LDA  £13    ; load ASCII CR     A9 0D
          STA  (MA),Y ; and put it to RAM.  91 ZZ
          RTS          ;                    60

SBD1:    JSR  M0      ; and negate number  20 XX XX
          STY  M0      ; save RAM point.    84 ZZ
          LDY  £0      ; number of digits = 0. A0 00
          LDX  £32    ; bit count = 32.    A2 20
          LDA  £0      ; zeroise accumulator A9 00
          ASL  M1     ; shift              06 ZZ
          ROL  M2     ; number             26 ZZ
          ROL  M3     ; left               26 ZZ
          ROL  M4     ; into              26 ZZ
          ROL  A      ; accumulator        2A
          CMP  £10    ; is acc less than 10? C9 0A
          BCC  SBD4   ; skip if so, else    90 04
          SBC  £10    ; subtract ten       E9 0A
          INC  M1     ; and set a result bit. E6 ZZ
          DEX        ; repeat            CA
          BNE  SBD3   ; 32 times.         D0 EC
          PHA        ; save digit.         48
          INY        ; increment no of digits. C8
          LDA  M4     ; check              A5 ZZ
          ORA  M3     ; if number          05 ZZ
          ORA  M2     ; is zero           05 ZZ
          ORA  M1     ; and               05 ZZ
          BNE  SBD2   ; repeat if not.     D0 DC
          TYA        ; transfer            98
          LDY  M0     ; Y to X.           AA
          LDY  M0     ; restore RAM point.  A4 ZZ
          PLA        ; pop digit off stack. 68
          CLC        ; convert it         18
          ADC  £30    ; to ASCII          69 30
          STA  (MA),Y ; and put into RAM.  91 ZZ
          INY        ; increment RAM point. C8
          DEX        ; get next          CA
          BNE  SBD5   ; digit, else       D0 F6
          LDA  £13    ; load ASCII CR     A9 0D
          STA  (MA),Y ; and put it to RAM.  91 ZZ
          RTS          ;                    60

SBD2:    LDY  £0      ; number of digits = 0. A0 00
          LDX  £32    ; bit count = 32.    A2 20
          LDA  £0      ; zeroise accumulator A9 00
          ASL  M1     ; shift              06 ZZ
          ROL  M2     ; number             26 ZZ
          ROL  M3     ; left               26 ZZ
          ROL  M4     ; into              26 ZZ
          ROL  A      ; accumulator        2A
          CMP  £10    ; is acc less than 10? C9 0A
          BCC  SBD4   ; skip if so, else    90 04
          SBC  £10    ; subtract ten       E9 0A
          INC  M1     ; and set a result bit. E6 ZZ
          DEX        ; repeat            CA
          BNE  SBD3   ; 32 times.         D0 EC
          PHA        ; save digit.         48
          INY        ; increment no of digits. C8
          LDA  M4     ; check              A5 ZZ
          ORA  M3     ; if number          05 ZZ
          ORA  M2     ; is zero           05 ZZ
          ORA  M1     ; and               05 ZZ
          BNE  SBD2   ; repeat if not.     D0 DC
          TYA        ; transfer            98
          LDY  M0     ; Y to X.           AA
          LDY  M0     ; restore RAM point.  A4 ZZ
          PLA        ; pop digit off stack. 68
          CLC        ; convert it         18
          ADC  £30    ; to ASCII          69 30
          STA  (MA),Y ; and put into RAM.  91 ZZ
          INY        ; increment RAM point. C8
          DEX        ; get next          CA
          BNE  SBD5   ; digit, else       D0 F6
          LDA  £13    ; load ASCII CR     A9 0D
          STA  (MA),Y ; and put it to RAM.  91 ZZ
          RTS          ;                    60

SBD3:    ASL  M1     ; shift              06 ZZ
          ROL  M2     ; number             26 ZZ
          ROL  M3     ; left               26 ZZ
          ROL  M4     ; into              26 ZZ
          ROL  A      ; accumulator        2A
          CMP  £10    ; is acc less than 10? C9 0A
          BCC  SBD4   ; skip if so, else    90 04
          SBC  £10    ; subtract ten       E9 0A
          INC  M1     ; and set a result bit. E6 ZZ
          DEX        ; repeat            CA
          BNE  SBD3   ; 32 times.         D0 EC
          PHA        ; save digit.         48
          INY        ; increment no of digits. C8
          LDA  M4     ; check              A5 ZZ
          ORA  M3     ; if number          05 ZZ
          ORA  M2     ; is zero           05 ZZ
          ORA  M1     ; and               05 ZZ
          BNE  SBD2   ; repeat if not.     D0 DC
          TYA        ; transfer            98
          LDY  M0     ; Y to X.           AA
          LDY  M0     ; restore RAM point.  A4 ZZ
          PLA        ; pop digit off stack. 68
          CLC        ; convert it         18
          ADC  £30    ; to ASCII          69 30
          STA  (MA),Y ; and put into RAM.  91 ZZ
          INY        ; increment RAM point. C8
          DEX        ; get next          CA
          BNE  SBD5   ; digit, else       D0 F6
          LDA  £13    ; load ASCII CR     A9 0D
          STA  (MA),Y ; and put it to RAM.  91 ZZ
          RTS          ;                    60

SBD4:    INC  M1     ; and set a result bit. E6 ZZ
          DEX        ; repeat            CA
          BNE  SBD3   ; 32 times.         D0 EC
          PHA        ; save digit.         48
          INY        ; increment no of digits. C8
          LDA  M4     ; check              A5 ZZ
          ORA  M3     ; if number          05 ZZ
          ORA  M2     ; is zero           05 ZZ
          ORA  M1     ; and               05 ZZ
          BNE  SBD2   ; repeat if not.     D0 DC
          TYA        ; transfer            98
          LDY  M0     ; Y to X.           AA
          LDY  M0     ; restore RAM point.  A4 ZZ
          PLA        ; pop digit off stack. 68
          CLC        ; convert it         18
          ADC  £30    ; to ASCII          69 30
          STA  (MA),Y ; and put into RAM.  91 ZZ
          INY        ; increment RAM point. C8
          DEX        ; get next          CA
          BNE  SBD5   ; digit, else       D0 F6
          LDA  £13    ; load ASCII CR     A9 0D
          STA  (MA),Y ; and put it to RAM.  91 ZZ
          RTS          ;                    60

SBD5:    PLA        ; pop digit off stack. 68
          CLC        ; convert it         18
          ADC  £30    ; to ASCII          69 30
          STA  (MA),Y ; and put into RAM.  91 ZZ
          INY        ; increment RAM point. C8
          DEX        ; get next          CA
          BNE  SBD5   ; digit, else       D0 F6
          LDA  £13    ; load ASCII CR     A9 0D
          STA  (MA),Y ; and put it to RAM.  91 ZZ
          RTS          ;                    60
    
```

# APC SUBSET

## Z80

Our set of Z80 numeric routines commences with a 32 bit integer divide routine called DIV4. It accepts the dividend in registers IX and IY, and the divisor in BC and DE. As documented in the data sheet, output is through the same registers containing quotient and remainder, respectively.

### Datasheet

```

/= DIV4 - 4-byte integer divide.
/ CLASS: 1
/ TIME CRITICAL? No.
/ DESCRIPTION: Divides one 4-byte unsigned integer by another.
/ Returns quotient and remainder. Checks for
/ divide by zero.
/ ACTION: Long division by shift-and-subtract, using HL
/ and (SP) as an extended accumulator.
/ SUBr DEPENDENCE: None.
/ INTERFACES: None.
/ INPUT: Dividend in IX,IY
/ Divisor in BC,DE
/ OUTPUT: Carry set, arguments unchanged if BCDE = 0 on entry.
/ A is always set to zero.
/ Quotient in IX,IY.
/ Remainder in BC,DE.
/ REGs USED: All normal and index registers (not alternate
/ registers).
/ STACK USE: 2
/ LENGTH: 54
/ PROCESSOR: Z80.
  
```

```

DIV4: LD A,B ; if all 78
      OR C ; BC B1
      OR D ; DE B2
      OR E ; are zero B3
  
```

```

SCF Z ; set carry 37
RET Z ; and return. C8
LD A,32D ; set bit count. 3E 20
LD HL,0000H ; set accumulator 21 00 00
PUSH HL ; and extend to stack. E5
TOP: ADD IY,IY ; shift left IY. FD 29
      EX (SP),IX ; get IX DD E3
      EX (SP),HL ; into HL E3
      ADC HL,HL ; shift left (with carry) ED 6A
      EX (SP),HL ; and return E3
      EX (SP),IX ; it to IX. DD E3
      ADC HL,HL ; shift HL left (with carry). ED 6A
      EX (SP),HL ; get (SP) into HL E3
      ADC HL,HL ; shift it left (with carry) ED 6A
      EX (SP),HL ; and return it to (SP). E3
      OR A ; clear carry. B7
      SBC HL,DE ; subtract ED 52
      EX (SP),HL ; BC, E3
      SBC HL,BC ; DE ED 42
      EX (SP),HL ; from (SP),HL. E3
      INC IY ; set result bit. FD 23
      JR NC,WENT ; jump if 30 09
      JR Z,WENT ; subtraction went. 28 07
      ADD HL,DE ; else 19
      EX (SP),HL ; add E3
      ADC HL,BC ; back ED 4A
      EX (SP),HL ; divisor E3
      DEC IY ; and reset result. FD 2B
WENT: DEC A ; repeat 3D
      JR NZ,TOP ; 32 times. 20 D9
      EX DE,HL ; put remainder from EB
      POP BC ; (SP),HL to BC,DE. C1
      RET C9
  
```

The second Z80 routine is particularly useful for checking the status of input and output ports, or any other bit-mapped operations. The routine accepts a 16 bit quantity through HL and outputs a string of "1" and "0" characters to a buffer pointed to by DE. Clearly the outbuffer might be the screen itself on any machine with a memory mapped display.

### Datasheet

```

/= CVBA - bit field to ASCII conversion.
/ CLASS: 1
/ TIME CRITICAL? No
/ DESCRIPTION: Converts a 16-bit field to ASCII ones and zeroes
/ ACTION: B ← 16
/ C ← ASCII zero (30H)
/ Then repeat 16 times:
/ A ← zero (00H)
/ HL
/ Cy ← [15---0] ← 0
/ A ← C + Cy
/ (DE) ← A
/ DE ← DE + 1
/ SUBr DEPENDENCE: None
/ INTERFACES: None
/ INPUT: HL holds the bits to be converted
/ DE holds the start address of the result
/ OUTPUT: HL = zero
/ DE holds the end of conversion + 1 address
/ REGs used: HL,DE
/ STACK USE: 4
/ LENGTH: 15
/ T STATES: 781
/ PROCESSOR: Z80
  
```

```

CVBA: PUSH AF ; save F5
      PUSH BC ; registers. C5
LD LD B,+16 ; set loop counter. 06 10
LD LD C,"0 ; set C to ASCII zero. 0E 30
CVB1: XOR A ; zeroise A. AF
      ADD HL,HL ; shift most sig bit to cy. 29
      ADC A,C ; add this to 30H in A. 89
      LD (DE),A ; store/display ASCII value. 12
      INC DE ; increment destination addr. 13
      DJNZ CVB1 ; get next bit till all 10
      POP BC ; processed, restore C1
      POP AF ; registers. F1
      RET C9
  
```

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Most assembly language enthusiasts have a library of handy routines that they have compiled over the years. We are eager to get our hands on these for publication in this series. They don't have to be long or technologically clever, just as long as they work and you can present them according to our documentation conventions outlined last month. Appropriate credit will be given in all cases.

APC SUB-SET will continue next month with more numeric routines.



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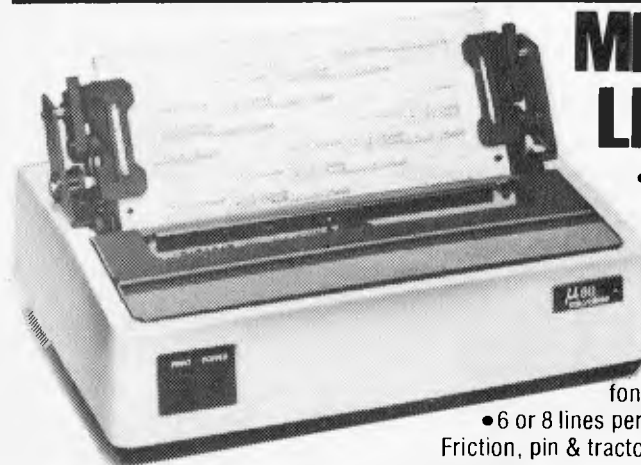
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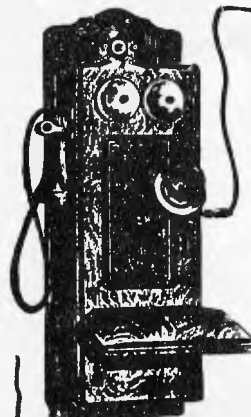


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**\$750**

## ECONOMY GREEN PHOSPHOR MONITOR

If you're seriously into computers then this is the monitor for you. Provides a sharper, brighter image, and you avoid eye fatigue! Suited more for the professional rather than the hobbyist! Cat X-1198.

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Our most popular monitor!

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DSE/A313.2/PAI



# VIC-20 COLOUR COMPUTER

Ideal for the first time user, this remarkable computer can be used immediately with plug in cartridges. The fantastic range of game cartridges can be used with any colour or B & W TV set, to look just like the arcade games. Or it can be expanded to form the heart of a complex computer system. The system is programmed in BASIC and ".....provides good value for money.....". (EA, July 82 Pp 114)

Also available:  
 Colour monitor to suit VIC 20, Cat X-1195 ..... \$379.00  
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ONLY  
**\$399**

Cat X-2000

## GENUINE VIC 20 PERIPHERALS



### Store your programs DATASETTE

only  
**\$99<sup>00</sup>**

This remarkable computer comes equipped with a tape cassette interface which lets you connect the Commodore tape unit directly into the computer. With this ability you can load, store or retrieve data on standard cassette tape. By a simple command the machine will automatically 'save' a full program for you. It's a handy and economical way of storing and retrieving data, plus you can buy existing software or create your own programs and store them. Cat X-2005.



### MEMORY MOTHERBOARD

Now you can connect up to 6 different expansion programs at the same time. Increase your computer's capabilities to its maximum of 32K plus connect interface cartridges as well. Cat X-2011

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**\$199**



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Fast, high capacity storage/retrieval of data on standard 5.25" floppy diskettes. Stores up to 170K on each diskette, with read/write compatibility with PET/CBM Computer Systems. Comes complete with own power supply. Cat X-2007

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**\$479**

Economical dot matrix printer makes paper copies of BASIC programs, letters, business data and graphic displays. Connects directly to the VIC 20, prints all characters incl. letters, numbers and graphics. Reliable tractor feed mechanism. Accepts sprocketed 8 inch roll or sheet paper. Unique uni-hammer print head for improved reliability. Cat X-2009.

### WANT TO KNOW MORE?

**Introduction to Computing**  
 Sample programs in the book and on tape make this an interesting introduction for the non-computerist. Cat B-2001 ..... **\$29.95**

**Introduction to Basic**  
 A gentle but thorough introduction to BASIC programming. Instructional tapes are supplied. Cat B-2002 ..... **\$29.95**

**Personal Computing on the VIC 20**  
 The 'friendliest' computer guide available. This manual comes free with every VIC 20 but is also for sale separately due to the high demand. Cat B-2003 ..... **\$12.00**  
 (All books written especially for the VIC 20)

### JOYSTICK | PADDLES

Allows 4 way movement. Play against the computer as in the popular arcade type game 'Space-Invaders'. Cat X-2020  
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For two player games such as 'Tennis'. Small and compact they allow movement left or right and are easy to fire with. Cat X-2022  
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<b>Super Alien</b> Can you capture the aliens before they zap you? Cat X-2051 ..... <b>\$39.95</b>	<b>Superslot</b> Colourful slot machine, works just like the real thing! Cat X-2049 ..... <b>\$39.95</b>
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<b>VIC Avengers</b> Space action for arcade enthusiasts. You are the VIC Avenger protecting the Earth from an invasion of space intruders. Cat X-2048 ..... <b>\$39.95</b>	<b>Super Lander</b> Pilot your Jupiter Lander through the treacherous crevices of a mysterious planet. Cat X-2052 ..... <b>\$39.95</b>

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<b>Car Chase</b> Fast paced road action Cat X-2031 ..... <b>\$14.00</b>	<b>Space Math</b> Maths improvement. Learn at home! Cat X-2035 ..... <b>\$14.00</b>
<b>VIC 21 Casino Game</b> Casino style blackjack Cat X-2032 ..... <b>\$14.00</b>	<b>Recreation Pack</b> Contains all of the above cassette programs in a slim pack. Cat X-2037. .... <b>\$75.00</b>
<b>Biorythm</b> Compare biorythm compatibility Cat X-2034 ..... <b>\$14.00</b>	<b>Programmable Character Set</b> Lets the VIC user create up to 64 programmable characters, and use them in BASIC programs. The Editor takes only one half kilo-byte of program space, works with tape, disk and printer. Cat X-2045 ..... <b>\$29.95</b>
<b>Slither/Super Slither</b> Dexterity game. Cat X-2036 ..... <b>\$14.00</b>	
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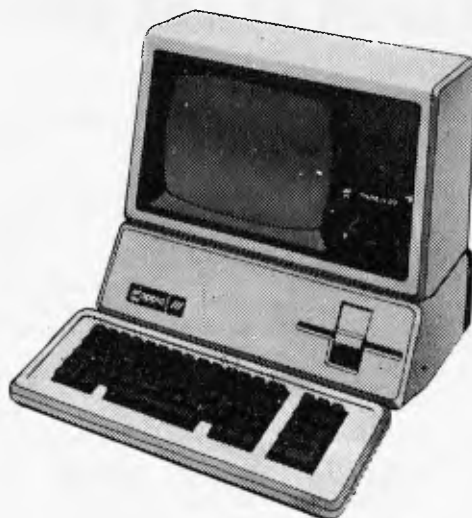


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1297 HAY STREET,  
WEST PERTH, WA 6005  
(09) 332-5651**



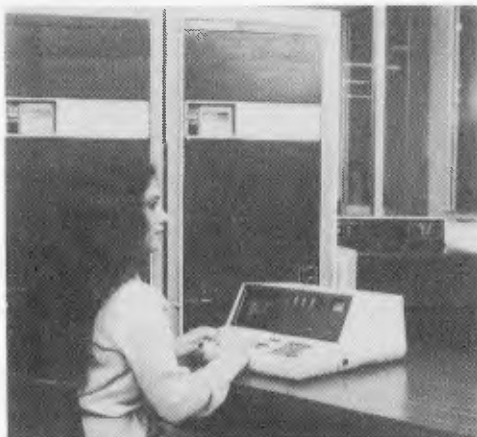
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FOR FURTHER INFORMATION CALL (03) 329-7533**



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## THE AUSTRALIAN BEGINNING PTY. LTD.

The Australian Beginning Pty. Ltd. is an Australian company, with Australian based computer facilities, using the Australian Telecommunications network to offer Australian clients Australian information services and software.

### WE ARE PROUD TO ANNOUNCE THE LAUNCHING OF AUSTRALIA'S FIRST MICROCOMPUTER INFORMATION UTILITY

The AUSTRALIAN BEGINNING is Australia's first microcomputer information utility, aimed at giving the average microcomputer user access to the computer data banks and also massive storage space previously only available to large Mainframe installations. The era of home computers has now officially begun in Australia, now that the AUSTRALIAN BEGINNING is here; as now, any small businessman or student can have on his desk for an extremely small cost, a system that has the level of storage power and access to data banks for which only a few years ago, government departments and large private users were paying millions of dollars.

The AUSTRALIAN BEGINNING can be accessed through a number of 'approved' personal computers, and terminals, by use of an acoustic coupler or modem.

Users will receive a number of benefits which will include:

#### INFORMATION SERVICES

Members will have access to a number of information sources which will include the latest news, sports results, financial reports, and farm information.

#### ELECTRONIC MAIL

Members will be able, also, to communicate nationwide with other AUSTRALIAN BEGINNING members through our system.

THE AUSTRALIAN BEGINNING  
RECOMMENDS 3M DISKETTES

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Users will have access to a myriad of computer programs that will include entertainment, educational aids, programming and diagnostic tools, and financial applications.

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Users will have the capability to make use of the Mainframe's huge storage capacity by using any of our large programs, or storing your large programs on our system.

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You can take advantage of our 'shopping by computer' system to get the best prices on a number of popular consumer items.

#### EXTREMELY EASY TO USE

You do not have to be a computer programmer to make use of the AUSTRALIAN BEGINNING. All of the instructions are in everyday English, so that even the younger members of your family will be able to operate the system.

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While services like these used to cost tens of thousands of dollars to the government departments and large corporations who used them, they are now available to you for less than the cost of a packet of cigarettes a day for the 'average' user.

You can join the AUSTRALIAN BEGINNING by paying a one-time joining fee of \$100, and a small hourly user charge of \$10 an hour 8 a.m. - 6 p.m. and \$4.50 an hour 6 p.m. - 8 a.m. weekdays and all weekends.

TO JOIN THE AUSTRALIAN BEGINNING FAMILY, AND TAKE ADVANTAGE OF THE EXCITING SERVICES WE WILL BE OFFERING, PLEASE COMPLETE THE COUPON BELOW:

**MEMBERSHIP REQUEST**

Yes, I think the idea of the AUSTRALIAN BEGINNING is great! I enclose \$100 so please send me my user manual and password.

I have a computer, Brand.....  
Model.....

Please send me information on low cost equipment packages I can use to take advantage of the AUSTRALIAN BEGINNING'S services.

NAME: .....

ADDRESS: .....

CITY: .....

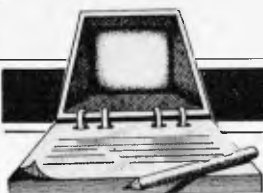
STATE: ..... POSTCODE: .....

PHONE: .....

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(SALES) PTY.LTD.,  
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I am interested, but I need more information.

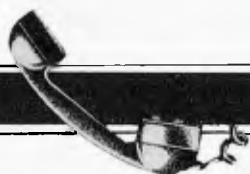
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## DIARY DATA

*Readers are strongly advised to check details with exhibition organisers before making travel arrangements to avoid wasted journeys due to cancellations, printer's errors, etc. Organisers are requested to notify APC of forthcoming events well in advance to allow time for inclusion in 'Diary Data'.*

Melbourne	Micro Computer Exhibition, SAE Australasian, (03) 347 2220	August 5, 1982
Sydney	Data 82, Centrepont. Contact: Graphic Directions	August 10-12, 1982
Canberra	National Microcomputer Conference. Contact: MICSIG, ACS	August 18-20, 1982
Hobart	Ninth Australian Computer Conference. Telephone (002) 25 3129	August 23-27, 1982
Melbourne	Data 82, Melbourne Showgrounds	November 9-11, 1982
Sydney	The 1st Australian Personal Computer Show, Centrepont. Contact: Australian Exhibition Services	March 10-12, 1983



## NETWORK NEWS



*Here is a list of all Australian personal computer networks. As more networks appear — and as more facilities are added to existing ones — we'll report them in this section, which appears monthly.*

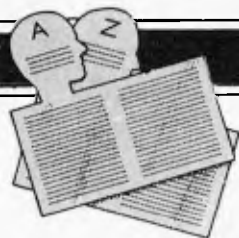
**The Australian Beginning.**  
Operator: The Australian Beginning Pty. Ltd. 364 La Trobe Street, Melbourne. Tel: (03) 329 7998. Facilities: Information service, electronic mail, software storage, and software downloading. Hours: 24 hours/day, 7 days/week.

**INFONET.** Operator: Network Services Division of Computer

**Sciences of Australia Pty. Ltd.,**  
460 Pacific Highway, St Leonards, NSW. Tel: (02) 439 0033. Facilities: Access to databases produced by the Australian Bureau of Statistics and the Institute of Economic and Social Research. Hours (E.S.T.): Monday to Friday (7am to 9pm), Saturday (8am to 5pm) and Sunday (8am to 11.30am).

**AUSINET.** Operator: ACI Computer Services, P.O. Box 42, Clayton, Victoria. Tel: (03) 544 8433. Facilities: Medium to databases whose subject coverage includes agriculture, education, energy, industry, public affairs, science and technology and an online Australian database directory. Hours: 8.30am to 9.00pm E.S.T. Monday to Friday.

**IP Sharp Associates Network.**  
Operator: IP Sharp Associates Pty. Ltd., 13th Floor, 175 Pitt Street, Sydney. Tel: (02) 232 6366. Facilities: The network is an international time sharing data processing network, the host computers being located in Toronto, Canada. Hours: 24 hours/day, 7 days/week.



## USER GROUPS INDEX

*Below is a list of alterations and additions to the list of user groups published in the March issue. Updates have been published in the April, May and June issues of APC; the next full listing will be published in the August issue.*

**APPLE USERS GROUP OF WA**  
The correct telephone number of the Secretary/Treasurer, John Currie is Fremantle, 335 7257.

**OSBORNE USERS GROUP**  
Forty Osborne Users attended the first Osborne Users meeting to be held in Australia. Mr Steve Freeman, General Manager of President Computers in Melbourne conducted the meeting from President Computers' Showroom Suite 1, 609 St Kilda Road,

Melbourne. Those interested contact Roslyn Miller on (03) 529 1788.

**CANBERRA COMPUCOLOR CLUB (CCC)**  
Intercolor and CompuColor users are welcome at meetings held at 7.30pm on the first Sunday of each month at the offices of Digital Equipment, 28 Lonsdale Street, Braddon. Telephone Jim Farquhar AH 41 2870 or Ken Kerrison BH 65 5417 or AH 73 3793.

**CPU PEACH USERS CLUB**  
Recently formed for Peach users in Perth, other 6809 users are welcome at meetings. Those interested should contact Brendon Butcher on 367 5880 or write to the Secretary, 1 Charf Crt, Riverton 6155.

**VIC 20 MELBOURNE USER GROUP**  
Meetings are held on the third Tuesday of every month, 7.30pm at Panatronics, 691 Whitehorse Road, Mont

Albert. For further information contact Neil Brandy on 890 0579

**CUVIE COMPUCOLOR/ ENTECOLOR MELBOURNE USER GROUP**  
Meetings are held on the first Tuesday of every month, 7.30pm at Panatronics, 691 Whitehorse Road, Mont Albert. For further information contact Keith Ochiltree on 82 8852.



# SHMUNCK

by B. Christmas

*This program utilises APC-80 for its sound and graphics.  
SHMUNCK is a teacher/parent programmable maths game. It deals with whole numbers only,  
but both positive and negative numbers may be used. A selection of seven  
preprogrammed sets is also offered.*

The program works on two number problems, i.e. one number (operand (+, -, X, ÷)) second number = answer. We will let operand show as () from now on. We will call these the first and second numbers.

The program allows us to set the size and range of each number by setting the boundaries or parameters in which the computer shall select at random, i.e. if parameters of 12,4 are selected for the first number and 8,6 for the second, we will always get problems in the range 12 () 8 = ? to 4 () 6 = ?

Also, if the same number is entered for both parameters of a number range, only that number will be used, e.g. entering 8,8 for the parameters of the first number, and 5,5 for the second, restricts the computer to the problem 8 () 5 = ?.

Normal size numbers may be used, with the understanding that numbers are selected at random in-between the set parameters. Thus, the difference in size of the parameters should be limited to the RND(n) limit, i.e. 32767.

Negative values may be set for any of these parameters, but the program will only accept them in order, i.e. enter highest value first, lowest value

second. (The program asks for high and low values for first and second numbers.)

The balance of this explanation uses these terms.

Now that we understand what sort of information we will need to enter, we can move on. The program also allows us to select from 1 or more of the following operands, ADDITION SUBTRACTION MULTIPLICATION DIVISION.

If more than one is selected, the computer will pick from the selection at random.

Several things should be borne in mind.

i) If you wish to work in positive numbers only for Subtraction, the low parameter for the first number must be greater than the high parameter for the second, e.g. 12,4(first);3,1(second) must always be positive, i.e. 4-3=1 is the lowest answer obtainable.

BUT 12,4 ;5,1 may return 4-5=-1  
ii) Always ensure that the second number parameters cover a number that will divide evenly into the range of the first number parameters for division selection. It does not matter if the

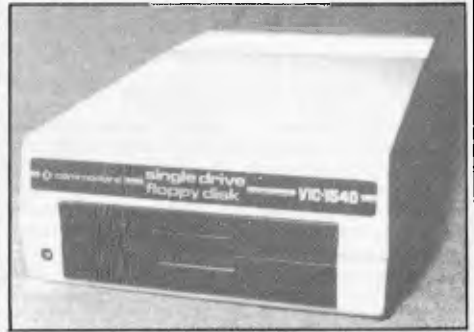
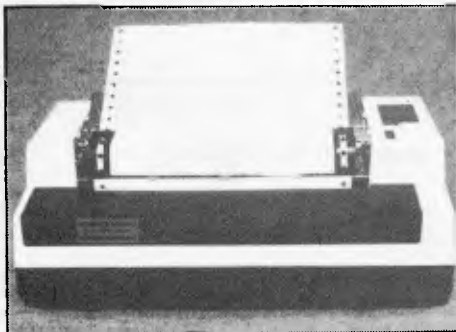
answer will be positive or negative. e.g. 12,2 ; 12,4 is alright  
BUT 12,2 ; 24,13 is not  
(nothing in this divided into 12,2 will produce a whole number answer).

Zeros are not accepted by the program as divisor parameters, but otherwise are allowed for. The program covers any other combinations in division, and if an error occurs, it is because our old friend RND(n) has been asked to do too much again. The rules for this are complicated, but an FC error may occur if the range of ANSWERS in division exceeds 32767. If it happens, reduce either set of parameters.

Now, just to keep your head spinning, you may choose and program up to 12 levels. These may be used in several ways.

- i) It allows coverage of the 1-12 multiplication tables (selection 1)
- ii) It allows difficulty levels in the game (bonus points are awarded as the square of the level selected).
- iii) Teachers may program problem levels for individual student requirements, or levels for groups who can

## WANT A VIC? OR GOT A VIC?..

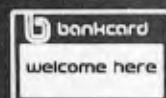


VIC PRINTER \$479 - VIC \$399 - ARFON EXPANSION \$249 - VIC DISK DRIVE \$699

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## \* IBM & PANASONIC PERSONAL COMPUTER SOFTWARE

### ELECTRONIC DISK

This program is an upgrade to the I.B.M. P.C. DOS to permit the use of extended capacity disk drives and allow RAM memory to be used as an Electronic Disk Drive.  
This program will create the equivalent of a disk drive in your extra RAM memory.

### ISAM DATABASE INCLUDING A NAME AND ADDRESS

#### DEMONSTRATION PROGRAM

ISAM (Indexed Sequential Access Method) provides keyed access to data files for reading, writing, updating and deleting records within the file.

The whole purpose for storing information on the computer is to have the computer manage the information, print reports, and find upon request any particular piece of information. A good analogy is a public library where hundreds of books have been organised to make it easy to find any particular book. ISAM will be the librarian who possesses efficient skill in storing and retrieving records (books) in a file (library) by a record's "Key". A file of addresses can be stored using the name as the record's key. Any particular record is then retrieved by specifying the name. The actual location of a record within the file is of no concern to the user or the application. ISAM interfaces directly to your Basic programs through a few variables. Accessing ISAM is as simple as executing a call to a basic subroutine.

ISAM represents state-of-the-art software by using sophisticated techniques in its data architecture, sorting, searching, updating, dynamic disk space management, record buffering, searching by full key or by partial key, sequential retrieval in both a forward and backward direction, and accessing up to seven ISAM files simultaneously.

You also get a complete NAME AND ADDRESS program that demonstrates ISAMs simplicity and power.

#### FEATURES:

OPEN FILE	GET RECORD BY KEY
CLOSE FILE	GET NEXT RECORD
ADD RECORD	GET PREVIOUS RECORD
DELETE RECORD	GET FIRST RECORD
UPDATE RECORD	GET LAST RECORD
SORT FILE BY KEY	SHOW FILE STATISTICS

\$69.95

### BOWLING LEAGUE STATISTICS MANAGER

This package maintains all bowling league statistics and memberships, computes individual handicaps and team standings, and prints various reports. This is the ideal system for a league secretary.  
EARN MONEY by using your IBM and this software package to maintain league statistics for several of the bowling leagues in your community.  
Printed reports can be sent to the screen, the IBM parallel printer, or to a serial printer.

\$99.95

### CROSS REFERENCE

Will list your basic program and print all of the variables used in the program. The line numbers following each variable are the lines on which the variable is used. The program also cross references all line referencing statements such as GOTO, GOSUB, ON-GOTO, ON-GOSUB, IF-THEN-ELSE, and RESTORE. You can easily determine if a line number is referenced by another part of the program.

The listing can be sent to the screen, the IBM parallel printer, or to a serial printer.

#### EXAMPLE: PROGRAM LISTING

```
820 Q$ = N$: J = 1: QL = 157
830 IF J > QL THEN Q = 0: RETURN
840 QM = (J + QL)/2
850 IF Q$ < Q$ (QM) THEN QL = QM + 1: GOTO 830
860 IF Q$ < Q$ (QM) THEN QL = QM - 1: GOTO
830
870 Q = 1: RETURN
```

#### CROSS REFERENCE LISTING

2	830 FROM	850	860			
4	J .....	820	830	840	850	
1	N\$ .....	820				
2	Q .....	830	870			
3	Q\$ .....	820	850	860		
2	Q\$( ) .....	850	860			
4	QL .....	820	830	840	860	
5	QM .....	840	850	850	860	860

END OF LISTING \$24.95

#### MINIMUM REQUIRED SYSTEM CONFIGURATION:

- ✓ IBM-PC WITH 48K MEMORY.
- ✓ 1 DISK DRIVE, DOS AND DISK BASIC.
- ✓ EITHER MONOCHROME OR COLOR/GRAPHICS

### GAMES PACKAGE 1

is a collection of 10 great games to play on your IBM-PC. Even though you may have purchased your IBM for "Work", these games turn the computer into a fun machine for the whole family. Includes games for both youngsters and adults.

- QUBIC: Tic-tac-toe for four in a row.
- OTHELLO: Strategic moves capture the IBM's pieces.
- KINGDOM: Manage your peasants and knights.
- CRIBBAGE: Popular card game against the IBM.
- BLACK BOX: Solve the mystery with ray-gun clues.
- SPACE TREK: Rid the galaxy of Klingons.
- BLACK JACK: Las Vegas style card game of 21.
- MASTER MIND: Guess the code combination. \$29.95

#### Software Available Shortly

- |                |                             |
|----------------|-----------------------------|
| Astro Attacker | Ledger System               |
| Basic Tutorial | Invoice & Statement package |
| Chomp (Pacman) | Stocks and Commodities      |
| Alien Invaders | Executive Calendar          |
| Frog           | Lawyer Billing.             |

- \* IBM is a trademark of International Business Machines Corporation.
- \* IBM and Panasonic are authorised names.

### FOR THE EXIDY SOURCERER — EZY FILE 2

#### FOR THE EXIDY SOURCERER — EZY FILE 2

Features include: fields of up to 20

- ★ Expansion of fields on-board screen editor.
- ★ Save files in format you wish.
- ★ Directory for disk users.
- ★ Save all or parts of file.
- ★ Expanded report features.
- ★ Print field in any order or position.
- ★ Up to 30 descriptors

Plus more \$65.95

(Ezy file 1 — upgrade \$30.00)

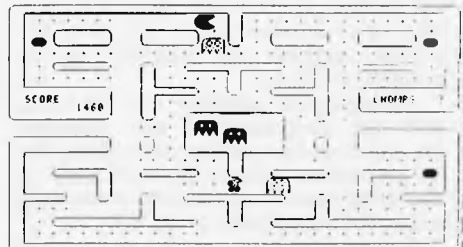
### CONVERTER

#### CONVERTER

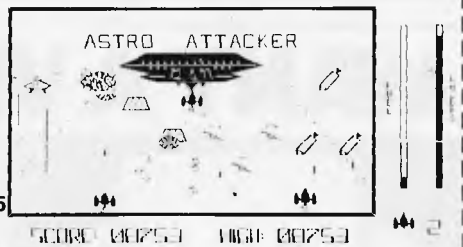
Convert basic programs to text files under CP/M so that they must easily be modified to run under disk bases, \$19.95.

### Software Available

CHOMP \$21.95



ASTRO ATTACKER \$21.95



MISSILE DEFENCE \$19.95



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work as a team on difficult problems, e.g. long division, long multiplication.

### THE PROGRAM ITSELF

- i) The name and score of the highest scoring player is kept.
- ii) You, as the teacher/parent, may select a time for the game to run (1-5). Each unit gives about 40 seconds play time, + time for each SHMUNCK to "die".
- iii) To reselect or reset parameters and keep score, type in "MENU" when the program asks for your name. (This comes up when you answer "N" when you are asked if you want another game).

This is not indicated anywhere

during running, so keep it secret, it wipes the parameter settings!

iv) As the problem answer is typed in, the program monitors the answer, and if it is correct, it goes over to the game. However, if the answer is incorrect, it will allow one further figure to be typed in and then wipe the wrong answer, resetting for another try. One digit will be removed from the right of the answer if the backspace key is depressed, or the whole answer removed if the New Line key is used.

If you are programming you could program a "password" into the start instead of "MENU" or alter the DATA statements to suit your needs, and save your own version. The DATA statements are labelled to assist with this.

Also, as students seem to get bored

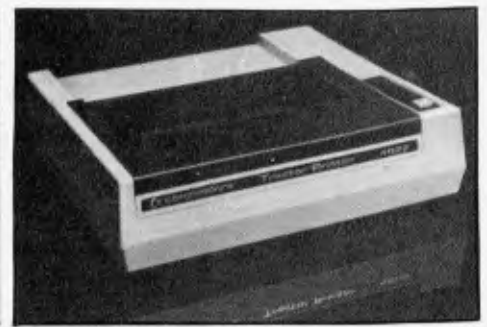
after some time at the same game, the basic Maths core could be written around several different games to keep interest up. Perhaps APC-80 might publish some, to keep teachers armed with plenty of choices in their Educational ammo!

I am indebted to Eaglehawk Primary School for the "lend" of some students (we didn't exactly have to twist their arms). They pointed out the many "blues" in the game (but sir, the aliens HAVE to shoot back). The students also graciously allowed the teachers to give me the data for the "EAGLEHAWK SPECIAL" (cries of "get back and let me in kids"). This covers the normal problems for years 4-6. (In whole numbers only, fractions will have to wait).

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		H	1st	L	H 2nd L	H	1st	L	H 2nd L	H	1st	L	H 2nd L	H	1st	L	H 2nd L
1	1 2 3 4 5 6 7 8 9 10 11 12																
2	1 2 3	10 100 1,000	1 1 1	10 100 1,000	1 1 1	10 100 1,000	1 1 1	10 100 1,000	1 1 1	5 10 20	1 1 1	5 10 20	1 1 1	25 144 144	1 1 1	5 12 144	1 1 1
3	1 2 3																
4	1 2 3 4 5	10 20 40 100 1,000	1 1 10 1 1	10 20 40 100 1,000	1 1 10 1 1												
5	1 2 3 4 5 6 7 8 9 10	50 50 500	10 100	49 49 499	1 1 50	99 99 999	50 50 500	49 49 450	1 1 99	99 99 499	10 10 99	10 10 100	1 1 11	144 144 999 999	0 0 99 99	12 12 99 99	1 1 11 11
6	1 2 3													300 1,000 30,000	100 500 1,000	60 100 600	10 60 100
7	1 2 3 4									80 500 12,000 30,000	12 100 1,000 20,000	80 300 1,000 9,999	16 50 500 1,009				

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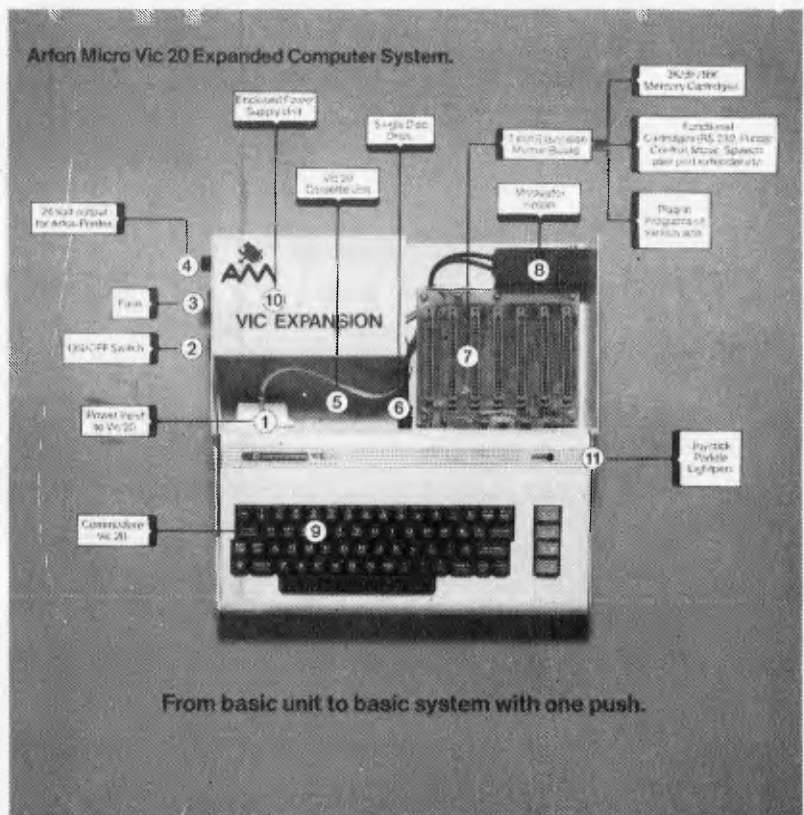
The cassette port and disc port are still totally usable as are the games paddles etc. Your modulator will now be held at the rear of the expansion board.

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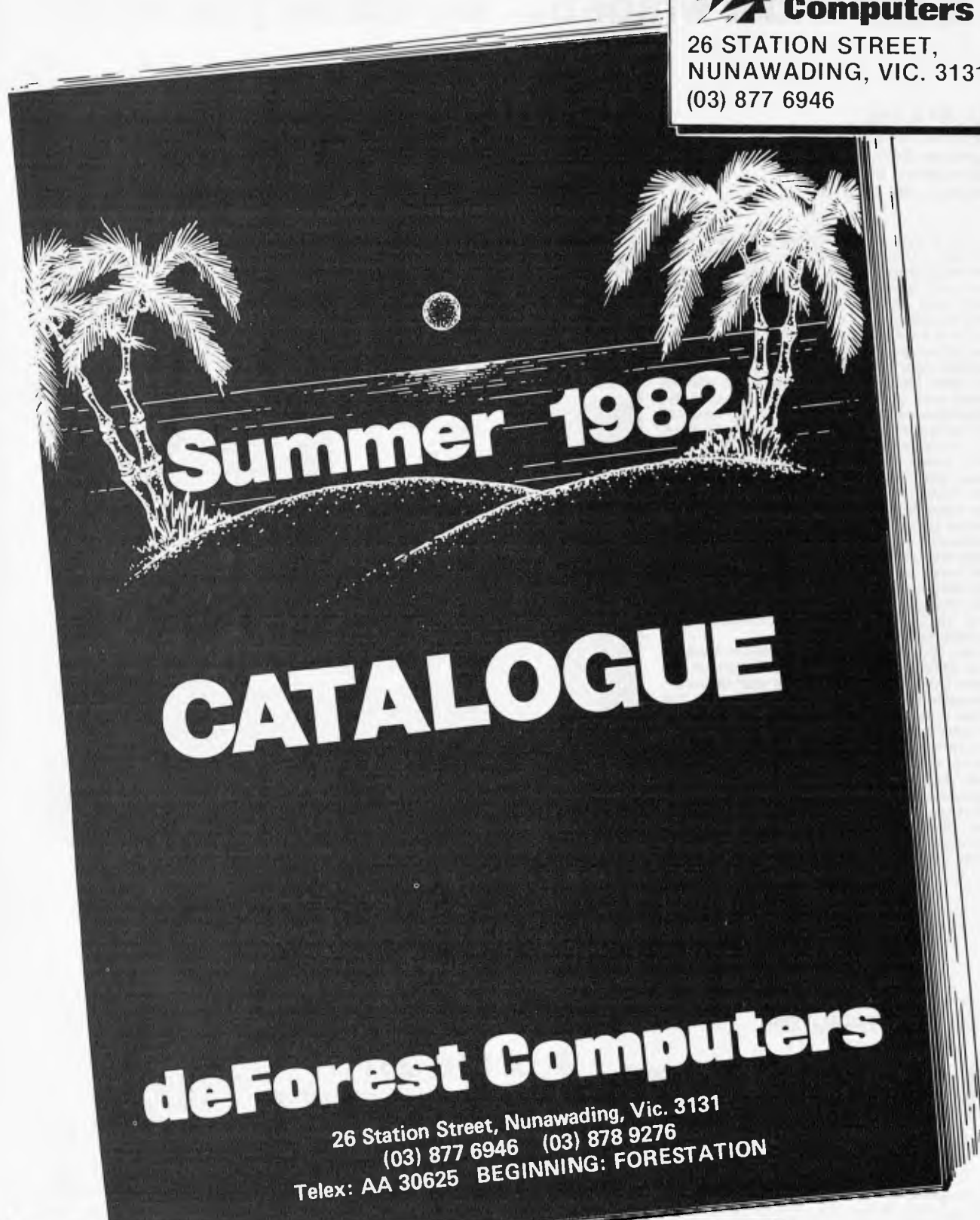
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# LAZING AROUND



by J J Clessa

There was a very good response to our puzzle about the committee of the ladies' golf club — about 70 entries, mostly with the correct solution. The answer was beautifully given in verse by R Farquhar who wrote:

When all the votes were counted  
And all the likes and dislikes reckoned,  
The captain's place went Audrey's way  
With Freda closely second.  
Wee Betty became treasurer,  
But what a fuss. I guess  
If that's the kind of folk who play  
Golf, I'll stick to Chess.

Nice one, but unfortunately your name was not the random selection. That honour went to L. Davidson — your prize is on its way.

Meanwhile, thanks for all the ideas for puzzles that some of you send in from time to time. It's not always possible to use them, for a variety of reasons, but whenever we do, we certainly acknowledge the originator. Keep the ideas flowing.

## QUICKIE

Using the symbols +, -, / or \*, rearrange

four fives to equal the numbers one to ten. For example  $5/5 * 5/5 = 1$ ;  $5/5 + 5/5 = 2$ , etc.

## PRIZE PUZZLE

By subtracting two million from a perfect cube, a number can be obtained which is itself a perfect square of one of the factors of two million. What is that factor (all numbers are positive integers)? Answers, on postcards only please, July Prize Puzzle, APC, P.O. Box 280, Hawthorn, 3122, to arrive not later than 30 August.

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Continued from page 20

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## Benchmarks


The calculator Benchmark (which I found in an article in the US magazine *Microcomputing*) consists of a program to evaluate the expression:

$$P = I \sum_{J=1}^N (1+Y)^J + M(1+Y)^{-N}$$

with  $M=20,000$ ,  $I=1400$ ,  $N=50$  and  $Y=0.08$ . (Answer is 17553.30307.) The formula is, in fact, used to calculate bond yields in the financial

world. I was attracted to this formula for two reasons, the first being that I liked the idea of a complex expression similar to those encountered in real life applications and the second being that the author listed Benchmark timings for several popular calculators using this expression and, in addition, a figure for the size of the program and the percentage of total memory used

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# MONROE 8820

**Peter Rodwell tests one of the latest upmarket business micros from the States.**

Monroe is an American company which has for some years now been known for its desk-top calculators; I'm sure you know the sort — those large things the size of a portable typewriter which professional number-handlers who don't actually require computing power still buy because, unlike pocket calculators, they're built to take a real pounding.

However, people must move with the times and, even if you don't need programmability or data storage facilities, you're supposed to have a desk-top computer these days; calculators are definitely not what the up-and-coming accountant wants seen on his desk.

Perhaps sensing this trend, Monroe has taken the logical step of going into the personal computer market. It still makes those large calculators (presumably there are still people around who just won't let go of an old technology), although they're no longer on sale in this country.

Two basic models make up the Monroe range: the OC 88XX, a business (or 'occupational', as the Monroe brochure puts it) micro, and the EC 8800, a rather nice-looking educational model with colour graphics, not yet available over here. Two business models are made, the OC 8810, which has a single minifloppy disk and the OC 8820, which has twin disks. This Benchtest is of the OC 8820.

## Hardware

The 8820 is an all-in-one computer with the electronics, keyboard, screen and disks housed in a well-made and quite heavy two-tone beige ABS casing measuring 53cm deep by 48cm wide by 29cm high. The whole unit is solidly constructed and has a feeling of real quality about it — you're left in no doubt that this is a serious piece of office equipment, built to take the pounding of day in, day out commercial life.

The keyboard has 93 keys, arranged in six groups. The main group is, of course, a full qwerty keyboard of typewriter pitch and with a nice solid feel, eminently suitable for touch-typing. To its right is a numeric pad with arithmetical operators, and beyond this is a column of cursor control keys topped with a clear/home key. A solitary red key labelled 'STOP' sits in the upper left corner; to its right is a row of two blocks of four programmable function keys such as editing and caps lock controls. All the keys auto-repeat when depressed for longer than a second or so.

The 22.5cm screen at first looks rather small but in fact, when you're seated at the machine and using it, it's just fine. The screen provides the first surprise of the system; it has orange lettering on a grey background. I found this fairly weird at first, being used to green on black, but I soon got used to it and found it quite pleasant to work with. The 80 x 24 display is rock-steady and clear, the lettering having true descenders, although it was slightly blurred around the edges of the screen. The full ASCII character set can be displayed plus a range of 'chunky' graphics; the latter are displayed not directly from the keyboard but by sending the appropriate codes to the screen from a program. Characters can also be displayed in double height, double width, inverse video or dimmed. A brightness control is mounted just below the screen in the form of a thumbwheel protruding downwards from the bezel.

The twin minifloppy disks are mounted horizontally, one above the other, to the right of the screen. The disks, made by Micropolis, are single-sided, double density soft-sectored units holding 320k each. They are almost silent in operation, making only a slight 'clunk' when they turn off and on.

Inside, a 3MHz Z80 sits at the centre of things, with 128 kbytes of RAM to play with plus 4k of video RAM and a 2k bootstrap PROM.

Along the bottom edge at the back is a row of connectors with which the Monroe communicates with the outside world. Three of these are RS232 ports, labelled 'Printer', 'Communication I/O' and 'Auxiliary service I/O'; the latter is designed for service engineers — a troubleshooting ROM pack plugs into it to aid with system diagnostics. Two other, larger connectors are labelled 'Expansion bus' and 'External disk' — more on these later. The reset switch is mounted at the back, too, but the on/off switch lives on the left side, low down towards the back.

A final note on the hardware design: this is one of the quietest machines I have come across (among those which have disks, of course). Not only are the disk drives virtually silent, but so is the fairly powerful fan.

## Operating system

The mention a few paragraphs earlier that the system has 128k of RAM will have already alerted you to the fact that the Monroe is somewhat different to the majority of 8-bit machines now on the

market. This difference gets larger the deeper one probes into the machine.

Although CP/M is available as an option, the standard operating system which comes with the machine is Monroe's own operating system, which I'll be abbreviating here to MOS, and which bears no relation to CP/M whatsoever.

MOS is a single-user multi-tasking operating system which takes the form of 43 kbytes of 'core' software (ie, it sits in memory all the time) plus a number of utility programs which reside on disk and are called in as needed.

On power-up, or on hitting reset, the system first performs a memory check (which takes seven seconds, during which a message on the screen tells you what's happening) and then, to the





accompaniment of a 'waiting' message on the screen, searches both disk drives for a disk containing MOS. It will boot from either drive but drive 0, the lower drive, is the preferred one. The operating system, all 43k of it, takes 10 seconds to load, during which the screen message changes to 'Loading'; once it's running, a green LED next to the disk drives lights up to say that MOS is active.

CP/M contains certain intrinsic commands such as 'DIR', the directory command, which are executed directly by the operating system without the need to load and run a separate program resident on disk. MOS has no such intrinsic commands; it considers anything typed in at the keyboard to be the name of a program on disk and goes to look for it on the currently-active drive, giving a terse error message if it can't find it.

To describe MOS in full detail would require a separate review of considerable length. The following description is, then, more a brief run-through of the system's facilities than an in-depth study.

Each utility program is kept on disk as a task file (the equivalent to a CP/M 'com' file — ie, a directly-executable program).

Allocate: allocates space on a disk as a direct-access file, either binary or ASCII.

Bootgen: used when creating a new disk; it tells the bootstrap loader where to find the operating system on the disk.

Close: takes a specified device off-line; has to be used before you remove a disk from the system.

Command: similar to, but more versatile than, CP/M's 'Submit'. This allows you to execute a number of commands by creating a text file of the commands and handing this to Command for execution. We'll discuss this in depth later.

Copya: this transfers ASCII between two devices; not only can this be used for copying, but it can also function between, say, the keyboard and a disk, so that the text can be typed straight onto disk.

Copyi: this performs an image copy between devices and/or files. It would be used, for example, for making back-up copies of disks.

Copylib: a fast transfer copy program; it can also be used to delete programs and operates in either an interactive or automatic mode.

Copyt: used for copying task files; task files can be either absolute or relocatable and this utility will copy either.

Creindex: allocates and creates an ISAM (indexed sequential access method) file.

Delete files: does exactly that.

Diskcheck: It's necessary to close files before changing a disk or switching off. If you forget to do this, Diskcheck gives you the chance to repair the damage by closing any files left open on the disk.

Diskinit: initialises a disk after it has been formatted by giving it a volume

name and bit map.

Format: formats a blank disk.

Lib: display a disk directory. Typing L displays just the file names (which can be up to 12 characters long) and the type of file: Tsk for task, Asc for ASCII, Bac for Basic, etc. Typing L, F displays this information plus a good deal more, such as file sizes and the date and time they were created and last used.

Open: brings a device on-line; if you're using drive 0 and you want to see what's on the disk in drive 1, you have to close drive 0 and open drive 1 first before typing L for Lib.

Option: each file has certain attributes, which can be changed with this utility. Thus a file can remain in memory after execution or be deleted from it; and a task can be aborted by another task or not.

Priority: as MOS is a multi-tasking operating system, tasks can be given priorities to determine their order of operation. That's what this does.

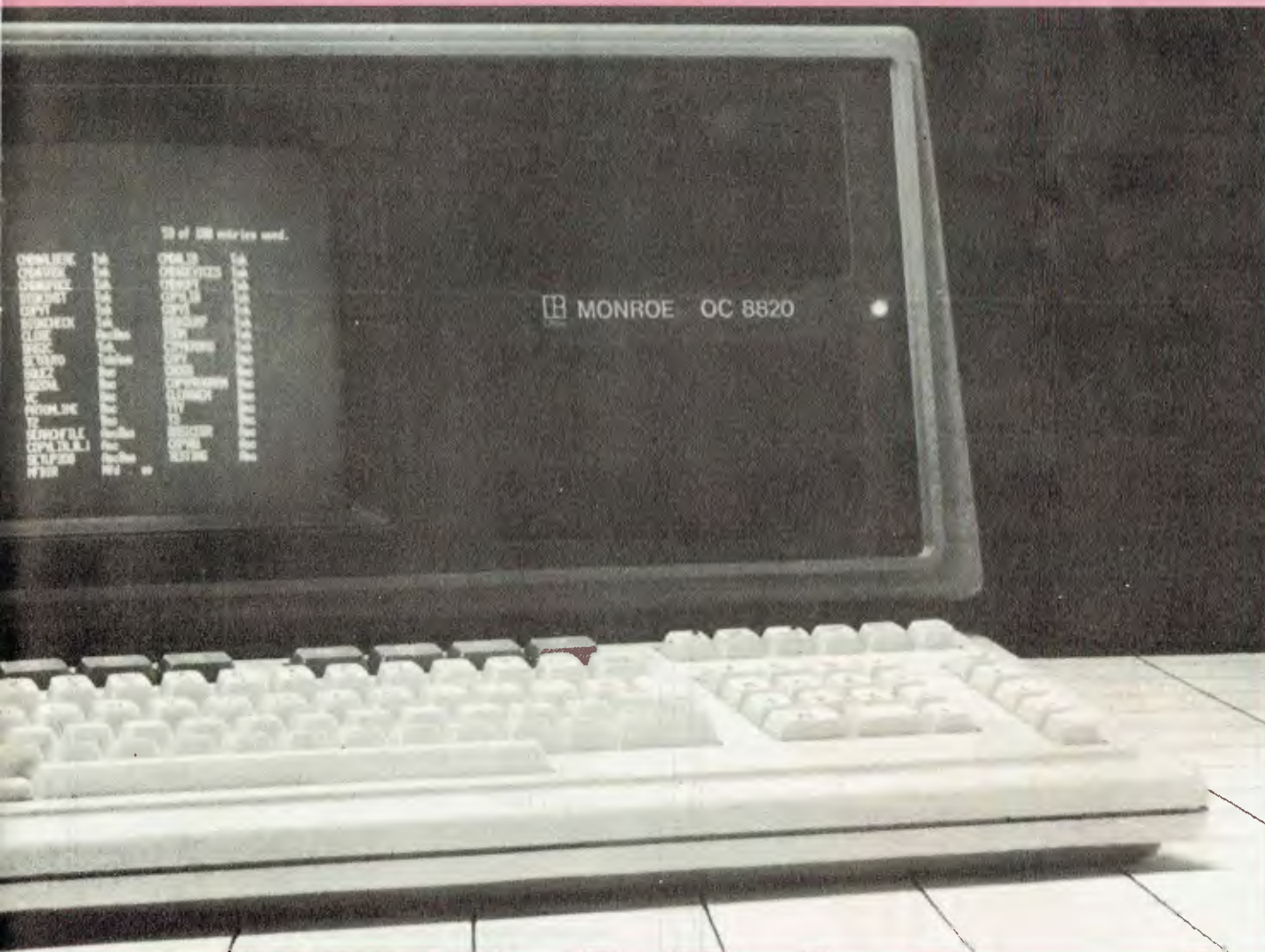
Rename: renames a file.

Space: tells you how much space is left on a disk, in sectors, which isn't as immediately useful as a kbytes read-out would be.

Set: enables the creation of an auto-start disk, ie, one which would immediately start an application program on boot-up without the user having to work through a sequence of operating system commands.

Sort: sorts out the contents of a file, including ASCII and numeric data files.

Time: sets the internal clock/





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# MONROE 8820

calendar. Unfortunately this is a software clock/calendar, so re-booting the operating system, such as is necessary when changing a disk, sets it to zero again. A hardware clock/calendar would have been more practical.

**Vol:** sets or changes the names of the system volume (ie, disk).

The above are all utilities associated with the system itself. An additional set of utilities is provided under the general classification of task handling utilities as follows:

**Cancel:** this cancels a task which is either current or in memory but dormant.

**Continue:** continues a task which has been paused.

**Devices:** displays information, including current status, of all the devices in the system.

**Load:** this loads one or more tasks into memory to allow multitasking to take place. The tasks are loaded in sequence and activated using the Start utility (see below).

**Pause:** this simply pauses a specified task.

**Run:** this combines the Load and Start utilities; tasks are brought into memory and immediately executed.

**Slice:** during multitasking, work is scheduled according to each task's priority or according to time slices within that priority. If two tasks have an equal priority, the first in the queue will take all the processor's time until it's finished. Slice allows you to allow them to execute simultaneously by allocating time slices (in milliseconds).

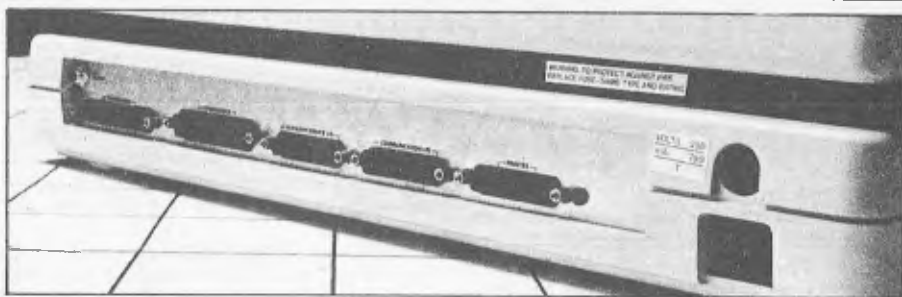
**Start:** as mentioned earlier, this initiates tasks which have previously been Loaded into memory.

**Task:** lists the status of each task currently in memory, showing its priority, status, etc.

At first sight, MOS appears both complicated and unfriendly, particularly if, like me, you have become accustomed to CP/M and its many and varied idiosyncrasies. The profusion of copying utilities, for example, seems very confusing at first; and there's no easy way to find out what's on one disk if you're logged into the other — you have to type 'Close fpy0: open fpy1:' and then Lib, for example, if you're logged



Keyboard feels nice and solid



onto the lower drive and want to see the directory of the disk in the other drive. Compare this to the equivalent CP/M command, DIR B.

But a closer look at the utilities not only reveals that things are not as bad as they seem but shows the philosophy behind the Monroe System.

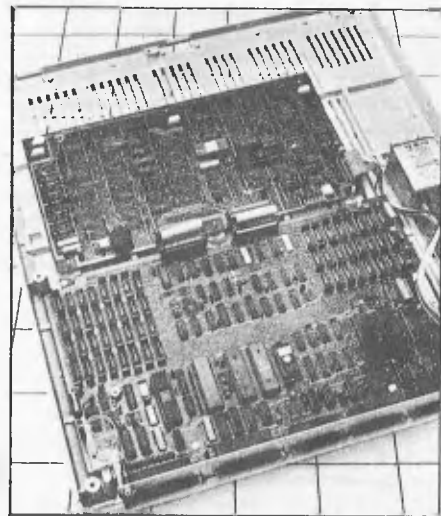
A microcomputer system will be used by two types of users — programmers and end users. In our Benchtests, we look at systems from the end user's point of view, mostly, although the programmer's angle obviously cannot be neglected. Looking at this machine as an end user, it appears awkward, unfriendly, overly complex and unnecessarily nitpicking in its syntax. In short, most end users, particularly the 'naive' (in computing terms) business user at whom the machine is aimed, would be frightened silly by it.

But it not intended that the end user should have to grapple with the utilities directly. The facilities exist for the programmer, using the very powerful utilities, to insulate the user from the operating system completely — the user would buy his Monroe with the software already arranged so that he would never actually have to come face to face with MOS; the auto start, run, load and other utilities can be combined to allow the user to carry out any operation necessary, including disk formatting, housekeeping and full multitasking without needing to learn anything of MOS at all. Although it is possible to insulate the user to some extent from CP/M, software houses rarely seem to bother and, in any case, CP/M simply doesn't allow the same degree of insulation.

The above answers the question that immediately formed in my mind when I first looked at MOS: why did Monroe go to the trouble and expense of writing its own operating system when there are several off-the-shelf systems already around, such as MP/M-II and Unix? The answer, at least in part, must be that no existing operating system for micros allows the programmer to provide such a high degree of insulation. I feel that Monroe made the right decision in going the lone route. It has decided that it wants to sell microcomputers to businessmen and it has realised that these customers have neither the time nor the inclination to learn the vocabulary, concepts and procedures of computing: to these users, the desk-top computer is another piece of office machinery and it needs to be as easy to use as a photocopier. Provided the programmer realises this and takes advantage of the machine's many powerful facilities, it should be easier to achieve this with the Monroe than with most other micros.

From the programmer's point of view, I feel the machine will prove an exciting and challenging beast. Prog-

Rear view



Two neat boards house the major electronics.

grammers weaned on — or at least thoroughly accustomed to — CP/M will find it strange indeed, but those coming fresh from the mini/mainframe world will find it easy to live with. Which brings us to Monroe's other reason for developing its own operating system: although the official line is to deny it, there are strong and well-informed rumours that the company is developing a minicomputer; it seems reasonable to suggest, then, that MOS will have a good degree of compatibility with the mini's operating system and I'd go so far as to suggest that they were developed by the same team — MOS just has a mini feeling to it.

One minor gripe; Monroe has provided eight programmable function keys (actually 16 as they can be shifted), yet MOS makes absolutely no use of these at all. I understand a future release will, hopefully in the style of Hewlett-Packard's softkeys.

## Monroe Basic

Although Pascal is mentioned as an option in the literature, Monroe Basic is the system's main language. As 'MBasic' has already been used by somebody else, Monroe calls its Basic 'MEBasic' and it's certainly a very comprehensive and powerful implementation of the language.

Basic is called up by typing 'Basic' followed by the amount of memory you want to allocate to it; typing 'Basic,, 34000' gives you Basic (which takes up 34k) plus another 34k to play with. If you don't allocate any memory, the system gives you the default value of just 5 kbytes.

I found MEBasic one of the easiest and most pleasant to use of the various Basics knocking around these days. During programming and in command mode it accepts input in either upper

# MONROE 8820

programming, these are converted and stored in upper case, so that 'a' and 'A', if used as variable names, reference the same variable and both appear as 'A' when the program is listed.

MEBasic checks your syntax dynamically as soon as you hit return at the end of the line. If you make a mistake, it consults an 8 kbyte disk file of error messages and tells you what's wrong; if the file isn't present on the current disk it gives you an error code instead. If you've made an error, the machine also beeps at you and automatically enters its editing mode, with the cursor positioned at the end of the offending line — you can't continue until you've corrected the mistake, and editing keys such as insert and delete are provided to make this very easy. Thus, once you've typed in your program, you know that it's at least free of syntax errors before you RUN it.

On entering MEBasic, you are allowed variable names of only one letter plus (optionally) one digit, ie, A-Z and A0-Z9. Typing EXTEND (or including it in a program) allows the use of variable names of up to 32 characters, all of which are significant. I would have preferred the EXTEND mode to be the default mode, thus encouraging more readable programming; there's also a NO EXTEND command which cancels the EXTEND mode. You need to exercise a little caution when using EXTEND, though: in the NO EXTEND mode the system, is indifferent to spaces, so that INPUTA: PRINTA will be accepted. Using EXTEND, though, makes spaces critical as INPUTA would be interpreted as a variable name, and, in this context, cause an error message.

As can be seen from the list of Basic reserved words, MEBasic contains as its core the 'standard' facilities found in most Basics and takes a standard syntax for these, thus making it easy to use for programmers coming from, say, Microsoft Basic. In addition, there's a vast range of facilities to delight the serious programmer and to make the writing of business applications packages a cinch.

Of greatest interest among these are the ISAM file-handling capabilities. Regrettably, time did not allow me to explore these as thoroughly as I would have liked, but, basically, they allow you to open, read, update and write ISAM files which you create with a special Basic program, the listing of which is in the MEBasic manual. I know of no other microcomputer Basic which incorporates ISAM handling; it's very powerful and very useful.

Scanning through the reserved words list, here's a rundown of those which are peculiar to MEBasic and whose use isn't immediately obvious.

**ADD\$:** adds the value of two strings of numbers to a specified number of decimal places. **SUB\$, DIV\$, and MUL\$** similarly subtract, divide and multiply strings.

**CLEAR:** clears all variables and closes any files which happen to be open.

**COMMON:** allows you to share variables and their values between programs which are CHAINED.

**COMP%:** compares two numeric

strings. **A\$** and **B\$**, returning -1 if  $A\$ < B\$$ , 0 if they're equal and 1 if  $A\$ > B\$$ .

**CVT:** converts numeric values into ASCII for an I/O file.

**FLSH:** causes the string following it to flash when printed on the screen.

**OCT\$:** converts a decimal value into an octal one. Similarly, **HEX\$** converts to hex.

**OPTION BASE:** Allows you to save memory space when using arrays; normally, **DIM A (5)** would give an array of six elements **A(0)** to **A(5)**; **OPTION BASE 1** would eliminate the default **A(0)** element to give an array of five elements.

**PDL:** returns the x or y coordinates of a joystick. As joysticks aren't provided with the OC 8820, I assume this is for use with the educational micro.

**POSIT:** Positions the file pointer to the specified number of bytes from the start of the file.

**SET TIME:** like the Time utility, this lets you set the internal calendar/clock.

**SLEEP:** Wins my 'Basic Reserved Word of the Year' award for 1982. It does just what it says by suspending the current program for a specified time (in seconds).

MEBasic has been designed not only for the OC 8820 but also for the educational computer with its high resolution colour graphics. Thus, in addition to the listed functions there is a whole range more dealing with colour graphics; as these obviously don't work on the OC 8820, I haven't included them in the list of reserved words.

As can be seen from this very quick look at MEBasic, it's a powerful language, thoughtfully designed and implemented and easy and friendly to use. Programmers will find it an efficient Basic as it not only encourages good documentation through the use of EXTENDED variable names but has many powerful built-in features, too, including the ability to CALL the operating system's supervisor calls directly. With the system came a large number of various Basic programs, some of them utilities and others just games and demonstrations; all are thoroughly documented and most are designed to show you how to use various features of both language and machine.

## Documentation

The system came with three bulky manuals, one on MOS, one on the utility programs and a third, very thick one, on MEBasic. They were all described as programmer's reference manuals and a warning inside pointed out that they had been designed for experienced programmers, not as tutorials. Fair enough, they certainly made no attempt to teach basic concepts but they all explained every feature of operating system, utilities and Basic very thoroughly. I'd go so far as to say that they're among the best examples of documentation I've seen, being clearly written, thoroughly and accurately indexed and including heavily-commented examples of each feature, leaving the reader in no doubt whatsoever of how each facility should be used.

No hardware manuals were supplied with the machine, the only hardware information being a single-sheet sales

### Basic reserved words

ABS	FNEND	PDL
ADD\$	FOR..NEXT..STEP	PEEK
ASCII	GET	PEEK2
ATR	GO SUB	PI
AUTO	GOTO	POKE
BYE	HEXS	POSIT
CALL	IF..THEN..ELSE	PREPARE
CHAIN	INP	PRINT
CHR\$	INPUT	PRINT USING
CLEAR	INPUT LINE	RANDOMIZE
CLOSE	INSTR	READ
COMMON	INT	REM
COMP%	INTEGER	RENUMBER
CONTINUE	ISAM OPEN	RESTORE
COS	ISAM READ	RESUME
CUR	ISAM UPDATE	RETURN
CVT	ISAM WRITE	RIGHT\$
CVT\$F	KILL	RND
CVT\$F\$	LET	RUN
DATA	LIST	SAVE
DBLE	LOAD	SCR
DEF	LOG	SET TIME
DIM	LOG10	SGN
DIV\$	MERC\$	SIN
DOUBLE	MIDS	SINGLE
EDIT	MOD	SLEEP
END	MUL\$	SOUND
ERASE	NAME	SPACES
ERRCODE	NEW	SQR
EXTEND	NO EXTEND	STOP
FGCIRCLE	NOTRACE	STRINGS
FGCOPY	NUM\$	SUB\$
FGCTL	NUM\$	SVC
FGDRAW	ON\$	SWAP
FGERASE	ON..ERROR GOTO	SY\$( )
FGFILL	ON..GOTO	TAN
FGLINE	ON..RESTORE	TIMES
FGPAINT	ON..RESUME\$	TRACE
FGPOINT	OPEN	UNSAVE
FGPUT	OPTION BASE	VAL
FGROT	OPTION EUROPE	VAROOT
FGSCALE	OUT	VARPTR
FIX		WHILE..WEND
FLOAT		
FLSH		
FN		

leaflet with a summary of the system's specifications.

## Expansion

Although not officially announced yet, it seems probable that the memory will be expandable to beyond 128k, although by how much and whether this will be an internal expansion or an add-on box just isn't known yet.

Hard disks are on their way, either 5 or 10 Mbytes as an external unit with a built-in tape drive for back-up. Monroe feels this is preferable to the conventional approach of replacing one of the floppies with a winchester drive and backing up onto a series of floppies, although many users seem happy with the latter approach.

Monroe is shortly to announce another system, a visible ledger machine with either 32 or 64 kbytes of RAM and a 100k cassette tapes store which can hold either programs or data. This will link up to the OC 8820 through the latter's communications port for bi-directional data transfer and will have its own keyboard, 40-character strip display and integral printer which, apart from printing the ledger cards, will act as a general purpose printer too. It's an interesting idea — there are lots of people around who feel uneasy at trusting their business records entirely to disk or tape and who would like to combine computing with more traditional methods. Anticipated selling price of the visible ledger system is around \$3000.

I mentioned earlier that Monroe is thought to be working on a mini; if and when this appears, the OC 8820 should be able to communicate with it and communication with other OC 8820s will be possible — it's a software requirement not a hardware upgrade.

## Conclusions

The Monroe OC 8820 is a well-built micro which makes no pretensions at being other than a no-nonsense business tool. It places the onus firmly on the programmer/software house to provide the user with a friendly, easy-to-use



# MONROE 8820

system tailored to his/her specific requirements, but all the facilities to do this are provided.

At just under \$5500 for the basic system, it's definitely an up-market micro these days, especially considering that it's an 8-bit machine at

heart. But the power and flexibility of its operating system compensates for the price and its quality construction equals that of Hewlett-Packard's HP 125, although, in a very definite swings-and-roundabouts comparison, it hasn't some of the HP 125's attractive features.

I disliked the Monroe at first and I feel that others, especially the

programmer used to CP/M, may feel the same. But on getting to know it, and on investigating the philosophy behind it, I found it a powerful and pleasant micro aimed at a specific niche in the market, for which it is well suited.

Ultimately, though, the machine's future will depend on the degree to which its applications software is tailored to it.

## Technical specifications

Processor: Z80A, 3MHz  
Memory: 128k user RAM, 4k video RAM, 2k bootstrap PROM  
Disks: Twin single-sided, double density, 320k each.  
Screen: 80x24 amber on grey, double height, double width, dimmed, flashing, lo-res graphics.  
I/O: 3xRS232 ports, expansion port, ext disk port.  
Keyboard: 93 keys inc full qwerty, numeric pad, cursor controls, 8 prog function keys, screen editing keys.  
System software: Monroe operating system; CP/M (opt)  
Languages: Monroe Basic, Pascal

## Benchmark timings

BM1	2.1
BM2	4.2
BM3	9.9
BM4	10.5
BM5	11.0
BM6	20.1
BM7	32.0
BM8	33.0

*All timings in seconds. For a full listing of the Benchmark programs, see APC Vol 1 No 8.*

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## PROGRAMS

APC is interested in Basic or Pascal Programs for any popular micro — please tell us which one you wrote your program on and how much memory it uses. Make sure your programs are fully debugged before you send them in on cassette (although we will accept disks) with a clear listing on plain paper. Documentation would be welcome, and if you want it returned please label everything with your name and address and include an SAE. Send contributions to APC Programs, 462 Burwood Road, Hawthorn, Vic. 3122.

## ZX81 Hypocycloids

by R Clark

Several readers have written in to ask for more programs for the 1k ZX81. As I've received so many letters about it here is a 1k program which will draw circular patterns on the screen. There is room in this type of program for experimentation and it is useful for demonstrating to beginners how to use the

PLOT command in conjunction with functions like SIN and COS.

When the computer requests input all that is required are three numbers, the variables A, N and R. The pattern will vary according to the numbers you assign to these variables.

```

10 INPUT A
20 INPUT N
30 INPUT R
35 REM N*A+R<31, N*A-R<21
40 FOR T=0 TO 2*PI STEP PI/50
50 LET X=INT(0.5+N*A*COS(T+R)*COS(T+N))
60 LET Y=INT(0.5+N*A*SIN(T-R)*SIN(T+N))
70 PLOT 31+X,22+Y
80 NEXT T
    
```

## TRS-80 Truth

by Mike Costello

This is a single-player game of reasoning in which the player tries to crack a secret rule set at the start by the computer. It is played using a standard card deck but is otherwise unlike a normal card game.

The player's hand consists of the full deck, which is played one card at a time. If a card is in accordance with the computer's rule it is put in a part of the screen reserved for correct plays. If it is not, it is put in the part of the screen

reserved for wrong cards. Guessing the rule is indicated by playing eight correct cards in succession, after which a score is given between 0 and 100%. This is based on the number of cards left in the pack and the number of mistakes made.

To play a card, type S,H,D or C for the suit and A,K,Q,J or 2-10 for the rank. A full stop enters the play and backspacing or pressing 'enter' will erase it. Truth will run in 14k on a TRS-80 Model 1 Level 2.

```

10 CLEAR2000:DEFINITE=C,E=H:DEFSTEN=Z:GTHY(10,0)=K(10,0):PCV(51,0)=M(51,0):J(10,0)=K
12:J(0,0)=M(0,0):C=949:RANDOM
20 GOSUB20010
30 CT=0:FOR=0TO3:K(1,0)="A":K(11,0)="J":K(12,0)="Q":K(13,0)="K":FOR=2TO10
40 FOR=0TO3:FOR=1TO13:K(0,0)=B:NEXT:NEXT:PLAYERS=HAND/STRINGS
50 FOR=0TO3:FOR=1TO13:K(0,0)=B:NEXT:NEXT:PLAYERS=HAND/NUMBERS
110 CLS:PRINTCHR$(23):PRINT@144:"T R U T H":PRINT@204:"©1981 M W COSTELLO"
120 GOSUB4100:A=PRECZ):PRINT@448:"PLEASE CHOOSE YOUR":PRINT"LEVEL OF PLAY":PRINT@58
4,11,"U1:PRINT@648,"2","U2:PRINT@712,"3","U3:PRINT@836,"TYPE 1, 2 OR 3"
120 GOSUB10010
130 IF2="1"THENUS=U1:GOSUB5100ELSEIF2="2"THENUS=U2:GOSUB6410ELSEIF2="3"THENUS=U3
GOSUB6800ELSE120
140 *COME BACK HERE WITH CHOSEN RULE (*HAVE VALUES OF 01-4 % GO)
1010 CLS:GOSUB11010:GOSUB11110:CC=64:CM=320:C5=0:C6=0:K=0
1090 ML=3:C=949:GOSUB50000
1092 IF2="Z"THENGOTO 64020ELSEGOSUB 17010:IFJUNK =1THENGOTO1090ELSEGOSUB 3012
1095 IFCT=0THENGOTO 13010:ELSEIFK=0THENGOTO 30010:ELSEFOR=0TO2:J(0,0)=J(0,0)+1:LINE
KT:J(0,0)=J(0,0)+1:GOTO1090:RECORD OF RIGHT/WRONG LAST 4
1100 *FOLLOWING ARE ALL SUBROUTINES
3012 IFCT=52THEN=1:GOTO3020:FIRST CARD ALWAYS RIGHT
3015 ONCGOSUB@020,0040,0060,0110,0130,0160,0210,0240,0270,0290,0310,0360,0380,0
410,0440,0450,0460,0470,0500,0510,0520,0530,0540,0550
3020 IFE=1GOSUB 12010:ELSEGOSUB 12105
3030 CT=CT+1:IFCT=0THENGOTO13010:ELSERETURN
5100 GOSUB6910
5400 GOSUBND(0):ONCGOSUB5500,5510,5520,5530,5540,5550,5560,5570:0 BRANCHES
5410 RETURN
5500 S1=X3:S2=X0:S3=V5:S4=V1:S5="":S6="":RETURN
    
```



# PROGRAMS

```

5510 S1=X4:S2=V1:S3=X5:S4=V7:RETURN
5520 L=RND(13):N=P(L,0):L1=L+6:IFL1<14THENS=P(L1,0)ELSENS=P(L1-13,0):L1=L1-13
5521 IFL1=13THENG=PY(1,0)ELSEO=P(L1+1,0)
5522 L2=L1+6:IFL2<14THENS=P(L2,0)ELSEOS=P(L2-13,0):L2=L2-13
5523 S1=N+ TO "NS=S2:V1:S3=Q+" TO "OS:S4=V7
5524 FORA=0T012:J1(A)=0:J2(A)=0:NEXT:FORA=0T06:J1(A)=L1:L1+1:IFL=14THENL=1
5525 NEXT:FORA=0T05:J2(A)=L:L+1:IFL=14THENL=1
5526 NEXT:RETURN
5530 S1=X3:S2=X3:S3=X3:XD=S4=Y7+" "+Y4+" "+Y5+" "+Y6+" "+Y7+" .....":RETURN
5540 S1=X3:S2=X3:S3=X3:S4=XD:S5=XE+" (FIRST 2 ALWAYS RIGHT)":RETURN
5550 S1=X3:S2=X6:S3=X8:S4=X8:S5=V1:RETURN
5560 S1=X3:S2=X6:S3=X8:S4=X7:S5=V1:RETURN
5570 S1=X2:S2=XF:S3=XG:RETURN
6410 GOSUB6910:GC=RND(10):ONGCGOSUB6420,6430,6440,6450,6460,6470,6480,6490,6500,
6510
6515 GC=GC+8:RETURN
6420 S1=X3:S2=X3:S3=X3:S4=XD:S5=Y5+" "+Y7+" "+Y4+" "+Y6+" "+Y5+" .....":RETURN
6430 S1=X6:S2=X6:S3=XH:RETURN
6440 S1=V3:S2="IT":S3=X3:S4="THIS RULE:
DIVIDE "+V1+" BY 4. IF REMAINDER = 3 PLAY "+Y7+", IF = 2 PLAY "+Y6+", IF = 1 PL
Y "+Y5+", ELSE PLAY "+Y4":RETURN
6450 S1=X2:S2=V1:S3=X4:S4=" AND "+X1+" IS CORRECT IF "+V1+" IS "+X5:RETURN
6460 S1=X3:S2=X6:S3="4 TO 6":S4=X8:S5=V1:RETURN
6470 S1=X3:S2=X6:S3="8 TO 10":S4=X7:S5=V1:RETURN
6480 S1=X3:S2=V3+ OR "+X6:S3=V4:S4=V1:RETURN
6490 L5=RND(4)-1:L6=L5:GOSUB6495:L7=L5:GOSUB6495:L8=L5:GOSUB6495:L9=L5:L5=L6:GOS
UB6497:T6=T5:L5=L7:GOSUB6497:T7=T5:L5=L9:GOSUB6497:T8=T5:L5=L9:GOSUB6497:T9=T5:G
OT06499
6495 L5=L5+1:IFL5>3THENL5=0
6496 RETURN
6497 IFL5=0THENT5=Y4ELSEIFL5=1THENT5=Y5ELSEIFL5=2THENT5=Y6ELSEIFL5=3THENT5=Y7ELS
EPRINT"BUG":STOP
6498 RETURN
6499 S1=X4+" "+X6:S2=V1:S3=T6+" OR "+T7+" AND "+S4=X5+" "+X6+" IS CORRECT IF
"+V1+" IS "+T8+" OR "+T9:RETURN
6500 S1=X1:S2=XF:S3=XG:S4=" ":S5="":S6=X2:S7=XF:S8=Y1:RETURN
6510 S1=X3:S2=X6:S3="WITHIN RANGE 2 LESS TO 2 MORE THAN "+V1:RETURN
6803 GOSUB6910:GC=RND(6):ONGCGOSUB6810,6820,6830,6840,6850,6860
6806 GC=GC+18:RETURN
6810 S1=X4:S2=V1:S3="SAME "+XA+" AS"+S4=V2+" ONE"+S5="":S6=X5:S7=V1:S8="DIFFEREN
T "+XA+" FROM"+S9=V2+" ONE":RETURN
6820 S1="A TO 7":S2=V2+" 2":S3=X1:S4="":S5="":S6="8 TO K":S7=V2+" 2":S8=X2:RETUR
N
6830 S1=X4:S2=XF+ BUT 3":S3=Y1:S4="":S5="":S6=X5:S7=S2:S8=XG:RETURN
6840 S1="EVERY THIRD CARD":S2="IT":S3=X3:XD=S4=Y5+" "+Y4+" "+Y7+" "+Y6:S5="(OTHE
R CARDS ARE ALWAYS CORRECT)":RETURN
6850 S1="COURT "+X3:S2=V1:S3="NOT "+S1:S4=V7:RETURN
6860 S1=X2:S2=V6+V2:S3=X8+ OR EQUAL TO":S4=V6+Y1+" CARDS":S5="":S6=X1:S7=S4:S8=
X8:S9=S2:RETURN
6910 S1="":S2="":S3="":S4="":S5="":S6="":S7="":S8="":S9="":RETURN
7000 RETURN
8020 IF(F=0ORF=3)AND(HS=1ORHS=2)THENE=1ELSEIF(F=1ORF=2)AND(HS=0ORHS=3)THENE=1ELS
EE=0
8030 RETURN
8040 L=1:IFG<(LORG)IFHD<(LORHD)THENE=1ELSEE=0ELSEIFHD<(LORHD)THENE=1ELSEE=0
8050 RETURN
8060 E=0:FORA=0T012:IFJ1(A)=GTHEN 0070 ELSENEXT:GOTO 8060
8070 FORA=0T012:IFJ2(A)=HDTHENE=1:GOTO 8100 ELSENEXT:GOTO 8100 'WITH E LEFT AS 0
8080 FORA=0T012:IFJ2(A)=GTHEN 0090 ELSENEXT
8090 FORA=0T012:IFJ1(A)=HDTHENE=1:GOTO 8100 ELSENEXT:GOTO 8100 'WITH E AS 0
8100 RETURN
8110 IF(F=3ANDHS=1)OR(F=1ANDHS=0)OR(F=2ANDHS=2)OR(F=2ANDHS=3)THENE=1ELSEE=0
8120 RETURN
8130 IFCT=S1THENE=1:RETURNELSEL=1:IFHD<(LORHD)THENL=0ELSEL=C1
8140 IFG<(LORG)THENL=F=0ELSEL=F=1:LF=D E N O M OF LAST CORRECT
8150 IFG<(GORL)THENL=0ELSEL=1
8160 IF(LC=1ANDLF=0ANDL=0)OR(LC=1ANDLF=1ANDL=0)OR(LC=0ANDLF=1ANDL=1)OR(LC=0AN
DLF=0ANDL=1)THENE=1ELSEE=0
8170 RETURN
8180 IFG=13THENG=0ELSEGT=G
8190 E=0:FORA=0T012:J1(A)=0:NEXT:FORA=0T02:J1(A)=GT+1:GT=GT+1:IFGT=13THENG=0
8200 NEXT:FORA=0T02:IFJ1(A)=HDTHENE=1:RETURNELSENEXT:RETURN'WITH E = 0
8210 IFG=1THENG=14ELSEGT=G
8220 E=0:FORA=0T012:J1(A)=0:NEXT:FORA=0T02:J1(A)=GT-1:GT=GT-1:IFGT=1THENG=14
8230 NEXT:FORA=0T02:IFJ1(A)=HDTHENE=1:RETURNELSENEXT:RETURN'JUST LIKE 25060
8240 E=0:IFHS=0ORHS=3THENE=1:RETURNELSEIF(JV(3)=1)THENE=1:RETURNELSERETURN'WITH E
=0 BECAUSE CARD RED BUT LAST PLAYED WAS CORRECT
8265 'END OF LEVEL 1 - NOW LEVEL 2 TESTS
8270 E=0:IF(F=1ANDHS=3)THENE=1ELSEIF(F=3ANDHS=0)THENE=1ELSEIF(F=0ANDHS=2)THENE=1
ELSEIF(F=2ANDHS=1)THENE=1
8280 RETURN
8290 FORA=0T012:J1(A)=0:NEXT:FORA=0T02:J1(A)=A+1:NEXT:J1(3)=5:J1(4)=7:J1(5)=11:J
1(6)=13
8300 FORA=0T06:IFHD=J1(A)THENE=1:RETURNELSENEXT:E=0:RETURN
8310 IF(G=6ORG=10)AND(HS=2)THENE=1:RETURN
8320 IF(G=9ORG=9ORG=13)AND(HS=1)THENE=1:RETURN
8330 IF(G=7ORG=11)AND(HS=3)THENE=1:RETURN
8340 IF(G=5ORG=8ORG=12)AND(HS=0)THENE=1:RETURN
8350 E=0:RETURN
8360 L=1:IFG<(GORL)THENL5=1ELSEL5=0
8370 IF(HS=1ORHS=2)AND(L5=0)THENE=1:RETURNELSEIF(HS=0ORHS=3)AND(L5=1)THENE=1:RET
URNELSEE=0:RETURN
8380 FORA=0T012:J1(A)=0:NEXT:L1=G+4:IFL1>13THENL1=L1-13
8390 FORA=0T02:J1(A)=L1:L1=L1+1:IFL1>13THENL1=1
8400 NEXT:FORA=0T02:IFHD=J1(A)THENE=1:RETURNELSENEXT:E=0:RETURN
8410 FORA=0T012:J1(A)=0:NEXT:L1=G-8:IFL1<1THENL1=L1+13
8420 FORA=0T02:J1(A)=L1:L1=L1-1:IFL1<1THENL1=13
8430 NEXT:FORA=0T02:IFHD=J1(A)THENE=1:RETURNELSENEXT:E=0:RETURN
8440 IF(HS=F)OR(HD=G)THENE=1:RETURNELSEE=0:RETURN
8450 L=1:IFHD<(LORHD)THENL=0
8452 IF(L=0ANDF=L8)OR(L=0ANDF=L9)THENE=1:RETURNELSEIF(L=1ANDF=L5)OR(L=1ANDF=L7)T
HENE=1:RETURNELSEE=0:RETURN
8460 IF(HS=0ORHS=3)AND(JV(3)=1)THENE=1:RETURNELSEIF(HS=1ORHS=2)AND(JV(3)=2)THENE=1:R
ETURNELSEE=0:RETURN
8470 FORA=0T012:J1(A)=0:NEXT:L1=G-2:FORA=0T04:IFL1<1THENL1=L1+13
8472 J1(A)=L1:L1=L1+1:IFL1>13THENL1=1
8474 NEXT:FORA=0T04:IFHD=J1(A)THENE=1:RETURNELSENEXT:E=0:RETURN
8490 'END LEVEL 2 - NOW LEVEL 3 TESTS
8500 IFCT>50THENE=1:RETURNELSEL=1:IF(F=0ORF=3)AND(F=0ORF=3)THENIFHD<(LORHD)TH
ENE=1:RETURN
8502 IF(F=1ORF=2)AND(F=0ORF=2)THENIFHD<(LORHD)THENE=1:RETURN
8504 IF(F=0ORF=3)AND(F=0ORF=2)THENIFHD<(LORHD)THENE=1:RETURN
8506 IF(F=1ORF=2)AND(F=0ORF=3)THENIFHD<(LORHD)THENE=1:RETURN
8508 E=0:RETURN
8510 IFCT>49THENE=1:RETURNELSEIF(F1=0ORF1=9)AND(HD<8)THENE=1:RETURNELSEIF(F1=1OR
F1=2)ANDHD>7THENE=1:RETURNELSEE=0:RETURN
8520 IFCT>48THENE=1:RETURNELSEL=1:IFHD<(LORHD)ANDJV(0)=1THENE=1:RETURNELSEIFHD<
(LORHD)ANDJV(0)=2THENE=1:RETURNELSEE=0:RETURN
8530 E=1:IFCT>49THENRETURNELSEL=C5/3:IFDL<INT(DL)THENRETURN

```



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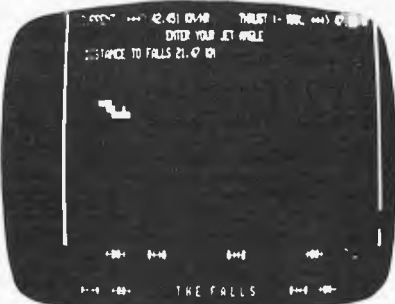
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CSH.....X	DATA....P	DEFIN....X	DEFIN....J	DEFIN....C
DESTR....P	DELETE...X	EDIT.....X	ERROR...P	FOR.....F
GOSUB...H	GOTO....G	INCR....K	INPUT...I	LEFT...L
LIST....L	LIST....R	MOD.....M	MOD....M	NEED....P
POINT....Z	POKE....O	REAR...R	REAR...R	RESET...S
RESTORE X	RESUME..X	RETURN..J	RIGHT...R	TRAIL...S
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STR....Z	SYSTEM..S	TAB.....T	TROFF...Y	TROFF...S
		USING...U	WRITE...V	

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PROGRAMS

```

8532 IFHS=0ANDF1=1THENRETURNELSEIFHS=3ANDF1=0THENRETURNELSEIFHS=2ANDF1=3THENRETU
RNEELSEIFHS=1ANDF1=2THENRETURNELSEIFHS=0:RETURN
8540 IFHD>10AND<11THENE=1:RETURNELSEIFHD<11ANDG>10THENE=J:RETURNELSEIFHS=0:RETURN
8550 IFC6=C5AND<HS=1ORHS=2>THENE=1:RETURNELSEIFC6<C5AND<HS=0ORHS=3>THENE=1:RETU
RNEELSE=0:RETURN
10010 Z=INKEY$:IFZ=" "THEN10010ELSERETURN
11010 PRINTY1:PRINT0256,Y2:PRINT0512,Y3:PRINT0576,Y4:PRINT0608,Y5:PRINT0704,Y6:P
RINT0736,Y7:PRINT0864,Y8:PRINTY9:RETURN
11110 PRINT0640,"":FORA=1TO13:PRINT(A,0):NEXT:PRINT0672,"":FORA=1TO13:PRINTP
(A,1):NEXT:PRINT0768,"":FORA=1TO13:PRINT(A,2):NEXT:PRINT0900,"":FORA=1TO13:
PRINT(A,3):NEXT:RETURN
11210 PRINT064,"":FORA=0TO51:PRINTPC(A),"":NEXT
11220 RETURN
11310 PRINT0920,"":FORA=0TO51:PRINTPC(A),"":NEXT
11320 RETURN
11410 GOSUB11110:IN FACT DRAWS ACTUAL HAND
11420 RETURN
12010 IFCT<52THENPRINT0844,VM:"CORRECT *****":GOSUB65310:PRINT0844,CHR*(30):GO
SUB65310:PRINT0844,VM:"CORRECT *****":GOSUB65310:PRINT0844,CHR*(30)
12020 GOSUB12200:PRINT0C,Q5:ZT=P<HD,HS):PRINTRIGHT*ZT,(LEN(ZT)-1)):IFPOS(0))
60THENCI=7ELSEIFHD=10THENCI=4ELSECI=3
12030 CC=CC+CI:GOSUB12250:PRINT0C,CHR*(224):PRINT0C,"":ZZ=P<HD,HS):ZT=RIGHT*(Z
Z,LEN(ZZ)-1):P<HD,HS="":FORA=1TO13:PRINTP(A,HS):NEXT
12040 GOSUB12200:PC(C5)=Q5+ZT:C5=C5+1
12050 F3=F2:G3=G2:F2=F1:G2=G1:F1=F0:G1=G0:F0=F:G0=G
12055 F=HS:G=HD
12060 JT=2:IFCT=52THENRETURNELSEK=K+1:RETURN
12105 PRINT0844,VM:"A MISTAKE *****":GOSUB65310:PRINT0844,CHR*(30):GOSUB65310:
PRINT0844,VM:"A MISTAKE *****":GOSUB65310:PRINT0844,CHR*(30)
12110 GOSUB12200:PRINT0C,Q5:ZT=P<HD,HS):PRINTRIGHT*ZT,(LEN(ZT)-1)):IFPOS(0))
60THENCI=7ELSEIFHD=10THENCI=4ELSECI=3
12120 CM=CM+CI:GOSUB12250:PRINT0C,CHR*(224):PRINT0C,"":ZZ=P<HD,HS):ZT=RIGHT*(Z
Z,LEN(ZZ)-1):P<HD,HS="":FORA=1TO13:PRINTP(A,HS):NEXT
12130 GOSUB12200:PM(C6)=Q5+ZT:C6=C6+1
12140 K=0:JT=1:RETURN
12200 IFHS=0THENQ5="S"ELSEIFHS=1THENQ5="H"ELSEIFHS=2THENQ5="D"ELSEQ5="C"
12210 RETURN
12250 IFHS<2THENC=640+HS*32ELSEC=704+HS*32
12255 RETURN
13010 CLS:PRINT"SORRY, YOU HAVE NOW PLAYED ALL YOUR CARDS AND WE MUST REVEAL THE
RULE:"
13020 GOSUB40010:GOTO40030
17010 CJ=0
17505 Z=LEFT*(ZW,1):IFZ="S"ORZ="H"ORZ="D"ORZ="C"THEN17507ELSE 17700
17507 IFZ="S"THENHS=0ELSEIFZ="H"THENHS=1ELSEIFZ="D"THENHS=2ELSEHS=3
17509 Z=MD*(ZW,2,1):IFZ<>"1"THENIFLEN(ZW)=3THEN17700
17510 IFZ="1"THENIFLEN(ZW)<3THEN 17700 ELSEIFRIGHT*(ZW,1)<>"0"THEN 17700 ELSEIF
Z<>"1"ANDLEN(ZW)=3THEN 17700
17515 IFLEN(ZW)=3THENHD=1ELSEIFZ="A"THENHD=1ELSEIFZ="J"THENHD=1ELSEIFZ="Q"THEN
HD=1ELSEIFZ="K"THENHD=13ELSEHD=VAL(Z):IFHD=0THEN 17700
17535 IF<HD,HS>=0THEN0090:"HE'S NOT HOLDING SUCH A CARD
17545 <HD,HS>=0:RETURN:SUB TOTAL PLAYER'S CARDS
17700 PRINT0960,CHR*(30):PRINT0960,"NO SUCH CARD IN THE PACK!":GOSUB65010:CJUN
K=1:PRINT0960,CHR*(30):PRINT0960,Y9:RETURN
20010 Y1="CORRECT":Y2="MISTAKES":Y3="YOUR HAND":Y4="SPADES":Y5="HEARTS":Y6="DIAM
ONDS":Y7="CLUBS":Y8="GIVE SUIT AND DENOMINATION OF CARD YOU WANT TO PLAY":Y9="I
F YOU DECIDE TO GIVE UP, TYPE: Z
20020 X1="BLACK":X2="RED":X3="CARD":X4="EVEN":X5="ODD":X6="DENOMINATION":X7=" LE
SS THAN":X8=" GREATER THAN":V1=" LAST CORRECT CARD":V2=V1+" BUT":V3="SUIT":V4="
SAME AS ":V5="DIFFERENT FROM":V6=" TOTAL OF ":V7=" AND VICE VERSA"
20030 VM="***** THAT DISCARD IS ":V8="1 TO 3":U1="BASIC":U2="INTERMEDIATE":U3="A
DVANCED
20040 XA="COLOUR":XB="IT FOLLOWS THE SEQUENCE":XC="CONSISTENT WITH":XD="SEQUENC
E OF: ":XE="2 ODD ALTERNATING WITH 2 EVEN":XF="PREVIOUS PLAY":XG="MISTAKE":XH="P
RIME NUMBER"
21000 RETURN
30010 R=FR<Z):CLS:PRINT"HELL DONE! WITH 8 CORRECT DISCARDS IN A ROW, YOU HAVE W
ORKED OUT THE SECRET RULE (UNLESS YOU'RE JUST LUCKY). THE RULE IS:
30020 GOSUB40010:GOSUB41003:GOTO40030
40010 PRINT192,81" IS CORRECT ONLY IF":PRINTS2:PRINT" IS "93;S4:PRINTS5
40020 IF$6)"THENPRINT0448,"AND":PRINTS6" IS CORRECT ONLY IF "S7" IS":PRINTS8;S9
40025 RETURN
40030 PRINT0902,"FOR ANOTHER GAME TYPE: G":PRINT0966,"TO SEE THE DISPLAY OF CAR
DS TYPE: D"
40040 GOSUB10010:IFZ="G"THENGOTO300ELSEIFZ="D"THENCLS:GOSUB11010:PRINT0896,"FOR A
NOTHER GAME TYPE: G TO SEE THE RULE AGAIN TYPE: R":PRINT0960,CHR*(30):GOSUB1
1210:GOSUB11310:GOSUB11410ELSE40040
40050 GOSUB10010:IFZ="G"THENGOTO300ELSEIFZ<>"R"THEN40050ELSECLS:GOSUB40010
40060 IFK<>0THEN40030ELSEGOSUB41003:GOTO40030
41003 L1=44-C6
41005 D1=CT/43:D2=L1/44:D3=(D1+D2)*50
41010 PRINT0729,"S C O R E":PRINT"CARDS IN HAND = "CT:PRINT0900,"MISTAKES = "
C6:PRINT"FINAL SCORE: ###.##%";D3:PRINT0954,("BUS" GAME)
41020 RETURN
50000 PRINT0C,CHR*(30):PRINT0C,"":PRINTCHR*(14)
50010 ZW="
50020 Z="":GOSUB10010
50030 IFZ="Z"THENPRINTCHR*(15):RETURN
50040 IFZ=" "THENPRINTCHR*(15):RETURNELSEIFZ=CHR*(8)THENIFZW=" "THEN50020ELSEZW=
LEFT*(ZW,LEN(ZW)-1)ELSEIFZ=CHR*(13)GOSUB 50070:GOTO50000ELSEIFZ<CHR*(32)THENPRIN
TCHR*(15):GOTO50000ELSEZW=ZW+Z
50050 PRINTCHR*(14):IFZ="S"THENPRINTY4,"":ELSEIFZ="H"THENPRINTY5,"":ELSEIFZ="
D"THENPRINTY6,"":ELSEIFZ="C"THENPRINTY7,"":ELSEPRINTY9
50060 IFLEN(ZW)<=11THEN50020ELSEPRINTCHR*(15):PRINT0960,"YOU'RE TYPING TOO MANY
CHARACTERS":GOSUB65010:PRINT0960,CHR*(30):GOTO50000
50070 PRINTCHR*(15):PRINT0960,CHR*(30):PRINT0960,"TYPE A FULL STOP TO PLAY YOU
R CARD - DON'T HIT ENTER":GOSUB65010:PRINT0960,CHR*(30):PRINT0960,Y9:RETURN
50090 PRINT0960,CHR*(30):PRINT0960,"YOU'RE NOT HOLDING THAT CARD!":GOSUB65010:
PRINT0960,CHR*(30):PRINT0960,Y9:CJUNK=1:RETURN
64020 CLS:PRINT0256,"IF YOU ARE SURE YOU WANT TO GIVE UP THE ATTEMPT TO GUESS TH
E SECRET RULE, HIT ENTER TO SEE WHAT THE RULE IS. OTHERWISE PRESS ANY OTHER K
EY TO RETURN TO THE GAME"
64230 GOSUB10010:IFZ=CHR*(13)THENCLS:PRINT0256,"THE SECRET RULE IS:":GOSUB40010
:GOTO40030ELSECLS:GOSUB11010:GOSUB11210:GOSUB11310:GOSUB11410:GOTO1000
65000 PRINT0512,"EMJAY, 17 LAINGRANK AVENUE, -15E PARK, NOTTINGHAM NG5 5BU":GOSU
B65110:GOSUB65110:RETURN
65010 FORA=1TO750:NEXT:RETURN
65010 FORA=1TO1250:NEXT:RETURN
65210 FORA=1TO300:NEXT:RETURN
65310 FORA=1TO375:NEXT:RETURN

```



# PROGRAMS

## PET Doc by Bob Chappell

Doc is an 'Eliza' type program — ie, the computer will strike up a conversation with you. The computer will introduce itself as 'Dr Solace', a psychiatrist who wants to know all your problems and will give replies based on your input. Writing a program like this needs cunning logic if it's not to be become

nonsensical. Cramming such logic and a good range of responses into 8k is not an easy task, so it is possible to make rubbish out of a conversation with the 'doctor'.

Doc contains full instructions and will run on any PET.

```

10 REM*DOC*BOB CHAPPELL*14/12/82
20 GOSUB330
30 L:=H#:B#="" :PRINT"QD":
40 GETH#:IFH#="" THEN40
50 V=ASC(H#):IFV=13ORV=20:ANDB#="" THEN40
60 IFV=13 THENPRINT"Q":GOTO110
70 PRINTH#:IFV=20 THENB#:=LEFT$(B#,LEN(B#)-1):GOTO40
80 IFV=44 THENH#=""
90 IFV<>39 THENB#:=B#+H#
100 GOTO40
110 H#:=B#+":L=LEN(H#):IFTI#<"000500"GOTO130
120 PRINT"SORRY, YOUR TIME IS UP." :K=39:TI#="000000":GOTO240
130 IFL>60 THENK=42:GOTO240
140 IFH#:=L$ THENK=43:GOTO240
150 REM**SPLIT INTO WORDS**
160 FORJ=1 TO:T$(J)="" :NEXT X=0:Z=1:FORJ=1 TO:L
170 IFMID$(H#,J,1)="" THENX=X+1:T$(X)=MID$(H#,Z,J-Z):Z=J+1
180 REM**FIND KEYWORD**
190 NEXT K=41:FORJ=1 TO:K#:=K$(J1):FORJ=1 TO:T#:=T$(J)
200 IFK#:=T#+T$(J+1) THENK=J1:F=J+2:J=X:J1=A:GOTO220
210 IFK#:=T$ THENK=J1:F=J+1:J=X:J1=A
220 NEXT J, J1
230 REM**SELECT REPLY**
240 Z=L(K)+INT(T(K)*RND(0)):IFZ=Z1 THEN240
250 REM**CONJUGATE**
260 Z1=Z:R#:=R$(Z):IFRIGHT$(R#,1)<>"*" THEN340
270 J#="" :IFFX$GOTO330
280 FORJ1=FTOX:T#:=T$(J1)
290 FORJ=1 TO:STEP2:IFT#:=C$(J) THENT#:=C$(J+1):J#:=B:GOTO310
300 IFT#:=C$(J+1) THENT#:=C$(J):J#:=B
310 NEXT J:IFT#:=X ANDT#="" THENT#:=ME
320 J#:=J#+T#+":NEXT J1
330 R#:=LEFT$(R#,LEN(R#)-1)+J#+":I?
340 LX=LX+3:IFLX>12 THENPRINT"QD":H#="" :LX=3
350 PRINTR#:IFZ=127 ORZ=128 THENH#="" :LX=LX+2
360 GOTO30
370 REM**INITIALISE**
380 PRINT"Q":POKE59468,12
390 A=40:B=16:C=142:D=43:E=30:LX=7:DIMK$(A),C$(B),R$(C),L(D),T(D),T$(E)
400 FORJ=1 TO:A:READK$(J):NEXT
410 FORJ=1 TO:B:READC$(J):NEXT
420 FORJ=1 TO:C:READR$(J):NEXT
430 FORJ=1 TO:D:READL$(J),T$(J):NEXT:T1#="000000":J=FND(-1)
440 PRINT"Q@HELLO, I AM DR. SOLACE, A CONSULTANT.
450 PRINT"PLEASE MAKE YOURSELF COMFORTABLE AND
460 PRINT"TELL ME YOUR PROBLEM." :RETURN
470 REM**EVALUATE YOURS**
480 DATA I, I AM, I CAN'T, I DON'T, I DON'T WANT, I WANT TO, I FEEL, I CAN, I CAN'T, I CAN YOU
490 DATA DO YOU, ARE YOU, WHO, HOW, WHAT, WHERE, WHEN, WHY, YOU ARE, YOU'RE, YOUR, YOU, MY
500 DATA SORRY, YES, NO, HATE, LOVE, THINK, DREAM, FRIEND, MONKEY, IF, GREAT
510 DATA COMPUTER, FOOD, SHUT UP, GOODBYE, BYE
520 REM**CONJUGATIONS**
530 DATA I, YOU, I'M, YOU'RE, MY, YOUR, AM, ARE, HAS, WERE, I'VE, YOU'VE, MYSELF, YOURSELF
540 DATA ME, YOU
550 REM**REPLIES**
560 DATA DOES IT WORRY YOU THAT YOU ARE?
570 DATA DID YOU THINK I WOULD BE SHOCKED TO HEAR THAT YOU ARE?
580 DATA HOW LONG HAVE YOU BEEN? DO YOU LIKE IT?
590 DATA ARE YOU ASHAMED THAT YOU ARE?
600 DATA ONE NEVER KNOWS UNLESS ONE TRIES, ONE SHOULDN'T GIVE UP
610 DATA HAVE YOU TRIED HARD TO?
620 DATA HOW CAN YOU TELL THAT YOU CAN'T?
630 DATA WHY WON'T YOU?, WHY DO YOU REFUSE TO?, IS IT WISE NOT TO?
640 DATA HAVE YOU ALWAYS DONE SO?, IS THAT WHY YOU WANT MY HELP?
650 DATA DO YOU WISH YOU COULD?, WHY DON'T YOU?
660 DATA DOES THAT WORRY YOU?, WOULD YOU LIKE TO?
670 DATA WOULD IT BE SO BAD IF YOU DID?
680 DATA BUT WHAT IF YOU NEVER GOT A?, WHAT WOULD YOU DO WITH A?
690 DATA WHAT IF I TOLD YOU THAT I OFTEN WANT A?
700 DATA CAN YOU SAY WHY YOU WANT TO?, WHEN DO YOU WANT TO?
710 DATA IS IT YOUR MAJOR AMBITION TO?
720 DATA WHAT DO THESE FEELINGS SUGGEST TO YOU?, DO YOU OFTEN FEEL?
730 DATA DO YOU ENJOY FEELING?, DESCRIBE WHAT IT IS LIKE TO FEEL?
740 DATA DO YOU REALLY WANT TO?, CAN YOU?
750 DATA WHY ARE YOU UNABLE TO?, WOULD IT HELP IF YOU COULD?
760 DATA WOULD YOU BE SURPRISED TO LEARN THAT I CAN?
770 DATA DON'T YOU BELIEVE THAT I CAN? NOT VERY WELL!
780 DATA PERHAPS ONE DAY I MIGHT?, I PREFER NOT TO?, WOULD I N'T YOU LIKE TO?
790 DATA WHY ARE YOU CURIOUS TO KNOW IF I AM?, DO YOU THINK I AM?
800 DATA "SUPPOSE I PREFER AT THIS POINT NOT TO REVEAL IF I AM?"
810 DATA DO YOU PREFER TO ASK THE QUESTIONS?, WHY DO YOU ASK THAT?
820 DATA WHAT ANSWER WOULD YOU LIKE TO HEAR?, IS THAT OF INTEREST TO YOU?
830 DATA YOU REALLY WANT TO KNOW?, WOULD YOU CLARIFY THE QUESTION?
840 DATA CAN YOU EXPLAIN WHY YOU ASKED THAT?, I WONDER WHAT LIES BEHIND THAT?
850 DATA PERHAPS ONLY IN YOUR IMAGINATION AM I?
860 DATA DO YOU FIND IT AMUSING TO THINK I AM?, WHY DO YOU THINK I AM?
870 DATA DO YOU WISH YOU WERE?
880 DATA I THINK IT BEST WE TALK ABOUT YOU NOT ME, I PREFER TO TALK ABOUT YOU
890 DATA WHY BRING ME INTO IT?, YOU SEEM VERY INTERESTED IN ME
900 DATA ARE YOU NOT SUBCONSCIOUSLY REFERRING TO YOURSELF?
910 DATA WHAT IS YOUR INTEREST IN MY?, WHAT ABOUT YOUR OWN?
920 DATA YOU SEEM CURIOUS TO KNOW ABOUT MY?
930 DATA IS THAT RIGHT? YOUR?, REALLY? YOUR?, YOUR?
940 DATA PLEASE DON'T CRY, THAT'S QUITE ALL RIGHT, WHY SO DEFENSIVE
950 DATA WHY ARE YOU APOLOGISING?, THERE'S NO NEED TO BE SORRY
960 DATA YOU APPEAR TO BE QUITE CERTAIN ON THAT, YOU SEEM CONVINCED OF THAT

```



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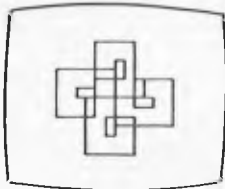
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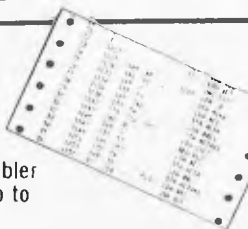
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## PROGRAMS

```

470 DATAAREN'T YOU BEING TOO POSITIVE?WHAT MAKES YOU SAY YES?
980 DATAYOU SEEM VERY CONFIDENT, YOU'RE QUITE SURE?
990 DATAARE YOU SURE?,WOULDN'T YOU LIKE TO THINK ABOUT THAT?
1000 DATAAREN'T YOU BEING A TRIFLE NEGATIVE?,DO YOU MEAN THAT?
1010 DATAWHY NOT?,I THINK YOU REALLY WANTED TO SAY YES
1020 DATAWHY DO YOU DETEST*,IS IT WRONG TO LOATHE*
1030 DATADEEP DOWN DON'T YOU REALLY LOVE*
1040 DATAIS IT WRONG TO LOVE*,HOW REAL IS THIS LOVE FOR*
1050 DATA"ARE YOU SURE THAT IT'S NOT JUST AN INFATUATION?"
1060 DATAYOU DON'T SEEM SURE*,ONLY THINK*,THINK OR HOPE*,HAVE YOU DOUBTS THAT*
1070 DATAARE YOUR DREAMS FRIGHTENING?,DO YOU DREAM VERY MUCH?
1080 DATAWHAT PEOPLE APPEAR IN YOUR DREAMS?
1090 DATACAN YOU THINK OF A RECURRING DREAM?,WHAT ABOUT NIGHTMARES?
1100 DATAWHAT ARE FRIENDS FOR?,WHY DO SOME PEOPLE HAVE NO FRIENDS?
1110 DATADOOES THE SUBJECT OF FRIENDS DISTURB YOU?
1120 DATAWHY DO SOME PEOPLE HAVE LOTS OF FRIENDS?
1130 DATAIS MONEY THE ROOT OF EVIL?,WHY IS MONEY IMPORTANT TO YOU?
1140 DATAARE YOU FREQUENTLY SHORT OF MONEY?,DO YOU THINK YOU ARE POOR?
1150 DATADOOES WEALTH BRING HAPPINESS?
1160 DATAONLY IF*,YOU DON'T SEEM SURE
1170 DATA" GREAT MEANING OF LARGE,FAMOUS OR GOOD?"WHAT DO YOU MEAN BY GREA.
1180 DATADO YOU MEAN BIG*,WOULD IT BE EXAGGERATING WHEN YOU SAY "GREAT*"
1190 DATACOMPUTERS CAN'T CONVERSE LIKE WE CAN,ARE YOU SCARED OF MACHINES?
1200 DATAWHY DO COMPUTERS SPRING TO MIND?,COMPUTERS ARE ONLY MACHINES
1210 DATACOULD A COMPUTER HELP YOU?,WHAT IS IT YOU FEAR FROM COMPUTERS?
1220 DATAWHAT FOOD DO YOU LIKE MOST?,WHY DO SOME PEOPLE OVERTEN?
1230 DATAWHAT ELSE BESIDES FOOD?,FOOD IS NECESSARY FOR LIFE
1240 DATAPLEASE DON'T TELL ME TO SHUT UP!,WHY DO YOU WANT ME TO SHUT UP?
1250 DATATHAT'S NOT VERY POLITE,WHY ARE YOU BEING SO AGGRESSIVE?
1260 DATA"THAT WILL BE TEN POUNDS, THANK YOU. NEXT PATIENT,PLEASE. *
1270 DATA"THANK YOU FOR TALKING TO ME. NEXT PATIENT,PLEASE. "
1280 DATAI WOULD LIKE TO HEAR MORE,GIVE ME A SPECIFIC EXAMPLE,I SEE
1290 DATATHAT IS FASCINATING,I UNDERSTAND,PLEASE CONTINUE,I DON'T UNDERSTAND
1300 DATACAN YOU ELABORATE ON THAT?,LET'S CHANGE THE SUBJECT
1310 DATA"WHY SUCH A LENGTHY REPLY?
1320 DATA"PLEASE KEEP YOUR REPLIES BRIEF"
1330 DATAWHY DO YOU REPEAT YOURSELF?,YOU JUST SAID THAT
1340 DATAPLEASE DON'T KEEP SAYING THE SAME THING
1350 REM**POINTERS TO REPLIES**
1360 DATA1,5,1,5,6,4,10,5,15,5,20,3,23,3,26,4,30,3,33,2,34,3,37,3,40,3,43,8
1370 DATA4,3,8,43,8,43,8,43,8,43,8,51,4,51,4,60,4,55,5,63,3,66,5
1380 DATA71,6,77,6,83,3,96,3,99,4,93,5,98,4,102,5,107,2,109,4,113,6
1390 DATA119,4,123,4,127,2,127,3,129,3,138,2,140,0
READY.

```

## TRS-80 Screen Dump

by C Ridley

For users of the TRS-80 Model 1 Level additional function.  
2 with the Tandy Line Printer VII It allows the user to obtain a straight  
this program should provide a useful copy of the screen by pressing shift '@'.

```

10 ' *** SCREEN DUMP TO LINE PRINTER ***
20 ' BY COLIN RIDLEY 10-10-81
40 DATA
CD,EB,03,FE,60,C0,00,3C,3E,0A,CD,3B,00,2A,06,7F
60 DATA
0C,10,0E,40,CD,35,7F,7E,FE,20,FC,32,7F,FE,7F,F4
70 DATA
32,7F,CD,3B,00,23,0D,20,EE,3E,0A,CD,3B,00,05,20
90 DATA
E1,C9,3E,20,C9,C5,0E,08,3E,20,CD,3C,00,0D,20,FC,C1,C9
90 FOR ADDR=32512 TO 32577
100 READ HEX$:GOSUB 150
110 POKE ADDR,DEC NEXT ADDR
120 POKE 16435,195:POKE 16436,0:POKE 16437,127:POKE 16405,0
130 NEW
150 N=ASC(HEX$)-48:IF N>9 THEN N=N-7
160 DEC=N*10
170 N=ASC(RIGHT$(HEX$,1))-48:IF N>9 THEN N=N-7
180 DEC=DEC+N:RETURN

```

## PET Boxes

by Victor Russell

Boxes is actually made up of three  
games — Boxes, Knight and Ladder. All  
three are instructive, entertaining and  
'user-proof'. They could easily be useful  
for demonstrations at club meetings,  
etc.

The program is not well annotated so

splitting the program into its three com-  
ponent games would not be very easy.  
Full instructions for each game are  
included in the program. As it is so long  
a good deal of RAM will be needed — at  
an educated guess about 32k. Boxes was  
written in Basic 2.0.

```

1 POKE144,49
2 DATA39,117,78,255,40,41,123,77,127,-1,-41,-123,77,127,-1,-39,-117,78,255,-40
3 DEFNPN(J)=PEEK(K+40*(J-1)+C-1)*INT(J/2)**#H
4 DEFNND(I)=INT(RND(1)**10)+45
5 DIMA(K),B(K),C(K),D(K),F(K),3) FORJ=0TO3:READA(J),B(K),C(K),D(K),F(K)
6 NEXT L=33250:B=128:F=160:U=59468:GOTO300
7 FORZ=0TO999:NEXT:RETURN
8 POKEI:(BORPEEK(K)**VAND1)+P*(V+1AND1):RETURN
9 GETAF:IFAF=""THENS
10 O=ASC(A*+N=VAL(A*+V=(N-1)/2)+(N<3):RETURN
11 POKEI:PEEK(K)ORB:RETURN
14 FORJ=0TO3:POKEI+40*(J),P:POKEI+40*(J),F:NEXT:RETURN
22 FORJ=0TO4:GOSUB11:POKEI+1,105:POKEI+40,233:K=K+32:NEXT

```



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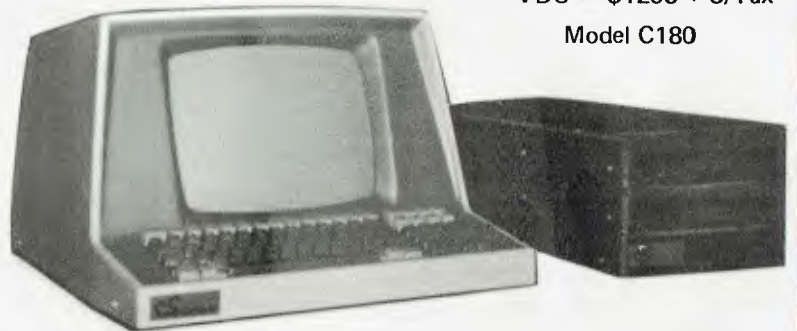


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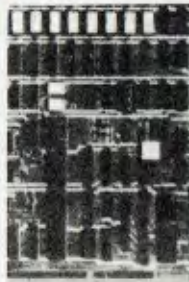
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## PROGRAMS

```

40 PRINT ") We are being threatened by
an alien";PRINT "intelligence, which is
going to"
30 PRINT "vaporize Earth unless we can r
am it";PRINT "with a remotely-controlled
satellite"
60 PRINT "which just happens to be up th
ere!";PRINT " There is a time limit aft
er which"
70 PRINT "there is no hope for us!";PRI
NT " The left hand joystick controls th
e"
90 PRINT "alien and the right hand joyst
ick";PRINT "controls the satellite."
90 PRINT " Both players may hide behind
the";PRINT "Earth, at their own peril !!
";PRINT
400 PRINT " ANY KEY TO START":PO
KE 764,255
401 IF PEEK(764)=255 THEN 401
450 DIM H(15),U(15):GRAPHICS 7:SETCOLOR
2,3,0:SETCOLOR 0,8,2:SETCOLOR 1,8,8
500 DEG :COLOR 2:FOR A=5 TO 90 STEP 2,95
:Y=SIN(A)*30:Y=COS(A)*20:PLOT X+80,Y+40:
DRAWTO 80-X,Y+40
510 PLOT X+80,40-Y:DRAWTO 80-X,40-Y:NEXT
A:PLOT 50,40:DRAWTO 110,40:COLOR 1:PLOT
80,60
520 FOR B=26 TO 5 STEP -7:FOR A=0 TO 360
STEP 20:DRAWTO SIN(A)*B+80,COS(A)*20+40
:NEXT A:NEXT B
530 RAM=PEEK(106)/2+2:FOR A=1536 TO 1620
:READ B:POKE A,B:IF B=34 THEN POKE A,RAM
531 NEXT A
540 DATA 162,120,169,0,157,3,34,202,208,
250,162,50,169,24,157,3,34,157,7,34,169,
60,157,4,34,157,6,34,169,231
541 DATA 157,5,34,104,96,162,120,169,0,1
57,131,34,202,208,250,162,50,169,16,157,
131,34,169,24,157,132,34,157
542 DATA 137,34,169,60,157,133,34,157,13
6,34,169,127,157,134,34,169,254,157,135,
34,169,8,157,136,34,104,96
545 M=0.15:FOR A=1 TO 15:READ B:H(A)=B*M
:READ B:U(A)=B*M:NEXT A:POKE 752,1
546 DATA 0,0,0,0,0,0,0,0,1,1,1,-1,1,0,0,
0,-1,1,-1,-1,-1,0,0,0,1,0,-1,0,0
550 POKE 54279,RAM-2:POKE 559,46:POKE 53
277,2:POKE 623,4:HE=53248:HG=53249:POKE
704,88:UE=1547:POKE HE,0
560 POKE HG,0:POKE 705,198:UG=1582:CHE=5
0:CHG=180:SPHE=0:SPHG=0:SPUE=0:SPUG=0:CU
E=50:UME=1536:UMG=1571:CUG=50
570 HIT=53261:RL=200:LL=46:TIME=500:PRIN
T "3TIME":POKE 53278,0
1000 S=STICK(0):SPHE=SPHE+H(S):SPUE=SPUE
+U(S):IF CHE+SPHE>RL OR CHE+SPHE<LL THEN
SPHE=0
1201 IF SPUE+CU E>88 OR SPUE+CU E<1 THEN S
PUE=0
1220 CHE=CHE+SPHE:POKE HE,CHE:CU E=CU E+SP
UE:POKE UE,CU E:X=USR(UME)
1500 S=STICK(1):SPHG=SPHG+H(S):SPUG=SPUG
+U(S):IF CHG+SPHG>RL OR CHG+SPHG<LL THEN
SPHG=0
1701 IF SPUG+CU G>85 OR SPUG+CU G<1 THEN S
PUG=0
1720 CHG=CHG+SPHG:POKE HG,CHG:CU G=CU G+SP
UG:POKE UG,CU G:X=USR(UMG)
1750 S=ABS(SPUE)+ABS(SPHE):SOUND 0,S*3,8
,S+5:S=ABS(SPUG)+ABS(SPHG):SOUND 1,S*3+4
8,8,S+5
1800 PRINT TIME," ":TIME=TIME-1:IF TIME
=0 THEN 3000
1900 IF PEEK(HIT)<>0 THEN 3000
1998 GOTO 1000
2000 PRINT "2OH DEAR THE EARTH HAS BEEN
VAPORIZED":SOUND 1,0,0,0:FOR A=1 TO 10:M
=RNDC(1)*16:FOR B=20 TO 60 STEP 2
2009 SETCOLOR 4,M,(B-20)*0.375:SOUND 0,B
,13,15:NEXT B:NEXT A:SETCOLOR 4,0,0:FOR
A=30 TO 1 STEP -2:SOUND 0,A,8,15
2010 FOR B=1 TO A:NEXT B:NEXT A:SOUND 0,
2,0,0:SETCOLOR 0,0,0:SETCOLOR 1,0,0:SETC
OLOR 2,10,6:GOTO 3020
3000 SOUND 1,0,0,0:SOUND 0,99,8,15:FOR A
=1 TO 10:POKE 704,14:POKE 705,14:FOR B=1
TO 30:NEXT B:SETCOLOR 4,A,5
3010 POKE 704,0:POKE 705,0:FOR B=1 TO 30
:NEXT B:SETCOLOR 4,0,0:NEXT A
7015 PRINT ") EARTH IS SAVED : WELL
DONE":SOUND 0,0,0,0
3020 PRINT :PRINT " Do you want to play
again?":POKE 764,255
3030 IF PEEK(764)=255 THEN 3030
3040 IF PEEK(764)=43 THEN SETCOLOR 0,8,2
:SETCOLOR 1,8,8:SETCOLOR 2,3,0:B=0:GOTO
550
3050 POKE 764,255:POKE 53277,0:POKE 5326
5,0:GRAPHICS 0:END

```



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**BALGOWLAH:** Trevor Burton Pty. Ltd., 93 Beatrice St. (02) 290 7233

**SYDNEY:** City Personal Computers, 75 Castlereagh St. (02) 233 8992

**LIVERPOOL:** Computer Focus, Shop 4, 224 George St. (02) 600 8222

**KILLARA:** Nauta and Associates, 28 Blaxland Rd. (02) 498 2858

**PARRAMATTA:** Trinity Computing, Shop 5, 1-9 Palmer St. (02) 683 4349

## ACT

**FYSHWICK:** Steve's Comm. Centre, 57 Wollongong St. (062) 80 4339

**PHILLIP ACT:** Computerland, 22-24 Colbee Court (062) 82 2342

**YARRALUMLA:** Yarralumla Software, 41 Bailey Place (062) 82 1379

## QUEENSLAND

**N. ROCKHAMPTON:** Rockhampton Sound Centre, 69 High St. (079) 28 6628

**MA. ROOCHYDORE:** Computer Business Aids, 33 Sixth Ave (071) 43 5551

**STONES CNR:** CW Electronics, 416 Logan Rd. (07) 397 0888

**WEST END:** Johns Perry Pty. Ltd., 268 Montague Rd. (07) 44 7504

**TOOWOOMBA:** Downs Office Equipment, 203 James St. (076) 32 4733

**CAIRNS:** Onro Industries, 136 Sheridan St. (070) 51 6111

**SOUTHPORT:** TRS Office Equipment, 115 Ferry Rd. (075) 32 3200

## VICTORIA

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**MONT ALBERT:** Panatronics P/L, 691 Whitehorse Rd. (03) 890 0579

**SHEPPARTON:** Data Parts, 1-3 Naomi St. (058) 21 7155

## TASMANIA

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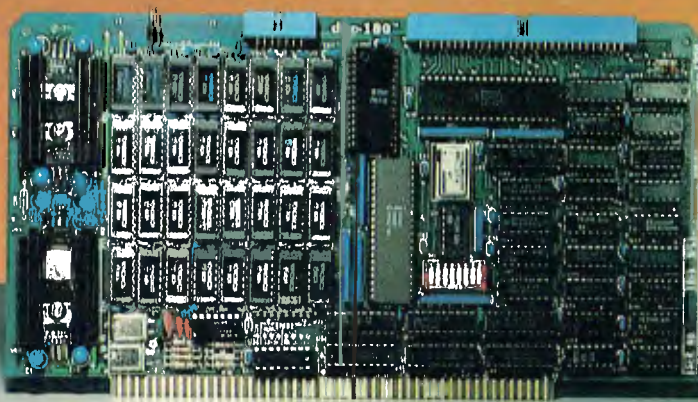
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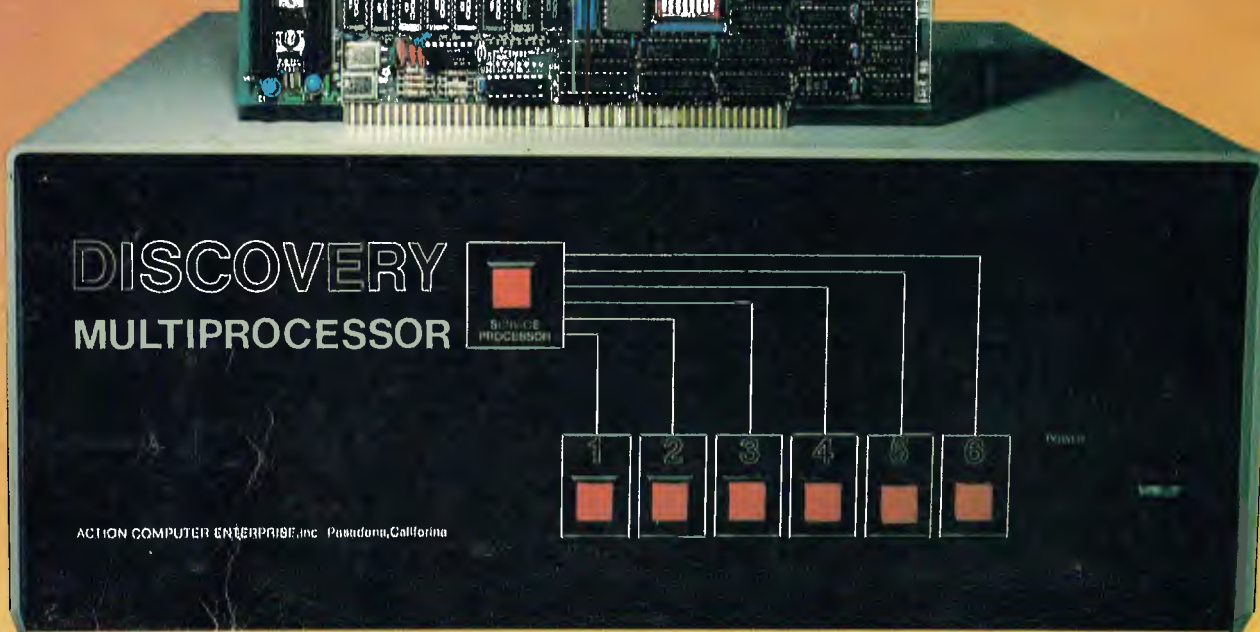


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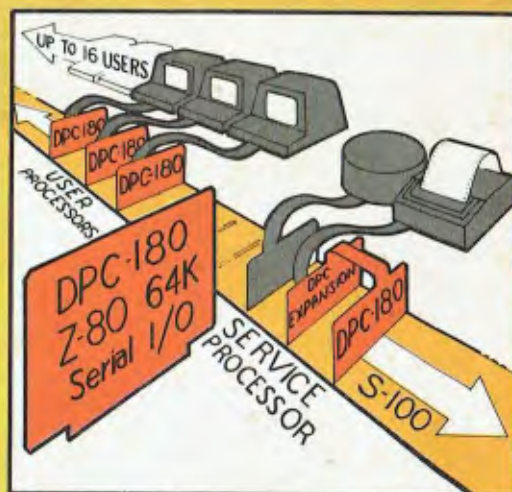
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