# Australian Personal Computer

VIDEO/ GRAPHICS SPECIAL

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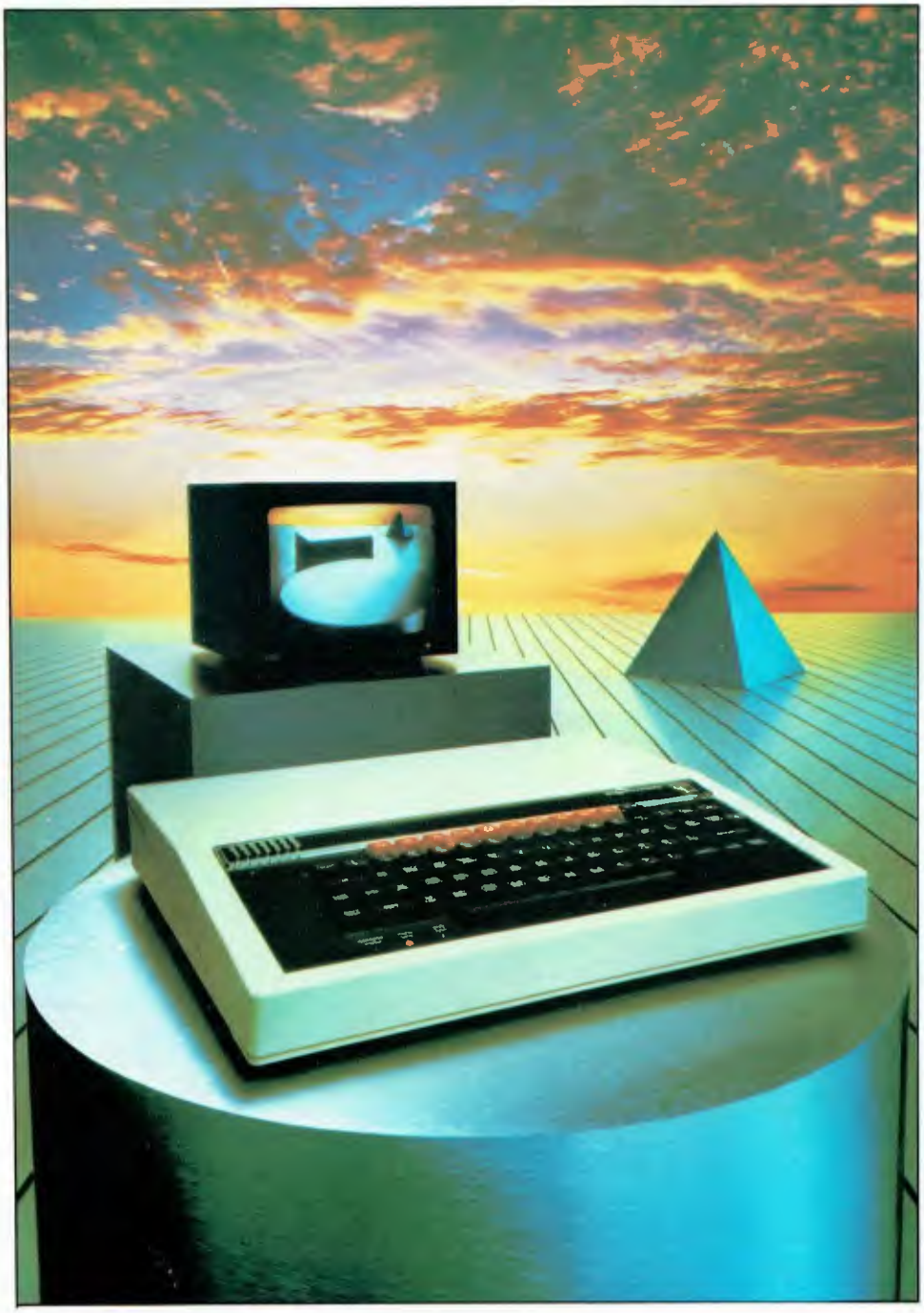
AUSTRALIA'S TOP TER MAGAZINE

## FIELD GOAL OR FUMBLE?
## Commodore's Plus/4 Benchtested

# BBC Microcomputer
# The teaching computer for those who have done their homework



**The BBC Microcomputer is the mainstay of the British educational system and will take their youth confidently into the 21st century.**

**The success of the BBC Computer Literacy Project is spreading rapidly across the world.**

**In Australia, a very large number of BBC school computer systems have already been installed in every state.**

Why? Because 'The BBC' is not just an educational computer. It is one part of the British Government's project to produce the best microcomputer for education, plus the whole range of software and training aids needed to secure for youth the advantages of computer literacy in the coming computer age. Software abounds. The TV 'Computer Programme' has only begun. There is a wide variety of books and teacher aids. And the list grows constantly.

Australia is fortunate to be able to adopt the entire project without change — and to enjoy all the future developments. For the BBC Computer Literacy Project is ongoing. It will still be with us in the 21st century.

Of course, you are probably aware that Barson Computers were selected to distribute the BBC micro in Australia and New Zealand because they have the desired technical expertise, and are capable of giving BBC Microcomputer users a very high level of support indeed.

**You see, the BBC did their homework,** too.

**BARSON** computers

To: Barson Computers Pty Ltd
335 Johnston Street, Abbotsford,
Victoria 3067

Please send me information on the BBC Microcomputer and Software ticked below.

Name .....

Telephone .....

Address .....

.....

Postcode .....

☐ BBC Microcomputer
☐ Educational Software
☐ Games Software

1411/APC983

# THE WORLD'S MOST EXCITING SCHOOL LIBRARY

When the BBC was assigned the task of producing a computer system for education, serious criteria were also established for the development of software which would form the basis of education today, and on into the 21st century.
As a result, more quality educational software has been developed for the BBC Micro that for any other educational computer. Not for the BBC the 'structured reinforcement' (drill and practise) variety of software. Here are examples of subjects, for students of all ages, covered by the world's most exciting educational and recreational software library.

## Educational:

**Art**
Drawing. Painting.

**Biology**
Animal. Monohybrid/Dihybrid/Chromosome. Statistics for Biologists. Human Energy. Biology Pack. Pond Ecology. Transpiration. Counter Current. Blood Sugar. Predator-Prey Hereds/Multifactorial Inheritance. Countercurrent Systems. Biomass Production. Flowering Experiment. Physiological Simulation.

**Business and Business Studies**
VU-Type. VU-Calc. VU-File. Accounts 1 & 2. Business Games. Forecast. Payroll. Mailing. Cashbook. Memo-Calc. Ledger.

**Computer Learning**
First Fleet Database. Factfile. Databas. Tree of Knowledge Graphs and Charts. Utilities 1. Lisp. Forth. The Classroom Micro and You. Curriculum and the Micro. Building Ideas. Keeping Learning. Home is where the chip is. Peeko Computer. The Computer Programmes 1 and 2. Acornsoft BCPL. Microtext. Bas. Procvar/Proc Flush/Proc Aid Computer procedures. Sort M/C. Sort Bas. Tas Logo. Search Bas.

**Games and Educational Games**
Fun With Words. Doctor Who. Fun Games. Philosopher's Quest. Monsters. Sphinx. Superlife. Adventure. Games of Strategy. Pirates. Snapper. Planetoid. Katakombs. Rocket Raid. Meteors. Super Invaders. Arcadians. Arcade Action. Games of Logic. Sliding Block Puzzle. Missing Signs. Cube Master. Chess. Time. Sailing Ships/navigation. Campaign 1346. Disraeli 1875. Castle of Riddles. Starship command. Missile Base. Snooker. Draughts. Reversi. Superlife. Battle. Cards. Hangman. Banner. Distances. Flags. Statpak. Countdown to Doom.

**Graphics and Graphics Teaching**
Shape Maker. Graphs and Charts. Creative Graphics. Eureka. Bar Charts. Moving Modules. Technical Drawing. Picture. Creative Graphics on the BBC Microcomputer.

**General Educational Subjects**
Educational I, Educational II. Results Analyst. Home Finance. Record Keeper. Desk Diary. Motorway. Farm Resources. Hill Railway. Rice Farming. Water on the Land. Prospecting. Light. Speed and Light. Urban Growth Stimulation. Urban Welfare. Census Analysis. Population Dynamics Transport/Manufacturing Location. Police.Diet. Map Skills 1 & 2. Balance Your Diet. Density and Circuit. Electrical Circuit.
Symbols to Moles. Lenses. Approximation, Estimation and Standard Form. Longitudinal Waves. Climate. Compass and Bearings. Yacht Race.

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**Logical Thinking**
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**Language Arts**
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**Mathematics**
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**Music**
Music. Advanced Music.

**Sciences**
Evolution and Natural Selection. Particle Scattering. Genetic Mapping. Enzymc Kinetics. Homogenous Equilibrium. Gas Chromatology. Organic Synthesis. Decomposition. Sulphuric Acid. Synthesis of Ammonia. Element. Formulae. Gas Laws. Rates of Reaction. Reaction Kinetics. Compound Identification. Diet Analysis. Organic Analysis. Plant Competition, Photoelectric Effect. Mass Spectrometer. Planetary Motion. Gravitational Fields. Capacitor Discharge. Gaseous Diffusion. Radioactive Decay. Electric Impedence. Acoustics. Collisions. Momentum. Alpha/Range/Fraun/Decay. Chemical Analysis. Chemical Structures. Chemical Simulations. Atomic Structure/Equilibrium. Projectiles. Satellite Orbits. Orbits and Alpha Scattering. Exponential Growth and Decay. Alphafoil. Nuclei. Gravity. Quantum Shuffle. Random Walk. Ampere. Millikan. Malthus. Watts in Your Home. Moving Molecules. Photosynthesis. Metabolic Pathways. Wave Motion. Transverse Waves. Interference and Diffraction of Waves.

**Spatial Perception**
Shape Builders. Shape Shooter. What Shape. Axes of Symmetry. Crash. Perspective.

**Word Processing**
VIEW. Wordwise. Wordpack.

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**Note:** The above describes existing cassette or disk software by title or content, and is a partial list only. Additional teaching aids including books, audio and video cassettes, tutors and OHP's, are all part of the BBC Computer Literacy Project. Software by Australian and International publishers and developers: Acornsoft, Advisory Unit, Cambridge Educational Software, Edward Arnold, Golem Software, Heineman, Input, Longman, Micro Primer, Passionfruit Software, Tas & WA Education Departments.

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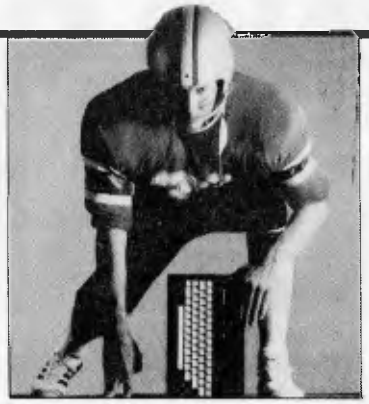
# inside

*Editor* Laurel Allen; *Consultant Editors* Steve Withers, Ian Davies; *Advertising (NSW and Qld)*: Mark Reiss (02) 268 0666; *Advertising (Vic, SA, WA, and Tas)*: Philip Treyvaud (03) 531 8611. *Subscriptions Manager* Valerie Meagher. Printed by Quadricolor Industries Pty Ltd. Subscription rates: Australia $35.00 per annum. Overseas A$47.00 (surface). A$130 (airmail). Published by Computer Publications Pty Ltd, 77 Glenhuntly Road, Elwood, Victoria 3184. Telephone: (Editorial and Publishing) (03) 531 8411. Telex: AA 30333 AMJ. *Distributors* Network Distribution Co., 54 Park Street, Sydney 2000.



*Cover photograph by Crispin Thomas*

## REGULARS

**4 NEWSPRINT**
If it's micro news, you'll read it first in Newsprint.

**11 YANKEE DOODLES**
Apple may have more tricks up its sleeve for the Macintosh — our man in the States plays his cards.

**13 ORIENT EXPRESS**
The MSX bandwagon keeps on rolling — our Tokyo correspondent hitches a ride.

**26 DO IT YOURSELF VIDEO**
Peter Vernon's simple project shows you how to connect a video recorder to your micro.

*'And this is our special micro insurance policy. Everything's written in small print . . .'*

**43 HOW TO WRITE GREAT SOFTWARE**
Want to produce a world beater? Heed our advice and you're likely to dodge a few pitfalls.

**51 FOR THE RECORD**
A listing of the latest graphics hardware.

**89 PROGRAMS**
To coincide with out biggest-ever issue, we've produced our largest programs section ever.

**152 BIBLIOFILE**
Looking for advice on the best books to buy? *APC* lends a helping hand.

**163 SUBSET**
Machine coding at speed the easy way.

**191 SOFTLIST**
A catalogue of the latest software releases, broken up into categories.

**214 COMMUNICATIONS**
Readers fight back — brickbats, a few bouquests, and our bludners.

**221 DIRECT ACCESS**
Diary Data and details of our Benchmarks.

**224 BLUDNERS**
Red faces time.

**224 ADVERTISERS INDEX**
Who's where in this issue.

Volume 5, Number 10, October 1984

APC

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## FEATURES AND SERIES

**15 VIDEO ON YOUR COMPUTER SCREEN**
The advantages and uses of combining personal computer and video output on one screen explained.

**47 LIKE MANNA FROM HEAVEN**
Apple has chosen an Australian made modem to market internationally. Bruce Otto delivers a checkout of Netcomm's baby.

**71 BEAT THE CLOCK**
Tony Williams explains how files of a useful size can be sorted on a micro without a disk.

**77 IF THE BUBBLE BURSTS**
Bubble memory is here at last, but what is it and what has it in store for you?

**140 TEACH YOURSELF LISP**
No, NIL isn't the same as zero, as Dick Pountain explains.

**168 PIRATE BULLETIN BOARDS**
'War Games' becomes a reality on US bulletin boards.

**185 OPEN ACCESS**
A true Lotus eater with all the software a business could want in one package. Peter Bright peels off the layers.

## BENCHTESTS & REVIEWS

**36 COMMODORE PLUS/4**
Commodore 64s are the most popular computers in the world. So what does Commodore's latest have to offer? Tony Hetherington's exclusive Benchtest provides the answers.

**18 GRAPHICS LUNACY**
A whole range of graphics products — from digitisers to Microsoft's Chart — are forced to communicate in a one day experimental workshop.

**33 IS THIS SOFTWARE ANY GOOD?**
The question of the worth of educational software still plagues, John and Mary Ann Paynter examine the dilemma.

**55 TO SERVE AND OBEY**
Well, your robot will if you follow our simple construction advice.

**65 TAKING TANDY UP A GRADE**
Now you can connect a Model 100 to a TV and a disk drive. But is Tandy's video/disk interface worth the price tag?

**68 GSX — A GRAPHICS STANDARD**
Bill Bolton examines Digital Research's attempt to standardise graphics production on business micros.

**172 OSBORNE ENCORE**
With twin disks, 25 line LCD, integral modem and IBM-compatibility, the full spec Encore is only half the weight of today's transportables. But can Osborne afford to be first a second time around?

## *Big Mac too pricey?*

Much earlier than expected, the big version of the Apple Macintosh has been announced. And it looks as if machines will be in Australia in October.

The buying public in Australia, by comparison with punters in the US, seems to be taking Apple's Macintosh very seriously.

By that I mean that they aren't rushing out and buying it as a toy — they are taking it seriously enough to be holding off buying the currently available mini version with only 128k and one diskette, and waiting for the 512k version.

Price, whatever Apple thinks, looks like being the biggest problem. To upgrade from the mini Mac to the big one you have to spend $1560, which is quite a lot of money for less than 400k of memory. (Although, in what appears to be a strange marketing move, users upgrading their 128k Macs receive a free copy of either MacDraw or MacProject. Wouldn't it be better just to have a cheaper upgrade cost?)

And the new machine costs $1550 more than the old one, at $4795 (including sales tax).

Disappointingly, the Mark II version is otherwise identical with the original Mac. Rumours from America raised hopes, just before the launch, that some of the $1560 (in the US, $1000) would be put towards the cost of including a second disk drive. But no.

In approximate terms, this implies that a working system, with only MacWrite and MacPaint as software, two disks and a printer as peripherals, and the 512k of memory, will cost around $6,000.

Possibly one could argue that this is far better value than the likely starting price of IBM's PC/AT (have you found a way of pronouncing that which doesn't sound like the PC80?). After all, the amount of equipment missing from a 'basic price' IBM can nearly double the basic price.

But anybody prepared to carp should start off by acknowledging one thing: Mac is now an established top five best-seller. It will succeed, where the Apple III could not.

The question is: will it ever make the Number One slot?

American figures show that Macintosh got 11 percent of the market there, in July. However, nobody is going to release figures for the Mac here, because they haven't been big enough to record by anybody except Apple, where they are secret, because they aren't very exciting so far.

From Apple's point of view, the reason that sales are slow is the lack of software. But they do report that there is a 'whole new flood of software out', and with the announcement of the bigger Mac, they included a list of a few dozen packages available. A dozen or so, including Filevision, PFS:File, Microsoft Chart, and so on, emerging now. Irritatingly, many of these titles have been pre-announced so often that the surprise is really not that they are available, but to discover that they weren't, before. I thought the 'new titles' were something new.

What is really and truly holding software houses up is the fact that writing a big program for Mac is *hard*. There isn't enough memory, especially compared with what you get on an IBM, and there are lots of new ways of doing things which have to be learned, and fed into the design of the program.

The crucial thing about the launch of the 'Big Mac', however, is that it will release software producers from the need to squeeze programs into 128k, provided, that is, that the Big Mac can answer one important question.

It is this: 'Will Big Mac be cheap enough for people to buy?'

I think the answer is: 'Not in Australia'. Certainly for universities, the price is ridiculous and for schools, even more so.

What else does Mac offer you? A nicer system. *That* much nicer? It doesn't matter, anyway, I haven't got the cash, remarked the professor.

The sensible thing for Apple to do would be to reduce the ordinary Mac to a round $3000 including printer and software, and sell the Big Mac at the same price, more or less, as the current machine.

Initially, this wouldn't make the machine terribly profitable — but it would sell them like mad.

And in a year, of course, the costs would have reduced, the profitability would have climbed, and there would be so many machines and so much software out in the world, that nothing could stop it.

But Apple is not going to do that, which is a pity, because the longer Apple takes to get its act moving, the bigger the lead IBM can build up, and the less choice there is for everybody.

*Guy Kewney*

## *Better green than soft*

Software shops are likely to go into shock as the news crosses the Pacific of the collapse of Software Centre, a massive franchise-store operation which had some 60 outlets in the US.

That group sold only software, and was the first of its type when it opened up in California nearly two years ago. Now, it is one of six such software-only chains, and the first major casualty of the software flop.

Or is it?

The group has now been taken over by Wayne Green, a man with fingers in more pies than there are crusts to cover them, and an old-established, if not leading, software publisher.

Admittedly, Green got the group for a song, out of bankruptcy — but even so, he sounds very convinced that he will make money from day to day, selling software in the US.

Observers blame Software Centre's collapse on too-rapid growth, which seems likely.

*Guy Kewney*

## *Statistical moves*

Who sells more micros, Apple or IBM?

The answer, by quite a margin (according to an American survey done in August) is Apple.

In the US, Apple claimed a total of 45 per cent of micro sales, spread across its three main ranges of IIe, IIc and Macintosh.

IBM, with both PC and XT to sell, sold 25 per cent of the units.

The surprise isn't quite as huge as it seems, however, for two reasons.

The figures are compiled by Infocorp, and they show sales through retailers — and IBM sells a very great many micros direct to its big corporate customers. So, of course, does Apple, but by common consent, not to the same extent.

And secondly Infocorp emphasises, the actual value of sales is quite remarkably different, with IBM very nearly getting the same. In dollar shares, IBM gets 14 per cent of the total amount spent for selling the XT, it gets 19 per cent for selling the PC, (a total of 31 per cent) and Apple only gets 35 percent if you include the 4 per cent of the dollars which are spent on the Lisa.

Actually, careful students of the US market wouldn't have been quite so surprised by those figures, as they

doubtless were to discover that Kaypro sold the same number of machines as Compaq in the period noted (July). Each got 5 per cent of the market. In dollar terms, however, Kaypro only got 4 per cent and Compaq 7 per cent, because Compaq charges a great deal more per machine.

Commodore, too, topped one poll in this survey. It was 'mentioned far more than any other company, as having reliability problems', says the report.

*Guy Kewney*

## *Low priced OCR reads text into your PC*

$15,500 cheaper than the competition (the Delairco OCR) the new Omni-Reader reads typewritten text directly into your computer memory, through your RS232 port at a maximum rate of one second per typed text line. It will work from white paper, or photo copied text. The four types-font read by the Omni-Reader, Courier 10, 12 and Letter Gothic 12 and Prestige Elite 12, can be added to "teaching" the Omni-Reader the new font.

You do this by scanning the new type face in a pre-defined way. The Omni-Reader can work with most computers through software interfaces or ASCII data file.

Price: $1,500 approximately from Input Technologies on (02) 438 2799.

## *Revelation now on 3" disks*

BBS Computer Shop are pretty pleased with themselves as they are able to make the Revelation database work on the shirt-pocket disks.

An apparently infinite order for Apricots from the Department of Agriculture has been holding fire until Revelation, a database and structured language combined, could run on the Barson and Hewlett-Packard machines. Revelation is available from Tony Cook's BBS Computer Shop on (03) 417 3211.

## *Talk to your spreadsheet*

You say "delete column" and it deletes. You say "goodbye" and it Conrol-C's for you. It's VoiceDrive on the ScratchPad spreadsheet for IBM PCs and compatibles. All commands are also optional as spoken words.

Each person who uses VoiceDrive teaches the computer to understand his or her own voice by reading through a list of words three times. This process is part of the training program and takes about ten minutes to complete, according to the Australian distributor, Source Data. Once the computer has learned your voice, a disk file is created to save your voice pattern. Your voice file is then loaded into the computer's memory each time you wish to use VoiceDrive.

ScratchPad offers virtual memory, unlimited window splitting, flexible grid (max. 999 rows or columns) and consolidation.

VoiceDrive and ScratchPad together need the Tecmar voice recognition card, and 128k.

Input Technologies are on (02) 438 2799.

## *Epson's new LCD*

Epson has launched a 25 line LCD display model, and hopes to have high volume units available to system builders (that is, people buying in lots of 100 or so) by summer.

And by the New Year even private buyers who want just one, will be able to purchase it, says Epson.


# Last month our company introduced 16 Macintosh software products and we will be offering an explosion of Mac software programs over the next 3 months.

## AVAILABLE NOW!

Mouse Stampede
Understanding Mac (book)
Mac Manager
Think Tank
PFS File
PFS Report
PFS File/Report Bundle
Transylvania
Introducing Mac (book)
Mac Coach
File Vision
Mac Slots
Mac Puzzle
Main Street Filer
Macintosh Complete (book)
Presenting the Mac (book)

**Think Tank**
The first Ideas Processor for the Macintosh.

**Filevision**
You can now file things away the way you see them. Filevision lets you store any kind of information visually.

**PFS File and Report**
This well known database product is now available for your Mac.

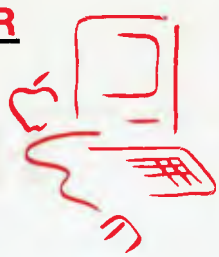
**The Main Street Filer**
An information management system for your Macintosh.

## DUE OCTOBER

The Quest
Mac the Knife Vol 1
Mac the Knife Vol 2
DB Master
Zork I
Zork II
T Maker
Zork III
Click Art
Helix
Deadline
Logo
Pensate
Xyphus
Run for the Money
Dollars and Sense
Frogger
Witness
Professional Music Composer
Davong 5 MB hard disk drive
Davong 10 MB hard disk drive
Using Mac Write and Mac Paint (book)

## DUE NOVEMBER

Main Street Writer
Home Accountant
Mac Tools
Sargon III
Legacy



**WHERE CAN YOU BUY THESE PROGRAMS?...**

Just turn the page...

# HI-TECH C

**An Australian developed C Compiler that runs rings around the opposition.**

**Features:**

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- Complete I/O library
- Source for libraries included — no royalties
- Easy to use — one command compiles, assembles and links
- Powerful debugging tool included
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- Supports ROM-based software
- Includes MACRO assembler, linker and librarian

**Disk formats:**

CP/M: 8" SSSD
Most 5¼" formats
(add $5 for 5¼" formats)
MSDOS: IBM PC format

**Pricing:** (includes 12 months support)

| | |
|---|---|
| Z80 | $250 |
| MSDOS | $300 |

**Post and Handling:** $5 on all orders

**System Requirements:**

Z80
56K or MSDOS 2.
CP/M2.2

**Z80 and 8086 versions now available.**

## HI-TECH SOFTWARE

P.O. Box 118, Eastwood, 2122. Ph. (02) 85 4552

BANKCARD FACILITIES AVAILABLE

But the new display cannot be bought as a simple CRT replacement by the amateur users. An interface to the normal video output of a microcomputer would be a highly complex bit of engineering — not something for a couple of spare evenings with a soldering iron.

The screen contains 640 by 200 dots enabling it to display up to 25 lines of 100 characters each — a larger capacity than the average desk-top computer monitor.

However, the LCD's overall size is only 280 by 166 by 15mm which makes it far more compact and slimmer than the bulky cathode ray tube.

The 128,000 fully dot addressable pixels have a dot size of 0.35mm square giving the panel a very high resolution which is excellent for both text and graphics.

Epson plans to offer the LCD with colour electroluminescent back-lighting which will allow the display to be used where there is little or no ambient light.

*Guy Kewney*

## *NEC — Stepping out of role*

NEC is making a mark on the Australian PC market. About to introduce a new PC — the APC 3, and with

## *Pocket-sized portable Bar code scanners*

You'll have 4,000 digits of pocket-sized memory in this battery-powered scanner. You can transfer the data into any RS232 interface, (using an extra device), or into an MSI hand-held LCD terminal for review and storage. Batteries last for two days of heavy use. The 6.25 inch unit can collect, decode, delete and transmit data. A Datawell interface-charger is needed. It works in complete dark to ambient sunlight.

Price: $360 from MSI on (02) 957 1991.

*Datawand portable scanner can collect, decode, delete and transmit data.*


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multi-user systems soon to release, Nippon Electric has gained the services of a new PR person.

Debbie Roberts was Chief Speech Writer with Susan Ryan's Department of Youth and Community Affairs.

She has moved from the leisurely administrative pace of government to the high speed computer industry. She can feel the difference.

"I worked hard in the Public Service and so do many people", she qualifies, "but in the Public Service, you can only get thrown out for things like theft or treason. If you are really bad, you get relegated to a corner."

Life at NEC is something else, she discovers. Sometimes, the Marketing Manager makes the tea. People step out of role to get the job done. She reports they work late and hard. "In crisis, everyone does everything."

"Out here in the real world, if you don't deliver you haven't got a job" she notes with surprise.

Other details she notices about life in the real world are little things. "At NEC, everytime the telephone rings, everything stops and that person gets treated like the King of England." Also, people are careful about how they spend company money. They turn out the lights. Similar reservations, by implication do not apply in the Public Service.

## *XperLogo for Mac*

Just arrived in Australia, one of the rush of new products from the Mac, XperLogo, is a 128k Mac adaption of the popular programming language, Logo. Extra Mac features of XperLogo include 2D and 3D spherical imagery, compiled speed, and powerful datafile 1/0, plus the ability to process using ERASE. It has a standard set of list processing primitives, and an easy interface to the Mac toolbox.

The price is $320. 'Phone Intelligence on (02) 981 2022.

## *Computers for the blind and partially sighted*

Three new products, the Versa Braille system, the Kurzweil Reading Machine, and the View Scan Text system offer new learning and employment for the blind and partially sighted.

### *View Scan Text System*

Partially sighted children and adults can expand their horizons with this portable, battery powered, LCD screen text reader and microcomputer.

A mouse-style hand-held reader, when rolled over textbooks, newspapers or other material, shows the (greatly magnified) information screen (text appears 6cm high).

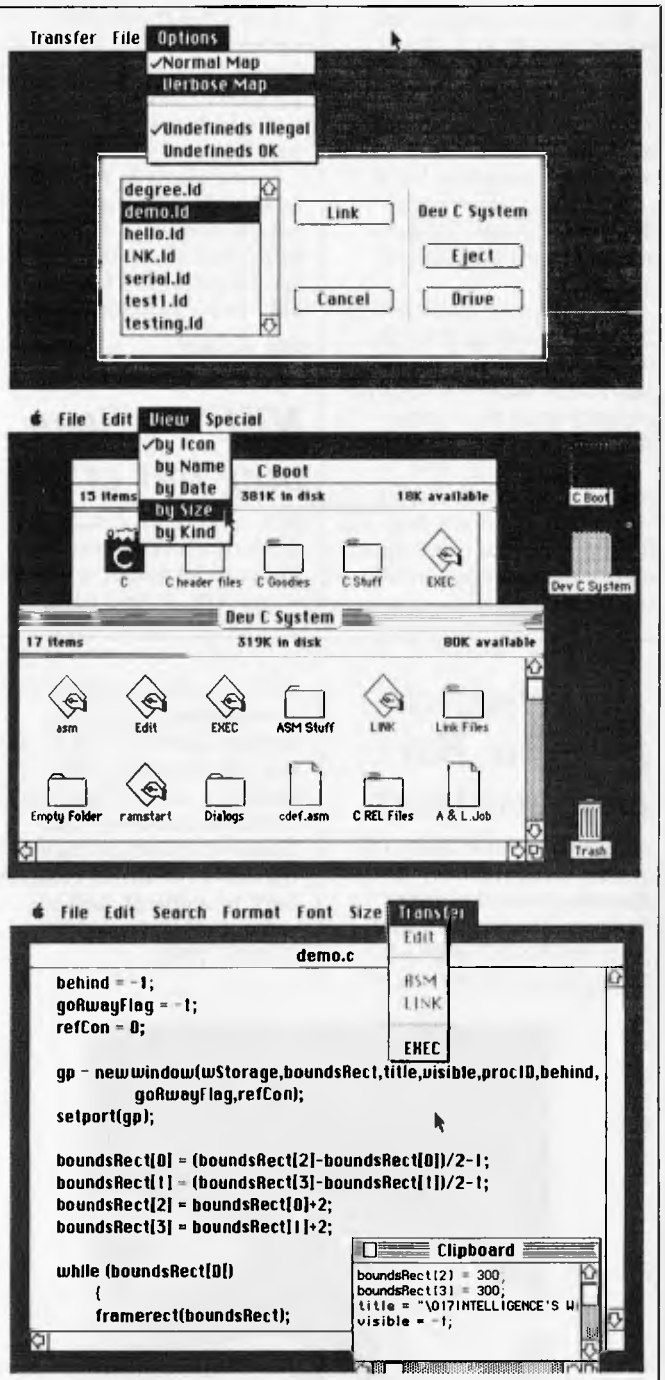
Price: $6,040 from Wormald on (02) 633 4126.

### *Kurzweill reading machine*

The KRM converts almost all typewritten and typeset material into speech.

Besides reading, the KRM serves as a talking calculator capable of performing complex logarithmic, trigonometric and exponential functions. It provides voice output for computers, speaking word by word, letter by letter or number by number. And it can be used to convert printed material into the digital signals required to drive Braille printers as well as to provide data entry for a variety of business and personal computers.

While the KRM makes most textbooks available to handicapped people, it is particularly important for students pursuing technical




## *C-Compiler now on Macintosh*

*Intelligence now has the first C-Compiler for the Macintosh. "It's selling fast since we brought it in two weeks ago", says Matthew Wilson, Mac specialist at Intelligence. "Softworks of Chicago got hold of Whitesmith's source code, and modified it to run on the Mac", he reports.*

*"It uses the mouse and windows and is bundled with the (yet unreleased by Apple) Editor/Assembler/Linker". The compiler conforms with the advanced features full V.7 Unix.*

*When you buy it, you also get a 1000 page manual "Inside MAC", which is available to Apple-registered software developers.*

*Price is $595 and Intelligence is on (02) 981 2022.*

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and professional careers, since scholarly or reserve materials are often difficult for human readers and are rarely available in Braille or talking books.

The machine can spell words, repeat sentences, announce punctuation, and "mark" phrases for later reference.

A blind consulting engineer and chief scientist for a national corporation uses a KRM to read internal memoirs, correspondence and technical papers as well as personal reading. Almost all of his work-related material can be read by the KRM.

A software systems engineer uses a KRM to read technical specifications system documentation, correspondence and other printed material. His machine is also connected with three computer systems where it is used to write and edit both printed documents and computer programs.

A five year old learned to work the KRM through a game of "Simon Says". Some students master the system in under four hours. The average is 10.

A Ph.D. candidate said, "I could not have passed my doctoral exams without it. No reader could be asked to commit themselves to the 10 or 12 hours a day that I needed at that time."

The reading machine consists of two principal units:

The electro-optical system automatically scans any document up to 11" x 14" using a linear scanning array camera, and X-Y mover. The system will read everyday typeset or typewritten materials from 6 to 24 point. A floppy disk drive loads system software.

A separate push button control panel activates and directs the system. With the touch of a finger, words or lines can be repeated, spelled out, or marked for later reference; punctuation and capitalisation can be announced if desired; and the voice itself can be varied in volume, speed and the pitch. The speaker system is contained in the control panel. The approximate dimensions are 10 x 9 x 2 inches.

The unit also has a keyboard, cassette tape recorder for computer storage, Basic, word processing and calculation, calendar and clock. A small printer is built in, and RS232 port is included. A bar code reader, more software, and a range of peripherals are under development.

The price is around $38,000. Further details are available from Wormald on (02) 633 4126.

## *The Versa Braille System*

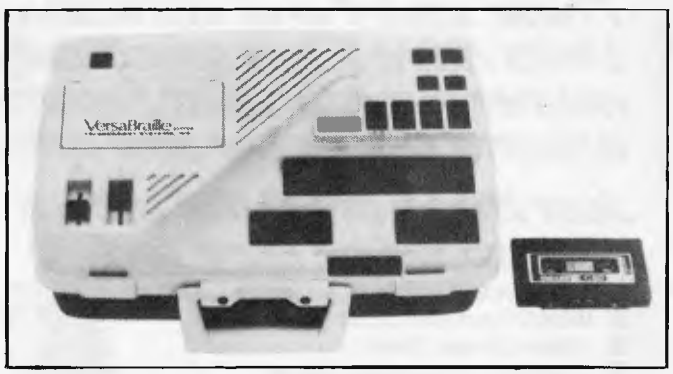
The portable (4.5kg) Versa Braille system makes it possible for a blind person to read, write, change, store and retrieve braille information. Information can be entered into the Versa Braille system in any of three ways:

1. Using the built-in electronic keyboard (which is quiet and only needs a light touch),
2. Inserting an ordinary audio C-60 cassette tape on which the braille information has been previously recorded. 400 pages of braille can be stored on one tape. (Access time to any page is an average 16 sec.)
3. Transmitting electronic data through the RS232 interface from computers, printers or telephone modem.

A microcomputer contained in the Versa Braille system makes it a "friendly" device and easy to use. The Versa Braille system is programmed to control the built-in tape deck so that specific "chapters" or "pages" of information can be automatically stored and retrieved by title and page number. The microcomputer also enables the written material to be edited (making corrections, insertions, and deletions quick and easy to accomplish). The edited copy is instantly a clean original.

The Versa Braille system is portable and battery operated, making it convenient to use in meetings and classes as well as in offices. With the built-in microphone and loudspeaker, audio information can also be stored and retrieved by braille title.

Price: $9,000. Wormald are on (02) 633 4126.



*Versa Braille System for storage and retrieval of braille*

*View Scan Text System magnifies text for the partially sighted*

*Kurzweill Reading Machine control panel. Type converted to speech*

# YANKEE DOODLES

*David Ahl reports from the States on the speedy next generation Macintosh, the unisex Amiga PC, the failure of Unix to catch on, and computer policy.*

## Next generation Macintosh

Although the Apple Mac-intosh has all kinds of advanced features and boasts a 32-bit 68008 CPU, users have complained right from the start that the Mac is slow and doesn't have enough memory. Thus, while the machine has been shipping in quantity for less than a year, insiders are already talking about the next generation Macintosh.

Much of the speed problem can be attributed to swapping programs and data to and from disk, so the new Mac will have a second 128k ROM which will contain much of the software now on disk.

Furthermore, the 64k RAM chips will be replaced by 256k parts from Japan, thus quadrupling the basic machine's RAM capacity to 512k. It's likely, too, that the new Mac will have a true 32-bit bus rather than the hybrid 32/16 bus found in the present model; this too should increase processing speed.

Two companies have already announced winchester hard disk drives for the Macintosh. Tecmar has four versions of its MacDrive: a 5Mbyte unit with a removable cartridge; dual 5Mbyte units; a 10Mbyte fixed hard disk; and a combination 5/10Mbyte unit. Davong offers six versions of its MacDrive system with capacities of 5, 10, 15, 21, 32, and 40Mbytes; all are fixed disk systems. Access time of both the Tecmar and Davong units is about 75ms.

## Foreign policy

In an effort to keep computers with possible military applications out of Soviet hands, the US Government is now monitoring all computer sales to foreign countries, even allies. The Commerce Department requires all exporters to have a licence, and any case that seems less than routine is passed on to the Department of Defence.The Customs Service is considering a scheme that would require manufacturers to install electronic bugs in computers, so they could be traced if they were smuggled out of the country.

Defence Department officials are convinced that even the current controls are inadequate, and are holding classified briefing sessions with industry leaders to try to convince them of the severity of the problem.

However, many manufacturers feel that the restrictions will mainly hurt exports while doing little to keep computers out of the hands of the Soviets. The prevailing feeling is that the Soviets will get around the regulations either by smuggling of US-made computers, or by buying similar systems from Japanese manufacturers.

Executives point out that European, Japanese and Taiwanese desktop computers are readily available in the Eastern bloc. People simply buy the systems they want in Vienna and truck them over the border to Budapest, now the personal computer capital of the Eastern bloc. 'It's absurd to think the Government can stop that kind of traffic,' said one manager.

## Amiga PC: the continuing story . . .

I mentioned the Amiga PC several months ago, but the final prototype looks even more interesting with its built-in unisex speech. It's based on the 68000 CPU, has 128k, a disk drive with 320k capacity, composite video and RGB output, a detachable keyboard, stereo sound (with four channels), parallel and serial ports, a bus connector and joystick ports.

Graphics and animation are superb. Low resolution is 320 x 200 pixels with an astounding 4096 colours, and a high resolution mode of 640 x 400 provides 24 colours. A frame buffer and sprites produce high speed animation in low-res mode. In addition, the system allows simultaneous vertical scrolling, horizontal scrolling, and animation of images.

The Amiga proprietary operating system is window-based, although the unit can also support CP/M, MS-DOS, and the P-System. A 'speech lab', incorporating both male and female voices with an unlimited vocabulary, is built in.

Amiga also promises 20 applications software packages upon release of the system in the autumn. Price is projected to be $1500.

## Miss for Unix

Not only will Unix fail to become an industry standard, but it will also achieve only a very modest market penetration, according to a recent study by International Data Corp (IDC). These conclusions, from an initial study conducted in February, have been reinforced by subsequent interviews with end users, OEMs, and vendors.

The main reason for its lack of success is that its cryptic command structure is difficult to use. While Unix could be made more friendly, such a transformation would lead to a loss in efficiency, one of the major advantages of the system.

Furthermore, Unix is inefficient for small systems, according to the study. Some software developers have reported that Unix programs on small systems actually run more slowly than with standard operating systems.

A third limitation of Unix is its lack of standardisation. Although AT&T designed the system to be standard, several implementations including Version III, Version V, the Berkeley Version, and Xenix have cropped up.

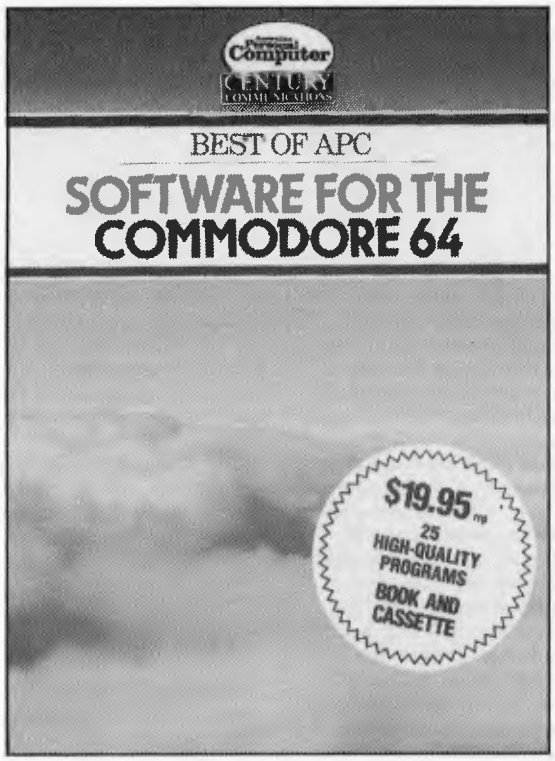
Another problem with Unix is that it tends not to be easily transportable across different microprocessor architectures; different implementations are required 8088/86, 68000, and 32032 CPUs.

A final problem identified by IDC is a lack of applications software that runs under Unix. It lacks the ability to support integrated database management systems, integrates communications and resource servers, and cannot accommodate advanced graphics packages, therefore few software developers have produced packages for it and they seem to be disinclined to do so in the near future.

Interestingly, the major commitment to Unix is by hardware manufacturers, a fact which may lure software developers to produce software for the system. Nevertheless, the report concludes: 'There is no more reason to believe Unix will become a standard any more than any of the alternatives will become standards.'

## Random bits

Warner Communications sold Atari to Jack Tramiel for no cash down and $240 million in promissory notes. Tramiel, former president of Commodore, dismissed the entire marketing department but has not revealed any of his future plans yet . . . Gavilan is finally shipping two versions of its notebook computer some six months late. An ominous note is the company's return to the venture capital market for another $15 million . . . Franklin Computer, maker of the most successful of the Apple work-alikes, has filed for relief in the Bankruptcy Court under Chapter 11 . . . Software vendors, particularly those with extensive commitments to Atari, VIC-20, TI99/4 and Sinclair, in the face of heavy inventory returns, obsolescence and saturation, are cutting prices and payrolls in an effort to keep afloat . . . The first American manufacturer of computers (in the 1940s), Sperry Univac, is selling a personal computer made by Mitsubishi in Japan . . . Another rah-rah yankee manufacturer, Monroe, procures its PC from Ricoh, another Japanese maker . . . The National Computer Conference (NCC), by far the largest show in the 1970s, fell far short of its attendance goals this year. 110°F temperatures in Las Vegas in July discouraged some attendees, but the rise of Comdex and various regional PC shows were probably more of a factor.

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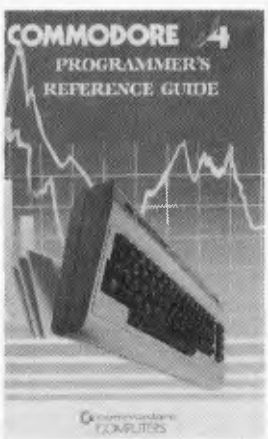


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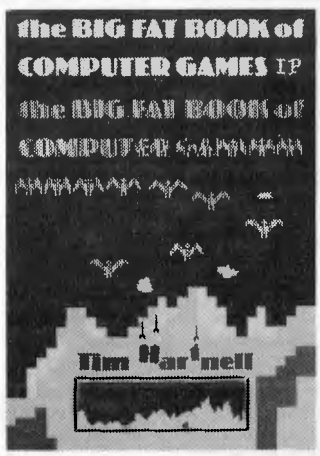


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# ORIENT EXPRESS

*Shinichiro Kakizawa reports from Japan on an MSX machine with stereo sound, examinations in computer proficiency, a calculator* cum *credit card and software for Buddhists. Well, praise be!*

## *Music while you work*

A new MSX machine, Palcom, has been launched by Pioneer, a company known for its stereo equipment amd more recently for optical laser disk players. The reason why Pioneer has joined the microcomputer business is clear — it wants to give added value to its laser disk business by providing a specially developed micro with convenient facilities and an interface specifically designed for laser disk players.

Palcom can control optical video disk players through a direct interface connection. As part of the deal, a number of computer games with video disks can present much more realistic pictures than any existing microcomputer graphics. The direct access capability of the video disks can provide pictures instantly, which is essential for computer games.

As Pioneer is a stereo machine supplier, it hasn't forgotten a sound system for its computer: game sounds are all generated in stereo. Mixing the sound from the video disk, stereo players, and computer-synthesised music is another standard feature of Palcom.

## *Hole in your pocket?*

An optical modem the size of a cigarette pack has been announced by Kanto Electronics in Tokyo. It's just 100mm x 50mm x 22mm, and can be directly attached to the interface slot without using cable or, alternatively, built into the machine.

The modem detects line defects and optical data errors; and communication distance is a maximum 100 metres using plastic fibre cable.

It's a useful piece of equipment when you're setting up your micro network in a hazardous, electrically noisy environment, but at $250 is slightly more expensive than standard modems.

## *Universal standard in print?*

Epson is attempting to establish a standard for interfacing printers. It's proposing that ESC/P, which stands somewhat clumsily for Epson Standard Code for Printers, be adopted world-wide. The aim is to provide a common control code architecture across all microcomputers and printers, so that any printer may become connected to any microcomputer without change. At present the printer is always the major headache when buying software, which may not be entirely compatible with your model of printer.

I understand the Epson people are busy persuading as many manufacturers as possible to agree with the new standard; and it seems that more than 20 companies have already agreed to join the bandwagon.

## *More time for prayer*

If you thought no more specialised software markets could be discovered, you have obviously underestimated Japanese initiative.

Denkei Computer Systems has come up with a software package to help priests and monks run their Buddhist temples more efficiently. Running a Buddhist temple is, I'm told, far from simple. It involves a lot of paperwork, direct mailing, keeping records of ancestors' posthumous sacred names, accounting, and other administrative tasks. The newly announced software addresses all these areas and creates more free time for the monks' traditional involvements: chanting, zen meditation and preaching.

So far the introduction of microprocessor systems into Buddhist temples and Shinto shrines has been slow, except in large temples which can afford a sizeable computer department. Denkei thinks this is mainly due to the lack of suitable packaged software systems for the smaller temples, and hopes to change things with its new Temple Management System. According to Denkei, there are over 50,000 Buddhist temples and many more Shinto shrines in Japan awaiting suitable software systems. It believes many of them will buy its software, which costs from $1500 to $1800 depending on the options the user chooses.

## *Calculating credit*

A credit card which can be used as a calculator has been announced by a finance company in Kyoto. Jointly developed by Casio and Dainippon Printing, the plastic credit card is laminated to the back of the Casio ultra-thin SL-800 calculator in place of the usual plastic back cover. It costs $10.

In Japan over 100 million credit cards are now in use and competition between the rival card companies is very tough, so in order to keep one step ahead the credit card companies are using all kinds of gimmicks to pull in the customers. The calculator *cum* credit card, from Shinkyoto Shinpan, is one such attempt to increase the usage of the cards.

## *Shooting for the market*

Another camera has succumbed to the lure of the Japanese micro market. Asahi Optical Industry, famous for its Pentax cameras, has announced its first 32-bit Pentax computer. The Pentax runs a Unix-like UNOS operating system from Charles River Data Systems. This system is a high-end scientific and business micro, targetted mainly for CAD/CAM applications using Asahi's proprietary program SCICARDS. It features a VERSA bus and can construct the Ethernet local area network.

## *Time to be certified*

One-day examinations to test the knowledge and experience of micro users were held recently in some 25 major cities in Japan. This was the second year of these nationwide examinations, and more than 10,000 micro users took part.

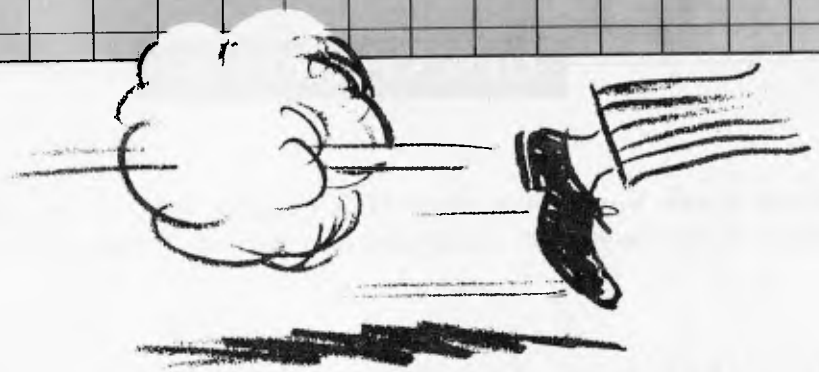
Japan is a highly competitive society where you can do practically nothing without a certificate; these are issued by the appropriate authority showing that you are properly qualified. Apart from the usual things like driving and flying licences, you have to pass rigorous government examinations to become a hairdresser, a cook, or even a masseuse.

And computers are no exception. The Ministry of Industry and Trade (MIT) has been conducting an information processing engineers' examination for over 15 years. Unlike cooking a fish, it's not compulsory to acquire a licence to run a computer; however, if you happen to be one of 150,000 people who have a licence your chances in the job market are greatly enhanced, your salary prospects are better, and you can charge higher fees for your freelance services.

So far this arrangement has only been applicable to the mini/mainframe users, and micro users were happily left alone to be content with their little machine. But now, as microcomputers spread into every home and business, the situation is changing — and you can study for a certificate to demonstrate proof of competence as a micro user.

The examination is organised by the Japan Microcomputers Club Association. It seems the papers are getting more difficult every year — last year every other participant who sat the examination failed.

Anyway, I'm not going to tell you whether or not I sat this year's examination.



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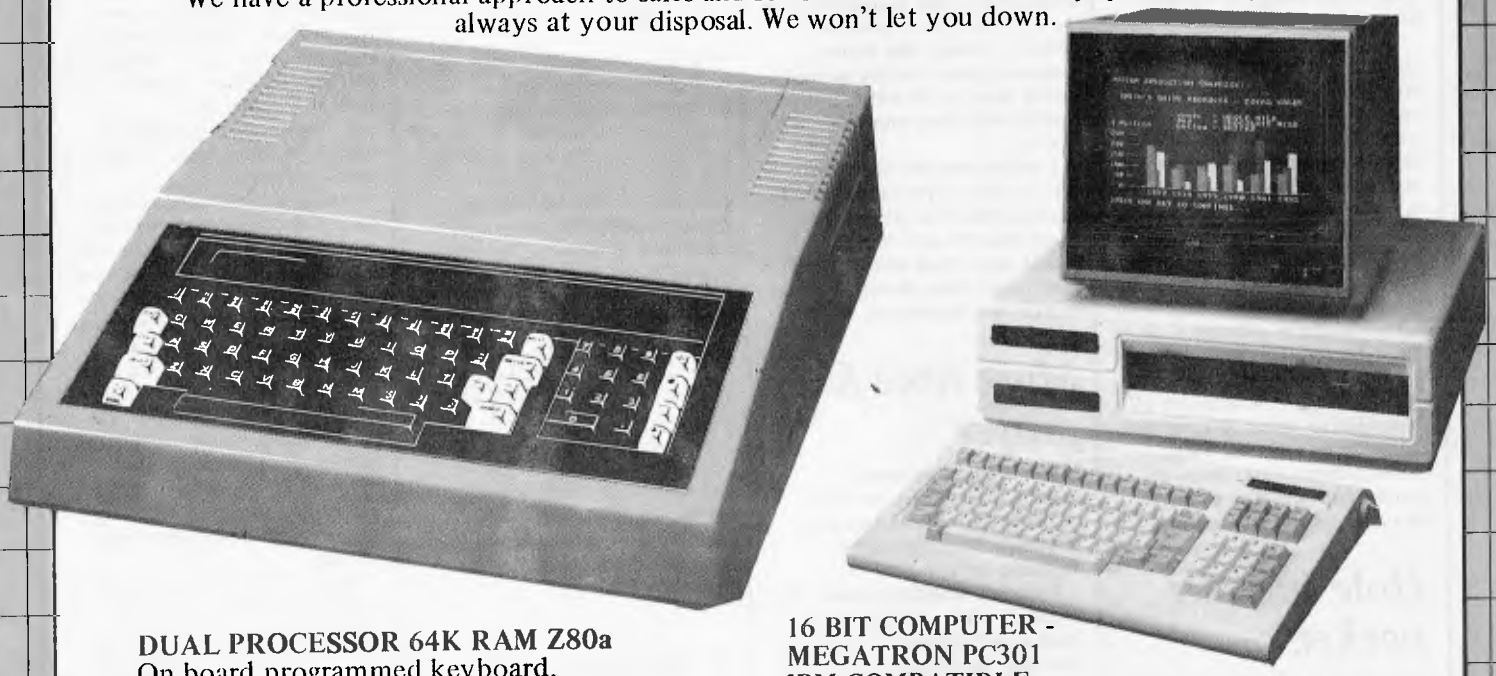

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# Video on your computer screen

## *A new Australian authoring package*

BY LAUREL ALLEN
Editor

Three Australians, Margaret Richmond, David Hanney and Ned Hyrapetian of Microcomputer Peripherals and Technics Ltd have developed an interactive computer-aided instruction video authoring system.

The system suits either large classes or individual instruction. Off-the-shelf video tapes or tailored material can be used.

Called the MPT Authoring Pack, their new system offers some unusual hardware features. Two elements appear to make their system different from others. First, they offer video images and text on the same monitor. Second, they have developed a precise video frame-counting method.

As manager of the project, Margaret Richmond worked together with programmer David Hanney. They wanted to provide the video images and the question and answer text sessions on one screen.

After one year of development, they introduced their new authoring system at the August training resources exhibition at the Sydney Hilton. The Catalyst authoring system was the only one at the exhibition to display text and video on a single monitor. All others on display presented video on one monitor and text on a second.

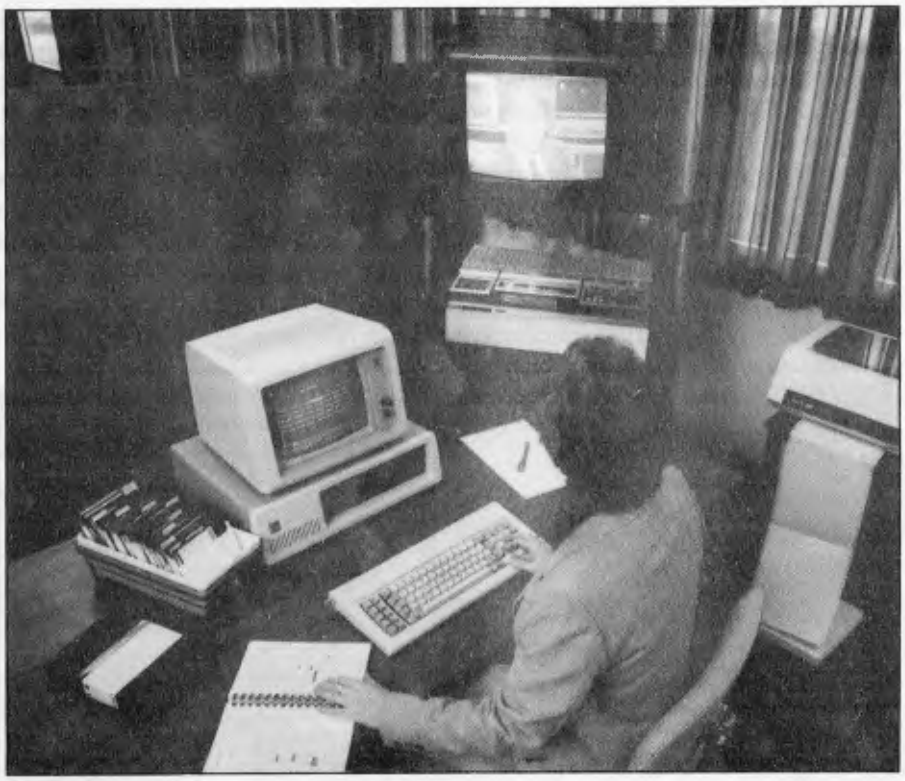
To get video and computer image on the one monitor, MPT uses a colour Ingersoll NC1414 monitor that has a manual switch between RGB and composite PAL. The monitor costs around $500. Hardware developer Ned Hyrapetian has replaced the manual switch with a computer controlled switch. He also developed a precise way of searching the video tape for the video sequence called up by the student interaction with the lesson text.

His solution uses the second audio channel on a stereo sound track of the video. He used this track to count, frame by frame, each video image.

His solution provides a low-cost Corvus Mirror-type product. Corvus Mirror uses a video tape as a hard disk back-up. The precise frame-count offers four types of images moving video, freeze-frame video, still photographic images and computer graphics.

A benefit of the use of the video signal for graphics presentation means that the image appears in improved quality 1000x1000 resolution rather than to the limits of the resolution of the computer system the graphic was originally developed on.

The Catalyst group show their author-



*The old method: video on one screen, and computer text and graphics on the other.*

software and add-on video and graphics controller card.

For the demonstration, they used a National AG 6200 video recorder and their tailored monitor, which they call the Personal Display Screen.

Other video recorders suitable are the new National NV 6170, and the National NV 8200 and the Sony SLO420P.

They say that will soon have the system available for Apple computers. The lesson-development software has help menus and five different types of computer page, all of which can be used in one lesson.

A graphic page lets the author design and incorporate charts or free-form drawings into the lesson, using a pad such as the Koala or a graphics tablet.

The author can choose to blink a portion of the graphic. Pie, bar, and other standard graphic features are included. More sophisticated graphics can be incorporated by creating them off the computer.

The images are then recorded on the video tape and displayed via the freeze-frame option.

Only one text font is available on the IBM version. More fonts will be available on the Apple II version. A video page gives a feature which saves the author time in organising sequential video scenes.

The author can set up nine branching options dependent on the student's answer and each of the nine answers can call up a different video scene.

The branching can be random, chosen by the student from a menu or selected by the computer acting on the student's

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As you can see, it's smaller than a transportable and considerably lighter – weighing 2.3 kg. Yet at the same time, it has a massive 64K RAM (expandable to 184K), a full 80-character Liquid Crystal Display and an excellent full-sized keyboard.

Normally you'd expect to find those specifications on a desktop computer.

But there's more. The EPSON PX-8 has inbuilt business software for word processing, graphics, speadsheet, communications and many more custom programmes on simple plug-in ROM units. It also uses an extended version of Microsoft Basic and a CP/M* operating system – which means you have access to one of the world's largest software bases.

As well, the EPSON PX-8 can be used as a low cost, space saving, intelligent terminal that can be plugged directly into a mainframe or any high performance microcomputer like the EPSON QX-10.

And then it has features which you will never find on a desktop. Rechargeable NiCad batteries (with built-in back-up batteries to preserve data with a trickle of current until you resume operation). An inbuilt microcassette recorder for data storage while you're on the move. In fact, everything you would require for complete portability. The EPSON PX-8 and screen folds into a book-sized package that easily fits inside your briefcase.

PERIPHERALS. The EPSON PX-8 is more than just the first portable that performs like a desktop.

A complete range of portable peripherals has been designed to go with it.

There is a 3.5" battery-operated floppy disk unit with 360K formatted capacity. (There is also a standard 5.25" mains-driven version.)

There is a battery-operated Acoustic Coupler which allows you to use any phone – even the one in your car – as a direct communication line to your office or national data base.

There are 60K and 120K battery-operated RAM packs which can be permanently added to the PX-8, greatly enhancing its memory capacity, without sacrificing its portability.

There is also the EPSON P40 compact thermal printer which operates on NiCad batteries, as well as a complete range of dot matrix printers.

Personal computing has just taken a great leap forward. Although the EPSON PX-8 was designed from the ground up as a portable computer, it's going to make a lot of desktops look like dinosaurs.

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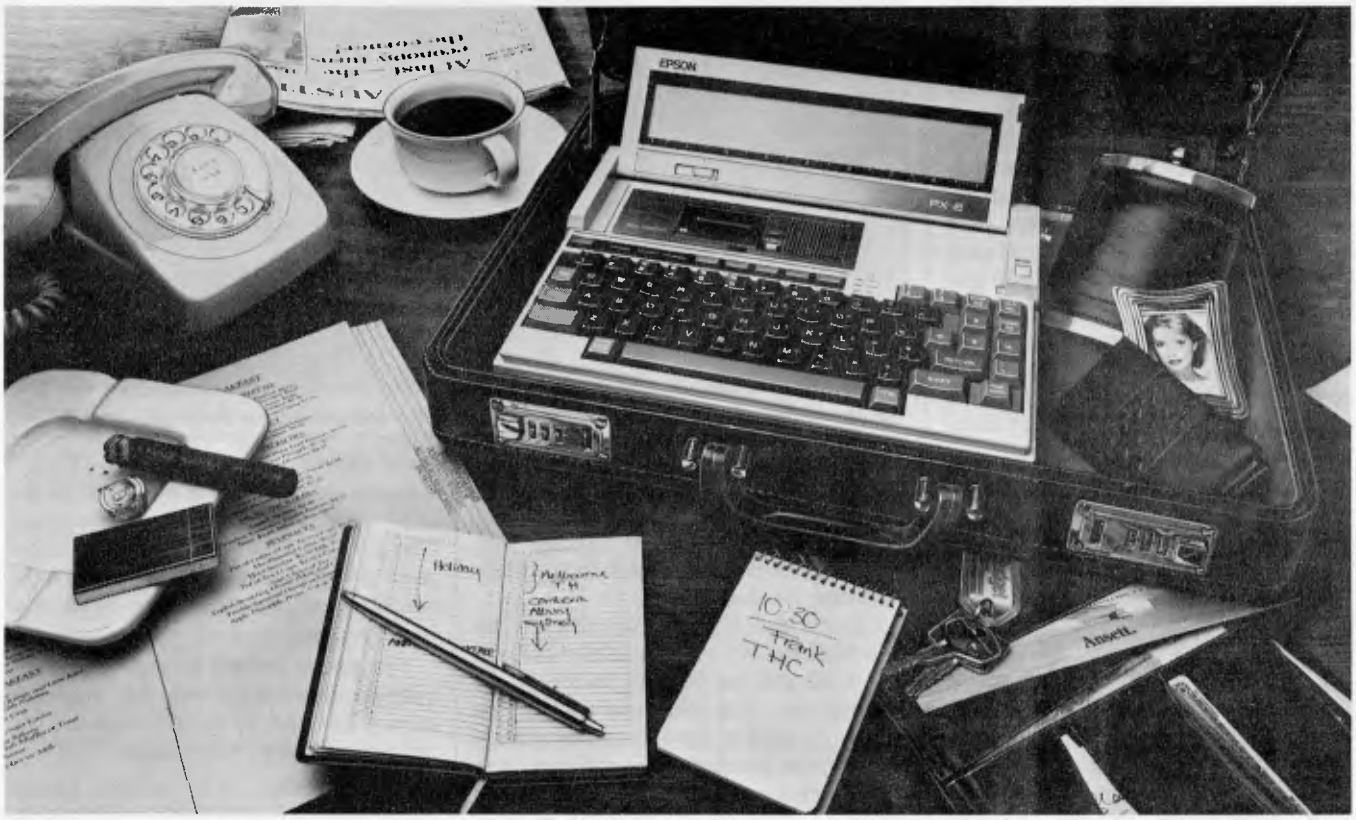


# HIDDEN IN THIS PICTURE IS A DESKTOP COMPUTER.

EPS0023

answer to the current question.

Margaret Richmond will develop training courses on the Catalyst system or you can buy the whole lot and do it yourself. It'll cost you $5000 for the software and video controller card and then $1000 for each PC you want to set up for student use.

The system works on the basic equipment that most people have at school or in the office. The system also provides a database which offers the facility for either end-of-session progress reports for students or analysis reports of use for their trainer plus reviews of selected individual students' progress or reports of chosen grouping's use of the system.

Catalyst used a Logitek FT printer at the demonstration. A wide variety of dot matrix printers are supported.

Videos used for the Catalyst system must be industrial recorders. This means they must have stereo tracks. The second track is used for frame-numbering. Programmer David Hanney says that he believes that any video stereo sound and a remote control port that is a standard Centronics-type port will run the Catalyst card. The interface card controls the video recorder which is 'frame accurate'. This means that you can go to or start on any video frame.

The frame-numbering system is called a time-code, and it outmodes the control-pulse method, says Hanney, which can give up to a 20-frame variable.

Trainers can re-shoot and accurately replace video segments without the need for expensive video tape editing sessions. The method also means that trainers can use any existing video — Star Wars — for example, to build into their training programs (if they have copyright agreement).

Catalyst also provide a keyboard alternative for those students whom trainers feel may be intimidated by keyboards. This option provides a 1,2,3,0 number pad. Training sections may have multi-lingual options.

The first questions can ask; 'Are you Greek, Italian' and a positive answer will give all the voice-over sound in their user's home language.

A creative trainer could build training sessions entertaining enough to rival any video game.

Those familiar with the on-screen game which features a high-noon scenario, in which a tough cowboy either falls dead in the dust — or laughs 'Ha Ha Ha — missed again!' will understand the potential. The system has infinite branching. This means that each student moves through the work at his or her own speed.

If it takes someone three times to get an answer right, the software requires the student to revise the work at the end of the session.

Each tape has an ID number. This means that you can't run the wrong tape and disk together. A help escape lets the student get out of either text and video when they need to. The text gives 'right', and 'wrong' responses to text questions on the video tape images and depending on the student's answer, moves the student into another video sequence.

One flaw to the system, which Catalyst also notes, is that video sequences don't appear immediately after the student has answered a text question. Waiting times at the demonstration averaged five to 10 seconds and can take up to a minute if the video material has to be collected from the far end of a two-hour tape.

At the demonstration, no wait was longer than 10 seconds for video images and the wait in front of the blank screen seemed to take for ever. The competitive Arthur Young authoring system seems to solve the problem by using a freeze-frame of a still scene over which they lay the text.

Freeze-frames can also be built into the lesson. Comptuer graphics reportedly appear with a 1000x1000 resolution clarity and can be recorded directly on to tape. Catalyst are now working on an Apple version for schools which they estimate will cost much less than the IBM. Another project on hand is the windowing of text into video and video into text. As the system offers a form of video editing, unedited video material can be used.

A number of different text instruction series can use the same video tape in different ways. Video sequences can be added to or changed by the author by selecting the frame numbers for the placement of the sequence. The system will also control laser disk.

Catalyst make the point that laser disk material can't be updated.

The system may be purchased at a cost of between $6000 and $7000. If you have compatible hardware already, this will reduce the cost.

If you choose to contract Catalyst to develop training programs for you this will cost $12,000 to $15,000 for one 30 to 40 minute program.

Production time is quoted at three weeks with special arrangements for new product training 'rush' jobs. the use of existing video tapes lowers production costs.

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# A day of graphics lunacy
## The first APC hands-on workshop

*Starting at 8.30am and finishing after sunset, the first APC hands-on workshop proved a winner — a high-technology mad-hatter's teaparty. It was a day of "will it work?", a luxurious blasting away at the new business graphics ideas. Here's how the saga unfolded . . .*

*Tuesday 2 September 1984 0830 HRS*
Mark Adams arrived in *APC's* Park St Sydney offices carrying a Multiplan disk a plastic folder of print-outs and looking nervous, just like the Editor. Within an hour, a collection of computer graphics software and hardware would start to arrive. The challenge was to turn Adams' Multiplan spreadsheet data into useful business graphics and employ all the new graphics software and hardware to do it.

Waiting in the *APC* office for benchtests were the new IBM compatibles, the Sperry PC, with 364k on board and a colour monitor and an IBM colour graphics card.

The second machine, the new Ollivetti/ AT&T M24 came with a mono screen and 128k. An urgent series of phone calls to Ollivetti later in the day to arrange a last minute delivery of a colour screen and more memory were to prove fruitless. Consequently, the machine of the day was the Sperry PC. The original intention of the workshop was to take three competitive pieces of business graphics software that could talk with Multiplan and see how they performed in test conditions on the two IBM compatibles. Two pieces of charting software able to talk to Multiplan dropped out. One because the latest upgrade was in another city for a day; the second cancelled because the demonstrator had a meeting in Tokyo to prepare for.

That left one product, the just-released Microsoft Chart, to work with. Fortunately, Chart did the trick. And not only did *APC* have Chart but also Phil Jones Microsoft's software expert and as well Chart proved to have drivers for 29 popular printers and plotters. As the day turned out as major exercise in hardware interfacing, Chart's strength in this area was made evident.

*0845 HRS*
The editor listed the software and hardware in hand and together with Adams devised how to use it all in the working environment.

*Mark Adams, corporate accountant with the Australian subsidiary of Cyanamid, the US chemicals giant, was the brave and willing victim of APC's first hands-on workshop. Here with Mark Peters of Sperry, and the Epson colour dot matrix printer*

Software on hand:
- MS-DOS Microsoft Chart
- Digiscan scanner for Apple
- Camera Eye for Apple Macintosh

Hardware on hand:
- Sperry PC with 364k, colour monitor, and IBM colour card
- Olivetti/AT&T M24 PC with 128k, mono screen
- Epson JX 80 7-colour printer
- Kodak Instagraphic Imaging Outfit
- Apple II
- Kodak Overhead projector
- Apple MacIntosh
- Digiscan parallel card for the Apple II
- MicronEye for the Apple MacIntosh
- Electrohome ECP 1000 computer projector and screen
- Graphtec M 1000 colour plotter
- Computer Furniture from McEnnally
- Electrohome computer projector

For more information about these products, see the Softlist and Computer Record Sections in this issue.

Other equipment which we had on hand but couldn't get up and running for lack of time or expert support was the Polaroid Palette system for making slides and prints from computer images, the Summagraphics bit pad Two, and the Summagraphics mouse.

*0900 HRS*
Adams told the editor how he could use the equipment to improve his financial reporting. His company, Cyanamid Australia Ltd is a subsidiary of the American

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the Sperry, Chart's driver lists were inspected and yes, it would talk to the Graphtec under HP emulation.

### *1140 HRS*

Tim Hixon called for more computers, and for DR Graph and or Mirage software up on the Ollivetti. Horror! No colour monitor and not enough memory! Urgent calls sent for the missing delivery. At Ollivetti, everyone was in conference. Phil Jones agreed to transfer Adams' factory efficiency charts development to the Ollivetti to clear the Sperry. He took the Chart disk out of the Sperry PC, and plugged it into the Ollivetti. It purred into action. Mirage was tried on the Sperry, with more memory on board. Software version problem was revealed. Version 4 was needed and the only copy was in Queensland for the day. Reluctantly, we put Mirage into the too-hard basket for the day. What about Dr Graph from Digital Research? We had high hopes. The man from Polaroid left, saying he would be back at 4.30 to set up Polaroid Palette, Presentation Master and Dr Graph.

### *1200 HRS*

No Epson people were in evidence but somehow, the Epson colour printer was connected to the Sperry. The plotter had plotted Adams' factory efficiency report from Chart and now was being reset for a transparency to put up on the Kodak overhead projector.

*12.00: Graphtek plotted out Mark Adams factory efficiency analysis on transparency, ready to use on the Kodak overhead projector*

### *1230 HRS*

Players supposed to leave the field for lunch. Jones and Adams wouldn't leave the keyboard of the Sperry as they were too engrossed in more refinements to their factory efficiency graph development.

They didn't like the way the text looked and were changing the fonts. Bullock brought in the Apple Macintosh and the MicronEye to the boardroom and set it up. He taped the Graphtek plotter graph on to a cardboard box and set it up at the right distance to read into the MAC, preliminary to setting up a memo for Adams' imaginary board-room presentation.

*12.30: The Macintosh reads in the Graphtek bar chart through the MicronEye digitiser*

### *1300 HRS*

The editor tripped over the Kambrook and everything went down. After everything was plugged in again Bullock had some trouble getting the colour graph to read into the MAC. He wasn't having much luck with the paper graph either because the pink bar charts presented a poor contrast against the white and MAC wouldn't read tones very well.

### *1500 HRS*

Now the plotter was printing out the transparency. In fact the plotter was plotting and the Epson printer was printing in seven colours, the MAC was scanning in black and white, the Olivetti and the Sperry were both glimmering in pie charts and bar charts and menus in phospherescent green. Graphics heaven.

### *1615 HRS*

Disaster!

Polaroid called to say that they couldn't make it, being called away to Tokyo. So no Dr Graph and no Polaroid Palette. The Apple II and the Digiscan system jumped the queue. There was general confusion on unpacking the box. Everyone thought that someone had packed the wrong stuff and put in a printer instead of the Digiscan.

Everyone was wrong. The Apple II Digiscan scans images of up to 80 columns by 24 lines by rolling the image through a printer-like device which, by changing the roller, also works as a printer.

Adams' graphs came off the Epson and were rolled through the Digiscan after being photocopied to bring up the contrast. The Digiscan worked quietly.

The Digiscan manual was generally applauded by all as being a nice, easy-to-read production. Although the Digiscan was slow to read images, (four minutes and 17 seconds to read the Chart graph) it would obviously prove useful in situations where small, high-contrast images were handled.

*3.15: We thought someone had made a mistake and packed a printer instead of a digitiser. We were wrong. The Apple II Digiscan reads images in through a printer with an interchangeable platen*

### *1630 HRS*

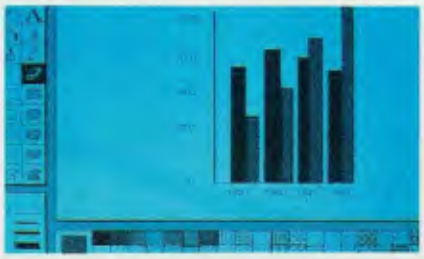
Now a new graph, the annual report analysis was up on the Apple II screen and the factory efficiency memo report on the Macintosh. It was time now to have a go with the computer projector. The computer was plugged into the Sperry composite video outlet and the Chart image of Adams' factory efficiency graph appeared in vast proportions. At the Olivetti keyboard Jones and Adams still were hard at it, plunging through the Chart menus in search of graphic perfection for their boardroom presentation. Their flashing menus and pie charts zipped across the big screen visible to all.

### *1645 HRS*

An unsuccessful effort was made to get full colour up on the big screen. It was no go at the time although the screen can technically do it. The decision was taken to set up just one colour for the photograph. "OK, what colour do you want — green, magenta, cyan, red, yellow blue, purple . . ?" "Pink" decided photographer Hixon, who then settled down to wait for the sun to set over Park Street so he could get a decent photograph of the screen.

Cyanamid company, a major international manufacturer of pharmaceuticals, agricultural chemicals, speciality chemicals and toiletries with two manufacturing plants in Australia.

The Baulkham Hills, NSW plant has about 120 employees, Hurstville, NSW about 180. Adams explained his responsibilities: monthly reports to the US head-office, boardroom reports to the general manager and the manufacturing manager. He described his needs to present financial reports and analysis for PR, efficiency planning, sales analysis and future plans as well as the monthly reports and the annual report.



*By the end of the day Mark Adams was whizzed through the Sperry PC, the Olivetti M24, Apple II, and finally the Apple Macintosh*

### *0915 HRS*

Equipment and people had begun to arrive in force. First, Phil Jones with a Microsoft Chart disk, then next Mark Peters from Sperry. Chart, and the other software we had on hand had not yet been tested on the new Sperry and he was there to see what happened.

Barry Grant and Andrew Uebergang, engineers from Electrical Equipment came empty-handed, their Graphtek plotter delivery car somewhere lost en route. They were to spend the next hour on the phone trying to track it down.

The Epson printer set in a blue and white box in the corridor from yesterday's delivery. Lyn Julian, organiser of the workshop tied up complex tea and coffee interfacing.

### *0930 HRS*

Photographer Tim Hixon arrived with a giant yellow bag full of fold-out reflectors, knock-down light stands and his Hasselblad camera with the optimal Polaroid back. At the same time Mark Bolan, software specialist with Apple, arrived to deliver a book review and stayed to sit down at a quickly-assembled set of tables and chairs in the corridor.

A huddle developed over a big black felt felt pen and a lined pad as Bolan, Adams, Jones and Richards worked out interfacing arrangements.

*9am: The APC boardroom*

A rough chart of Adams' charting and analysis presentation needs appeared taped to the corridor wall. Adams of Cyanamid and Jones of Microsoft worked out what they would have to get up on Chart from the Multiplan disk. What he wanted was a three-section warehouse comparison report and a factory efficiency report. He also wanted a comparison of 1983 and 1984 performance in the warehouse and factory. Adams then wanted to present the financial highlights of the year for the annual report.

### *1000 HRS*

Hixon began to set up his lights in the boardroom, planning a photo series that would start with an empty room, progressively accumulating things like a comic strip as the day went on.

In the corridor things were pretty crowded as Andrew Uebergang and Barry Grant were still nervously pacing, hoping for their lost plotter and Larry Chinchilla, video consultant and Peter Rolston, sales manager of AWA Rediffusion arrived with the biggest boxes of all — the portable Electrohome colour video and computer projector with an 80 x 127 free-standing curved screen and giant projector on wheels. They began to set it up in the spare office to give the editor a quick demonstration.

*We had planned to work with three graphics software packages: Chart, Mirage and DR Draw Two dropped out, and we used Microsoft Chart as shown here*

### *1030 HRS*

Phil Jones and Mark Adams sat down at the Sperry set up on the board-room table. Jones began to sweat a little. He knew he was on the line to make Chart, a new, just-released product, perform. Mark Adams' factory efficiency charting was complex and everyone was watching.

*10.30: The first machine on trial was the Sperry PC*

### *1100 HRS*

William Bullock, from Software Source arrived at the same time as a delivery box from Kodak. Bullock bearing the MacIntosh digitiser, the MicronEye, and Mr Kodak with the overhead projector and the Instagraphic imaging equipment. The MAC was collected from the bench-test room and set up on the coffee table also in the corridor. Bullock connected Macintosh digitiser, the MicronEye, and MicronEye to Adams' rough day plan taped to the wall and lo and behold, the image appeared on the Macintosh screen.

Everyone marvelled at the wonders of technology. They gathered around like relatives around a new baby ... "You mean the RAM chip is just stuck on the back of the lens . . ?"

### *1130 HRS*

While everyone wonders if it was done with mirrors and if Bullock had something up his sleeve, more men arrived with more boxes. By now, the corridor evoked visions of steerage class on the Titanic just before it went down. This time the delivery was the Polaroid Palette system and Dr Graph software. Meanwhile, inside the board room, Mark Peters of Sperry and others had connected the knee bone to the leg bone.

The Graphtec plotter was plugged into

*1700 HRS*

While the wait was on, the post mortem began. Was this day of madness worth it? Was computer graphics the dream that turned into a nightmare? Adams' opinion of the day was called for. Mark Adams works with Multiplan, and operates an IBM PC.

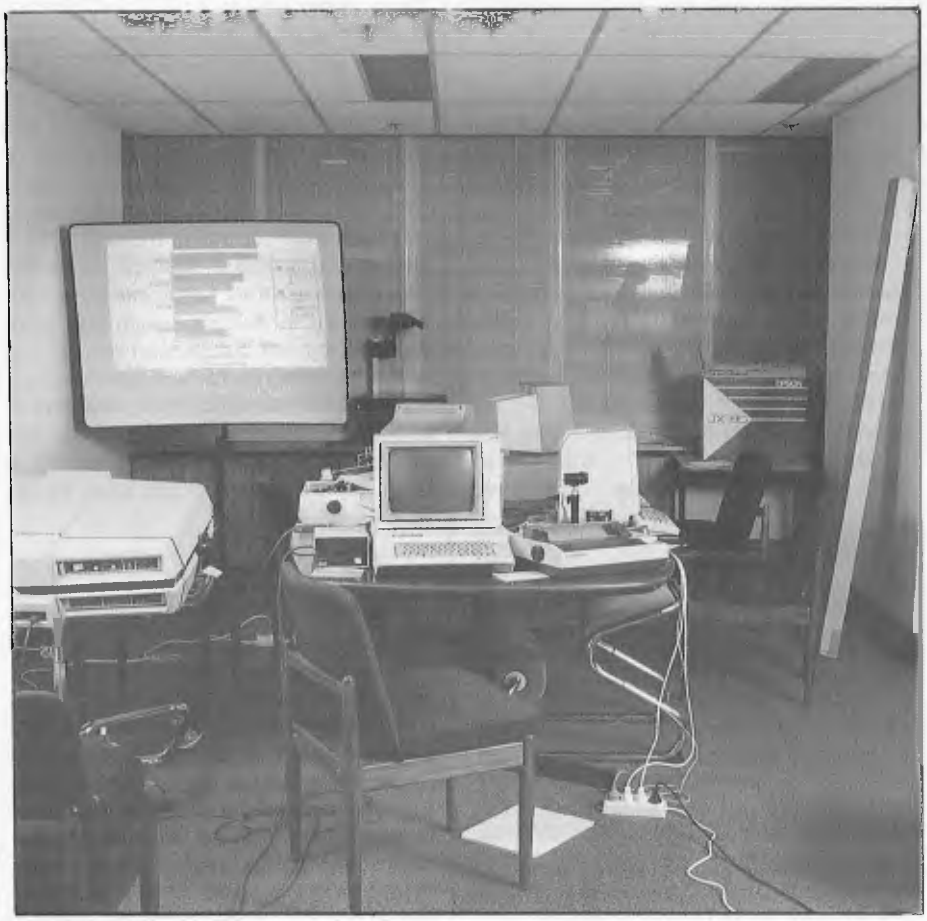
He has no graphics software or graphics equipment. He said that after the day's demonstration, he would definitely buy Chart, "because it is very compatible with Multiplan."

He also liked the Graphtek plotter and the Epson seven-colour printer although felt that it would be a luxury to buy both. He would like to see the printer in a wider format as in his work he does wide spreadsheets.

"I reckon a 15-inch model would be a winner", he said. If he could have a colour graphics printer that would print his wide spreadsheets and do colour work as well, he would definitely purchase.

He also liked the large screen projector.

It would be very good for the monthly report, he said. Not every one is good at figures — and graphs are an easy way to express trends.



*Above. The mad hatter's hi-technology tea-party in action; Phil Jones of Microsoft, lower right, and Mark Adams of Cyanamid, Mark Peters of Sperry, and William Bullock of Software Source at the top of the table*

*6.00: The boardroom transmogrified at the end of the day; Sperry PC, Olivetti M24, Apple II, Apple Macintosh, Digiscan, MicronEye, Graphtek plotter, Epson printer, Kodak overhead projection, and the Electro home computer/video projector and screen. Hidden, but vital, MacEnally computer furniture*

The first *APC* hands-on workshop proved a success in which competitive companies worked cheerfully together on interfacing new products in new ways. More hands-on workshops are in the pipe-line. Next issue, we gather the forces together for a competitive Benchtest olympics of the three new IBM compatibles: the Sperry PC, the Olivetti M24, and the NEC PC. Also in planning are a Software Integration Philosophy workshop and a Computer Art and Artist's workshop.

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The innovative and very powerful outline processor can be used as a standalone organizer or as a companion to the word processor. Using this outline mode, single ideas can be quickly captured and then expanded into fuller concepts and solutions. Any outline-frame or subheading within an outline can be instantly expanded to include text, spreadsheets, graphs or databases. Finally, with Framework, your PC is truly a thinking machine.

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Framework's database system can be learned quickly and put through its paces effortlessly because most commands are common throughout the entire program. Framework itself will handle most of your analytical information management needs, and if very large data handling is required, Framework is fully compatible with dBASE II®.

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The new DOS access capability allows any user to actually run other PCDOS software inside Framework. This allows users to gather data from other programs without quitting Framework. It will be of great help to people who frequently shuttle between programs and to businesses who perform frequent interchange of programs or data with larger systems.

**Custom Applications**

Framework comes complete with its own programming language. Users can begin writing their own custom packages or use software developers right away. In addition, dealers will continue to receive the excellent support that has helped make Ashton-Tate the front-runner in the software industry with dBASE II and FRIDAY!

**Hardware**

Framework will run on the IBM PC, PC XT and all compatibles. It requires just 256K RAM and dual 360Kb floppy disk drives with monochrome display.

**Availability**

Framework will be available in Australia from the end of July. Contact your dealer end-June for more details or write to the Master Distributor, ARCOM Pacific, Freepost 2 (no stamp required), P.O. Box 13, Clayfield, Qld. 4011.

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# Do it yourself Video Software

## *A PC-VCR project for NV370 owners*

BY PETER VERNON

Computers and video are a combination whose time has come. Matching a video cassette recorder (VCR) or laser video disk with a microcomputer opens up fields of communication with awesome potential.

Imagine, for example, a video encyclopaedia able to access information on any subject almost instantly with instead of pictures, actual video sequences and still frames displayed along with the text.

The new video-disk games use this method. One of the more popular of these new games is based on the Star Wars movie. Depending on your skill and with suitable 'May the force be with you, Luke' sound effects, your 40 cents can offer you a range of battle options.

Interactive laser video disk games, now in arcades, will be shortly available for the home and already the same techniques have been applied to training — for example, McGraw Hill, Arthur Young and MPI.

For more information see the interactive video authoring story in this issue. It is only a matter of time before the same concepts are applied more generally in both games and full video image data bases that can search world video libraries on line.

The project described here isn't quite up to the standards of Encyclopaedia Galactica but it is a useful start and the experimenter will be in a good position to take advantage of more advanced equipment and video program material when they become available.

You will be able to write your interactive video program which will fast-forward and backwards through your tape for images in response to the answers to the user's on-screen questions.

For example, if you program your own sea-drama, using tape you have on hand and your text asks: 'Turn to port?', and the instruction is 'Yes', then your screen (if you have done everything right) should show ships turning to port. What you do is limited only by your video tapes and by your imagination.

Called 'Compuviz', this little gadget connects to the parallel output port or Centronics printer port of any computer and allows software control of the Play, Rewind, Fast Forward and Pause functions of the National NV-370 video cassette recorder.

The NV-370 was used because it was available but it is also one of the largest-selling VHS video cassette recorders. With appropriate modifications, a similar circuit could be used with any VCR which uses a wired remote control unit.

You will need these items which you can buy at any Davred electronics supply shop.

- 5x5 volt PCP mounting relays; 1x1.2k, 1x2.7k, 1x4.7k, 1x56k and 1x68k
- 5 small signal diodes 2N2001
- 5 BC 557 transistors
- 1 8x9 cm Vero strip board
- 15 cm of 8-way parallel cable
- 1 2.5mm audio jack.
- A connector to suit your output port. Study your manual to find out which one your computer will need.

If you have no experience with hobbyist electronics, you may instead prefer to buy *APC* Compuviz Project Kit which comes with instructions on how to make it work. This will cost you $40 for the bits and the instructions.

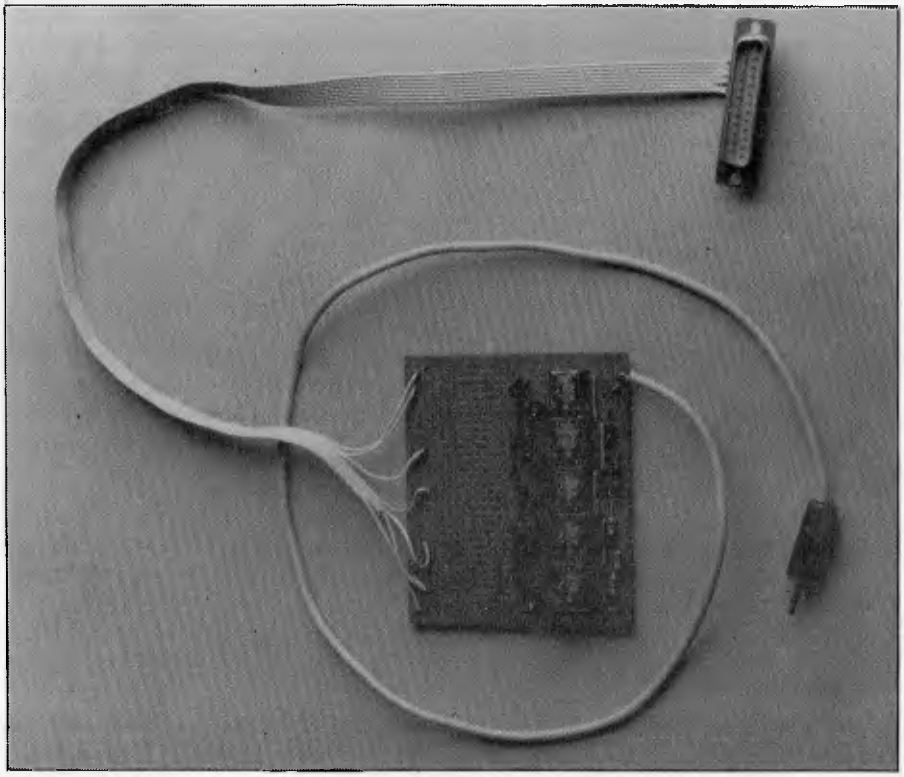
You will also need some basic tools which you will have to buy separately. You'll need a pen-sized soldering iron, solder, a craft knife and a pair of needle-nosed pliers.

Write to Compuviz Video Project, *Australian Personal Computer*, 54 Park St, Sydney 2000 and enclose your cheque for $40. Don't forget to let us know what sort of computer you have. The project only works with the NV-370 Video.

## *How it works*

The NV-370 VCR has a small remote control handset connected to the recorder by a cable and sub-miniature audio jack. Providing computer control is a matter of duplicating the functions of this remote control unit.

The remote control handset essentially consists of a string of resistors wired across pushbutton switches (see Fig 1).



Pushing a function button switches one or more of these resistors across the remote control input and circuitry inside the VCR converts the voltage flowing through the handset into commands for the recorder's microprocessor controller.

At first glance, it appears that the same

functions could be duplicated using CMOS analog switches to switch resistor values in the computer VCR controller. This approach didn't work, however, because the switches of the 4066 CMOS IC have an internal resistance of their own which varies, according to the specifications, between 190 ohms and around 1000 ohms when the switch is 'ON'. This unpredictable variation plays havoc with the control circuits of the VCR!

The present design, based on relays, is less 'state-of-the-art' but it works.

As shown in Fig 2a, miniature PCB mounting relays are connected by transistor buffers to the output port of the computer and used to switch the different resistors across the remote control input. By sending appropriate binary values to the output port, combinations of resistors can be selected to activate the chosen function of the VCR.

Note that this version of the Compuviz does not control the RECORD function of the VCR although it would be a simple matter to add another relay and resistor for this function.

Using a computer equipped with a real-time clock and calendar, the programmable recording features of even the simplest VCR could then be expanded to any degree of complexity.

# *How to build it*

The prototype version of the VCR controller was built on 'Veroboard' strip board and tested using a Sorcerer computer. Miniature relays designed for 5V operation were purchased from Davred Electronics along with the BC557 transistors and resistors of the appropriate values, for a total cost of less than $20.

Note that there is no electrical connection between the computer and the VCR. While this may not be important with some types of equipment, it may be critical with other designs.

The voltage level defined as 'ground' is not a constant and can vary considerably between two appliances, giving rise to potentially damaging voltage gradients between the computer and the VCR. The degree of isolation provided by the use of relays prevents these types of problems.

The output port of the Sorcerer computer has built-in resistors which prevent attached equipment from drawing too much current from the TTL outputs of the port. When the VCR controller is used with other computers, such as the Commodore 64 or IBM PC, it will be necessary to add the current-limiting resistors shown in Fig 2b.

If you're not sure whether they will be required for your computer system, build them in anyway. They are a useful precaution during any experiments and can be removed later if they interfere with the operation of the controller.

The diodes shown connected across the relays of the controller circuit are necessary to guard against 'back emf', the voltage produced by the sudden collapse of the magnetic field when a relay or other inductive load is switched off.

This voltage can be quite high and since it always flows in the opposite direction to the supply voltage, it can damage the switching transistors of the controller. The diodes connected in reverse across the relay coils discharge the back emf harmlessly.

Once the device is built it would be wise to test it before connecting to the VCR. Check the wiring and construction carefully and then plug the controller into the computer parallel output port and enter and run the program shown in listing 1.

Ensure that the resistances across the controller output jack as are shown in Table 1 for each of the commands shown. If all is well, plug the output jack into the remote control socket of the VCR and check that each programmed function operates correctly.

Because of the way the controller circuit is designed, each relay is activated by a 'O' level on its data input. Unless otherwise specified, a TTL gate is always at a 'I' level, so that when the computer is first switched on, the pins of the output port will be at this level. If the relays were activated by a high level the VCR would be simultaneously commanded to stop, play, rewind, pause and fast forward with nasty results. While using 'O' levels does complicate the programming a little bit, it does eliminate other much more serious complications.

# *Software*

Software for the VCR controller divides naturally into two categories: the basic output operations which activate some function of the recorder, and the high-level programs which use the controller to present and organise the video-taped material.

Both types of software can be written in Basic, using either the OUT or equivalent statement to send values to a parallel output port or LPRINT CHR$() if the controller is connected to a parallel printer port.

As the circuit is designed, the NV-370 VCR is controlled by five data bits. Since the relays are switched by 'O' levels, selecting a particular function is a matter of taking one output bit low while keeping the others high.

Timing of the output signals is not critical as long as there is sufficient time for the VCR to recognise and respond to a particular output signal.

The sequence of the control signals is important however. Some functions of the NV-370 VCR vary according to which function was previously selected, so that, for example, if FAST FORWARD is selected after PLAY, the recorder will go into the CUE mode, playing at around five times the normal rate but still displaying a picture.

If, on the other hand, FAST FORWARD is selected while the recorder is not playing, the tape will be wound forward without displaying a picture. In the same way, REWIND after PLAY will select reverse play at five times normal speed while REWIND after STOP will rewind the tape without displaying a picture.

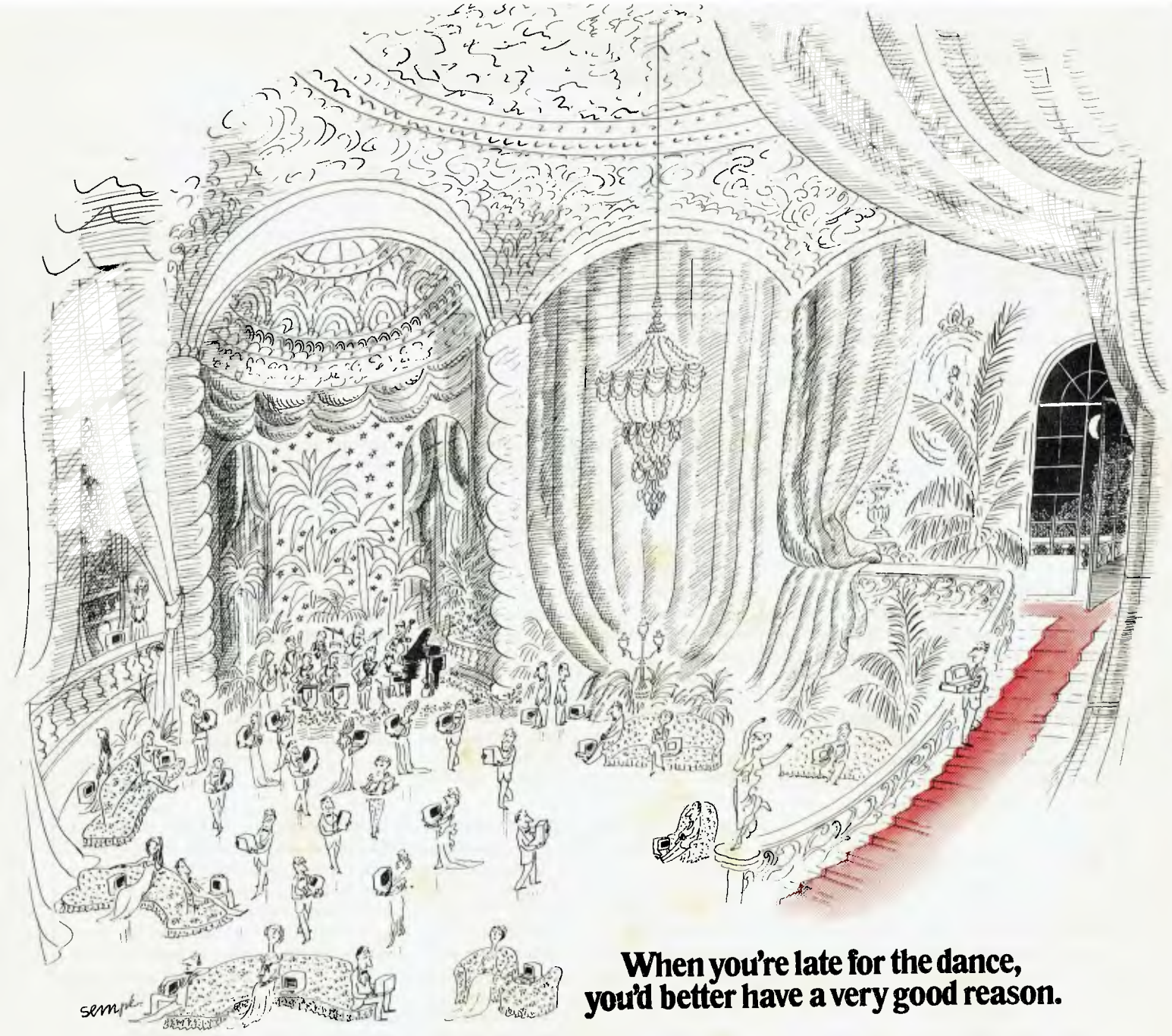
It is also important to switch off all relays after issuing a command to the controller. The NV-370 stores the last command received and will continue to carry out that command until instructed otherwise. This is not important if the command is PLAY, but is important after a REWIND or PAUSE command. PAUSE in particular is a toggling command which means that the first instruction will halt the recorder and the second will restart it. An OFF command must be given between the two PAUSE commands for the function to work correctly.

Table 1 shows the output values and the functions performed by the VCR controller connected to the NV-370 and wired as shown in Fig 2a and listing 1 is a simple Basic program to demonstrate these commands.

# *Using the controller*

It is not possible to give an exhaustive description of the use of the Compuviz VCR controller simply because the uses to which it is put depend on the type of video program material available. Applications in training and education come to mind as well as games based around popular movies (although copyright laws forbid taping of television programs). Following are some guidelines for 'high level' video computer software.

The present design provides no feedback from the VCR to the computer so the computer has no way of determining which segment of the video tape is played at any time.



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Feedback on tape position requires either an 'industrial' video recorder with dual sound tracks, capable of writing and reading timing marks on the tape at high speed or a connection to the tape counter of the VCR which means meddling with the complex internal circuitry of the player.

For the moment, the video tape is best positioned by timing each section of the tape in PLAY, REWIND and FAST FORWARD modes and then using a computer program with timing loops or a real-time clock.

| OUT or LPRINT CHR$( | RESISTANCE | FUNCTION |
|---|---|---|
| 255 | OPEN CIRCUIT | ALL OFF |
| 254 | 0 ohms | STOP |
| 253 | 1.2K ohms | REWIND |
| 252 | 2.7k ohms | FAST FORWARD |
| 251 | 4.7k ohms | PAUSE |
| 247 | 132k ohms | PLAY |

*Table 1. Output values, resistance across VCR remote input and functions activated for the NV-370*

Typically, instructional programs would display a section of the video tape then ask questions based on this material. Depending on the answers to the questions, the program would then either advance to a new section of the tape (FAST FORWARD for 30 seconds) or replay the same material (REWIND for two minutes).

Adventure games would also be written using the same principles. Another method is to use the cassette port of the computer.

With suitable cables between the cassette interface and audio input and output ports of the VCR the video recorder could be used to store computer programs in exactly the same way as an audio cassette recorder.

Using this method, the standard Basic CLOAD statement would be used to locate particular sections of the tape and load in a computer program to accompany the video.

Since the audio of a standard VCR is disabled in fast forward and rewind modes, however, speed searching of the tape is not possible.

The video output of a computer can also be recorded on tape, of course, although some computers give better results than others.

Video recorders are not very tolerant of timing faults in the input they record and most computers do not provide 'broadcast standard' timing, or 'sync' signals.

Finding out whether the output of a particular computer can be recorded on tape is a matter of trial and error but if it is possible, it would be a perfect way to store graphics displays and particular screen formats for permanent reference or for demonstrations of computer capabilities without a computer.

Using a VCR in this way has a bonus if you need to display video output on a television set but don't have an RF modulator.

The composite video output of the computer can be connected to the video input of the VCR and the VCR's RF output connected to the TV receiver. It's an inexpensive way to obtain RF output from a computer which doesn't otherwise provide it but it could be handy in some situations.

## *In conclusion*

The combined use of video recorders and computers is as yet in its first stages. Together they open the way for new means of communication, entertainment and education with possibly far-ranging effects. No doubt, as the techniques are developed and the equipment refined, we'll see a form of synergy in operation — the whole will be much greater than the sum of the parts.

Building and experimenting with the project described here may put you in on the ground floor of the next communications revolution.

```
10 REM ****** VCR CONTROLLER TEST AND DEMONSTRATION ******
20 :
30 N=255:REM The address of your output port goes here
40 :
50 REM To REWIND the video tape without display
60 OUT N,255:REM First select ALL OFF
70 OUT N,253:REM Then REWIND
80 OUT N,255:REM Then ALL OFF
90 :
100 REM To PLAY the video tape
110 OUT N,239
120 OUT N,255
130 :
140 REM To PAUSE
150 OUT N,247
160 OUT N,255
170 :
180 REM A pause of more than about 30 seconds may damage
190 REM the video tape.  Most VCRs stop automatically
200 REM if you leave the tape in  PAUSE mode for more
210 REM than five minutes.
220 :
230 REM To restart after a PAUSE
240 OUT N,247
250 OUT N,255
260 :
270 REM To play at five times normal speed (CUE mode)
280 OUT N,239:REM First select PLAY
290 OUT N,251:REM Then select Fast Forward
300 :
310 REM To play backwards at five times speed (REVIEW mode)
320 OUT N,239:REM First select PLAY
330 OUT N,253:REM Then select Rewind
340 :
350 REM To Fast Forward from PLAY mode, without display
360 OUT N,255:REM First select all functions off
370 OUT N,251:REM Then select Fast Forward
380 :
390 REM ****** To STOP ******
400 OUT N,254:REM Select STOP
410 OUT N,255:REM Then select ALL OFF
```

*Listing One*

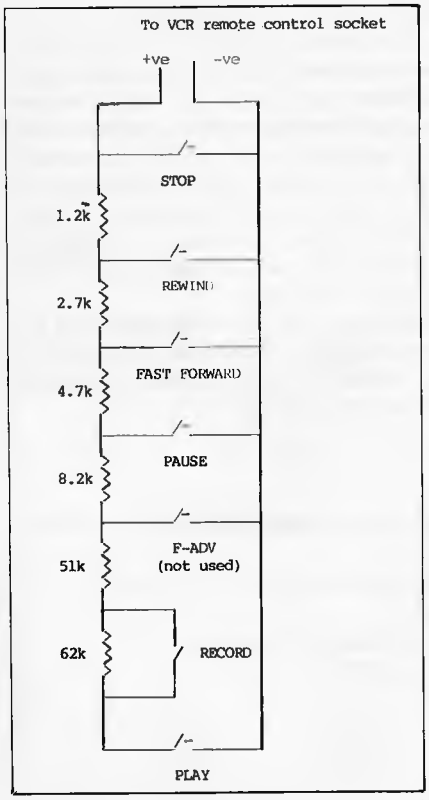


*Fig. 1. The NV-370 VCR remote control handset*

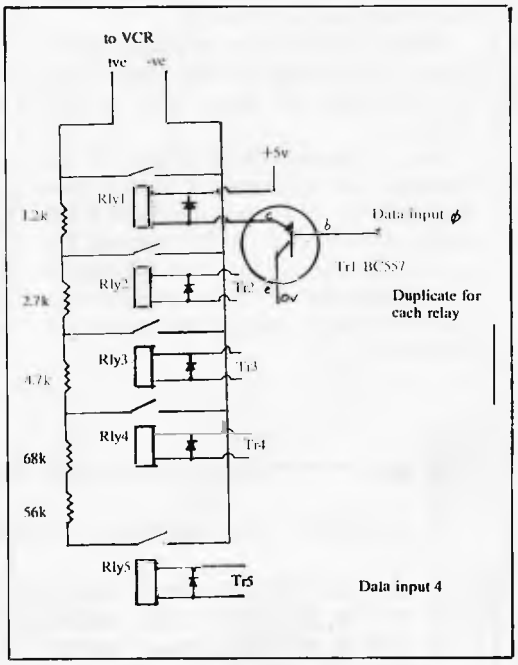


*Fig. 2a. The Compuviz VCR controller*

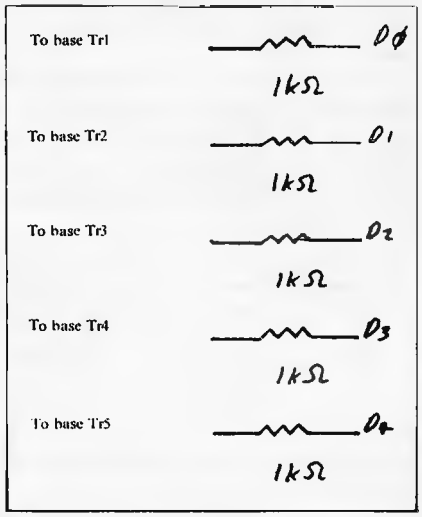


*Fig. 2b. Current-limiting resistors may be required in series with the base of each transistor relay driver if they are not already incorporated in your computer output port.*


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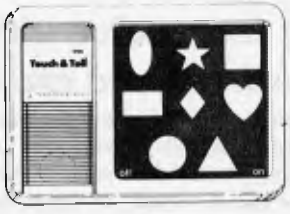

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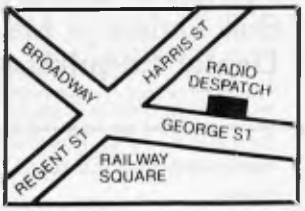

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# Is this software any good?

*An educational psychologist investigates*

*Mary Ann Paynter of Computer Tutor.*

Parents, teachers and users of educational software often ask me: 'Is this program any good?'

As a psychologist of learning and a software designer, I am most interested in questions relating to the potential educational worth of software products.

The kinds of questions that interest me are along these lines: 'What are the educational objectives of this program? How are the objectives achieved? What effects will this program have on a learner's performance?'

Because of my professional training, the kinds of questions I ask are, of course, framed somewhat differently. Essentially they do boil down to the same question that I am often asked — 'Is this program any good?'

There are three ways to work out the educational value of a software product.

You can read the technical and advertising literature which describes the program.

The ideas behind such literature will presumably have originated from the developer (even if they have been written by someone else).

Software reviews are another source if you feel prepared to accept a reviewer's ability to comment adequately on a software program.

In the absence of either sufficient description from a developer or a reviewer, you can always look at the programs themselves on the assumption that it is possible to gain some idea of what the designers had in mind when they created the programs and further, how they intended to achieve their objectives.

For the most part, technical description relating to educational design are not normally provided by developers of software although lately this is changing.

This is particularly true of the lower priced (under $100) commercial products with which most of us are familiar.

To a large degree then, the only information that provides a description of the educational intentions of the software designer is provided by the advertising accompanying the program.

For example, I culled the following advertising descriptions from magazines and the packaging of six educational software products:

- '..... emphasises and reinforces an understanding at place value.'
- '..... provides an opportunity to develop skills of understanding and using scales.'
- '..... designed to raise the child's skills at discrimination. Using music and graphic shapes .... children are prepared for reading exercises.'
- '..... encourages students to improve their English while having fun.'
- '..... injects real pleasure into addition, subtraction, multiplication and division — simply by visiting a magic bakery.'

On the face of it, all of these descriptions seem to contain the promise that the programs they describe have educational worth and that the developers intend to fulfil some educational objectives.

One question, however, keeps nagging me: What is it that a learner will be able to do when he completes a program?

When I use the word 'do', I mean it to be taken in its ordinary sense of behaving in some fashion. For example, if a learner completes a program, the description of which implies that she will be able to solve algebraic problems, then I want to see her solve algebraic problems.

If a child is said to be prepared for reading exercises, I want to observe the child behaving in some way that indicates to me that he is prepared for reading.

If it turns out that 'reading preparedness' is indicated when a child can tell the difference between graphic shapes or letters of the alphabet, then I want to see how many correct discriminations the child makes. I want to see him sort an 'A' from a 'B'.

If a software designer implies that a program will affect a learner's behaviour so that she can solve problems involving fractions, then I want to observe her solving problems involving fractions. I do not want to be told that the program 'demystifies' fractions — this is not an educational objective I can understand.

In short, I am not interested in how a program 'encourages', 'gives opportunities', 'demystifies' or 'emphasises understanding.' These educational claims are meaningless to me.

I want to know in very clear terms what a learner will do after completing a program. I want educational objectives that are stated in a way that makes it possible for me to see what changes can potentially occur in a learner's performance.

If I have this kind of information then I can find out if the program is doing what it is supposed to be doing.

Like most other people, I do take advertising descriptions with a grain of salt and probably, better than most people I understand how difficult it is to formulate a set of educational objectives without appearing to be making false claims.

However, I see no inherent difficulty in a developer's stating, in, very explicit terms, the educational objectives a software product is designed to meet.

I believe that unless we get this kind of information from developers there is no way that we can assess the educational worth of educational software products.

Another possible source of information about intended educational objectives (and how well they are met by designers) is contained in reviews about educational software.

Usually reviewers are more or less qualified to comment on some aspect of the educational design of the software.

In fact it is becoming debatable whether or not a single reviewer can offer accurate comments on all aspects of software design. From my point of view, for example, if psychological principles are used in a piece of software, a

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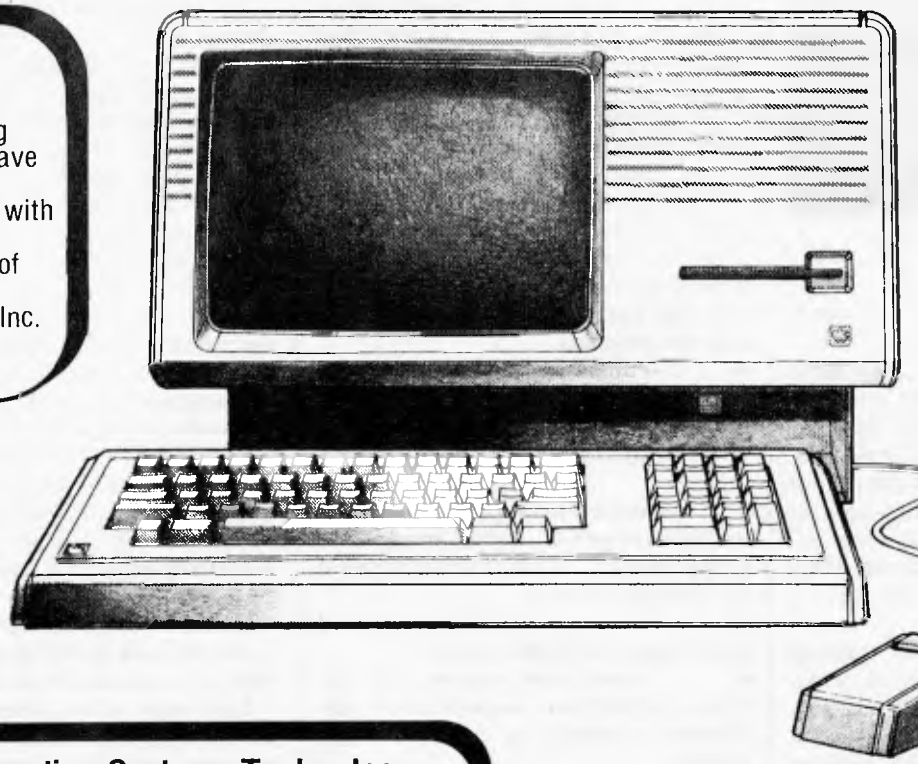

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psychologist, rather than say a teacher of geography is the proper person to comment on the psychological methods used.

Review panels are probably a much better way to proceed.

I must, however, admit that after reading many reviews I am often quite in the dark about what the reviewer's comments mean in terms of a software designer's educational objectives and how well they have been achieved.

There is as in advertising descriptions, a tendency to make very vague statements about what a program is designed to do. For example, here is a review that I found in which the reviewers are describing a program written for high school physics.

'The program is essentially a test in applications of such concepts as Newton's Laws of Motion and Gravity and the Laws of Conservation of Momentum, Energy and Kinetics..... *The exercises encourage analytical skills and information processing procedures.'* (emphasis mine)

The first part of this review describes a program in which learners appear to practise solving physics problems that are generated by the program. Good! I can understand this.

However, when I come to the line that I have indicated, I no longer understand what effect the program will have on a learner. I can not observe an 'analytical skill' nor can I see 'an information processing procedure.'

Quite frankly, I am not even sure what they are. For 'analytical skill' I take it that the reviewer means a learner demonstrating being able to solve problems by solving problems.

'Information processing procedure' probably means 'thinking' or 'cognizing', again demonstrated (in terms of the program) demonstrated by solving problems!

What I can see is that a learner solves physics problems with perhaps fewer errors than she made before she did the program or perhaps at a faster rate than she managed in the past.

I find it quite puzzling and certainly unhelpful when reviewers trade in the coin of 'encouraging analytical skills' and 'information processing procedures'.

It leads me to speculate on whether the reviewer has formed a clear idea about the designer's educational objectives and the methods used for achieving them or whether there are, in fact, any clear educational objectives and methods to be reviewed.

This kind of nebulous treatment by reviewers of software harms good products and covers up the inadequacies of the poor ones.

I feel that an obvious source of information about educational software lies in examining the software itself.

I am proceeding with the notion that examining software products will give an indication of the education intent of the designer and (perhaps only to the professional eye) some idea of the methods by which the objectives are achieved.

Personally, after inspecting a lot of software I am critical of most of the products that are available on two major grounds:

- The end performances suggested by many programs give no apparent indication about their relationship to education as most of us understand it
- The methods that are used to achieve whatever the designer has in mind often bear no resemblance to what is known about the conditions under which humans learn.

I mention the second point because it is important for the public to know that there is a great deal of research in the field of learning and that there are applications which (theoretically) can be used in software design in order to enhance a learner's performance. However, the features of a software program that are put there as a result of a designer's knowledge about learning and other psychological constructs such as motivation are not immediately apparent to those without special training, so I do not propose to go into any detail in this matter.

I would simply like to contend that many products I have seen would have no effect on a learner's performance.

In other words a badly-designed program on arithmetic might not enable a learner to solve problems any better or might even result in his making more errors after he did the program.

Having said that I would now like to address the issue of one class of software product that is apparently dominating the educational software scene.

I am referring to the ubiquitous 'educational game.'

I do not include educational games which are based on research evidence. I am taking exception rather to the products that are designed by zealous amateur educators and psychologists.

I do not subscribe to the view that the only form of valid educational instruction occurs inside an institution between the hours of nine and three. Nor do I believe that education must follow some set of standardised practices.

However, I do not like it suggested to me by some software designer or other that a program will have a positive effect on the learner's performance when he is in school unless this is patently the case, as suggested by experimental evidence, either for the design being used or as a test of the software after it has been created.

It seems to me to be quite obvious that many of these educational games bear little relationship to various aspects of mainstream education. They are entertainment dressed up as education.

I question very closely the assumption that skills acquired in the 'games' format will transfer in a consistent and enduring way to those areas that we usually conceive as constituting educational performance.

Essentially I suppose I am questioning the kind of thinking that marries up playing a computer game with the skills required for answering questions on economics in an examination.

While I wholeheartedly support the idea that instructional practice ought to be focussed on the learner I do not support this current school of software design that suggests that we must serve up a teaspoon of sugar to make the education go down.

*Mary Ann Paynter is director of research and development with Computer Tutor and a doctoral student in educational software development at Sydney University.*

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# Commodore Plus/4

*Commodore has kept the world waiting for its first new machine since the best-selling '64, and has now produced the Plus/4 — an inexpensive home/small business micro with four built-in software packages. Commodore expects to have the machine available in the shops around the end of the year. How does it compare with its existing line up? Tony Hetherington finds out.*

Commodore dominates the world of home computers, so the computer world has waited with bated breath for the new Commodore micro, the Plus/4.

For around $600 it offers the potential buyer a home micro with four built-in business packages, a word processor, spreadsheet, file manager and graphics package.

It has, however, abandoned the sprites and sound of previous Commodore machines in favour of a new Basic and built-in machine code monitor called Tedmon.

## Hardware

The Plus/4 is extremely small. It's not down to the size of the VZ-200s of this world, but it must be the smallest machine yet to house a full qwerty typewriter-style keyboard, and function and cursor keys.

This 'micro' computer is housed in a charcoal grey plastic case and is accompanied by a power supply, TV lead and manuals: The power supply is standard Commodore which looks ridiculous alongside the Plus/4, and should be hidden at all times.

The qwerty keys are moulded from off-white plastic, and are nicely shaped but have rather a light touch; nevertheless, I didn't have any overtyping problems. The letter and number keys also have two graphics, or functions, attached to them, and are accessed by pressing the required key along with either the SHIFT or COMMODORE keys. Arranged along the top of the qwerty keys are four grey function keys, which with the shift key give seven programmable functions and a HELP key.

There is an MSX-style cursor key cluster on the bottom right of the keyboard, with the cursor keys shaped into arrows.

The keyboard unit has a flat plate containing the keys mounted on an angled plinth. This plinth slopes the keyboard at a pleasant angle, and also contains a range of ports and interfaces.

The right-hand side of the machine houses the ON/OFF and RESET keys, and the left side a TV output. From left to right along the back are the power input, serial port, cassette port, I/O port, a cartridge slot labelled 'memory expansion', two joystick ports and a video output.

The two joystick ports are Commodore's own design, and replace the standard ports found on the VIC-20 and '64 to allow you 'to use Commodore's advanced joysticks', but couldn't find anything about them that was so spectacular to warrant a move away from standard ports.

Another Plus/4 move away from standards is the cassette port which allows you to use the new Commodore 1531 Datasette, but I've yet to discover any significant differences between this and its VIC and '64 predecessor, the 1530.

Fans of the famous 1541 disk drive will be delighted to hear that you can still use this with the Plus/4 via the serial port (note that this is soon to be replaced by the 1542 drive, which is really a bug free 1541 in a different-coloured box). You'll also be able to buy a super new fast disk drive, the SFD-481, which is reportedly 12 times as fast as the 1541 and will plug into the cartridge slot.

The curious I/O port will apparently take an RS232 adaptor plug, and a modem that allows Commodore owners access to a wider range of peripherals and accessories.

The review machine was described as a 'final preproduction model', and its insides revealed exactly what that meant. The hardware was the final configuration, but was achieved by the use of numerous EPROMs and a spaghetti of patching wires. The hardware will stay the same but the circuit board will be tidied up on production versions.

The Plus/4 is driven by a 7501 processor (another 6502 derivative) which runs at between 0.89 and 1.76MHz. This is dependent on the amount of text and graphics on the screen, which is reminiscent of ZX81 days with its fast and slow modes.

Alongside the CPU is 64k of RAM and a bank of four ROM chips, which include 32k ROM incorporating the Basic and 20k of 3-Plus-1 software.

## System software

When the Plus/4 is switched on the opening screen is displayed, informing you that the Plus/4 runs under Basic 3.5 and has 60671 bytes free. Below this is an invitation to press F1 and enter the delights of the built-in 3-Plus-1 software. 3-Plus-1 is to be a major selling point of the Plus/4.

Pressing F1 from the power-up screen takes you directly into the first of the three main packages, the word processor. The other two, a spreadsheet and a file manager, are accessed from the word processor via a few key presses. Unfortunately Commodore has failed to give these packages a name, so I'll have to christen them for the sake of individuality.

In essence the word processor is a subset of the Easy Script program available for the '64, so I'll call it Subscript. The others are not so easily defined, and are

*'The Plus/4 is extremely small. It's not down to the size of the VZ-200s of this world, but it must be the smallest machine yet to house a full qwerty typewriter-style keyboard and function keys.'*

best referred to as 4calc (spreadsheet) and 4base (file manager).

The final package which forms the 'Plus-1' is described as a business graphics package, but is little more than a graphing utility used solely by 4calc so I'll treat it as such.

Subscript is a competent product which allows you to type and edit 80-column documents on a 40-column screen. You can also insert special control characters into the document's text which are used to centre or justify text, create page headers and footers, and define page lengths and margins. However, all these characters are displayed on the screen at all times, so it isn't until you actually print out the letter or document that you see how it looks. This is unfortunate as a preview of the finished product is a very useful facility.

On the plus side you can load, save and merge documents from a disk drive, and integrate Subscript with the other packages to produce, for example, a letter individually addressed to everyone on your mailing list held on 4base. Although it's possible to use Subscript without a disk drive to type, edit and print letters, it's best used with one. The same is true of 4calc, but one is essential if you are to use 4base.

Subscript has one final but essential task to perform, and that is to be a front end for the other packages. For example, you enter the other packages from Sub-

script and before anything can be printed it must be passed to Subscript. This may have its disadvantages, but it also means that any graph spreadsheet or database record can be easily incorporated into a Subscript document.

4calc is a powerful spreadsheet program and is entered by keying 'tc' (to calculator) while in Subscript. It has a standard spreadsheet format with the screen as a window that's moved over a larger spreadsheet. The window size is just three rows of 12 cells, but the whole sheet is 50 rows by 17 columns making a total of 850 cells — sufficient for most home applications. Up to 36 characters can be entered into each cell, but only the first 11 are displayed on the screen. All the characters are of course present when the spreadsheet is printed out.

Each cell can be filled with text for either a heading, numerical values, or a formula that can act on individual cell contents and sum entire rows and columns.

4calc includes a powerful spreadsheet editor which not only allows you to change the contents of any cell, but also lets you insert or delete cells in the middle of rows and columns. You can even copy whole rows or columns and edit them, thus greatly speeding up input of a lot of similar data.

Press 'gr' when in command mode and your spreadsheet will be automatically graphed by the so-called business graphics package. Although this is quite useful there's only one type of graph available, and that's a very rough bar chart. It's rough in the sense that it's unfinished, for it has neither a scale nor axis labels. The bars themselves are constructed solely from hash signs.

However, all is not lost. Since 4calc is fully integrated with Subscript, it's easy to pass the graph or indeed all or part of the spreadsheet to Subscript. It then becomes part of a Subscript document and can be edited. Particularly useful in this respect is Subscript's search and replace utility, which can be used to replace the hash signs with a more appropriate character to give the bar chart a more pleasing appearance. Transferring data from 4calc to Subscript is made even easier by the ability to split the screen and have it displayed in either half: you can pass a completed spreadsheet to Subscript knowing exactly where it will appear in your document.

As with Subscript, 4calc supports a disk drive so that you can load and save completed spreadsheets. A disk drive is, of course, essential to4base as it's a disk file manager package. On entering it your first task is to either insert an existing data disk or create a new one. Creating a disk or file is a simple task made easier by a question and answer session, which ensures that you can't go too far wrong.

You are asked the number of fields each record in your file will have, followed by a loop sequence in which you must enter each field name and the number of characters allowed for the contents. When this sequence is complete, 4base displays all the field names and field lengths along with a calculated maximum number of records allowed. This is limited by the capacity of a disk and has a maximum of 999 records, obviously affected by the length of and number of fields as well as the field names. The minimum number of records is 200, which consists of 17 fields of 38 characters, each with a 35-character field name. Consequently you may have to be prepared to reorganise your file to get the required number of records.

When you have defined your file, 4base formats a disk for you. This is dependent on the number of records and can take between 130 and 160 seconds, and is longer than the standard disk formatting because it writes record details onto the disk. Once this is completed, 4base will report the space left on a disk.

It may seem a little curious to have on average 140 free blocks, particularly if you have to reduce field lengths to accommodate your records, but this space is used by 4base to store sort files created by its powerful sort routines. You shouldn't use a 4base disk for spreadsheets or documents as they will take up this space.

When the file is defined you can easily enter record details. You can also search for specific records or have 4base run through them in sequence — in fact, all you would expect from a database including sort routines. You can sort the whole file by any field or fields and even sort a set number of records (for example, the first 50), or define a range in which only sorted records will fall.

As with 4calc, data from your files can be printed by Subscript. The data is passed to Subscript but is drawn from the 4base disk; all the necessary commands are part of Subscript. These are additional control characters which define where in a document a 4base field will appear: for example, each field of an address file is defined at the top of a letter to be sent to a club's members.

This ability to rapidly pass data between the parts of 3-Plus-1, coupled with the fact that it's a ROM-based package, is a major advantage.

Plus/4 programmers will use an odd mixture of the old and new when they program in Basic 3.5, since according to Commodore it contains Basic 2 and Basic 4 commands seen on previous Commodore machines, mixed with powerful graphics commands.

Programmers will also appreciate the full screen editor accompanied by an overworked ESCAPE key. Pressing this key together with others produces powerful editing features, such as delete to start or end of a line. In addition, you can also scroll lines, insert characters and even define a screen window.

Another overworked key is the HELP key which aids in program debugging. Imagine that you have written a program with several multi-statement lines and one of them contains an error. At first sight, the Plus/4 is particularly unhelpful as all it displays is 'Syntax error' followed by the line number; pressing HELP will display the whole program line and flash part of it, starting with the statement containing the error. This is quite an unusual interpretation of a HELP key, and there are further surprises contained in the Basic — commands that are found on other machines but have an unusual format or syntax. For example, Auto 10 will, as on other machines, generate program line numbers but instead of Auto on its own having the same effect (as 10 is usually the default value), it turns off the line numbers.

Plus/4 programmers have access to a total of 12 colours (eight luminances of 15 colours plus black), which can all be pre-

## *Technical specifications*

| | |
|---|---|
| CPU: | 7501 running at between 0.89 and 1.76MHz |
| ROM: | 32k incorporating Basic 3.5,<br>20k 3-Plus-1 software |
| RAM: | 64k, 60k available to users. 10k used in high resolution mode. |
| Display: | Text (40 x 24), high-res (320 x 200) and multicolour (160 x 200) |
| Keyboard: | 67 typewriter-style keys including four function keys and four cursor control keys |
| Colours: | 121 colours (15 colours; eight luminances + black) |
| Sound: | One channel, two tones |
| Dimensions: | 66.7mm x 422.3mm x 238.1mm (H x W x D) |

sent together on the high resolution screen.

The high resolution screen has a resolution of 320 x 200 pixels, each of which can be set. The colour of the pixels is restricted to one foreground and one background colour in each 8 x 8 pixels square. More colours can be included in multicolour mode, which falls half way between high-res and the 24-line 40-character text mode. This has a lower resolution of 160 x 200, but each character can have more than one colour.

There are two more graphic modes: the high-res and multicolour modes, with the bottom five lines reserved as a text window.

Seasoned Commodore programmers will be surprised with the ease in which high resolution graphics can be created on the screen. Lines can be drawn with the DRAW command as well as BOXes and CIRCLEs; boxes can be filled in and even rotated through any angle. A powerful PAINT command ensures that irregular shapes can be quickly coloured: in other words, the days of having to POKE anything you want on the screen are gone (such a facility still exists but I can't see anyone using it). Unfortunately the sprites, which were the stalwarts of '64 games, have also disappeared along with two sound channels. In their place the Plus/4 has advanced graphics commands, and also the ability to format printed output with the PRINT USING command which can, for example, ensure that a $ sign is in the right place.

As a bonus to machine code programmers there's a built-in machine code monitor called Tedmon. Through a series of ten commands this allows the machine code buff to examine and manipulate blocks of memory, and even assemble or disassemble single lines of 6502 machine code.

It's not really surprising that Basic 3.5 contains a full list of disk commands, since its built-in software is so heavily dependent on a drive being present. HEADER is such a command, and is used to format a disk before it's used by the Plus/4. There are two forms to this command: one which formats the entire disk before writing a directory, another which overwrites an existing directory. The full header takes about one-and-a-half minutes to format a disk, whereas the quick HEADER can overwrite a directory in just three seconds. Obviously the full header must be used on a new disk, but if you're recycling a disk, then the quick header will suffice, since with the old directory overwritten the disk is effectively wiped.

cal about the Plus/4, particularly those who rely heavily on sprites. This initial resistance will soon pass if the machine sells well, but I doubt whether the typical Plus/4 user will rush out and buy the latest camel-bashing game.

## Documentation

The documentation I was supplied with was undoubtedly preproduction standard. It consisted of piles of photocopied sheets which split broadly into three parts: a Basic tutorial; a Plus/4 encyclopaedia; and a separate guide to the 3-Plus-1 software.

All three were easy to read, and contained many examples and exercises all designed to help you learn more easily. The Basic tutorial clearly explained the simpler concepts of programming through commands and sample programs, leading the user on to the encyclopaedia which presents an alphabetic list of the Basic commands, and contains syntax, an explanation of its purpose and some examples.

Together these forms provide a relatively good guide to Basic but don't expect to learn too many advanced techniques, as all such topics are replaced with a signpost to the forthcoming *Plus/4 Programmers' Reference Guide* (this will cost you extra). Some of the information omitted from the manual concerns the creation of random access and relative disk files: these are better and faster than the sequential files dealt with all too briefly in the manual.

I can understand the need for a

*This initial resistance will soon pass if the machine sells well, but I doubt whether the typical Plus/4 user will rush out and buy the latest camel-bashing game.*

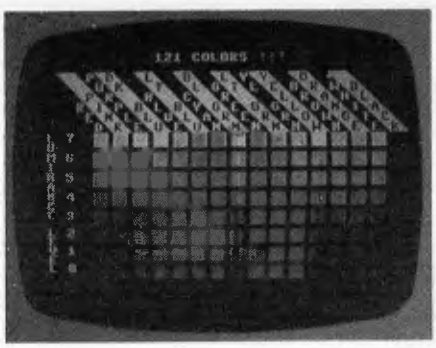
## Applications software

With the inclusion of built-in applications software the need for other packages is not so great. Indeed it will be difficult for companies to sell Plus/4 owners business programs as they will already own three good packages.

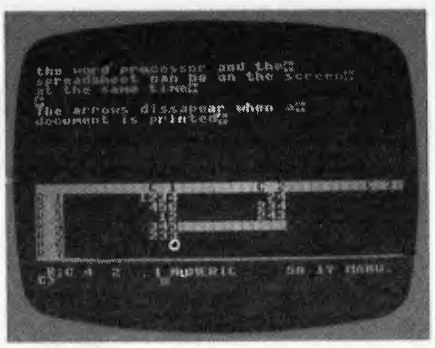
Software might be supplied on three different mediums — cartridge, cassette and disk, but I imagine that disk will be the most-used medium as Plus/4 owners will also have a disk drive. Cassettes are still slow and cartridges are still expensive.

Some cassette games will probably filter up from the Plus/4's younger brother, the C16 (a scaled-down version of the Plus/4 without the built-in software and missing 48k of RAM). This lack of memory may well be a problem for software houses, especially as in high-res mode, the C16 is left with a feeble 2k.

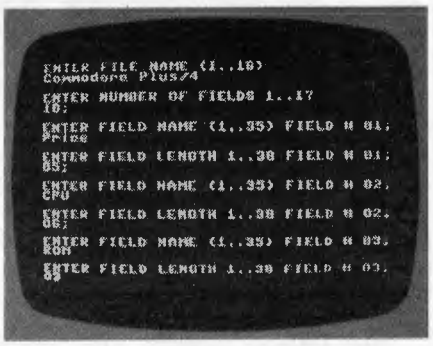
Most of the existing software houses, which produce games for the Commodore machines, were initially scepti-




*The Plus/4 features 121 colours*

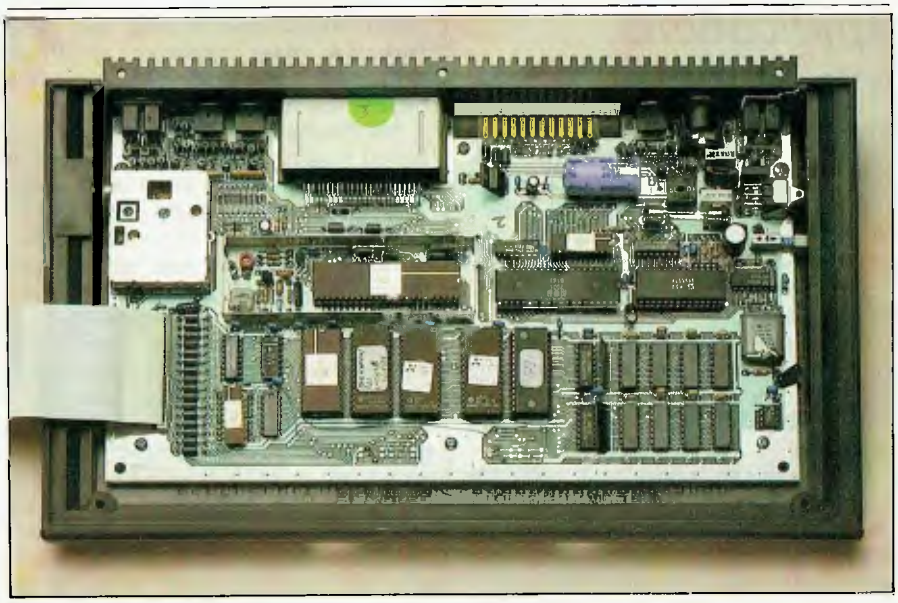


*Subscript and 4calc displayed together*




*4base files are easy to create*

*The keyboard features a full qwerty layout and an MSX-style cursor cluster*



*The 3-plus-1 software is housed in two ROM chips alongside the Basic ROM chips*

separate book to deal with using ROM calls and addressing the user port, but syntax for the Basic commands should be in the Basic programming guide. After all, using random access files is far easier than using a machine code monitor.

The final part of the manual is thankfully more comprehensive, and tells you all you need to know about the 3-Plus-1 software.

Each package is dealt with in turn, and full operating instructions are given along with examples and exercises. Each section closes with a command summary and relevant details on integrating the software with other packages.

The 3-Plus-1 manual also makes several references to a demonstration disk, which seems like an excellent idea and would round off an attractive package.

## Prices

The Plus/4 is competitively priced at around $599. However, you should regard the purchase of a disk drive as compulsory at an additional $399.

The Plus/4 is going to be about $100 more expensive than the Commodore 64. Commodore feels that the Plus/4's built-in software and lack of sprites and sound channels will keep the two machines apart; the idea being that games players will buy the '64 and the more serious users will choose the Plus/4.

More direct competition exists between the C16 and the VIC 20, with the C16 being introduced in a starter pack for $199. In true Commodore style, it intends to continue selling the VIC 20 'if the demand exists.'

## Conclusion

So what is the Plus/4's potential place in the market? It has a vastly improved Basic, but also some annoying features. The worst of these are the non-standard joystick and cassette interface, which aren't even compatible with the previous Commodore machines.

It's main attractions are obviously the 3-Plus-1 packages and at its expected retail price of $599, the Plus/4 will have an interesting impact on the marketplace.

## Benchmarks

| | |
|---|---|
| BM1 | 2.0 |
| BM2 | 9.8 |
| BM3 | 18.2 |
| BM4 | 18.7 |
| BM5 | 18.8 |
| BM6 | 34.8 |
| BM7 | 55.3 |
| BM8 | 101.1 |

*All timings in seconds. For a full listing of the Benchmark programs see 'Direct Access'.*

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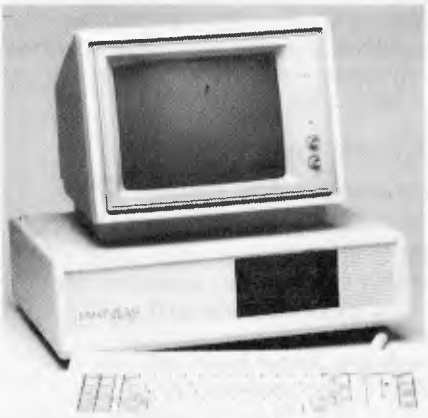

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The PANDA PC has no motherboard, instead it has 12 expansion slots. The basic system has 4 PCBs and service is easily carried out on site. You will **continue to have the use** of your computer unlike other PCs that have to be taken away for service. In fact you can do it yourself!

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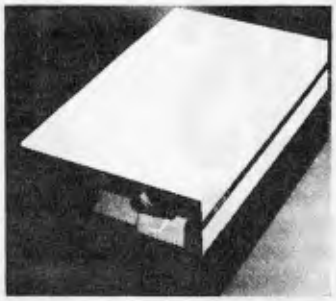

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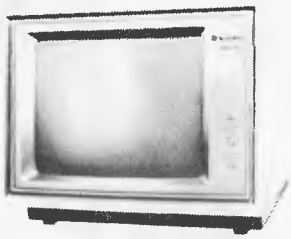

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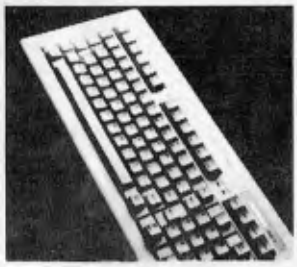

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# How to write great software

Part one of a series

BY MIKE BOLAN

You don't have to be a computer programmer to design great software but you do have to be a problem solver.

This is in part why software is the most exciting area in which to develop ideas and solutions. There are no real limits, the software designer can create a complete dream solution to almost any problem from factory operation to child development and education, from mapping to investments.

Clever programmers can create virtually any illusion, worlds and planets populated with strange creatures that defy logic, pictures of scenes that we can never know, so real that we feel that we must be there.

Many of the effects in films like *Star Wars* were created using computer software. Of course, the computer itself is just a static vehicle, it's the software that's the 'stuff of dreams'.

The successful author invites the user into a dream world, perhaps for a game of adventure or space invaders, perhaps to solve a complex series of business problems. Utility software lets the user create that dream world themselves.

Bill Budge's *Pinball Construction Set* is a good example. Excellent software makes the business of using a computer an enjoyable and rewarding experience, so enjoyable that it's not like using a computer at all.

Developing software can be a rewarding business but most software authors and their financial backers, often with great ideas and programs distinguished in their elegance, founder when they market their programs.

Why is this? These articles present straightforward ways to help the developer/financial backer or just plain hacker, understand the dynamics of the software business and produce a successful product. Remember, successful software doesn't just solve some technical problem, it also has to sell well, have low maintainance costs and a long market life.

There's been an awful lot of nonsense written about user-friendliness so let's get this straight now.

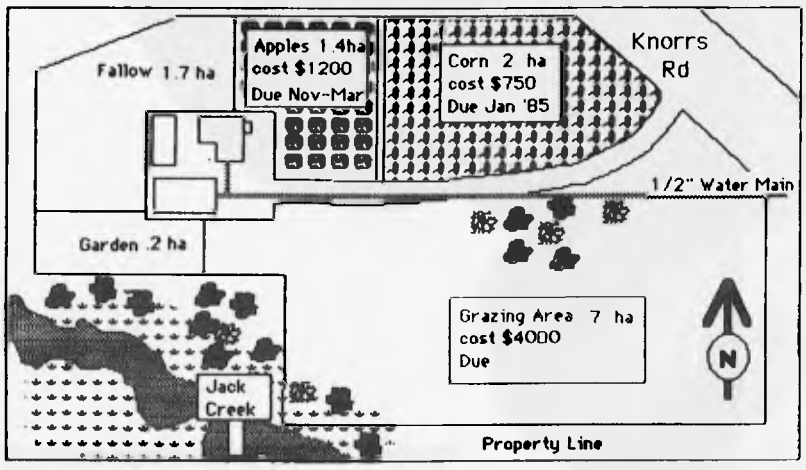


**Diagram 1** One of the final reports from our farm management program

By user-friendly I mean a product designed with the user's specific needs in mind. User-friendliness is a global concept applying to the whole product, (including manuals etc) and doesn't just refer to some single idea like menu selection. In producing a piece of software for the market we are really trying to sell a solution to a problem to some group of people.

To be successful we must define the problem and our solution(s) to it most carefully. What better way to research this than to ask people experiencing these problems what they need? If we meet their needs and try not to introduce new problems for them then we are producing something likely to be user-friendly.

People do not accept ideas, technologies or software just because they are new. In fact most people take a long time to accept new ideas and technologies and if those ideas fail to meet certain tests, they are not accepted at all. Studies of reasons for acceptance show that there are four major factors required for a new idea to stand any chance of being accepted and all four must be met for the idea to gain popularity. The idea must:

**1. Supply a relative advantage.**

The innovation must supply a real advantage over the existing way of doing things. Personal cheque book balancing programs that offer no real advantage over manual methods will never sell well.

**2. Be compatible with the user's world.**

Basic human nature resists change and no matter how innovative our designs they must 'fit' the user's environment. People do not want to spend time learning whole new ways of doing things so software operation should be as familiar to the user as possible, preferably so that they can benefit from existing knowledge when using it.

**3. Be easy to try out.**

For software this means that buyers need to be able to test the system for themselves, usually via a demonstration

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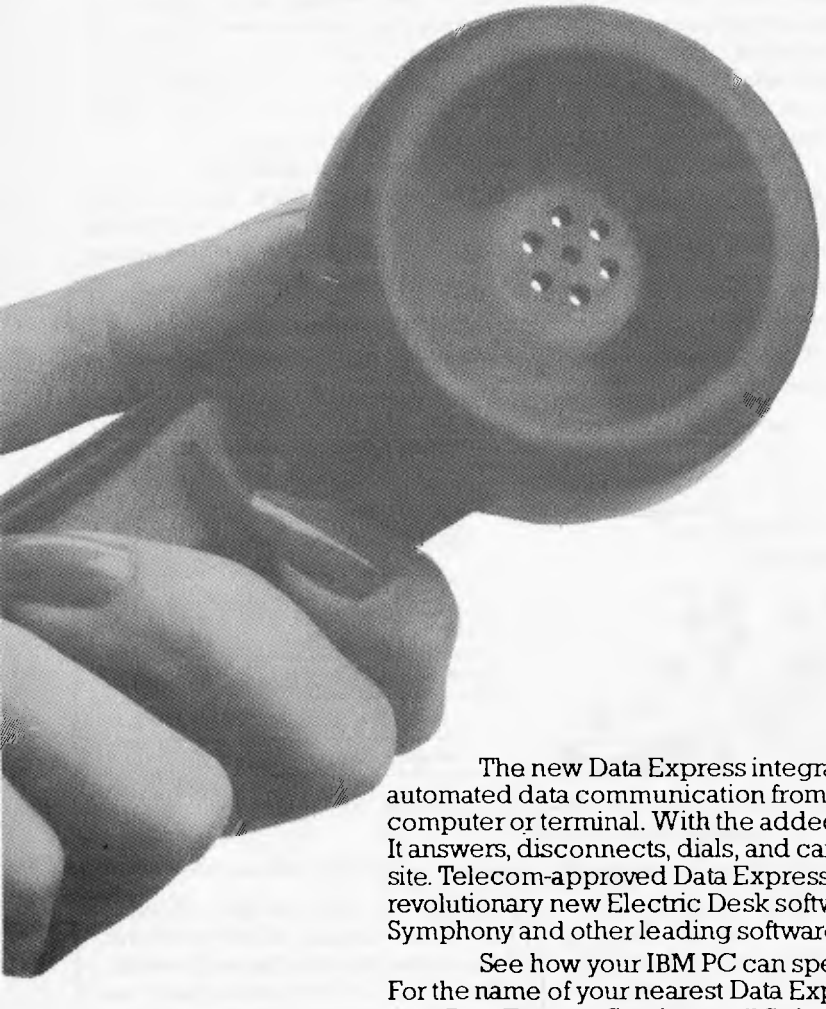

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disk — more on this later.

**4. Be highly visible.**

The idea must be seen in as many places as possible. Again with software this means using strategies such as giving copies to the Press, key dealers, television commentators and so on. These strategies will pay off with greater sales through increased public awareness.

Establish the final result first: starting at the end may sound odd to some but this is what the user is waiting for . . . a result.

It is for this result that he bought the program and learned to use it — perhaps it was even the reason for buying a computer in the first place. After all that time and energy the result needs to be very worthwhile.

That's why you should start your design here. Remember, with computers nearly everything is possible now and now is not the time to compromise ideas and utility for programming convenience.

So what is the result? Is it a report, a map, big cash savings . . . what? What will the report look like? What will the map look like? Where are the savings going to be effected and how? These are questions of real concern to the user and therefore to the software designer.

Let's follow a small part of an imaginary software project to help farmers to manage their properties. We'll suppose that the software will help farmers visualise their returns from different crops to help them improve future performance.

We will probably decide to use graphics a lot as farmers won't want to try to figure out where to plant their crops from tables or numbers, they'll want a map. The same mapping section of the program could also be used for getting government permission for outbuildings and for planning land use. Naturally this added use will help us to sell our software.

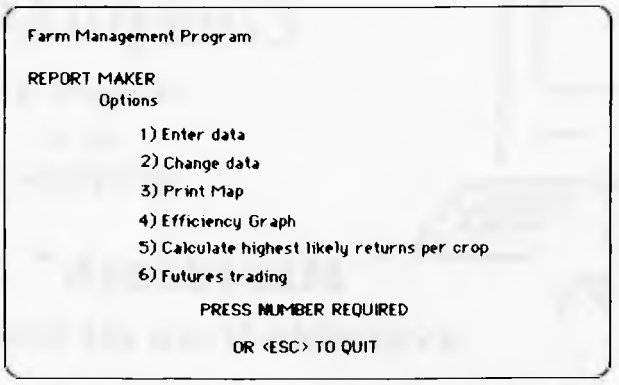



**Diagram 2** A working screen used in the program design

**FIGURE 1**

If your software looks good on screen and better on paper then the user will be proud to show the result to others. Quality maps are much more likely to be circulated than maps made up of text symbols for instance so try wherever possible to make your program output look great!

Formalise the results: write down the ideas and draw the graphics. Start building up a file of output, what you expect the screens to look like and how the reports will appear. Keep working on this and the type and quality of information the computer produces until you feel that it's of greatest use (or highly saleable!).

Start working back towards the beginning of the program — figure how, from the farmer's standpoint, the map was produced. How would your farmer want to draw this map? How about the map symbols? Should they be part of the program or should a symbol editor be supplied which allows the farmer to design his own symbols? How about both?

Order the information so that you can see how you get from one screen to another and what has to be done to generate each report.

If your program isn't going to use graphics then work on the appearances of the various screens and what the options are going to look like.

**DIAGRAM 2**

Naturally you'll remember that farmers often work with their hands so your program shouldn't expect their fingers to dance nimbly across the keyboard. Choose reasonable keys and filter out keys not used so mistakes are easily avoided.

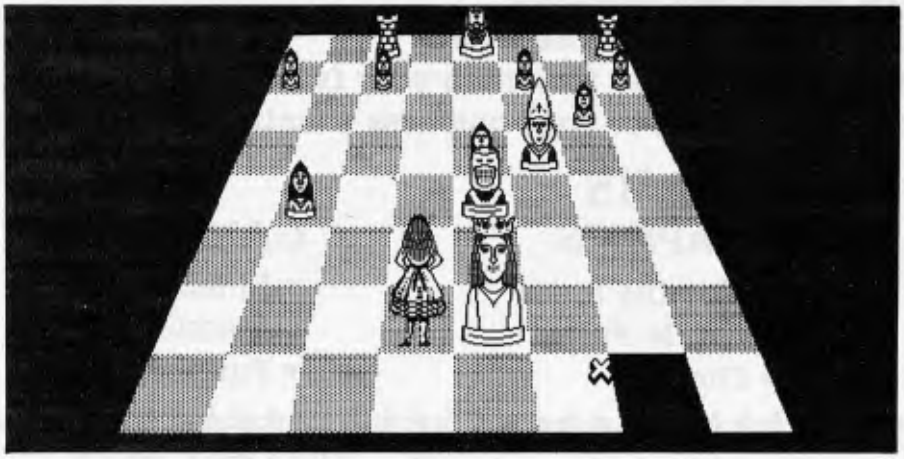
At this stage you will have a loose leaf book filled with neat reports, figures, tables and computer screens. There will also be a section describing the needs of the market your software is to address.

Now show it to some farmers. Find out if they understand it and whether they have any improvements to suggest. Listen to these people. If they don't understand something change the program design, don't argue with them. They are giving you free advice on how to make your software sell.

Naturally these same comments apply to printed reports such as an accounts ledger. It is the software designer's responsibility to make sure the reports are reasonably formatted for the target market, in this case the farmer.

Your book of screens is also useful because it means your documentation is being partly prepared and organised before you do any coding at all. Not only that but you can test the market with this material and decide if you really want to invest in this package after all.

You can use the same book to help sell your software in advance, debug your ideas and drum up finance. All this and it helps you develop great software too.



*A position from Alice, a dimensional "chessalike" game, showing a different way to represent a chess board to make the software more interesting.*

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# Like manna from heaven

## *New Netcomm Apple modem talks to IBM*

BY BRUCE OTTO
Senior Writer

Just a few kilometres up the road from Apple's Australian headquarters in Ryde is the office of a small Australian high-technology developer from which in May 1983 Apple Computer Inc, California, ordered data communications equipment for the Apple II and III world market.

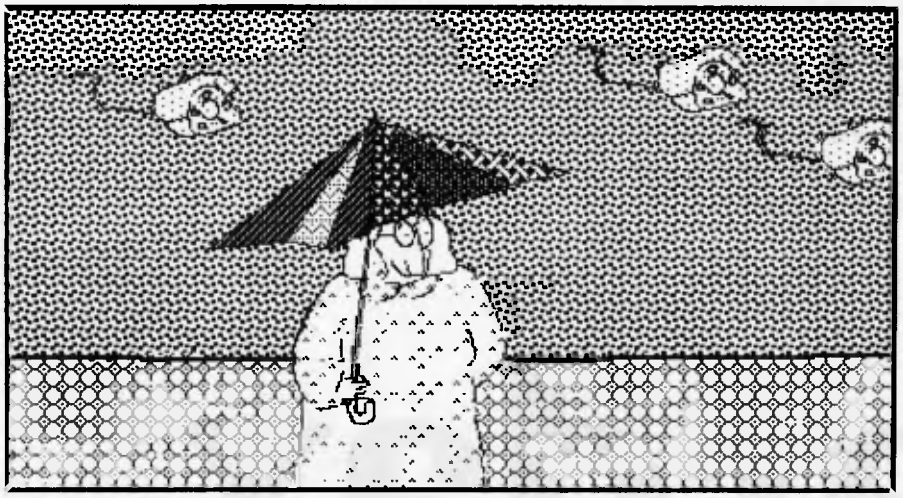

*Illustration by Victoria Roberts on MacIntosh computer*

The Australian company is NetComm, known in the US as DataNetComm Inc. In Australia, in the absence of cost-efficient, sophisticated modems for the local Apple II and III user base, the company has also developed and now markets a remarkable internal unit which supports the host of other data communications packages developed by the company in recent years.

Later this year, Apple Computer Australia will market a locally-manufactured 'Apple Modem' supplied and supported by NetComm.

To cover itself from both angles, the company will also market its sophisticated In/Modem for the IBM PC later this year.

However, in mixed-environment 'telecommuting' — the rapidly-evolving situation where a primarily business user accesses and works on a major office system from home — the Apple can now offer the major dual-use benefit of thousands of home and educational use software programs plus a complete business communications ability.

'The Apple II is a first-class machine for small business and particularly for education,' said NetComm managing director Chris Howells.

'Even in the larger corporate Apple II family machines today is largely illusory. The fact is that these computers can now deliver very cost-efficient and effective mainframe and database communications.

'The actual communications problem now apparent in the Australian marketplace is of quite another sort. Many EDP departments have absolutely no idea of the current state of the art of Apple's datacom with IBM, DEC or WANG.

'Middle management is subsequently misinformed about personal computer capabilities.

'In Australia, the result can be that a company will spend a lot more than is necessary on new or replacement personal computer hardware or peripherals. In the US the business market was less conservative and much quicker to embrace the Apple.'

For anyone who really wants to play modems, this NetComm product is definitely manna.

At $495.00 retail (plus sales tax), NetComm claims that the multi-functional Apple In/Modem far outperforms the handful of data modems now available in its price category in Australia and, on price alone, compares well with such basic products as Dick Smith's Dataphone and the Cicada 300T.

The main features that differentiate the In/Modem are its Auto Dial/Auto Answer intelligence plus its extraordinary multi-functionality.

Supplied as an easily-fitted card attached to a slimline telephone and small box of tricks with one switch (the isolation circuitry required by Telecom and called the DAA), the NetComm Apple In/Modem provides the capability to expand enormously remote communications as required, potentially encompassing all mainframe protocols as well as the currently popular Data Bases/Electronic Mail.

The only variable factors in extending communications to IBM mainframes are an additional card and protocol software packages which NetComm has developed and which are now available in Australia directly from the company.

The prices and performances of these are outlined later.

The handset can be used as a normal telephone or for manual dial applications.

A small visual display on the DAA otherwise advises the user of the exact status of the connection to the computer, which is useful when the full range of In/Modem capabilities is being used.

For although manual dialing might be the norm in file transfers between two remote personal computer users, the NetComm device incorporates a microprocessor and can, for instance, automatically dial, answer and disconnect as programmed with the display advising of the function in progress.

At base level, utilising such software as Apple Access II or NetComm's Asynch2 (which runs on the Apple II+ where Access II will not and also allows connection to such remote hosts as DEC, Wang and Prime), the NetComm In/Modem provides for data communications between two microcomputers or from the Apple to such simple database services as The Source, Australian Beginning, CSIRONET or OTC Midas among others.

Complying with the locally applicable CCITT V21 and V23 standards, the In/Modem can transmit and receive at the hobbyist 300 baud full duplex speed, plus 1200 baud half duplex and 1200/75 baud (PRESTEL) full duplex.

However, the device can also support full US Bell Standard transmissions (Bell 103/Bell 202) which allows you to make

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— *"superbly easy to use, quick, convenient." PCAL Report Dec 83*
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direct connections to US or European host computers.

At this level of operation, the In/Modem is already outperforming the basic modems previously mentioned.

If you want or have the need for a 'fully loaded' Apple II or III that will talk to just about any remote or local mainframe, then again NetComm can help.

A series of hardware/software packages has been developed by the company over a three-year period and enhancements are constantly being added.

In most cases, your initial purchase would be one of the NetComm intelligent 'Apple Protocol Communications Cards' (ACPCs), plus the relevant protocol software.

The ACPC cards and software have been validated in communications use with IBM, PRIME, AMDAHL, DEC, WANG, FACOM, NATSEMI, UNIVAC, Burroughs and ICL mainframes as well as minis and other micros using these protocols.

An initial purchase ($513) sets you up for any subsequent expansion of your Apple's communications abilities because the ACPC has the necessary capability for multiple protocols by just adding the needed extra protocol software.

Even if the communications needs for your Apple encompass the most sophisticated connections with remote IBM SNA hosts as a fully compatible IBM terminal, NetComm now has a version of the ACPC which the company describes as capable of very faithful and accurate emulation connecting to any SNA/SDLC host.

The key factor to remember in assessing the Apple's communications ability (especially to IBM hosts) is that only one package is purchased.

Additional hardware is not required for further expansion of communications. NetComm supplies disk-based software upgrades for this purpose at considerably less cost than the complete hardware/software package. One card enables all communications jobs to be done.

Additionally, the NetComm CPCs can readily be linked with directly to in-house host computers.

A modem is only required for remote connections, and the NetComm Apple In/Modem supports any and all of the protocol software packages.

All packages are applicable to the Apple II family machines (some work on the IIc) and most are also available for the Apple III.

*Netcomm Apple Modem cards and software let Apple computers talk to IBM, Prime, Amdahl, DEC, Wang, Facom, Natsemi, Univac, Burroughs, and ICL mainframes*

## Synchronous terminals

**SNA IIe and III IBM 3270SNA Emulation.**

This allows the Apple automatically to dial any remote IBM SNA host and connect to the network as a fully effective and compatible IBM terminal.

Four simultaneous VDU sessions with the host can be processed on one Apple with unique IBM keyboard and screen facilities fully emulated. Printers are fully supported.

The NetComm SNA software very faithfully and accurately emulates the functions of a single 3270 controller with multiple, simultaneously active, attached 3278 VDUs and attached 3287 printers. **$250.00.**

**BiSync II/IBM 2780/3780.**

Nearly every mainframe can support file transfers of any Apple II file type with this protocol which is the de facto industry standard for reliability.

Inbuilt error detection and correction automatically reduces the possibility of line errors to almost nil.

No old punch cards or line printers are required and the equipment can also be used for vastly improving reliability for file transfers between Apples. **$125.00**

**Apple II/IBM 3270 Bi Synch.**

This allows your Apple to run as a mainframe enquiry terminal, emulating an IBM 3271 or 3274 Controller with an IBM 3277 or 3278 VDU.

Extensively validated on IBM 370/135, 145, 158, IBM 4341, 3031 (and FACOM M140) under operating systems VM370 and OS/MVS. **$100.00**

## Asynchronous Terminals

**ASync2 Asynchronous Terminal Communications.**

A hardware/software package for the Apple II+, or a software only package for IIe (with Super Serial Card) or IIc personal computers.

ASync2 is operationally similar to Apple's Access II software — which is not applicable to Australia's substantial Apple II+ installed user base.

The program allows access to remote asynchronous computer hosts (DEC, WANG, PRIME), public data bases and other personal computers.

Auto Dial and Answer is supported, as is the new Apple II operating system, ProDOS. File Transfer, Auto Logon, Online Printer, Screen image capture are just some of the outstanding goodies. Properly emulates the mainframe terminal needed. **$145.00**

## Videotex

**DataNetComm Videotex (Prestel).**

Converts your Apple II family machine to a full graphics mode, monochrome videotex/viewdata/Prestel type terminal for use with Australian or overseas public or closed group services as applicable.

Supports Auto Dial and connect via ordinary Telecom lines. **$145.00**

For anyone with any further data communications problems with an Apple II or III machine, we recommend a call to NetComm, (02) 498 5577. Ask for Tim Kitto.

# d foreign language. 2 or 3

```
.list files
   DATABASE  FILES  NBRRCDS  LAST UPDATE
    HOMES     001     1005     11/01/83
.use homes
.list homes selling for<50000
*** SYNTAX ERROR *** RE-ENTER
.list structure
   FLD    NAME     TYPE   WIDTH   DEC
   001  ADDRESS     C       025
   002 SELLPRICE    N       009     002
   003   AGENT      C       025
.list for sellprice<50000
```

# R language.

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Which means no more difficult programming routines just to get a piece of information. Or lines and lines of code for a routine operation. All R:base asks for is some good conversation.

But there's a lot more to R:base than just friendliness.

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# For the record

*A graphics software and hardware list*

## READS IMAGES INTO APPLE

**TOBOR PTY LTD's** (03-836 7569) **Digi-Scan** combines the capability to take an image from hard copy such as drawings or photos and transfer it to the high-resolution screen of a computer along with the traditional functions of an 80-column dot matrix printer.

A line-oriented digitiser and printer based on a remanufactured 80-column printer, the unit has a quick-removal print and scan head assembly along with a 32-bit analog-to-digital converter.

It is designed to be compatible with the Apple II, IIe and similar computers with at least 48k of memory and one disk drive.

The image to be transferred to the Apple is placed in the Digi-Scan, scan width and grey scale are selected from the menu-operated software and the image appears on the screen line-by-line.

When the scan is completed the image may be saved or edited from within the 'Graffiti' editing program supplied.

The resulting file is a 34-sector Apple-DOS picture file suitable for use in programs or graphics-oriented word processors.

Price is $843 plus 20% sales tax.

## MAKE 35 MM SLIDES OFF YOUR SCREEN

**POLAROID AUSTRALIA PTY LTD** (02)-887 2333) has introduced its **Palette** system to provide users of PCs with graphics peripherals with a virtually instantaneous hard copy of screen display on either bromide or transparency.

Polaroid says the system allows even monochrome display computers with a graphics capability to produce hard copies in colour. The computer and software match exposure parameters to the film being used which can be Polaroid instant print or transparency or conventional 35mm film.

Up to 16 colours can be generated within a single image drawing on 72 colour keys.

Image resolution is 920 x 700 lines.

At present **Palette** will create images from IBM, Apple and Digital PCs. Print size limited to 3¼in x 4¼in and transparencies to 35mm. Price is $2,200 plus 22.8% sales tax and copies are in stock from

## THREE PEN PLOTTER

**ANDERSON DIGITAL EQUIPMENT PTY LTD** (03-544 3444) has on offer a three-pen plotter, **PIXY**, with graphics down to 0.1mm and a speed of 200mm per second.

The three pens plot automatically, according to the distributors.

The system is compatible with IBM PC under Lotus 1-2-3 and there is a variety of software graphics packages available.

Price is $995 plus 20% tax.

## DESKTOP GRAPHICS NOW WITH ZOOM

**TCG** (02-699 8300) has in hand an upgraded version of its **Seiko 13 in 1104 desktop graphics terminal.**

The GR1104 now sports 1024 x 780 line resolution and capabilities including line, circle, arc, fan, rectangle, grid, mark, text and polygon with six line textures.

TCG says the new unit has the same high resolution as its predecessor and adds on zooming and segment selection as well.

Up to eight colours can be called up simultaneously from the 512-colour palette and the company claims full editing of elements along with rotation, scaling and translation of local elements is made possible by the 256-byte memory.

Price is $8,660 plus 20% tax and earliest delivery is December.

## GETTING PICTURES INTO YOUR PC

**MINICOMP** (02-957 6800) distributes Summagraphics products throughout Australia and New Zealand and claims 70% of the world digitiser market. **Bit Pad One** was the company's first major breakthrough in which it claimed a solid proportion of the market for small application digitising.

To a degree superseded by the Bit Pad Two, the earlier model still represents respectable capability with Point, Stream and Switch Stream modes and RS-232, IEEE and eight-bit parallel output interfaces.

Resolution is to 0.1mm and accuracy ± 0.08%.

Price is $1,495 plus 20% sales tax.

## NEW BIT PAD

**Bit Pad Two** is format and plug compatible with Bit Pad One and the rest of the Summagraphic range of tablets along with updated electromagnetic technology producing notable improvements including the elimination of periodic biasing.

Options exist for a 3 or 4-button cursor or a 1-button stylus and all are interchangeable.

The unit is available in two models — the 1103 which is compatible with RS-232 versions of Bit Pad One and has selectable resolution from 5 to 20 points per millimetre.

The model 1105 is compatible with Summagraphics' RS-232 UIO tablets.

Price is $1035 plus 20% sales tax.

## HI TECH MOUSE

**Summamouse** is an upmarket rodent said to combine latest technology in a package that uses solid-state optics. The mouse works via three big keys, rated at 10 million cycles and in the interests of reliability DIP switches have been eliminated and no internal adjustments are required.

A microprocessor calculates optimum operating conditions to accommodate component or optical system changes.

At 168g weight and 99x66x25mm the Summamouse is a compact device which gives 100 lines per 0.25mm resolution and a report rate up to 140 per second.

Interface is internal bidirectional RS-232C or TTL serial.

Price is $595 plus 20% sales tax including pad.

## MM DIGITISER

**The MM Series Digitizers,** models 961 and 1201, can perform steering, menu

picking and graphics functions and incorporate a built-in mouse.

The 961 measures in at 152 x 228mm and the 1201 at 297 x 297mm.

The smaller tablets fits easily alongside a CRT for cursor movement and menu picking.

Noticeable is the 1000 points of resolution per square inch and the collection of all electronics on a single printed circuit.

Options exist for a one-button stylus for freehand drawing and menu picking, a four-button cursor for accurate tracing or a three-button cursor for mouse-like steering.

Each tablet uses the same format and can be interchanged depending on document size.

Price for the 961 is $643 and for the 1201 $995, both plus 20% sales tax. Both items are in stock.

## UPGRADE YOUR DIGITISER

**The Microgrid** was developed to satisfy a growing market for a compact high-performance digitiser.

It has thin and lightweight tablets with adjustment features traditionally found only on larger units.

Microgrid systems are available in sizes ranging from 305 x 305mm to 1067 x 1523mm.

Options include a one-button stylus of four or 16-button cursors. All systems include dual RS-232 ports, an 8-bit parallel port and two transducer ports. All units are plug and format compatible with Summagraphics ID, Summagrid, Supergrid and the UIOF MM series.

The capability to upgrade exists through a controller board expansion bus including IEEE-488.

Resolution is up to 40 lines per mm, selectable while accuracy is 0.254mm with 0.127mm as an option.

Price ranges from around $2,000 to $8,000 plus 20% sales tax.

## SEVEN COLOUR DOT MATRIX WORKS WITH SPERRY

**EPSON AUSTRALIA PTY LTD** (03-543 6455) sells the **JX-80 colour dot matrix printer** which takes the well-known manufacturer one step beyond its FX series.

Print rate is 160 characters per second.

Price is $1110 plus 20% sales tax and stocks are available.

## FAX DIRECT FROM YOUR PC

**RANK XEROX (AUSTRALIA) Pty Ltd** (02-449 0449) offers a desktop facsimile terminal, the **Telecopier 295** which accepts graphic and other information direct from a computer for transmission via Telecom lines.

The company offers an RS-232C interface as an option.

The unit is fully compatible with high-speed Group 3 facsimile devices already in widespread use world wide and conforms to CCITT standards.

The 295 stores as many as 25 separate messages of several pages each and transmits each page in less than 30 seconds. A built-in security code check is another feature.

Price: $5,950. No sales tax.

## COMPUTER GRAPHICS WORKSTATIONS

**KINETIC SYSTEMS Pty Ltd** (03-347 7326) distributes three **Megatek** computer graphic workstations.

The **Model 1600** has a 19in tilt and swivel monitor and detachable keyboard and its functions include translation, scale, rotation, clipping, complex polygon fill, pick and peripheral viewing.

The unit is compatible with VT100/52 and Tektronix 4041.

Price: $16,000 plus 20% sales tax.

The **Model 3355** features multiple viewports, continuous zoom/pan and two-dimensional dynamic transformations. The processor has a throughput of 400,000 absolute vectors per second. The unit provides VT100 or Tektronix 4014 emulation.

Price: $28,000 plus 20% sales tax.

The **Model 7200** provides a broad range of refresh systems with both high resolution stroke refresh and colour raster displays supported by a common dual bus architecture supporting up to four displays.

The 7200 features local graphics functions for complex two or three dimensional graphics transformations — rotate, continuous scale and translate and clip.

Price: $40,000 plus sales tax.

All items have delivery of 6 weeks ex factory in the USA.

## QUICK SKETCHES

**IMAGINEERING** (02-212 1411) has released products that will interest Apple users in the form of **Gibson Light Pen** hardware and software produced by Koala Technologies.

The pen functions in the traditional mode, varying display items on screen at the touch of the pen tip and is now available for the Apple II, IIe and II+ PCs.

The distributor says the unit will soon be compatible with the IBM PC, IBM PC jr and the Commodore.

Price: $299 including sales tax.

## DEC INK JET IN EIGHT COLOURS

**DIGITAL EQUIPMENT CORPORATION** (02-412 5252) has released its high-resolution **LCP10 ink jet colour printer** which offers a substantial upgrading in resolution over previous models and better capability for colour mixing.

The printer plugs into the printer port of the Digital VT241 terminal. As well, overhead slides and hard copy can be reproduced in colour.

Sheet or roll paper may be used while the high resolution is measured at 4.8 dots per mm (120 dots per inch) in both horizontal and vertical directions.

Interestingly a separate black ink reservoir provides a genuine black along with seven colours.

The LCP10 also functions as a bidirectional dot matrix printer with a speed of 20 characters per second.

Price: $3,700 plus 20% sales tax.

## YOUR IMAGES ON A GIANT SCREEN

**AWA REDIFFUSION Pty Ltd (02-406 5677)** distributes two large-screen video and computer projection monitors.

The **Electrohome EDP-57 monochrome projection monitor** provides high resolution video displays of alphanumeric and graphic information from computer generated signals.

AWA says the system is ideal for demonstrating new computer hardware and software or for replacing several conventional monitors in a classroom.

The monitor measures 27in x 14in x 8in and weighs 50lb. The unit can project on to a variety of screens including flat and rear projection screens and AWA offer a 6ft 1in high gain screen suitable for high ambient light areas.

The circuitry of the EDP-57 allows interfacing with almost all CRT computer terminals in use. For some terminals not equipped with composite video outputs Electrohome offer an

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### TUNE TRIVIA

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Listen to the hits of Michael Jackson, Willie Nelson, Denise Williams, The Eurythmics, while you control computer generated instruments and special effects. Every musical arrangement comes complete with bass, rhythm, melody and harmony. Computer Song Albums are also compatible with the music video kit soon to be released.

---

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**3001 Sound Odyssey –**
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optional interface module.

The EDP-57 is compatible with NTSC, PAL, CCIR and SECAM systems and also accepts signals from most VTR, Videodisc and TV camera outputs.

A range of peripheral equipment including pedestal base, desk stand, ceiling mount, elevating legs for the screen and colour interface are available from AWA.

Price (basic): $5,966 plus 20% sales tax.

The **Electrohome ECP 1000** has all the features of the EDP-57 along with colour capability.

This greatly expands the system's capability to take in a very wide range of computer output devices ranging from PCs to sophisticated graphic devices.

Included is an automatic frequency locking device that synchronizes the projector to the frequency of the computer terminal.

The unit weighs 75lb and requires only one cable connection.

The image can be varied by the operator from 5 to 7 feet diagonal.

Price (basic unit): $14,000 plus 20%

## PLOTTER FOR AUTOCAD

**ELECTRICAL EQUIPMENT LIMITED** (02 267 1122) has released an ROM which changes the capability of its **Graphtec MP1000 Graphic Plotter.**

The ROM changes the software protocol of the system so that it runs subject to the Computer Aided Design Software system — AUTOCAD.

The ROM can be supplied as an option to new customers and retrofitted to existing users' equipment.

The range now stands at:

**Eight-bit parallel plotter** without built-in curves and circles

Price: $1054 plus 20% sales tax

**Revised MP1000 with RS-232 interface**

Price: $1110 plus 20% sales tax

**GPIV Interface model,** again with curves and circles

Price: $1173 plus 20% sales tax

**Eight bit Parallel deluxe** — the low-cost model with curves and circles.

Price: $1342 plus 20% sales tax.

## MINI MONITORS

**ANDERSON DIGITAL EQUIPMENT** (03 544 3444) have a range of three colour monitors covering a wide range of PCs.

Variants of Quadram's **Quadchrome RGB 12-in diagonal colour monitor** have an upper limit of 16 colours.

The screen displays up to 690 horizontal dots by 480 vertical lines and is suitable for word processing and accounting functions.

The system can print out through the **Quadjet lightweight low-cost inkjet printer.**

Prices: Basic Centronics Parallel Quadchrome: $1369 plus 20% sales tax

IBM-compatible Quadchrome: $1397 plus 20% sales tax

Apple-compatible Quadchrome: $1459 plus 20% sales tax

Quadjet: $1369 plus 20% tax

## SAGE NOW FOR CAD/CAM

**RAKON COMPUTERS** (02 43 1351) has upgraded its SAGE computers to full CAD/CAM capability.

The IVS SIX/80 package includes colour or mono graphics terminal, digital design tablet, plotter capability along with CAD/CAM software and SAGE hardware.

The UK-based company says the product is intended to appeal to all architecture and engineering design houses.

Under the new configuration the SAGE comes up to one megabyte of main memory and a 10MB hard disk.

The software was developed specifically for the 32 bit, 68000-based SAGE. All line types in general drawing can be used including circles, arcs, tangents, elipses, radii fillets and welds.

Most important is that the SAGE range covers a wide spectrum and cost of individual applications would vary considerably.

Price: From $11,000 upwards.

## WP FOR GRAPHICS

**NOVUS DESIGN** (03 266 5250) offers a computer aided drafting system which is said to emulate a word processor in its function. **The Drawing Processor** allows the user to manipulate graphics like words.

The system hardware comprises computer, digitising tablet and hard copy device.

The system is compatible with the IBM PC or equivalent with 256K RAM and 8087 Numeric Coprocessor along with an IBM Color Graphics card, Hercules Graphics Card, Plantronics Graphics Card or EAGLE Monochrome Card.

An asynchronous communication adapter is required each for the plotter and digitizer. Plotter compatibility includes: Hewlett Packard 7420, 7475, 7580, 7585; Houston Instruments DMP 29, 40, 41, 42; Mannesmann Tally Pixy 1, 3; AMDEK Amplot II; Alphanumerics Alphaplot I or II.

Digitizer compatibility includes: GTCO type 4 and 5; KURTA; Houston Instruments HIPAD; Hitachi; Numonics.

Price (3D Computer Aided Software): Basic $1500. Full System $2400 plus 20% sales tax

(The Drawing Processor): Basic $1500 Full System $2,200 plus 20% sales tax

*Refer to "Softlist" for a full graphics software listing.*

# To Serve and Obey

*Mention robotics and most people conjure up mad scientists, human frailty and world doom. But nightmares apart, it's an intriguing and beneficial area of research. Andrew Bangham explains how you can step up your own computer-controlled device using a BBC Micro as an example.*

BY ANDREW BANGHAM

Ever thought about building your own toy robot, or making Meccano or Lego machines run under computer control? What about making a mechanical mouse wind its way around the lounge room? All you need is a micro. such as the BBC, radio control-type servo-motors, an ordinary DC model motor, some wire and a few connectors.

It is possible to control a model maker's servo-motor directly by using a BBC Micro, two wires to supply 5v power and one to connect the servo-motor control pin to either the user parallel port or the printer port. These little servo-motors are delightful; small and light enough to be used in model aeroplanes, yet remarkably powerful.

Each unit includes a small DC motor, a gear box, a position sensor and a feedback amplifier. The motor usually moves a lever (via the gear box) through 90 degrees and the internal feedback system ensures that the position of the lever is dictated by the control wire.

## *Servo-motors*

Servo-motors are digital. To control the position of the lever a voltage pulse (0 to 5v) is applied to the control wire; it is the duration of this pulse which governs the position of the lever. For example, a one millisecond pulse commands the servo-motor to move its lever to one end of its throw, and a two millisecond pulse moves it to the other end.

Sending the servo-motor one pulse of, say, 1.5 milliseconds (to move the lever into the centre position) will be of little use: the motor will leap into action but will be unable to continue.It must be frequently reminded; and this is done by sending a continuous stream of pulses. If the pulses are all the same length then the lever will remain in one place and the servo-motor will resist any attempt to move the lever mechanically (if you force it out of position then it will immediately return to the set point). If the pulses are of a different length the the motor will move the lever to execute the command.

A muscle is a good way of describing the way in which digital servo-motors work, as both require a stream of pulses to maintain a constant position. Animal nerve/muscle systems are remarkable linear servo-motors. They have a good power-to-weight ratio, respond fast and are energy-efficient. Like digital servo-motors, muscles have to receive a continuous stream of nerve action potentials in order to function: a tetanus. In other words muscles and servo-motors have to be refreshed; servo-motors need about 50 pulses per second.

Fig 1 summarises the requirements of the servo-motor. The computer communicates to the motor through a port; in this case the user port. (The printer port, however, may be a safer choice: since the outputs are buffered, there is less risk of mistakes in the external circuitry damaging the computer.) Whatever happens you should take care not to short any outputs to ground, and not to connect any devices with the wrong polarity. Power can be drawn from the 5v supply in the analogue port, though care should be taken when using larger motors. Electric motors constitute an inductive load and although I have had no problems with this, use of diode may prevent voltages being fed back into the computer. Many servo-motors have a large capacitor to accommodate the current surges.

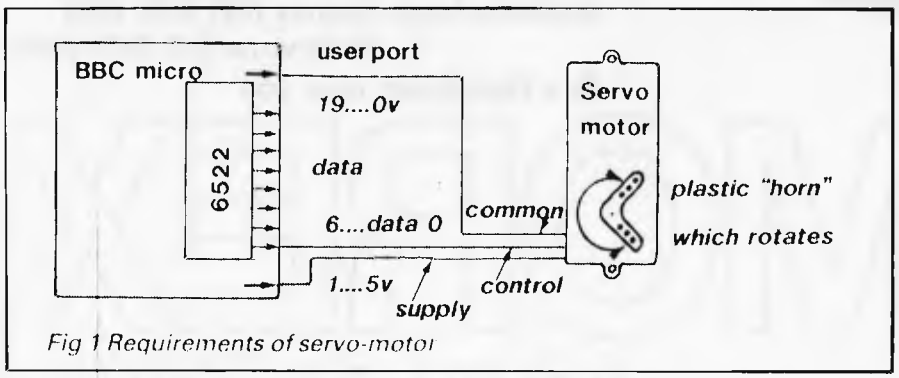


Fig 1 Requirements of servo-motor

| "AND" truth table | | |
|---|---|---|
| input 1 | 2 | output |
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

Fig 2 'AND' truth table

If the microprocessor outputs the number 255 (&FF) all wires will be five volts. Likewise the 0 (&0) is represented by all wires being set at 0 volts, and 240 (&F0) is represented by the four most significant wires (or bits) being set at five volts and the four remaining ones being set at 0 volts.

When the microprocessor outputs a number (bit pattern) this is maintained for less than a microsecond before the next number is arrived at. To trap the bit pattern an interfacing chip is used (in the case of the BBC Micro user port this is a 6522). If the microprocessor writes a bit pattern (that is, number) to the 6522, the 6522 can maintain that pattern until it is told to change it or 'latched'. In fact a single 6522 has not just one but two similar user ports: port A and port B. Port A is used for the printer and has a driver chip to send the output over long distances, but I used port 'B' - although more fragile, it save shaving to disconnect the printer. (The *User Guide* explains how to handle the user port on pages 435-437.)

The 6522 uses memory locations &FE60 to &FE6F, so those addresses do not contain memories but the various registers of the rather complex 6522 chip. Two methods can be used to put bytes into, or read bytes from, these memory locations. They can be POKEd (?&FE00 &FF) or PEEKed (PRINT?&FE60) directly, or they can be

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approached the *proper* way using OSBYTE &96 for reading and OSBYTE &97 for writing. The latter has the advantage of being processor-independent, so if you have a second 6502 processor system it will work. (Incidentally, does *anyone* have a second 6502 processor system?) The former method has the advantage of speed and was used for this reason.

To ouput a value to user port B, instruct the 6522 to switch to output mode, POKE the value &FF to the data direction register B

?&FE62=&FF

and the pattern of voltages on user port pins 11 to 18 will be dictated by the value (between 0 and 255) POKEd into the data output register B

?&FE60=value

A value of &FF (255) will make them all five volts, &0 all zeros, and so on.

A Basic program can be written which sets all the data pins to five volts, immediately turns them off again and then loops continuously to produce a stream of pulses. For example:

```
10 ?&FE62=&FF
20 NOW=TIME
30 FOR I%= 1 TO 200
40 ?&FE60=&FF :REM all on
50 ?&FE60=&00 :REM all off
60 NEXT   :REM next pulse
70 T=TIME-NOW
80 PRINT "TIME PER LOOP=";T
```

But there are two major problems. Firstly, it takes too long to go round the loop; the loop produces 20 pulses per second and 50 are needed. Secondly, although the pulse length lies between one and two milliseconds, it cannot be controlled. Inserting a couple of null statements such as:

```
45 Z%=0:Z%=0
```

will cause the motor to move to a new position but it's hardly a credible way of controlling a motor. Basic can be used to decide the commanded position for the motor but cannot be used to drive it as this requires machine code. No problem: the BBC Microoperating system makes it relatively easy to use assembly code as part of a Basic program which can then automatically assemble this to machine code. Furthermore; the BBC Micro makes it unusually easy to handle interrupts.

## *Computer interrupts*

But first of all let's see how to write a machine code program to produce a

```
 10 osbyte=&FFF4
 20 A%=&97 :X%=&62 :Y%=&FF
 50 CALL osbyte:REM set up port B for
    output
 66 NOW=TIME
 70 CLS
100 DIM timer% 12 ,read% 12
110 xtimer=timer% MOD 256
120 ytimer=timer% DIV 256
122 xread=read% MOD 256
124 yread=read% DIV 256
125 PROCinitial
130 t=.02   :REM sec between pulses
140 time%=&FFFFFFFF -(t*100) +1
150 timer%?4=&FF
    :REM load highest byte
170 !timer%=time%     :REM set up timer
171 REM enable events to start pulses
174 *FX14,5
175 A%=4 :X%=xtimer :Y%=ytimer
    :CALL &FFF1
185 REM get ready to watch timer
186 A%=3 :X%=xread :Y%=yread
187 I=0 :value%=100
189 NOW=TIME
190 REPEAT
191    value%=128+128*SIN(I)
196    PRINTTAB(10,10)"value ="value%"
    I="I
200    ?angle=value%
202    wait=TIME
203    REPEAT
204       CALL &FFF1 :PRINTTAB(2,5)!read%"
    "TIME
205       UNTIL TIME>wait+10
208    I=I+.5 :IF I>10 THEN I=0
210    UNTIL TIME>NOW+2000
211 REM disable events
215 *FX13,5
219 END
220
230
240 DEF PROCinitial
250 DIM space% 200
260 FOR C=0 TO 2 STEP 2
261    portb=&FE60
270    P%=space%
280    angle=P%
290    P%=P%+1
300    [OPT C
310     eventhandler
311    \save registers first
320    PHP:PHA:TYA:PHA:TXA:PHA
340    LDA £&04
350    LDX £xtimer
360    LDY £ytimer
370    JSR &FFF1 \reset timer
380    LDA £&FF
390    STA portb
395    \wait approx. 1msec
400    LDY £&FF
410    LOOP DEY
420           BNE LOOP
425    \and countout pulse
430    LDY angle
440    LOOP1 DEY
450           BNE LOOP1
452    \stop all output pulses
455    LDA £&0
457    STA portb
460    PLA:TAX:PLA:TAY:PLA:PLP
470    RTS
480    ]
490    NEXT C
495 REM point to eventhandler
500 !&220=eventhandler OR (!&220 AND
    &FFFF0000)
510 ENDPROC
520
530
```

*Listing 1*

```
L
   10 MODE 0
   15 REM ****************************************
   16 REM         This is important
   17 REM ****************************************
   20 osbyte=&FFF4
   30 A%=&97 :X%=&62 :Y%=&FF
   40 CALL osbyte:REM set up port B for output
   50 CLS
   60 DIM p%(8)
   70 DIM timer% 12 ,read% 12
   80 xtimer=timer% MOD 256
   90 ytimer=timer% DIV 256
  100 xread=read% MOD 256
  110 yread=read% DIV 256
  120 PROCinitial
  130 FOR I%=angle TO angle+8:angle?I%=128:NEXT
  140 t=.02   :REM sec between pulses
  150 time%=&FFFFFFFF -(t*100) +1
  160 timer%?4=&FF      :REM load highest byte
  170 !timer%=time%     :REM set up timer, enable events
  180 *FX14,5
  190 A%=4 :X%=xtimer :Y%=ytimer :CALL &FFF1
  195   REM ****************************************
  196   REM             this is filler
  197   REM ****************************************
  200 CLS
  210 PRINT"PRESS   F for faster rate   S for slower rate of change"
  220 PRINT"          1 for motor 1 forwards   ! backwards"
  230 PRINT"          2                                  "
  240 PRINT"          3    etc"
  250 PRINT"        L for lower pulse frequency    H for higher"
  260 PRINT''''"SPACE BAR TO FINISH"
  270 PRINTTAB(25,8)"POSITION OF THE FIRST MOTOR PLOTTED AGAINST TIME"
  280 PRINTTAB(25)"In this program the motor position is controlled "
  290 PRINTTAB(25)"by pressing keys, however the motors could"
  300 PRINTTAB(25)"follow any pattern(s)"
  310 delta=1
  320 NOW=TIME
  330 motor=0 :!&%=&00020005
  340 REM layout screen, plot motor 1 angle and display others
  350 PRINTTAB(0,15)"delta....."
```

*Listing 2*

. . . continued

# 3Com EtherSeries

## Local Network Communication for Personal Computers

**EtherSeries is a family of hardware and software communication products for increasing the productivity of personal computer users. EtherSeries networks provide peripheral sharing, information access, and personal communications, saving you time and money.**

## NETWORK HARDWARE

### 3Com EtherLink

EtherLink connects your personal computer to Ethernet. It is a user installable plug-in plug-in board that incorporates the latest VLSI technology. Once you're "on the network", you are ready to take advantage of the EtherShare™, EtherPrint™ EtherMail™, and Remote EtherMail™ network services.

### 3Com Network Servers

EtherSeries networks provide disk sharing, printer sharing, and electronic mail. These functions are provided by network servers, which are specially designated computers with disks and printers that the other computers can use.

EtherSeries, EtherLink, EtherShare, EtherPrint, EtherMail, Remote EtherMail, and 3Com are trademarks of 3Com Corporation.

## NETWORK SOFTWARE

### 3Com EtherShare

The EtherShare software lets many personal computer users share the hard disk on a network server. The shared hard disk saves money and allows virtually all MS DOS software to be used with EtherShare.

### 3Com EtherPrint

EtherPrint lets many personal computer users share the printer's capability and cost via the network.

### 3Com EtherMail

EtherMail can be used to send messages and memos, even documents and files, to other personal computer users over the network. Judged the "Software Product of the Year" by *International Resource Development, Inc.*, EtherMail is powerful, yet easy to use electronic mail package.

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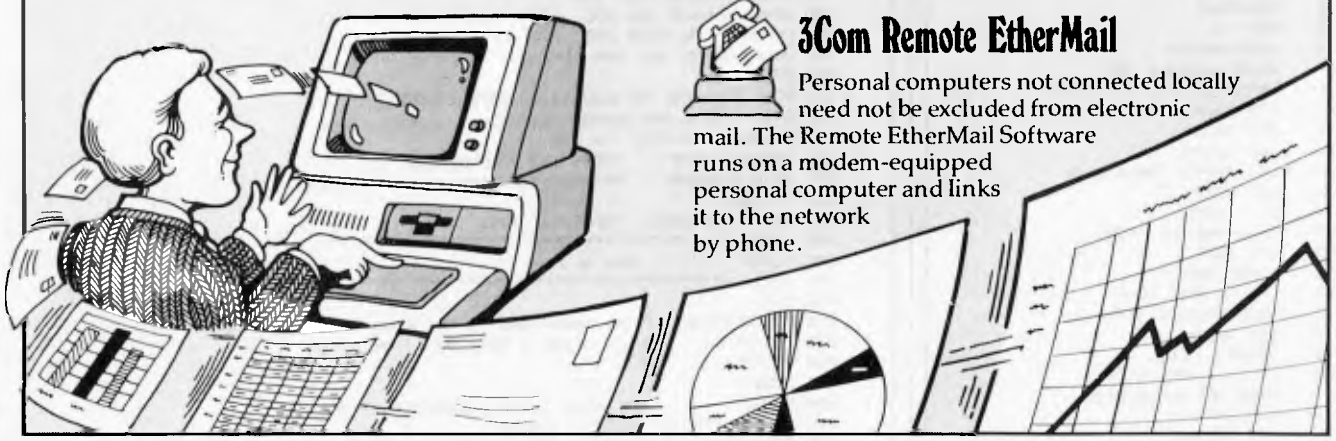
Personal computers not connected locally need not be excluded from electronic mail. The Remote EtherMail Software runs on a modem-equipped personal computer and links it to the network by phone.



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```
360 FOR I%=1 TO 8 :PRINT"Motor ";I%;" position " :NEXT
370 PRINT"pulse frequency..."
380 VDU 28,17,31,79,0
390 MOVE398,98 :DRAW 1202,98 :DRAW 1202,602
395 DRAW 398,602 :DRAW 398,98
400 VDU 24,400;100;1200;600; :VDU 29,400;100;
410 x=0 :MOVE x,2*(?angle)
420 REPEAT
430   IF INKEY(-68) THEN delta=delta+1
440   IF INKEY(-82) THEN delta=delta-1  :IF delta<1 THEN delta=1
450   IF INKEY(-87) THEN t=t+.005 :time%=&FFFFFFFF -(t*100) +1 :itimer%=time%
460   IF INKEY(-85) THEN t=t-.005 :time%=&FFFFFFFF -(t*100) +1 :itimer%=time%
470   position=FNmotor(delta) :IF position=-1 THEN 490
480   p%(motor)=position
490   PRINTTAB(0,15)delta
500   *FX21,0
510   FOR I%=1 TO 8 :PRINTp%(I%) :NEXT
520   DRAW x,2*(?angle)
530   x=x+4 :IF x>800 THEN x=0:MOVE x,2*(?angle) :ELSE :DRAW x,2*(?angle)
540   UNTIL INKEY(-99)
550 *FX13,5
560 PRINT"bye"
570 END
580
590
600 DEF FNmotor(rate)  REM returns -1 if no changes
610 REM moves motor to new position value of which is returned
620 REM the number of motor repositioned is returned in  'motor'
630 K%=INKEY(5)
640 IF K%<&21 OR K%>&38 THEN a=-1 :GOTO 720
650    motor=(K% OR &30) - 48
660    s=K% AND &10   :REM 0 backwards 16 forwards
670    IF s=0 THEN rate=-rate
680    a=angle?(motor-1)+rate
690    IF a>255 THEN a=255
700    IF a<1 THEN a=1
705  REM ****************************************
706  REM      this sets angle of each motor in turn
707  REM ****************************************
710    angle?(motor-1)=a
720 =a
730
740
750
755  REM ****************************************
756  REM       What remains is important
757  REM ****************************************
760 DEF PROCinitial
770 DIM space% 600
780 FOR C=0 TO 2 STEP 2
790   zeropage=&70    :REM free for users
800   portb=&FE60 :osword=&FFF1
810   P%=space%
820   angle=P%  :P%=P%+8   :REM potentially 8 motors
830   table=P%  :P%=P%+256   :REM 256 possible pulse lengths
840   lowtable%=table MOD 256
850   hightable%=table DIV 256
860   ?zeropage=lowtable% :zeropage?1=hightable%
870   [OPT C
880   .eventhandler
890   PHP:PHA:TYA:PHA:TXA:PHA
900   LDA &&04
910   LDX &xtimer
920   LDY &ytimer
930   JSR osword
940   LDY &&0
950   LDA &&FF
960   .fill   STA (zeropage),Y
970           INY
980           BNE fill
990    \Start pulse, for some motors it may be possible to start
1000   \before filling table and so reduce the wait loop below
1010  LDA &&FF :STA portb
1020   \fill table with exceptions
1030  LDA &&FE:LDY angle   :STA (zeropage),Y
1040  LDA &&FD:LDY angle+1:AND (zeropage),Y:STA (zeropage),Y
1050  LDA &&FB:LDY angle+2:AND (zeropage),Y:STA (zeropage),Y
1060  LDA &&F7:LDY angle+3:AND (zeropage),Y:STA (zeropage),Y
1070  LDA &&EF:LDY angle+4:AND (zeropage),Y:STA (zeropage),Y
1080  LDA &&DF:LDY angle+5:AND (zeropage),Y:STA (zeropage),Y
1090  LDA &&BF:LDY angle+6:AND (zeropage),Y:STA (zeropage),Y
1100  LDA &&7F:LDY angle+7:AND (zeropage),Y:STA (zeropage),Y
1110  \table is now loaded, fill in some time
1120  LDY &&60
1130  .wait DEY
```

single pulse. To start the pulse load the accumulator (which is analogous to the display register of most calculators) with the number &FF (225), then store the accumulator contents in what the processor thinks is memory cell&FE60 but what is really the 6522's output register. This will make all data pins five volts.
LDA$&FF/backslash starts a remark-STA&FE60/store accumulator in memory cell number &FE60 (hexadecimal).

The processor will be made to wait for roughly three quarters of a millisecond by loading the Y register with 255 (&FF) and decrementing it by one, checking to see if the result is a zero and, if not, then looping back to decrement Y again.

```
LDY$&FF
      .LOOPDEY/this takes two cycles — one microsecond
       BNE LOOP/three cycles if it branches
```

The total time for a single loop is five cycles or 2.5 microseconds (256 loops takes 640 microseconds).

To turn the pulse off after a variable time, a loop can be used again, but instead of loading the Y register with &FF it should be loaded with the contents of a variable called 'angle'. The larger the angle, the longer the pulse will last. Finally zeros are output to the user port and the pulse is over. LDY angle

```
      .LOOP2DEY
      BNE LOOP2
LDA $&00
STA &FE60
```

With this arrangement the pulse can be made to vary from approximately 0.64 milliseconds. Clearly this method is an answer to the problem. The pulse can be made longer by adding another loop if necessary. A full working program is given in Listing 1, but before consulting it consider how to replace one pulse by a stream of pulses. A pulse must be produced roughly every 20 milliseconds. This interval can be timed using the event timer. Like TIME the event timer works in centiseconds. It can be instructed to generate an interrupt pulse whenever it crosses zero: if it can be made to count up the two centiseconds (20 milliseconds, or 50 per second) from &FFFFFFFFFE to &0000000000 then generate an interrupt and if that interrupt pulse forces the microprocessor to reset the timer and run the pulse generating program outline above, then a stream of pulses will be produced.

The 6502 processor has a maskable interrupt pin. If a signal is received on this pin the processor drops whatever it was doing and starts to handle the interupt. The operating system makes extensive use of interrupts and the machine runs under continous interrupts

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```
1140            BNE wait
1150    LDA £&FF   \all pulses on
1160    LDY £&0
1170    .loop AND (zeropage),Y   \but mask off with each exception in turn
1180            STA portb
1190            INY
1200            BNE loop
1210     \all pulses should now be finished
1220    PLA:TAX:PLA:TAY:PLA:PLP
1230    RTS
1240    ]
1250    NEXT C
1260 !&220=eventhandler OR (!&220 AND &FFFF0000)
1270 ENDPROC
1280
```

— TIME is constantly updated, bytes are transferred to input buffers, and so on. All these things continue even when an ordinary program is being run or edited and are carried out using interrupts. The BBC Micro enables extra routines to be added which can be executed whenever the appropriate interrupt occurs. The operating system already recognises many possible sources of interrupts, automatically identifies them and passes them as 'Events'. An Event 5 is generated when the interval timer crosses zero, enabling and then trapping this event is 6502 interrupt handling made easy.

To start the interval timer it must be given a starting value. An OSWORD call with the accumulator (A%) equal to 4 will write a value to the timer. The value to be written must occupy five bytes at an address pointed to by X%=low byte and Y%=high byte of the 16-bit (two byte) address. Some space for these five bytes can be reserved with a DIM statement.

```
10 osbyte=&FFF4:REM osbyte address
20 DIM timer%12
30 X%=timer%MOD256
40 Y%=timer%DIV256
50 !timer%=&FFFFFFFE:REM2
   centiseconds countdown
60 timer?4=&FF:REM fifth byte
70 A%=4
80 CALL osbyte
```

The Basic program above will start the timer counting down two centiseconds. If Event 5 is first enabled using *FX 14,5 then as soon as the timer hits zero the processor will jump to whatever routine is pointed to by the address in &220 (low byte first followed by the high byte) (obviously the address of the pulse generating program must be inserted into the vector at &220).

The program shown in Listing 1 loads the Event vector with the address of the Event handler routine on line 500. The Event handler routine first saves all the registers on the stack (a last-in, first-out buffer), then resets the timer, delivers a pulse and finally reinstates all the registers (X,Y,A and status registers). The 'C' loop assembles the program; by stepping from 0 to three, in steps of three, the operating system is forced to list the assembled program as it is assembled. By stepping to two instead of three listing of the assembly process can be be suppressed.

The Basic program sets up the timer, assembles the Event handler, enables the Events, starts the timer, then repeatedly sets the commanded angle to new values (actually a lumpy sine wave) until twenty seconds are up, at which point it turns off the events. With a motor connected the motor will follow the lumpy sine wave, moving its 'horn' to each commanded angle in turn. Everything stops after twenty seconds. If the events are not turned off they will continue even though the Basic program may have finished — the servo-motor handling routine will have become a temporary part of the computer's operating system.

This program works well but is a little restrictive as all eight data lines on the output port produce the same pulse shape.

More than one motor can be handled simultaneously by rethinking the way in which the pulse is terminated. Clearly there is no time to count down eight different values, turning off each motor as its counter times out. An alternative method is to generate a look-up table of 256 values; the timing loop loading and outputting each byte (pattern) in turn. As the table would take too long to produce (since bit patterns would still have to be generated) the trick is to utilise the 'AND' instruction. A logical 'AND' returns one *only* if both inputs are ones, otherwise it returns zero (see Fig 2).

Listing 2 shows a Basic program to position up to eight servo-motors simultaneously. Simple key presses change the commanded angles. The Event handler program starts the same way as before but loads 256 memory addresses with &FFs — a simple process which takes about 1.2 milliseconds. Then all the pulses are started and the table is filled with a list of exceptions. For example, if motor 0 (connected to data bit 0 on the output port) is to receive a pulse which stops after a timing count of 128,


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then the 128th byte of the above table is loaded with &FE (bit zero is zero) which replaces &FF. Likewise if motor 1 had to be turned off after a count of 10 then the 10th byte of the table would be loaded with &FD (bit one is zero). Next a short wait before the timing loop itself. The timing loop starts with the accumulator set to &FF (all bits on). This is ANDed with each byte of the table inturn and output.

In the example above the first nine bytes of the table contain &FF and since &FF(accumulator) AND &FF(table) is &FF, nothing happens. However, when the 10th byte is encountered the operation is &FF AND &FD yielding &FD which turns off the pulse going to motor 1. The next byte of the table contains &FF but since the accumulator now contains &FD, &FD AND &FF yields &FD again and motor 1 remains off. This continues until it reaches the 128th element of the table at which point the operation is F&D AND &FE yielding &FC which leaves motor 1 off and also turns off motor 0. Thus by ANDing the table elements. in turn, the motors can be progressively turned off without having to time each one separately. (Note that the exceptions were also loaded into the table by ANDing in case two pulses had to be turned off simultaneously).

The Basic program checks the keyboard to see which motor is to be adjusted then POKEs the new value into the appropriate angle (motor 0 is controlled by angle, motor 1 by memory cell angle+1, and so on).

Since the whole eight motor Event handling routine only lasts about 2 1/2 - 3 milliseconds in every 20 milliseconds the interruptions slow Basic programs down by about 12.5%.

Since this is hardly noticeable under most circumstances the computer appears to run the Basic program and the Event handler program at the same time.

## *Conclusion*

All kinds of programs can be produced to command motors to move. To control an ordinary low voltage (less than 12 volts) DC motor a relay is required. The most obvious one to use is the tape recorder controlling relay. Just connect pins 1 and 7 (see page 499 of the *User Guide)* of the cassette recorder socket in series with your motor and battery and you can switch the motor on and off.

Using

```
A%=&89
X%=0:REM turns motor off
CALL & FFF4: REM osbyte call
X%= 1:REM turns motor on
CALL &FFF4
```

you should be able to hear the relay clicking.

To control more than one ordinary small DC motor the user port can be used but this time rather more simply than with servo-motors. Not enough current can be drawn from the port to drive (as opposed to control) a motor directly so a buffer and power supply must be inserted between the data pin and its corresponding motor.

A convenient chip is a ULN2803A (R.S.303-422) which contains eight independent Darlington drivers. These behave rather like switches and are connected in series with the motor and its power supply; five volts on an input pin switch it on while 0 volts input switches the circuit off. Each driver can be controlled directly by the user port data pin and will switch up to 500 milliamps at five volts (absolute maximum of 2.5 watt motors).

Connect a five volt supply voltage to the supply pin (10) and ground to pin 9, and each data output pin to the appropriate Darlington input pin; for example, input 1 is pin 1 and its output pin is 18, input 2 pin 2 output pin 17. The motor is connected between the five volt supply and the appropriate Darlington output pin. When the input is high (five volts) its output is shorted to ground switching on the motor, but when it is low (0 volts) the output pin voltage becomes the same as the supply voltage and the motor is switched off. No other power supplies or components are needed.

Just imagine: this could be the way to start a family of robots. Think of the possibilities. Could you produce a robot that BREAKs its own controlling program?


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# Taking Tandy up a Grade

*The Tandy Model 100 gets a boost from this quick and easy to use interface, says Geof Wheelwright.*

Since the introduction of the lap portable, its main drawbacks have been lack of memory and the size of the screen display. Tandy, however, has come up with a solution that is available now for its Model 100. It's a disk/video interface that gives you both 40-and 80-column composite video/TV output as well as one 5¼in disk drive and room for an optional second drive.

## First impressions

The interface is a big white box that comes packed in the obligatory styrofoam and cardboard casing. When you get the casing off, you'll find a manual, a disk with the Model 100 'operating system' on it and the disk/video unit itself.

The interface attaches via a 40-pin lead that's about as sturdy as an old Apple II joystick connector. The Apple II joystick connector was famous — or infamous —for its constant pin-bending activities, which inevitably resulted in yet another trip to the service department or the purchase of yet another lead. Given that you would probably want to be able to hook and unhook your disk/video interface quite freely, it doesn't make much sense to use a fragile 40-pin connector as the linking point.

It wouldn't have been hard to have a wedge-shaped adaptor that hooked on the back of the Model 100, giving it some much-needed height and a good typing tilt as well as providing a sturdy amphenol plug that could be plugged and unplugged without any problem.

## Documentation

The interface comes with a single manual which is nice and chatty, in true Tandy/American style.

The manual consists of four sections. The first tells you how to set the system up and provides a number of pretty pictures. Part two describes all of the new commands available to run the disk system. The third section comprises an in depth analysis of the disk format, showing exactly how it is laid out.

The final section is basically a set of appendices detailing the technical aspects and containing tables of ASCII and error codes. Overall, the manual covers virtually everything you might need to know about the system.

If, by any chance you need to know more, Tandy also has a service manual available. This covers every technical detail you could possibly want — from taking the disk drive to pieces to the electronic circuitry and the signals it produces.

## In use

The design of the disk/video interface is consistent with the Model 100: simple to use and limited in its power.

Once you've connected things up, just stick the operating system diskette in the top drive (there is only one drive on the basic interface, but an optional second drive — which fits below the first in the same box — is available) and switch on both your monitor and the interface.

Then you turn on the Model 100 and you're ready to go. The disk is immediately available to you for storage, but you have to give a command from Basic to use the monitor. The commands SCREEN 1,0 or SCREEN 1,1 (depending on whether or not you want the bottom line of the screen taken up by prompts) will transfer all subsequent information to the screen and will cause the monitor — rather than the LCD — to be the boot-up display from that point onwards.

It's worth pointing out that although everything in Basic, Text, Telecom, Schedule and Address appears on the monitor, the main 'menu' at power-up still appears on the LCD, turning it into a sort of microscreen from which programs and files are selected.

As you're not likely to be switching quickly between files too often, having the main menu on the LCD is not a great drawback.

Changing from the 40- to 80-column display is also pretty easy. It's a statement from Basic in the form: WIDTH 80 for 80 columns or WIDTH 40 for 40 columns. The 80-column display does add a good deal to the powerful word processor built into the Model 100. Text, the simple name given to the word processor on the Model 100, NEC PC-8201 and Olivetti M10, has the capacity for string-searching, variable width printing, block moves and deletes, automatic word wrap and full screen editing.

The disk drive is relatively quick — but so it should be, given the comparatively small amounts of data being shoved back and forth between the disk and the Model 100's limited 32k memory. The single-sided, double-density drive offers about 170k of formatted storage.

## Conclusion

Aside from my quibble with the connector my only other reservation about the device is the price. At $1,299, the interface is a little on the pricey side. But then, Tandy has never been about low prices, instead making things easy to use and offering excellent service, back-up and dealer support for its products at a 'competitive price'.

The great thing about the interface is that it's quick to hook up and very easy to use. So it's a trade-off between convenience and price.

## Additional commands available

| | |
|---|---|
| LFILES | Displays the filenames on the disk. |
| SCREEN | Assigns the console to a specified device. |
| WIDTH | Sets the screen width. |
| DSKO$ | Writes a string to the specified sector. |
| DISK$ | Gets a string from the specified sector. |
| LOC | Gets the current record number. |

When the new Kyocera breed of LAPPIES (Largely Available Portable Processing In Every Sense) computers were first released in their respective Tandy Model 100, NEC PC-8201 and Olivetti M10 configurations, I was charmed by their size, power and ease of use.

I also hoped that these portables would grow up and be able — when

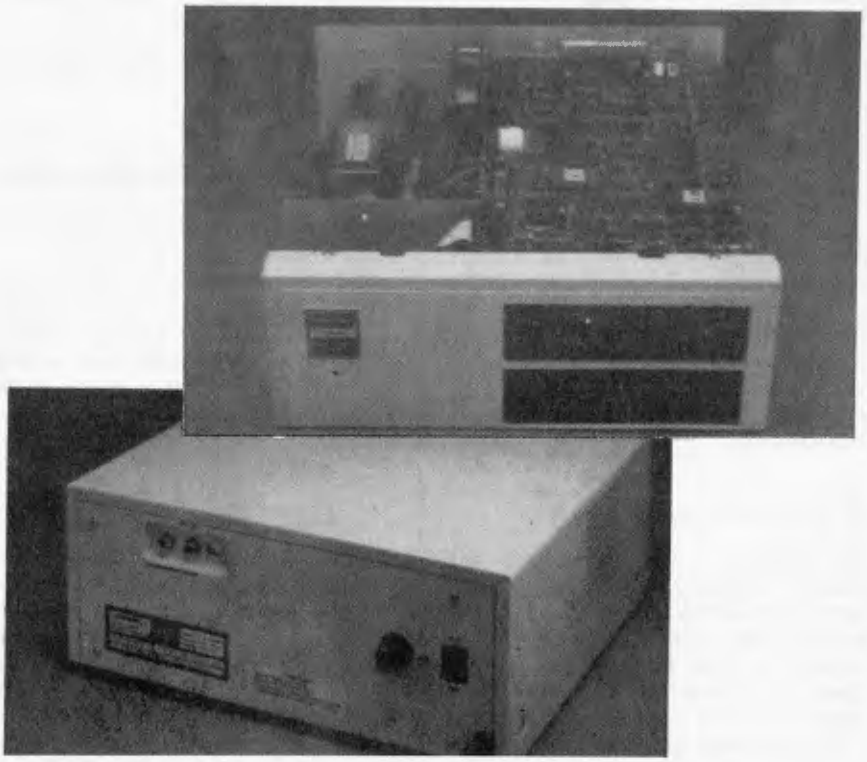
necessary — to take more memory, use disks and run a cathode ray tube screen display.

The NEC machine pretty much solved the memory question with its bank-switching system that allowed up to three banks of 32k to be accessed in turn. One of those memory banks comes in the form of an optional 32k memory cartridge which can be plugged in the left-hand side of the machine.

A 32k memory cartridge, however, is not a disk — it doesn't act much like one (and at more than $450 a time, it certainly doesn't cost much like one) — and the Kyocera LCD screens are still only 40 columns wide by 8 lines.

NEC was rumoured to have a solution that involved a plug-in disk interface/ROM/80-column video outlet that not only gives you access to a full 80-column display from your portable, but also the use of a 5¼in disk drive and the CP/M business operating system on a chip. That solution still has not appeared in this country.

Tandy, however, has come up with the goods, although the system still lacks a standard operating system. It is possible that some enterprising entrepreneur will come up with a CP/M system that will work with the Model 100 making a lot more software available.



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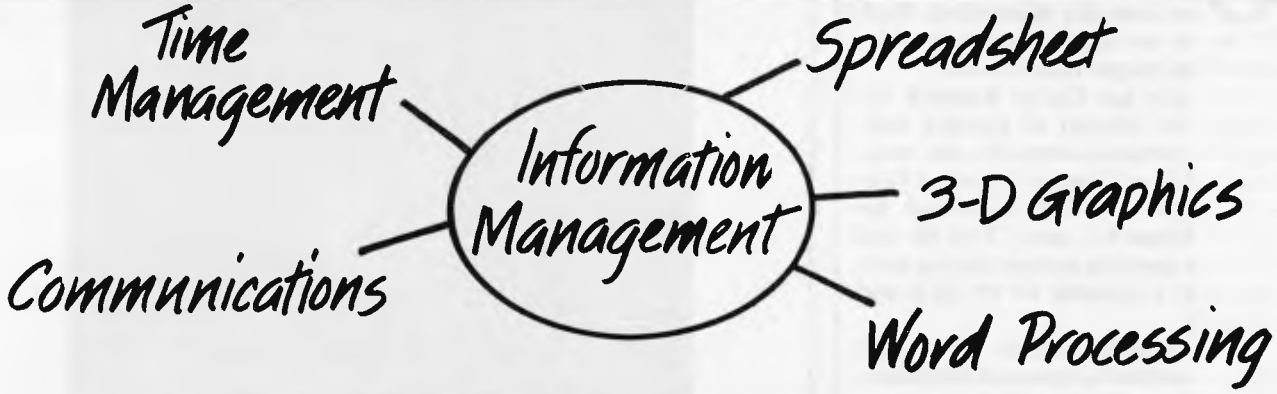


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# GSX — a graphics standard

BY BILL BOLTON

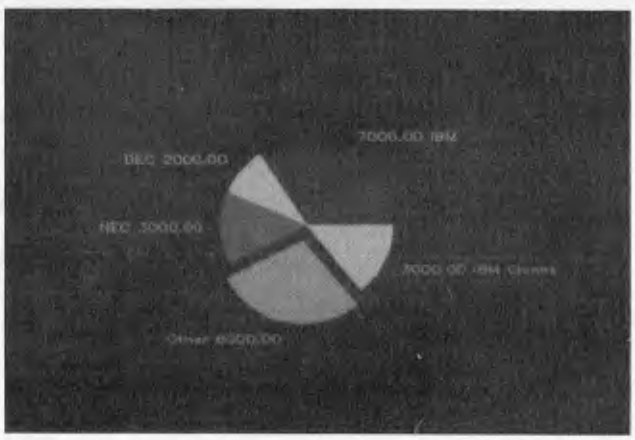
One of the major problems with graphics on personal computers has been lack of standards. Each PC had its own idea of how its graphics capabilities should be controlled.

Two years ago Digital Research addressed the problem of graphics standards for personal computers and introduced GSX or Graphics System Extensions. GSX was first introduced for Digital Research's own CP/M-80 and CP/M-86 operating systems but has since also made it available for PC-DOS and MS-DOS.

GSX exists to provide a standard graphics interface on personal computers. The GSX graphics interface provides a standard access on to a wide variety of physical graphics input and output devices, in much the same way that a personal computer operating system provides a standard interface on to a variety of disk drives, printers, screens etc. However GSX isn't limited to one operating system. On all the operating systems that support GSX, the programmer's interface to GSX is consistent. This makes it practical to develop graphics applications programs with confidence that they can easily be transported to many different types of personal computers.

GSX offers the user access to powerful graphics productivity tools. *DR Graph* allows the building of typical business graphs such as line, bar and pie charts. It won't let you do anything else but business display graphics but it has a very flexible and easy-to-understand user interface for doing that.

*DR Draw* is a more general graphics package for producing graphics images. While not in the full CAD/CAM class it does provide a very flexible general drawing package which can be used for a very wide variety of graphics tasks. I use it extensively for making paperwork forms and also for generating display graphic slides for talks and presentations. It's almost impossible to describe all the things that *DR Draw* can do, so Arcom Pacific has recently sent out to many dealers a self-executing demonstration (for the IBM PC and compatibles) of just some of the graphics that can be created with *DR Draw*, you should ask your dealer to show it to you.



*A typical example of the use of DR Graph. The values shown were derived from a table; the software automatically created the pie chart and positioned the lettering.*

*Access 10* allows a PC to emulate a Tektronix 4010/14 graphics terminal when communicating to a host computer running *Plot* 10 or compatible software.

*Presentation Master* is a composite product for the IBM PC that includes a Polaroid Palette graphics camera device with *DR Graph, DR Draw* and full instructions on how the products integrate together on the IBM PC. The Palette can produce both instant colour prints and slides of graphics output from GSX. It has facilities for effectively doubling the resolution of the IBM PC colour graphics display.

Another practical implication of GSX for a user is portability of graphics applications software from one PC to another. For instance *DR Graph* is available for CP/M-80, CP/M-86, PC-DOS and MS-DOS. So it is quite possible to take a graph file created with *DR Graph* on a Visual 1050 computer, and 8 bit running CP/M Plus, and transfer that file across to an IBM PC running *DR Graph* on PC-DOS, and have the IBM PC display the graph. The same graph file could then be transferred to a NEC APC running *DR Graph* under CP/M-86 and again it could be displayed.

Now you should note that the portability of that *DR Graph* file between machines is not directly because of GSX. It is directly because *DR Graph* exists on all those machines. If you could find a similar graphics applications package that existed on all three machines you could probably do similar things with it. The real point is that GSX easily allows *DR Graph* to exist on all three machines (and many others) so GSX is the underlying cause of the portability of the graph file.

While GSX can be accessed from most high-level compiled languages with a simple machine language interface, Digital Research's CBASIC compiler provides a set of intrinsic graphics commands which provide access to the graphics facilities of a personal computer via GSX. The CBASIC compiler is available for all the operating environments that support GSX and is an ideal tool for using the power of the GSX

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# ...other computers cringe

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As for electrical and mechanical reliability, look inside a PortaPak. There's a striking difference. The PortaPak is completely modular. We didn't scrimp by putting all the circuits on one board. We use *three*. Servicing is simpler, quicker and cheaper. It's why the leading national computer service company, TCG Pty Ltd, is pleased to offer a 12 month service contract on PortaPak in all capital cities.

Take an extra close look at the Canon disk drives. If Rolls-Royce built computers, they'd use Canon drives. See the massive head protection shield? Hear the way the heads lock away every time they deselect? The designers had an unusual attitude to reliability – fanatical.

Now carry out some speed tests. On a standard benchmark test using BASIC routines*, the timings are: PortaPak 12.9 seconds, IBM PC 16.4 seconds, NEC APC 19.7 seconds and Sirius 16.4 seconds. Using a standard dBASE II routine**, the timings are: PortaPak 8 minutes 11 seconds, IBM PC 11m 52s, Sirius 17m 9s and NEC APC 19m 16s.

The expensive imports really cringe at this because they make so much of being "16-bit" machines. PortaPak is an 8-bit machine and proud of it. Not only is an 8-bit machine inherently better suited to jobs like word processing, accounting, spreadsheets, etc, but the 6MHz clock rate ensures it can run rings around the others even in complicated mathematical tasks.

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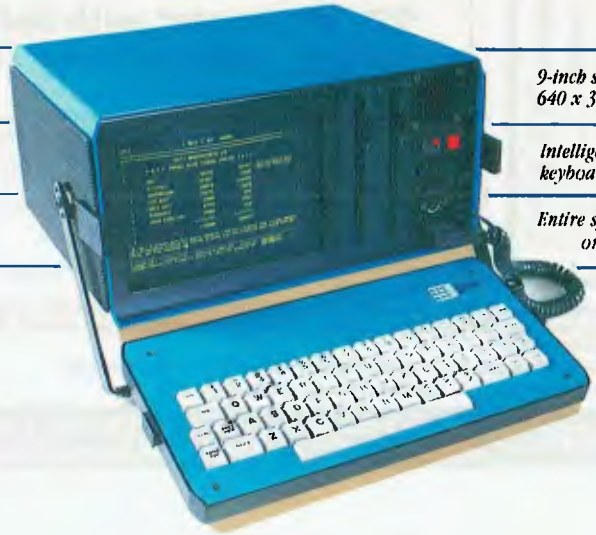

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*See Australian Personal Computer, Feb., 1984.
**See Australian Micro Computerworld, Nov., 1983.

THE PORTABLE COMPUTER CO.

graphics interface for those programmers who don't want to bother with machine language interfaces to GSX.

Using GSX, programmers can write graphics applications and graphics from these applications can be reproduced, without modification, on a wide variety of output devices, such as monitors, plotters, printers and cameras. Through GSX, end users can communicate with graphics applications via input devices such as mice or cursor keys.

Many popular graphics applications have already been written to use GSX including Digital Research's *DR Draw, DR Graph* and *Access 10*, Chang Lab's *Graphplan* and Condor's UGRAF.

Any compiler language need only be supplemented by short assembler bindings to call GSX functions. The bindings to the Digital Research language compilers are available in Digital Research GSX Toolkit.

The portability of GSX across operating systems, languages, microcomputers etc makes GSX a true 'virtual device interface', or VDI, as per the ANSI standard. As a VDI, GSX uses a 32k square integer co-ordinate space to plot graphics and a standard set of graphics operations.

The resident operating system services in GSX include more than 30 functions that can be called on to draw lines, polygons and standard GDP primitives (common shapes like circles) or to fill shapes with patterns and colours or to control graphics output to physical devices.

*GSX – making your graphics portable*

With one exception, GSX is supplied with the operating system for the personal computer concerned, usually by the supplier of that personal computer. So, for instance, GSX for the DEC Rainbow comes with CP/M-86 from DEC, and GSX for the NEC APC comes from NEC for both MS-DOS and CP/M-86 for the APC.

The exception is the IBM PC. Digital Research supplies GSX for the IBM PC and close compatibles. All the Digital Research graphics products for PC-DOS include GSX for the IBM PC with them, so if you buy *DR Graph, DR Draw, Access 10* or CBASIC Compiler for PC-DOS you get GSX.

The GSX for your machine will include a number of device drivers. There will be one (or more) for the CRT display plus a selection of drivers for popular printers and plotters. The GSX device driver library is updated from time to time by Digital Research and any new drivers should be available from the same source as your GSX. If your GSX came from DEC you should ask DEC about new device drivers (if any) for your GSX.

For PC-DOS device drivers are available for a number of graphics cards, including the IBM colour graphics adapter in monochrome and colour modes, the Hercules monochrome board, Plantronics PC+ Colorplus mice board etc along with several mice such as the Microsoft mouse, Mouse Systems and Summa Mouse.

*Bill Balton is a software specialist with Arcom Pacific, the Queensland company that distributes Digital Research products.*


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| Ease of Use | ☐ | ☐ | ☐ | ☑ |
| Performance | ☐ | ☐ | ☐ | ☑ |
| Documentation | ☐ | ☐ | ☐ | ☑ |
| Serviceability | ☐ | ☐ | ☐ | ☑ |

See review in September issue

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# Beat the clock

*The performance of different sort methods can change dramatically when a re-sort is required. Tony Williams pitched some minimal memory sorts against his stopwatch.*

If you use a microcomputer to sort large files you may find the amount of available memory a serious limitation. For example, a file of 400 records, each 80 characters long, will require 32,000 bytes not including the space for overheads and the program (a record is a unit of information: that is, a person's name, telephone number and address). Large files will certainly require the use of a disk so that parts of files can be sorted and merged.

Obviously, the more disk manipulation used, the slower the job becomes — to a point where the process is of little interest to most users. However, files of a useful size can be sorted on a micro without the use of a disk, particularly if care is taken in the design of the record so as to minimise its size. It will also be wise to choose a sorting method which does not make demands on memory for temporary workspace.

## *Minimal memory methods*

A number of 'minimal memory' methods are available and some theoretical and practical comparisons of their performance have been published. There is less information on re-sort performance, which is a pity because very often one is not as interested in the time required to set up a sorted file as the time required to add or delete a few records and then re-sort them.

Sort techniques, at least for minimal memory methods, all depend upon comparison and are closely related to search methods. It is first necessary to define the search key; if your records comprise name, telephone number and address you might decide to sort the records in alphabetic order of names. The name part of each record then becomes the key.

Let's assume that our keys are numeric and are to be sorted into ascending order (we could just as well sort into descending order if desired). The most obvious and simple technique is usually called sequential sorting. Consider the sequence of digits 3 4 2 1 5; it is required to sort these into 1 2 3 4 5. The procedure is to take the first (that is, 3) and compare this in turn with each of the others until a smaller one is found (2). 2 is then compared with the remainder of the sequence until the smallest is found (1). 1 is then removed from the sequence and the digits shuffled to the right to close the gap. It is then placed at the head of the file and the process repeated on the rest of the file, and so on. This is the only method which allows you to print each sorted record as it's produced: with the other methods it is necessary for the whole of the file to be sorted before it can be printed. This is perhaps its only virtue but not to be ignored if you are working with a slow printer.

The number of comparisons required is often taken as a measure of speed and in this case is approximately n 2/2 where n is large and equal to the number of records. The method takes approximately the same time no matter how well the file is initially sorted, so is unlikely to be a good choice for re-sorting.

Another method, attractive because of its compact program, is called bubble sorting. Consider again the same sequence: compare the first digit with the second; if the second is smaller swap them, compare the second with the third, if the third is smaller swap, and so on, to the end of the sequence.

This gives 3 2 1 4 5 as a first attempt; the process is repeated on the whole sequence until no further swaps are made. It is slow on unsorted files but better than sequential and promises to be good on well-sorted files, and for a completely sorted file requires only n comparisons.

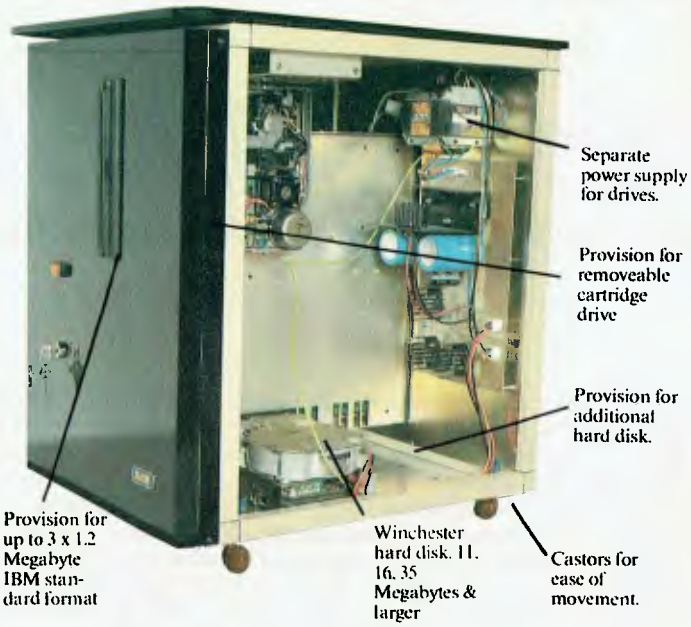
The bubble sort can be improved by searching for the best place to put an out-of-order record when this has been detected by a comparison. This can be done by applying a sequential search as in the sequential sort method, producing a program that is somewhat faster for an initial sort and dramatically faster at re-sorting. The use of a binary search gives even better performance for an initial sort (a binary search consists of halving the search area, finding in which half the target lies, halving that area, and so on), but the program is quite long and complicated.

The Shell method is somewhat similar to bubble sorting but instead of comparing adjacent keys, those some distance apart are compared and exchanged if necessary. The distance apart diminishes at each pass through the file. It's common practice to make the distances a half, quarter, eigth, sixteenth, and so on, of the file length but other sequences are used. A very compact Fortran version is given by Berztiss (1). The method always makes the same number of comparisons which, according to Berztiss, is of the order n 3/2.

The sort performance tests were executed using a file consisting of records 66 characters long. The sort operated on the characters 0-9, A-Z and a-z in that order of precendence with all other ASCII characters ignored. The records were held in memory as a sequence of bytes (not array elements) without pointers to minimise memory demand. All programs were written in machine code for a Commodore 8032. For the re-sort tests the four 66-byte records 1...1, a...a, m...m and z...z were appended to the file.

The basic sequential sort and basic bubble tests were executed on a file of 390 records. The results, shown here, were so poor that no further tests were made on these methods:

# Starts small, thinks big

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## SORT SPEEDS

| | Sort time (sec) | Re-sort time (sec) |
|---|---|---|
| SEQUENTIAL: | 77 | 43 |
| BUBBLE: | 143 | 93 |

The table below shows the byte length for each of the programs (it does not include additional common sub-routines):

| | Program length: byte |
|---|---|
| SEQUENTIAL | 535 |
| BUBBLE | 406 |
| BUBBLE/SEQUENTIAL | 468 |
| BUBBLE/BINARY | 519 |
| SHELL | 659 |

## *Conclusion*

These results indicate that the best all-rounder is the bubble/sequential program. It's a quicker sorter, a very quick re-sorter and uses only a modest amount of memory. If you are desperate for space then the bubble sort would be your choice but it's very slow. The Shell method is outstanding for initial sorting and is easy to program.

As an additional guide to choice, I executed a further trial on the Shell and bubble/sequential methods. This consisted of sorting 969 records, each 24 characters long, using the whole of the record as the key. The time in seconds to sort, re-sort with four added lines and re-sort with 20 added lines was 16.5, 7.0 and 7.5 for 'Shell' and 198 (yes 198!), 3.0 and 9.5 for bubble/sequential. This illustrates that the choice of method must be guided by requirements and the ideal would be to maintain a library of sort routines.

*Reference*
*1 Berztiss AT* Data Structures, *Academic Press New York 1975*

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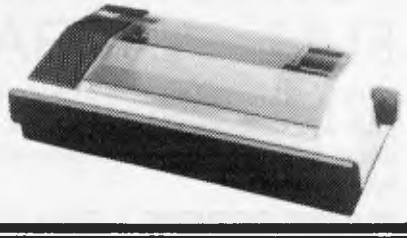

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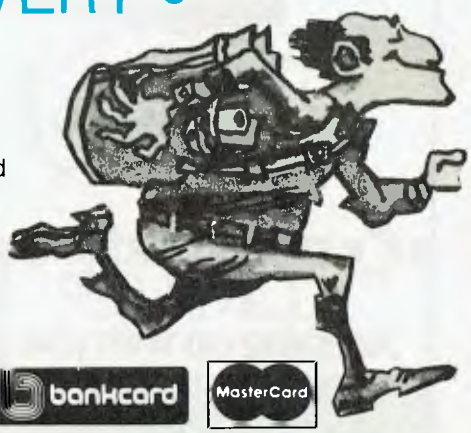

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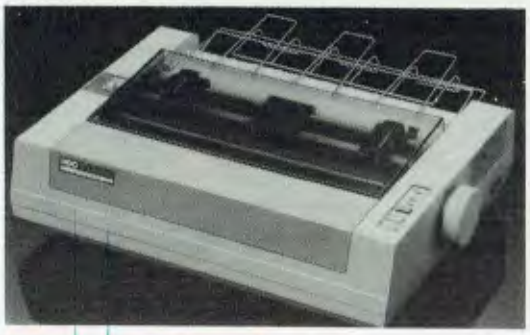

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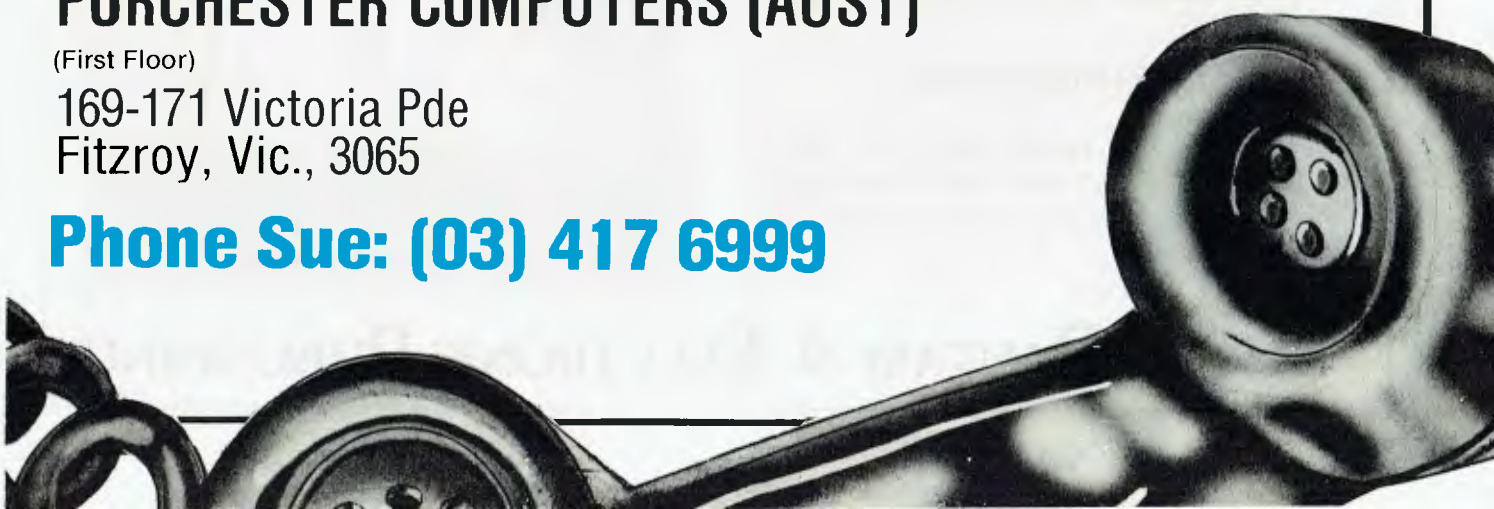

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# If the bubble bursts

*One exciting data storage development has slipped quietly into the market with a minimum of fuss. It's taken almost twenty years to get here and could signal the beginning of the end for disk drives. What is bubble memory and how does it work? Mike Mephan reveals all.*

Memory is the name of the game, and the name of the memory is bubble. Fujitsu is first into the market with a one megabit magnetic bubble memory unit. The company also offers similar devices as alternatives to disk drives on its FM8 and FM16 micros.

In the US, a number of portables with bubble memory have appeared, such as the badly-named Portabubble from Teleram which weighs in at 10lb and has become standard word processor issue to reporters on the *New Yerk Times*.

One of the reason why magnetic bubble memory has taken so long to realise its full potential in the computer industry is that the technology is not easily explained in words of one syllable. The people who have been involved in its development over the past 20 years have tended to talk about bubble memory in terms which are not easily understood by the average electronics technician, and would be complete gobbledygook to the hobbyist.

## Theory of magnetism

It is necessary to understand some of the theory of magnetism at this point.

The accepted difference between a ferromagnetic and a non-ferromagnetic substance is in their atomic structures. Unique to the ferromagnetic substance is the fact that at least one of the electrons of each of its atoms has a spin about the axis of the atom which is uncompensated by an other electron.

If two neighbouring atoms find themselves with their uncompensated electrons spinning in parallel, not only do they maintain that position, but begin a chain reaction of forcing atoms next to them to assume the same alignment. In this way, all the atoms in the substance have their unbiased electrons spinning in parallel very quickly and the substance is totally self-magnetised to saturation point.

However, the substance is of a crystalline nature and each crystal is divided into magnetic domains. While each domain is totally saturated magnetically, not all domains lie in the same magnetic section.

In fact, nature being as clever as it is, the effect is of the magnetic forces of each individual domain of the crystal combining to give an overall minimum magnetic force as close to zero force as possible, so it can be seen that in ferromagnetic substances these forces exist as a natural state.

Not all of these magnetic substances act in exactly the same way. Some are totally random in the way the magnetic domains lie, some have a directional preference. In addition, some have larger domains than others.

The materials used in the manufacture of bubble memories are iron oxide compounds described as rare earth garnets. By combining these materials in different proportions and by adding other non-ferromagnetic materials, the magnetic properties of the

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*We have always liked the Medfly. We sold enough of them to know them well! But, when you compare the Lingo against the Medfly, ask whether the Basis Medfly organisation is still manufacturing computers?*

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| Amber monitor | 220 |
| Custom ROMs | 140 |
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| **Total** | **$2460** |

### Dick Smith's Cat

**As supplied $699**

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|---|---|
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| Emulator required to run Apple software | 99 |
| RF modulator | 35 |
| Z80 processor for CP/M | 449 |
| Extra 64K memory (approx) | 120 |
| Serial adapter RS232C | 129 |
| Voice synthesizer | 35 |
| Amber monitor | 299 |
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### Apple IIe

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|---|---|
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| 64K card | 578 |
| RF modulator | 51 |
| Voice synthesizer | 35 |
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| | Lingo 128 | Medfly | Cat | Apple IIe |
|---|---|---|---|---|
| **Processor** | 6502 | 6502 | 6502 A | 6502 |
| **Z80 processor for CP/M built-in** | YES | YES | NO | NO |
| **RAM memory standard** | 128K | 64K | 64K | 64K |
| **Enhanced microsoft basic** | YES | YES | YES | NO |
| **Size of interpreter in ROM** | 24K | NIL | 24K | 12K |
| **Numeric keypad** | YES | YES | YES | NO |
| **80 column text display built-in** | YES | YES | YES | NO |
| **Voice synthesizer included** | YES | NO | NO | NO |
| **RGB colour output standard** | YES | YES | YES | NO |
| **RS232 serial adapter included** | YES | YES | NO | NO |
| **Centronics printer port included** | YES | YES | YES | NO |
| **Twin drives built-in** | YES | NO | NO | NO |
| **Data capacity of each drive** | 164K | 164K | 164K | 140K |
| **Whisper quiet Chinon Japanese drives** | YES | NO | NO | NO |
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| **Separate processor for keypad** | YES | YES | YES | NO |
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bubbles can be altered quite substantially.

The most important factors to be considered when choosing the right substance are the stability of the magnetic bubbles once formed, their size and the uniaxial magnetic properties of the substance.

If the substance is one which prefers its domains to lie along a single axis, in other words north and south but never east and west, it has a uniaxial magnetic anisotropy (which means it has different properties in different directions). By cutting through that material at right angles to its axis, you would see each of the domains in cross section. At that moment the domains would appear as long, unformed shapes (Fig 1).

## 'Magic'

The magic starts when an external magnetic field is applied to the overall cross section. Each domain shrinks in size, eventually taking on a uniform shape, and that's a bubble (Fig 2).

If the external magnetic field is increased the bubble continues to shrink, eventually collapsing; its magnetic direction becoming the same as the domain surrounding it. The magnetic force needed to form and maintain the bubble is quite critical.

Now we have two essential components of our bubble memory: the garnet material containing the magnetic domains; and the


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Elsewhere in this magazine you've probably seen Dick Smith Electronics new bargain bulletin. You may not have noticed on the back page many of our NSW, ACT & QLD addresses missing! (Yep. It's the white hole under the 'Chatswood Chase' map).

Just so you'll know where to find us, here are the missing store locations ...

P.S. It's not our fault. The printer said something about falling off the film ...

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external magnetic forces to maintain the magnetic domains in their bubble form at all times.

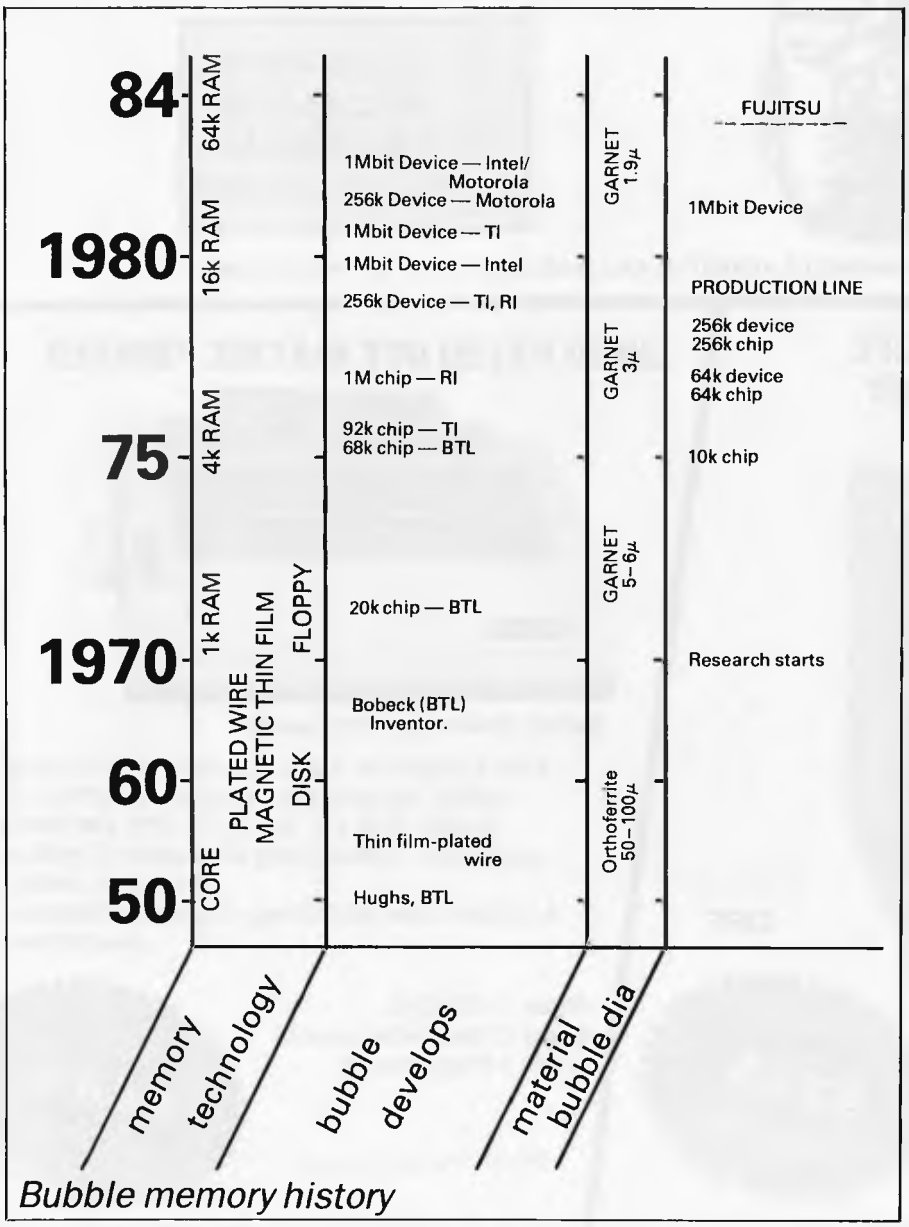
Each bubble can be thought of as a tiny cylindrical bar magnet floating in a sea of opposing magnetism. While it is surrounded it can only remain at its point of creation; but it does want to get away so it takes only the slightest change in the direction of the surrounding magnetic bias to make the bubble scurry off in exactly the right direction.

This indicates that a third component is required to alter the direction of the magnetic field surrounding the bubbles. The component takes the form of a pair of field coils enveloping the garnet integrated circuit and the bias magnet; the windings of the coils are at right angles to one another.

Now that we know that bubbles are highly mobile elements in the structure, we're a whisker away from understanding exactly how they're used as a data storage medium. Three more components are needed to complete our elementary bubble memory chip: the first is a means of creating a bubble in exactly the right position in the garnet; second is a method of detecting the presence of a bubble; and third is the capability of organising the movement and structuring the organisation of bubbles which have been generated.

Once you have these components, it's not difficult to understand that a bubble can be created to represent a bit of data and moved down a line of storage elements until all the elements have been used up in a typical write operation, or shifted down the line past the detector element, vacating storage elements, in a read operation. Data consisting of a series of ones and zeros will be represented by creating a bubble for a 'one' and not creating a bubble for a 'zero'.

The storage elements are very simple iron alloy 'stepping stones' for the bubbles. The elements are deposited on the surface of the garnet chip and the bubbles hop underneath the stepping stones within the garnet. It's also important that no permanent magnetic field can remain in the stepping stones, so they are made from magnetically 'soft' material.



*Bubble memory history*

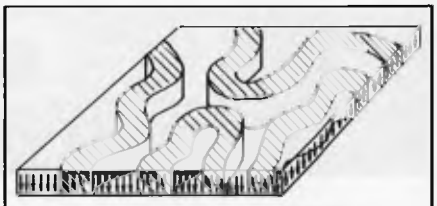


*Fig 1 The ferromagnetic garnet is self-magnetised to saturation although the magnetic forces are arranged into domains of opposite polarity, cancelling any overall magnetic effect. It will remain like this until an external magnetic force is applied.*

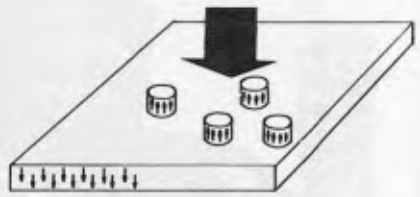


*Fig 2 At a critical point, the external magnetic force will bring the shrinking domains to a point where they become cylindrical in shape; these are the bubbles.*

*If the magnetic force applied to the garnet were increased beyond this point, the bubbles would reach a state of collapse and take on the polarity of the surrounding domain.*

## Simplicity

Organising the movement of bubbles is simplicity itself. By feeding alternating current through one of the field coils, it can be seen that an alternating magnetic force will be set up surrounding the garnet. If a similar current but 90 degrees out of phase with the first is sent to the second coil, another alternating magnetic force will surround the chip at right angles to the previous force. When both are working together, the result is the setting up of a rotating magnetic field. As the field rotates, the magnetic polarity of the specially shaped stepping stones is altered sequentially (Figs 3-7).

Unlike poles attract, so the bubble will move very quickly from its current position to the element displaying an opposite polarity to its own. Hopping from stepping stone to stepping stone as the polarity of the elements change, the bubbles form a con-

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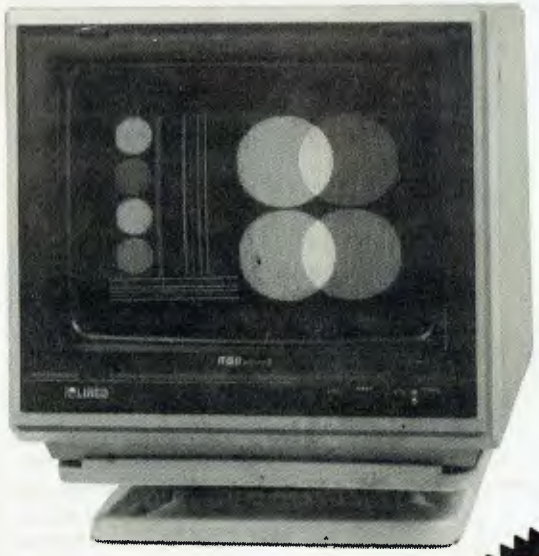

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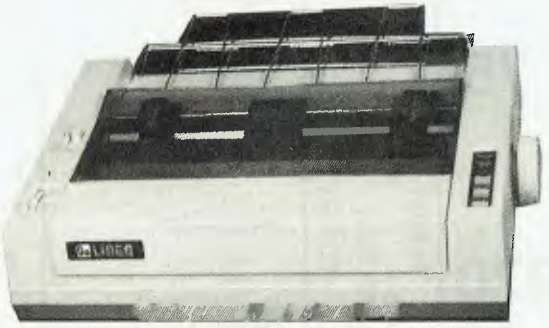

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tinuous stream of serial data.

If the current to the coils is stopped, so too is the movement of the bubbles. They remain static, safely stored by the field generated by the bias magnetic until the rotating field gets them on the move once more.

Log jams at the end of the line are easily avoidable by shunting bubbles into a storage loop, where they happily hop around in a circle until the music stops (Fig 8).

In this simplified description we have a bubble being generated at the beginning of a line, moved down the line step by step and then detected at the line end. Some storage capability has been indicated by the 'loop' structure but, at present, once the bubble comes to the end of the line for detection it is destroyed and lost forever.

In order to ensure that data can be read more than once, it's necessary to add yet another component to the bubble chip — a replicator. Instead of reading the bubbles which were originally stored, replica bubbles are created and a branch made in the line of stepping stones.

The original bubbles will now happily continue their looping forever and a day, with replicas shooting off down the branch to the end of the line for detection (reading) and ultimate destruction.

A chip constructed in the fashion described here would be workable but impractical. Remember that if the device is to compete with other mass storage systems, it must be capable of holding tens of thousands of bits. If all these bits are to be read sequentially, read and write timing will be excessive.

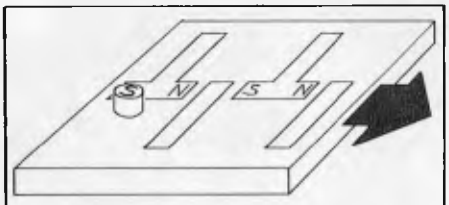



*Fig 3* ***Movement of a bubble****: the large arrow indicates the current direction of the rotating field. Soft iron elements take on the magnetic polarity of the rotating magnetic field, while the bubble within the garnet acts like a tiny bar magnet with a constant polarity. The field in this position attracts the bubble to the nearest 'south'. T-bar elements illustrate the principle, but more efficient elements such as asymmetric chevrons are more commonly used in bubble memory chips.*

If, for example, the frequency of the rotating drive field created by the bias coils is 50K Hz, this is the bit shift rate. Reading the last bit entered into a 64k chip would occur 1.28 seconds after write operation.

The solution is to have, instead of one

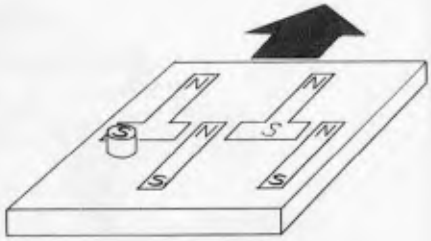



*Fig 4 First change in polarity for the elements forces the bubble to move to the centre of the 'T' element.*

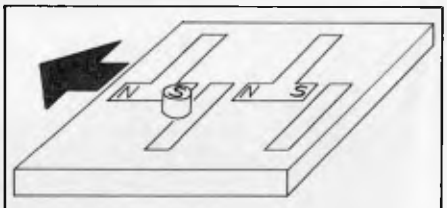
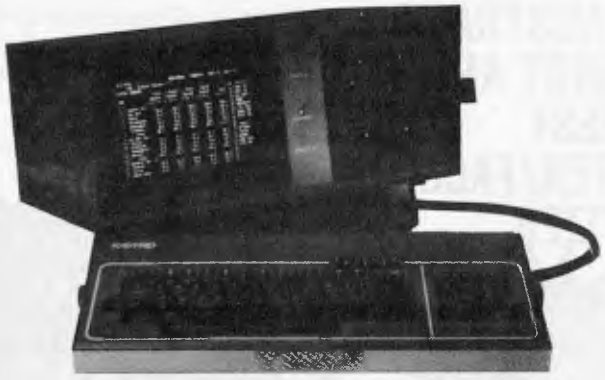



*Fig 5 Another change and another hop for the bubble.*

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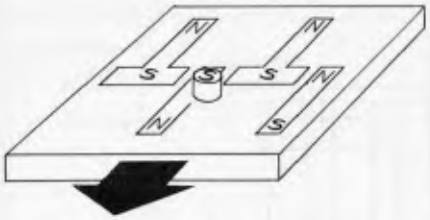

*Fig 6 End of the first cycle brings it to the last stop in that element.*

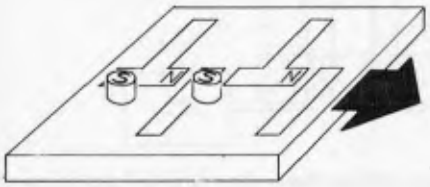

***Fig 7 First move in the second cycle takes our first bubble to the second element, and another bubble moves into the first element position.***

very long loop, a number of much shorter loops, each being accessed at the same time. This is achieved by having an input track which, once full of bubble data, transfers its data in a parallel operation into a number of loops. If the 64k chip is organised as 128 loops of 512 bits, no single bit is, theoretically, further away from the detector than 512 bits. Access time in a read operation is reduced to 10 milli-seconds compared with the previous time of over a second.

All these operations require very complicated and precise control signals, and a whole new family of bubble memory interface chips have been developed alongside bubble memories.

The circuitry needed to drive the bubble memory is fairly standard in electronic terms, but there are a few different processes to be controlled and synchronised.

The field coils, for example, have to be driven simultaneously to create a field rotation frequency of 50K Hz with an error margin of one per cent. Ensuring that both stop and start together without the typical problem of 'ringing' is a feat in itself; to synchronise, read, write, replicate, swap and destroy signals, all of which have their own sequence and timing characteristics, has been a major achievement in electronic engineering.

## Conclusion

The question still remains: have bubble memories missed the boat or will the totally solid state home computer be a reality in the future? My guess is that flexible magnetic media is already redundant technology, and that within a relatively short period of time the cost of bubble memories will plummet to a level which will make it comparable with a good floppy disk unit.


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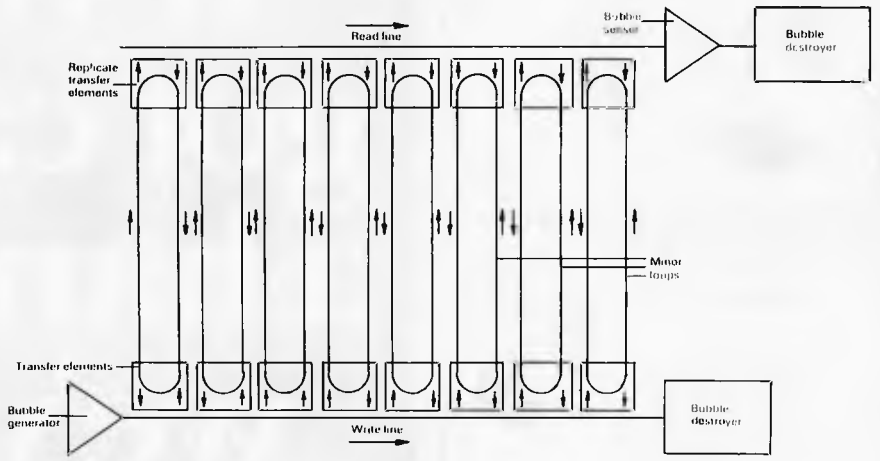


*Fig 8 Bubble memory is organised into loops. When the write line is full, bubbles will be transferred to the loops in parallel where they will loop until needed for replication/read.*

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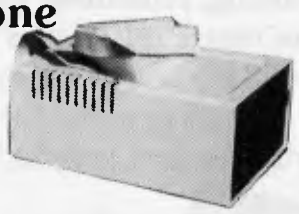

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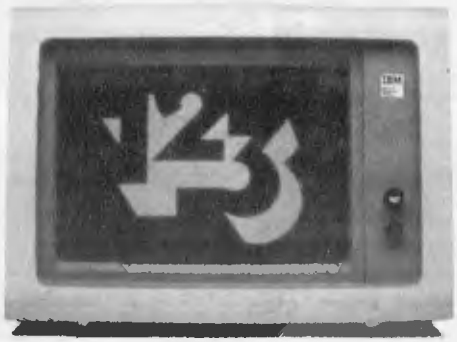

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# Atari Autorun

## by Steven Green

This useful disk-based utility produces an autorun menu from which machine code and Basic programs can be loaded, using only the SELECT and START keys.

Program one should be typed in and saved to disk as SAVE"D:MENU".

The second program can then be typed in and RUN. After running this program you should select DOS, option K — Binary Save to Disk. In answer to the prompt SAVE-GIVE FILE, START, END, (INIT, RUN) type AUTORUN.SYS, 0600, 0686, 0600. This sequence creates an autorun file which will run the menu program each time the drive is booted.

The menu will now load Basic and machine code programs (with the extender .OBJ) without the need to call DOS. The required program is selected using the SELECT key and loaded at a press of the START key.

It's also possible to delete, lock, unlock and rename files from the menu with use of CTRL and D, L, U and R keys respectively. Pressing the 2 key will produce a menu of the contents of drive two, and pressing D will call DOS.

```
PROGRAM 1, MENU
1 REM . S.P.GREEN


30000 DIM FA$(17),FB$(28),A$(16),C$(39
):FOR I=1 TO 39:C$(I,I)=" ":NEXT I:FB$
="D1:"
30005 POKE 580,1:CONSOL=53279:NAME=301
60:LINE=30170:KEY=764:V=3:H=0:R=0:K=0
30010 GRAPHICS 0:POKE 709,32:POKE 710,
40:POKE 712,40:POKE 82,2:POKE 65,0:POK
E KEY,255
```

```
30015 ? "}}":POSITION 13,0:? "  DISK
MENU   DRIVE ";FB$(2,2):? :?
30016 REM "}}"=ESC CTRL 2  ESC CTRL CL
EAR
30020 IF FB$(2,2)="1" THEN OPEN #1,6,0
,"D1:*.*"
30022 IF FB$(2,2)="2" THEN OPEN #1,6,0
,"D2:*.*"
30025 TRAP 30060:IF R=40 THEN 30070
30030 INPUT #1,FA$:IF FA$(5,8)="FREE"
THEN POSITION 12,1:? FA$;:POSITION H,V
:GOTO 30060
30033 IF FA$(3,5)="DOS" OR FA$(3,5)="D
UP" OR FA$(3,6)="MENU" OR FA$(3,9)="AU
TORUN" THEN 30025
30035 ? FA$(1,1);:FOR I=3 TO 10:IF FA$
(I,I)<>" " THEN ? FA$(I,I);:NEXT I
30040 IF FA$(11,11)<>" " THEN ? ".";:?
 FA$(11,13);:FOR I=I TO (LEN(FA$)-6):?
 " ";:NEXT I:? FA$(15,17):GOTO 30050
30045 FOR I=I TO LEN(FA$)-2:? " ";:NEX
T I:? FA$(15,17)
30050 R=R+1:IF R>19 THEN POKE 85,22:PO
KE 84,R-17
30055 GOTO 30025
30060 K=1:CLOSE #1:GOTO 30070
30070 TRAP 30180:POKE 752,0:POSITION 1
,23:? "PRESS SELECT OR START  (D=DOS)
      ";
30075 FOR LOOP=0 TO 0 STEP 0:IF V>22 A
ND H=0 THEN H=20:V=3
30080 IF R>19 THEN IF V>=R-17 AND H=20
 THEN V=3:H=0
30085 IF R<=19 THEN IF V>=R+3 THEN V=3
:H=0
30090 POSITION H,V:? " ";:IF PEEK(CONS
OL)=5 THEN V=V+1:FOR I=1 TO 50:NEXT I
30095 IF PEEK(CONSOL)=6 THEN GOSUB NAM
E:GOTO 30140
30100 IF PEEK(CONSOL)=3 AND R=40 THEN
FOR I=2 TO 22:POSITION 0,I:? C$:NEXT I
:R=0:POSITION 2,3:GOTO 30025
30110 IF PEEK(KEY)=186 THEN GOSUB NAME
:A$="Deleating => ":P=8:GOSUB LINE:XIO
 33,#1,0,0,FB$:GOTO 30005
30115 IF PEEK(KEY)=128 THEN GOSUB NAME
:A$="Locking => ":P=8:GOSUB LINE:XIO 3
5,#1,0,0,FB$:GOTO 30005
30120 IF PEEK(KEY)=139 THEN GOSUB NAME
:A$="Unlocking => ":P=8:GOSUB LINE:XIO
 36,#1,0,0,FB$:GOTO 30005
30125 IF PEEK(KEY)=168 THEN GOSUB NAME
:A$="New name for=>":P=0:GOSUB LINE:GO
SUB 30175:XIO 32,#1,0,0,FB$:GOTO 30005
30126 IF PEEK(KEY)=31 THEN FB$="D1:":P
```

```
OSITION 34,0:? FB$(2,2):GOTO 30005
30127 IF PEEK(KEY)=30 THEN FB$="D2:":P
OSITION 34,0:? FB$(2,2):GOTO 30005
30128 IF PEEK(KEY)=58 THEN POKE KEY,25
5:DOS
30129 POKE KEY,255
30130 NEXT LOOP
30140 IF FB$(4,4)=" " THEN 30005
30145 FOR I=4 TO LEN(FB$):FB$(I,I)=CHR
$(ASC(FB$(I,I))+128):NEXT I
30150 POSITION 0,23:? "Loading ";FB$(4
,LEN(FB$));:FOR I=LEN(FB$) TO 15:? " "
;:NEXT I:? "Please stand by..";:POSITI
ON H,V
30155 FOR I=4 TO LEN(FB$):FB$(I,I)=CHR
$(ASC(FB$(I,I))-128):NEXT I
30156 IF FB$(LEN(FB$)-2,LEN(FB$))="OBJ
" THEN 30200
30157 IF FB$(LEN(FB$)-2,LEN(FB$))="ENT
" THEN ENTER FB$
30158 RUN FB$
30160 FOR H=H+3 TO H+14:LOCATE H,V,X:I
F X<>32 THEN FB$(LEN(FB$)+1)=CHR$(X):N
EXT H
30165 POSITION H,V:PUT #6,X:RETURN
30170 POKE 752,1:POSITION 0,23:? C$;:P
OSITION P,23:? A$;FB$(4,LEN(FB$));:POK
E KEY,255:FOR I=1 TO 500:NEXT I:RETURN

30175 ? "}";:INPUT A$:? "}":FB$(LEN(FB
$)+1)=",":FB$(LEN(FB$)+1)=A$:RETURN
30176 REM "}"=ESC CTRL 2, "}"=ESC CTRL
 CLEAR
30180 POKE 752,1:? "}}":POSITION 17,10
:? "SORRY! ":POSITION 5,12:? "UNABLE T
O FOLLOW INSTRUCTIONS..."
30181 REM "}}"=ESC CTRL CLEAR ESC CTRL
 2
30185 POSITION 2,14:? "PLEASE CHECK  D
RIVES AND/OR FILESPECS   THEN   PRESS
 OPTION  FOR MENU."
30190 IF PEEK(CONSOL)<>3 THEN 30190
30195 RUN
30200 FOR A=1536 TO 1717:READ B:POKE A
,B:NEXT A
30210 DATA 162,16,32,173,6,134,207,104
,104,157,69,3,104,157,68,3,169,4,157,7
4,3,169,3,157,66
30220 DATA 3,32,86,228,16,3,76,166,6,1
69,203,157,68,3,169,0,157,69,3,169,2,1
57,72,3,169
30230 DATA 0,157,73,3,169,7,157,66,3,3
2,86,228,16,6,192,136,240,92,208,96,16
9,255,197,203,208
30240 DATA 4,197,204,240,210,169,205,1
57,68,3,169,0,157,69,3,32,86,228,16,2,
```

```
48,69,165,207,240
30250 DATA 14,165,203,141,224,2,165,20
4,141,225,2,169,0,133,207,165,203,157,
68,3,165,204,157,69,3
30260 DATA 165,205,56,229,203,157,72,3
,165,206,229,204,157,73,3,254,72,3,208
,3,254,73,3,32,86
30270 DATA 228,16,137,192,3,240,133,76
,166,6,32,173,6,108,224,2,152,133,212,
169,0,133,213,169,12
30280 DATA 157,66,3,32,86,228,96
30290 LO=USR(1536,ADR(FB$))
30300 GOTO 30180

PROGRAM 2, AUTORUN MENU
100 FOR N=1536 TO 1670
110 READ X:POKE N,X:NEXT N
120 END
10000 DATA 162,0,189,26,3,201,69,240,5
,232,232,232,208,244,232,142,105,6,189
,26
10010 DATA 3,133,205,169,107,157,26,3,
232,189,26,3,133,206,169,6,157,26,3,16
0
10020 DATA 0,162,16,177,205,153,107,6,
200,202,208,247,169,67,141,111,6,169,6
,141
10030 DATA 112,6,169,11,141,106,6,96,1
72,106,6,240,9,185,123,6,206,106,6,160
10040 DATA 1,96,138,72,174,105,6,165,2
05,157,26,3,232,165,206,157,26,3,104,1
70
10050 DATA 169,155,160,1,96,7,0,251,24
3,51,246,67,6,163,246,51,246,60,246,76
10060 DATA 228,243,249,0,34,85,78,69,7
7,58,68,34,78,85,82
```

# Commodore 64 Basic assembler

## by N Thomas

The intention when writing this program in Basic was to have a fully-working 'Basic' assembler with which to write a machine code version following the same methods and philosophy. In this way, all the principles to be used have been tested in the Basic program, and also, when eventually the assembler source is completed, it will be possible to amend the machine code very swiftly using the latest version of the program as the software (in Commodore tradition!) will be upward-compatible.

The program should be suitable for use with the VIC 20 and Pet computers, merely by changing line 5640. The value of 43 is the zero page location of start of Basic pointer on the 64 and should be changed to the relevant number for the computer used.

The outline method used in the program is as follows. The assembler source code is written as though it were Basic code — that is, with each line having its own line number. Start of code is signified by a square bracket, [, followed by the initial assembly address and then by an optional storage address (for assembly into free memory for subsequent transfer into the 'running' memory after completion of the assembly process). End of the source is signified by an optional close bracket, ]. The source code can be located anywhere, but from line 6000 on is obviously most suitable.

The assembler uses standard 6502 mnemonics and addressing mode conventions, and also includes the most useful pseudo-op codes. These are :

| | |
|---|---|
| *=N | Moves assembly to location 'N'. |
| *=*+N | Moves assembly on by 'N' bytes. |
| .DAT | Stores the integer value |

'N' in one byte if N<256, and in two bytes (lo-hi) if N>255.

.TXT 'ABC' Stores the ASCII codes for the text between the single quotes in the order in which it appears.

So-called 'variables' and labels are dealt with in a manner slightly different from most assemblers. Variables are assigned by superseding the variable name by a colon, for example:

120 :VARIAB=$FFD2 :COMMENT.

Note that the colon must be the first character on the line. Labels are more unusual in that they appear as the last word on the line and include a trailing colon, for example:

130 LDA (POINT),Y ;COMMENT-LOOP:

The main reason for having the label as the last word on the line is for improved formatting of the source.

The main principle used to convert mnemonics and operands into the relevant machine code is as follows:

MN$() Contains the 56 different mnemonics plus the two extra mnemonics .DAT and TXT.

MN%() AND MD%() Contain the corresponding fundamental op-codes and the number (from one to eight) of the relevant addressing method used by any particular op-code respectively.

MD$() Contains eight strings (plus one error string) corresponding to the eight possible addressing methods. As there are different addressing modes (immediate, accumulator, and so on), each string is 13 characters long with each character supplying the number divided by four which must be logically 'OR'ED to the fundamental op-code to give the final full code.

Thus, taking the following as an example:

200 LDA #$0D ;COMMENT

Subroutine 2100 searches for "LDA"
This results in MN=32
The fundamental code = MN%(32) = 161 ($A1)
The addressing method = MD%(32) = 1
Therefore, MD$(1)="231EE045E76EE"
Next, subroutine 2300 calculates the addressing mode used based on the operand "#$0D" and returns a value of 1
Extracting character 1 from MD$(1) gives 2
The final op-code = ($A1) or (2*4) = $A9
The total length of the instruction is extracted from IL$ which is in terms of the 13 addressing modes

If the operand is a variable or label, the source is searched for a variable of the same name and, if found, the variable is evaluated. If it's not found, then it's assumed to be a label and this is evaluated on the final pass of the assembler.

The length of the instruction is stored in the end-of-line byte of the line of source (normally zero). When the final assembly pass is calculating the label addresses, it sums these values so that no recalculation is necessary. Finally, on completion of the assembly (or on an error) the source code end-of-line bytes are reset back to zero.

It should be noted that if the assembly is halted for any reason, this tidying-up process should be forced by typing GOTO 3910.

The program as it stands can be rather slow at assembling long source files with many labels. The process can quite easily be speeded up by replacing the label search routine by equivalent machine code. The example source appended to the program shows a possible method of searching for the start of the source and this operates virtually instantaneously.

```
0 ::::::GOTO110:::BASIC ASSEMBLER::::::
1 ::::::::::::::::::N. THOMAS  1984::::::
2 ------------------------------------
3 :
4 :
5 :
100 --SPECIAL FUNCTIONS--
110 DEF FNA(X)=9*INT((X-48)/16)+X-INT(X/16)*16
120 DEF FNB(X)=X+48-7*(X>9 AND X<16)
130 DEF FNC(X)=PEEK(X)+256*PEEK(X+1)
140
150 PRINT"              BASIC ASSEMBLER"
160 PRINT:GOTO 5710
190 :
200 :
1000 --GET--
1010 E=1:IF PT+Y+2=FNC(PT) THEN RETURN
1020 Y=Y+1:C=PEEK(PT+Y):C$=CHR$(C)
1030 IF C$=":" OR C$=";" THEN E=2:RETURN
1040 IF C>127 THENC$=KW$(C AND 127)
1050 E=0:RETURN
1060 .
1100 --WORD--
1110 WD$=""
1120 GOSUB 1010:IF E<>0 THEN RETURN
1130 IF C=32 THEN 1150
1140 WD$=WD$+C$:GOTO 1120
1150 IF C=32 THEN GOSUB 1010:GOTO 1150
1160 Y=Y-1:RETURN
1170 .
1200 --HEX--
1210 K$="":IF K>255 THEN RETURN
1220 K1=INT(K/16)
1230 K$=CHR$(FNB(K1))
1240 K1=K-K1*16
1250 K$=K$+CHR$(FNB(K1))
1260 RETURN
1270 .
1300 --DOUBLE-HEX--
1310 K=INT(A/256)
```

```
1320 GOSUB 1210:N$=K$
1330 K=A-256*K
1340 GOSUB 1210:N$=N$+K$
1350 RETURN
1360 .
1400 --PRINTLINE--
1410 P$=RIGHT$("    "+STR$(FNC(PT+2)),5)
1420 L=0:GOSUB 1610:RETURN
1430 .
1500 --PRINT-AND-STORE--
1510 GOSUB 1210:P$=K$
1520 :
1530 IF LB>127 THEN LF=LF+1
1540 IF LF>1 THEN P$="**"
1550 GOSUB 1810
1560 POKE S,K  :REM --STORE--
1570 A=A+1:S=S+1
1580 RETURN
1590 .
1600 --END--
1610 E=1
1620 IF FNC(FNC(PT))=0 THEN E=2
1630 IF PEEK(FNC(PT)+4)=ASC("J")THEN E=2
1640 RETURN
1650 .
1700 --PRINT-ADDRESS--
1710 GOSUB 1310
1720 P$="."+N$:GOSUB 1810
1730 L=L+6:RETURN
1740 .
1800 --PRINT--
1810 L=L+LEN(P$)
1820 PRINT P$;
1830 IF DV<>0 THEN PRINT#DV,P$;
1840 RETURN
1850 .
1900 --NUMBER--
1910 N=0
1920 IF LEFT$(N$,1)="$" THEN 1960
1930 IF LEFT$(N$,1)="%" THEN 2000
1940 IF LEFT$(N$,1)="'" THEN 2040
1950 N=VAL(N$):RETURN
1960 N$=RIGHT$(Z$+MID$(N$,2),4)
1970 FOR I=1 TO 4
1980 N=N+16^(I-1)*FNR(ASC(MID$(N$,5-I,1)))
1990 NEXT:RETURN
2000 N$=RIGHT$(Z$+MID$(N$,2),8)
22010 FOR I=1 TO 8
2020 N=N+(ASC(MID$(N$,9-I,1))-48)*2^(I-1)
2030 NEXT:RETURN
2040 N=ASC(MID$(N$,2,1)):RETURN
2050 .
2100 --MNEMONIC SEARCH--
2110 M0=1:M1=58
2120 MN=M0+INT((M1-M0)/2)
2130 IF MN$(MN)=MN$ THEN RETURN
2140 IF M1-M0 < 4 THEN 2170
2150 IF MN$(MN)<MN$ THEN M1=MN:GOTO 2120
2160 M0=MN:GOTO 2120
2170 MN=M0-1
2180 MN=MN+1:IF MN$=MN$(MN) THEN RETURN
2190 IF MN<>M1 THEN 2180
2200 MN=0:RETURN
2210 .
2300 --ADDRESSING MODE--
2310 IF LEFT$(MN$,1)="B" AND MN$<>"BRK" THEN AD=12:RETURN
2320 IF AD$="#" THEN AD=1:RETURN
2330 IIF AD$<>"" THEN 2380
2340 IF OP$="" THEN AD=4:RETURN
2350 IF LEFT$(MN$,1)="J" THEN 2370
2360 IF N<256 THEN AD=3:RETURN
2370 AD=2:RETURN
2380 IF AD$="A" THEN AD=5:RETURN
2390 IF AD$="(,X)" THEN AD=6:RETURN
2400 IF AD$="(),Y" THEN AD=7:RETURN
2410 IF AD$<>",X" THEN 2440
2420 IF N<256 THEN AD=8:RETURN
2430 AD=10:RETURN
2440 IF AD$<>",Y" THEN 2470
2450 IF N<256 THEN AD=9:RETURN
2460 AD=11:RETURN
2470 IF AD$="()" THEN AD=13:RETURN
2480 AD=0:RETURN
2490 .
2500 --PARSE OPERAND--
2510 OP=0:LW=LEN(WD$):N1=0:NF=N1:OP$="":AD$=OP$
2520 IF LW=0 THEN RETURN
2530 IF LW=1 AND WD$="A" THEN AD$=WD$:RETURN
2540 I=1:T2$=""
2550 T1$=MID$(WD$,I,1):T1=ASC(T1$)
2560 IF T1$="("OR T1$=")"OR T1$="#"OR T1$="," THEN AD$=AD$+T1$:GOTO2610
```

```
2570 IF T1$="X"OR T1$="Y" THEN IF T2$="," THEN AD$=AD$+T1$:GOTO2610
2580 IF T1$="'"OR T1$="$"OR T1$="%"OR (T1$>="0"AND T1$<="9")AND OP=0 THEN NF=1
2590 IF T1=43 OR T1=45 THEN OP=LEN(OP$)+1
2600  OP$=OP$+T1$
2610 T2$=T1$:IF I<LW THEN I=I+1:GOTO 2550
2620 IF OP=0 THEN RETURN
2630 NI=VAL(MID$(OP$,OP))
2640 OP$=MID$(OP$,1,OP-1)
2650 RETURN
2660 .
2700 --VARIABLE SEARCH--
2710 P1=PT:PT=PS
2720 PT=FNC(PT):Y=3
2730 GOSUB 1010
2740 IF C$<>"." THEN 2810
2750 GOSUB 1110
2760 IF LEN(OP$)>LEN(WD$)+2 THEN 2810
2770 IF LEFT$(WD$,LEN(OP$))<>OP$ THEN 2810
2780 N$=MID$(WD$,LEN(OP$)+2)
2790 GOSUB 1910
2800 VF=2:PT=P1:RETURN
2810 GOSUB 1610
2820 IF E=1 THEN 2720
2830 VF=1:PT=P1:RETURN
2840 .
3000 --PROGRAM START--
3010 ----------------
3020 GOSUB 5010:REM ..INITIALISE..
3030 GOSUB 5610:REM ..FIND SOURCE..
3035 PRINT"FOUND AT"PS:PT=PS
3040 Y=4:GOSUB 1110:REM ..WORD..
3050 N$=WD$:GOSUB 1910:REM ..NUMBER..
3060 PRINT "START OF CODE AT ";
3070 K=N:GOSUB 1210
3080 PRINT WD$"  "N
3090 AS=N
3100 IF E=0 THEN GOSUB 1110
3110 N$=WD$:GOSUB 1910
3120 PRINT "        STORE AT ";
3130 K=N:GOSUB 1210
3140 PRINT WD$"  "N
3150 SS=N:S=SS:A=AS
3160 PRINT:INPUT "CONTINUE  N OR <R>";Q1$
3170 IF Q1$<>"" THEN END
3180 PRINT
3190 :
3200 PT=FNC(PT):L=0:LF=0:REM..NEWLINE..
3210 GOSUB 1410:GOSUB 1710:WD$=""
3215 VF=1:LB$=""
3220 Y=3:GOSUB 1010:IF E<>2 THEN Y=3:VF=0
3224 IF C$="," THEN 3230
3225 IF C$="*" THEN 4410
3226 IF E<>1 THEN GOSUB 1110
3230 MN$=WD$:WD$=""
3240 IF E<>0 THEN 3260
3250 GOSUB 1110:Y1=Y
3260 GOSUB 2510
3270 C=FNC(PT)-2
3280 IF CHR$(PEEK(C))<>"." THEN 3335
3290 Y=C-PT
3300 Y=Y-2:GOSUB 1010
3310 IF C$=" " OR C=32 THEN 3335
3320 LB$=C$+LB$
3330 GOTO 3300
3335 Y=Y1:IF MN$<>".TXT" THEN 3360
3342 IF RIGHT$(OP$,1)="'" THEN 3350
3344 GOSUB 1110:OP$=OP$+" "+WD$
3346 IF E<>1 THEN 3342
3350 WD$=OP$
3360 P$=LEFT$(" "+MN$+" "+WD$+BL$,38-L-LEN(LB$))+LB$+"
3370 GOSUB 1810
3375 IF LEFT$(MN$,1)="*" THEN 3750
3376 IF VF=1 THEN 3750
3380 GOSUB 2110
3390 IF MD%(MN)=9 THEN 4810
3400 IF MN>0 THEN 3430
3410 P$=" [illegible]" GOSUB 1810
3420 GOTO 3910
3430 IF NF=1 THEN 3490
3440 IF OP$="" THEN N=0:GOTO 3520
3450 GOSUB 2710
3460 IF VF=2 THEN 3510
3470 LB=128:N$="256":GOTO 3500
3480 :
3490 N$=OP$
3500 GOSUB 1910
3510 N=N+N1
3520 GOSUB 2910:REM ..ADR MODE
3530 IF PD<>0 THEN 3560
```

```
3540 P$=" ?? ADR MODE":GOSUB 1810
3550 GOTO 3910
3560 IL=VAL(MID$(IL$,AD,1))
3570 MD=MD%(MN)
3580 K=MN%(MN) AND MK%(MD)
3590 T$=MID$(MD$(MD),AD,1)
3600 IF T$<>"E" THEN 3620
3605 IF AD=9 THEN AD=11:GOTO 3560
3610 IF AD=8 THEN AD=10:GOTO 3560
3615 GOTO 3540
3620 K=K OR (4*VAL(T$))
3630
3650 GOSUB 1510  REM  PRINT+STORE
3660 IF IL=1 THEN 3730
3670 N1=INT(N/256)
3680 K=N-256*N1
3690 GOSUB 1510
3700 IF IL=2 THEN 3730
3710 K=N1
3720 GOSUB 1510
3730 LB=LB+IL
3740 REM---------------
3750 POKE FNC(PT)-1,LB
3760 LB=0:P$=CHR$(13):GOSUB 1810
3770 GOSUB1610
3780 ON E GOTO 3200,3810
3790 .
3799 STOP
3800 --FIND LABELS--
3810 P$=P$+"END OF MAIN PASS"+P$+P$+"SEARCHING FOR LABELS"+P$+P$
3820 GOSUB 1810
3830 PT=PS:A=AS:S=SS
3840 PT=FNC(PT)
3850 GOSUB 4010:GOSUB 1610
3860 ON E GOTO 3840,3910
3870 .
3900 --TIDY UP--
3910 PT=PS
3920 PT=FNC(PT)
3930 POKE FNC(PT)-1,0
3940 GOSUB 1610
3950 IF E=1 THEN 3920
3960 IF DV=4 THEN CLOSE DV
3970 PRINTDN$"END":END:------------------:END:
3980 ----------------
3990 :
4000 --LABELS--
4010 IL=PEEK(FNC(PT)-1)
4020 IF IL>127 THEN 4060
4030 A=A+IL:S=S+IL
4040 RETURN
4050 :
4060 IF IL=255 THEN 4710
4070 IL=IL AND 127
4080 Y=3:GOSUB 1110:MN$=WD$:GOSUB 1110
4085 LB$=WD$
4090 GOSUB 1410:GOSUB 2510 :REM   SPLIT INTO OP$
4100 P1=PT:PT=PS:A1=AS
4110 PT=FNC(PT)
4120 C=FNC(PT)-2
4125 C1=PEEK(C+1)
4130 IF C1<>255 THEN C1=127 AND C1:GOTO 4140
4135 Y=5:GOSUB 1110:N$=WD$:GOSUB 1910
4136 C1=N-A1
4140 IF CHR$(PEEK(C))="." THEN 4190
4150 A1=A1+C1
4160 GOSUB 1610
4170 IF E=1 THEN 4110
4180 PT=P1:P$="NOT FOUND":GOSUB 1810:GOTO 3910          ABORT
4190 T$="" VF=1:Y=C-PT
4200 Y=Y-2:GOSUB 1010
4210 T$=C$+T$:IF T$=OP$ THEN 4250
4220 IF LEN(T$)<LEN(OP$) THEN 4200
4230 VF=0:GOTO 4150
4240 GOSUB 1810:GOTO 3910
4250 REM
4255 GOSUB 1710
4256 P$=LEFT$(" "+MN$+"  "+LB$+BL$,41-L)
4257 GOSUB 1810
4260 A1=A1+N1:A=A+1:S=S+1
4270 IF IL=2 THEN 4340
4280 K=A1-INT(A1/256)*256
4290 GOSUB 1510
4300 K=INT(A1/256)
4310 GOSUB 1510
4315 P$=CHR$(13):GOSUB 1810
4320 PT=P1:RETURN
4330 .
4340 K=A1-A
4350 IF K>127 OR -K>126 THEN K=0:P$=CHR$(13)+"TOO BIG":GOSUB1910:GOTO 4310
```

```
4360 K=K-1:IF K<0 THEN K=256+K
4370 GOTO 4310
4380 .
4400 --* PSEUDO OP--
4410 Y=4:GOSUB 1010
4420 IF C$<>"=" THEN 3910
4430 GOSUB 1110
4435 MN$="*="+WD$:
4440 IF LEFT$(WD$,1)="*"  THEN 4550
4450 N$=WD$:GOSUB 1910
4460 IF N>A THEN 4500
4470 PRINT"WARNING: NEW ADDR<OLD"
4480 INPUT "CONTINUE  N OR <R>";Q2$
4490 IF Q2$<>"" THEN 3910
4500 S=S+N-A
4510 A=N:LB=255
4520 WD$="" GOTO 3270
4530 .
4550 N$=MID$(WD$,3)
4560 GOSUB 1910
4570 IF N<128 THEN 4590
4580 PRINT"STEP>127??" N=127
4590 A=A+N:S=S+N
4600 LB=N
4610 WD$="" GOTO 3270
4620 .
4700 --NEW ADDR--
4710 Y=5:GOSUB 1110
4720 N$=WD$:GOSUB 1910
4730 S=S+N-A
4740 A=N
4750 RETURN
4760 .
4800 --',' PSEUDO OP--
4810 ON MN%(MN) GOTO 4830,4900
4815 REM  .DAT  .TXT
4820 GOTO 3410
4825 REM  LB=1:GOSUB 1510: GOTO 3750
4830 N$=OP$:GOSUB 1910:N1=N
4840 LB=1:IF N<256 THEN 4880
4850 N1=INT(N/256)
4860 K=N-256*N1
4870 GOSUB 1510:LB=2
4880 K=N1:GOSUB 1510
4890 GOTO 3750
4900 '
4910 LB=0
4920 FOR I=1 TO LEN(OP$)
4930 K=ASC(MID$(OP$,I,1))
4940 IF K=ASC("'") THEN 4960
4950 LB=LB+1:GOSUB 1510
4960 NEXT:GOTO 3750
4995 .
5000 --INITIALISE--
5010 DIM KW$(75)
5020 DIM MN$(58)
5030 DIM MN%(58)
5040 DIM MD$(7)
5050 DIM MK%(7)
5060 DIM MD%(58)
5080 Z$="00000000":SL$="                "
5090 IL$="2321122223323"
5095 UP$="":DN$="":HM$=""
5100 I=40960+157:J=0 : REM  KEYWORD STORED ON CBM64 HERE : CHANGE FOR VIC & PET
5110 I=I+1:KW$(J)=KW$(J)+CHR$(PEEK(I)AND127):IF PEEK(I)<128 THEN 5110
5115 PRINT HM$;DN$;DN$;DN$;KW$(J)"    "
5120 J=J+1:IF J<76 THEN 5110
5130 PRINT UP$"KEYWORDS SET UP"
5140 '
5150 FOR J=1 TO 58
5160 READ MN$(J),MD%(J),MN%(J)
5170 NEXT J
5180 '
5190 FOR J=0 TO 7
5200 READ MD$(J),MK%(J)
5210 NEXT J
5220 '
5230 RETURN
5235 DATA .DAT,9,1,.TXT,9,2
5240 DATA ADC,1,97,AND,1,33,ASL,3,6
5250 DATA BCC,0,144,BCS,0,176,BEQ,0,240
5260 DATA BIT,6,36,BMI,0,48,BNE,0,208
5270 DATA BPL,0,16,BRK,0,0,BVC,0,80
5280 DATA BVS,0,112,CLC,0,24,CLD,0,216
5290 DATA CLI,0,88,CLV,0,184,CMP,1,193
5300 DATA CPX,4,224,CPY,4,192,DEC,2,198
5310 DATA DEX,0,202,DEY,0,136,EOR,1,65
5320 DATA INC,2,230,INX,0,232,INY,0,200
5330 DATA JMP,7,76,JSR,0,32,LDA,1,1C1
5340 DATA LDX,5,162,LDY,5,160,LSR,3,74
```

```
5350 DATA NOP,0,234,ORA,1,1,PHA,0,72
5360 DATA PHP,0,8,PLA,0,104,PLP,0,40
5370 DATA ROL,3,42,ROR,3,106,RTI,0,64
5380 DATA RTS,0,96,SBC,1,225,SEC,0,56
5390 DATA SED,0,248,SEI,0,120,STA,1,129
5400 DATA STX,2,134,STY,2,132,TAX,0,170
5410 DATA TAY,0,168,TSX,0,186,TXA,0,138
5420 DATA TXS,0,154,TYA,0,152
5430 DATA 0000000000000,255
5440 DATA 231EE045E7EEC,227
5450 DATA E20EEEC4C6CEC,231
5460 DATA E31E2EE5577EE,227
5470 DATA 031EEEEEEEEEE,243
5480 DATA 031EEEE5577EE,227
5490 DATA E20EEEEEEEEEE,247
5500 DATA E0EEEEEEEEEE0,223
5600 --FIND SOURCE--
5610 PRINT"SEARCHING FOR SOURCE"
5620 PS=10637:REM FIRST TRY
5630 IF CHR$(PEEK(PS+4))="E" THEN RETURN
5640 PS=FNC(43)   REM THIS IS START OF BASIC ON CBM64   CHANGE FOR VIC & PET
5650 IF CHR$(PEEK(PS+4))="E" THEN RETURN
5660 PS=FNC(PS):PRINTFNC(PS+2)UP$
5670 IF PS<>0 THEN 5650
5680 PS=0
5690 PRINT"NOT FOUND":STOP
5700 --OUTPUT DEVICE--
5710 INPUT "OUTPUT TO PRINTER, Y/N";Q3$
5720 DV=0 IF Q3$<>"Y" THEN 3020
5730 DV=4:OPEN DV,DV
5740 GOTO 3020
5750 ------------------------------
```

# Apple II Menu

## by Mike Norris

This neat little routine for Apple users prsents a menu of options on the screen with one displayed in reverse mode. This option can be selected by pressing the RETURN key, or you can move on to another option by pressing the space bar. This then highlights the next choice down in reverse mode, and so on.

Pressing the space bar when the last menu item is highlighted returns you to the first option.

The programs referee feels that it will help a user in selecting the right menu option, as the highlighting focuses attention on one item at a time.

```
  120  LET STROBE =  - 16368: LET KEY =  - 16384
  140  DIM MENU$(10)
  160  DATA 5
  180  DATA     ***  MAIN MENU  ***
  200  DATA GO FOR A WALK
  220  DATA PLAY WITH THE COMPUTER
  240  DATA WATCH T.V.
  260  DATA READ A BOOK
  280  DATA EXIT
  300  REM
  400  READ MANY
  420  FOR J = 0 TO MANY
  440  READ MENU$(J)
  460  NEXT J
  500  REM
  520  GOSUB 10000
  540  HOME : VTAB 10
  560  PRINT "SO YOU WANT TO ";MENU$(CHOICE)
  580  VTAB 23
  600  END
  990  REM
10000  REM  MENU
10020  HOME : VTAB 2: HTAB 20 -  LEN (MENU$(0)) / 2
10040  INVERSE : PRINT MENU$(0): NORMAL
10060  LET MODE = 0
10080  FOR J = 1 TO MANY
10100  GOSUB 20000
10120  NEXT
10140  VTAB 24: HTAB 1
10160  PRINT "SPACE BAR TO CHOOSE. RETURN TO GO";
10180  LET CHOICE = 1
```

```
10200  LET MODE = 1: LET J = CHOICE: GOSUB 20000
10220  POKE STROBE,0
10240  LET HIT =  PEEK (KEY),
10260  IF HIT < 128 THEN  GOTO 10240
10280  LET HIT = HIT - 128
10300  IF HIT <  > 13 AND HIT <  > 32 THEN  GOTO 10220
10320  IF HIT = 13 THEN  RETURN
10340  LET MODE = 0: LET J = CHOICE: GOSUB 20000
10360  LET CHOICE = CHOICE + 1
10380  IF CHOICE > MANY THEN  LET CHOICE = 1
10400  GOTO 10200
19990  REM
20000  REM PRINT OPTION `J`
20020  VTAB 2 * J + 4: HTAB 20 -  LEN (MENU$(J)) / 2
20040  IF MODE = 1 THEN  INVERSE
20060  PRINT MENU$(J)
20080  NORMAL
20100  RETURN
29990  REM
63000 D$ =  CHR$ (4): PRINT D$: PRINT D$;"SAVE MENU2"
```

# BBC Equation solver

## by Philip Tudor

'Equation solver' is a novel application of a database-style program which is used to store, amend and delete a database of up to 200 expressions and, of course, solve them. It will be particularly useful to engineers, statisticians and others who regularly use complex formulae.

The program is menu-driven and has the following options:

1 Solve: the user selects the expression by its name or location; and is then prompted for the equation's unknowns and the answer is printed.

2 Learn: the user enters the expression and its name (which is checked before storing)

3 Delete: removes any expression

4 Menu: prints out a numbered list of all expressions held on either the screen or a printer

5 Dump: causes all screen output to be duplicated on a printer

6 Screen: turns off dump

7 Search: prints full details about an expression (name, location, expression, and so on, by entering only the name, part of name, location or expression

8 Load: load an expression from tape or disk

9 Save: save to tape or disk between two specified locations (to save all, specify top and bottom locations)

The equation limit of 200 expressions can be altered by changing the variable T% in line 2010.

There is one slight flaw that disk users should be aware of: when equations are saved, a new disk file is created. Should this fail, perhaps because the disk is full, then no error message is displayed. Consequently, the program fails to load.

```
LIST
   10REM ********************
   20REM **EQUATION SOLVER.**
   30REM **    BY:P.TUDOR    **
   40REM **    MARCH 1983    **
   50REM ********************
   60MODE7
   70PROCINITIALIZE
   80PROCTITLE
   90PROCEXPLAIN
  100TEST=0:PROCSELECTION:GOTO 1100+(10*VAL(A$))
  110PROCSOLVE:PROCCLS:GOTO100
  120PROCLEARN:PROCCLS:GOTO100
  130PROCDELETE:PROCCLS:GOTO100
  140PROCMENU:PROCCLS:GOTO100
  150PROCDUMP:PROCCLS:GOTO100
  160PROCSCREEN:PROCCLS:GOTO100
  170PROCSEARCH:PROCCLS:GOTO100
  180PROCLOAD:PROCCLS:GOTO100
  190PROCSAVE:PROCCLS:GOTO100
  200REM**TITLE**
  210DEFPROCTITLE
  220PROCCLS:IF POS=1THENPRINT'"  **EQUATION SOLVER**"';:GOTO230:ELSE:PRINT:FOR
I=1TO2:VDU141,134:PRINT"       **Equation Solver**":NEXT
  230ENDPROC
  240REM**EXPLAIN**
  250DEFPROCEXPLAIN
  260PRINT"'Equation Solver' has a variety of" "commands to help you solve equat
ions""more quickly and easily. You can teach" "it formulae, load & save formula
e and""it also incorporates a comprehensive"
  270PRINT"search system. It accepts commands in" "either case. ('ESCAPE' to ex
t.)"
  280ENDPROC
  290REM**SELECTION**
  300DEFPROCSELECTION
  310PRINT'CHR$131;"A list of 'COMMAND' words follows"
```

```
320PRINT'CHR$134"1."CHR$135"Solve...Select equation and solve."
330PRINTCHR$134"2."CHR$135"Learn...Add new formula to memory."
340PRINTCHR$134"3."CHR$135"Delete..Remove a formula from RAM."
350PRINTCHR$134"4."CHR$135"Menu....Print out formulae in RAM."
360PRINTCHR$134"5."CHR$135"Dump....Produce a hardcopy output."
370PRINTCHR$134"6."CHR$135"Screen..Produce only monitor copy."
380PRINTCHR$134"7."CHR$135"Search..Search memory for formula."
390PRINTCHR$134"8."CHR$135"Load....Formulae,cass/disk to RAM."
400PRINTCHR$134"9."CHR$135"Save....Formulae,RAM to cass/disk."
410PRINT'"          ENTER COMMAND NUMBER."
420ONERRORGOTO2040
430A$=GET$:IFVAL(A$)>9ORVAL(A$)<1THEN430
440ENDPROC
450REM**LOAD**
460DEFPROCLOAD
470PROCCLS:PRINT'"LOAD:"''"Do you want to use cassette or disk      drive (C or
D) ?":A$=GET$:PROCCHECK(A$):A$=R$:IFA$<>"D"AND A$<>"C"THEN470:*TAPE
480IFA$="D"THEN *DISC
490PRINT'"Do you want to add the formulae on ";:IFA$="D"THENPRINT"disc":ELSE:P
RINT"tape"
500PRINT"to those in RAM or erase them before    starting (A or E) ?"
510A$=GET$:PROCCHECK(A$):A$=R$:IFA$<>"E"AND A$<>"A"THEN490
520IFA$="E"THEN N%=0
530IFA$="T"THENPRINT'"Please PRESS play on TAPE drive."
540Y=OPENUP"FORMULA":REPEAT:N%=N%+1
550INPUT£Y,A$(N%),C$(N%),U$(N%):UNTIL EOF£Y
560CLOSE£Y



570ENDPROC
580REM**SAVE**
590DEFPROCSAVE
600PROCCLS:PRINT'"SAVE:"':IFN%=0 PRINT"There are no formulae in RAM to be
 saved."''P$:A$=GET$:ENDPROC:ELSEPRINT'"Do you want to use cassette or disk
drive (C or D) ?":A$=GET$:PROCCHECK(A$):A$=R$:IFA$<>"D"AND A$<>"C"THEN600:*TAP
610IFA$="C"THEN660
620*DISC
630PRINT'"Do you want to destroy the old file of  formulae ?":Z$=GET$:PROCCHEC
K(Z$):Z$=R$
640IF Z$="Y"THEN *ACCESS FORMULA
650IF Z$="Y"THEN *DELETE FORMULA
660PRINT'"Which section of RAM do you wish to save(enter locations when prompt
od)"
670INPUT'"From:",A%:INPUT'"To:",B%:IFA%<1ORB%<1ORB%>N%THENPRINT'"Please use nu
mbers above 0 and that      exist in RAM.":GOTO670:ELSE:X%=A%
680PRINT
690Y=OPENOUT"FORMULA"
700REPEAT
710PRINT£Y,A$(X%),C$(X%),U$(X%):X%=X%+1:UNTIL X%=B%+1:CLOSE£Y:IF A$="D"THEN *A
CCESS FORMULA L
720ENDPROC
730REM**PRINTER OUTPUT**
740DEFPROCOUMP
750*FX5,1
760*FX6,1
770*FX8,4
780VDU2:P0%=1
790ENDPROC
800REM**MONITOR ONLY**
810DEFPROCSCREEN
820VDU3:P0%=0
830ENDPROC
840REM**SEARCH FOR FORMULA**
850DEFPROCSEARCH
860PROCCLS:PRINT'"SEARCH:"':IFN%=0 PRINT"There are no formulae in RAM to be
    searched"''P$:A$=GET$:ENDPROC:ELSE:PRINT"Do you want to search for the equa
tion  by its NAME, FORMULA or LOCATION in the menu ()";N%;")"
870PRINT'"Enter 'N','F' or 'L' ?"
880A$=GET$:PROCCHECK(A$):A$=R$:IFA$="N"THEN890ELSE IFA$="F"THEN990ELSE IFA$="L
"THEN1020 ELSE880
890PRINT'"Do you know the full name (Y or N)"
900A$=GET$:PROCCHECK(A$):A$=R$:IFA$="Y"THEN940ELSE IFA$="N"THEN910ELSE900
910PROCCLS:PRINT'"Please enter as much of it as possible  (e.g. ADRATI for QUA
DRATIC) ?"
920INPUTN$:PROCCHECK(N$):N$=R$:IFN$=""THEN920ELSE P%=0:FORL%=1TON%:IF INSTR(C$
(L%),N$)>0 THENPRINT'"Formula:";A$(L%)'"Name:";C$(L%)'"Location:";I%:P%=1:NEXT
NTP$:A$=GET$:NEXT:ELSE:NEXT
930IFP%=0THENPRINT'"There are no formulae with names         containing ";N$:GO
TO970ELSE970
940INPUT'"What name is the desired formula stored under",N$:PROCCHECK(N$):N$=R
$
950P%=0:FORI%=1TON%:IFC$(I%)=N$THENP%=1:PRINT'"Formula:";A$(I%)'"Name:";C$(I%
)'"Location:";I%'"P$:A$=GET$:NEXT:ELSE:NEXT
960IFP%=0THENPRINT'"There are no formulae stored under the   name of ";N$:GOTO
970
970PRINT'"Do you want another search (Y or N) ?"
980A$=GET$:PROCCHECK(A$):A$=R$:IFA$="Y"THENB60ELSE IFA$="N"THEN ENDPROC ELSE98
0
990PRINT'"Enter the formula";:INPUTN$:PROCCHECK(N$):N$=R$
1000FORI%=1TON%:IFA$(I%)=N$THEN1040:ELSE NEXT
1010PRINT'"There is no such formula in RAM"'"Do you want another search (Y
N) ?":A$=GET$:PROCCHECK(A$):A$=R$:IFA$="Y"THEN860ELSE ENDPROC



1020PRINT'"What LOCATION is the formula (1-";N%;") ";
1030INPUTI%:IFI%>N% OR I%<1THEN1030ELSE 1040
1040PROCCLS:PRINT'"Formula:";A$(I%)'"Name:";C$(I%)'"Location:";I%'
1050PRINT'P$:A$=GET$:ENDPROC
1060REM**DELETE A FORMULA**
1070DEFPROCDELETE
1080PROCCLS:PRINT'"DELETE:":IFN%=0THENPRINT'"There are no formulae in RAM to de
lete."''P$:A$=GET$:ENDPROC
1090PRINT'"Do you want to DELETE the formula by    NAME or FORMULA (N or F)?"
1100A$=GET$:PROCCHECK(A$):A$=R$:IFA$="N"THEN1110ELSE IFA$="F"THEN1200ELSE1090
1110PRINT'"Enter the NAME of the formula";:INPUTN$:PROCCHECK(N$):N$=R$
1120FORI%=1TON%:IFC$(I%)=N$THENF%=1 ELSE NEXT
1130IFF%<>1THENPRINT'"There is no formula in RAM with that    name":GOTO1150:EL
SE F%=0
1140PRINT'"Formula:";A$(I%)'"Name:";C$(I%)
1150PRINT"Are you sure (Y or N) ?"
1160A$=GET$:PROCCHECK(A$):A$=R$:IFA$="Y"THEN1170ELSE IFA$="N"THEN1110 ELSE 1160
1170PRINT'"DELETED":C$(I%)="":A$(I%)="":U$(I%)=""
1180A%=0:FORI%=1TON%:IFC$(I%)<>""THENA%=A%+1:C$(A%)=C$(I%):A$(A%)=A$(I%):U$(A%)
=U$(I%):NEXT ELSE NEXT
1190N%=A%:PRINT'P$:A$=GET$:ENDPROC
```

```
1200PRINT'"Enter the formula to be DELETED";:INPUTN$:PROCCHECK(N$):N$=R$
1210FORI%=1TONX:IFA$(I%)=N$THENF%=1:ELSE NEXT
1220IFF%<>1THENPRINT'"There is no such formula in RAM":GOTO1200:ELSE F%=0
1230PRINT'"Formula:";A$(I%)'"Name:";C$(I%)'
1240PRINT"Are you sure (Y or N) ?"
1250A$=GET$:PROCCHECK(A$):A$=R$:IFA$="Y"THEN1260 ELSE IFA$="N"THEN1200 ELSE I25
0
1260PRINT'"DELETED":C$(I%)="":A$(I%)="":U$(I%)=""
1270AX=0:FORI%=1TONX:IFC$(I%)<>""THENAX=AX+1:C$(AX)=C$(I%):A$(AX)=A$(I%):U$(AX)
=U$(I%):NEXT ELSE NEXT
1280NX=AX:PRINT'P$:A$=GET$:ENDPROC
1290REM**MENU**
1300DEFPROCMENU
1310PROCCLS:PRINT'"MENU:":IFNX=0THENPRINT'"The store is empty"'';P$:A$=GET$:END
PROC:ELSE FORI%=1TONX:PRINT';I%;".";C$(I%);'';TAB(2);A$(I%),'';P$:A$=GET$:NEXT:E
NDPROC
1320REM**LEARN**
1330DEFPROCLEARN
1340LEARN=TRUE:PROCCLS:PRINT'"LEARN:":IFNX+1>T%THENPRINT'"The program has reac
ed its MAXIMUM      capacity":PRINT'P$:A$=GET$:ENDPROC:ELSE NX=NX+1
1350PRINT'"Enter the name of the NEW formula"
1360INPUTC$(NX):PROCCHECK(C$(NX)):C$(NX)=R$:IFC$(NX)=""THEN1360
1370PRINT'"Enter the NEW formula (Unknowns, 1 chr.)":
1380INPUTA$(NX):PROCCHECK(A$(NX)):A$(NX)=R$:IFA$(NX)=""THEN1380
1390p%=0:p1%=0:FORI%=1TOLEN(A$(NX)):x$=MID$(A$(NX),I%,1):IF:x$="("THENp%=p%+1:E
LSE IFx$=")"THENp1%=p1%+1
1400NEXTI%:IFp%<>p1%THENPRINT'"Please check that you have the same     number o
f left and right parentheses.":GOTO1380
1410PRINT'"Now, enter the single chr. unknowns      (e.g. AB for A+B)":INPUTU$(
NX):PROCCHECK(U$(NX)):U$(NX)=R$:
1420FORL%=1TOLEN(U$(NX)):MX=ASC(MID$(U$(NX),L%,1)):IFMX<65ORMX>90THENPRINT"I d
o not understand, please re-enter     the unknowns as single alphabetic chr's.":G
OTO1410:ELSE NEXT
1430PRINT'"Are you sure (Y or N) ?"
1440A$=GET$:PROCCHECK(A$):A$=R$:IFA$="Y"THEN LEARN=FALSE:GOTO1450:ELSE:IFA$="N"
THEN NX=NX-1:GOTO1470:ELSE:GOTO1440
1450TEST=TRUE:PROCSOLVE:TEST=FALSE
1460PRINT'"STORED"
1470PRINT'P$:A$=GET$:ENDPROC
1480REM**SOLVE**
1490DEFPROCSOLVE
1500IF TEST=TRUE THEN1680



1510PROCCLS:PRINT'"SOLVE:":IFNX=0THENPRINT"There are no formulae in RAM to be
    solved":PRINT'P$:A$=GET$:ENDPROC:ELSE:PRINT"Do you want to select the formul
a to be SOLVED by its NAME, FORMULA or LOCATION in the menu (1-";NX;")"
1520PRINT'"Enter 'N','F' or 'L' ?"
1530A$=GET$:PROCCHECK(A$):A$=R$:IFA$="N"THEN1540ELSE IFA$="F"THEN1610ELSE IFA$=
"L"THEN1640 ELSE1530
1540PRINT'"What name is the desired formula stored under";
1550INPUTN$:PROCCHECK(N$):N$=R$:IFN$=""THEN1550
1560FORI%=1TONX:IFC$(I%)=N$THEN1580ELSENEXT
1570PRINT'"There is no formulae stored under the   name of ";N$:GOTO1600
1580PRINT'CHR$134;A$(I%)'"Is this the correct formula ?"
1590A$=GET$:PROCCHECK(A$):A$=R$:IFA$="Y"THEN1650
1600PRINT'"Do you want another search":A$=GET$:PROCCHECK(A$):A$=R$:IFA$="Y"THEN
1540ELSEENDPROC
1610PRINT'"Enter the formula";:INPUTN$:PROCCHECK(N$):N$=R$
1620FORI%=1TONX:IFA$(I%)=N$THEN1650:ELSE NEXT
1630PRINT'"There is no such formula in RAM"'"Do you want another search (Y or N
)?":A$=GET$:PROCCHECK(A$):A$=R$:IFA$="Y"THEN1610ELSE ENDPROC
1640PRINT'"What LOCATION is the formula (1-";NX;") ";:INPUTI%:IFI%<NX OR I%>1TH
EN1640ELSE 1650
1650PROCCLS:PRINT'"Formula:";A$(I%)'"Name:";C$(I%)
1660PRINT"Enter the unknowns as prompted."
1670FORK%=1TO LEN(U$(I%)):PRINT;MID$(U$(I%),K%,1);"=";:INPUTans
1680IF TEST=TRUE THEN FORK%=1TOLEN(U$(NX)):ans=1:GOTO(171O+(10*((ASC(MID$(U$(NX
),K%,1)))-64)))
1690GOTO(1710+(10*((ASC(MID$(U$(I%),K%,1)))-64)))
1700IF TEST=FALSE THEN NEXT:ANS=EVAL(A$(I%)):PRINT'"The answer = ";ANS'"P$:A$=G
ET$:ENDPROC
1710NEXTK%:ANS=EVAL(A$(NX)):ENDPROC
1720A=ans:GOTO1700
1730B=ans:GOTO1700
1740C=ans:GOTO1700
1750D=ans:GOTO1700
1760E=ans:GOTO1700
1770F=ans:GOTO1700
1780G=ans:GOTO1700
1790H=ans:GOTO1700
1800I=ans:GOTO1700
1810J=ans:GOTO1700
1820K=ans:GOTO1700
1830L=ans:GOTO1700
1840M=ans:GOTO1700
1850N=ans:GOTO1700
1860O=ans:GOTO1700
1870P=ans:GOTO1700
1880Q=ans:GOTO1700
1890R=ans:GOTO1700
1900S=ans:GOTO1700
1910T=ans:GOTO1700
1920U=ans:GOTO1700
1930V=ans:GOTO1700
1940W=ans:GOTO1700
1950X=ans:GOTO1700
1960Y=ans:GOTO1700
1970Z=ans:GOTO1700
1980REM**INITIALIZE**
1990DEFPROCINITIALIZE
2000P$="      "+CHR$134+"Press any key to continue"
2010LEARN=FALSE:Z$="":TEST=-1:ANS=0:x$="":p%=0:p1%=0:PO%=0:NX=0:T%=200:DIMA$(T%)
C$(T%),U$(T%)
2020ENDPROC
2030REM**USE AGAIN?**
2040PROCCLS:PRINT" ";



20501F ERR=254 THENPRINT"There is no disc interface installed in this machine
 please see your local    Acorn dealer for details of possible    installation."
:GOTO2150
20601F ERR=18 THENPRINT"You cannot divide by zero.":GOTO2150
20701F ERR=23 THENPRINT"Accuracy lost-number too extreme.":GOTO2150
```

```
2075IF ERR=198 PRINT"The disk is full!":GOTO2150
2080IF ERR=218 THENPRINT"Loading Error.":GOTO2150
2085IF ERR=222 PRINT"The FORMULA file is not on this disk.":GOTO2150
2090IF ERR=214 THENPRINT"There is no file to DELETE.":GOTO2150
2100IF ERR=11 THENPRINT"Capacity is too high.":GOTO2150
2110IF ERR=20 THENPRINT"The numbers were too extreme.":GOTO2150
2120IF ERR=26 AND TEST=TRUE THEN PRINT"That equation was invalid.":N%=N%-1:TEST
=FALSE:GOTO2150
2130IF ERR=22AND TEST=-1 PRINT'"STORED (if the variables are given a    certain
 value, the equation will not    work.)"'"P$:A$=GET$:PROCCLS:GOTO100:ELSE:IF ERR
=22 PRINT"You cannot take the log of a negative   number or of zero.":GOTO2150
2140IF ERR=21AND TEST=-1 PRINT'"STORED (if the variables are given a    certain
 value, the equation will not    work.)"'"P$:A$=GET$:PROCCLS:GOTO100:ELSE:IF ERR
=21 THENPRINT"You cannot 'root a negative number.":GOTO2150
2150PRINT'CHR$131;"Do you want to use this facility again?":VDU3:POS=0:TEST=0:A
$=GET$:PROCCHECK(A$):A$=R$
2160IF LEARN=TRUE THEN N%=N%-1:LEARN=FALSE
2170IFA$="Y"THEN80 ELSEEND
2180REM**LOWER CASE CHECK & CORRECT**
2190DEFPROCCHECK(A1$)
2200R$="":FORH%=1TOLEN(A1$):s$=MID$(A1$,H%,1):g%=ASC(s$)
2210IFg%>96ANDg%<123THENr$=CHR$(ASC(s$)-32)ELSE r$=s$
2220R$=R$+r$:NEXT
2230ENDPROC
2240REM**CHECK FOR PRINTER & CLS**
2250DEFPROCCLS:IFPOS=1THEN VDU3:CLS:VDU2:ENDPROC ELSE CLS:ENDPROC
```

```
A list of 'COMMAND' words follows

1.Solve...Select equation and solve.
2.Learn...Add new formula to memory.
3.Delete..Remove a formula from RAM.
4.Menu....Print out formulae in RAM.
5.Dump....Produce a hardcopy output.
6.Screen..Produce only monitor copy.
7.Search..Search memory for formula.
8.Load....Formulae,cass/disk to RAM.
9.Save....Formulae,RAM to cass/disk.

        ENTER COMMAND NUMBER.
```

# Commodore Honeypot

## by Chris Haley

'Honeypot' is an enjoyable game for the Commodore 64 in which you must manoeuvre a bee around flowers to collect nectar for the hive.

Nectar is collected by hovering over one of the flowers which occasionally bloom and must be carried back to the hive. When you fill up the hive you move on to the next level.

However, life isn't all sweetness and honey for a bee as there's a large bird and an evil spider out to get you. Also, touching any other part of the plants is fatal as is contact with weeds; and, of course, flying into the sun is not recommended.

It's important that you visit each flower as it blooms, even though the ones furthest from the hive have the most nectar, as this will pollinate them and increase the chances of more flowers appearing when the existing ones disappear.

Read the REM statements at the beginning of the program as they contain vital coding instructions relating to Commodore's control characters. Consequently, there is no need to type these lines at all, so you should begin typing at line 900.

Make sure that you have a working joystick as this is the only way to control your bee.

```
10 REM ---------- HONEYPOT ----------
20 REM "⌒                          "
30 REM "(C) C.S. HALEY 1984        "
40 REM "⌣                          "
50 REM COMMODORE SPECIAL SYMBOLS
60 REM "▼" CURSOR DOWN
70 REM "▲" CURSOR UP
80 REM "►" CURSOR RIGHT
90 REM "◄" CURSOR LEFT
100 REM "▪" HOME (CURSOR)
110 REM "▒" CLEAR SCREEN
120 REM "■" REVERSE CHARACTERS ON
130 REM "□" REVERSE CHARACTERS OFF
140 REM "■" BLACK
150 REM "■" RED
160 REM "■" CYAN
170 REM "■" GREEN
180 REM "■" YELLOW
190 REM BECAUSE MY PRINTER DOES NOT
200 REM LIST THE CHARACTERS WHICH
210 REM REPRESENT THE COLOURS OBTAINED
220 REM USING THE COMMODORE LOGO KEY I
230 REM HAVE REPLACED THESE WHERE THEY
240 REM OCCUR IN THIS LISTING BY
250 REM ABBREVIATIONS FOR THE ACTUAL
260 REM COLOUR SHOWN IN SQUARE BRACKETS
270 REM FOR EXAMPLE [LT.GRN].
280 REM "■" DELETE - THIS ONLY OCCURS
290 REM LINE 1510 AND IS USED TO MOVE
300 REM THE BUN TO THE LEFT. TO OBTAIN
310 REM THIS, KEY IN THE LINE OMITTING
```

```
320 REM THE DELETES THEN CURSOR BACK TO
330 REM THE APPROPRIATE POSITION IN THE
340 REM LINE. OPEN A GAP WITH THE
350 REM THE INSERT KEY AND THEN PRESS
360 REM THE DELETE KEY.
370 REM ALL OTHER SPECIAL SYMBOLS ARE
380 REM GRAPHICS USED TO MAKE THE SCENE
390 REM THE PARTS OF THE SCENE ARE:-
400 REM LINES 57020-57070 THE WEEDS
410 REM 57075-57140 THE FLOWER PLANTS
420 REM 57150-57180 THE HONEY STORE
430 REM 58020 THE SUN
440 REM 58030 THE CLOUD
450 REM 58040-58060 THE HIVE
460 REM 58085 THE GRASS
500 REM****************************************
510 REM DO NOT TYPE IN THE REMS!
520 REM****************************************
900 GOSUB40000:REM GOTO INITIALISATION
989 REM START OF MAIN GAME LOOPS
990 S8=PEEK(S(30)):SB=PEEK(S(31)):FORL=0TO1
1000 FORP=3TO7:FORJ=0TO9F:FORI=0TO1
1009 REM DETECT FIRE BUTTON AND BEE DIRECTION
1010 FF=PEEK(49151)
1020 BD=PEEK(49169)
1060 SO=0
1070 IFFFANDBS>0THENBS=BS-1:SO=1:POKEN(18),0:POKEN(18),129:PRINT"[HOME]       "; PS
1079 REM DETECT BEE COLLISIONS
1080 SS=PEEK(S(30)):SB=PEEK(S(31))
1090 IFSSAND1THENGOTO2000
1100 IFSBAND1THENGOTO3000
1109 REM MOVE SPIDER
1110 SD=PEEK(S(0))-PEEK(S(2))
1120 X2=X2+SGN(SD)*YJ:POKES(2),X2AND255
1130 IFABS(SD)<20ANDY2>3HTHENY2=Y2-YJ:GOTO1150
1140 IFY2<235THENY2=Y2+YJ
1150 POKE(S(3)),Y2
1170 POKER1,B(BD-I):POKER2,SP(I)
1174 REM MOVE BIRD
1175 X3=X3+XI:IF(X3)350)THENX3=0
1180 IF(X3AND256)THENPOKES(16),PEEK(S(16))OR4:POKES(4),X3AND255:GOTO1195
1190 POKES(16),PEEK(S(16))AND251:POKES(4),X3AND255
1195 S5=PEEK(S(5))+INT(5.5-10*RND(0)):IFS5<185ANDS5>115THENPOKES(5),S5
1200 BN=BN-ND:IFBN<0THEN5000
1210 POKES(37),BC(BN/25):POKEN(0),250-BN*2
1300 NEXT:NEXT
1399 REM GROW PLANTS
1400 SO=PEEK(S(21))
1405 IFPL(P)THEN1430
1410 IFRND(0)*10*(8-P))FF%THEN1445
1420 PL(P)=1:FF%=FF%-8+P
1430 FX=1-FX:PRINTBL$:PP$(P):PH$(PL(P),FX)::SO=SOORPS(PL(P))
1435 PL(P)=PL(P)+1
1440 IFPL(P))8THENSO=SOAND(NOT2^P):POKES(39+P),4:IFPL(P)=10THENPL(P)=0
1445 SO=SOOR(PS(PL(P)))^P:POKES(21),SO
1490 NEXT
1499 REM DISPLAY SCORES
1500 PO%=PO%+HN+BS+BN+FF%:PRINT"[HOME][RVS][RED]                    [OFF]";PO%;
1505 PRINT"[HOME][DOWN][RVS][RED]                              [OFF]";FF%;" ";
1510 PRINT"[HOME][DOWN][DOWN]";
1520 PRINT"[RVS][RED]      [OFF]";
1530 IFBN<0THEN5000
1550 NEXT
1554 REM NIGHTFALL
1555 POKE53280,0:POKE53281,0
1560 GOTO5060
1999 REM BEE COLLISIONS WITH OTHER SPRITES
2000 IFSSAND6THEN2030
2010 FORF=3TO7:IFSSANDFP(F)THENPOKES(F+39),10:FF%=FF%+1:IFBN<100THENBN=BN+S-F
2020 NEXT:GOTO1100
2030 IF(SSAND2)AND(ABS(PEEK(S(1))-PEEK(S(3)))>15)THEN1100
2050 IFSOTHENPOKES(1),PEEK(S(1))-20:POKEN(18),0:POKEN(18),33:GOTO1100
2060 GOTO 5000:REM GOTO DEATH SCENE
2999 REM BEE COLLISIONS WITH DATA
3000 BX=PEEK(S(0)):BU=PEEK(S(16))AND1:BY=PEEK(S(1))
3010 IFBY)65ANDBY<130THEN1110
3020 IFBU=0THENIFRND(0)<CDTHEN5000
3030 IFBN)35THENBN=BN-10:HN=HN+10:GOTO3045
3040 IFHN)0THENBN=BN+10:HN=HN-10
3045 IFHN)500THEN6000
3050 PRINTBL$;H$;HS$(HN/25);:GOTO1110
4999 REM DEATH OF BEE
5000 SV=49213:POKES(3),235:POKER1,248:POKEN(4),0
5010 BY=PEEK(S(1)):DR=(235-BY)/246:POKEN(11),17
5020 FORIW=235TO10STEP-2:FORJW=0TO1
5030 BY=BY+DR:POKES(1),BY:POKEN(8),IW-JW:POKER2,SP(JW)
5040 NEXT:NEXT:POKEN(11),0:BB=BB-1
5050 IFBB)0THENBN=25:BS=11-LV:GOSUB58500:S8=PEEK(S(30)):SB=PEEK(S(31)):GOTO1010
5060 POKES(32),7:POKES(33),0:POKES(21),0
5070 PRINT"[HOME][DOWN][DOWN][DOWN]       [RVS]DO YOU WANT ANOTHER GAME?[OFF]"
5080 GET$:IFA$=""THEN5080
5090 IFA$="Y"THENGOSUB57500:GOTO990
5100 SV810
5999 REM INCREMENT DIFFICULTY LEVEL
6000 LV=LV+1:PRINT"[HOME][DOWN][DOWN][DOWN
```

```
6020 POKEN(11),0:POKEN(4),0
6030 POKEN(0),200:POKEN(1),1
6040 PRINT"
6050 DF=DF-1:IFDF<0THENDF=0
6060 BS=11-LV:IFBS<0THENBS=0
6070 YJ=YJ+1:XI=XI+1
6080 HN=100:BN=25:FF%=10:SH=SH-2
6090 ND=LV/5:CD=CD+0.1
6100 GOSUB50000
6110 GOTO990
39999 REM DISPLAY INSTRUCTIONS
40000 POKE53280,7:POKE53281,0
40010 PRINT"              HONEYPOT":PRINT
40020 PRINT"  THE OBJECT OF THE GAME IS TO FILL THE"
40030 PRINT"HONEYCOMB IN THE HIVE WITH HONEY, USING"
40039 REM INITIALISE VARIABLES
40040 PRINT"THE BEE TO COLLECT NECTAR FROM THE "
40050 PRINT"PLANTS AS THEY FLOWER. THIS ALSO"
40060 PRINT"FERTILIZES THE PLANT AND INCREASES THE"
40070 PRINT"CHANCE OF ANOTHER PLANT GROWING. THE"
40080 PRINT"FLOWERS FURTHEST FROM THE HIVE HAVE THE"
40090 PRINT"MOST NECTAR. THE BEE DARKENS AND ITS"
40100 PRINT"BUZZ DEEPENS AS IT FILLS WITH NECTAR."
40110 PRINT"  THE BEE WILL DIE IF IT RUNS OUT OF"
40120 PRINT"NECTAR OR IF NIGHT FALLS BEFORE THE"
40130 PRINT"HIVE IS FULL. AVOID FLYING INTO PARTS"
40140 PRINT"OF PLANTS OTHER THAN THE FLOWERS AND"
40150 PRINT"DO NOT FLY INTO THE SUN."
40160 PRINT"  THE SPIDER AND BIRD WILL CATCH THE"
40170 PRINT"BEE IF THEY CAN BUT THE BEE CAN ESCAPE"
40180 PRINT"BY USING ONE OF ITS FEW STINGS."
40190 PRINT"  CONTROL THE BEE WITH A JOYSTICK IN"
40200 PRINT"PORT 2, FIRE CONTROLS THE STING."
49999 REM READ M/C AND SPRITE DATA
50000 C=0:FORK=49200TO49384
50005 READA:C=C+A:POKEK,A:NEXT
50008 READT:IFT<>CTHENPRINT"ERROR IN MACHINE CODE DATA - TOTAL =";C:STOP
50010 POKE49190,1:POKE49192,25:POKE49193,65:POKE49194,65:POKE49195,220
50015 C=0:FORK=240TO248:I=K*64:FORJ=0TO63
50020 READA:C=C+A:POKEI+J,A:NEXT:NEXT
50030 READT:IFT<>CTHENPRINT"ERROR IN SPRITE DATA - TOTAL =";C:STOP
50040 DIM S(47),B(1,1),N(29),PH$(9,1),HS$(20)
50045 FORI=0TO46:S(I)=53248+I:NEXT
50050 R1=2040:R2=2041
50060 B(0,0)=240:B(0,1)=241:B(1,0)=242:B(1,1)=243
50070 SP(0)=244:SP(1)=245
50080 FORI=0TO7:FP(I)=247:NEXT
50090 FORI=0TO28:N(I)=54272+I:NEXT
50100 BC(0)=1:BC(1)=7:BC(2)=8:BC(3)=10:BC(4)=2
56000 POKEN(0),200:POKEN(1),1:POKEN(2),0:POKEN(3),7:POKEN(5),2:POKEN(6),64
56010 POKEN(19),9:POKEN(20),0:POKEN(14),170:POKEN(15),255
56020 POKEN(12),15:POKEN(13),255
56050 POKES(6),31:POKES(7),195
56060 POKES(8),79:POKES(9),195
56070 POKES(10),128:POKES(11),195
56080 POKES(12),175:POKES(13),195
56090 POKES(14),223:POKES(15),195
56100 POKES(27),1
56110 POKES(39),0:POKES(40),0:POKES(41),2
56120 POKES(29),4:POKES(30),8
56125 POKER1,240:POKER2,244:POKE2042,246:FORT=2043TO2047:POKET,247:NEXT
57000 BL$="
57010 PP$(3)="":WP$(0)=""
57020 FORI=1TO4:PP$(3+I)=PP$(2+I)+"":WP$(I)=WP$(I-1)+"":NEXT
57030 WH$(0)="":
57040 WH$(1)="":
57050 WH$(2)=WH$(1)+"":
57060 WH$(3)=WH$(0)+"":
57070 WH$(0)=WH$(0)+"":WH$(1)=WH$(1)+"":WH$(4)=WH$(1)
57075 PH$(0,0)="":PH$(0,1)=""
57080 PH$(1,0)="[LT.GRN.]":PH$(1,1)=PH$(1,0)
57090 PH$(2,0)="[LT.GRN.]":PH$(2,1)="[LT.GRN.]":
57100 PH$(3,0)="[LT.GRN.]":PH$(3,1)="[LT.GRN.]":
57110 PH$(4,0)="[LT.GRN.]":PH$(4,1)="[LT.GRN.]":
57120 PH$(5,0)="":PH$(5,1)="":PH$(6,0)="":PH$(6,1)="":PH$(7,0)="":PH$(7,1)=""
57130 PH$(8,0)="":PH$(8,1)=PH$(8,0)
57140 PH$(9,0)="                ":PH$(9,1)=PH$(9,0)
57150 HS$="
57160 HS$(0)="":HS$(1)="":HS$(2)="":HS$(3)="":HS$(4)="":
57170 FORI=5TO17STEP4:FORII=ITOI+3
57180 HS$(II)="":NEXT:NEXT
57500 FF%=10:BB=3:PO%=0
57510 DF=4:CD=0.2:ND=0.2:LV=1
57520 BS=10:HN=100:BN=25
57530 YJ=4:SH=188
57540 FORI=0TO9:PS(I)=0:NEXT:PS(5)=2:PS(6)=2:PS(7)=2
57550 XI=10
57800 PRINT"       [ORANGE]PRESS ANY KEY TO CONTINUE"
57810 GETA$:IFA$=""THEN57810
57999 REM SET UP SCREEN
58000 FORI=3TO7:PL(I)=INT(RND(0)*10)-10:IFPL(I)<0THENPL(I)=0
58010 NEXT:FORI=42TO46:POKES(II),4:NEXT
58015 POKES(32),6:POKES(33),6
58020 PRINT"
58030 PRINT"[LT.GREY]
58040 PRINT"":BL$:"
58050 PRINT"[BROWN]
```

# Everything a micro should bee

# microbee

# Welcome to the microbee family

## microbee — Australia's Own Personal Microcomputer Success Story

**microbee** is Australia's own personal computer, designed and manufactured in Australia as the computer for homes, schools and you. The prestigious Australian Micro Magazine has called the **microbee** *"the success story of Australian computer manufacture."*

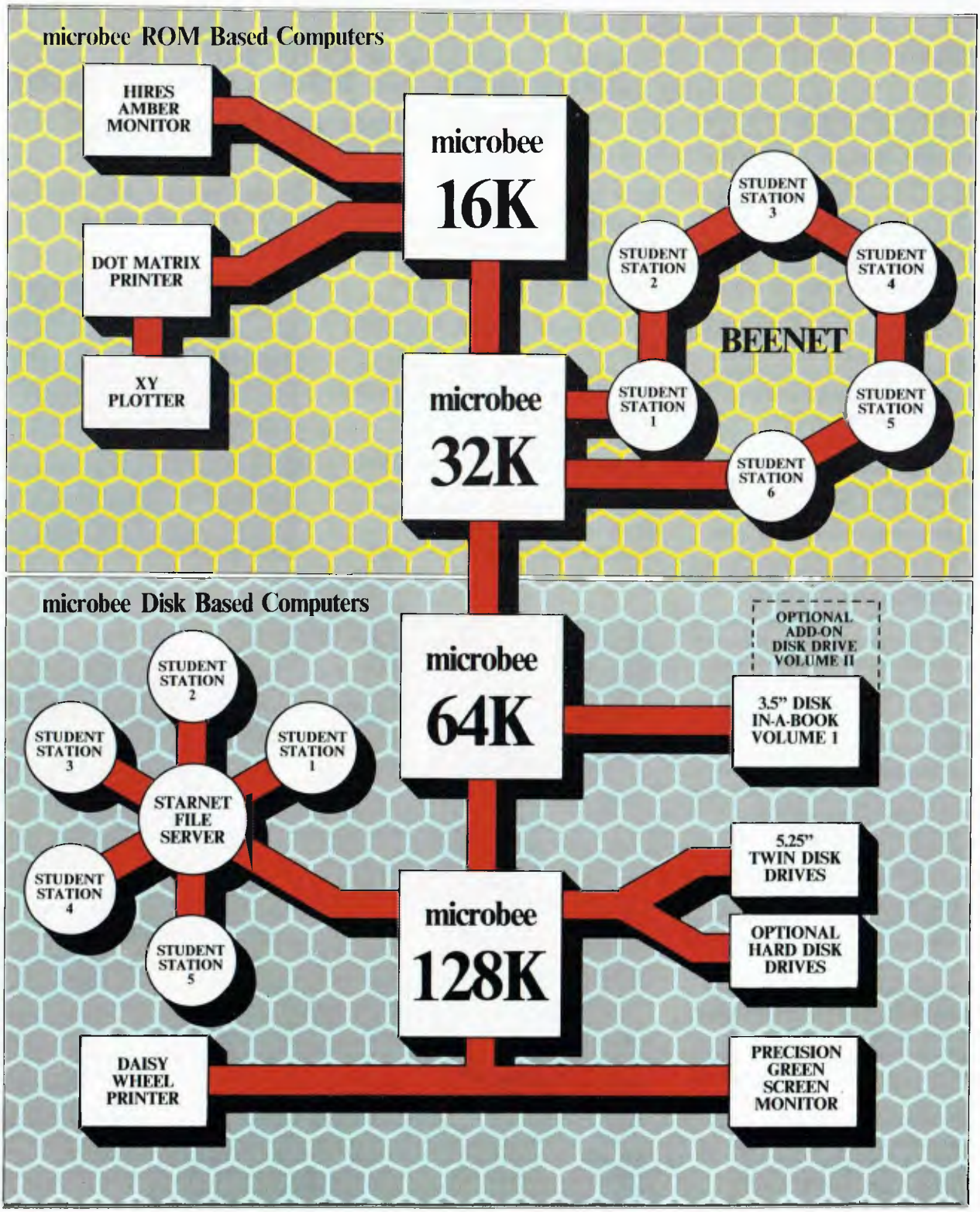
Since its introduction in February 1982 the **microbee** has come to dominate the Australian education market in the face of strong overseas competition. Over 30,000 **microbees** are now in homes, schools and businesses in Australia and others are being exported

The **microbee family** comprises low cost educational and personal computers through to advanced network systems and small business computers.

The latest breakthrough is the new **microbee** "COMPUTER-IN-A-BOOK" using state of the art 3.5 inch low cost disk drive technology combined with the proven **microbee** keyboard console.

## Quality control and Service

**microbee** is manufactured in Australia under strict quality controls and is backed with a strong national service team. Best of all, **microbee** policy is to offer continual upgrade capability meaning you can always convert your **microbee** to a later model. No **microbee** need ever become obsolete!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HIRES AMBER MONITOR
DOT MATRIX PRINTER
XY PLOTTER
microbee 16K
microbee 32K
STUDENT STATION 1
STUDENT STATION 2
STUDENT STATION 3
STUDENT STATION 4
STUDENT STATION 5
STUDENT STATION 6
BEENET
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microbee 128K
STARNET FILE SERVER
STUDENT STATION 1
STUDENT STATION 2
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STUDENT STATION 4
STUDENT STATION 5
OPTIONAL ADD-ON DISK DRIVE VOLUME II
3.5" DISK IN-A-BOOK VOLUME 1
5.25" TWIN DISK DRIVES
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PRECISION GREEN SCREEN MONITOR

# Everything a progressive micro should bee

## New Release

## Microbee 3.5 inch Disk System
## The Computer-in-a-Book!

The hottest new development in the Microcomputer World is the new high density, low cost 3.5 inch disk drives. Already standard on the Apple Macintosh, HP 150 Touch Screen Computer and the ACT Apricot these new drives offer giant 500K capacity using a fully enclosed diskette. Essentially the 3.5 inch drives have the same or more capacity as the 5.25 inch drives but occupy 30 percent of the volume. The results are obvious: Low cost, high reliability disk drive storage in a small easily portable system.

Ideal for the home library, the **microbee** COMPUTER-IN-A BOOK series is available in matching volumes expandable to meet your changing computer needs. The **microbee** COMPUTER-IN-A-BOOK is available in several options designed to suit the varying needs of the user. If you require an ultra low cost system which essentially adds disk drive capability to the power of Microworld Basic, Wordbee Wordprocessor and is capable of running a wide range of educational and entertainment software then the **microbee 64K/Book (Volume I)** system is ideal. Supplied with CP/M you will have the full library of world class software at your fingertips. The **microbee 64K/BOOK (Volume I)** can be expanded to use additional disk drives **(Volume II)** at any time.

The **microbee Computer-in-a-Book** is supplied with demonstration/training software, Microworld Basic, Wordbee, Telcom, CP/M 2.2 and a range of powerful utilities. Included with each **Computer-in-a-Book** is a special software registration form entitling the owner to purchase Wordstar/Mailmerge, Spellstar, Microsoft Basic, Multiplan at substantial savings because we have prepaid the license fees for you.

### VOLUME I

**microbee 64K/Computer-in-a-Book (Volume I)** comes with Microbee 64K keyboard unit, single 3.5 drive unit and software on diskettes including:
Demonstration diskette, Microworld Basic, Wordbee wordprocessor, Telcom and CP/M with utilities. A matching owner's manual is supplied.

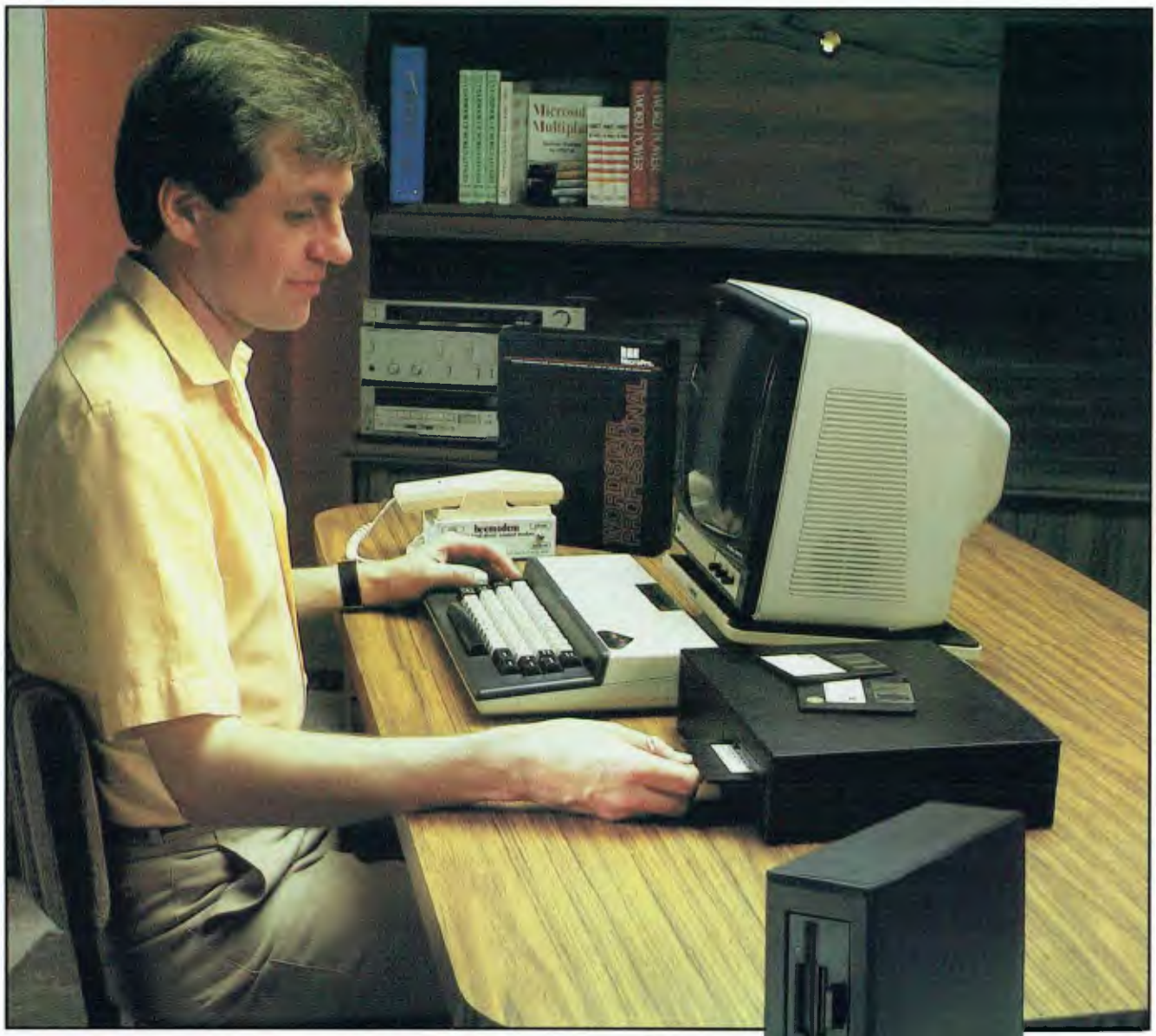
### VOLUME II

(Volume II) Add On Drive is available in a matching volume to Volume I and expands the system to twin drive capacity. Dual drive operation enables you to use complex and interactive software, back-up operating disks easily and is ideal even for professional applications.

**microbee**
**Computer-In-A-Book**
**Volume I . . . . . $995**
**Volume II . . . . . $345**

Additional equipment recommended

**Hi-res. Green Monitor . . . $149.50**
**Hi-res. Amber Monitor . . $169.50**
**Swivel Base . . . . . $24.50**
**Beemodem . . . . . $169.50**




Software for the **microbee Computer-in-a-Book** on 3.5 diskettes.

| | |
|---|---|
| **Wordstar/Mailmerge diskette with manuals** | **$69.50** |
| **Spellstar with Australian Dictionary** | **$59.50** |
| **Microsoft Multiplan** | **$59.50** |
| **Microsoft Basic/Simply dB Database** | **$59.50** |
| **Borland Turbo Pascal** | **$69.50** |
| **Microworld** | |
| **Disk Library Managment** | **$19.50** |
| **Arcade game collection** | **$29.50** |
| **Learning Can Be Fun Series** | **$29.50** |
| **Bee Scientist A** | **$29.50** |

# Everything a personal micro should bee

**microbee 16K Educator makes homework interesting and stimulating.**

Designed to serve the needs of education combining high quality graphics and sound effects capability. **microbee** 16K Educator has been chosen by the NSW, QLD. and the Australian Schools Commission as a recommended computer for use in schools. Now with Wordbee wordprocessing.

**microbee** 16K Educator.... **$449**

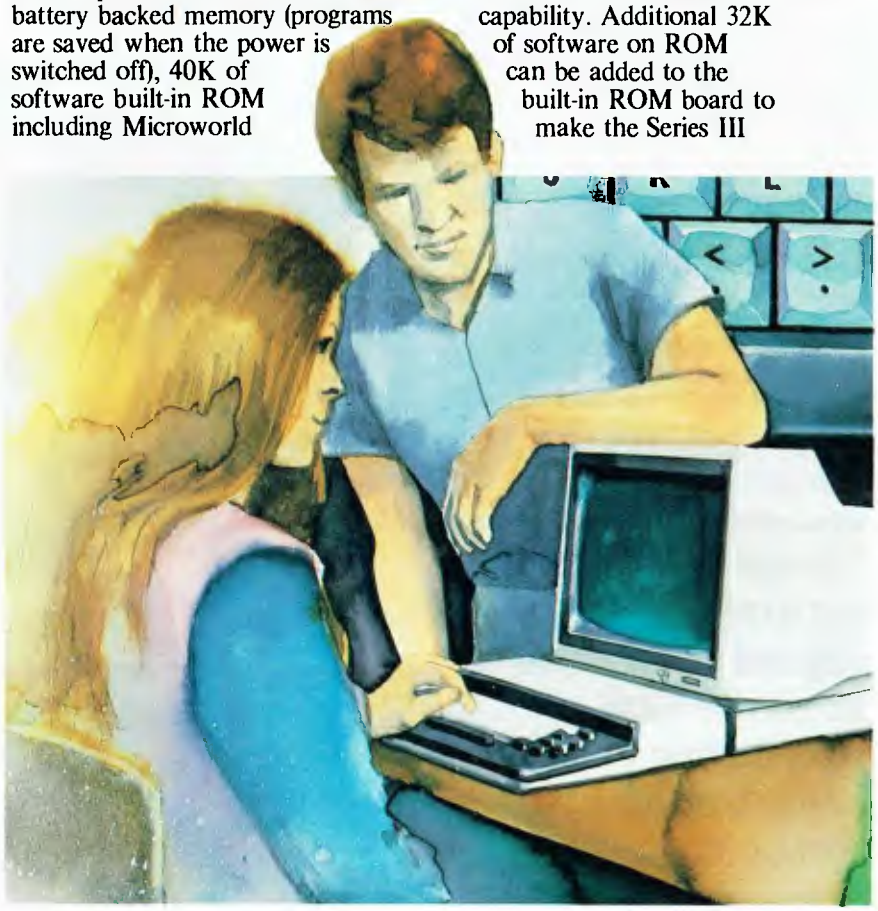
**microbee 32K Communicator Workstation. . . . $599.00**
includes 32K microbee Series III and Hi-res Green Monitor.

Available separately:

microbee 32K Series III . . $499.00
Hi-res.Green Monitor . . . $149.50
Hi-res.Amber Monitor . . . $169.50
Swivel Base . . . . . $24.50

# microbee Series III now with Built-in Silicon Disk . . .

The best selling **microbee** is the new 32K Communicator Series III and it is no wonder. The Series III has now been expanded to include 32K of battery backed memory (programs are saved when the power is switched off), 40K of software built-in ROM including Microworld Basic, Wordbee word-processor, Telcom 3 with real time clock/alarm, machine code monitor, self testing and full communications capability. Additional 32K of software on ROM can be added to the built-in ROM board to make the Series III 32K **microbee** the only low cost personal computer on the market with a built-in silicon disk.



The **microbee** is widely used in Homes, Schools and Business in Australia, New Zealand and worldwide. The features that have made it popular are the functions such as programmable serial and parallel ports, sound effects, high resolution PCG graphics with 512 by 256 bit resolution, programmable 80 by 24 or 64 by 16 screen character display, terminal emulation and communications capability.

The new Telcom ROM which has been added to the Series III turns your **microbee** into a real time clock with alarm features. It has full communications capability so your Microbee can become a home terminal and talk to other computers across the world via the telephone lines using the BEEMODEM. The new Telcom now has built-in testing, machine code monitor and even a calculator!

**microbee** has a large range of proven peripherals such as a fast low cost dot matrix printer, a new low cost daisy wheel printer and the new high quality 8401 XY plotter. A large range of software and other accessories means that you will always be able to use your **microbee** to meet virtually any need.

# Everything a micro should bee for small business

The **microbee** 128K dual drive small business computer is a total kit package for the serious small business user.

**"microbee small business computer offers bright prospects to those who would be masters of their own future"**

The package consists of a **microbee** with 128K of dynamic RAM controlled by the proven Z80A processor; a dual 400K disk drive; the **microbee** high resolution amber screen monitor; and the **microbee** dot matrix parallel printer. Included in the price of **only $2,395** is a whole host of bundled software for word processing, terminal emulation and communication with other computers world wide, spreadsheet analysis and more.

A special user interface called "B-shell" allows the use of industry standard software, while being much 'friendlier' than most CP/M systems. 'ICONS' are used to select commonly used programs. INIT and TRANSFER programs simplify 'housekeeping' function. A comprehensive HELP system is also supplied.

The CP/M 2.2 operating system fully utilises the capabilities of the 128K SBC. Automatic disk caching increases program speed by 50%. 'M-drive' software allows 64K of RAM to be used as a fast disk. SETDRIVE allows other disk formats such as KAYPRO, and OSBORNE to be read.

**"Small business survival may soon depend upon rapid access to vital information on which important decisions can be made."**

**The complete microbee Small Business System comprises:**

*Hardware*

**microbee 128K with twin 400K disk drives**
**microbee Dot Matrix Printer**
**microbee Precision Amber Monitor**
**Cables and full manuals**

*Software*

**Wordstar/Mailmerge 3.3**
**Microsoft Basic**
**Microsoft Multiplan**
**Microworld Basic**
**Telcom Communications Package**
**Full range of support utilities**
**Comprehensive training guides and tutorials**

A complete library of manuals so you can easily learn to gain the maximum benefit from your system is also included.
**Wordstar reference manual.**
**Wordstar training guide.**
**Microsoft Multiplan manual and the Microsoft BASIC manual.**

**128K microbee dual 400K slim line floppy disk drives; green screen high resolution monitor; bundled software and manuals .... $1,995.**

**With microbee dot matrix parallel printer and amber monitor $2,395**

# "Incredible 128K microbee Small Business Computer opens new opportunities for convenient disk based applications"

**microbee** Small Business Computer combines the very latest design innovation, world class quality and continuing after sales support. A unique feature of all **microbees** is that they are designed to be expandable and upgradeable as and when new developments become available. You should not fear obsolescence.

**Standard Specifications:**

**PROCESSOR:**
Z80A running at 3.375 MHZ
**KEYBOARD:**
60 key FULL SIZED QWERTY layout with full travel.
**DISPLAY:**
Direct video to external monitor.
80 by 24 and 64 by 16 character display modes, high resolution PCG graphics to 512 by 256 pixels. Upper and lower case with full programmability at any screen location.
**INPUT/OUTPUT:**
Programmable 8 bit input/output parallel port, programmable RS232 port, cassette interface, direct video.
**MEMORY:**
128K of dynamic RAM, 2K screen and graphics RAM, 8K of system firmware controlled with specially designed memory management unit.

**"World class software plus user manuals lets you set up your system and start working."**

# No micro should bee without these accessories

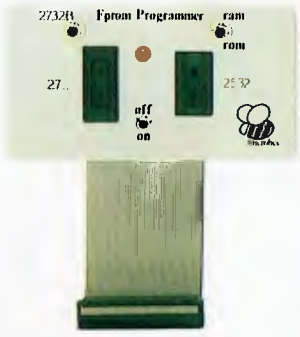
## microbee DP100 Dot Matrix Printer

A most popular accessory now even faster. At 100 CPS the **microbee DP100** is ideal for low cost printing at home, school or business. It can print on any paper either tractor feed or friction feed and can be altered under software to print in standard, compressed, expanded or even graphic modes.

**microbee DP100 Printer with cable** ..... **$399.00**
**Replacement ribbons** ..... **$9.75**
**Paper (1000 sheets)** ..... **$29.95**

## Eprom Programmer

Now convert your 32K **microbee** into an EPROM Programmer and store programs in EPROM for use in the **microbee Series III Personal Communicators** or use the **microbee ROM Board** to add silicon disk storage to your **bee.** The **Bee-Eprom Programmer** is fully self contained and draws its power from the 50 way expansion port on the **16K/32K microbee series.**




**Eprom Programmer** ..... **$139.00**

## ROM Board

Add 8 2764 type EPROMS or firmware such as FORTH, OZ-LOGO CHESS, SPACE INVADERS to your **16K/32K microbee** with 5.1 or 5.22E colour BASIC using the 50 way expansion port on the core board. No external power supply is required and the BASIC 'PAK' command can be used to access and ROM on the board.

**ROM Board** ..... **$79.50**

## microbee DSY-120 Letter Quality Daisy Wheel Printer

This new addition is ideal for producing letter quality printout from the **microbee.** The DSY-120 uses Diablo standard daisy wheels for easy font replacement. It is supplied with Courier 12 point standard.

**microbee**
**DSY-120 with cable** ..... **$549.00**
**Replacement ribbons** ..... **$12.75**

## Beethoven

Music is part of all our lives. The **Beethoven** module is the ultimate creativity machine and effectively converts your **microbee** into a four-voiced music synthesiser that will impress all your friends. A powerful program, **Beecomposer,** enables you to compose music using the **bee's** powerful graphics to write the music using a delightfully easy-to-use graphics word processor. The **Beethoven** and **Beetalker** were developed by Robotron and have been reviewed in *Your Computer.*

**Beethoven** ..... **$99.00**

## Beetalker

Experiment with the fascinating world of speech synthesis. The **Beetalker** uses the phoneme technique and can be programmed to speak in any language. A powerful text to speech program is supplied so you can use **Beetalker** in your next program. Why not try the optional ELIZA program ($12.50 on cassette) which combines artificial intelligence with the **Beetalker?**

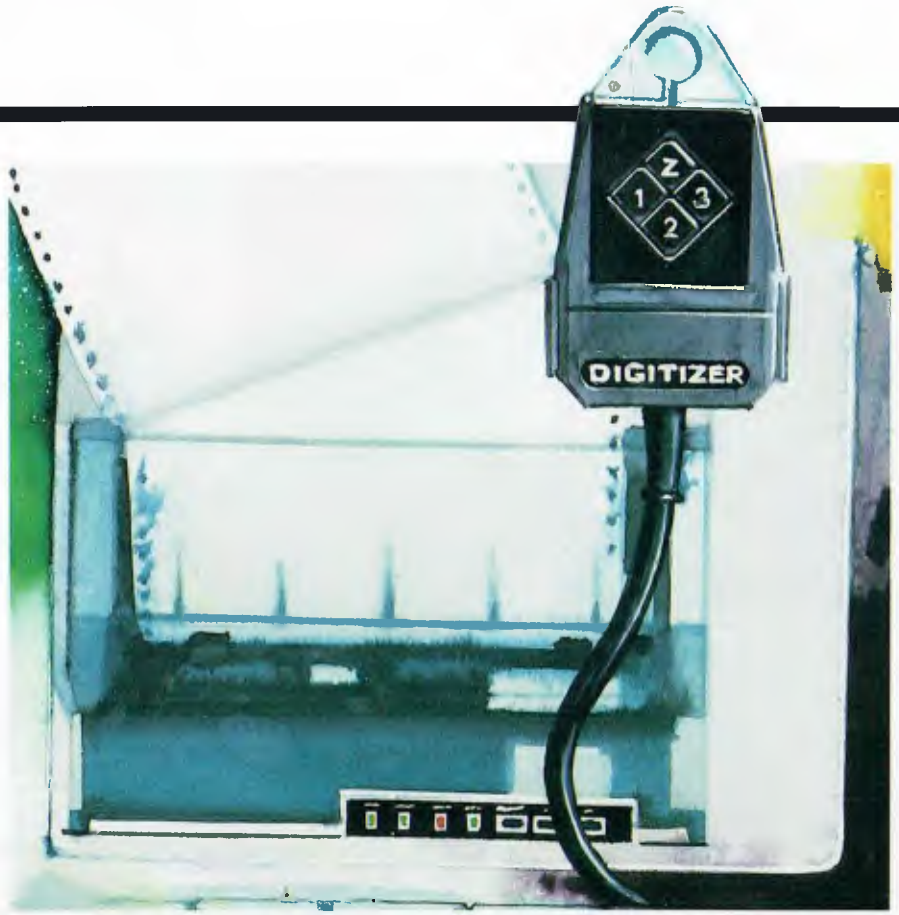
**Beetalker** ..... **$99.00**

# microbee has a large range of useful 'work horse' peripherals to meet any job.

## Beemodem

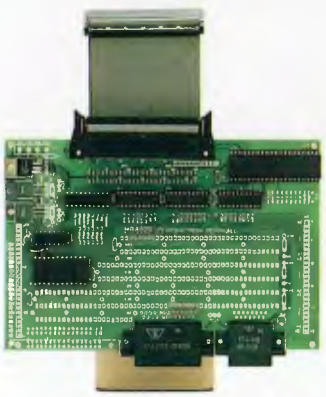
A must for telecomputing the Beemodem is a complete low cost modem reknown for its high reliability performance. It is powered when plugged into your **microbee** and has a built-in telephone for maximum user convenience. The Beemodem operates at standard 300 baud CCITT frequencies and is fully Telecom approved for connection to Australian telephone network.

**Beemodem** ..... **$169.50**




## Experimenter Board

This was designed to make hardware experiments on the **microbee** a lot easier. You will need to know how to use a soldering iron so the board is supplied in kit form. Facilities incorporated include, buffers for address and data lines, buffers on outgoing control lines, decoding for 16 ports and 2 programmable parallel ports. Full instructions and suggested experiments are supplied.



**Experimenter Board** . . . . . **$69.50**

## microbee Floppy Disks 5¼"

Double sided, Double density Disks. Made for **microbee** by Memorex. These top quality certified disks are **$4.95 each** or **$49.50** for 10 in a handy library box.

## microbee 8401 X-Y Plotter

Also a new addition the **microbee 8401 Plotter** expands the output capability of the **microbee** to handle A3 sheets with 4 colour printing capability. The 8401 can accept felt tipped pens for high quality printout or conventional 'biro' for general purpose use. Ideal for business graphics, scientific data output or even preparing posters. The 8401 is supplied with full support software including a detailed manual.

**microbee**
**8401 Plotter with cables** . . . . . **$1975.00**
**9251 Pens - water base (felt)** . . . . . **$14.95**
**9250 Pens - oil based** . . . . . **$4.50**
**9252 Pens - water base (for OHP film)** . . . . . **$14.95**
***All Pens in sets of 4 Black, Red, Green and Blue.***

## microbee Monitors Precision Series

A high quality monitor as supplied with the **microbee** Small Business system these are also available in green (P31) or amber (PUM) phosphors.

**Precision green monitor** . . . . . **$229.00**
**Precision amber monitor** . . . . . **$249.00**

## microbee Monitors HI-RES Series

There are two types of recommended **microbee monitors.** For general purpose usage the new high res **microbee** green and amber monitors are highly recommended. These are made specially for **microbee** and have a built-in power supply to supply the **microbee** direct. Optional swivel bases are available to help you install a full ergonomic workstation.

**Hi-res. green monitor** . . . . . **$149.50**
**Hi-res. amber monitor** . . . . . **$169.50**
**Swivel base** . . . . . **$24.50**

# Everything a classroom micro should bee

## Microbee Recommended computer for use in schools

**microbee** has been selected by the N.S.W. Queensland and Western Australian Education Departments and the Australian Schools Commission as a recommended computer for use in schools. To date over 10,000 are operating daily in schools, technical colleges and universities throughout Australia and New Zealand.

The advantages of the **microbee** in education arise from the cost-effective use of computing power, full expandability, large range of bundled and pre-paid software and most importantly, AUSTRALIAN MANUFACTURE which has enabled **microbee** to grow with the needs of education as this exciting computer era is unfolding in our world. Any **microbee** can be

programmed to act as a terminal on a mainframe computer such as IBM or DEC and in fact as lot of **microbees** spend their computing lives doing just that!

Installations such as the STARNET **microbee** Classroom operated by Dr. Bill Butts at Macquarie University School of Education (as shown above) are now operating Australia wide and offer the full power of all **microbee** CP/M Software and disk drive advantages to up to 16 student stations for a fraction of the cost of individual disk systems. A most exciting breakthrough from the Applied Technology R & D Laboratories is INTERCONNECT TELCOM 2.1 which enables any **microbee** student station on the STARNET to communicate with a remote **microbee** or any other computer via modem and telephone. Using this facility it is possible to connect students on a STARNET to virtually any other classroom in the world using AUSTPAC (Australia wide) or MIDAS (worldwide through OTC).

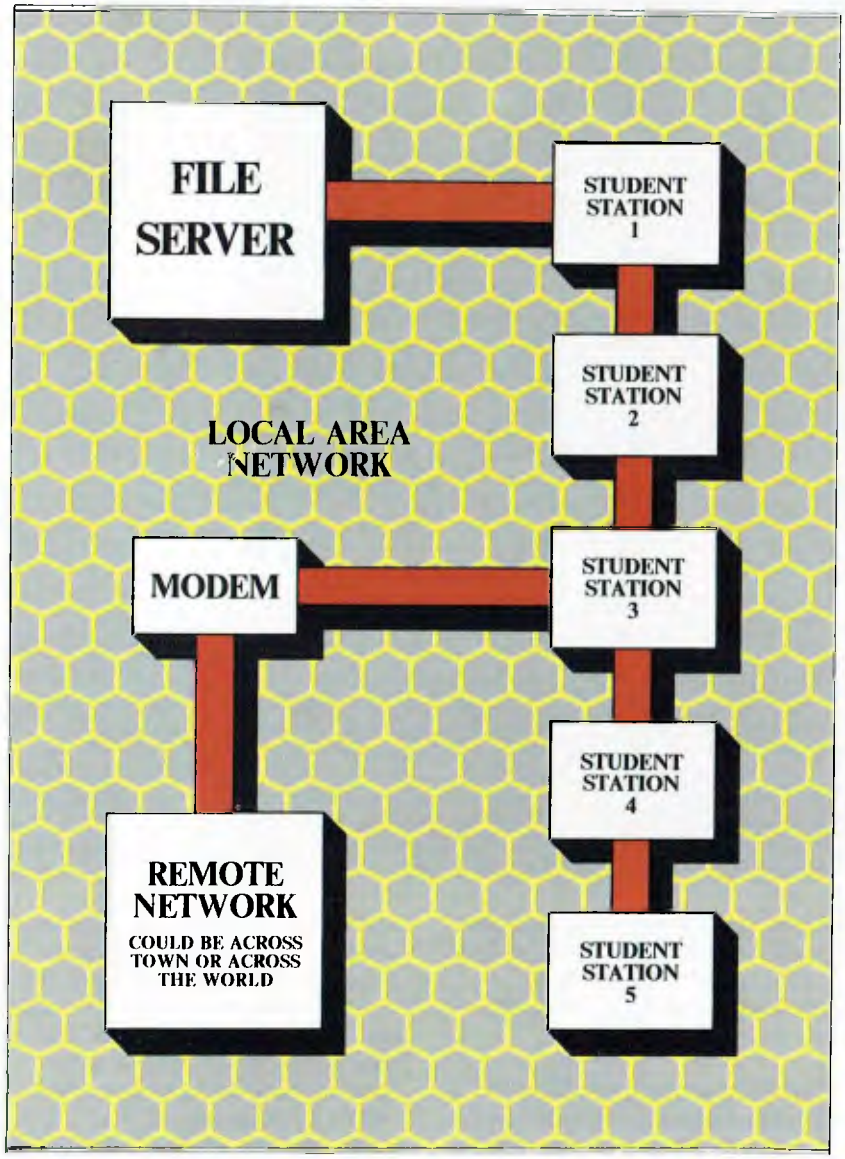
# microbee classroom networks for learning

## microbee computers were designed for education

**microbee** computers were specifically designed with the needs of Australian educators in mind. That was our primary goal and let's face it, education is one of the most important phases of information transfer in our society. We all never stop learning and this is where **microbee** excels. Rather than just a computer designed to meet the retail market **microbee** is the Australian Education Computer designed and built in Australia by Australians for Australians.

Many schools have selected 16K Educators and 32K Personal Communicators and these are now supported with a wide range of educational and entertainment software from many sources. When many machines are used in the same classroom it is more practical to network them together using BEENET 1 for full interactive operation or the new **microbee 64K Computer-in-a-Book** to introduce low cost disk software to the classroom without the inconvenience of a tape recorder system. Full application information is available from your **microbee** Educational Specialists at every **microbee Technology Centre.**

Schools intending to use CP/M software such as Wordstar, Multiplan and Database should consider STARNET as pictured on the previous pages. This newly announced system is probably one of the most cost effective and yet powerful network systems yet produced in Australia. As the STARNET system requires a special multi-user software license the system and its components are only available to schools and approved educational institutions at this point in time.



# microbee — fully expandable

**microbee** is fully expandable in schools as well as in the home. ROM based **microbees** such as 16K or 32K models can be readily adapted to BEENET 1 with only slight modification internally.

The workhorse of the STARNET system is the **microbee 64K Workstation.** This is normally only supplied as a full station including **microbee Hi-Res. Monitor, Swivel base and cabling.** Optional ROMS can be added to include MICROWORLD BASIC, WORDBEE, MONITOR and NETWORK. Using this option the **microbee 64K Workstation** can be used to duplicate the functions of a stand alone 32K when not used in the STARNET configuration. Where necessary a disk interface can be added so that 3.5 or 5.25 inch disk drives can be operated from the student station for full versatility.

The **microbee** is a versatile machine that is growing with the needs of our community. From a small 16K computer to a 128K system with 10Mb of hard disk storage in 2½ years. Who knows where the future will lead us? All we can say is that **microbee** is a classic example of applying technology to human needs and whatever happens **microbee** will be at the forefront of that technology.

# Everything a micro should bee for software

## Diskette Software

| | |
|---|---|
| Borland Turbo Pascal | $69.50 |
| Adventure Pak 1 | $29.95 |
| Bee Casino | $29.95 |
| Bee Scientist 1 | $39.95 |
| Bee Scientist 2 | $29.95 |
| Learning Can Be Fun | $39.95 |
| Disk Catalog System | $19.95 |
| Geo-tech Drawing | $21.95 |
| Sydney Approach | $19.95 |
| Temple of Azragor | $19.95 |
| Castle of Eldritch | $19.95 |
| Market Simulation | $19.95 |
| Sketchpad | $19.95 |
| Capture | $19.95 |
| Chess/Chess Tutor | $19.95 |
| Chopper Pilot | $19.95 |
| Defender | $19.95 |
| Dungeons of Khan | $19.95 |
| Electronic Hobby Mate | $19.95 |
| Eureka | $19.95 |
| Eye of Min | $19.95 |
| Genius and Insanity | $19.95 |
| Geograbee | $19.95 |
| Histrobee | $19.95 |
| Miner | $19.95 |
| Ring of Doom | $19.95 |
| Robot Man | $19.95 |
| Sabre of Sultar | $19.95 |
| Scrambler | $19.95 |
| Space Invaders | $19.95 |
| Survivor | $19.95 |
| The Valley & Caves | $19.95 |
| Typing Tutor/Hints | $19.95 |
| Viper | $19.95 |
| Wonderwords | $19.95 |
| Word Adventure | $19.95 |

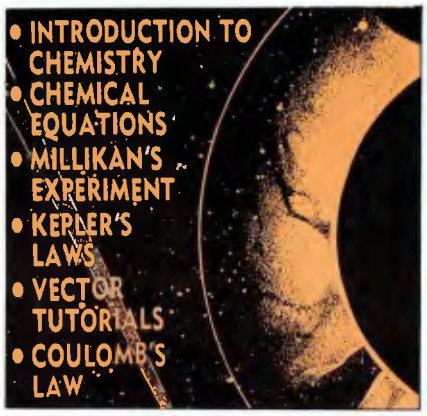
## Cassette Software

Adventure in 3D
Amazon Search
A-Reading-All
Atlantic Sea Battle
Azragor — Temple of
Bee Piano
Big Character VDU
Bill the Barman
Biorythms/Printer Pac
Black Jack
Busy Calc
Capture
Cannibals and Missionaries
Cave Hunt
Chase Plus
Chemical Equations
Chess/Chess Tutor
Chopper Pilot
Complex
Computer Modelling
Concentration
Craps and Roulette
Coulombs Law
Data Base
Debug (16 + 32K)
Depth Charge
Defender
Destroyer
Draughts
Dungeons of Khan
Electro Mate
Eliza
EI-Reading-OU
Escape from Colditz
Escape Key (16 + 32K)
Eureka
Eye of Min
Frontier Adventure
Geograbee
Geo-Tech Drawing (1 & 2)
Geo-Tech Drawing (3 & 4)
General Ledger
Genetic Inheritance
Genius & Insanity
Golf
Graphic Games (Vol 1)
Graphic Lander
Graphic Life
Gridfire
Hustle
Insurance Inventory
Introduction to Chemistry
Joysub Justle
Keplers Law
Keyboard Tutorial
Lazer Blazer
Learning Can Be Fun 1A
Learning Can Be Fun 1B
Learning Can Be Fun 1C
Learning Can Be Fun 2A
Learning Can Be Fun 2B
Learning Can Be Fun 2C
Logo 16 & 32
Marbles and Jail Bait
Market Simulation
Maths Adventure
Matrix Calculator
Metric Converter
Millikans Experiment
Miner
Morse Code (Tutorial)
Museum Adventure
Moving with Maths
Noughts and Crosses
One Day Cricket
P.C.G. Sampler
Pools and Lotto
Projectiles
Prospector
Quest for the Castle Eldritch
Reels
Ring of Doom
Robotman (Colour)
Sabre of Sultar
Scrambler
Sea Dog
Search and Destroy Wumpus
Sketch Pad
Space Lanes
Speed Reading
Spelling Wars 1 & 2
Stat Tutorial
Stat Pack Ver 1 to 4
Survivor
Space Invaders
Space Lanes
Super Disassembler
Sword Quest
Sydney Approach
Target/Z Trek
Teachers Busy Bee
Text Formatter
The Valley and Caves
Turtle
Typing Tutor/Basic Hints
Vectors & Graphing
Video Maze
Viper
Work A Bee
Word Adventure
Wonderwords
Yahtze

**"Software for Education Games Utility and Business"**

**Cassettes .....$12.50**

**Diskettes from .....$19.95**




## BEE SCIENTIST 1

A selection of our best PHYSICS and CHEMISTRY programs. You can study chemical equations, valency, Kepler's laws, Coulomb's law, Millikan's experiment and others in the comfort of your own home. Many programs feature excellent graphics and very realistic simulation of the laboratory experiments. For a complete review of each program see the individual listings for each title in our catalog. A very good value for money package for all parents having high school students doing chemistry or physics.

**Cassette Pack $49.95** **Diskette $39.95**

## DUNGEONS OF KHAN

The adventure is one of mystical powers of both sight and sound. The setting is a fantasy world of dungeons, warriors, goblins, torturers and a princess. You are a powerful warrior who has been wandering the lands of Morragoth in search of Princess Lara, who has been abducted by the evil Khan. Your search has brought you to the "Dungeons of Khan", which are guarded by the legendary Dungeon Masters. The power of these masters is almost unlmited but they can be killed by "the sword of Light" which only you may control. You must learn to use the sword wisely in order to slay a Dungeon Master. Search the dungeons for Princess Lara, free her from these masters, and get her out alive.

**Cassette $12.50** **Diskette $19.95**

## LEARNING CAN BE FUN

**available as a complete set in display folder — or on disk.**

**Cassette Pack $49.95** **Diskette $39.95**

**LEARNING CAN BE FUN vol 1A**
GORILLA Based on the Krazy Kong game, you must answer each maths problem before the barrels rolled by the gorilla hits the boy, each correct answer moves the boy closer to the gorilla until it is eventually put back in its cage. FRACE A series of shaded boxes are displayed, each representing a fractional number, answer as many as possible whilst a racing car does 10 laps of the screen.

**LEARNING CAN BE FUN vol 1B**
MUNCH Based on the PacMan game, the player selects the maths tables to be revised, and the screen is drawn with each "ghost" representing the answer to a question on the tables, select the correct answers to lock all the ghosts away. T-N-T The fuse is lit, try to answer all the questions before the big explosion.

**LEARNING CAN BE FUN vol 1C**
ADSTAR Based on the Space Invaders theme, aimed at infant level, shoot down the aliens by answering questions on single digit addition. SQUARE Uses graphic shapes from the Blakes 7 TV series, answering each question with the square of the number displayed causes the Liberator to destroy one object.

**LEARNING CAN BE FUN vol 2A**
A—C Use the well known alien creature to answer your questions on maths, each correct answer causes a potted plant to grow taller. M—RACE Similar to A—C but without the graphics, the main variation is that you are working against the clock, answer the questions before the time runs out.

**LEARNING CAN BE FUN vol 2B**
RESCUE An educational game for word matching. Fly your helicopter to rescue castaways on a desert island. Supurb graphics...
ALPHA2 Arrange the words into correct alphabetic sequence, there is a stop watch timing you, try to beat your best previous scores, or those of your friends.

**LEARNING CAN BE FUN vol 2C**
FROG-HOP An educational game for finding words with the opposite meanings. For each word you get correct the frog will catch a fly, otherwise the fly will escape.
ALPHAB Another variation on the alphabetic ordering drill (see ALPHA2 above).

## GEOGRABEE

The whole family will enjoy trying to beat the clock whilst identifying oceans, countries and continents, on the excellently drawn maps. Ideal for school work.

**Cassette $12.50** **Diskette $19.95**

## ADVENTURE PACK

EYE OF MIN An adventure program featuring a graphic map that is updated as you progress in your search of the eye. When you have solved this excellent mystery, the next in series is waiting, it is called "SABRE". SABRE If you like a really good mystery and can decipher the clues, you will love Sabre. The program has a tiny PCG map that updates as you proceed. AZRAGOR The third program in an adventure series featuring a high resolution graphics map of the terrain of the quest. After you had solved the "EYE of MIN" in the first program and obtained the priceless gem, you lost it during your quest for the "SABRE of SULTAR". Here is your opportunity to regain the treasure which is now kept in the "TEMPLE of AZRAGOR" the site of many a macabre blood sacrifice at the hands of the earth maidens.

**Cassette Pack $29.95** **Diskette $29.95**

## DEFENDER

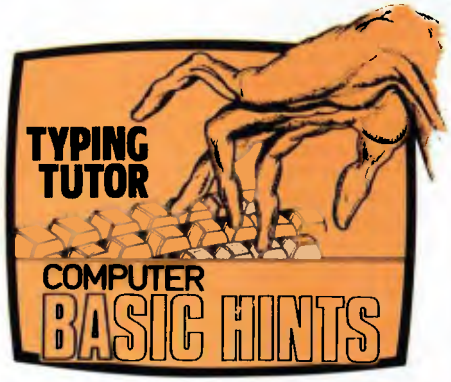
High speed, high resolution, high flying space arcade style game, guaranteed to keep you glued to your seat while you rescue the human race from alien invaders.
**Cassette $12.50** **Diskette $19.95**

## EUREKA

An "arcade" game where you attempt to mine diamond by blasting through unstable earth. Can you get all the jewels using the 5 miners provided? Beware of cave-ins, and ensure you keep enough explosives to return to the surface to cash in at the bank. Two versions provided, one for keyboard control, the other for joysticks.
**Cassette $12.50** **Diskette $19.95**

## SPELLING WARS

A well known little robot will help you with your spelling. The program has graded levels that are suitable for all levels from primary through to "Mums & Dads."
**Cassette $12.50**

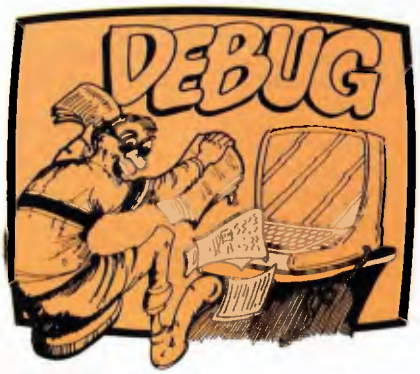



## TYPING TUTOR/HINTS

This package enables you to learn to touch type using the Pitman touch typing method. For those who want to master Microworld Basic there is a series of hints and suggested subroutines arranged in a most effective menu driven style.
**Cassette $12.50** **Diskette $19.95**

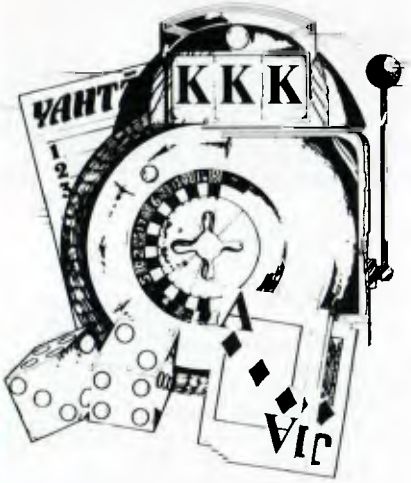
## DRAUGHTS PLUS

Draughts Plus contains three popular board games after microbee draughts, you can play Reversi and Link X, games the whole family will enjoy.
**Cassette $12.50**




## DEBUG

An interactive machine program debugger, that may be used to breakpoint or single step through programs to trace their execution. Registers, Stack, Condition codes, and up to 10, areas of memory may be monitored during execution. Two versions are on the tape, one for 16K and the other for 32K **microbees.**
**Cassette $12.50**




## BEE CASINO

A value package containing several cassettes in an attractive display case. There is a wide selection of gambling/casino games. Some programs are re-released (and rewritten) from earlier tapes, others are brand new games not previously sold for the microbee. No need to take the wife to Las Vegas or Wrest Point, stay at home and enjoy the challenge without risking any of your hard earned money to chance.
**Cassette $39.95** **Diskette $29.95**

## CHOPPER PILOT

An arcade style game where you fly a helicopter through a city, and a series of mazes without crashing into the scenery. Two modes of play are possible, one is for training where you can't crash, you simply fly through the obstacles.
**Cassette $12.50** **Diskette $19.95**

## Australian Education Software Support

There is a wide and ever growing range of high quality software written especially for Australian schools available for the **microbee.** Just released is 'Birds of Antartica' — an outstanding database application for secondary students. A full list of all available teacher support resources for **microbee** is available from your local **microbee Technology Centre.**

**New Release**

### JUST RELEASED
### BIRDS OF ANTARCTICA

Exactly what all educators have been waiting for! Exceptional quality in program content and presentation makes this an outstanding database application for secondary students. Demonstrates that the APPLICATION of technology is more important than the technology itself. This package offers numerous ways of using the program as a highly motivating research tool.

**Supplied to Schools by Dept. of Education.**

## microbee Instruction Books and User Manuals

| | |
|---|---|
| *microbee Technical Manual* | 24.95 |
| *microworld Editor/Assembler Manual.* | 5.00 |
| *Inside CP/M by David E. Cortesi* | 39.95 |
| *microsoft Basic Manual* | 24.95 |
| *microworld Basic Users Manual* | 12.50 |
| *An Introduction to Microbee Personal Computers and Programming — Your First 100 Programs. Mary Duckworth & Marlene Davidson* | 9.95 |
| *Wordbee Manual* | 9.95 |
| *Data Pack — microsoft Multiplan Manual microsoft Basic Manual Wordstar Reference Manual* | 49.95 |
| *Telcom III Maual* | 5.00 |
| *Wordstar Reference Manual* | 24.95 |
| *Wordstar Installation Manual* | 14.95 |
| *Wordstar Training Manual.* | 21.95 |
| *Multiplan Manual* | 24.95 |
| *Mailmerge Manual* | 19.95 |
| *Wildcards Vol I* | 15.00 |
| *Wildcards Vol II* | 16.00 |
| *Wildcards Vol III* | 16.00 |
| *Z80 Instruction Manual — Nat Wadworth* | 9.95 |
| *CP/M and the Personal Computer* | 22.95 |
| *Getting Started On Your microbee* | 9.95 |
| *Getting started On Your Micro* | 7.95 |

## *'ONLINE'* The monthly microbee magazine

**'ONLINE'** is the **microbee** owners journal full of information and features about your favourite personal computer. It is available from your local **microbee technology centre** at a cost of **$2.50** OR you can subscribe to *'ONLINE'* which is published monthly for **$25.00 annually. Why not fill out the coupon now and subscribe? That way you're sure to be informed of all the latest microbee** developments, new products and computing information!

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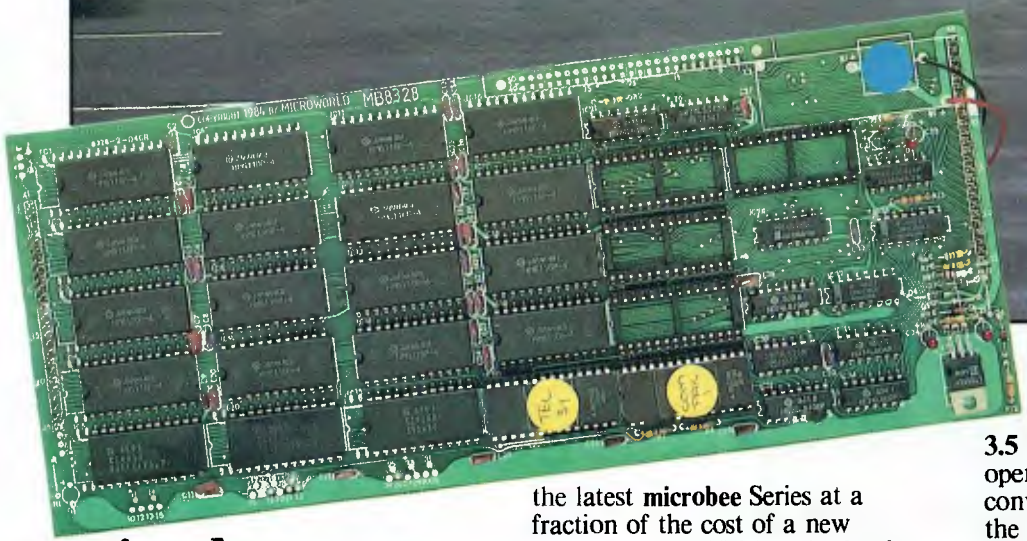
# Why microbee will not become obsolete




## microbee Quality control and up-grading facilities

A major advantage of the **microbee** is that all units can be readily expanded. An older 16K ROM based **microbee** can be updated to the latest **microbee** Series at a fraction of the cost of a new computer. A ROM based **microbee** can be converted to a Small Business Computer running disk drives with packaged software for wordprocessing, spreadsheet and BASIC. No other computer at present on the market gives this built-in guard against obsolescence.

New product improvements are being developed all the time. All **microbees** can be upgraded to run in RGB colour and now the incredible **3.5 inch Computer-in-a-Book Series** opens new opportunities for convenient disk-based applications of the unit. Add on peripherals such as BEEMODEM offer facilities at a price not available for other microcomputers.

**microbee** is manufactured in Australia under strict quality controls and is backed with a strong national service team. Best of all, **microbee** policy is to offer continual upgrade capability meaning you can always convert your **microbee** to a later model. **No microbee need ever become obsolete!**

# Technology Centres and User Groups

## Classes for microbee owners and users

Ask at your local **microbee Technology Centre** for details of classes in Microcomputing Concepts from Programming in Basic for Beginners, CP/M explained, Wordstar/ Mailmerge/Spellstar and other advanced topics. Enquire now for bookings available.

## microbee User Groups

There are over 30 user groups active in Australia. These are recommended for you to contact for newsletter and local friendly enthusiastic support.

N.S.W. User Groups

**Sydney microbee Users Group,**
Colin Tringham, President/Editor,
P.O. Box C233, Clarence Street,
Sydney 2000. (02) 92 6408

**Primary Schools microbee Users Group,**
Barry Manefield, Co-Ordinator,
c/- Denistone East Primary School,
Denistone East 2212

**Central Coast Computer Club,**
Max Maughan, Secretary,
Koala Crescent, West Gosford 2250

**Barrier microbee Users Group,**
P.R. Cotter, President,
553 Radium Street, Broken Hill 2880
(080) 88 1621

**Blue Mountains microbee Users Group,**
Don Cunningham, Secretary,
28 Frank Street, Mr. Druitt 2770

**Dubbo microbee Users Group,**
Frank Wilcox, Publicity Officer,
33-35 Carrington Avenue, Dubbo 2830

**Newcastle microbee Users Group,**
Lee Osman, Organiser,
12 Cleverton Close, Warners Bay 2282

**Illawarra microbee Users Group,**
Ronald Read, Organiser,
49 Beatus Street, Unanderra 2526

**Summerland Computer Club,**
Dianna Estreich, Co-Ordinator,
112 Casino Street, South Lismore 2480

**Hawksbury microbee Computer Club,**
Bruce Rennie, Organisor,
6 Warks Road, Kurrajong Heights 2758
(045) 67 7329

**Albury/Wodonga microbee Users Group**
E. Eulenstein, Convenor,
202 Kooba Street, Albury 2640,
(060) 25 1601

**Cooma microbee Users Group,**
Phill Zikan, Convenor,
P.O. Box 92, Cooma 2630,
(0648) 2 3315

**Wagga Wagga microbee Users Group,**
Arthur Hand, Organiser,
1 Ilex Street, Wagga Wagga 2650,
(069) 22 4640

**Yass microbee Users Group,**
N. Burke, Hon. Secretary,
25 DeMestre Street, Yass 2582

### A.C.T.

**Canberra microbee Users Group,**
Bill Horsfall, Convenor,
(062) 58 3193

### Tasmania

**Hobart microbee Users Group,**
Brian Links, Assistant Secretary,
18 Tunah Street, Howrah 7018

### Northern Territory

**Alice Springs microbee Users Group,**
Doug Craigie, Spokesperson,
P.O. Box 3230, Alice Springs 5750

**Darwin microbee Users Group,**
R.J. Cockburn, Executive Officer,
35 McCusker Avenue, Enfield 5085

### Western Australia

**microbee Users Group of Western Aust.**
Mike Oborn, Secretary
4 Garnkirk Road, Greenwood 6024
(09) 326 1261

### South Australia

**microbee Users Group of South Aust.**
R. Jackson, Secretary,
G.P.O. Box 767, Adelaide 5001

**The Port Lincoln microbee Users Group**
Lincomputer, P.O. Box 345,
Port Lincoln 5606

### Victoria

**Microbug Australia,**
Dixon Kenney,
P.O. Box 157, Nunawading 3131
(03) 873 4476

**Bendigo microbee Users Group,**
Bruce Wilson, Spokesperson,
38 Nolan Street, Bendigo 3131,

**Puckapunyal/Seymour microbee Users Group**
G.R. Chinner, Spokesperson,
9 Monash Drive, Seymour 3660
(057) 92 3165

**Western Suburbs microbee User Group,**
Sue Ferrito, Secretary,
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(03) 367 6569

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**Gold Coast microbee Users Group**
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(075) 31 4610

**Brisbane microbee Users Group,**
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**Cairns District microbee Users Group,**
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**Maryborough microbee Users Group,**
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218 Adelaide Street, Maryborough 4650,
(071) 22 1743

**Townsville microbee Users Group,**
Mannie Van Rijswijk, Secretary,
P.O. Box 5751, Townsville 4810,
73 4236

**Mackay microbee Users Group,**
Geoff Gehrins, Spokesperson,
P.O. Box 230, Mackay 4740,
(079) 42 3214

**I.S.H.S. Computer Club,**
Glen Beaumont, President,
Inala State High School,
Cnr. Hampton St., and Glanala Rd.,
Inala 4077

### International

**"Mikrobiten"**
c/- Olle Ljungquist,
Bjornkarrsv 72, S-183 41,
Taby, Sweden

## for BEEMODEM owners

**microbee** is a communications machine and using TELCOM and the BEEMODEM you should try to contact the following PAMS (Remote CP/M Systems)

Software Tools RCPM (ST-RCPM):
(07) 378 9530 24 hours EST.
Mi Computer Club BBS (MiCC-BBS)
(02)662 1686 24 hours EST.
Micro Design Lab
RCPM (MDL-RCPM)
(02) 663 0151 24 hours EST.
Sydney Public Access
RCPM (SPA-RCPM)
(02) 808 3536 24 hours EST.
Omen RTRS (OM-RTRS): (02) 498 2495
1630-0900 + 24 hours weekends
Melbourne CBBS (MICOM-CBBS)
(03) 762 5088 24 hours EST
Sorcerer CBBS (SCUA-CBBS)
(03) 836 4616 24 hours EST
TARDIS RCPM (TARDIS-RCPM)
(03) 67 7760 1800-0800 + 24 hours weekends
Gippsland RCPM (GL-RCPM)
(051) 34 1563 24 hours EST
Adelaide Micro UG BBS (AMUG-BBS) (08)
271 2043 1000-2200 weekends only CST
Computer ventures BBS (CV-BBS)
(08) 255 9146 24 hours CST.
Outback RCPM (OUTB-RCPM)
(089) 27 7111 24 hours CST.
OMEN II RTRS (OM2-RTRS)
(089) 27 4454 24 hours CST.
OMEN III RTRS (OM3-RTRS)
(09) 279 8555 0800-2400 + 24 hours w/ends
**New Zealand**
Attache RBBS (ATT-RBBS): ISD 64 9 76
2039 + 24 hours NZT Domestic (09) 76 2039

All prices are subject to change without notice.

# microbee Technology Centres

**microbee** is designed and produced in Australia to meet the special needs of the Australian market. Our philosophy is to offer full product support as close to the customer as possible and for this reason **microbee Technology Centres** have been established in all major capital centres to support the **microbee** and offer a full technical back-up when needed. All Centres have the ability to perform on-the-spot service and upgrades for **microbees.** All are staffed by trained specialists who have the full back-up from computer engineers at our factories.

## Direct Orders
## Ph: (02) 487 2711

bankcard welcome here

**N.S.W.**
1 Pattison Ave,
Waitara 2077, N.S.W.
Phone (02) 487 2711

**VIC.**
729 Glenferrie Rd,
Hawthorn 3122, Vic.
**Phone (03) 819 5288**

**W.A.**
141 Stirling Highway,
Nedlands, W.A.
Phone (09) 386 8289

**S.A.**
151 Unley Road,
Unley 5061, S.A.
**Phone (08) 272 1384**

**QLD.**
**455 Logan Road,**
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Phone (07) 394 3688

**FACTORY**
Koala Crescent,
West Gosford 2250.
**Phone (043) 24 2711**

**DIRECT ORDERS**
PHONE (02) 487 2711
TELEX AA72767 —
APPTEC

```
58055 PRINT"[BROWN] [ORANGE]
58060 PRINT"[BROWN] [ORANGE]
58065 PRINTBL$;H$:HS$(NN/25)
58070 FORIW=0TO4:PRINTBL$;WP$(IW);WH$(IW);BL$;PP$(IW+3);
58080 FORJW=0TOPL(IW+3):PRINT" ";PH$(IW,0);:NEXT:NEXT
58085 PRINTBL$;"
58500 POKES(2),80:POKES(3),235:V2=235:X2=80
58510 POKES(0),30:POKES(1),190:POKES(16),1
58520 POKES(4),0:POKES(5),132:X3=0
58530 POKES(28),1:POKES(37),7:POKES(38),1
58540 PRINT"STINGS      SCORE       SEEDS       BEES
58550 PRINT";BS;
58560 PRINT";PO%;
58570 PRINT";FE%;" ";
58580 PRINT";BB;"
58600 POKES(21),7:POKEN(24),15:POKEN(4),0:POKEN(4),65:SYS49200
59000 RETURN
59999 REM INTERRUPT SPRITE ROUTINE
60000 DATA 120,169,74,141,20,3,169,192,141,21,3,88,96,120,169,49
60010 DATA 141,20,3,169,234,141,21,3,88,96,72,138,72,152,72,169
60020 DATA 0,141,39,192,173,144,220,170,41,16,208,5,169,1,141,39
60030 DATA192,138,41,8,208,39,169,1,141,37,192,173,16,208,74,144,8,173,0,208,205
60040 DATA 41,192,176,20,173,0,208,24,109,38,192,141,0,208,144,8
60050 DATA173,16,208,9,1,141,16,208,138,41,4,208,39,169,0,141,37,192,173,16,208
60060 DATA 74,176,8,173,0,208,205,40,192,144,20,173,0,208,56,237
60070 DATA 38,192,141,0,208,176,8,173,16,208,41,254,141,16,208,138
60080 DATA 41,2,208,15,173,1,208,205,43,192,176,7,24,109,38,192
60090 DATA 141,1,208,138,41,1,208,15,173,1,208,205,42,192,144,7
60100 DATA 56,237,38,192,141,1,208,104,168,104,170,104,76,49,234,20165
60999 REM BEE1 SPRITE
61010 DATA 0,0,0,128,0,0,128,0,0,32,0,0,33,64,0,37
61020 DATA 69,0,37,85,64,57,85,0,170,85,0,41,85,160,41,105
61030 DATA 105,1,105,105,2,105,105,0,169,104,0,41,160,0,130,32
61040 DATA 0,130,32,2,0,8,2,32,2,0,0,0,0,0,0,0
61099 REM BEE2 SPRITE
61100 DATA 1,1,0,5,69,64,5,85,0,129,85,0,129,84,0,32
61110 DATA 68,0,34,168,0,33,106,0,41,105,128,57,105,96,169,105
61120 DATA 104,41,105,105,34,105,105,0,169,105,0,41,160,0,34,32
61130 DATA 0,130,32,0,136,32,0,136,0,0,0,0,0,0,0,0
61199 REM BEE3 SPRITE
61200 DATA 0,0,0,0,0,2,0,0,2,0,0,8,0,1,72,0
61210 DATA 81,88,1,85,88,0,85,100,0,85,170,10,85,104,105,105
61220 DATA 104,105,105,64,105,105,128,41,106,0,10,104,0,8,130,0
61230 DATA 8,130,0,32,32,128,128,8,128,0,0,0,0,0,0,0
61299 REM BEE4 SPRITE
61300 DATA 0,64,64,1,81,80,0,85,80,0,85,65,0,21,65,0
61310 DATA 17,8,0,41,136,0,169,72,2,105,104,9,105,100,41,105
61320 DATA 106,105,105,104,105,105,136,105,106,0,10,104,0,8,136,0
61330 DATA 8,130,0,8,34,0,32,34,0,0,0,0,0,0,0,0
61399 REM SPUG1 SPRITE
61400 DATA 0,0,0,0,0,0,0,0,0,0,0,0,6,0,24,9
61410 DATA 0,36,9,0,36,19,0,50,21,158,106,21,173,106,20,201
61420 DATA 202,20,109,138,20,63,10,4,30,8,4,0,8,0,0,0
61430 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
61499 REM SPUG2 SPRITE
61500 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,6
61510 DATA 0,24,15,0,60,13,128,44,13,158,100,21,173,106,20,220
61520 DATA 202,20,109,138,20,63,10,15,30,2,15,0,2,0,0,0
61530 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
61599 REM BIRD1 SPRITE
61600 DATA 0,56,0,6,252,0,31,126,0,15,191,0,7,223,128,3
61610 DATA 239,0,129,254,0,231,255,136,255,255,244,127,255,247,127,255
61620 DATA 254,127,255,255,255,255,235,227,255,128,128,51,0,0,0,0
61630 DATA 0,4,128,0,2,64,0,7,112,0,10,168,0,0,0,0
61699 REM FLOWER SPRITE
61700 DATA 0,8,0,0,28,0,0,62,0,3,190,224,7,221,240,7
61710 DATA 221,240,7,235,240,3,235,224,12,255,152,31,62,124,63,255
61720 DATA 254,31,62,124,12,255,152,3,235,224,7,235,240,7,221,240
61730 DATA 7,221,240,3,190,224,0,62,0,0,28,0,0,0,0,0
61799 REM DEAD BEE SPRITE
61800 DATA 0,0,0,0,0,0,0,136,0,0,136,32,0,130,32,0
61810 DATA 34,32,0,41,160,0,169,105,34,105,105,41,105,105,169,105
61820 DATA 104,57,105,96,41,105,128,33,106,0,34,168,0,32,68,0
61830 DATA 129,64,0,129,85,0,5,85,0,5,69,64,1,1,0,33079

READY.
```

# Snake

## by FM O'Dwyer

An old favourite arcade game has been zapped up for the Atari. Written in machine code, Snake, by F M O'Dwyer, will need all your skills to keep ahead.

Control is via a joystick in port 1 of the Atari and using this you can guide the snake around the screen aiming for the numbers which appear from time to time at random positions. If you are unsuccessful the number changes into a deadly obstacle.

It is therefore wise to try and get all the numbers, even if they are a low value, or you will be constantly obstructed. For some reason it seems far easier to bump into the obstacles than the numbers.

If you do manage to get to a number

before it changes, your length will increase by an equivalent number of segments. Points are scored each time you get a number. You must also be careful not to bump into your own tail and this gets increasingly difficult as you grow.

If you go off the edge of the screen you wrap around, which is quite confusing with the game so fast. Just when you think you know where you are, you are suddenly wisked over to the other side of the screen. Obviously a great deal of practice is required.

You gain a life every 1000 points. Pressing START starts a new game and pressing OPTION allows you to change the speed of the game. A check sum is included in the program to ensure you type the data statements in correctly.

| | |
|---|---|
| 100 | Sets up the screen for the introduction page. |
| 110-190 | Prints instructions. |
| 200 | Closes and opens the keyboard and gets input. The close is executed first to make sure there is no open error. |
| 210 | Prints 'please wait' as data is being loaded. |
| 220 | Reads in the number of data statements for use in line 330. |
| 230 | Reads in start and end address data. |
| 240 | Converts the four eight-bit numbers to 16-bit addresses. |
| 260 | Reads in data. |
| 270 | Checks the number of data statements to make sure they are all there. |
| 280 | Checks sum to ensure data has been input correctly. |
| 290 | Turns off any current sound, selects the graphics screen mode, and executes the machine code. |
| 300 | Checks the flag and reset A if not set. |
| 310 | Set the flag. |
| 320 | End of subroutine. |
| 330-1890 | Data for the machine code. |

```
100 GRAPHICS 0:SETCOLOR 4,2,6:SETCOLOR
 2,11,10:SETCOLOR 1,0,0:POKE 752,1
110 ? "                 SNAKE"
120 ? :? "   Using a joystick in port
#1, guide":? "the snake over the numbe
rs which"
130 ? "appear from time to time.  If y
ou are":? "not successful in doing thi
s within"
140 ? "the time limit, then the number
 turns":? "into a deadly obstacle.  Ho
wever, if"
150 ? "you do succeed, the snake will
grow.":? :? "    If you run into an obs
tacle or"

160 ? "your own tail then you lose a l
ife.":? "You gain a life every 1000 po
ints.":?
170 ? "Pressing START starts a new gam
e.":? "Pressing OPTION allows you to c
hange"
180 ? "the speed of the game.  Press o
nce to":? "enter change speed mode.  E
ach"
190 ? "subsequent press takes you to t
he ":? "next speed.  1 is fastest, and
 9 is":? "the slowest."
200 ? :? "       press any key to begin
":POKE 764,255:CLOSE #1:OPEN #1,4,0,"K
:":GET #1,K
210 POSITION 2,22:? "                 please w
ait."
220 READ N,I,I:TRAP 280:CHK=0
230 READ SLO,SHI,LLO,LHI
240 ST=SLO+256*SHI:LT=LLO+256*LHI
250 GOSUB 300
260 FOR I=ST TO LT:READ X:CHK=CHK+X:PO
KE I,X:NEXT I
270 IF (LT-ST)<>N THEN 230

280 IF CHK<>164459 AND CHK<>164819 THE
N GRAPHICS 0:? "SOME ERROR - CHECK DAT
A STATEMENTS":END
290 SOUND 0,0,0,0:GRAPHICS 0:X=USR(A):
END
300 IF FLAG<>1 THEN A=ST
310 FLAG=1
320 RETURN
330 DATA 1559
340 DATA 255,255,0,48,16,54,169,0,141,
150
350 DATA 48,141,151,48,216,169,64,133,
16,133
360 DATA 64,169,8,133,2,169,48,133,3,1
69
370 DATA 2,133,9,32,154,48,32,184,51,3
2
380 DATA 191,48,32,237,52,32,31,53,173
,31
390 DATA 208,201,3,240,240,169,0,162,2
0,160
400 DATA 14,32,138,53,173,31,208,201,6
,208
410 DATA 233,173,31,208,201,6,240,249,

169,0
420 DATA 141,148,48,141,149,48,169,3,1
41,152
430 DATA 48,169,16,141,153,48,32,191,4
8,32
440 DATA 235,48,169,0,133,20,133,19,13
3,18
450 DATA 32,26,49,165,19,201,1,208,10,
169
460 DATA 0,133,19,32,232,53,32,103,51,
173
470 DATA 31,208,201,6,240,191,201,3,24
0,155
480 DATA 174,0,6,160,0,136,208,253,202
,208
490 DATA 250,76,104,48,0,0,0,0,0,0
500 DATA 173,48,2,133,212,173,49,2,133
,213
510 DATA 160,7,169,4,145,212,200,192,2
9,208
520 DATA 249,160,3,169,70,145,212,160,
```

```
6,169
530 DATA 6,145,212,32,191,48,96,165,88
,133

540 DATA 212,165,89,133,213,162,0,160,
0,138
550 DATA 72,152,72,169,0,168,145,212,2
30,212
560 DATA 208,2,230,213,104,168,104,170
,232,208
570 DATA 1,200,192,3,208,229,224,152,2
08,225
580 DATA 96,32,170,53,162,20,142,0,8,1
42
590 DATA 21,49,232,142,2,8,160,11,140,
22
600 DATA 49,140,1,8,140,3,8,169,4,141
610 DATA 24,49,169,0,141,25,49,169,11,
141
620 DATA 23,49,96,0,0,0,0,0,173,120
630 DATA 2,201,15,240,51,162,0,134,77,
174
640 DATA 23,49,201,11,208,7,224,7,240,
36
650 DATA 141,23,49,201,7,208,7,224,11,
240
660 DATA 25,141,23,49,201,14,208,7,224
,13

670 DATA 240,14,141,23,49,201,13,208,7
,224
680 DATA 14,240,3,141,23,49,173,23,49,
201
690 DATA 7,208,17,238,21,49,173,21,49,
201
700 DATA 40,208,68,169,0,141,21,49,240
,61
710 DATA 201,11,208,17,206,21,49,173,2
1,49

720 DATA 201,255,208,47,169,39,141,21,
49,208
730 DATA 40,201,14,208,17,206,22,49,17
3,22
740 DATA 49,201,0,208,26,169,22,141,22
,49
750 DATA 208,19,201,13,208,15,238,22,4
9,173
760 DATA 22,49,201,23,208,5,169,1,141,
22
770 DATA 49,174,21,49,172,22,49,32,208
,50
780 DATA 201,0,240,81,201,10,240,85,20
1,1

790 DATA 240,81,32,154,52,56,233,1,72,
24
800 DATA 10,109,24,49,141,24,49,173,25
,49
810 DATA 105,0,141,25,49,104,10,10,10,
10
820 DATA 248,24,109,148,48,141,148,48,
173,149
830 DATA 48,105,0,141,149,48,205,153,4
8,208
840 DATA 24,238,152,48,32,209,53,32,15
4,52
850 DATA 32,209,53,32,154,52,173,153,4
8,24
860 DATA 105,16,141,153,48,216,32,40,5
0,32
870 DATA 223,50,96,104,104,206,152,48,
240,6
880 DATA 32,197,52,76,90,48,32,197,52,
32
890 DATA 103,52,32,40,50,76,42,48,173,
149
900 DATA 48,160,0,162,15,32,97,50,232,
232

910 DATA 173,148,48,32,97,50,162,0,236
,152
920 DATA 48,240,13,224,6,240,9,169,11,
232
930 DATA 32,139,50,76,60,50,169,0,232,
32
940 DATA 139,50,32,103,52,160,35,169,0
,162
950 DATA 21,32,138,53,96,72,141,138,50
,152
960 DATA 72,138,72,173,138,50,41,240,7
4,74
970 DATA 74,74,24,105,16,32,139,50,232
,173
980 DATA 138,50,41,15,24,105,16,32,139
,50
990 DATA 104,170,104,168,104,96,0,141,
10,212

1000 DATA 32,157,50,140,156,50,160,0,1
45,206
1010 DATA 172,156,50,96,0,72,152,72,13
8,72
1020 DATA 165,88,133,206,165,89,133,20
7,152,240

1030 DATA 17,24,165,206,105,40,133,206
,165,207
1040 DATA 105,0,133,207,136,76,170,50,
24,138
1050 DATA 101,206,133,206,165,207,105,
0,133,207
1060 DATA 104,170,104,168,104,96,32,15
7,50,140
1070 DATA 222,50,160,0,177,206,172,222
,50,96
1080 DATA 0,169,1,174,21,49,172,22,49,
```

```
32
1090 DATA 142,50,169,254,24,109,24,49,
133,206
1100 DATA 169,7,109,25,49,133,207,160,
0,177
1110 DATA 206,170,200,177,206,168,169,
0,32,142
1120 DATA 50,32,11,51,96,169,252,24,10
9,24
1130 DATA 49,133,203,169,7,109,25,49,1
33,204
1140 DATA 173,25,49,74,168,173,24,49,1
06,56

1150 DATA 233,1,170,152,233,0,168,138,
72,152
1160 DATA 72.160.0.177,203,160.2.145.2


03,160
1170 DATA 1,177,203,160,3,145,203,104,
168,104
1180 DATA 170,56,165,203,233,2,133,203
,165,204
1190 DATA 233,0,133,204,202,224,255,20
8,214,136
1200 DATA 192,255,208,209,173,21,49,14
1,0,8
1210 DATA 173,22,49,141,1,8,96,174,182
,51
1220 DATA 172,183,51,32,208,50,201,0,2
40,9
1230 DATA 201,1,240,5,169,10,32,139,50
,173
1240 DATA 10,210,41,63,201,39,144,3,56
,233
1250 DATA 39,170,173,10,210,41,31,56,2
33,1
1260 DATA 201,21,144,3,56,233,21,24,10
5,1


1270 DATA 168,32,208,50,201,0,208,217,
173,10
1280 DATA 210,41,7,142,182,51,140,183,
51,24
1290 DATA 105,2,32,139,50,96,0,0,165,1
06
1300 DATA 56,233,8,141,244,2,133,207,1
33,213
1310 DATA 169,0,133,212,133,206,169,0,
133,203
1320 DATA 169,224,133,204,162,0,160,4,
138,72
1330 DATA 152,72,160,0,177,203,145,212
,104,168
1340 DATA 104,170,230,212,208,2,230,21
3,230,203
1350 DATA 208,2,230,204,202,224,255,20
8,225,136
1360 DATA 192,255,208,220,160,8,185,25
5,51,145
1370 DATA 206,200,192,104,208,246,96,2
55,195,195
1380 DATA 195,195,195,195,255,8,8,8,8,
8

1390 DATA 8,8,8,170,2,2,170,128,128,17
0
1400 DATA 0,170,2,2,170,2,2,170,0,130,
1410 DATA 130,130,130,170,2,2,2,170,12
8,128
1420 DATA 170,2,2,170,0,170,128,128,17
0,130
1430 DATA 130,170,0,170,2,2,2,2,2,2,2
1440 DATA 2,170,130,130,170,130,130,17
0,0,85
1450 DATA 85,85,85,85,85,85,85,56,84,2
14
1460 DATA 254,254,186,68,56,0,24,24,24
,0
1470 DATA 0,0,0,173,149,48,205,151,48,
240
1480 DATA 4,144,22,176,8,173,148,48,20
5,150
1490 DATA 48,144,12,173,148,48,141,150
,48,173
1500 DATA 149,48,141,151,48,160,0,162,
8,173
1510 DATA 151,48,32,97,50,232,232,173,
150,48

1520 DATA 32,97,50,96,72,165,19,72,165
,20
1530 DATA 72,169,175,141,1,210,169,50,
141,0
1540 DATA 210,169,0,133,20,165,20,201,
5,208
1550 DATA 250,169,0,141,1,210,141,0,21
0,104
1560 DATA 133,20,104,133,19,104,96,165
,19,72
1570 DATA 165,20,72,169,143,141,1,210,
162,0
1580 DATA 134,20,142,0,210,232,165,20,
201,50
1590 DATA 208,246,169,0,141,1,210,141,
0,210
1600 DATA 104,133,20,104,133,19,96,160
,0,169
1610 DATA 0,162,1,32,138,53,160,14,169
,0
1620 DATA 162,20,32,138,53,162,17,96,1
38,72
1630 DATA 162,14,160,0,32,139,50,104,1
70,173
```

```
1640 DATA 31,208,201,6,240,34,201,3,20
8,234
1650 DATA 232,224,26,208,2,162,17,173,
31,208
1660 DATA 201,3,240,249,164,20,200,140
,138,50
1670 DATA 164,20,204,138,50,208,249,76
,2,53
1680 DATA 138,56,233,16,10,10,141,0,6,
96
1690 DATA 51,37,44,37,35,52,0,51,48,37

1700 DATA 37,36,26,255,48,50,37,51,51,
0
1710 DATA 51,52,33,50,52,0,52,47,0,34
1720 DATA 37,39,41,46,255,0,34,57,0,38

1730 DATA 50,33,46,43,0,47,12,36,55,57

1740 DATA 37,50,255,0,0,0,0,0,0,0
1750 DATA 0,0,0,0,0,0,0,0,0,0
1760 DATA 0,0,0,255,140,138,50,168,140
,169
1770 DATA 53,172,138,50,185,64,53,201,

255,240
1780 DATA 13,172,169,53,32,139,50,238,
138,50
1790 DATA 232,76,142,53,96,0,169,0,133
,212
1800 DATA 169,8,133,213,160,4,162,0,15
2,72
1810 DATA 160,0,169,0,145,212,104,168,
230,212
1820 DATA 208,2,230,213,202,224,255,20
8,235,136
1830 DATA 192,255,208,230,96,165,20,72
,165,19
1840 DATA 72,169,0,133,20,165,20,201,5
,208
1850 DATA 250,104,133,19,104,133,20,96
,165,20
1860 DATA 72,165,19,72,169,175,141,1,2
10,169
1870 DATA 200,141,0,210,169,0,133,20,1
65,20
1880 DATA 201,5,208,250,169,0,141,0,21
0,141
1890 DATA 1,210,104,133,19,104,133,20,

96,0
```

# Spectrum Voyager

## by Jeffrey Lee

You control a small shuttle craft on its way across the screen, guiding it past mines while collecting fuel pods before docking with the mother ship. It sounds easy, but I can assure you that it's not.

If you find the program too difficult and want to slow things down, add line 177 FOR W=1 TO 8 : NEXT W.

This delightfully short program fits neatly into any Spectrum.

```
  1 REM VOYAGER JEFFREY LEE
  5 INK 4: BRIGHT 1: PAPER 0: B
ORDER 0: CLS
  20 LET HI=500
  25 LET H$="JEFF"
  30 GO SUB 2000
  40 CLS : GO SUB 3000
  50 LET SC=0
  60 LET LIV=3
  70 LET D$="00000"
  80 CLS : IF LIV<=0 THEN  GO TO
 9000
  81 PRINT AT 0,0;"VOYAGER:SCORE
 "ID$;":LIVES ";LIV
  82 PRINT AT 10,0; INK 3;"▙"AT
 11,0;"▀▀";AT 13,0;"▟▀▙"AT 14,0;
"▜▛"
  100 FOR F=1 TO 20
  110 LET X=INT (RND*22)+4: LET Y
=INT  (RND*15)+4
  111 LET X1=INT (RND*22)+4: LET
 Y1=INT  (RND*15)+4
  120 PRINT AT Y,X; INK 7; BRIGHT
 1;"▀"
  121 IF F/3=INT F/3 THEN  PRINT
 AT Y1,X1; INK 2; BRIGHT 1;"*"
  130 BEEP .002,60
  140 NEXT F
  150 LET X=INT (RND*15)+4
  160 LET Y=30
  170 PRINT AT X,Y;" "
  171 LET Y=Y-1
  172 PRINT AT X,Y;"◀"
  175 IF ATTR (X,Y-1)=67 THEN  GO
 SUB 7000
  176 IF LIV<=0 THEN  GO TO 9000
  180 LET D$(6-LEN (STR$ SC) TO )
=(STR$ SC)
  190 PRINT AT 0,14;D$
  195 GO SUB 4000
  200 IF  INKEY$="" AND IN 31=0 TH
EN  GO TO 250
  205 PRINT AT X,Y;" "
  210 LET X=X+(INKEY$="L" OR INKE
Y$="1" OR (IN 31<8 AND IN 31<20
 AND X>21)-(INKEY$="P" OR INKEY$
="0" OR (IN 31>7 AND IN 31<16) A
ND X>2)
  220 PRINT AT X,Y;"◀"
  230 BEEP .002,10
  240 IF ATTR (X,Y-1)=71 THEN  GO
 SUB 500
  245 IF X<=1 THEN  GO TO 1000
  270 GO TO 170
  500 FOR F=50 TO 60 STEP 2: BEEP
 .02,F: NEXT F
  510 LET SC=SC+20
  520 RETURN
 1000 IF LIV<=0 THEN  GO TO 9000
 1001 CLS : IF X<>12 THEN  GO TO
 1030
 1010 PRINT "WELL DONE'PREPARE TO
  CONTINUE;"
 1020 GO TO 1040
 1030 IF LIV<=0 THEN  GO TO 9000
 1031 CLS : PRINT "HARD LUCK:PREP
ARE TO CONTINUE;"
 1032 GO SUB 5000
 1033 LET LIV=LIV-1
 1040 IF LIV<=0 THEN  GO TO 9000
 1041 FOR I=7 TO 0 STEP -1
 1042 FOR T=1 TO 25: NEXT T
 1050 PRINT AT 5,0; INK 7;"COUNTD
OWN-";I; INK 4;I;" "
 1060 BEEP .1,10
 1070 NEXT I
 1080 GO TO 80
 2000 FOR F=5 TO 25 STEP 2
 2005 READ A$
 2010 FOR G=30 TO F STEP -1
 2020 PRINT AT 5,G;A$;" "
 2025 BEEP .001,G*2
 2030 NEXT G: NEXT F
 2040 DATA "*","*","V","O","Y","A
","G","E","R","*","*"
 2045 LET F=5
 2050 FOR F=1 TO 5
 2060 READ A
 2070 IF A=5 THEN  LET K=I
 2080 BEEP K,(A/3.6)-20
 2090 NEXT F

 2100 DATA 97,105,89,43,69
 2110 FOR F=USR "A" TO USR "C"+7
 2120 READ A: POKE F,A: NEXT F
 2130 DATA 15,6,126,BIN 10101011,
126,6,15,0
 2140 DATA 145,82,52,31,248,52,82
,145
 2150 PRINT AT 21,0;"◀"
 2160 FOR F=30 TO 0 STEP -1
 2165 FOR G=1 TO 3: NEXT G
 2166 BEEP .0009,G*2
 2170 PRINT AT 21,F;"◀"
 2180 NEXT F
 2190 PRINT AT 8,0;"INSTRUCTIONS;
"

 2200 LET I$=" GUIDE YOUR CRAFT (
▀) ACROSS THESCREEN COLLECTING F
UEL PODS (▪) WHILST AVOIDING MIN
ES (▲) BEFORETRYING TO LAND IN T
HE DOCKING  BAY OF YOUR MOTHERS
HIP.
                CONTROLS:
                P-UP          L-DO
WN              KEMPSTON JOYSTICK M
AY BE USED.   GOOD LUCK!"
 2205 PRINT AT 10,0;
 2206 INK 6
 2210 FOR F=1 TO LEN I$
 2220 IF CODE I$(F) 144 THEN  PRI
NT I$(F);: FLASH 1;" ";CHR$ 81: G
O TO 2225
 2221 PRINT  INK (2 AND I$(F)="▲"
)+(7 AND I$(F)="▪")+(6 AND I$(F)
="▀");: FLASH 1;I$(F);"■";CHR$ 8;
 2230 IF I$(F)<>" " THEN  BEEP .0
05,5
 2240 NEXT F
 2250 PRINT )0; INK 5;"  PRESS AN
Y KEY/FIRE TO START"
 2260 IF INKEY$="" THEN  GO TO 2
260
 2270 IF INKEY$="" AND IN 31=16 T
HEN  GO TO 2270
 2280 RETURN
 3000 REM TUNE
 3010 FOR F=1 TO 13
 3020 READ D,P
 3030 LET D=D/3.6-10
 3035 LET P=P-1
 3040 BEEP P,D
 3050 NEXT P
 3060 DATA 53,4,69,4,81,4,69,4,
73,4,61,4,69,8,53,4,41,4,
73,4,41,4,49,4,53,8
 3070 RETURN
 4000 IF ATTR (X,Y-1)=66 THEN  GO
 TO 4020
 4010 RETURN
 4020 GO TO 1030
 5000 LET X$="1114331101": LET Y
$="3213212121"
 5010 FOR A=1 TO 11: BEEP VAL (Y$
(A))/4,VAL (X$(A))-1: NEXT A: RE
TURN
 7000 GO TO 1030
 9000 CLS : PRINT AT 5,10;"GAME O
VER"
 9010 PRINT AT 6,9;"SCORE=";d$
 9020 IF SC<HI THEN  GO TO 9100
 9030 LET HI=SC
 9031 PRINT AT 10,0;"NEW HIGH SCO
RE:PLEASE ENTER NAME"
 9040 INPUT  LINE H$
 9050 FOR F=1 TO 3
 9060 FOR G=7 TO 0 STEP -1: BORDE
R G: NEXT G: NEXT F
 9100 PRINT AT 15,0; INK 5;"HIGH
SCORE BY:"; INK 4;H$;AT 17,0; IN
K 5;"WITH A SCORE OF:"; INK 4;HI
 9110 PRINT )0; INK 2; BRIGHT 1;
FLASH 1;"DO YOU WANT TO PLAY AGA
IN (Y/N)?"
 9120 IF INKEY$="N" OR INKEY$="n"
 THEN  STOP
 9125 IF INKEY$<>"y" AND INKEY$<>
"Y" THEN  GO TO 9120
 9128 CLS
 9129 RESTORE 10
 9130 GO TO 30
```

# Minicalc Spreadsheet

## by Chris Stamboulidis

Minicalc is a spreadsheet program requiring a 24k VZ-200 system and an optional 80-column printer. It is based on a program written by Barry Spencer in the April 1984 issue of *Rainbow* magazine.

It features the following facilities:

— 9 x 43 cells on the spreadsheet
— tape storage and retrieval of data and functions
— dump to a printer
— column and row addition functions as well as +, −, *, /, ↑ , absolute and integer functions
— non-destructive function view command to display formulae assigned to any cell

After you RUN the program, you will be greeted by the title screen and asked whether you require instructions. Hitting the 'Y' key will display the commands available and the syntax required to implement them. Note that when entering formulae for the cell functions, it is often necessary to use commas (such as when specifying cells). Unfortunately, the INPUT statement in Basic will not accept characters entered after a comma unless the entire input is enclosed in quotation marks. The result otherwise is an '? extra ignored' error message.

Hitting 'Y' will enter the spreadsheet proper and the upper left section will be displayed (there are 16 overlapping sections in all). The '>' prompt means that you may now enter a command.

To enter data, simply type Gx,y and hit (RETURN); x and y specify a cell x positions across and y positions down; this can be thought of as a GOTO command. When the 'G' cursor appears in the specified cell, you may enter numbers of strings up to 8 characters in length. From here, you may use the cursor control keys to move around the displayed section of the spreadsheet, entering data as you go. To get back to the command mode, simply hit (RETURN).

To enter formulae, use Fx,y where x and y specify the cell in which the result will be displayed. An 'F' cursor will appear in the cell specified and you will be prompted to type in the function into the two upper-most screen lines. Remember to use quote marks here, and hit (RETURN) when finished.

The four pre-set functions are:

— Ca,b gives the sum of the values appearing in the column from row a to row b
— Ra,b does the same in a row from column a to column b
— 'A' at the beginning or end of a formula takes the absolute value of the result
— 'I' at the beginning or end takes the integer value of the result. When specifying cells, use square brackets
eg, [3,13].

To view a function in a particular cell, use Vx,y, hitting (RETURN) to get back to the command mode.

Movement from section to section within the spreadsheet is via the MU, MD, ML, MR commands (move up, down, left & right). MH returns you to the upper leftmost section.

S and L are used for saving and loading from tape, and P enters the print mode.

U will update the entire spreadsheet, ie, all formulae will be calculated and the results displayed. Note that calculations occur from top to bottom, so that if a formula refers to a cell below it, you must update twice.

Finally, when typing in the program, the following characters should be entered in inverse text:

line 180 ; "?"
line 450 ; "G"
line 510 ; "F"

```
10 ' ---MINICALC----  5/6/84
12 ' REQUIRES 24K SYSTEM
15 CLS:PRINT@200,"M I N I C A L C"
20 CLEAR7000:DIML$(9,43),V(40),I$(9,43)
30 FORIX=1TO32:S$=S$+" ":NEXT:S1$=LEFT$(
S$,30):S2$=LEFT$(S$,29)
70 PRINT@489,"INSTRUCTIONS?";
72 W$=INKEY$:IFW$=""THEN72
74 IFW$="Y"THENGOSUB2000ELSEIFW$="N"THEN
90ELSE72
90 CLS
100 FORTX=28736TO28767:POKETX,32:NEXT:PO
KE28749,50:POKE28759,51
105 POKE28739,49:PRINT@96,"";
110 FORTX=1TO12:PRINTRIGHT$(STR$(TX),2):
NEXT:PRINT"13";
130 FORTX=28769TO29154STEP32:P=PEEK(TX):
IFP>63THENPOKETX,P-64
135 NEXT
140 FORTX=28768TO29153STEP32:P=PEEK(TX):
IFP>63THENPOKETX,P-64
```

```
150 NEXT:XS=0:YS=0
170 PRINT@0,S1$;
175 PRINT@0,">":PRINT:P=2:A$="":C$="":PR
INT@P,"";:A$=INKEY$
180 A$=INKEY$:B$=INKEY$:IFA$=""THENPRINT
@P,"?";:GOTO180
185 IFA$=B$THEN180
190 PRINT@P," ";:IFA$=CHR$(13)THEN230
200 IFA$=CHR$(8)ANDLEN(C$)>0THENP=P-1:C$
=LEFT$(C$,P-2):GOTO180
210 C$=C$+A$
220 PRINT@P,A$;:P=P+1:GOTO180
230 L$=LEFT$(C$,1)
240 IFL$="G"THENFX=0:GOTO330
250 IFL$="F"THENFX=1:GOTO330
260 IFL$="V"THENFX=2:GOTO330
270 IFL$="U"THEN940
280 IFL$="S"THEN970
290 IFL$="L"THEN1060
300 IFL$="M"THEN1170
310 IFL$="P"GOSUB1320
315 IFL$="Q"THEN2200
320 GOTO170
330 L$="":FORTX=2TOLEN(C$):M$=MID$(C$,TX
,1):IFM$=","THEN360
340 L$=L$+M$
350 NEXT:GOTO170
360 L$=RIGHT$(L$,1):X=VAL(L$)-XS:IFX+XS>
9THEN170
370 L$=RIGHT$(C$,LEN(C$)-TX)
380 Y=VAL(L$)-YS:IFY>14THEN170
390 IFFX<>2THEN430
400 IFLEN(I$(X+XS,Y+YS))=0THEN170ELSEI1=
1
410 PRINT@32,S$;:PRINT@32,MID$(I$(X+XS,Y
+YS),1+32*(I1-1),32);
420 I1$=INKEY$:G$=INKEY$:IFI1$=""THEN420
422 IFI1$=G$THEN420
424 PRINT@32,S1$;
425 IFLEN(I$(X+XS,Y+YS))>32*I1THENI1=I1+
1:GOTO410ELSE170
430 IFX<1ORX>30RY<1ORY>13THEN170ELSEPRIN
T@32,S$;
440 P=Y*32+X*10+57:PRINT@P,"          ";:
L$(X+XS,Y+YS)=""
445 IFFX=1THENGOSUB510:GOTO170
450 A$=INKEY$:B$=INKEY$:IFA$=""THENPRINT
@P,"G";:GOTO450
455 IFA$=B$THEN450
```

```
460 PRINT@P," ";
465 IFA$=CHR$(13)THEN500ELSEIFA$=CHR$(10
)THENY=Y+1:GOTO430
466 IFA$=CHR$(8)THENX=X-1:GOTO430
470 IFA$=CHR$(27)THENY=Y-1:GOTO430
475 IFA$=CHR$(9)THENX=X+1:GOTO430
480 IFA$=CHR$(8)ANDLEN(L$(X+XS,Y+YS))>0T
HENP=P-1:GOTO485ELSE490
485 L$(X+XS,Y+YS)=LEFT$(L$(X+XS,Y+YS),LE
N(L$(X+XS,Y+YS))-1)
486 GOTO450
490 L$(X+XS,Y+YS)=L$(X+XS,Y+YS)+A$:PRINT
@P,A$;:P=P+1
495 IFP<>511THEN450
500 GOTO170
510 PRINT@P,"F";:PRINT@0,I$(X+XS,Y+YS)
530 PRINT@0,S1$:PRINT@0,"";:INPUTI$:GOSU
B1150:O=0
535 I$(X+XS,Y+YS)=I$:XA=X+XS:YA=Y+YS
540 O=0:V(0)=0:FORZ=1TOLEN(I$):M$=MID$(
I$,Z,1)
560 IFM$="["THENX$="":Y$="":GOTO880
570 IFM$="<"THENX$="":Y$="":GOTO1110
580 IFM$="R"THEN750
590 IFM$="C"THEN750
600 NEXT:IZ=0:V=V(0):O=1:FORZ=1TOLEN(I$
):M$=MID$(I$,Z,1)
630 IFM$="*"THENV=V*V(O):GOTO930
640 IFM$="+"THENV=V+V(O):GOTO930
650 IFM$="/"THENV=V/V(O):GOTO930
660 IFM$="-"THENV=V-V(O):GOTO930
670 IFM$="I"THENIZ=IZ+1
680 IFM$="A"THENIZ=IZ+2
690 IFM$="^"THENV=V^V(O):GOTO930
700 NEXT
710 IFIZ=1THENV=INT(V)
720 IFIZ=2THENV=ABS(V)
730 IFIZ=3THENV=INT(ABS(V))
740 GOTO860
750 FORTZ=2TOLEN(I$):IFMID$(I$,TZ,1)=","
THEN765ELSE770
765 T1$=MID$(I$,2,TZ-2):LL=LEN(I$)-TZ:T2
$=MID$(I$,TZ+1,LL)
766 GOTO780
770 NEXT
780 V=0:IFM$="C"THEN830
800 FORZ=VAL(T1$)TOVAL(T2$):V=V+VAL(L$(
TZ,YA)):NEXT:GOTO860
830 FORZ=VAL(T1$)TOVAL(T2$):V=V+VAL(L$(
```

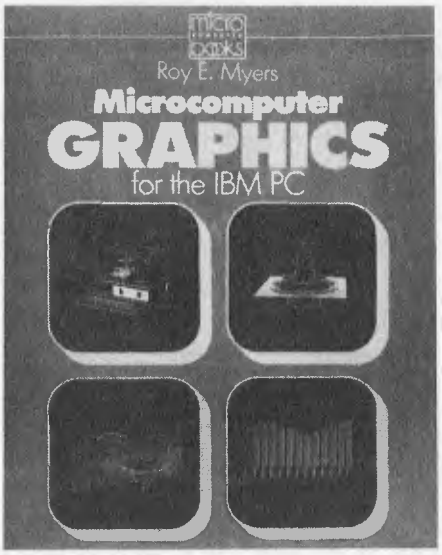
```
XA,Tx)):NEXT
860 PRINT@P-1,"          ";:PRINT@P,V;:L$
(XA,YA)=STR$(V)
865 IFLEFT$(L$(XA,YA),1)=" "THEN866ELSE8
70
866 L$(XA,YA)=RIGHT$(L$(XA,YA),LEN(L$(XA
,YA))-1)
870 RETURN
880 Tx=Tx+1:M$=MID$(I$,Tx,1):IFM$=","THE
N900
890 X$=X$+M$:GOTO880
900 Tx=Tx+1:M$=MID$(I$,Tx,1):IFM$="]"THE
N920
910 Y$=Y$+M$:GOTO900
920 X1=VAL(X$):Y1=VAL(Y$):V(O)=VAL(L$(X1
,Y1)):O=O+1:GOTO600
930 O=O+1:NEXT:GOTO170
940 FORYx=1TO43:FORXx=1TO9:IFI$(Xx,Yx)="
"THEN960
950 I$=I$(Xx,Yx):X$="":Y$="":XA=Xx:YA=Yx
:GOSUB540
960 NEXT:NEXT:GOSUB1240:FORO=98TO480STEP
32:PRINT@O,S1$;:NEXT
962 PRINT@482,S2$;:POKE29183,32
964 FORXx=1TO3:FORYx=1TO13:PRINT@Yx*32+X
x*10+57,L$(Xx+XS,Yx+YS);
966 NEXT:NEXT:GOTO170
970 INPUT"HIT <RETURN> TO SAVE";NA$
980 FORTx=1TO9:FORYx=1TO43:PRINT#"MIN",L
$(Tx,Yx),I$(Tx,Yx):NEXT
990 NEXT:GOTO170
1060 INPUT"HIT <RETURN> TO LOAD";TA$
1070 FORTx=1TO9:FORYx=1TO43:INPUT#"MIN",
L$(Tx,Yx),I$(Tx,Yx):NEXT
1080 NEXT:GOTO170
1110 I1$=""
1120 Tx=Tx+1:M$=MID$(I$,Tx,1):IFM$=">"TH
EN1140
1130 I1$=I1$+M$:GOTO1120
1140 V(O)=VAL(I1$):O=O+1:GOTO600
1150 IFI$="N"THEN170
1160 RETURN
1170 L$=MID$(C$,2,1)
1175 IFL$="H"THENXS=0:YS=0
1180 IFL$="L"ANDXS<>0THENXS=XS-2
1190 IFL$="R"ANDXS<6THENXS=XS+2
1200 IFL$="U"ANDYS<>0THENYS=YS-10
1210 IFL$="D"ANDYS<30THENYS=YS+10
1220 GOSUB1240:GOSUB1290
```

```
1230 POKE28749,50+XS:POKE28759,51+XS:POK
E28739,49+XS
1231 FORXz=1TO3:FORYz=1TO13
1232 PRINT@Yz*32+Xz*10+57,L$(Xz+XS,Yz+YS
);:NEXT:NEXT:GOTO170
1240 FORYz=1TO13:FORXz=1TO3:PRINT@Yz*32+
Xz*10+57,"     ";
1250 NEXT:NEXT:Z=58:FORAz=28779TO29163ST
EP32:POKEAz,Z
1260 POKEAz+1,Z:POKEAz+10,Z:POKEAz+11,Z:
POKEAz+20,Z:NEXT:RETURN
1290 FORYz=1TO9:Pz=28736+Yz*32:Tz=YS/10-
1+49:POKEPz,Tz:NEXT
1300 FORYz=10TO13:Pz=28736+Yz*32:Tz=YS/1
0+49:POKEPz,Tz:NEXT
1310 RETURN
1320 PRINT@0,"START ROW":INPUTA:PRINT@0,
" LAST ROW":INPUTB
1340 FORY=ATOB:FORX=1TO9
1350 LPRINTTAB((X-1)*9)L$(X,Y);
1360 NEXT:LPRINTCHR$(13);:NEXT:RETURN
2000 CLS:PRINT"COMMAND":PRINT@17,"SYNTAX
"
2010 PRINT" QUIT"TAB(13)"Q":PRINT" CELL
ENTRY"TAB(7)"GX,Y"
2020 PRINT" FUNCTION ENTRY   FX,Y":PRINT
" FUNCTION VIEW    VX,Y"
2025 PRINT" MOVE HOME"TAB(8)"MH"
2030 PRINT" MOVE LEFT"TAB(8)"ML":PRINT"
MOVE RIGHT"TAB(7)"MR"
2050 PRINT" MOVE UP"TAB(10)"MU":PRINT" M
OVE DOWN"TAB(8)"MD"
2070 PRINT" UPDATE"TAB(11)"U":PRINT" SAV
E TO TAPE     S"
2090 PRINT" LOAD FROM TAPE   L":PRINT" P
RINT"TAB(12)"P"
2115 PRINT"  USE QUOTE MARKS FOR FORMULA
E":PRINT@491,"<RETURN>";
2120 Q$=INKEY$:IFQ$=""THEN2120
2130 IFQ$=CHR$(13)THENRETURNELSE2120
2200 PRINT@1,"ARE YOU SURE";:INPUTAN$
2210 IFAN$="YES"THENCLS:CLEAR50:END
2220 GOTO170
```

# Microcomputer Graphics for the IBM PC

**by Roy E Myers**

IBM and compatible users may like to try their hands at making a graphic IBM computer on their screens. The program is quite long, but simple in structure. It is written in Advanced Basic and needs a colour/graphics interface. In planning the program, approximate measurements (in inches) were take from an IBM PC system unit, monitor, and keyboard, using the lower left-hand rear corner of the system unit as a reference point. This point becomes the origin of the X, Y, Z axis system. The measurements are provided in DATA statements and read as needed in the program.




```
10 'PROGRAM A6.1  (IBM)
20 'Front cover; upper left
100 '=============================================
110 RHO = 100: D = 1500
120 THETA = .5: S1 = SIN(THETA): C1 = COS(THETA)
130 PHI = 1.25: S2 = SIN(PHI): C2 = COS(PHI)
140 KEY OFF: SCREEN 2: CLS: C = 3: SC = 5/12
150 WINDOW SCREEN (0,0) - (639,199)
160 '------------------------------
170 FOR IMAGE = 1 TO 2
180  'System unit
190  GOSUB 750: GOSUB 750: GOSUB 860
200  ST = .3: IF IMAGE = 2 THEN ST = .9
210  FOR Y = .75 TO 5.85 STEP ST
220   X = 15.75: Z = 2.5
230   GOSUB 1060: PSET (SX,SY)
240   X = 16: Z = 1
250   GOSUB 1060: LINE - (SX,SY)
260  NEXT Y
270 '-------------------------------------
280 'Disk drives
290  GOSUB 750
300  X = 15: Y = 12: Z = 2
310  GOSUB 1060: PAINT (SX,SY)
320  C = 0: GOSUB 750: GOSUB 750
330  READ X,Y,Z: GOSUB 1060: PAINT (SX,SY),0,0
340  READ X,Y,Z: GOSUB 1060: PAINT (SX,SY),0,0
350  GOSUB 750: GOSUB 750: GOSUB 750: C = 3
360 '-------------------------------------
370 'Box for IBM logo
380  GOSUB 750
390 'Power switch
400  GOSUB 750
410  X = 1: Y = 19.5: Z = 2.5
420  GOSUB 1060: PAINT (SX,SY)
430 'Monitor
440  GOSUB 750: GOSUB 750
450  X = 13: Y = 15.5: Z = 12
```

```
460  GOSUB 1060: CIRCLE (SX,SY),6
470  Z = 10: GOSUB 1060: CIRCLE (SX,SY),6
480  Z = 13.5: GOSUB 1060: CIRCLE (SX,SY),2
490  GOSUB 750: GOSUB 750
500 '-----------------------------------


510 'Keyboard
520  GOSUB 750
530  FOR X = 19 TO 23
540   Y = 1.5: Z = .75
550   GOSUB 1060: PSET (SX,SY)
560   Y = 16.5: GOSUB 1060: LINE - (SX,SY)
570  NEXT X
580  IF IMAGE = 2 THEN 710
590 '-----------------------------------


600 'Set viewport
610  X = 13: Y = 3: Z = 15
620  GOSUB 1060 : PX = SX
630  X = 13: Y = 14: Z = 15
640  GOSUB 1060: PY = SY
650  X = 14: Y = 14: Z = 6.5
660  GOSUB 1060: QX = SX
670  X = 14: Y = 3: Z = 6.5
680  GOSUB 1060: QY = SY
690  VIEW (PX,PY) - (QX,QY)
700  RESTORE
710 NEXT IMAGE
720 END
730 '=================================


740 'Line drawing subroutine
750 READ N
760 READ X,Y,Z: X = X+X1: Y = Y+Y1: Z = Z+Z1
770 GOSUB 1060: PSET (SX,SY),C
780 FOR I = 1 TO N
790  READ X,Y,Z: X = X+X1: Y = Y+Y1: Z = Z+Z1
800  GOSUB 1060
810  LINE - (SX,SY),C
820 NEXT I
830 RETURN
840 '=================================


850 'Hidden lines - binary search
860  FOR J = 1 TO 3
870   READ X,Y,Z: GOSUB 1060: XV = SX: YV = SY
880   READ X,Y,Z: GOSUB 1060: XH = SX: YH = SY
890   READ X,Y,Z: GOSUB 1060: XP = SX: YP = SY
900   READ X,Y,Z: GOSUB 1060: XQ = SX: YQ = SY
910   V1 = (XH - XV)/2: V2 = (YH - YV)/2
920   U1 = XP - XQ: U2 = YP - YQ
930   XT = XV + V1: YT = YV + V2
940   FOR I = 2 TO 7
950    CROSS1 = U2*(XV-XQ) - U1*(YV-YQ)
960    CROSS2 = U2*(XT-XQ) - U1*(YT-YQ)
970    VI = SGN(CROSS1*CROSS2)
980    V1 = V1/2: V2 = V2/2
990    XT = XT + V1*V1: YT = YT + V1*V2
1000  NEXT I
```

```
1010  LINE (XV,YV) - (XT,YT)
1020 NEXT J
1030 RETURN
1040 '=======================================

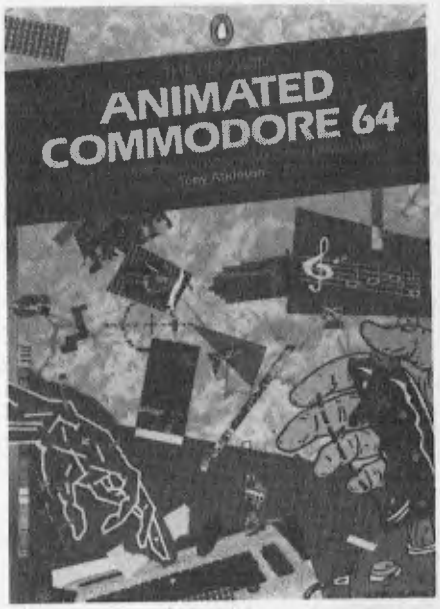
1050 'Perspective projection subroutine
1060 XE = -X*S1 + Y*C1
1070 YE = -X*C1*C2 - Y*S1*C2 + Z*S2
1080 ZE = -X*S2*C1 - Y*S1*S2 - Z*C2 + RHO
1090 SX = D*XE/ZE + 310
1100 SY = 110 - SC*D*YE/ZE
1110 RETURN
1120 '=======================================

1130 'System unit
1140 DATA 5, 0,19.5,5.5, 15,19.5,5.5, 16,19.5,0
1150 DATA 0,19.5,0, 0,19.5,5.5, 0,17.5,5.5
1160 DATA 1, 15,19.5,5.5, 15,0,5.5
1170 'Hidden line data
1180 DATA 15,0,5.5,  0,0,5.5
1190 DATA 12.75,2,16.5, 14.5,2,5.5
1200 DATA 15,0,5.5, 16,0,0
1210 DATA 17,0,1, 17,18,1
1220 DATA 16,19.5,0, 16,0,0
1230 DATA 17,18,1, 17,18,0
1240 'Disk drives
1250 DATA 4, 15,6.5,1, 15,6.5,4.5, 15,18.5,4.5
1260 DATA 15,18.5,1, 15,6.5,1
1270 DATA 4, 15,9,3.75, 15,10,3.75, 15,10,1.75
1280 DATA 15,9,1.75, 15,9,3.75
1290 DATA 4, 15,15,3.75, 15,16,3.75, 15,16,1.75
1300 DATA 15,15,1.75, 15,15,3.75
1310 DATA 15,9.5,2.5, 15,15.5,2.5
1320 DATA 1, 15,7,2.75, 15,12,2.75
1330 DATA 1, 15,13,2.75, 15,18,2.75
1340 DATA 1, 15,12.5,4.5, 15,12.5,1
1350 'IBM logo
1360 DATA 4, 15.5,1,4.5, 15.5,2,4.5, 15.5,2,3.5
1370 DATA 15.5,1,3.5, 15.5,1,4.5
1380 'Power switch
1390 DATA 3, 0,19.5,1.5, 2,19.5,1.5, 2,19.5,3.5
1400 DATA 0,19.5,3.5
1410 'Monitor
1420 DATA 10, 12.75,2,16.5, 12.75,17.5,16.5, 0,17.5,16.5
1430 DATA 0,0,16.5, 12.75,2,16.5, 14.5,2,5.5
1440 DATA 14.5,17.5,5.5, 0,17.5,5.5, 0,17.5,16.5
1450 DATA 12.75,17.5,16.5, 14.5,17.5,5.5
1460 DATA 4, 13,3,15.5, 13,14,15.5, 14,14,6.5
1470 DATA 14,3,6.5, 13,3,15.5
1480 DATA 4, 13,15,15, 13,16,15, 13,16,14.5
1490 DATA 13,15,14.5, 13,15,15
1500 DATA 4, 14,14.5,7, 14,16.5,7, 14,16.5,7.5
1510 DATA 14,14.5,7.5, 14,14.5,7
1520 'Keyboard
1530 DATA 10, 17,18,1, 17,0,1, 25,0,.5
1540 DATA 25,18,.5, 17,18,1, 17,18,0
1550 DATA 25,18,0, 25,0,0, 25,0,.5
1560 DATA 25,18,.5, 25,18,0
1570 DATA 1, 18,1,.75, 18,17,.75
1580 DATA 24,17,.75, 18,1,.75
```

# Animated Commodore 64

**by Tony Atkinson**

*UFO Shooting Gallery Program.* As soon as you've typed in this program, save it on disk or tape before you RUN it. It's a long program in machine language and a small error could mean you lose the whole thing — before you've had a chance to use it! When you RUN this program, the screen goes dark and an orange flying saucer appears. Your mission? To destroy the alien craft with laser beams. Any key fires the laser.




```
10 N=12500
20 READD:IFD=-1THEN52
30 POKEN,D:N=N+1:GOTO20
31 DATA 169,193,141,249,7,173,21,208,9,
    2,141,21,208,169,8,141
32 DATA 10,208,169,100,141,2,208,160,
    255,140,3,208,173,31,208,41,2,201
33 DATA2,240,16,152,72,32,113,49,32,188,
    52,104,168,136,208,231
34 DATA 76,212,48,173,21,208,41,253,141,
    21,208,169,192,141,248,7,173,21
35 DATA 208,9,1,141,21,208,169,7,141,39,
    208,173,29,208,9,1,141,29

36 DATA208,173,23,208,9,1,141,23,208
38 DATA 169,90,141,0,208,141,1,208
39 DATA 162,15,142,24,212,169,129,141,4,
    212,169,15,141


43 DATA 5,212,169,40,141,1,212,169,200,
    141,0,212,32,188,52,32,188,52
44 DATA 202,208,224,169,0,141,4,212,141,
    5,212,173,21,208,41,254,141,21
```

```
45 DATA 208,76,212,48,96,32,228,255,201,
    0,240,248,32,154
47 DATA 49,162,40,169,120,157,143,5,169,
    1,157,143,217,32,218,52,202
48 DATA 208,240,32,218,52,162,40,169,32,
    157,143,5,202,208,248,162,15
49 DATA 142,24,212,169,33,141,4,212,169,
    128,141,5,212,169,100,141,1

50 DATA 212,169,223,141,0,212,32,218
51 DATA 52,202,208,227,169,0,141,4,212,
    141,5,212,96,-1
52 FORN=0TO18:READD:POKE13500+N,D:NEXT
53 DATA 138,72,152,72,162,5,160,200,136,
    208,253,202
54 DATA 208,248,104,168,104,170,96
55 FORN=0TO9:READD:POKE13530+N,D:NEXT
57 DATA 138,72,162,255,202,208,253,104,
    170,96

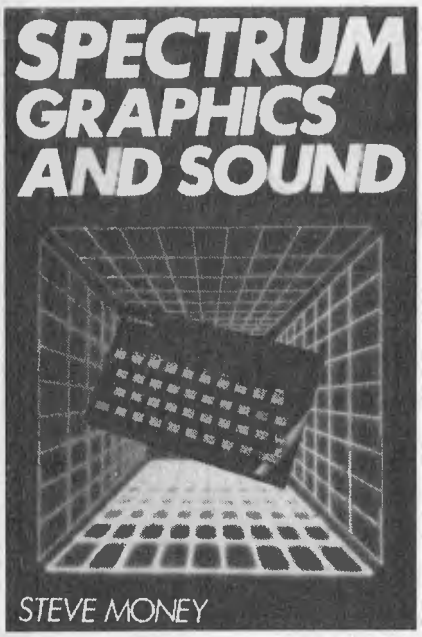
60 FORN=0TO62:READD:POKE12288+N,D:NEXT
61 DATA 0,30,96,0,255,254,1,255,255,3
62 DATA 255,255,3,255,254,15,255,254
64 DATA 31,255,254
65 DATA 63,255,254,127,255,252,255,255
66 DATA 255,255,255,255,255,255,255
67 DATA 255,255,255,255,255,254,255,255
68 DATA 254,31,255,252,63,255,248,63
69 DATA 255,0,7,255,0,7,248,0,3,208,0

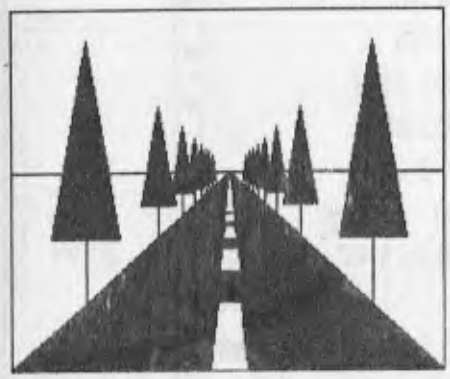
70 FORN=0TO62:READD:POKE12352+N,D:NEXT
71 DATA 0,0,0,0,126,0,0,255,192,1,255
72 DATA 224,3,255,224,3,255,248,7,255
73 DATA 248,127,255,255,255,255,255,170
74 DATA 170,170,255,255,255,255,255,255
75 DATA 63,255,248,0,0,0,0,0,0,0,0,0,0
76 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
80 POKE53280,0:POKE53281,0:PRINTCHR$(147
):SYS12500
```

# Spectrum Graphics and Sound

**by Steve Money**

Try drawing a perspective view of a road lined with trees on your ZX Spectrum. The program is simple but very effective as you'll see by the picture.



```
100 REM Perspective view of road
105 REM Draw sky
110 PAPER 5: CLS
115 REM Draw desert
130 PAPER 6
140 FOR y=10 TO 21
150 FOR x=0 TO 31
160 PRINT AT y,x;" ";
170 NEXT x: NEXT y
175 REM Draw road
180 FOR x=-128 TO 127
190 PLOT  INK 0;128,96
200 DRAW  INK 0;x,-96
210 NEXT x
220 LET sx=1024: LET sy=960
225 REM Draw road markings
230 FOR y=100 TO 2000 STEP 100
240 LET y1=INT (sy*10/(y+50))
250 LET y2=INT (sy*10/y)
260 LET x=INT (sx*1/(y+50))
270 FOR k=128-x TO 128+x
280 PLOT  PAPER 7; INVERSE 1;k,96-y1
290 DRAW  PAPER 7; INVERSE 1;0,y1-y2
300 NEXT k
310 LET x1=INT (sx*1/y)
320 FOR k=0 TO x1-x
330 PLOT  PAPER 7; INVERSE 1;128-x,96-y1
340 DRAW  PAPER 7; INVERSE 1;-k,y1-y2
350 PLOT  PAPER 7; INVERSE 1;128+x,96-y1
360 DRAW  PAPER 7; INVERSE 1;k,y1-y2
370 NEXT k: NEXT y: INVERSE 0
375 REM Draw horizon
380 PLOT  INK 0;0,96
390 DRAW  INK 0;255,0
395 REM Draw trees
400 LET tr=5: LET tt=20: LET tw=3
410 FOR y=150 TO 1200 STEP 150
420 LET y1=INT (sy*10/y)
430 LET y2=INT (sy*(10-tr)/y)
440 LET y3=INT (sy*(10-tt)/y)
450 LET x=INT (sx*12.5/y)
460 LET x1=INT (sx*tw/y)
470 LET x2=128-x: GO SUB 1000
480 LET x2=128+x: GO SUB 1000
490 NEXT y
500 STOP
990 REM Tree drawing subroutine
1000 PLOT  INK 0;x2,96-y1
1010 DRAW  INK 0;0,y2
1040 FOR k=-x1 TO x1
1050 PLOT  INK 0;x2,96-y3
1060 DRAW  INK 0;k,y3-y2
1070 NEXT k: OVER 0
1080 RETURN
```

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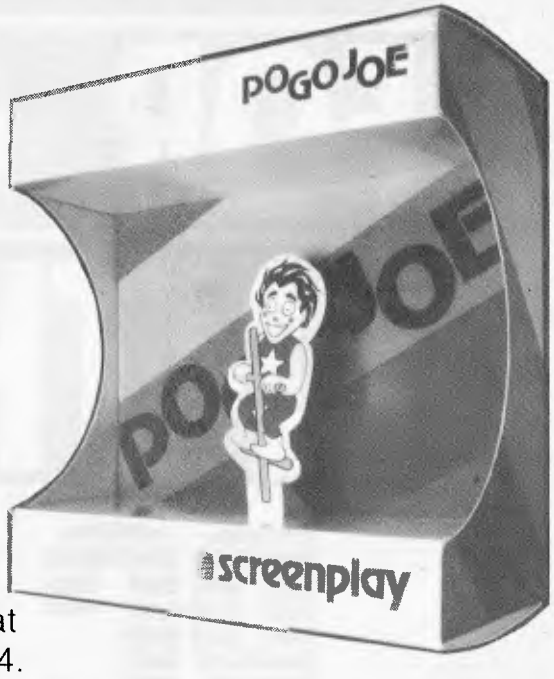


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Find out the methods the professionals use to test out their programs and how you can adapt them for yourself.

## 40 DIY ADVENTURES
We supply routines that will help you construct your own adventure game.

## 43 FLEXI-DISC, FREE PROGRAM LISTINGS
PCG's absolutely enormous programs section includes details of how to use the flexi-disc plus free programs for virtually every home micro.

## 71 BOOKSHELF
A Commodore 64 puzzles book, games computers play and Basic keywords are the subjects of books under our spotlight this month.

## 72 LOOKING GOOD
Subroutines to perform the missing PRINT AT function on the TI 99/4A, VIC 20 and C64.

## 77 PCG-64: COMMODORE ENHANCEMENTS
Ian Davies delivers upgrades for your '64 with LPRINT and AUTO line numbering commands.

## 82 HOME MICRO SUPERTEST
This month design and documentation fall under our scrutiny.

## 88 SCREEN TESTS
Reviews, screen shots and ratings for all the latest games.

### 88 GAME-OF-THE-MONTH
This month Atari's 'Pole Position' wins.

## 99 64 AND CP/M
A machine code parallel printer driver for the Commodore 64 running under CP/M.

## 100 PUZZLES
When you've waded through all of the above, relax with some trivial tests.

## 101 SUBSCRIPTIONS
One day your newsagent will go on strike and then where will you be?


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# LISP

*Dick Pountain's 'Teach Yourself' series continues with a definition of new functions and examples of proper Lisp programs.*

*This is part two of* APC's *Teach Yourself Lisp series. Copies of part one, which commenced in August 1984, are available through Back issues.*

*A product for those following the Lisp series: Microsoft has released a version of the language for MS-DOS and CP/M80 computers.*

*The package, called the muLisp-82 Artificial Intelligence Development System will work on a range of machines including the Apple and IBM PC.*

*It can cope, says Microsoft, with the bigger (segmented) memory systems of the 8088 or 8086 family of microchips — something a bit beneath one or two Lisp compilers which can restrict memory artificially.*

*As well as two educational programs, the package also includes an implementation of the original Eliza or Doctor program, written by Joseph Weizenbaum of the Massachusetts Institute of Technology — the program which always ducked any attempt to ask it a question by turning the question into another. ('Who are you?' — 'Why do you want to know who I am?').*

*If you can't find a store selling it, contact Microsoft on (02) 450 2522.*

Lisp works on names, numbers and lists by applying functions to them; a function is applied by making it the first element of a list, the rest of which contains its arguments. Functions always return values (so far we have looked at CAR, CDR and CONS) but lisp systems include many other functions; typical microcomputer versions will have between 60 and 100 built-in functions. You'll find a list of these in the supplied system manual, along with descriptions of what they do and how they treat their arguments. One function that's always included is OBLIST, which returns a list of all the objects Lisp knows about in the order in which they were created. It will list on the screen any names that you have created during the session and the names of all the built-in functions.

PLUS, DIFFERENCE and TIMES are always provided to do arithmetic (in some systems they can take more than two arguments so (PLUS 1 2 3 4) returns 10). Division is more variable between systems. No home computer implementation of Lisp that I know of has floating point arithmetic; most have signed 16-bit integer maths, which can cope with numbers between -32768 and 32767 (the notable exception is Microsoft's muLISP which, like most mainframe versions, has 'infinite' precision integer arithmetic so you can deal with any number whose representation will fit into free RAM). Most micro Lisps provide QUOTIENT and REMAINDER for integer division and some have DIVIDE which returns both quotient and remainder. Lisp is not geared to lots of number crunching: if that's what you need a good Basic will serve you better.

Another important group of functions perform tests. They return a value which is either True or False, just like =, <, > do in Basic. However, the representation of True of False in Lisp is not 1 or 0 as in most other languages: instead they have their own special names, T and NIL. these two words are built into the system and if you type them in at the keyboard they evaluate to themselves, just as a number does. It's important not to confuse NIL with arithmetic 0, though. It does represent nothing, but a different sort of nothing (no prizes for guessing that it represents the empty list (), as you'll see if you type in ()).

Typical tests include:

| | |
|---|---|
| (NUMBERPX) | — is X a number? |
| (ATOMX) | — is X an atom? |
| (NULLX) | — is X NIL? |
| (ZEROPX) | — IS X zero? |
| (EQUALXY) | — are X and Y the same? |
| (GREATERPXY) | — is X numerically greater than Y? |
| (MEMBERXY) | — is X a member of the list Y? |

The P which often ends these names is one of the historic relics that litter Lisp, standing for 'predicate' (a question mark at the end of all test names would have been better but I don't think they had them in those days). You've probably realised by now that some of these tests are sensitive to the type of their arguments: for example, GREATERP must have numbers not lists. This is the price we pay for letting a name take values of any type but it's well worth it. Check how your system behaves if you give it the wrong types; some give error messages while others just return NIL. Try this:

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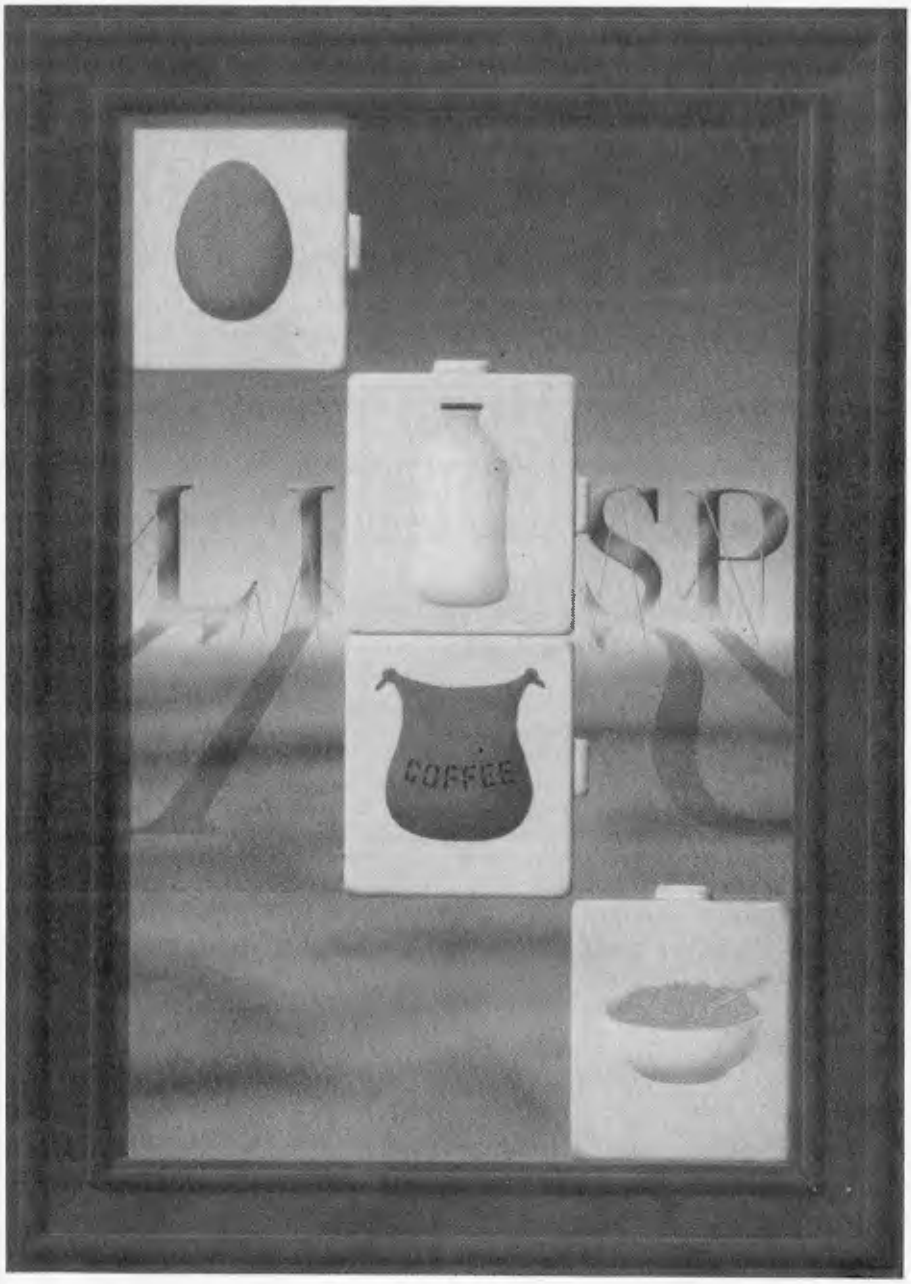


```
* (SETQ FRED 4)
* (SETQ TOM '(1 2 3))
* (GREATERP TOM FRED)
```

(Throughout this article I'm going to show in the examples exactly what you'd see on the screen. * is the prompt and Lisp's replies will appear on the next line at the left margin).

If all that Lisp could do were evaluate its built-in functions in this way, it would be a rather boring type of (integer only!) desk calculator. But, of course, we can define our own functions: defining functions is programming in Lisp. In order for our functions to do all the things that a Basic or Pascal program can (and more), they'll need to be more complex than the ones we've seen so far: they must be able to branch and loop and choose just as GOTO, FOR . . . NEXT and IF do. But for now let's just settle for defining something simple.

The function that defines functions in Lisp has various names in different systems but it's usually one of DEFINE, DEF, DE or DEFUN (DEFine FUNction). I'll stick to DEFINE because it says what it does.

DEFINE takes three arguments, so: (DEFINE function-name (list of its arguments)(body of function)) where the 'body' of the function is just what you would type in if you wanted to do what the function is supposed to do. As an example let's define SQUARE to calculate the square of a number. To square nine, using what we know so far, we type:

```
* (TIMES 9 9)
81
```

In our SQUARE function we want to replace the specific number nine with a variable argument, which we'll call NUM. So:

```
* (DEFINE SQUARE (NUM)
  (TIMES NUM NUM))
SQUARE
```

does the trick. Notice the value 'SQUARE' which Lisp returned. DEFINE is, after, all, only another function and it must return a value, which is always the name of the function we've just defined. We use SQUARE just like any other function:

```
* (SQUARE 8)
64
```

Two points are worthy of comment; the first is that we didn't need to use any quotes in the definition: DEFINE is one of that rare breed of functions that doesn't evaluate any of its arguments.

The second is that the variable which represents SQUARE's argument (namely NUM) is given to DEFINE as a list (that is, in brackets). This is nothing to do with the type of NUM (in this case it's a number not a list), but is the way DEFINE wants its second argument and who are we to argue. The reason becomes obvious when you define a function which takes more than one argument.

```
* DEFINE SAME-FIRST-ELEMENT?
  (LIST1 LIST2)
  (EQUAL (CAR LIST1) (CAR LIST2)) )
SAME-FIRST-ELEMENT?
```

We can use the function thus:

```
* (SAME-FIRST-ELEMENT? '(1 2 3)
  '(1 EGG 2 PIGS))
T
```

or:

```
* (SAME-FIRST-ELEMENT? '(1 2 3)
  '(A B C))
NIL
```

Note SAME-FIRST-ELEMENT? is a normal, respectable Lisp function and evaluates its arguments, hence the quotes before the lists. This is true of all functions created with DEFINE.

Note again that the brackets around (LIST1 LIST2) are there because it's a list of the formal arguments, not because LIST1 and LIST2 represent lists. Satisfy yourself that you understand why the brackets are as they are in (EQUAL (CAR LIST1) (CAR LIST2)). It's exactly what you'd type at the keyboard to do the test, assuming that LIST1 and LIST2 had been given values with SETQ.

Finally, note that Lisp doesn't mind a definition running over more than one line. When you hit RETURN Lisp won't accept the definition until all the brackets are balanced, which means that it's finished. Note also the extra spaces before the last bracket (which matches the one before DEFINE and ends the definition). This

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makes the structure of the EQUAL clause easier to see than if it had three right brackets at the end. If you're not to be driven batty by the brackets in Lisp (it's rumoured to stand for Lots of Irritating Single Parentheses) then pay attention to the layout of your definitions, breaking them at natural places onto a new line.

This raises a further point: how do you edit Lisp definitions? There is no simple answer. The Lisp interpreter normally allows only the use of the BACKSPACE/DELETE to undo things typed on the current line. Some home computer implementations might allow you to use the built-in editor which works for Basic programs. Otherwise a separate editing program is required and very often one, written in Lisp, will be supplied as a separate file which you can load. Lisp people tend to be spartan, almost monastic souls unspoiled by full-screen editors, so don't expect it to look like WordStar.

Now that we can define functions, all that's lacking in order to write real programs is some means of directing control flow.

This is a rather controversial area among Lisp people. The original 'pure' form of Lisp relied entirely on a function called COND (for 'CONDition') to alter the course of evaluation. Various other control structures

```
                (COND
NIL   └→(test1 ─┐          exp1 exp2)
NIL   └→(test2 ─┐          exp3  exp4   exp5)
T     └→(test3 →   exp6 → exp7) →   value of exp7
never  reached  (test4     exp8  exp9   exp10)  )
```

*Fig 1 COND: tracing control flow*

```
(DEFINE LOOK-FOR-EGG (LIST)
  (COND
    (  (EQUAL  (CAR LIST)    'EGG)                    'FIRST!  )
    (  (EQUAL  (CAR (CDR LIST))    'EGG)            'SECOND!  )
    (  (EQUAL  (CAR(CDR(CDR LIST)))    'EGG)         'THIRD!  )
    (    T                                           'DUNNO!  )
  )
)
```

*Fig 2 Function for the word 'EGG'*


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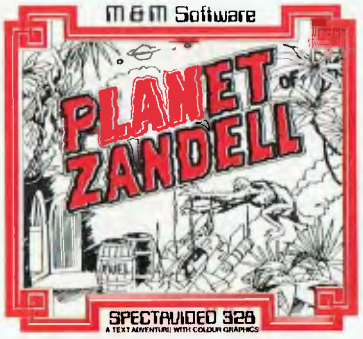


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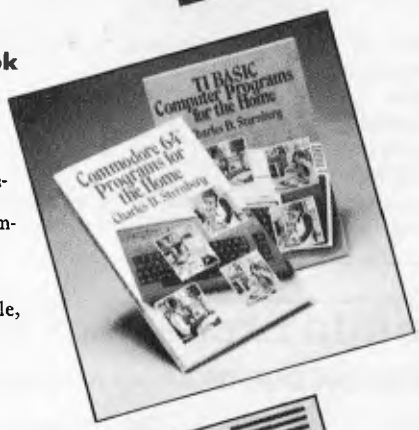


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have been tried, mostly modelled on those in more conventional languages: for example, LOOP or WHILE. I'll only consider a pure form of Lisp using COND here, partly because COND is both powerful and elegant once you grasp it but also because the newer constructs tend to vary from version to version.

COND is a function which chooses between a number of lists (called 'clauses') which make up its arguments. Each clause has two parts: the first element is a test expression which returns T or NIL (sometimes called a 'predicate'), and the rest can be any number of Lisp expressions:

```
(COND
  (test1 expressions . . . .)
  (test2 expressions . . . .)
  (test3 expressions . . . .)
  . . . . . .
  (testN expressions . . . .))
```

COND performs the tests one at a time starting from the top and when it finds one that isn't NIL, evaluates the expressions that follow it. The value of the *last* of these expressions is the value returned by COND. If all the tests yield NIL then COND Just returns NIL.

It may help to understand COND better if we stop thinking in Lisp functional terms for a minute and pretend we're in Basic. Tracing control flow with your finger, as in a Basic program, COND works down the column of tests and when it finds a true one carries on across and out (Fig 1).

The tests don't have to evaluate to T — any value other than NIL will trigger COND. If you want to make sure that *something* always gets evaluated, then the last clause can simply have T as its test portion. If all the other tests fail, this last clause will always be evaluated. It wouldn't make sense to start any clause before the last with T, because the clauses below it could never be reached and would be redundant. The example in Fig 2 may help to clarify this.

This preposterous function looks for the word 'EGG' in a list and tells you which position it's in, though it gives up after trying the first three! Artificial intelligence written very small indeed:

```
*(LOOK-FOR-EGG ' (DOG EGG FISH
  PIG))
SECOND!
```

You could read a COND like this as IF . . . THEN . . . IF . . . THEN . . . IF . . . THEN . . . OTHERWISE . . . ., where the T clause is the otherwise part which is always executed by default.

Instead of the puny 'FIRST!, 'SECOND!, and so on, we could have any number of expressions doing processing of great complexity. Don't forget that only the value of the last such expression is returned; if there were more than one, the others could only be there for their side-effects as they can't return any value. For example, if we make this change:

```
(COND
  ( (EQUAL (CAR LIST) 'EGG)
  (SETQ EGGPOSN 1)'FIRST!) . . .
```

then the SETQ expression sets the variable EGGPOSN to one as a side-effect: that is, it contributes nothing to the value returned by LOOK-FOR-EGG, which remains FIRST! if this clause if chosen.

Don't be depressed by the sight of that grisly progression of CAR(CDR(CDRs (what if we wanted to search the first 100 places?). That is not a sensible way to do things in List but we haven't yet discovered the trick to do it properly. A short term improvement would be to use CADR and CADDR, but what we really want is a means of repeating the application of CAR (or any other function) as many times as necessary.


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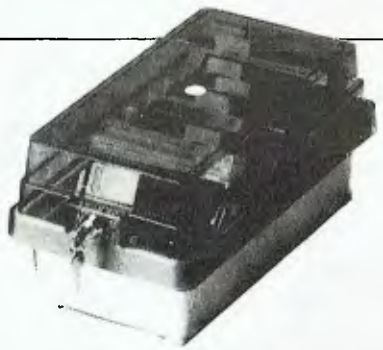

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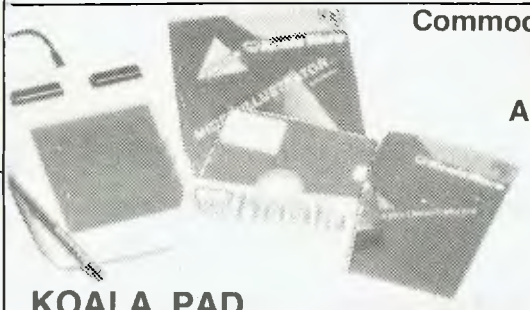

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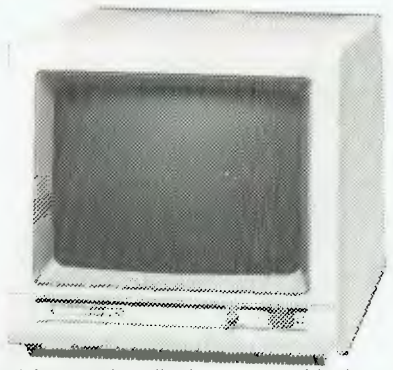

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# PC Graphics for technical types

*A good general graphics background*

**The Computer Image, Applications of Computer Graphics: Addison Wesley, 125pp $39.95.**

Four articles from authors, Greenberg, Marcus, Schmidt and Gorter discuss and describe recent techniques in computer graphics. This book is for anyone technically inclined.

Donald Greenberg's *Overview of Computer Graphics* is the first section and provides a clear and concise picture of the major problems of computer graphics, such as the hidden line/surface removal problem and an overview of the currently implemented solutions.

Aaron Marcus' article *Colour: A tool for Computer Graphics Communication* introduces a good explanation on the art of communicating with colours. Included are definitions and explanations of colour phenomena.

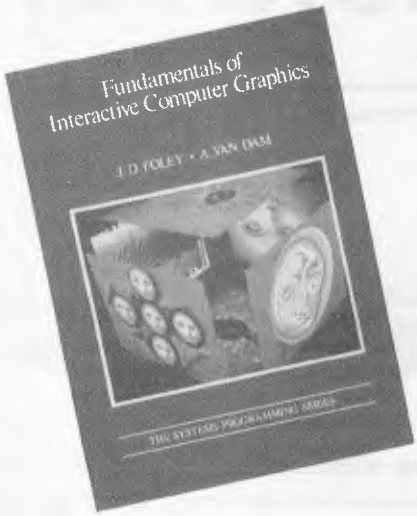
*Computer-Aided Business Graphics* by Allan Schmidt provides a broad description of how graphics can be used to understand business issues.

*Polaroid Instant Photography in the Computer Graphics Camera* by Vernon Gorter describes how graphics images can be recorded on to polaroid film for study.

The book provides a good, general background to the whole area of computer graphics and would be of real use as a primer to any technically-minded reader interested in this evolving field.

# Hardcore graphics guide

*An excellent graphics resource*




**Fundamentals of Interactive Computer Graphics: Foley & Van Dam, Addison Wesley 652pp**

Part of the IBM-sponsored System Programming Series, this text is aimed at computer sophisticates who seek a comprehensive tutorial on interactive computer graphics.

After a discussion of the history and uses of interactive computer graphics the authors provide clear examples, in Pascal, of basic graphics techniques, windowing, strings, picture generation etc.

Discussions of hardware, basic graphics implementations, transformations, viewing, modelling and object heirarchy all follow. The book contains numerous and interesting examples of each of the major points discussed and the inside covers and a centre section contain great full-colour graphics plates. Discussions of shape representation, shading models, hidden surface and edge algorithms and colour intensity issues are also included.

This book is a major work in the interactive graphics field and is an excellent resource and reference for those interested in a comprehensive and detailed view of the business.

The main audience will be professional programmers and systems folk although anyone interested in computer graphics will find plenty of useful information.

# Just Basic

*If you know how*

**Microcomputer Graphics: Myers, Addison Wesley. 279pp $15.95**

If you can program in Basic, own an Apple II+ or IIe and are interested in computer graphics this book was written for you. But make sure you know your Basic programming. I found some of the explanations tortuous and some concepts were introduced in the programs before they had been explained.

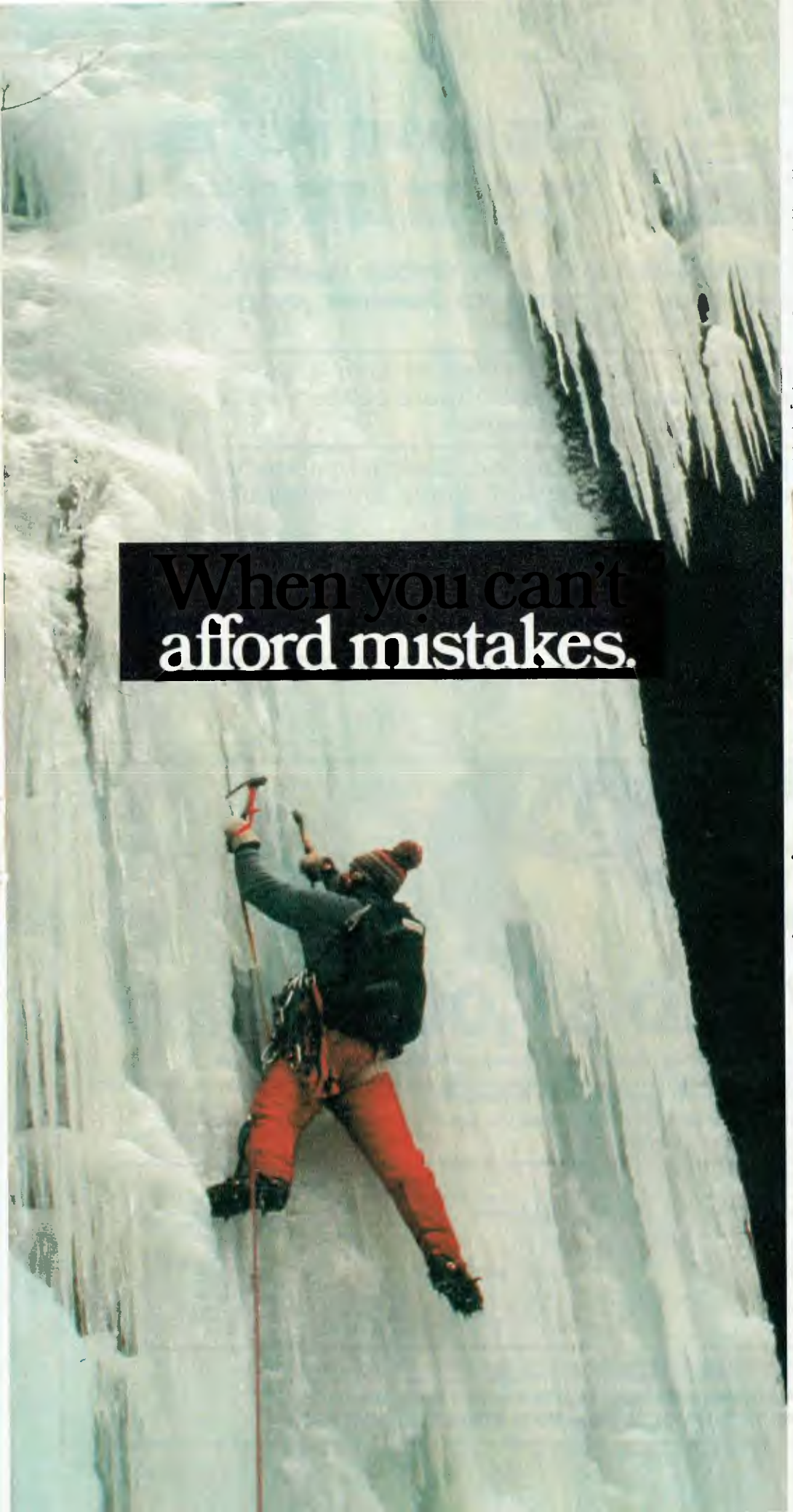
The book is loaded, and I mean loaded, with handy Basic programs to do everything, clipping, viewports, hidden lines and surfaces, matrix transformations, animations ... everything. But be prepared for lots of data entry for Mr Myers chose not to list out his programs as routines so that the reader could, wherever possible, take advantage of material typed in earlier.

This is a pity as it may reduce the number of people prepared to learn from the book ... better still would have been a disk of routines but I suppose the price would have been sent out of sight ... sigh.

The author rightly points out that the book is not intended to illustrate programming techniques ... again too bad as many new programmers could have got double value from the effort of punching in all that code.

Despite these possible drawbacks for some readers this book contains more programs about different graphics techniques than I have seen elsewhere. If you don't mind typing in programs this book is good value.

*Reviewer, Mike Bolan is a software specialist with Apple Computers.*



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# Get rich quick secrets

## *Apple millionaire's passion for gadgets*

*The wonderful, terrible Steven Jobs*

To discriminating readers, the idea of a book on Apple Computer Inc. probably has as much appeal as a biography of Michael Jackson or Princess Di — subjects whose coverage by the Press would have to be weighed in tons of newsprint.

By now, many schoolchildren can probably recite from memory the legend of the pioneering personal-computer manufacturing company started in a garage by two disaffected young Californians that today — eight years later — is a $1 billion-plus corporation.

Yet nowhere in the extravagant coverage of Apple's short history have there been answers to the questions about the *wunderkind* company that are still hotly debated in the computer industry.

For one, did Apple succeed largely because of dumb luck or because its founders had a huge and precocious talent for engineering and marketing?

To what extent is Apple the creation of the two founders, Steven Jobs and Stephen Wozniak, rather than that of the greybeards who joined the company soon after its incorporation?

Did the company, started by two members of the counter-culture, succeed within or outside Silicon Valley's tight network of moneymen and technophiles?

These questions are involved enough to demand treatment at book length. And here at last, in *The Little Kingdom: The Private Story of Apple Computer* by Michael Moritz, a *Time* correspondent, some answers are offered. Moritz's intimate account of the company's rise — backed by superb reporting and written at a crackling pace — weaves together Apple's history and biographies of the two Steves.

Moritz's reporting demonstrates that the Apple founders are lucky indeed.

But Wozniak's obsession with building electronic artifacts and Jobs's fierce determination to build a company and get rich quick were complementary attitudes that in many ways 'made' their luck.

Neither of the two is gifted in any conventional sense, and both are college dropouts. Moritz's richly detailed portraits of the pair in their adolescence and early twenties, however, show how the right mixture of personal idiosyncracies and unconventional talents can produce an improbable success story.

The principal asset of Jobs, who is now 29 and chairman of Apple, appears as an ability to think big. He 'started to talk about millions before his colleagues had contemplated thousands,' the author writes. His other talents include a remarkable instinct for guessing what features of a product — down to a minute level of detail — will help improve its sales appeal, and he goes to any lengths to have his ideas implemented.

In one scene, Jobs and Apple's first president, Michael Scott, quarrel about a product warranty for the Apple II computer: 'When Scott threw up his hands in horror at the notion of offering a one-year warranty on the computer when the industry standard was 90 days, Jobs burst into tears, had to be cooled off with what eventually became a standard ritual (a walk around the parking lot), but eventually won his way.'

He discovers an intriguing method for recovering from the rigors of entrepreneurship: 'massaging his feet in the flush of a toilet bowl.'

Wozniak emerges in the book as a compulsive and eccentric tinkerer. But there is nothing here to suggest that he is a technical genius, in spite of a passionate interest in electronic gadgetry he had since childhood.

Astounded by the offer of between $489 and $589 for each fully assembled machine they can deliver to the Byte Shop, one of the first computer stores, Jobs and Wozniak get to work on their first personal computer.

But they deliver instead a set of inert computer innards — 'fully assembled printed circuit boards .... Some energetic invention was required before the boards could be made to do anything.'

Today Wozniak is 34 and, like Jobs, a multi-millionaire, but he works as a relatively humble engineer at Apple. He was reluctant to start a company, so that Apple would not have existed without Jobs's yen to make money — and without the Silicon Valley's hothouse environment for fledgling high-tech enterprises.

The first venture capitalist approached by Jobs and Wozniak declined to invest in Apple, having mentally dismissed the hippie-looking Jobs as a 'renegade from the human race.' But he suggested A.C. 'Mike' Markkula as someone who might help redress the two partners' abysmal lack of business experience and marketing skills.

Markkula, a 'gadget freak' himself, recruited Scott — another veteran of the electronics industry — to be Apple's president, underwrote a $250,000 bank loan for the venture, and soon after acquired the backing of the snootiest venture capitalists.

Still, the real heroes in *The Little Kingdom* do not seem to be Markkula, Scott, Wozniak, or Jobs, but the long-suffering parents of the two Steves — especially Jobs's.

Wozniak's parents lovingly aided and encouraged their son's tinkering throughout his childhood. Jobs's adoptive parents indulged his temperamental nature, even moving to a new home when he refused to set foot again in the local public school.

Later, when Jobs and Wozniak virtually took over the entire Jobs household to build their computers, Jobs's mother, recovering from a gall bladder operation, worked around them in her kitchen.

She 'acted as receptionist, serving coffee to parts salesmen and prospective customers. She tolerated her son's infatuation with carrots and cleared up Wozniak's hamburger wrappers .... When Wozniak's wife of six months called in tears, it was [she] who provided consolation.'

*The Little Kingdom* is packed with such lively anecdotes. The Apple founders — so different temperamentally that they were never close friends and have in recent years become estranged from each other — are seen in all their human frailty, much less like characters in a conventional business history than in a fictional saga like *Buddenbrooks.*

The faintly disturbing question that occurs to this reader at the end of the book is this: Are Jobs and Wozniak as representative of young entrepreneurs of our time as the founding Buddenbrookses were of the Hanseatic merchants of Thomas Mann's day?

**— CHERYLL BARRON**

*Correspondent Cheryll Barron reports on the doings in Silicon Valley.*

(Reprinted from Business Week)

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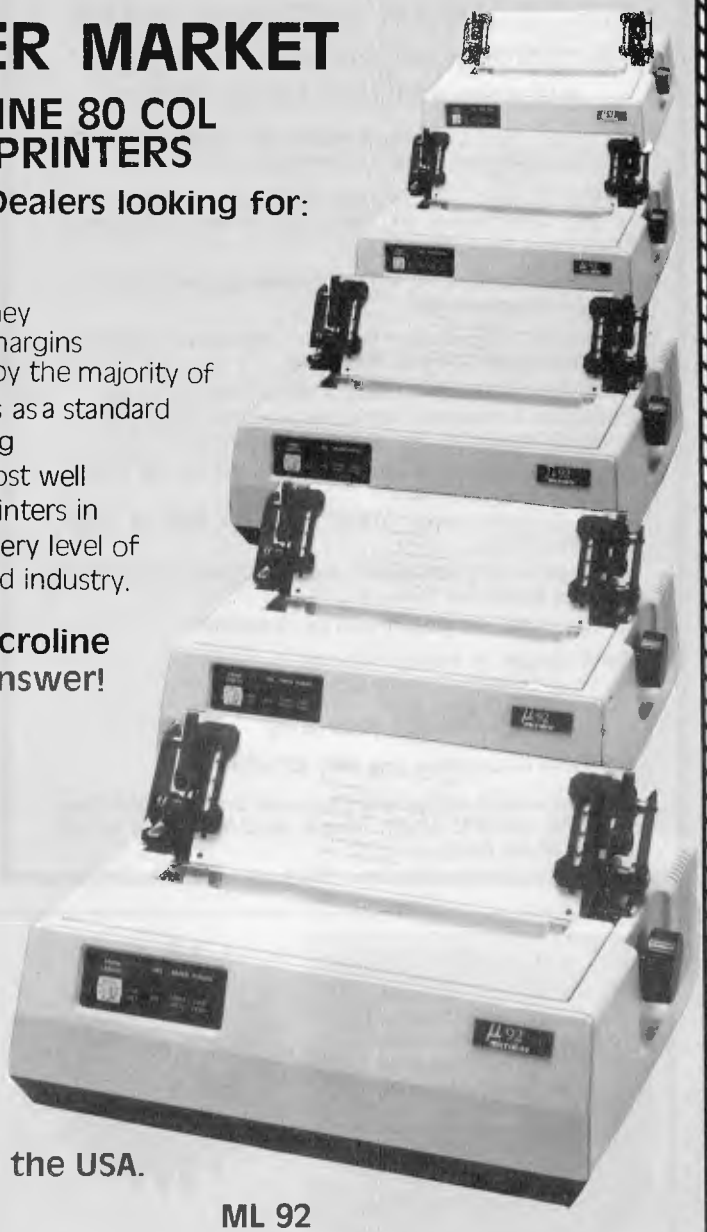

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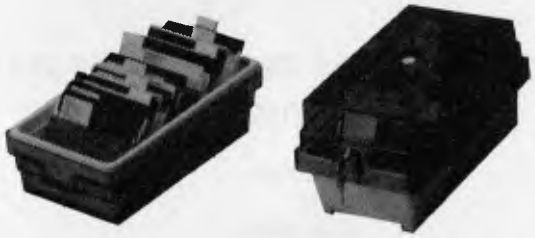

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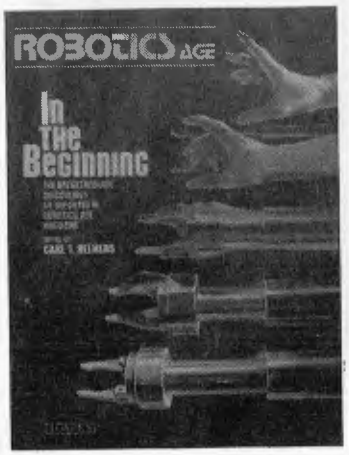
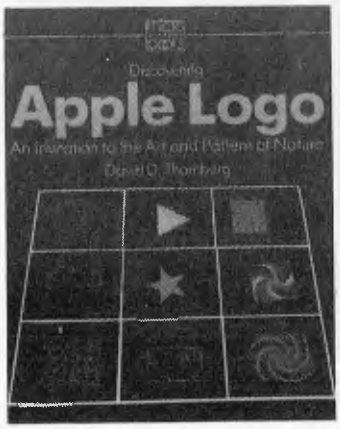
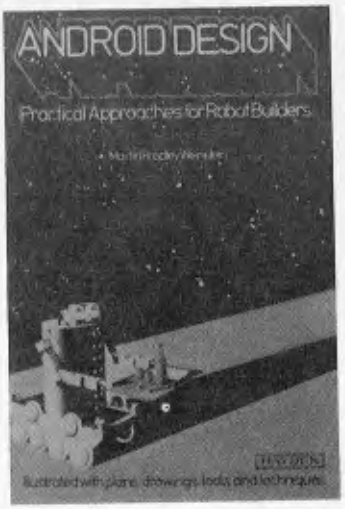


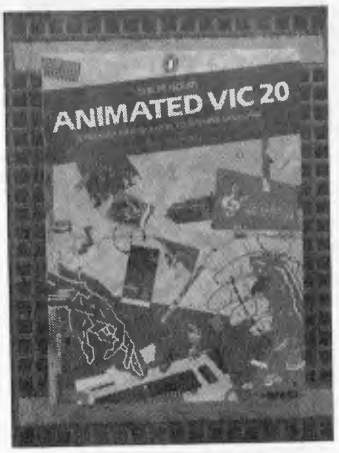

*Robotics Age, In the Beginning. $31.95, Holt Saunders, 02 4393633.*



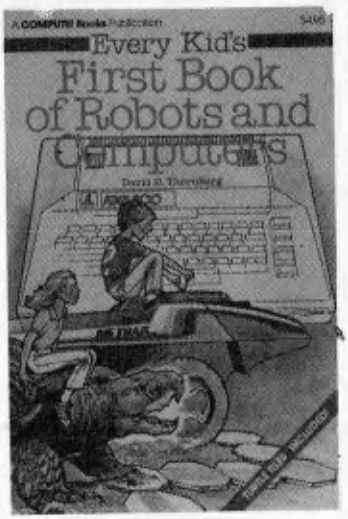

*Discovering Apple Logo, $15.95, Addison Wesley, 02 8882733.*




*Android Design. Practical Approaches for Robot Builders, $22.50, Holt Saunders, 02 4393633.*




*Animated VIC 20, $14.95, Penguin Books, 03 8703444.*

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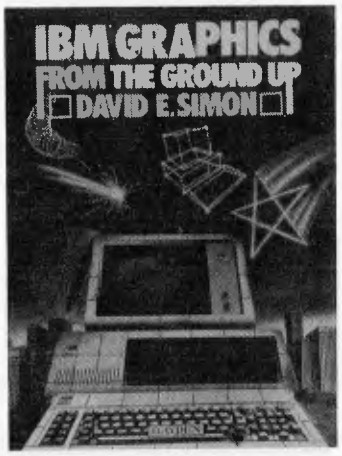


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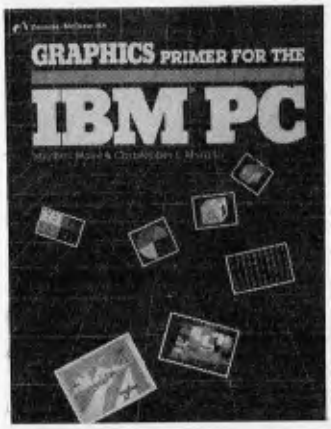
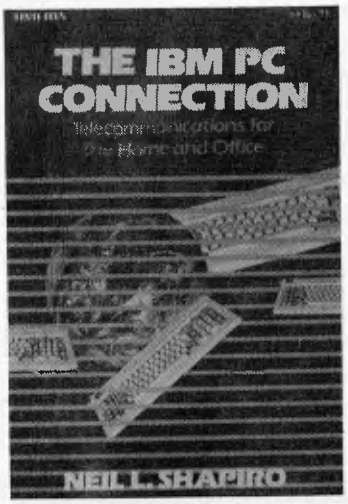



*Graphics Primer for the IBM PC, $37.35, McGraw-Hill, 02 4064288.*

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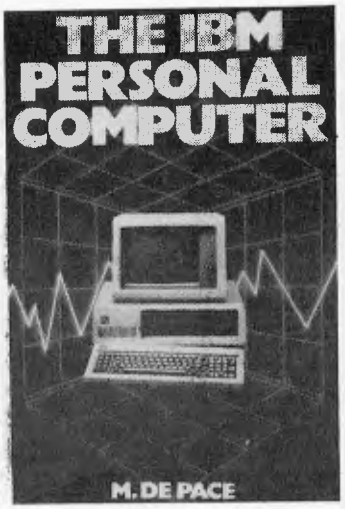


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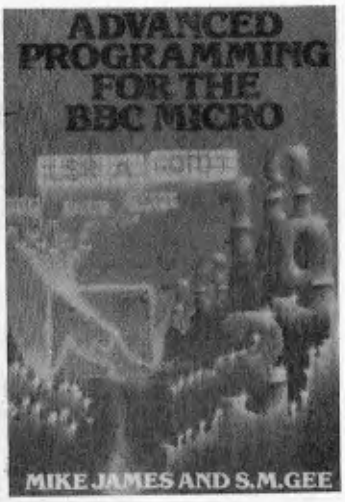


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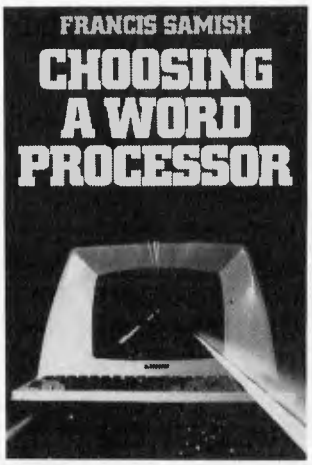


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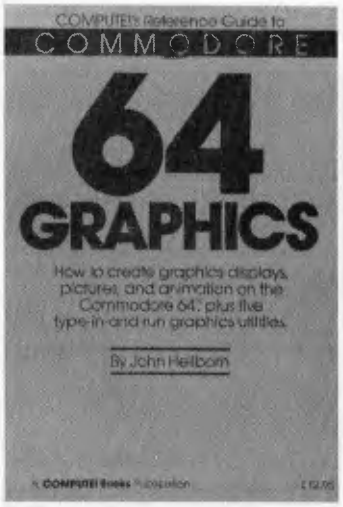


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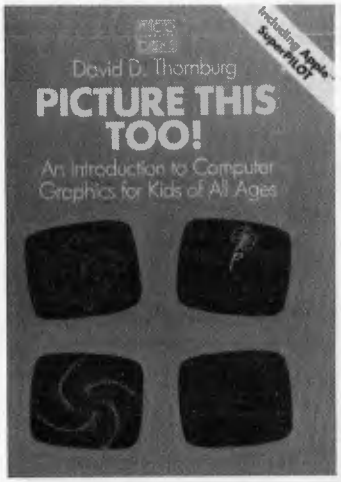


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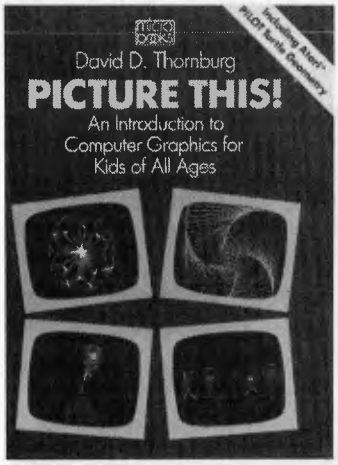


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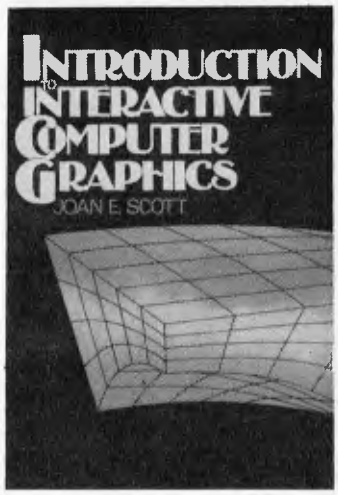


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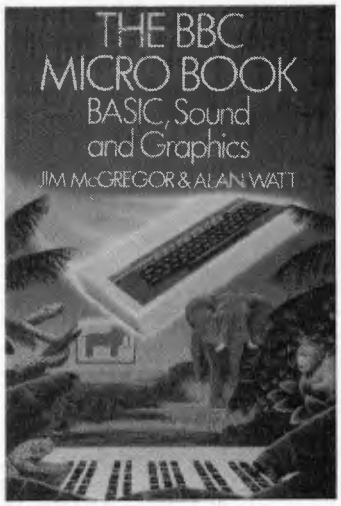


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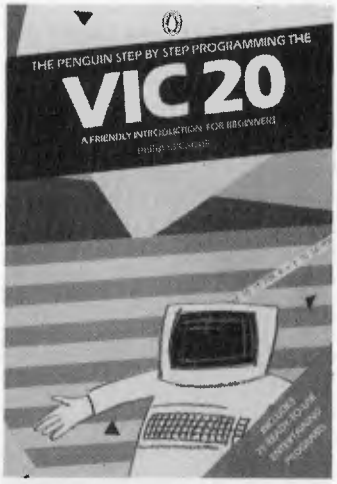


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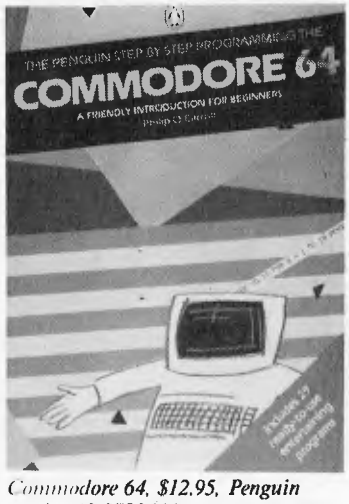


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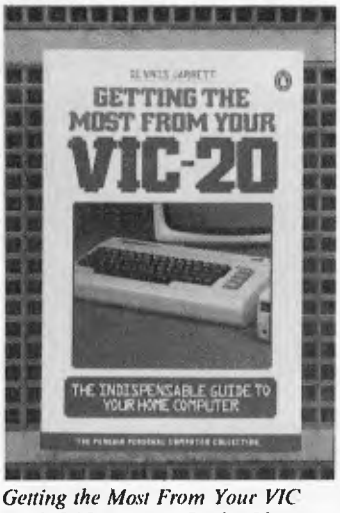


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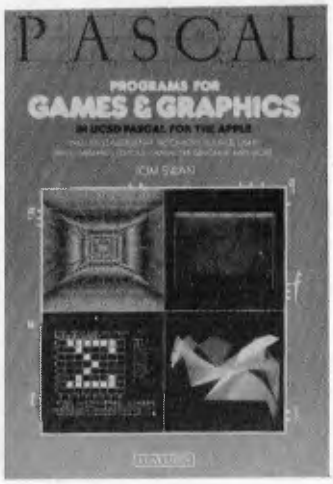


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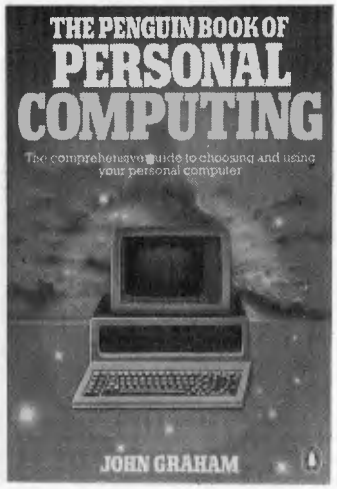


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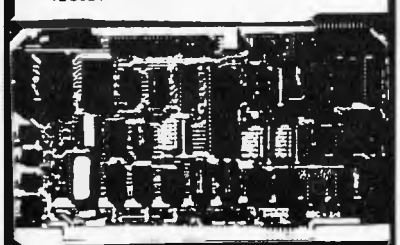

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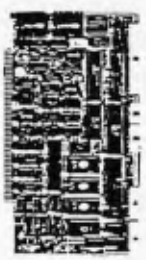

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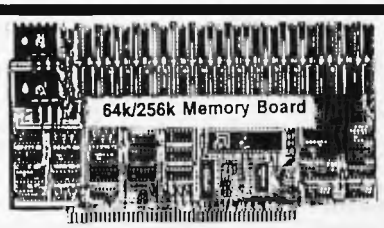


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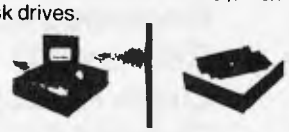

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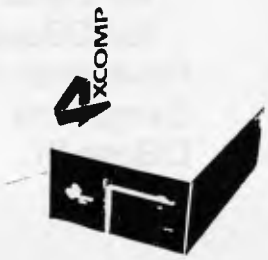


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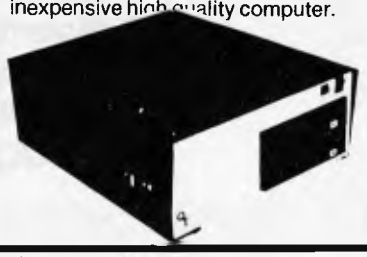

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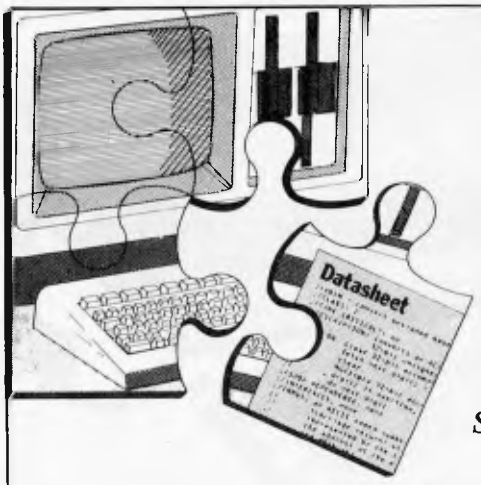


*Alan Tootill and David Barrow present more useful assembly language subroutines. This is your chance to build a library of general-purpose routines, documented to the standard we have developed together in this series. You can contribute a Datasheet, improve or develop one already printed or translate the implementation of a good idea from one processor to another. APC will pay for those contributions that achieve Datasheet status. Contributions (for any of the popular processors) should be sent to: SUBSET, 77 Glenhuntly Road, Elwood, Victoria 3184.*

# *Intelligent block moves*

Martin Ford's intelligent data block transfer routine for the 6502, BLKMV *(APC*, April), resulted in a fairly hefty response from readers. At 112 bytes, it certainly isn't the most economical 6502 solution and several shorter versions for the 6502 have been submitted, along with routines for the Z80 and 6809, to do the same job.

First (Datasheet 1), a Z80 equivalent to BLKMV from Kim Michelson, a systems analyst, who extracted it from his test monitor.

IBTZ8, like BLKMV, checks for the destination of the transfer being at the same location as the source and exits immediately if it is. This is a feature not included in the 6809 and improved (shorter) 6502 versions. Though a byte-miser by nature, I think it worth a couple of extra bytes or so to account for any error conditions and eliminate as much unnecessary processing as possible.

Now an improvement to the 6502 routine (Datasheet 2). IBT65 from Alex Selby knocks 29 bytes off BLKMV. Alex also sent a similar routine at 81 bytes which transfers 'n + 1' data bytes — one more than the number input in M4 and M5. This is a problem commonly encountered in 6502 code

## Datasheet 1

```
;= IBTZ8 - Intelligent Block Transfer for the Z80.
;/ CLASS: 2 (flags corrupted).
;/ TIME CRITICAL?:  No.
;/ DESCRIPTION: Overwrite-proof data block transfer.
;/ ACTION:  IF destination <> source THEN
;/              IF destination < source THEN
;/                 transfer from 1st byte upwards.
;/              ELSE transfer from last byte downwards.
;/          ELSE no transfer effected.
;/ SUBr DEPENDENCE:  None.
;/ INTERFACES: Source & destination RAM.
;/ INPUT:   HL = source 1st byte.
;/          DE = destination 1st byte.
;/          BC = byte length of data block.
;/ OUTPUT:  Block at destination.
;/          F BC DE HL changed.
;/ REGs USED: BC DE HL
;/ STACK USE: 0.
;/ LENGTH:  19.
;/ PROCESSOR: Z80.
;
;....IF dest = source THEN exit immediately.
IBTZ8  OR   A         ;clear carry for SBC and test     B7
       SBC  HL,DE     ;for source <, =, >, destination  ED 52
       ADD  HL,DE     ;restoring source with no flag    19
       RET  Z         ;change. Exit if same place.      C8
;
;....ELSE IF source > dest THEN move from 1st byte....
       JR   C,BACK    ;skip if dest above source.       38 03
       LDIR           ;source above dest so move from   ED B0
       RET            ;1st byte to last and exit.       C9
;
;....ELSE move from last byte.
BACK   ADD  HL,BC     ;move source pointer to last      09
       DEC  HL        ;byte in block, and               2B
       EX   DE,HL     ;also move destination pointer    EB
       ADD  HL,BC     ;to last byte in dest block by    09
       DEC  HL        ;adding byte length then dec'ing  2B
       EX   DE,HL     ;to point back to last byte.      EB
       LDDR           ;now move from last byte to 1st   ED B8
       RET            ;and exit.                        C9
```

## Datasheet 2

```
;* IBT65 - Intelligent Block Transfer for the 6502.
;/ CLASS: 2 (Page Zero changed, direct memory reference).
;/ TIME CRITICAL?:  No.
;/ DESCRIPTION: Overwrite-proof data block transfer.
;/ ACTION:  IF destination < source THEN
;/              transfer from 1st byte upwards.
;/          ELSE transfer from last byte downwards.
;/ SUBr DEPENDENCE:  None.
;/ INTERFACES: Source & destination RAM.
;/ INPUT:   M0,1 = source 1st byte.
;/          M2,3 = destination 1st byte.
;/          M4,5 = byte length of data block.
;/ OUTPUT:  Block at destination.
;/          M1 and M3 corrupted.
;/ REGs USED: M0 to M5
;/ STACK USE: 4.
;/ LENGTH:  83.
;/ PROCESSOR: 6502.
;
IBT65  PHP            ;save registers                   08
       PHA            ;on stack                         48
       TXA            ;                                 8A
       PHA            ;                                 48
       TYA            ;                                 98
       PHA            ;and                              48
       CLD            ;ensure binary arithmetic.        D8
       LDX  M5        ;get byte length hi-byte          A6 ZZ
                      ;for 256-byte block count.
;
;....test relative positions of source and destination.
       SEC            ;no borrow going into             38
       LDA  M0        ;source - destination             A5 ZZ
       SBC  M2        ;comparison.                      E5 ZZ
       LDA  M1        ;                                 A5 ZZ
       SBC  M3        ;if source below dest             E5 ZZ
       BCC  RVRS      ;then move from end down.         90 1B
;
;....initialise index and count for 1st to last byte move.
       LDY  $0        ;index from lowest byte.          A0 00
       INX            ;correct for DEC end check.       E8
;
;....1st to last byte move in 256-byte blocks.
FWDLP  CPY  M4        ;test possible end of             C4 ZZ
       BNE  FWDTFR    ;block, skip if not there.        D0 03
       DEX            ;else dec length hi-byte          CA
       BEQ  EXIT      ;and end if block end.            F0 2E
FWDTFR LDA  (M0),Y    ;get source byte into             B1 ZZ
       STA  (M2),Y    ;destination and move index       91 ZZ
       INY            ;to next byte, looping till       C8
       BNE  FWDLP     ;end of 256-byte index            D0 F2
       INC  M1        ;then inc base hi-bytes           E6 ZZ
       INC  M3        ;for next 256-byte block          E6 ZZ
```

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```
        JMP  FWDLP     ;and repeat.                    4C YY YY
;
;....note that carry flag is clear on branch to RVRS.
;....move   base   addresses  to  last  page  of  block  and
;....initialise index and count for last to 1st byte move.
RVRS    LDY  M4        ;index from highest byte.       A4 ZZ
        TXA            ;add hi-byte of byte length     8A
        ADC  M1        ;to source and destination      65 ZZ
        STA  M1        ;base addresses so they         85 ZZ
        TXA            ;index the highest page of      8A
        CLC            ;the data blocks.               18
        ADC  M3        ;                               65 ZZ
        STA  M3        ;                               85 ZZ
        INX            ;correct for DEC end check.     E8
;
;....last to 1st byte move in 256-byte blocks.
RVRSLP TYA             ;test for end of index          98
        BEQ  HIDEC     ;256-byte block, skip if so.    F0 0B
RVTFR   DEY            ;pre-dec index and move one     88
        LDA  (M0),Y    ;byte from source to            B1 ZZ
        STA  (M2),Y    ;destination and                91 ZZ
        JMP  RVRSLP    ;repeat till 1st byte done.     4C YY YY
HIDEC   DEC  M1        ;end of 256-byte block so       C6 ZZ
        DEC  M3        ;dec base address hi-bytes to   C6 ZZ
        DEX            ;index next lower block and     CA
        BNE  RVTFR     ;repeat if count not done.      D0 F1
;
;....transfer effected, restore and return.
EXIT    PLA            ;restore registers              68
        TAY            ;from stack                     A8
        PLA            ;                               68
        TAX            ;                               AA
        PLA            ;                               68
        PLP            ;                               28
        RTS            ;and exit.                      60
```

when using index registers which can address the 'zeroth' byte as the first.

IBT65 solves the problem by incrementing the index register after transfer for the forward move and decrementing before transfer for the backward move. In each case the byte at 'base + n' is disregarded. As the index registers of the 6502 are only 8-bit, data is moved in 256-byte blocks. This requires manipulation only of the high byte of the base address.

Post-incrementing and pre-decrementing is automatic in the 6809 version, IBT68 (Datasheet 3), from Bob Kellock. IBT68 differs from the Z80 and 6502 versions in requiring the end address of the source block to be input instead of the block byte length. If you prefer to input length rather than end address in register D then the five instructions at label DOWN should be replaced by LEAXD,X and LEAYD,Y. This makes the routine seven bytes shorter.

At the cost of three extra bytes of stack use to accommodate the U and DP registers, Bob has achieved a two byte saving by the trick of using the RTI (Return from Interrupt) instruction for exit. This restores all registers — but only if the entire flag (bit 7 of the Condition Codes register) is set before the CCR is pushed. Otherwise only the CCR and PC are pulled.

As it stands, IBT68 can only be used when the E flag is known to be set.

Inserting the instruction ORCC$%10000000 at the start of IBT68 to eliminate the risk of stacking errors adds back the two saved bytes.

## Datasheet 3

```
;= IBT68 - Intelligent Block Transfer for the 6809.
;/ CLASS: 1.
;/ TIME CRITICAL?:  No.
;/ DESCRIPTION: Overwrite-proof data block transfer.
;/ ACTION:  IF destination < source THEN
;/                  transfer from 1st byte upwards.
;/          ELSE transfer from last byte downwards.
;/ SUBr DEPENDENCE:  None.
;/ INTERFACES: Source & destination RAM.
;/ INPUT:   X = source 1st byte.
;/          D = source top byte.
;/          Y = destination 1st byte.
;/          X = D and X = Y are valid input parameters.
;/          E (Entire) flag must be set.
;/ OUTPUT:  Block at destination.
;/          All register contents as at input.
;/ REGs USED: X D Y
;/ STACK USE: 10.
;/ LENGTH:  35.
;/ PROCESSOR: 6809.
;
;....save all registers to use byte-saving RTI
IBT6B  PSHS U,Y,X,DP,D,CC ;instruction on exit.     34 7F
;
;....test relative positions of source and destination.
       CMPX 6,S        ;if source less than dest    AC 66
       BLO  DOWN       ;then move from end down.    25 09
;
;....source above dest so move from 1st byte to last.
UP     LDA  ,X+        ;get source byte, inc point, A6 80
       STA  ,Y+        ;to dest, inc point,         A7 A0
       CMPX 1,S        ;looping till source point   AC 61
       BLS  UP         ;gone past source end byte.  23 F8
       RTI             ;then exit restore all regs. 3B
;
;....source below dest so index block tops.....
DOWN   ADDD £1         ;inc source top for auto dec C3 00 01
       TFR  D,X        ;X indexes source top + 1    1F 01
       SUBD 4,S        ;sub source start for block  A3 64
       ADDD 6,S        ;length & add to dest start  E3 66
       TFR  D,Y        ;for Y index to dest top +1. 1F 02
;
;....and move from last byte to 1st by auto-decrement.
DOWNLP LDA  ,-X        ;dec point, get source byte, A6 82
       STA  ,-Y        ;dec point, to destination,  A7 A2
       CMPX 4,S        ;looping till source point   AC 64
       BHI  DOWNLP     ;at source 1st byte.         22 F8
       RTI             ;then exit restore all regs. 3B
```

# *Repetitive speed*

QUKFLL (Datasheet 4) from R Easto demonstrates that programming for speed often means ignoring some of the more powerful Z80 instructions. Filling a block of RAM with a single character is usually done by storing that character in one location and then using one of the block transfer instructions to copy it repeatedly into subsequent locations.

Every iteration of LDIR or LDDR takes 21 Time States for each byte filled against the very low 6.3 cycles per byte of the method used in QUKFLL. With the loop section extended to provide a complete screen line clear or fill, say, at 32 characters (16 PUSHes), the time per byte reduces to less than 6 Time States.

## Datasheet 4

```
;= QUKFLL- Rapid store single character to 16-byte blocks.
;/ CLASS: 2 (Not interruptible, direct memory reference,
;/          registers corrupted).
;/ TIME CRITICAL?:  No, but written for speed.
;/ DESCRIPTION: Stores a single character in an input count
;/              of 16-byte blocks of contiguous memory.
;/ ACTION:  Save Stack Pointer to temporary RAM store
;/          Load Stack Pointer with destination end address
;/          For count: Push character to 16 bytes
;/          Restore Stack Pointer and exit.
;/ SUBr DEPENDENCE:  None.
;/ INTERFACES: Destination RAM and 2 bytes temporary store.
;/ INPUT:   A = character to be stored.
;/          B = count of 16-byte blocks.
;/          HL = address of destination end + 1.
;/ OUTPUT:  Destination filled with character.
;/          H = L = A.  B = 0.
;/ REGs USED: AF B HL
;/ STACK USE: 0.
;/ LENGTH:  22.
```

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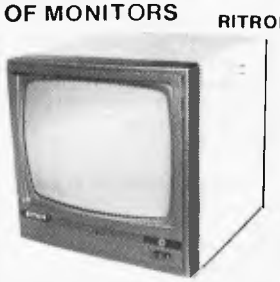

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```
;/ TIME STATES:  101 * block count + 59
;/               (approximately 6.3 cycles per byte).
;/ PROCESSOR:  Z80.
;
SPARE  DEFS 2           ;assign temp SP store.
;
QUKFLL LD   (SPARE),SP ;save SP in temp for use  ED 73 YY YY
       LD   SP,HL       ;indexing destination.    F9
       LD   H,A         ;move char to H & L for   67
       LD   L,A         ;2-byte pushes.           6F
;
;....loop for block count, pushing 16 chars each loop.
PUSHLP PUSH HL          ;(this section could      E5
       PUSH HL          ;be extended to provide   E5
       PUSH HL          ;a complete screen line   E5
       PUSH HL          ;push in each iteration   E5
       PUSH HL          ;making B the count of    E5
       PUSH HL          ;no. of screen lines      E5
       PUSH HL          ;to be cleared/filled     E5
       PUSH HL          ;from bottom up).         E5
       DJNZ PUSHLP      ;loop for each block.     10 F6
;
;....recover Stack Pointer from temp store.
       LD   SP,(SPARE) ;get correct stack and    ED 7B YY YY
       RET              ;exit.                    C9
```

# *Z80 Conditional Restart*

Peter Mortimore makes an interesting point. Did you know that your Z80 has a conditional RST38H facility? The machine code for RST38H is FF, which has the value minus one. If you jump on zero, not zero, the carry or no carry by minus one, you will jump back to execute the FF or RST38H. In other words:

20FFie. JR NZ,−1 = RST NZ,38H
28FFie. JR Z,−1 = RST Z,38H
30FFie. JR NC,−1 = RST NC,38H
38FFie. JR C,−1 = RST C,38H


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# Pirate Bulletin Boards

*The intellectual challenge of software theft*

BY LANCE MAIR
NZ Correspondent

A number of files from 'pirate' boards, downloaded on to floppy disk, have fascinated Apple users in recent months. As well as giving an insight into illegal 'Wargames' style activity, the files contain an enormous amount of information on software protection and cracking techniques.

A gentleman (or is it a lady?) named Krackowicz is the articulate and often amusing host of the cracking section of a New York bulletin board called the Jolly Roger.

Krackowicz has lofty 'ideals' and with a little inspiration from America's founding fathers he declares that his activity is dedicated to the proposition that all men are equally entitled to the knowledge and enjoyment of computers and software.

His self-appointed vocation is to '... provide information and stimulate dialogue among the international brotherhood of software crackists.'

His disclaimer warns: 'The management of this system, as well as your host, certainly do not advocate or advise any illegal acts and all information presented here is intended to educate, inform, or amuse those who read it.'

As any self-respecting Blackbeard would snort, 'Yo ho ho ...'

Undoubtedly a good deal of plain software theft is being encouraged by these pirate boards — but Krackowicz and his ilk appear equally motivated by the intellectual challenge of it all.

Indeed the pirates appear to feel kinship with devisers of software protection schemes. Talking to beginner crackists on the subject of 'obfuscation, or intentional lack of clarity', Krackowicz warns that the major software companies ... know we are out here waiting for their latest output. They often try to misdirect us or find innovative ways of hiding sensitive portions of the program with a variety of techniques.'

Trainee pirates who find this disconcerting are assured the defeating of such attempts to obscure the trail will bring nothing but joy. But the task will not be easy: 'This is a discipline — perhaps not so demanding as championship karate or the Unification Church but it requires knowledge, patience and attention to detail.'

Krackowicz says his tips are aimed at the beginning to intermediate software cracker. That doesn't mean beginning computer users. A good knowledge of assembly language is assumed and if you haven't passed BASIC yet, forget it.

The Jolly Roger files amount to a long (nearly 25,000 words) series of tutorials describing a variety of protection techniques and teaching the process of memory snooping — '... the unglamorous activity that occupies most of the time of the dedicated Krackist'. Instructions are provided for a hardware aid available through the bulletin board — the 'Romswitch with Krakrom NMI'.

Popular software given the Krackowicz treatment includes *Cyclod, Type Attack, Super Puckman* and the *Arcade Machine.*

Krackowicz is quick to compliment new and clever protection schemes but he scorns software houses that make it too easy.

'After the excellent and challenging protection Sirius put on the *Bandits/ Cyclod* group, it was discouraging to see the putrid litdos command change on *Escape from Rungistan'.*

Other bulletin board files doing the rounds lately have come from a board called Pirate's Harbour. Unlike the Jolly Roger files, this material consists mainly of shorter messages which detail general cracking techniques plus specific solutions for a large number of programs.

Few contributors leave their real name, preferring pseudonyms such as Mr Xerox, Dr Nibblemaster, Red Rebel, Long John Silver, Disk Zapper and the Big Toe.

Sample contribution headings:

- How I cracked Superscribe II Ver 3.2 over Christmas weekend (Cloneman)
- Cracking Softporn, Visicalc and Visiterm (Richard Brandow)
- Using the ramcard as a major cracking tool (Axe Man)
- Some places to look for good ideas and help on cracking.

Messages can be long and complex but most are short and cryptic.

*MSG LEFT BY DR NIBBLEMASTER*
*DATE POSTED: WED JULY 28 6:51:47 PM*
*TO ALL YE PIRATES: HOW TO CRACK (PROGRAM X)*
*BOOT 3.3*

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*Illustration by Willie Ryan*

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*16K CARD IN SLT 1*
*FFFC:59 FF N CO91*
*BOOT GAME*
*RESET INTO MONITOR*
*CO90 9DOO<DOOO F2FFMN CO91*
*7FD:4C 0 B*
*9DBFG*
*16CA:4C 00 48*
*A964:FF*
*BSAVE (PROGRAM X), A$7FD, L$8FFOF*
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*1. Put disk in deep freezer for 24 hours.*
*2. Take disk out of freezer and with a brisk movement, bring sharply against the edge of the counter, desk or the like.*
*This will crack it for sure.*

```
*------------*   A=APPLE TIPS
!B.B. ACCESS !   B=OTHER PIRATE BBS
!'S' = SCAN  !   C=CHAT W/JEAN LAFFITE
!'P' = POST  !   D=PILFER SOME BOOTY
!'R' = REMOVE!   E=SEND NOTE IN BOTTLE
!'&' = SELECT!   F=MUTINY (FEEDBACK)
*------------*   G=GENERAL SECTION
H=S.O.S. (HELP)  I=SHIP INFO
J=DISC STUFF     K=KRACKING KORNER
L=PIRATE STUFF   M=OTHERS ABOARD
N=SET NULLS      O=WALK THE PLANK
Q=GAME STUFF     T=TIME ABOARD
U=CASE CHANGE    V=VIDEO WIDTH
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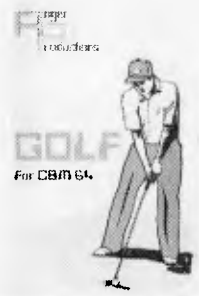


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# Osborne Encore

*Osborne has learnt its lesson the hard way, but despite financial difficulties the company is out to prove it is still alive and kicking. The Encore (which may be called another name when launched in Australia) is fully portable, IBM compatible and built to a desktop specification. Will it be competition for the lap held computers?*

Three years ago Adam Osborne changed the face of microcomputing. It was not only the shape of the Osborne 1 which was novel, though it set the style for a swarm of imitators (its almost military functionalism still looks better to my eye than its smoother rivals). What was more important was the fact that you could for the first time carry around a fully functional CP/M computer in one lump.

To be safe you still needed mains power (the battery pack never did quite materialise), and its weight, at around 30lbs, provided a good way of developing biceps. But it worked, and a lot of people I know still use it as their breadwinner, humping it around in the back seat of the car on occasion, but mainly using it as a desktop word processing machine. For the most important thing of all was that Osborne, far from charging a premium for the benefits of transportability, actually undersold all the desktop manufacturers in a highly embarrassing fashion, and bundled a heap of industry standard software to boot (regrettable pun intended).

Having sold somewhere in the region of 150,000 Osborne 1s worldwide, the kamikaze pricing policy finally came unstuck, and Osborne, in July 1983, filed for protection under America's 'Chapter 11', roughly the equivalent of a voluntary liquidation. The causes of the Osborne collapse were quite complex, but a big factor was that the Osborne 1 suffered from being the first in a new market.

The Osborne 1 had a very small screen and a limited disk capacity of 90k. As rivals came out with bigger screens and disks, Osborne had to offer matching options and each took longer to emerge than the buoyant market could bear. Finally came the big one: the move to 16-bits and IBM-compatibility. An IBM-compatible Osborne was announced, but was delayed in production, and Osborne 1 sales slumped as potential customers waited instead for the new machine. The ensuing cash-flow crisis almost proved fatal.

The word 'almost' is crucial, because Osborne is back in business. The company has reorganised, made arrangements to clear up its debts (it will be discharged from Chapter 11 soon) and announced . . . a fully portable, IBM-compatible computer called the 'Encore'.

The lessons have been learnt, and the new-look Osborne company will steer clear of manufacturing; it will market the Osborne Encore in Europe and the rest of the world. The machine is designed by a silicon valley firm called Vadem, set up by ex-Osborne employees and manufactured under contract by Selectron of Santa Clara. The machine will be sold in the US, not by Osborne but by Morrow Designs, as the Morrow 'Pivot'.

Like the Osborne 1, the Encore has a completely new shape, and opens a new sector of the computer market. Whereas the Osborne 1 and its successors (from Kaypro through to 16-bit Compaq), are 'transportables' which require mains power, the Encore is fully portable with battery back-up and a weight of around 10lbs. But, unlike lap-helds such as the Epson PX-8, the Encore will have the full specification of a desktop 16-bit computer, complete with 80 x 25 LCD display. The still secret offerings from ACT and Tandy will almost certainly follow into this new sector.

I said 'will have' above because both Hitachi and Sharp — the manufacturers of 80 x 25 screens — have run into production problems which are delaying delivery, and rather than wait, Vadem/Osborne have decided to launch and ship an interim version of the machine with an 80 x 16 LCD screen.

The machine tested in this review was a pre-production prototype which lacked, in addition to the 25 line screen, the battery pack and the built-in modem. Some aspects of the operating software were also incomplete.

## *Hardware*

The Encore has that same obviously new and obviously right look about it that the Osborne 1 had; obvious in hindsight that is. An upright flat case about the size of a medium-sized cassette/radio holds the drives and screen, and the front 'lid' folds down horizontal to become the keyboard.

The test machine had twin 5¼in drives (each holding 360k) in the recess at the right-hand side. These are a new ⅓rd height design, a little over 1in thick, of Japanese manufacture. The standard Encore will in fact only have a single drive, the second being an optional extra. The drive doors are opened by pressing on a ribbed area, which both releases the door and partly ejects the diskette. Fiddling around at the side of the machine, out of eyesight, was awkward at first — especially with the two slim drives so close together. It became quite natural after a few hours, but it would be better if the red disk warning lights could be moved to, or repeated on, the front of the machine.

An 80 x 16 LCD screen sits in a window in the front of the case, and this will be the unit fitted on the machines shipped in September; however, the window in the case has a moulded groove at the bottom so that it can be opened up to admit the full 80 x 25 screen when it is ready.

Both Sharp and Hitachi are busy trying to manufacture these 25-line displays (Apple, ACT, IBM, Tandy and who knows who else are also in the market for them). The 16-line screen has a reasonably pleasing typeface, and the contrast is neither better nor worse than that of the Epson PX-8 (you need

*63 proper typewriter keys; note the four brightly coloured icon-style function keys*

# CEREBRAL SOLUTIONS PRESENT

# ECO-C COMPILER

The Ecosoft C compiler is perfect for the beginner and the experienced professional. Eco-C is a **full** C compiler and supports all data types (including longs, floats and doubles) and operators (except bit fields). Everything you need is in the package.

The experienced programmer will appreciate that the C library has over 100 library functions, including transcendentals. To the beginner, this means you can quickly start writing C programs. They conform to UNIX v7 specifications, so programs written with the Eco-C compiler can be run under the UNIX C Compiler with few (if any) changes. You won't have to rewrite when a new piece of hardware comes on the market.

We haven't forgotten the professional, either. The Eco-C compiler generates Z80 assembler output (Zilog mnemonics) for use with Microsoft's MACRO 80 assembler (M80) to produce REL files for the linker (L80). The compiler uses a true LL (1) grammar with predictive (not brute force) parsing. Variables can be made fully recursive to the limit of the symbol table space. Files larger than free memory can be compiled and there are no alignment restrictions on preprocessor directives. Assembly language interfacing is a snap. Best of all, there are no royalty requirements for using the compiler **or** the library. The result is a professional package that generates extremely efficient code.

### Eco-C Library Function

Input/Output

| | | |
|---|---|---|
| close () | creat () | fclose () |
| feof () | ferror () | fflush () |
| fgets () | fileno () | __fillbuff () |
| __flushbuf () | fopen () | fprint () |
| fputs () | fseek () | fscanf () |
| ftell () | __getc () | getc () |
| getchar () | getd () | getl () |
| gets () | getw () | lseek () |
| __putc () | putc () | putchar () |
| putd () | putl () | puts () |
| putw () | read () | rewind () |
| __scan () | scanf () | sprintf () |
| sscanf () | ungetc () | unlink () |
| write () | | |

String Manipulation

| | | |
|---|---|---|
| atof () | atoi () | __atol () |
| atol () | decimal () | __ftoa () |
| ftoa () | __hex () | hex () |
| index () | itoa () | lmod () |
| ltoa () | __octal () | octal () |
| strcat () | strcmp () | strcpy () |
| strlen () | strncat () | strncpy () |

### Utility Functions

| | | |
|---|---|---|
| alloc () | bsort () | calloc () |
| chain () | dint () | drand () |
| drandl () | __exit () | exit () |
| fabs () | free () | irand () |
| isalnum () | isalpha () | isascii () |
| isdigit () | islower () | isprint () |
| ispunct () | isspace () | isupper () |
| longjmp () | lrand () | qsort () |
| rsvstk () | sbrk () | setjmp () |
| setmem () | soundex () | |

### Operating System Functions

| | | |
|---|---|---|
| __bdos () | __bios () | __exit () |
| exit () | inp () | outp () |

### Transcendental Functions

| | | |
|---|---|---|
| acos () | asin () | atan () |
| atan2 () | cos () | cosh () |
| cotan () | exp () | log () |
| ln () | power () | sin () |
| sinh () | sqrt () | tan () |
| tanh () | | |

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good strong frontal illumination for both). A contrast control thumb-wheel is situated at the left-hand side of the case.

One thing that is certain is that this LCD has a much faster refresh rate than any I've seen to date. Whereas all the lap-helds update their display with a very noticeable lag, the Encore screen was not noticeably slower than a cathode ray tube.

Power (15 volts DC) on the prototype was supplied by a small, boxed power-supply connected to a large step-down transformer giving US 110 volts.

A compartment next to the power switch will hold a NiCad pack to supply battery power for up to five hours — though extensive use of twin disk drives and modem will cut that down considerably. The battery pack is the same sort used in portable video camera/recorders.

*'The Encore is claimed by Vadem to be almost completely hardware compatible with the IBM PC (the display is of course the source of incompatibility at present) and completely software-compatible with well behaved PC-DOS programs.'*

## Keyboard

The keyboard is a simple switch-matrix type, not an 'intelligent' unit with its own processor — as on the IBM PC. The 63 keys are proper typewriter ones with concave tops, quite similar to those on the Tandy Model 100; they have a light but not unpleasant feel.

A four way cursor group sits to the right of the space bar and all the IBM special keys are present, but in different arrangement because the Encore has no dedicated numeric keypad. The Home, End, PgUp and PgDn keys are the shifts of the cursor keys, while Scroll Lock and Caps Lock sit outboard of ALT at the left of the space bar. Vadem has wisely moved that damnable '/' key outboard of the left-hand Shift key so that the bottom row is standard qwerty rather than IBM. Next to the right-hand Shift key was a key — unmarked on the prototype — which functions as an IBM DEL key, and can be used to reboot the machine by CTRL ALT DEL. The key actually marked DEL on the keyboard is conventional backspace delete (like the original Osborne 1s, it sometimes only backspaces, depending on the application).

Above the keyboard proper is a block of function keys which are implemented as a ZX81-style membrane keyboard (though you can clearly feel mechanical microswitches underneath the plastic sheet). Ten of these correspond to the IBM function keys while four below them are marked with 'icon'-style symbols and perform special Encore functions (of which more below).

The whole keyboard swings upwards to become a lid, covering the screen and locking two latches with release buttons on top of the case.

The case on the prototype was hand-made in paint-sprayed perspex. The production version will be in injection moulded, self-coloured ABS.

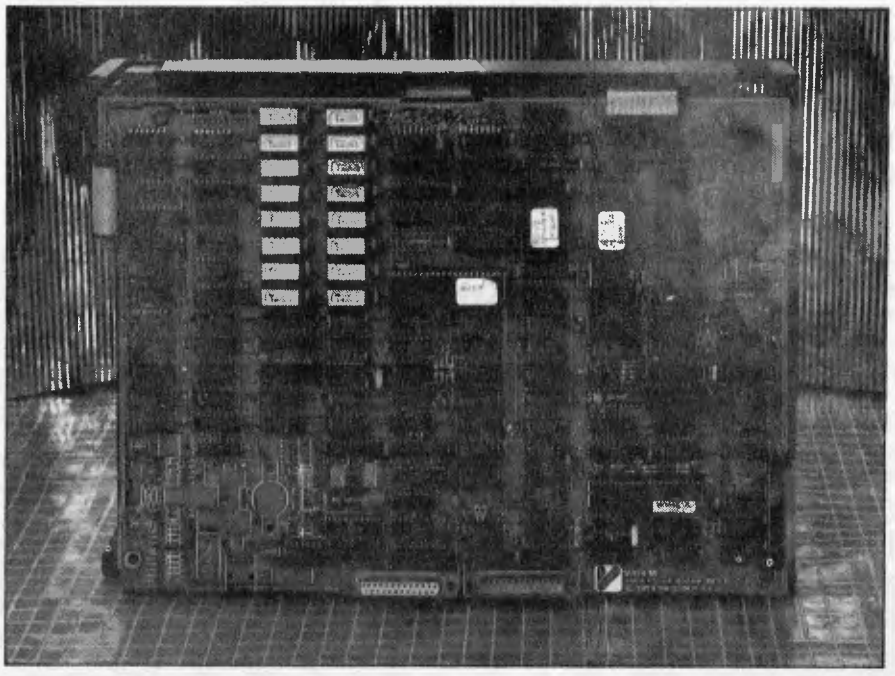
There is no carrying handle at the top of the case; instead sockets are provided at the sides for a nylon shoulder strap. Several commentators (myself included) have suggested that a suitcase-type handle would be more useful for short moves, and one may find its way onto the production version.

The overall feel of the package is excellent; it's not too heavy to carry around town on foot, yet it sits on a desktop like a proper computer, with the screen right there where you want it in front of your face. This is definitely not a lap-held machine as its whole shape and balance militate against perching it on your knees.

The back of the case contains D25 connectors for a Centronics parallel printer and RS232 (300 to 19,200 baud). A small empty window reveals where the separate connector for the auto-dial/auto-answer modem will sit. Approval is currently being sought for this unit, which on Australian models will be CCITT standard 300 baud only. The US versions will have a different — Bell standard — unit, so frequent Atlantic hoppers will need to buy a separate modem and hang it off the RS232 to cover both territories.

Removal of four screws allows the back of the case to be opened and reveals a neatly designed single board with 120 ICs on it. The processor is the 80C86 — a CMOS version of the Intel 8086 — which has just become available in quantity, and of which we shall be seeing a lot more in the next year or two. There were three ROMs holding the Vadem BIOS and the special application programs, and a NEC 8318 disk controller to handle the drives.

The standard Encore will have 16, 64k dynamic RAM chips (128k total),



*Neatly and compactly designed, the Encore uses the 80C86 processor*

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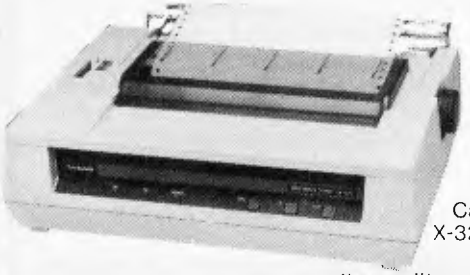

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but the review machine had 512k fitted, in the new 256k chips — the first I've seen in the 'flesh'. Most of this was allocated to a RAM disk; it will be an expansion option in the final product.

A real-time clock/calendar chip with battery back-up is used by one of the built-in programs to keep an appointments calendar and world clock.

All the rest of the ICs are high speed, CMOS discrete logic. A spokesman for Vadem told me that in a later version of the machine these will all be replaced by four Gate Arrays (ULAs) but not until they're absolutely sure that the design is frozen.

## Firmware

The four special 'keys' on the Encore let you select one of the three built-in utility programs, even in the middle of running an application from disk.

The key with a picture of a disk on it selects normal operation from the disk drives. When an application is running from the disk drives it can be interrupted at any time by pressing one of the other three special keys; pressing the 'disk' key then resumes the application where it was left off.

The effect is rather similar to working under Concurrent CP/M, except that the changeover can be even faster as the utilities are in ROM, and so don't need to be loaded and run.

The key marked with a clock selects a clock-calendar/scheduler program called the Time Manager, which was only partly implemented on the test machine. A screen display of a one month calendar, the time and a map of the world in hi-res graphics appear when you press it. The cursor sits over today's date on the calendar. All that could be done with the review machine was to move the cursor with the arrow keys around the calendar — when it moves beyond the first or last day, a new month's calendar is substituted.

The intention in the finished version is that the Time Manager will allow you to enter appointments (stored in a disk file) which will be displayed in a window on the screen. As the cursor is moved to a date, the appointments for that date will be retrieved and displayed. The world map will be incorporated in a similar way; moving a cursor across the map will display the local time for the appropriate time-zone. Nice ergonomics.

The Time Manager function is selected by default when you switch the Encore on, so you need to press the disk key before you can boot DOS.

The 'telephone' picture key selects a ROM-based communications program which works through the built-in modem; since the latter was not fitted to the test machine, the software merely produced a non-functioning command menu, which would allow such parameters as parity, stop bits and text capture to be set. In a similar way to the Time Manager, the communications program will allow a file of telephone numbers to be kept on disk and recalled for use by the auto-dial modem.

The third special key is the calculator, marked with the four arithmetic symbols. This was not implemented at all on the prototype. When it is, it will turn the block of 22 keys starting with T H N on the keyboard into a standard desk calculator (with a memory). The calculator functions are marked in blue at the bottom right corner of the keytops — a full numeric keypad is included.

These special keys are so convenient to use that one wishes there could be more of them; there's a tantalising space big enough for three more, and three space ROM sockets on the main board. A ROM-based word processor would be very handy indeed.

## Software

The Encore is claimed by Vadem to be almost completely hardware-compatible with the IBM PC (the display is of course the source of incompatibility at present) and completely software-compatible with well-behaved PC-DOS programs. It will read disks taken out of an IBM PC.

IBM's placing of the PC-DOS BIOS in ROM has lead to a confusing situation for the look-alike manufacturers (I don't suppose it was accidental). The IBM ROM is of course copyrighted, and IBM has successfully acted against several manufacturers for infringement. If software houses write programs which only use legal DOS function calls, there is no problem; as long as a look-alike has PC-DOS (with its own, non-ripped-off BIOS) then the programs should run. Such programs are said to be 'well-behaved'.

Many software houses, though, are tempted by the demons of more speed and less code, to write programs which make direct calls into the IBM ROM BIOS. These will not run on any machine that does not have all the BIOS entry points in the same place as IBM's (in other words an exact copy of IBM's BIOS).

Worse still, some well known programs make calls direct to the IBM hardware (for example, writing characters straight into the screen buffer) bypassing even the BIOS. To run these you need to duplicate the IBM PC exactly in all respects, or to get cunning.

The Encore will boot standard IBM PC-DOS version 2.00 from an IBM disk, so any well-behaved program will be run immediately. Well-behaved programs are not the majority, though, especially among the best sellers.

Vadem got cunning over Lotus 1-2-3, the best selling PC program of all, which is notoriously badly-behaved. It incorporated a special 1-2-3 driver in its BIOS so that a standard IBM copy of the program can be booted and run. I know it's true because I did it with a virgin copy.

At the moment you can't use the graph functions of 1-2-3 because the 16-line display is not only a different size

*'Most buyers will probably use it as a mains powered, desktop computer, but take it home every evening and on business trips too. And it can fold up so that it takes up no more desk space than a radio.'*

| Encore Olivetti GW Basic) | | IBM PC (MBasic) |
|---|---|---|
| BM1 | 1.9 | 1.5 |
| BM2 | 6.6 | 5.2 |
| BM3 | 14.2 | 12.1 |
| BM4 | 14.6 | 12.6 |
| BM5 | 15.8 | 13.6 |
| BM6 | 28.3 | 23.5 |
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*All timings in seconds. For a full listing of the Benchmark programs see 'Direct Access'.*

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from the IBM's, but it isn't configured to do bit-mapped graphics. It emulates 4/5ths of an IBM monochrome screen. When the 80 x 25 screen arrives it will emulate the IBM Graphics Adaptor's 640 x 200 pixels too. The only difference will be the lack of colour and the aspect ratio — the LCD display has square pixles which makes it much wider in proportion to its height than the average CRT.

I tried a variety of other IBM PC programs in the Encore with mixed results. The word processors WordStar and Palantir both worked as they should aside from the fact that with eight screen lines missing some of Palantir's menus scrolled off the top. Microsoft Word would not boot nor would Forth Inc's polyFORTH; the latter does not run under PC-DOS anyway but is its own operating system.

Two other PC operating systems that I tried — CP/M-86 and the UCSD p-system — would not run, though the p-system showed willing by reporting that it couldn't find SYSTEM.INTERP.

The queerest experiment was running Laboratory Microsystems' PC Forth. This booted up OK, but seemed at first not to accept input. When I pressed the DEL key, however, everything I had typed not merely appeared on the screen but had been correctly executed! Tantalising stuff; clearly a quite trivial patch would make it work properly if one only knew what.

A call to Vadem's chief designer elicited the following list of IBM programs that were known to work correctly on the Encore: WordStar, 1-2-3, Multi-plan, dBase II and New Word. The latter is a WordStar look-alike written by ex-Micropro employees, which Osborne is going to bundle with the machine.

Vadem says that Microsoft's GW-Basic will run on the Encore in its generic MS-DOS form, though I found that neither IBM Basic nor Basica will. This may be connected with the fact that the IBM has Basic in ROM; the disk versions probably rely on some of the ROM routines.

As shown in the Benchmarks box the Encore's Benchmarks are slower than the PC's. On the subject of speed all the programs I ran responded about as fast as they do on the PC, and the disk operations felt about right, too, booting PC-DOS in 10 seconds.

## Expandability

The standard Encore will have one disk drive, 128k of memory and mains power only. An extra disk drive, 256k or 512k of memory and a battery pack will be optional. The 80 x 25 line display will become standard fitting when it's available in volume.

Osborne was not prepared to discuss details, but admitted the principle that early buyers would be offered a special price for upgrading.

## Prices

Though Osborne executives were very cagey about pricing at the press conference where Encore was announced, they implied that the cost would be competitive with 'transportable' PC-compatibles such as the Compaq. This suggests a price of around $3,500-$4,000 for the standard machine.

Shipment is planned to begin in September of this year, with or without the 25-line display.

## Conclusions

It looks as though Osborne/Vadem may have done it again. The Encore at last makes all the capabilities of a desktop business computer available in a fully portable form. It looks and feels like a new kind of computer, and the package feels right. As it sits on the desk in front of you, you start to wonder: 'Why *should* a computer take up any more room than this?'

The dedicated keys for the ROM-based utilities are a treat to use, and make one wonder if this isn't perhaps a better way to go than mice and windows and all that stuff. After all, in every other sector of consumer design, 'push-button' operation has become the paradigm for ease of use — just look at radios, TVs and washing machines.

There are a few provisos to this fulsome accolade though. Firstly, it only applies to the full 25-line display version. The 16-line version is an uncomfortable compromise, which will require some software packages to be modified in order to be usable.

Secondly, don't expect to see the Encore displacing the lap-held machines. The battery life will be quite low when the disk drive(s) and modem are in constant use, and small as it is, you can't easily use it in a crowded meeting hall or in the back seat of a car.

Thirdly, someone just has to invent a low-powered light for illuminating LCD displays — preferably some sort of thin strip that clips along the top of the screen. It's just too inconvenient only to be able to use them in brightly lit rooms, which is the case at present.

As to the question of IBM PC compatibility, the Encore is already capable of running some of the best selling PC programs. If it's a sales success (as it surely must be) then software houses will start to take account of it when configuring their products, as many of them already do with Compaq.

One final point; the bundling of only a word processing package with Encore looks positively mean compared to Osborne 1.

Perhaps that is the lesson learnt from the collapse, but perhaps also it is a reflection of the diminished value for money and higher profit margins which seems to have been the most tangible results of the 16-bit 'revolution' so far.

## Technical specifications

| | |
|---|---|
| Processor: | 80C86 16-bit |
| Memory: | 128k RAM expandable to 256k using 64k DRAM or 526k using 156k DRAM |
| Display: | 16 line x 80 column LCD text and graphics, 480 x 128 pixel addressable |
| Storage: | 360k integral 5¼in floppy disk drive |
| Keyboard: | 63 alphanumeric keys, 10 function keys, 22 key calculator (keyboard overlay) |
| Modem: | Integral 300 baud auto-dial/auto-answer Bell CCITT & NTA Centronics parallel port |
| Power: | 15v DC supplied by AC/DC adaptor, battery circuitry |
| Size: | Height 9.5in, width 13in, depth 5.5in |
| Weight: | 9.5lbs with strap (excl battery) |
| Clock: | real-time addressable with battery back-up |
| Calculator: | Four function windowing |
| Comms: | Terminal emulation program functions integrated with modem |
| Bundled software: | MS-DOS 2.1: NewWord word porcessor |
| Options: | Second integral 5¼in floppy drive, 25 x 80 column display |
| Battery: | Rechargeable removable 1.8 AhNiCad, weight 1.5lb. |

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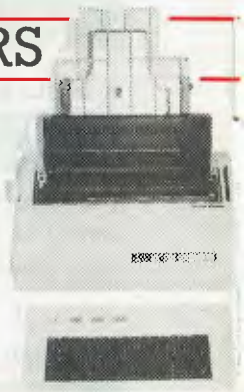

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# Open Access

*Open Access is being pitched directly against Lotus Corporation's integrated business system, Symphony. Implemented on the IBM PC, APC finds out how well it lives up to its name.*

BY PETER BRIGHT

Open Access from Software Products International is one of the first of the new breed of fully integrated business software packages. It incorporates database, word processor, spreadsheet, graphics, communications and a time manager. All the modules can exchange data and each presents a common user interface. The idea is that instead of buying several different packages to do different tasks, you just buy one product that will do everything for you.

Open Access is being pitched directly against Lotus Corporation's integrated system Symphony and Ashton Tate's Framework (both tested in the September issue of *APC*).

In order to use the product you need 192k of RAM and two 320k drives on a DEC, HP, IBM, TI, Tandy, Wang or Apricot, and preferably a hard disk and a graphics board. The package can work in black and white, but is much more effective in colour.

The product is very well presented. It comes packaged in a box which opens up to reveal three manuals, a folder containing 5 floppy disks and various bits and pieces. The first manual gets you started, the second is a more advanced tutorial and the third is a reference manual. The first two manuals have associated data disks, so you can put the programs in drive A and the relevant data disk in drive B and just follow the examples through.

## *In Use*

To start up Open Access simply boot the system using the system disk (IBM really is misguided not to allow software to be shipped with DOS tracks). Next insert the Open Access boot disk and off you go.

The major problem, as far as disk access is concerned, is that Open Access programs take up two disks. This is unavoidable since together they make nearly 650k of code. But it does mean that you have to swap disks around occasionally which can be a nuisance. (On the plus side the system makes this very easy to do.) The only way around it is to use a hard disk. However, I tested Open Access on a twin floppy system.

## *User Interface*

First I'll deal with the common attributes of all the modules.

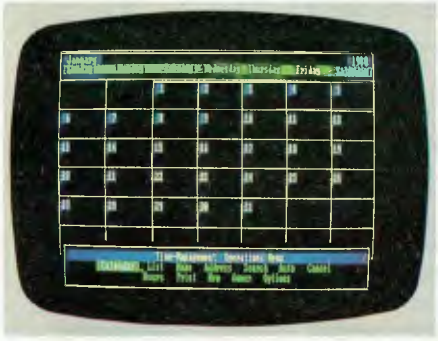
Open Access is controlled by sequences of single keystrokes. Many of the keys control specific functions, so a function key overlay is supplied to indicate which functions have been assigned to the keys. This is a good idea but the problem is that function keys 5, 7 and 9 aren't labelled because their function changes according to the module being used. It took me quite a while to remember which key to use.

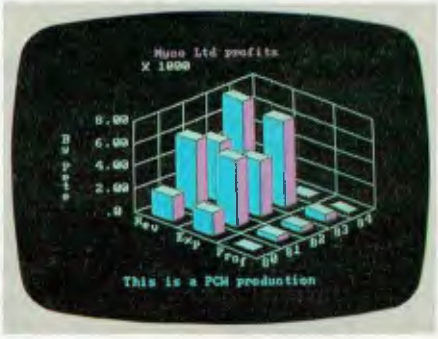
An added problem is that several system functions are controlled by other keys which aren't marked. The manual has a list of key functions, but it's annoying to have to refer to it repeatedly.

Open Access makes widespread use of windows as user aids. If you hit the HELP key (F1), a window is opened to display the available options.

A nice point about the HELP screens is that they are context-sensitive and only display the information required for the job in hand. However, I didn't find them particularly helpful! Generally the explanations are short and meaningless. To choose a module, you move the cursor up and down a window containing a list of available options. When you get to the one needed, hit the DO key and the module will be selected.

Another more useful application of





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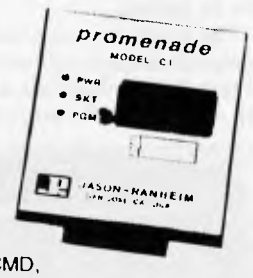


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windows is the SEARCH facility. If you can't remember the name of the file you want to load, hit the SEARCH button. This will open a window showing all the files on the data disk. Again, this facility is context-sensitive, so if you're in the database, you'll only be shown valid database files.

The two other most commonly used keys are the DO and the UNDO keys. The DO key is used in much the same way as the RETURN key in most other applications. I spent my first few hours with Open Access hitting the return but ton instead of DO. The UNDO key is used to terminate commands.

## Data Transfer

A major advantage of an integrated system is that data can be transferred between different modules. Some packages such as Apple Lisa allow data to be passed very easily, others such as this one take a more complicated route.

Data can be sent to and from all Open Access modules, but it is one of the more complex operations. It is not always relevant: for example, you wouldn't want to send data from the Time Manager to the spreadsheet. Others, such as Information Manager to word processor, have three different ways of transferring data.

Three main channels of communication are used within Open Access.The first method is the Context command. This allows you to move directly out of one module and into another taking the data with you. It is the neatest and most direct method, but it is not applicable to all modules.

For those of you who value their data, the second method will be more suitable. The Standard Interface Format (SIF) DOS disk file is arranged in a pre-defined format. SIF files are usually an alternative to Context interchange, except when data is being transferred from the word processor when Context transfer is not available. The last method is to use an ASCII print file.

There are other methods of transferring data: for example Open Access can read dBaseII files. In fact a whole booklet is made up of data transfer details.

Once familiar with operating the system, you'll probably find that you keep pressing the same sequence of keys repeatedly, Open Access has facility that allows you to store a sequence of keystrokes which can be called at a later date. This can be helpful if used carefully. The problem is that it remembers keystrokes so the program must be in exactly the same state every time the procedure is called. If this is not the case then the system will happily reproduce keystrokes which could produce the wrong effect.

## Information Manager

The first module on the list is Information Manager.This is a very complex module. I'll just look at the highlights here as Kathy Lang (*APC* database reviewer) will be taking a closer look at this in a future issue.

Information Manager is described in the literature as a 'relational' database. 'Relational' means different things to different people — in this case it means that you can join together up to five files to form a 'virtual file', which is capable of being interrogated in the normal way.

The upkeep of multiple files is aided by the use of the MUST MATCH structure. This allows you to design the input so that a field in one file must match a corresponding field in an associated file.

Information Manager uses a subset of IBM Structured Query Language (SQL) to interrogate the database. This allows you to enter queries in an 'English-like' way. The Query Language uses a number of 'clauses'. Three of the main ones are 'From', 'Where' and 'Select'. The From clause tells the system which file you wish to interrogate but you can interrogate more than one file by joining them with the Where clause.

The input and output of data is achieved by the use of masks. To enter data onto the system, you design the way you want the screen to look and save it in a mask file. When you want to input data to the database you just specify the correct mask. Printed reports can also be formatted in much the same way.

## Spreadsheet

Words fail me on new things to say about spreadsheets. This one is fairly standard — it looks very pretty on the colour screen. The two major points worth noting are its capacity and its goal-seeking abilities.

The maximum model size is 3000 rows by 216 columns. This should be enough for most applications.

The goal-seeking ability is a very useful facility not common on spreadsheets. It allows you to set goals and then let the machine work backwards to find the values needed to reach the goal. For example, say you were to tell the model that profits=sales-costs and that costs are a constant $5000 per year. All spreadsheets will allow you to enter different values for sales and will calculate profits. However, only goal-seeking spreadsheets will allow you to enter a figure for profits and work back to the sales needed to reach your target.

The Open Access spreadsheet also has a number of very helpful built-in formulae and two different depreciation formulae: future value calculation and internal rate of return; and modified internal rate of return calculation.

## Graphics

The graphics abilities of Open Access are certainly very impressive. To use them you need an IBM-compatible graphics board.

As well as being able to draw the usual line charts, bar graphs and pie charts, Open Access can handle three-dimensional barcharts. These look good but I'm not sure that they're particularly useful.

Most of the major graphics functions are handled from one main menu. This allows you to choose between bar graphs, line charts and pie charts. It also allows you to choose between windowed, overlaid, 3-D and simple 2-D. Some combinations won't work: for example, I had hopes of looking at a 3-D pie chart, but the system just ignored me!

One nice little feature is that you can set up a computer equivalent of a slide show and let the system display a series of graphs. The system can also divide the screen into windows and display multiple graphs on one screen.

The display colours can be altered depending on the hardware capabilities of your system. You have a choice of two different palettes: the first is magenta, cyan and grey, and the second is red, green and brown. You can also control the screen colour separately, so you end up with four different colours on the screen.

## Word processor

The word processor seems to be very powerful. My lasting memory is that when I tried to delete some text, I (naturally) hit the delete button: no text was deleted. It turns out that the backspace key deletes text. In the new 1.1 version (the one on sale in Australia) the delete key in the word processor now works correctly.

Although entering text is easy enough, printing documents is rather daunting. In WordStar, when you want to print a document you just hit the 'P' key. In the Open Access word processor you are greeted with a whole print menu. This lets you set the paper width, length, spacing, margins, and so on. If you hit the print

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key again this selects all the defaults. I'm sure that as soon as you get used to it, the system is very flexible. Open Access uses a system of printer drivers to make sure that it can be used with a wide range of different printers. Again this is very flexible, and it means that if you change your printer you just change the driver and off you go.

## Communications

Until a few months ago, communications was very much a secondary feature of the micro scene. However, a great many packages have appeared recently to link micros. Open Access follows this trend by providing a very comprehensive comms facility.

The first thing I noticed about the comms module was its flexibility. Like the printer interface, the comms module uses a system to change modem. The review copy of Open Access came with two printer drivers: one for a 1200 baud modem; and one for a 300 baud modem.

When I tried this module out, I couldn't get it to work. This maybe my problem rather than the package's. The drivers were designed for mega-intelligent auto-dial/auto-answer modems, but the *APC* budget can only stretch to a no-frills 300 baud acoustic coupler. The result was that I couldn't persuade the package that all I wanted was a simple 300 baud dumb terminal. Perhaps if I'd spent more time on it I could have persuaded it to work.

## Time Manager

Time Manager is a sort of electronic cross between a diary and a year planner.

Each month is displayed as a grid with a box for each day. You can enter all your appointments, and then see at a glance what you are doing at any time on any date. The system can print out lists of appointments and can automatically schedule regular appointments.

## Conclusion

Integrated business systems seem to be the current trend and I can only be impressed with this package.

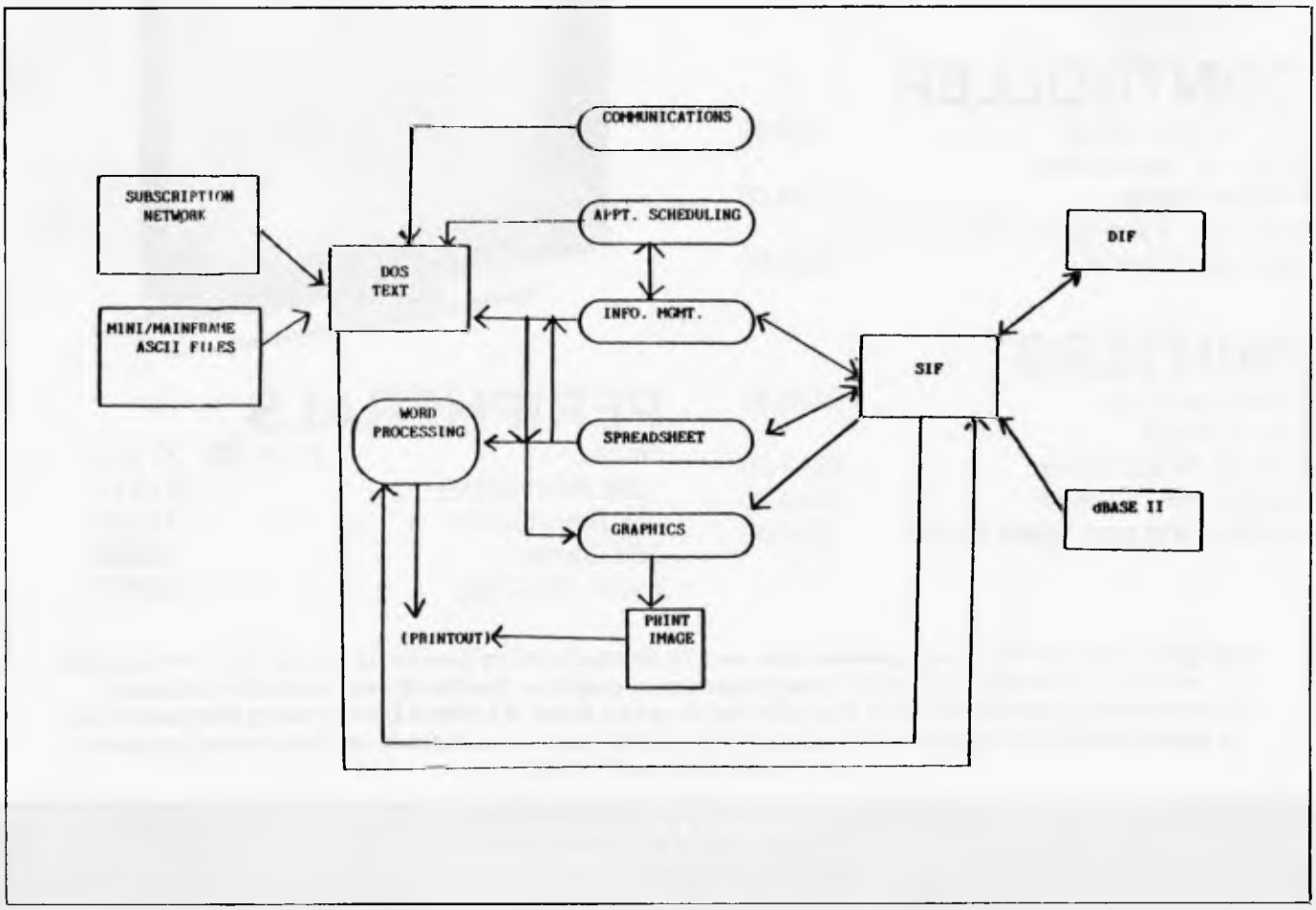
When I started this review, I thought that the whole system would probably be good, but that each individual module would not stand up on its own. This is not the case. All the modules are very impressive, and when the system is viewed as a whole it's outstanding.

Generally the system was easy to use; I especially found windows and the context-sensitive SEARCH facility very useful. The only moans I have are that the control keys are sometimes obscure — it's annoying having to reach repeatedly for the reference book to find which key to use.

My other criticism of Open Access is that it can be complicated to move data from one module to another. The transfer is not difficult, it's just that the user is sometimes faced with up to three alternative ways of doing the same thing — each method is subtly different and it's not always obvious which one to use. A better bet would be to tell the system you want the data moved and let it worry about how to do it.

Overall, I found Open Access very impressive. It will be interesting to see how it compares with Symphony.

*Open Access costs $995.*




*Open Access communications pathways*

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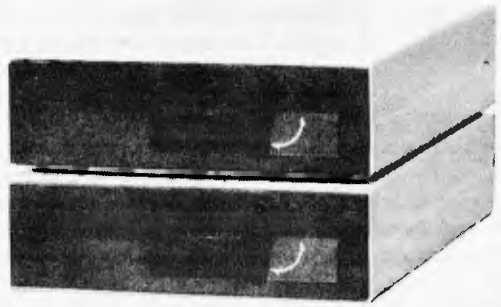

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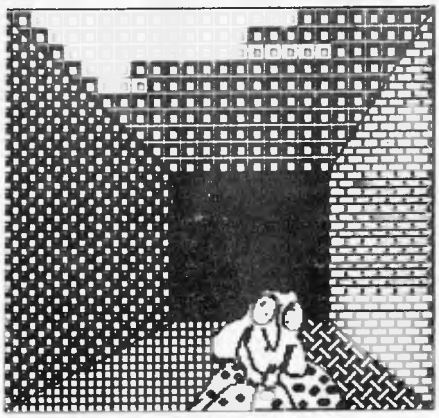

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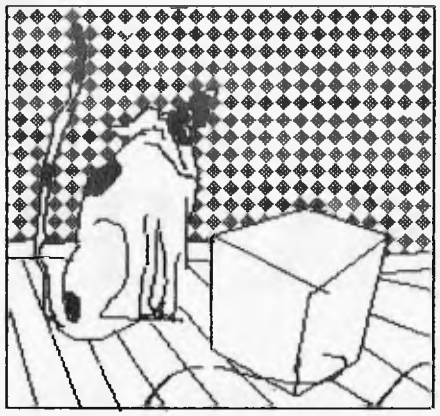

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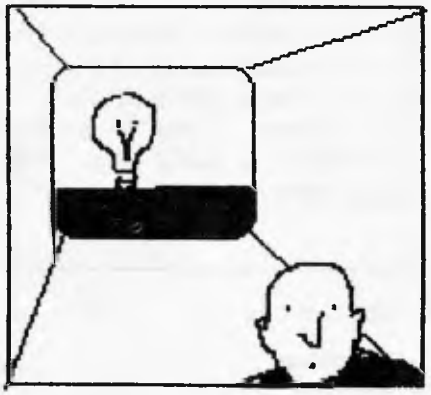

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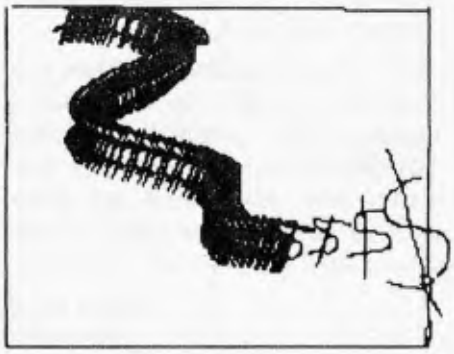

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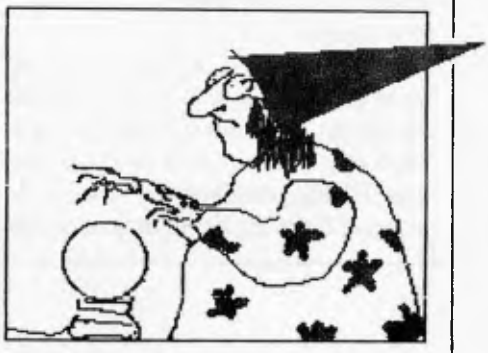

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*Graphics by Victoria Roberts on an Apple Macintosh and MacPaint software.*

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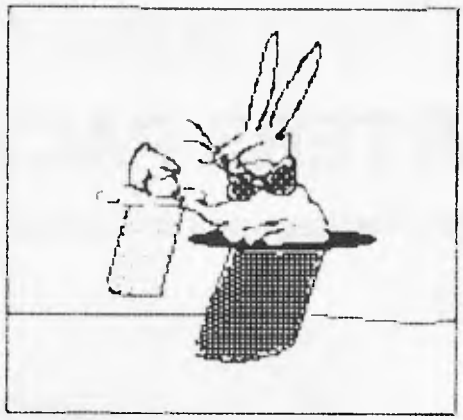

integrated software

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- Chart: a business graphics program that lets the user graphically explain ideas by choosing from over 40 different chart formats.
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- Electric Desk: a brand new integrated package, offering spreadsheet, wordprocessing, database and communication facilities.
- File Vision: the first database you can see. Visualise your data with a MacPaint like drawing systtm.
- Granny's Garden: adventure games for primary kids, to stimulate creative writing and introduce mapping. Voted one of the top 10 educational programs developed in the UK.
- HyperGraphics: an easy computer generated program that enables you to add colour graphics to your presentation.
- The Incredible Keyboard: an intro to the Incredible Keyboard, an over-lay that lets you use your computer keyboard work like a music keyboard. It features some great video graphics and synchronised music.
- Kinder Koncepts: 30 educational programs on reading and maths for primary and remedial children.
- Multiplan: the latest update of the well-known spreadsheet. Expert-systems: financial statement and budget are templates to Multiplan which make the spreadsheet easier to use.
- MEC Education Sampler: education software of programs used widely in schools in USA.
- K-7 Maths: a maths sampler for infants to year 7 children.
- Project: a package to help you create schedules, allocate resources and budget costs for their projects — big ones or little ones!
- PCG Graphics: an easy tutorial using MicroBee graphics. It includes a demo poker game and animation using graphics.
- PFS File: an easy to use database accepted by IBM
- PFS Graph: this program allows data to be displayed pictorially.
- Symphony: The new integrated package with spreadsheet, wordprocessing, graphics communications, database and macro-teach mode
- Spectaculator: Turn your computer into a sophisticated calculator and your T.V. into a worksheet.
- SuperCalc 111: An integrated product with high-powered spreadsheet and exceptional graphics.
- Superfile (southdata): a free form database for 8 or 16 bit micros.
- Timeworks Demo: includes education demo, some strategy games, home management and programming. Good Value for $5!
- Thoughtware: The first of a new wave; analyse your management methods, and meeting control etc.
- Workabee: a sampler of games, music activities and varied programs for the MicroBee.
- Wordstar Product Demo: This includes Wordstar, Mailmerge, Spellstar and StarIndex. A must for all IBM and compatible users.
- Word: a mouse driven, easy to use, see-what-you-get wordprocessor.

# ★ ★ WOMBAT ★ ★

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11. High Speed Background Tinting.
12. Softswitch selection of 40 or 70 Columns (Library Module).
13. Automatic Line Re-Numbering (Library Module).
14. Library Modules will be provided with the Wombat Basic to give the Wombat Basic unlimited scope as far as Commands and Capabilities are concerned.
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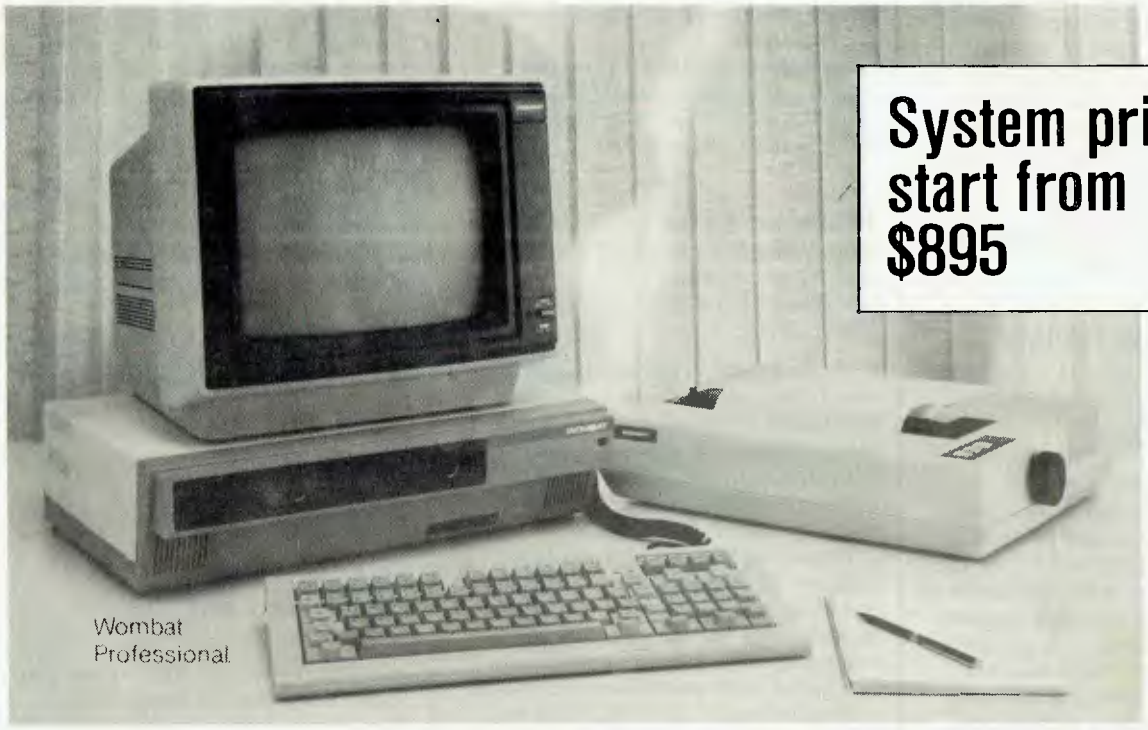


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COMPILED BY
LAUREL ALLEN
Editor

# GRAPHICS

*Business Presentation Graphics for IBM*

## Graphwriter

Sourceware
4/73 Albert Avenue
Chatswood NSW 2067
02 411 5711

*Graphwriter* has been designed to take advantage of the high resolution of pen plotters, rather than the low-to-medium resolution of PC screens for presentation graphics.

*Graphwriter* allows users to select from a wide variety of specialised formats, such as Gantt charts, organisation charts, horizontal bar charts, paired bar charts, scatter charts, bubble charts, surface charts, combinations (such as pie-bar charts), overlay charts, and tabular charts — as well as the usual pie, line and bar charts. It includes a 'plot compose' feature that repositions and resizes components of the chart to avoid overwriting or overcrowding.

Requirements: IBM PC and plotter. Skill: Novice. Price: $995.

## Fact and Fiction Toolkit

Ashtron Software
PO Box 579
Gosford NSW 2250
043 283 555

Supported by either a mouse or joystick, *Fact and Fiction Toolkit* lets children and adults create illustrated stories on the computer screen. As they write and draw, they learn the basics of word processing and computer graphics. Included in the package is a gallery of some 50 double high-resolution pictures including animals, background scenes, spaceships, even witches and ghosts. Pictures from the gallery can be scaled, moved, or 'flipped'.

An added feature of the program is the draw and erase options allowing the user to choose any of 16 colours to illustrate their own stories. A gallery of eight type fonts enables the easy insertion of text on the graphics screen. Files can be saved to disk and printed from within the program.

Requirements: Apple IIc, IIe with extended 80 column card and mouse or joy-stick. Skill: Novice. Price: $60.

*3D design for PCs*

## MicroCAD

Novus Design
153 Mills Street
Middle Park Vic 3206
03 690 1402

*MicroCAD* was developed by an architect/engineer for his own practice. Drawings, scaling, rotations, perspectives, pen plotting, routine editing and movement are supported by the MAIN menu. The CO-ORDINATE menu is used to edit pointsets by changing co-ordinates, bearings and lengths of lines nu mer-ically.

*MicroCAD* lets you build a collection of 3-dimensional objects and recall them in any combination. Images may be moved anywhere in 3-D space and rotated there, changed in size and viewed in perspective. *MicroCAD* has a rotatable graph paper which emulates the functions of a drafting machine. This rotatable grid, when used in conjunction with the optional rotatable character set and built-in arrowheads allows easy dimensioning of drawings and notation.

Requirements: IBM PC or compatibles. Graphics card, two drives, 256k RAM, B/W or RGB monitor. Skill: Novice. Price: $2880.

## Professor Pixel

Sourceware Pty Ltd
4/73 Albert Avenue
Chatswood NSW 2067
02 411 5711

*Professor Pixel* is a tutorial program which teaches graphics, sound and animation using the Basic programming language. It enables users to develop their own business charts, engineering designs, artistic scenes using on-screen instructions.

Beginning with graphic concepts, *Professor Pixel* guides the user through the ideas relating to colour, resolution, shapes, lines and painting and then teaches how to enhance graphic presentations with animation and sound.

Requirements: IBM PC, IBM PC/XT, IBM PCjunior. 128k, a double-sided diskette drive, a colour graphics card, and display monitor. Skill: Novice. Price: $99.95.

## Facemaker

Ashtron Software
PO Box 579
Gosford NSW 2250
043 283 555

Designed for young children aged 5-12 *Facemaker* permits the user to build-up over a million possible identikit-type faces on the screen. The program asks you to select features from a series of choices: eyes, mouths, ears, noses, hairstyles, even earrings and hats! The program teaches children to read the names of the features with their associate quality adjective and then later to follow the sentence structures as they appear. Children have fun drawing each other or working together with *Facemaker*, thus improving their reading ability and powers of observation.

Requirements: BBC Micro, a Powerpad. Skill: Novice. Price: $45.

*3-D Electronic Finger Painting*

## SuperGraphics

Ashtron Software
PO Box 579
Gosford NSW 2250
043 283 555

A design tool for both the beginner and the professional artist. *SuperGraphics* combines electronic finger painting with fine-line, high resolution graphics. Built-in structures allow push button creation of basic shapes: line, rectangle, circle, triangle. Additionally, colour and paint functions allow easy adaption and experimentation with pictures. Other capabilities include object movement, repetition, rotation, mirroring, and magnification of entire pictures or single objects. Storage utilities allow for the saving and loading of pictures.

Requirements: available in November for Apple IIc (disk, price t.b.a) and Commodore 64 (price $69.95). Skill: Novice.

*500 Images On Tap*

## Mac The Knife

Software Source
PO Box 311
Bondi Junction NSW 2022
02 389 6388

A graphics package which gives you about 500 pre-saved images and literally hundreds of patterns for your Macpaint pallette. Also includes font enhancements, so you can type a variety of graphics straight into your documents or pictures. A great way to tutor yourself in Macpaint graphics. Use Fat Bits to see how it's done.

Work on an Australian version has begun and volume two should be available in October. This will be a package made up mostly of new fonts, which is obviously going to expand your document capabilities even further. This package also includes valuable tips and

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| ★ 6.0 PLUS TRSDOS enhancement | $59.00 |
| ★ Model 4 Lazywriter wordprocessor | $175.00 |

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## Multisoft

• Principle Distributors

techniques that will come in handy in other Macintosh applications.

Requirements: Apple Macintosh. Skill: Novice. Price: $79.

## Leo's 'Lectric Paintbrush

Ashtron Software
PO Box 579
Gosford NSW 2250
043 283 555

*ChalkBoard's* electronic "finger-painting" program is designed for young children. *Leo's 'Lectric Paintbrush* offers the following features: ability to select background and foreground colours, move objects, copy objects, fill shapes, ability to draw with one finger or many (multi-contact support), and the option to save pictures to either disk or cassette.

Requirements: Atari series, Commodore 64, Powerpad. Skill: Novice. Price: $46.50.

*Draw Your Own Documents*

## CX MacBase

Software Source
PO Box 311
Bondi Junction NSW 2022
02 389 6388

*CX MacBase* enables you to juggle files, texts, charts and graphs. You actually draw your documents on the screen in a way that comes most naturally — just like using a ruler and a pencil. Combine texts, pictures, graphs, and calcu-lations. You'll find it easy to create your own data management applications, from the simplest customer list to supply maintenance, billing and decision-making aids.

Requirements: Apple Macintosh. Skill: Novice. Price: $395.

*Read Images Into Your MAC*

## Micron Eye

Software Source
PO Box 311
Bondi Junction NSW 2022
02 389 6388

An amazing camera to go with your MAC. Use it to copy your logos or whatever you like. Just like an ordinary camera, aim, focus and shoot. Play with the image as much as you like using all your Macpaint tools. Imagine the advantages of being able to photographically enhance your business presentations and letters, all on the same document as your text and other diagrams.

Requirements: Micro Camera. Apple Macintosh. Skill: Novice. Price: $795 (with camera).

## Poster

Ashtron Software
PO Box 579
Gosford NSW 2250
043 283 555

*Poster* is a simple but powerful programming language that helps you paint on the screen. You can choose from a variety of background colours and brush strokes. You can create colourful patterns and shapes, paint pictures, even tell stories with your posters. Pictures created with *Poster* can be saved to disk and later recalled to the screen or incorporated into your own programs. An index of commands is included describing the range of functions available within *Poster.*

Requirements: Commodore 64. Skill: Novice. Price: $29.95.

## Micro Illustrator

Ashtron Software
PO Box 579
Gosford NSW 2250
043 283 555

*Micro Illustrator* creates pictures, designs, diagrams, colours, boxes, frames, circles and disks. You can draw them, change them, colour them, mirror or magnify them. Pictures can be saved to either disk or tape and recalled for revision or incorporated into your own programs.

Requirements: Apple II series, Atari series. A PowerPad. Skill: Novice. Price: disk $53.95, cartridge $63.50

*Visual Displays With Zoom*

## DR Draw

Arcom Pacific
252 Abbotsford Road
Mayne Qld 4006
07 529 522

*DR Draw* is designed for anyone in a business or professional setting who needs to create visual displays for use in format presentations or office communications.

With *DR Draw,* you can create complex visuals on the screen, such as organisation charts, project-flow diagrams, logos, area layouts, block diagrams and formal presentation slides. Menus prompt the user through creation and manipulation of the picture elements which are the basic building blocks for a diagram. To build a picture, you select geometric or text elements from the available options and use the graphics cursor to place elements in the desired locations in the diagram. When building a diagram, you can zoom in on a specific section of the diagram to work on details and zoom back out to view the whole picture.

Requirements: CP/M-86 or Concurrent CP/M-86 with GSX, NEC APC, Rainbow, IBM PC, PC/XT and compatibles. Skill: Novice. Price: $355.

*The Graphics Standard*

## GSX

Arcom Pacific
252 Abbotsford Road
Mayne Qld 4006
07 529 522

*GSX* is the graphic system extension to the CP/M, MS-DOS and PC-DOS families of operating systems, providing graphics capabilities through standard operating system calls. *GSX* is based on the ANSI Virtual Device Interface (VDI) to provide portability across systems and devices. The programmer can access the power of *GSX* through the Digital Research CB-80 and CB-86 languages which contain graphic 'primitives' to directly connect with the VDI. Other DRI languages which can directly interface with *GSX* are C, PL/1, Pascal MT+ and Fortran. *GSX* includes a library of fully supported graphics device drivers and is intended for use by application developers and systems programmers.

*GSX* ensures that the proper driver is dynamically loaded as needed. Thus, only one device driver resides in memory at any time. Requests for new work stations are handled automatically, maximising the memory available for the application programs.

Requirements: NEC APC, IBM PC, PC/XT and compatibles. Skill: Intermediate to experienced. Price: normally with hardware cost.

*Presentation Business Graphics*

## DR Graph

Arcom Pacific
252 Abbotsford Road
Mayne Qld 4006
07 529 522

*DR Graph* is an interactive software application that delivers a full spectrum of effective business graphics. It lets you create professional, presentation-quality graphs and charts. You can even build graphs directly from electronic spread-sheets such as SuperCalc.

*DR Graph* eliminates the guesswork by making initial design decisions for you. It automatically labels the axes and plots your selected values, chooses the size of letters, line styles and much more. It features single keystroke changes or enhancements.

Requirements: CP/M-86, CP/M-86 with GSX, NEC APC, Rainbow, IBM PC, PC/XT and compatibles. Skill: Novice. Price: $355.

### Mirage
Dimension Graphics
265 Miller Street
North Sydney NSW 2060
02 929 5794

*Mirage* is a comprehensive and flexible database graphics software for the display of numerical data in graphical form. It was designed for non-computer users, and is available on mainframes and personal computers. *Mirage* can handle large quantities of data from the keyboard or directly from a report file which is read into a relational database so that information can be selected, manipulated and displayed graphically. It has a graphics editor for free form drawing of curves, boxes, circles, text, diagrams, logos etc. Graphics can be produced in colour on hard copies such as 35mm slides, overhead transparencies and paper.

The program is suitable for applications such as analysis, reporting, and presentation of numerical data. Typical users of *Mirage* are secretaries, managers, programmers, graphic artists and training instructors.

*Mirage* supports production of complex charts, diagrams and logos by giving the user the ability to draw line, polygons, curves, boxes, circles, text and arrows. Powerful operations can be performed eg, users can point to graphic objects on the screen using a digitizer or cross-hair cursor. These objects can be selected by one, by a subset or by a group and then manipulated with operations like MOVE, DELETE, ROTATE, RUBBER-STAMP, SCALE. For example, a circle can be moved to a new position by pointing to new co-ordinates on the screen.

Requirements: IBM PC and compatibles. Skill: Three menu levels. Price: $2500.

*Ambitious Colour Graphics*

### Designer's Toolkit
Apple Computers
37 Waterloo Road
North Ryde NSW 2113
02 888 5888

*Designer's Toolkit* is an easy to use set of tools. Using a graphics overlay on the graphics tablet, you can get 20 pen and brush techniques and 10 styles. You can also define symbols and 300 colour combinations are available. Freestyle and pre-defined shapes are options. You can invert, fan or fill images and enlarge the image by up to 64 times and draw a 'window' around a section to work on. 15 text fonts in 3 sizes are included.

Requirements: Apple II series, Apple graphics tablet. Skill: Novice. Price: $357.

*Technical Drawing Made Easy*

### TouchCad
Kinetic Systems Pty Ltd
357 Nicholson Street
North Carlton Vic 3054
03 347 7326

Architects, landscape designers, engineers and circuit designers will find uses for *TouchCad.* The user makes drawings from simple components such as lines (of any width), circles, arcs and solid filled areas. Drawings may be annotated with text of any size, inserted at any point and at any angle. The drawings can be stored and used as components in other drawings. The ability to define parts libraries simply by drawing them, and to write custom menus allows specialised application systems to be easily developed under *TouchCad.*

Drawings may be created through the keyboard or with the optional *TouchPen* and on screen menu. The large set of editing commands allows drawn objects to be moved, copied, modified, erased, rotated and scaled vertically and horizontally. Repetitive patterns such as brick walls or memory arrays can be generated automatically. A full bi-directional zoom facility allows work on the drawing at any level of detail.

Up to 127 layers and colours may be used, allowing selective viewing or plotting of drawings as if on transparent overlays.

Requirements: IBM compatibles eg, Sirius, DEC Rainbow, Columbia, NEC APC, Eagle. Skill: Novice. Price: $1795.

## WORDPROCESSORS

*Wordprocessor includes mailmerger*

### WordPerfect
Sourceware
4/73 Albert Avenue
Chatswood NSW 2067
02 411 5711

*WordPerfect* has three features. 1. Basic wordprocessing. 2. Mailmerge that allows you to create mailing lists, form letters, telephone lists and fill in blank forms. 3. A mathematics feature does invoices and balance sheets with four function maths.

Requirements: 128k RAM, two disk drives, MS-DOS, PC-DOS, Z-DOS. It supports over 35 printers. Skill: Novice. Price: $650.

*Form letters for your MAC*

### MegaMerge
Software Source
PO Box 311
Bondi Junction NSW 2022
02 389 6388

With *MegaMerge* you can use *MacWrite* to create form letters, print mailing labels, and more. You can overcome *MacWrite's* limited document size by chaining several documents together and printing them as one long document.

*MegaMerge* takes full advantage of all of the fonts, styles, pictures, and formatting you bought the MAC for. With *MegaMerge* and *MacWrite* working together you will be able to do many useful things with your Macintosh, such as: Print hundreds of form letters to everyone on your mailing list; print mailing labels quickly and easily; and include standard 'boilerplates' in your contracts, letters, reports and other documents.

Requirements: Apple Macintosh. MacWrite. Skill: Novice. Price: $210.

### Text Com
SCA Software
449 Swanston Street
Melbourne Vic 3000
03 347 7011

A card that permits the exchange of Multimate documents with Wang dedicated word processing equipment. It lets you communicate and distribute documents among various systems in your office. It maintains integrity of the communicated Wang or Multimate documents without supervision. No separate conversion steps are necessary.

Requirements: IBM PC, PC/XT. Skill: Novice. Price: $1795.

## SPECIFIC JOB SOFTWARE

*Glasshouse and Orchid monitoring*

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Minder Systems
PO Box 33-544
Takaupuna
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applications: glasshouse ventilation control relative to inside/outside temperature, wind speed, wind direction, and humidity. Irrigation control can also be demonstrated based on a light integration meter. Other applications are cool store control; townhouse complex control and stun gun control for the sheep killing chain.

Requirements: Runs on Apple II, Apple II+, IBM PC, Wang PC, National Panasonic JB3000 and Commodore. Skill: Novice. Price: Not known.

*New Microsoft assembler upgrade*

### Macro Assembler 1.27

Microsoft
1/17 Rodborough Road
Frenchs Forest NSW 2086
PO Box 95
Forestville NSW 2087
02 452 5088

The new version 1.27 offers several enhancements, including the ability to recognise memory greater than 512k and a range of enhancements to the Microsoft Library Manager which include the following: the contents of one library file may be added to another simply by specifying the library file name as an argument to the addition operator, the internal page size is variable thus reducing wasted space and the user may specify a name other than the original for modified library, therefore enabling the modified library to be placed on a different disk to the original. The user can now utilise between 3000 and 9000 public symbols within a single library, depending on whether symbols average more or less than 9 characters in length.

Requirements: MS-DOS, 8-bit or 16-bit systems. Skill: Novice. Price: $339. Upgrade $25.

*Equipment service software*

### Serviceman

Copystatic
Computer House
Grant Street
Nottingham, England
0011 44 602 702417

Developed to control photocopier service, this program has applications in any field service operation.

When a customer contacts the service department either with any sort of problem or emergency, the current meter reading and the serial number of the machine are immediately entered into the system; the service department then logs the nature of the problem . . . by code and four lines of description . . . then the system automatically produces all the appropriate documentation.

While the customer is still on the telephone, the system checks which service engineers have the necessary parts in their vans, and which engineers have the necessary skills and experience to perform the repair.

The system integrates completely with the company's financial management system. As soon as a call is taken at the switchboard, the status of the customers account is checked; if payment for previous work is overdue, the service engineer can be instructed to collect before starting on the repair required.

Requirements: DEC multiuser system. Skill: Novice. Price: Not known.

*Negotiating by computer for a winning edge*

### The Negotiation Edge

Kiplings Business Communications
71 Palmerston Crescent
South Melbourne Vic 3205
03 690 6155

It enables the user to evaluate the personalities involved in any negotiations and suggests tactics to gain the winning edge. Operation is simple. If you are the user, you simply type in agreement or disagreement to between 70 and 100 statements about yourself, such as "I like to attend parties related to my job." You then agree or disagree on 50 adjectives such as talkative or sarcastic about your counterpart in negotiations, and provide some information about the meeting circumstances.

The Negotiation Edge then produces a smoothly worded eight to ten-page report as a complete negotiation game plan including preparation, tactics and strategies and closing.

Requirements: IBM PC. Skill: Novice. Price: $495.

*Genesis Medical Management System*

### Genesis

Cerebral Systems
2/281 Pacific Highway
North Sydney NSW 2060
02 923 2288

This system replicates the *Surgery Management System* already in use by medical practices and is not a fancy accounting system. The *Genesis Medical Management System* is an instant billing system for the receptionist, saving time on all the tasks normally performed manually by producing invoices, receipts and bank deposit slips and allowing batch payment entry of large cheques for multiple accounts ie, Medicare and insurance company cheques.

The *Management* section produces all relevant reports, accounts rendered, statistics and maintenance as well as providing for letterheads, warnings for out-of-date referrals, patients on hold and messages for receipts and invoices. The system has the facility to print messages on statements which relate to the age of the account. The system also allows for recovery after power failures and file corruptions.

Requirements: IBM PC and compatibles and most other microcomputers. Hard disk, and two printers for Medicare. Skill: Novice. Price: $2500.

## FORMS GENERATION

*Forms generation for your MAC*

### MegaForm

Software Source
PO Box 311
Bondi Junction NSW 2022
02 389 6388

*MegaForm* is an easy-to-use forms and report generator. You can use *MegaForm* to create actual size forms and reports, such as: invoice forms, order forms, purchase orders, expense reports and more.

With *MegaForm* you can draw forms and reports exactly as you want them to appear. You can even incorporate pictures from MacPaint and other Macintosh programs.

Requirements: Apple Macintosh. Skill: Novice. Price: Not released.

## ACCOUNTING

*Accounting for the MAC*

### Mac IAL

Interactive Application
123 Walker Street
North Sydney NSW 2060
02 920 1377

The initial release will include three packages, *Accounts Receivable, General Ledger* and *Stock Control.* Each is a stand-alone system. The new family of software products makes extensive use of the Macintosh mouse and utilises symbols to display action choices for selection using either the mouse or the keyboard. The software also features help messages throughout and these may be displayed on the screen at any time a user requires assistance. All file

# Before you compare our new computer system with any other, double the price.

Other computer systems that get anywhere near the new CPC464 on specification cost around twice as much.

Which other home computer, for instance, gives you 64K of RAM (42K available), 32K of ROM and a colour monitor or VDU?

Which other home computer, gives you a built-in cassette data recorder, typewriter style keyboard, numeric keypad and a very fast extended BASIC?

What's more, the CPC464 comes complete and ready-to-go.

Just plug it in.

## 64K RAM.

Dollar for dollar, other micros can't match the CPC464's memory. Over 42K is available to users, thanks to the implementation of ROM overlay techniques.

So there's plenty of room for sophisticated and complex programs.

## High resolution graphics. Stereo sound.

The monitor drives each colour on the screen directly from the computer. There's no unnecessary circuitry to distort your view. No tuning problems. And no arguments about who's using the computer and who's watching TV.

Sounds good, doesn't it?

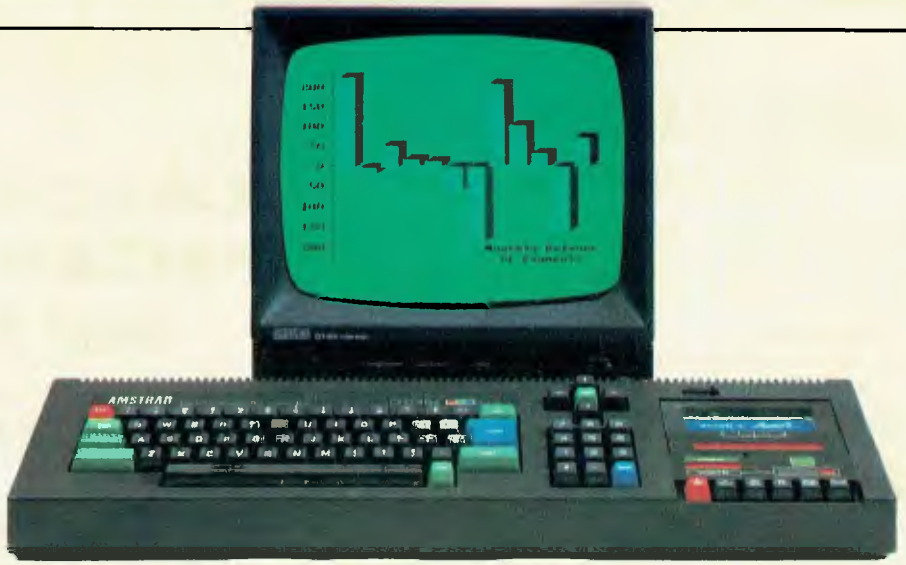
So does the CPC464 with its 3-voice, 7-octave stereo output fed through a hi-fi amplifier and speakers.

## Amsoft. High quality software.

A rapidly expanding range of programs is already available. High quality software that takes full advantage of the CPC464's high specification and speed-loading capability.

Which means even complex programs can be loaded quickly.

Arcade games, educational programs and business applications are all designed to utilise the CPC464's impressive graphics, sound and processing abilities.




CPC464 green screen VDU (GT64)

## Green screen VDU.

Text and numerical data are bright, sharp and easily read at a glance. Which is invaluable for word processing, accounting, budgeting and developing programs. And this purpose designed visual display system has an 80 column text display.

Green screen versions of the CPC464 can be used with a colour TV by connecting the optional power supply and modulator MP-1.

## Amstrad. User Information Service.

Whether you're interested in serious commercial applications or you're a games fanatic you'll want to receive the latest information about your AMSTRAD Computer. Upon request you will be advised about the latest software and its application, special information concerning your CPC464, available peripherals and software reviews. There will also be programs and exercises to try.

## User Clubs.

In addition to the User Information Service you will be given details of where you may contact your nearest independent user club.

## CPC464. Unlimited scope for expansion.

At Amstrad, we try to anticipate your future requirements. That's why there's a built-in parallel printer interface. A low cost optional disk drive system including CP/M* and LOGO. A joystick port. And the virtually unlimited potential of the Z80 data bus with sideways ROM support.

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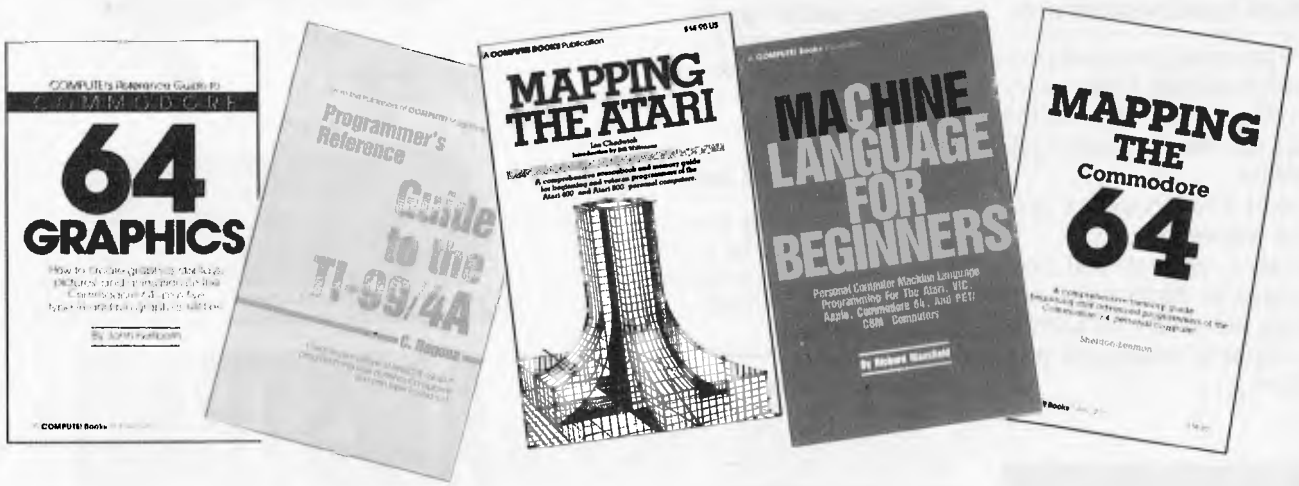


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sizes are defined by the user and can be extended at will, provided disk space is available.

One diskette will hold 300 accounts and 1500 transactions of *Accounts Receivable*, 1000 products, 400 purchase orders and 200 current transactions on *Stock Control* and 500 accounts and 300 transactions for *General Ledger*.

Requirements: Apple Macintosh. Microsoft Basic Interpreter, 400k. Skill: Novice. Price: On release.

## SPREADSHEETS

*Updated SuperCalc*

### SuperCalc 3

Arcom Pacific
252 Abbotsford Road
Mayne Qld 4006
07 529 522

*SuperCalc 3* adds fully integrated presentation quality graphics and a data management capability to *SuperCalc 2*. Access to the graphics is a single keystroke to view, print or plot. It features a key sort and additional financial functions.

Requirements: IBM PC, PC/XT, compatibles. 96k. Skill: Novice. Price: $445.

## STATISTICS

### Ecosoft Microstat

Data Sciences
73 River Street
South Yarra Vic 3141
03 241 4883

This is a statistical software package featuring time series analysis and forecasting, multiple regression, non-parametric tests of significance etc.

Requirements: IBM PC, CP/M. Skill: Novice. Price: $525.

### Microstat 4.0

Cerebral Solutions
Suite Two, Palm Court
281 Pacific Highway
North Sydney NSW 2060
02 923 2288

*Microstat* consists of a library of statistical programs that perform most common statistical tests and procedures. It was developed for 'real life' applications using fairly large data sets. It has a powerful Data Management Subsystem and can read database managers, spreadsheet programs and word processors.

Requirements: MS-DOS, CP/M-86 and CP/M. Skill: Novice. Price: $490.

## UTILITIES

*Starlink expands PC to four terminals*

### Starlink

Arcom Pacific
252 Abbotsford Road
Mayne
Brisbane Qld 4006
07 529 522

The *StarLink* system to connects as many as four terminals to an IBM PC. This allows computer users to share files, software and data simultaneously. *StarLink* consists of a microprocessor and random-access memory on an add-on board as well as the multitasking, multiuser Concurrent PC-DOS operating system.

On the main console, Concurrent PC-DOS handles multiple tasks and runs both PC-DOS and CP/M programs. The operating system also comes with protection and file-locking functions that keep information from unauthorised users. Files can be protected individually for additional security.

Because the on-board 8088 microprocessor, 64k RAM and Concurrent PC-DOS intelligent I/O buffering capabilities independently control most of the communications processes, the IBM PC can function quickly and efficiently, even with four active terminals.

Requirements: IBM PC-XT or IBM PC compatibles. Either two double-sided floppy disk drives or one double-sided floppy and one hard disk drive. 512k. A hard disk is recommended. Skill: Novice. Price: Not released.

## INTEGRATED SOFTWARE

*Lotus 1-2-3 converted for Toshiba T300*

### Lotus 1-2-3

Toshiba
84-92 Talavere Road
North Ryde NSW 2113
02 887 3322

The award winning software package, Lotus 1-2-3 can now operate on the Toshiba microcomputer system with its performance enhanced by the design and capabilities of the hardware; more k of data on the spreadsheet and high resolution graphics.

Lotus 1-2-3 offers users information management (electronic filing), spreadsheet (electronic worksheet for analysis and forecasting) and a business graphics program (spreadsheet information displayed in graphic form) all in one. The Lotus 1-2-3 kit for the T300 consists of a fully licensed copy of the package, additional documentation necessary for the T300, diskettes and a keyboard overlay.

Requirements: Toshiba T300. Skill: Novice. Price: $795.

*A 6 module integrated package*

### Open Access

Software Suppliers
7 Avon Road
North Ryde NSW 2113
02 888 1955

*Open Access* includes an electronic spreadsheet, 3-D graphics, word processor, appointment scheduler and telecommunications module — all revolving around a powerful information manager. Integration means that you no longer need to re-enter data; all modules have a similar operating procedure making it easy to use.

Requirements: MS-DOS, PC-DOS. Skill: Novice. Price: $995.

### Aura

Imagic
8/93 South Creek Road
Dee Why West NSW 2099
02 981 2744

*Aura* is a menu driven integrated package combining a database with wordprocessing, business graphics and spreadsheet. The database serves as the core of the package. Called the Information Manager, it serves as an electronic file cabinet and an application development tool. It allows the user to define and customise menus, as well as entire sets of tasks without being a programmer. Business graphics in *Aura* allow the usual bar and pie, as well as free-draw diagrams.

Requirements: IBM PC, 256k. Skill: Novice. Price: $795.

### Electric Desk

Software Corp. of Australia
449 Swanston Street
Melbourne Vic 3000
03 347 7011

*Electric Desk*, a new integrated package, offers spreadsheet, word processing, database and communication facilities. It also supports windowing and has a macro programming language and context-sensitive 'help'. The database command feature allows up to 65,000

# apricot

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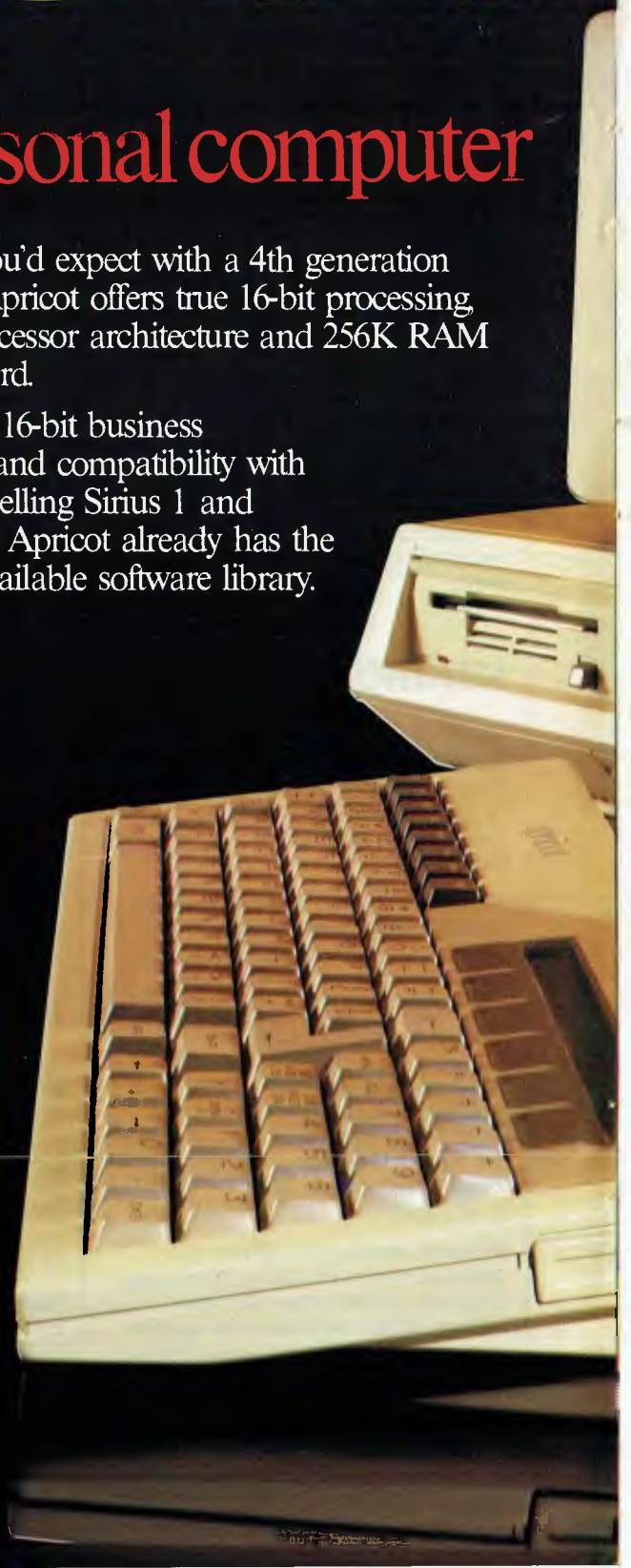
As you'd expect with a 4th generation system, Apricot offers true 16-bit processing, multi-processor architecture and 256K RAM as standard.

With 16-bit business software and compatibility with the best selling Sirius 1 and IBM PC, Apricot already has the largest available software library.

Incorporating the very latest advances in computer technology, Apricot uses 3½" pocket-size diskettes. Secure and compact, yet offering increased storage capacity.



Apricot includes over $1,000 of software—SuperCalc spreadsheet, business and communications software—to ensure that your system is immediately effective.

And because executives are not office bound, Apricot offers portability, a further feature aimed at improving efficiency.

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records and data entry screens to be "painted" onto the screen. The spreadsheet feature allows up to 255 columns by 255 rows. *Electric Desk* supports user selective on-screen colour combinations and comes complete on one diskette.

Requirements: IBM or IBM PCjunior. Skill: Novice. Price: $465.

*Faster Spreadsheet for Access*

## Open Access version A1.01.

Software Suppliers
7 Avon Road
North Ryde NSW 2113
02 888 1955

*Open Access* is an integrated system comprising: information manager, spread-sheet, 3-D Graphics, word processing, communications and time manager. Software Suppliers advise that the new version is from six to ten times faster in spreadsheet calculations than the previous version. Also further enhancements in macro editing and information management modules have been incorporated. Software Suppliers advise that as part of their customer assurance policy these and any future upgrades will be made available to registered users.

Requirements: IBM PC and compatibles. Skill: Novice. Price: $995.

*Toss out your mainframe*

## PC/Focus V.I.O

Computer Power
25th Floor National Mutual Building
44 Market Street
Sydney NSW 2000
02 292 211

The premier 4th generation language *FOCUS*, previously only available for large IBM mainframe computers, is now available with all mainframe facilities on the IBM Personal Computer.

Several of the new features of PC/FOCUS Rel. 1.0 include: the ability to use efficient full screen synchronous 3270 protocol to transfer files between *PC/FOCUS* and mainframe *FOCUS*; *TABLETALK* — a series of prompting windows to enable users without prior knowledge of *FOCUS* to generate reports from files on the PC or the mainframe; *FILETALK* — a series of windows which prompt the user through all stages of file production; the ability to output files in the standard DIF format and Lotus 1-2-3 format, which enables users to have their data in the FOCUS database and use Lotus as their modelling software; High resolution graphics.

Requirements: IBM PC/XT, 640k, hard disk. Skill: Novice. Price: $2960.

*Sorry, no coffee breaks*

## OverVUE

Software Source
PO Box 311
Bondi Junction NSW 2022
02 389 6388

*OverVUE* is a data processor for organising and analysing information using the Apple Macintosh. *OverVUE* combines spreadsheet-like display and extremely fast operation to provide a unique tool for managing information. And of course, *OverVUE* takes full advantage of the Macintosh toolkit (windows, scroll bars, pull down menus, etc.). New databases can be set up in minutes, and existing ones modified in seconds.

Requirements: Apple Macintosh. Skill: Novice. Price: $395.

*Picture database*

## FileVision

Software Source
PO Box 311
Bondi Junction NSW
02 3896388

The first software that combines a practical filing system with a simple to use, object oriented drawing system. Which lets you quickly visualise your data.

In the click of a mouse, you can retrieve the data stored behind each object in your picture. You can even select the objects in your pictures, based on the data in your files.

*Filevision* lets you link another picture to an object. And lets you group objects together as a common type. So you can create zoom like effects, step by step hierarchies or overlays.

Requirements: Apple Mac. Skill: Novice. Price: $315.

*A free-form database*

## Superfile

Sunshine State Scientific Systems
16 Niddrie Drive
Toowoomba Qld 4350
076 353362

*Superfile*, by Southdata Ltd of the UK is a free-form database that does not impose the restrictions of conventional systems. Every record can be different from every other, with the result that a single *Superfile* database can access many different logical files at the same time.

*Superfile* has powerful search commands. These are a phonetic or "sounds-like" search, plus >, <, =, embedded string, and wild card.

*Superfile* has two supporting packages suitable for the first-time end-user. Superforms and Supertab. One can design one's own equivalents of paper forms on the computer screen with Superforms and use them to enter, alter, and retrieve information. One can also design reports for printing lists of information — sorted, with totals and sub-totals — using Supertab. *Superfile* can interface to almost any language.

Requirements: 16-bit: at least 192k RAM, PC-DOS, MS-DOS, CP/M-86, Idris (Sage IV), Unix and others. 8 bit: Z80 CP/M, MP/M, TurboDOS, MmmOST and others. Skill: Novice to technical. Price: $523 to $2274.

*Talk to your database in English*

## Rbase Clout

Imagineering
579 Harris Street
Ultimo NSW 2007
02 212 1411

*Clout*, a natural language interface, is designed for use with Microim's RBase series of relational database management software. *Clout* has a built in dictionary of 200 words and allows the user to add his or her own vocabulary.

*Clout* has the ability to search through the database to retrieve records based on adjectives or qualifying terms. This means, for example, the user could ask the database to show the top three salesmen in orders for 1983. The user also could ask the database to "list all employees who have above average salaries" followed by "what are their birthdates?"

The process begins with a "conversation" between *Clout* and the user. The user queries the computer with a word or series of words not already in the database vocabulary. *Clout* responds with questions to direct the user to define the unfamiliar terms. In this way, if the database were to include a field of data entitled "jobs", the user could construct a definition for "occupation" or "work" to mean the same thing. All three words would be interchangeable when a database is queried about jobs.

Requirements: RBase on PC-DOS. MS-DOS, CTOS, BTOS and CP/M. Skill: Novice. Price: $300.

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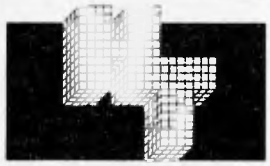

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# EDUCATION

### Australia — a Profile
Imagineering
PO Box 558
Broadway NSW 2007
02 2121411

This is a social and geographic database consisting of census information including population, age distribution, ethnic origin, income, housing, employment and industrial and agricultural activity. *Australia — a Profile* is a comprehensive source of statistical information designed to encourage students to learn to use computers, to analyse information and draw conclusions.

Requirements: Apple IIe, Commodore 64, MicroBee, BBC Acorn. Skill: Novice.

### One World
Imagineering
PO Box 558
Broadway NSW 2007
02 2121411

*One World* is a database on all the nations of the world. It is to be used in the subject areas of social studies, geography, current affairs and general reference. A database of demographic, political and economic information, this package is invaluable as a quick reference in class and for students working on assignments. However its real power lies in the ability to search and analyse the database according to the criteria you select.

Requirements: Apple IIe, Commodore 64, MicroBee, BBC Acorn. Skill: Novice. Price: $129.

### Operation Frog
Ashtron Software
PO Box 579
Gosford NSW 2250
043 283555

*Operation: Frog* for 9 year olds and over, introduces the player to fundamentals of biology, anatomy and scientific thought, with a no-mess, no fuss computerised 'dissection'.

The game has two levels of play: dissection and reconstruction. In the dissection phase, the child places an organ on the 'examination tray' and calls up diagrams and animation sequences that illustrate how the organ works inside the frog's body. To perform dissection, children select the proper sequence of procedures (cut, pin, snip, probe or remove) and choose their instruments. Through choosing sequences and instruments, the child gains familiarity with working tools of biology. The entire process familiarises them with body systems. Error messages and a 'help key' provide guidance and prevent frustration.

Upon completing the dissection, children have an opportunity never available in real life: reconstruction. Parts of the frog which have been removed are replaced, in puzzle fashion. The player is rewarded and the game is over when the frog is brought back to life — and hops off the screen.

Requirements: Apple II, Commodore 64 in December Skill: Novice. Price: $59.95.

# MANUFACTURING

*A new manufacturing system*

### Manufacturing
Ardent Information Services
19 Waranga Street
Dandenong Vic 3175

*Manufacturing* is a modular system consisting of inventory, bill of materials, job costing, work in progress, materials requirements planning, purchase order management and warehousing. Written in C for speed and transportability, it is available with both single and multi-user capabilities.

Requirements: MS-DOS, 128k RAM, diskette drive, winchester disk, 132 column printer. Skill: Novice. Price: $400 per module.

# LANGUAGE

*Instant Pascal for the novice*

### Macintosh Pascal
Apple Computers
37 Waterloo Road
North Ryde NSW 2113
02 888 5888

Apple Computer provides an interactive programming environment ideal for students and novice programmers who wish to create their own customised applications.

The program checks each Pascal statement for proper syntax as it is entered, and displays any unrecognisable text in hollowed lettering. At any time the users can ask *Macintosh Pascal* to check the entire program for consistency and proper syntax. Program text is automatically indented to graphically represent the program's logic structure, and Pascal keywords are automatically set in boldface type. Users can also access the Macintosh clipboard, scrapbook and note pad while editing.

*Macintosh Pascal* provides access to all of the QuickDraw routines implemented in the Macintosh ROM. Developed by Apple, these routines are a graphics environment that lets developers create applications that support the complex graphics capabilities of the Macintosh and Lisa computers. In addition, various key Macintosh operating system procedures, such as a mouse and keyboard event routines, are available as standard functions in *Macintosh Pascal*.

Requirements: Apple Mac and Lisa II. Skill: Novice. Price: $200.

*Small, medium or large C compiler*

### C Compiler 2.0
Microsoft
1/17 Rodborough Road
Frenchs Forest NSW 2086
PO Box 95
Forestville NSW 2087
02 4525088

With expanded memory addressing capabilities, programs compiled with Microsoft C can now take advantage of the full memory of their system. A programmer may now choose either the small, medium, compact or large memory model, selecting the one that best meets the needs of a particular application.

The library defines a comprehensive set of I/O subroutines which implement most UNIX-compatible standard functions. Full MS-DOS 2.0 pathnames are supported in the Compiler plus libraries for all filenames referenced in the command line and within the program.

Microsoft's *C Compiler version 2.0* includes a set of development utilities including a function extraction utility, an object module disassembler, an overlay linker and a library manager to allow the modification of program libraries.

Requirements: MS-DOS. Skill: Technical. Price: $750. Upgrade $125.

# FILE MANAGEMENT

### FMS-80 3.1
S.I. Microcomputer Systems
PO Box 1650
North Sydney NSW 2060
02 9223977

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latest version (3.10) of *FMS-80*. It provides the power and facilities normally found on programs needing considerable programming knowledge. *FMS-80* helps the user to write or modify the way his database works. Reports too are readily changed.

Requirements: MS-DOS, PC-DOS, CP/M, MP/M, MMMost (8-bit). Skill: Novice. Price: Around $1000, depending on PC used.

*File Management for your MAC*

## MegaFiler

Software Source
PO Box 311
Bondi Junction NSW 2022
02 389 6388

With *MegaFiler* you can print lists, tables, mailing labels and MegaMerge mailing lists. Or you can incorporate them into MacWrite and other Macintosh applications. With MegaMerge and MacWrite, *MegaFiler* provides a complete mail-list management system, including sorting, searching and form letter generation.

Requirements: Apple Macintosh. Skill: Novice. Price: $310.

*Another electronic diary*

## Dateline

Sourceware
PO Box 311
Bondi Junction NSW 2022
02 389 6388

*Dateline* is an electronic diary running on the Macintosh computer. It manages all your appointments, finds time slots for new appointments and prints an appointment diary for your travels.

Address files can be interfaced to MacWrite, MegaFiler and MegaMerge. Approximately one thousand address files can be kept on line and be alphabetically searched in ascending or descending order. Linked address entries will automatically appear when a name is entered for an appointment in any given time slot. Appointments can be commented.

Requirements: Apple Macintosh. Skill: Novice. Price: $149.

## dBase III

Arcom Pacific
252 Abbotsford Road
Mayne Qld 4066
07 52 9522

*dBase III* allows individuals to enter, manipulate and retrieve large volumes of data and develop customised application programs to put the data to work.

Features include storage capabilities of over two billion records per file and 128 fields per record, the ability to use 10 database files simultaneously, and an English-like command and programming language. The system also provides ultra-fast sorting and indexing of stored data, colour display and user interactive features such as the command assistance mode that guides the first-time user with a set of "pull-down" menus and prompts.

Requirements: IBM PC, PC/XT and compatibles. 256k, 2 floppy disk drives or 1 floppy and 1 fixed. Skill: Intermediate. Price: $795.

*Megadesk top appointments book*

## MegaDesk

Software Source
PO Box 311
Bondi Junction NSW 2022
02 3896388

*MegaDesk* has an appointments book and a "quicklook" filer.

The appointment book is a calendar that shows you any month of any year. Every day has its own page on which you can jot down information of your choice, such as appointments, meetings, and so on. While you don't need to own MegaFiler to use *MegaDesk*, the desktop appointment book uses standard MegaFiler files. This gives you the ability to sort and find information in your appointment book using MegaFiler.

The "Quicklook" accessory gives you a brief look into any MegaFiler file on your desk. This gives you instant access to information, while using any other programs.

Requirements: Apple Macintosh. Skill: Novice. Price: Not released.


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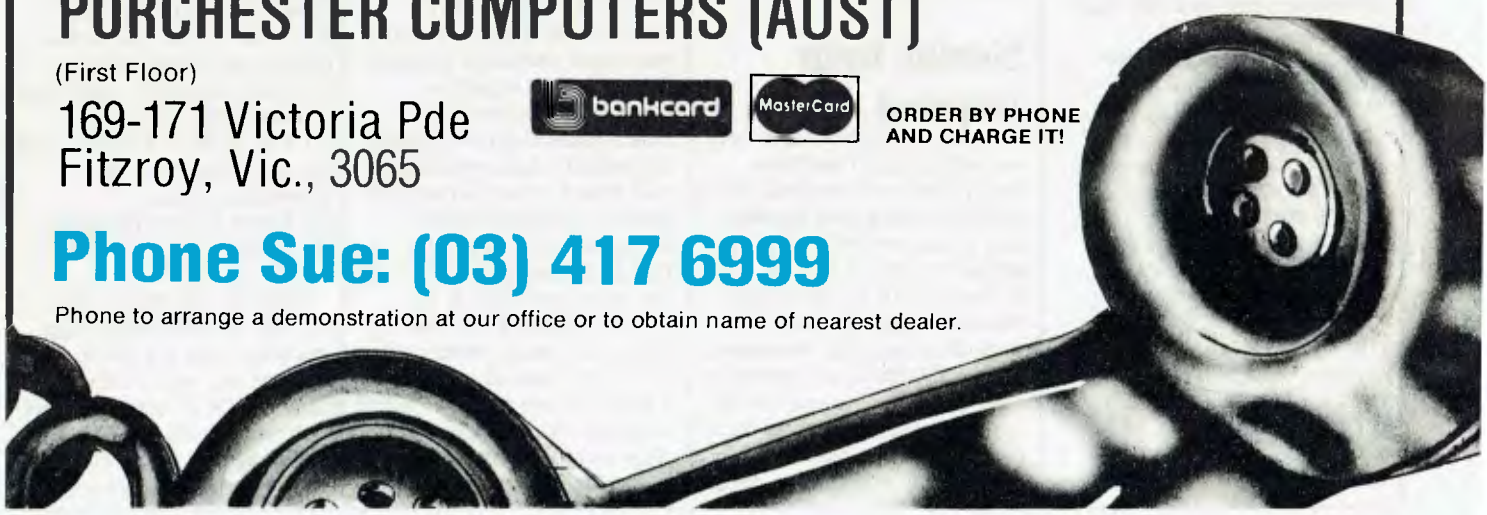

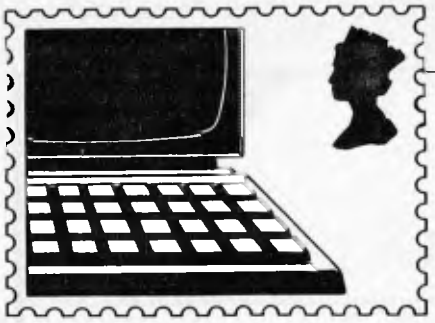

# COMMUNICATIONS

*APC welcomes correspondence from its readers but we must warn that it tends to be one way! Please be as brief as possible and add 'not for publication' if your letter is to be kept private. Address letters to: 'Communications', APC, 77 Glenhuntly Road, Elwood, Victoria 3184.*

## Alternative soap opera

Well, I finally did it. I am a 32-year-old bloke with a wife, two kids, five cats and a dog to support, and I have decided to purchase a computer.

Speak to Trudy (the wife), and establish some realistic parameters:
1 It ought to look nice.
2 Must be big and impressive looking — can't have folk thinking we aren't serious about it.
3 Trudy's till-now latent desire to type comes to the fore — proper keyboard, darling. Things are now becoming serious.

Of course, we realised that friends who already owned a computer would help us in our choice. Who were we kidding?

The one who lent us a Spectrum may never speak to us again, due to our expressed concern for the cobweb of wires, tiny keyboard and multi-function keys. Valid criticisms we thought — let's tell them. After all, friendship can rise above all this.

Wrong!

We eventually decided on a Sharp MZ-711. Next step — a magazine. Revert to parameters one and two and come up with *APC*.

Of course, I don't understand a bit (oops!) of it: 'Wait a minute love! It's got our computer in it, so we *must* have decided on a good one if the top magazine is writing about it!'

Your reviewer seems to have been fairly impressed by our choice (Benchtest, *APC* March). Yes, there were criticisms but then, I don't suppose there *is* a perfect machine. As fas as I'm concerned, what Surya lacks in a surname, he/she (with sincere apologies for whichever is incorrect) makes up for with an easily readable and understandable style.

*Bob Courtney*

*(He, for a he 'Surya' is, has now left us, and although we wish him well, he'll be 'suryasly' missed — Ed)*

## Oh Zork, Zork

I have been playing Zork III for at least a year now and I have spent many a day taking out my frustration on the keyboard while playing a game. That was OK, but I think, (in fact I am positive), that I have just come to the edge of my sanity.

Who do these Infocom people think they are? Why must they twist innocent people's minds into the shape of a mangled peanut? The fact is I need help, and fast. How do I get past the two stone statues that are standing on either side of the hallway? Every time I try to get past them I get pulverised to a pulp! Please help. In case the game differs from machine to machine (which would just be my luck) I own a Commodore 64.

*Craig Bolton*

*Can any reader help poor Craig? — Ed.*

## Serial help request

Can any of your readers help me with a slight problem that I have encountered. The problem being that nowhere can I find anybody who would be able to tell me how to connect an RS232 to my VZ-200, enabling me to run a modem from the computer.

The VZ-200 is an inexpensive, great little micro but is severely restricted by its lack of ability to connect peripherals such as the modem, which would open up the way for better communications for users.

I would be grateful if any one who has had success, or even ideas on how this can be done, could write to me at 'C/- 187 Port Road, Hindmarsh 5007', or send them into the magazine.

*Nigel Pope*

## WP for VZ-200

Many thanks to you and to Ted Barker with his VZ-200 Database. It's nice to know somebody remembers the little people. As Dick Smith continually sprooks, there have been 'over 25,000 sold', and that's 25,000 people out there with no usable software to speak of.

Does anybody know of a suitable word-processor type program for the VZ-200? I can't find one!

Again, many thanks, and keep up the good work.

*Ben McQuillan*

## QL OK for business

I do not as yet own a computer, however I have had some experience with a Canon BX-3 and several mainframes. I am now self-employed and hope to establish myself as a games inventor specialising in educational computer games. I invented educational card and board games for several years in my spare time before my introduction to programming and now that I am once again left to my own resources, I feel that my games are much better suited to the medium of computers. I have wanted to buy a home computer for some time to help with the compilation of games descriptions and patent specs as well as with the potential development of prototypes, but have been hamstrung by lack of money, but I have now received an offer of assistance with a bank loan for up to $2000 and am trying to decide which machine is the most appropriate. I had heard the Sinclair machines mentioned favourably and was pleased to see your article in the August issue about the QL. However, I was mystified by your conclusion that whereas 'you would consider it seriously as a truly personal computer, but not something to run a business on.' Though I read your report with interest, I did not find the reasons for this reservation. I have previously considered the Atari 800XL, the Commodore 64 and the Sega — Compared to these the QL seems exceptional value.

*John Rogers*

## Epson PX-8 solution

I refer to Dick Pountain's article on the Epson PX-8 in your July issue.

As a solution to his difficulties with pressing the carriage return key while impatiently waiting for programs to execute, I suggest he use the SHIFT LOCK key. I have seen this technique in use by several professional computer users and it has several advantages:
(1) The keyboard buffer does not get clogged up by extraneous typing.
(2) There is also the satisfying clicking of 'hard' SHIFT LOCK keys.

Even on computers without this obvious advantage, one often sees a LED to indicate the state of the SHIFT LOCK key, as in this case, so a pretty light flashes to distract the user's attention from the annoyance of a

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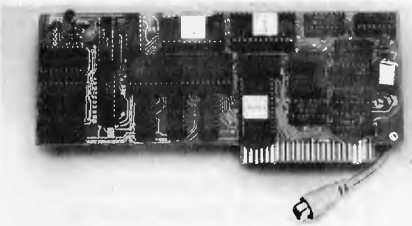

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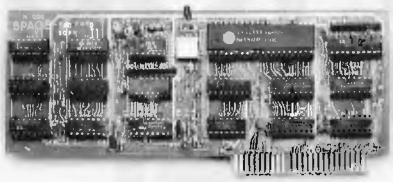

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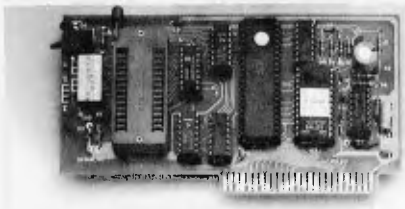

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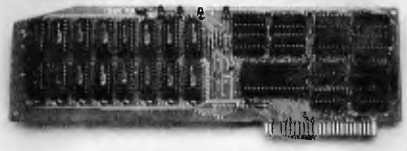

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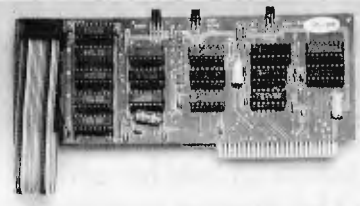

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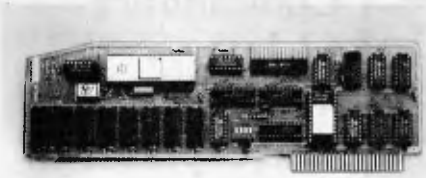

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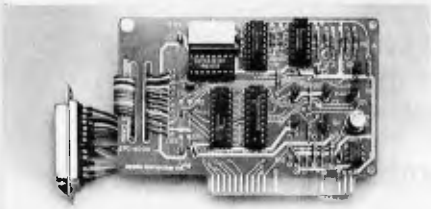

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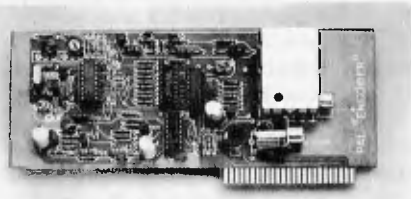

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snail-like program.

I hope this suggestion is of use to any other impatient user in the same dire predicament.

*R Williams*

## Marriage guidance

It's all down to you that my wife has fallen hook, line and sinker for what she calls *'Her* Sirius!' She moons about 'him' night and day!

To get my old lady back into bed with me, could you please write lots about Sirius and none of it nice! I think it's the only way my marriage is going to survive.

*D Jones*

*(You could always snuggle up with the Sirius and its dual 'floppies' — Ed)*

## Retrieving Commodore 64 programs

I have just spent three months developing a game on the Commodore 64 which I hope to sell to make a fortune. However, when I tried to load it to add the finish ing touches, it failed with a bad error message.

Is there anything I can do to retrieve my program and my sanity, or do I have to start again?

*R Deacon*

*You'll be delighted to know that there's a good chance of retrieving your program courtesy of the curious way in which the Commodore 64 loads programs. One of the reasons why it takes so long to load a program is that it loads it in twice. The first load is stored immediately in memory, and the contents are checked against the incoming second load. This is supposed to prevent loading errors, but it slows things down considerably.*

*If your program failed to load in this second stage, you can retrieve it by convincing the machine that all is well by typing in the following commands.*

*POKE 45, PEEK(831):*
*POKE 46, PEEK(832):CLR*
*— Ed*

## Soggy jargon

With reference to Banks' Statement, *APC,* August: 'The number of jargon words . . . is inversely proportional to the square of the misunderstanding . . . 'So, the more jargon, the less misunderstanding?' . . . more tightly defined . . . '? Banks hoist with his own verbiage, more like!

Let us be clear: technical terms, used sparingly and directly, are not jargon.

The 'interface between CPU and disk drive' (for disk controller) is good, precise, technical English.

The 'interface between education and industry' (for where they meet) is soggy jargon.

Terms start sharply defined, like new-minted coins. They are debased into jargon when used, first loosely, then in vague imagery, finally to look clever.

*JS Paine*

## Commodore 64 bug warning: unacceptable errors

I hope you can help me with a problem which may serve as a warning to others contemplating buying a Commodore 64 plus VIC 1541 disk drive.

According to the disk drive manual, the sample programs issued with the drive, the word processing package Easyscript and all other published material I have investigated, an already existing file on a disk may be overwritten by a file of the same name by using the SAVE & REPLACE command.

What they fail to mention is that there's a very good

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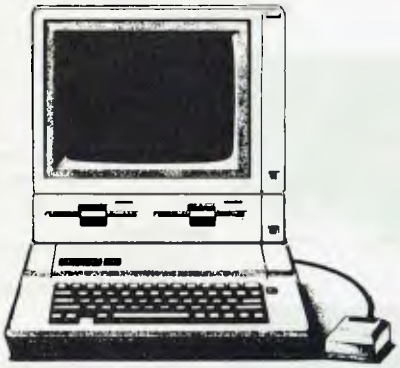

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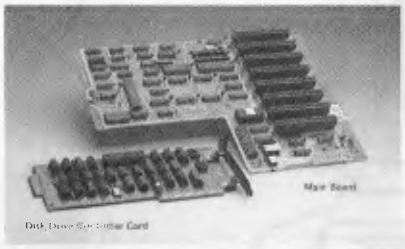

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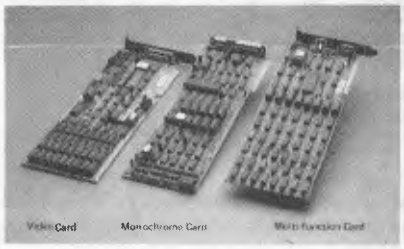

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chance that this will destroy many other disk files by overwriting them. This can naturally cause problems.

Is there a bug in this system or is it a mistake in the manual?

*S James*

*You are right in thinking that there's a bug in the disk system, which in turn is causing a problem with the SAVE & REPLACE command.*

*The problem arises whenever the program you're about to save is bigger than the one to be replaced. The result is disastrous, as it overwrites existing data on the disk.*

*However, it's not unreasonable to think that it's a mistake in the manual, as it's littered with them. Such bugs and manual mistakes are unacceptable, and there seem to be no plans to rectify them. There's a new version of the manual but it still contains errors.*

*Commodore is about to launch the 1542 disk drive, which is basically the 1541 in a new coat. Whether it has inherited its predecessor's bugs remains to be seen. — Ed*

# Reliable Apple II INPUT routine

Using Applesoft Basic, the Apple II signals all errors except '?' or '??' following a bad INPUT response. This can be awkward when a semi-skilled operator is entering a long series of inputs without looking constantly at the screen.

Could you suggest a way of attaching a CHR$(7) signal to these two error signs? I have tried monitoring PEEK(254), which works — the first time an error occurs. However, I have been unable to prevent the signal appearing at subsequent requests for input before the response has been entered.

Until I can make the INPUT routine more reliable, I am asking operators to enter the inputs as sequences of DATA lines (errors which can be picked up during program execution), but this is tedious and a waste of time.

I would appreciate your help to enable me to revert more safely to the INPUT routine.

*Graham Balmain*

*It's remarkably easy to alter the Apple's operating system, as it's stored on disk and copied into RAM when the machine is switched on. Consequently it's easy to change part of it by POKEing the required action into the correct location. The error messages are stored between the addresses 43380 and 43581.*

*The following program will allow you to display these locations and their contents onscreen, thereby allowing you to alter them at will.*

```
10 FOR Z=43380 TO 43581
20 X=PEEK(z)—128 °
   (PEEK (Z) >
   128):a$=CHR$
   (46°(X<32)+X°(X>31))
30 PRINT Z" "PEEK (Z),A$
40 NEXT
```

*When you alter an error message, you must ensure that the new version has fewer or the same amount of characters as the old one, and the last character in your message must have bit seven set (the number stored is 128 higher than its ASCII value).*

*There is, however, a simpler answer to your problem — utilise the Apple's ON ERROR GOSUB command, which will go to an error subroutine, ring bells and display messages to its heart's content.*

*Dr MP Thorne*

*'No, you can't go out until the computer's done your work.'*


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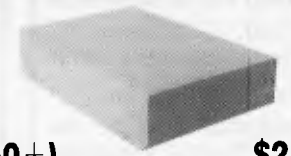

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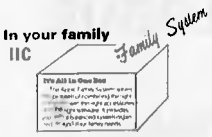

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| Singapore | PerComp Asia '84<br>Contact: Singapore Exhibition Services Pty Ltd, 11 Dhoby Ghat 15-09, Cathay Building, Singapore 0922 | October 29–November 2 1984 |
| Sydney | ACC '84<br>Contact: Beverley Parrot Tel: (02) 241 1478 | November 5–9, 1984 |
| Montreaux, Switzerland | Ergodesign '84<br>Contact: Ergodesign '84 General Secretariat. PO Box 122, CH 1820, Montreaux, Switzerland | November 6–9, 1984 |
| Brisbane | Computer Expo '84<br>Contact: Robert Woodland Exhibitions Tel: (07) 372 3380 | November 8–11, 1984 |
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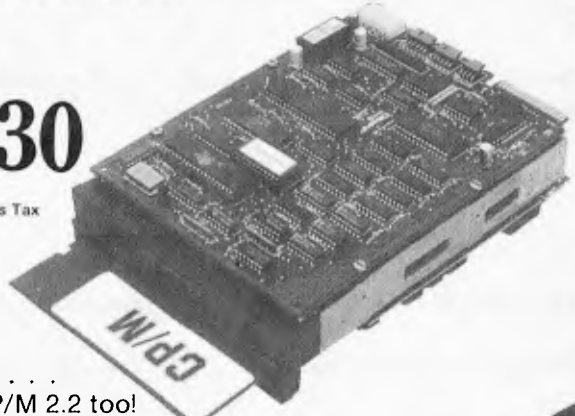


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# BENCHMARKS

*A list of Benchmarks used when evaluating micros is given below. An explanation can be found in the February '84 issue.*

```
100 REM Benchmark 1
110 PRINT "S"
120 FOR K=1 TO 1000
130 NEXT K
140 PRINT "E"
150 END

100 REM Benchmark 2
110 PRINT "S"
120 K=0
130 K=K+1
140 IF K<1000 THEN 130
150 PRINT "E"
160 END

100 REM Benchmark 3
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/K*K+K-K
150 IF K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 4
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 K<1000 THEN 130
160 PRINT "E"
170 END

100 REM Benchmark 5
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 GOSUB 190
160 IF K<1000 THEN 130
170 PRINT "E"
180 END .
190 RETURN

100 REM Benchmark 6
110 PRINT "S"
120 K=0
```

```
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB220
170 FORL=1 TO 5
180 NEXTL
190 IF K<1000 THEN 140
200 PRINT "E"
210 END
220 RETURN

100 REM Benchmark 7
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 230
170 FOR L=1 TO 5
180 M(L)=A
190 NEXTL
200 If K<1000 THEN 140
210 PRINT "E"
```

```
220 END
230 RETURN

100 REM Benchmark 8
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K^2
150 B=LOG(K)
160 C=SIN(K)
170 IF K<1000 THEN 130
180 PRINT "E"
190 END
```


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**A**
Abspect Software ..... 220
ACT ..... OBC
AED ..... 72
Aladdin Computer Supplies ..... 86
Amust Computer Corporation ..... 188
Applied Technology ..... Insert
Arcom Pacific ..... 25,63
ASP Microcomputers ..... 222
Atlantis International Computers ..... 35
Australian Exhibition Services ..... 20
AWA-Thorn ..... 202,203

**B**
Barson Computers ..... IFC,1,206,207
Bayne & Trembath ..... 167
Brother Industries ..... 41
BS Microcomp ..... 17

**C**
Calcutronic ..... 204
Cash & Carry Computers ..... 200
Catalyst ..... 221
Caulfield Typewriter Services ..... 223
Cerebral Solutions ..... 174
Chambers Computer Supplies ..... 212
Commercial & Professional Microsystems ..... 186
Compak Computer Centre ..... 78,79,82,83
Compsoft (Australia) ..... 220
Compumusic ..... 46
Computique ..... 84
Computer Edge ..... 194,195
Computer Marketing HQ ..... 84
Computer Print & Paper Company ..... 62
Computer Reporting Services ..... 12
Computer Solutions ..... 48,61
Computertime ..... 73
Computer Transition Systems ..... 180
Corgi & Bantam Electronic Publishing ..... 76
CW Electronics ..... 211
Cybex Computing ..... 209

**D**
Data Media Wholesalers ..... 14,87
Data Parts ..... 148,149,150,151
Datron ..... 157
Deforest Computers ..... 197
Dick Smith Electronics ..... 80,176
Digital Source International ..... 164

**E**
Eastern Micro Electronics ..... 171
Edusoft ..... 32
Energy Control ..... 219
Epson Australia ..... 16
Essette Dymo ..... 30

**F**
Forrest Data Services ..... 220
Fred Hoe and Sons ..... 158

**G**
Gametronics ..... 147
Gambit Games ..... 180
G.C.S. Computers ..... 211

**H**
High Technology ..... 209
Hi-Tech Software ..... 6
Hi-Tron Systems ..... 66
Holt-Saunders ..... 204
Home Computers ..... 146

**I**
Ideal Computer Systems ..... 178
IDN Advanced Systems ..... 184
IMA Computer Co ..... 34
Imagineering ..... 5,7,50,58,88
Immedia ..... 211
Independent Software Duplication ..... 220
Interfaceware ..... 156

**J**
John Sands ..... IBC
JW Ross ..... 197

**K**
KJ Computer Services ..... 70

**L**
Labtam ..... 21
Last Word ..... 158
Lion Electronics ..... 186
Lysco ..... 220

**M**
Mac Designs ..... 140
Mailsoft ..... 170
Megatron Computer Industries ..... 14
Memorex ..... 56
Metropolitan Business Machines ..... 77
Micro Allsoft ..... 197
Microbuff ..... 190,215
Micro City ..... 186
Micro Expanders ..... 221
Micromail ..... 217
Micropro Computers ..... 80
Microstation ..... 42
Mountain Valley Software ..... 142,143
Multisoft ..... 147

**N**
Nashua ..... 153
Netcomm ..... 14,87
New Generation Computer Store ..... 219

**O**
Ozi Soft ..... 53

**P**
Pacesetter Peripherals ..... 85
Paragon Educational Duplication ..... 204
PC Games ..... 134
Pogo Joe ..... 137
Porchester Computers ..... 74,75,213
Precision Marketing ..... 167
Public Domain Software House ..... 158

**Q**
QT Computer Systems ..... 162

**R**
Radio Despatch Service ..... 31
Rank Furniture Marketing ..... 9
RF Computer Communications ..... 146
Rifa ..... 145
Robert Woodland Exhibitions ..... 223
Robs Computer Centre ..... 182,183
Rod Irving Electronics ..... 166

**S**
Scientific Devices ..... 181
Software Corporation of Australia ..... 44
Software Suppliers ..... 67
South Pacific Software ..... 154
Sperry ..... 28
System Solutions ..... 64

**T**
Talking Computers ..... 222
Telecomputing ..... 161
The Computer Spot ..... 216
The Microcomputer House ..... 154
The Portable Computer Company ..... 69
Trident Technical Systems ..... 220

**U**
Uni Co-op ..... 144
Unlimited Computer Solutions ..... 61

**W**
Warbuton Franki ..... 60
Westcoast Electronic Supplies ..... 220
Western Technology ..... 180


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```
822 POKEC1-21,RC:POKEC1,RC:POKEC2,RC:POKEC3,RC
825 POKES1+1,19:POKES1-22,24:POKES2-22,24:POKES3-22,16
826 POKEC1+1,RC:POKEC1-22,RC:POKEC2-22,RC:POKEC3-22,RC
828 POKEVV,PEEK(VV)AND150R(RS*16):NEXT:POKEV1,0:POKEV4,0
830 LR=0:SS=SS-1:IFSS>0THENPRINT"■":GOSUB650:RETURN
840 PRINT"■■■
```

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