

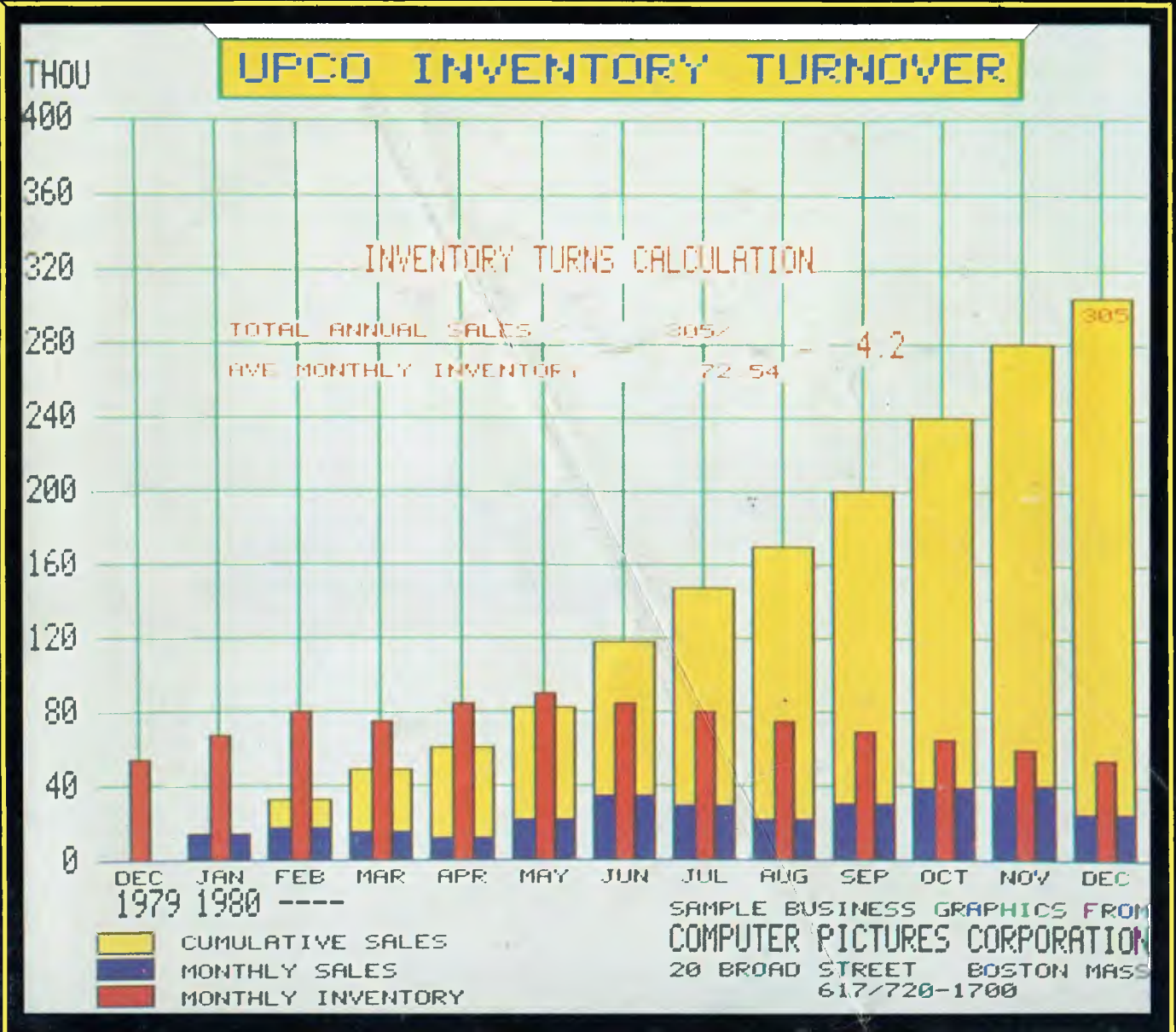
your computer

March, 1982

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inside your computer

Vol 1, No 9, March 1982

news

6

Your Computer News

Our round up of the latest in software and hardware, new and upcoming releases and happenings in the world of micro-computers.

56

Applefest

Les Bell reports on the products and the faces at Electronic Concepts' cleverly conceived Sydney exhibition of Apples and Apple-related ware.

business

19

The Model Business

Financial planning and modelling is one of the first areas where the combination of low cost micro-computers and easy-to-use software allows the business man to use a personal computer as a decision-making tool. Here's our in-depth analysis of the financial planning packages currently available.

34

Colour Graphics

Your Computer reveals how the wonderful world of colour graphics can save the beleaguered executive from being buried alive in fan-fold printouts.

features

44

Keep On Trekking!

In the world of computer games, Star Trek is considered the classic game in the 'in space' genre. Les Bell describes and explains the game, and urges its revival

48

Readers Cartoon

An imaginative reader, one Mr

Crow, has provided his scenario for Australia in 1998 — when the computers didn't work. But his version of Les Bell does bear a striking resemblance to one we've seen before...

65

Documenting Your System

Do you have a system built up from different boards and thus find it difficult to remember which bits connect where? The answer is documentation, and as Les Bell explains, it's a process that begins with when you unpack your new system and find the manual...

reviews

52

The Caverns of Mordia

Stephanie Blackett experiences a brilliant J.R.R. Tolkien-inspired fantasy war game, written and illustrated by two University of New South Wales scientists.

68

War Games

We meet Roger Keating, the desk-top general, the expatriate New Zealander who works full-time in Sydney creating war games which are produced in the US and re-imported into Australia.

education

58

Tandy's Courseware

Our resident computer education writer, Dr John Barrett, examines Tandy's entries in the educational courseware field. He also sets out guidelines for buying educational software.

for beginners

37

The Beginners Guide

Les Bell's handy household hints on how to buy and live with your first micro; including advice ex-

pandability, languages and using application packages.

40

Confessions of a Computer Salesman

Inside tips on the decisions you have to make, how to shop, how to obtain the relevant information from salesmen and the pitfalls.

70

Basic For Birdwatchers, Pt VI

This month, episode six, Les Bell's step-by-step tutorial on BASIC deals with random access files. And Brendan Akhurst's accompanying cartoon? Well, just check page 71.

74

Understanding Assembler

Part two of our tutorial on assembly language. This time we delve into the 8080 instruction set and prepare to write complete and sensible programs.

departments

61

Heard On The Bus

Leon Yendor, our resident computer social conscience, this month lobs a broadside at the more absurd side of the United States' laws on the export of technology.

79

Linton-Simpkins

Pithy computer buff Frank Linton-Simpkins fixes a knowing eye on police computers around the world; in particular, the installation at London's New Scotland Yard. Oh yes, he explains that Scotland Yard is misnamed!

62

NZ Scene

News from across the Tasman.

83-91

Popular Systems

Individual columns devoted to the popular systems: ZX80, Apple, CP/M and PET. If your system isn't included, it probably will be soon.

84

Clubs

A full listing of computer clubs.

93

Text File

Your words, our pages...

94

Glossary

A guide to the latest and fastest-spreading foreign language — computer jargon.

98

Readers Services

Want to contribute a story or program, write a letter, ask a question, subscribe or...? Read this first.



CHOOSE AN EXPANDABLE COMPUTER...
(ITALIAN MODEL SHOWN)

In our two-article beginner's guide, commencing on page 37, editor Les Bell and computer salesman Peter Sandys provide two perspectives on buying your first microcomputer. Les suggests you choose a system which can be expanded once you've exhausted its initial capabilities; hence Mr Akhurst's cartoon...

editorial



OUR MAGAZINE was named for our readers. We are writing for present and future owners and users of personal computers, people who not only have access to a computer, but can (or will soon) say 'that's my computer'.

Having a personal computer to use in your own way for the jobs you choose is a tremendously productive situation.

It can also be a bit baffling at first (and for some time to come!), which is why a magazine like YC can be particularly helpful. And why the magazine is called Your Computer.

It's our policy to help people using computers as personal tools, which is why this issue devotes a lot of space to the first of an occasional series on software products for the business executive and manager. In this issue we examine closely the most popular financial planning packages for personal computers. Future articles will cover other applications software for the professional.

For the executive, the computer is best used not as a glorified accounting machine but as a decision-making tool. The combination of the creative mind and a fast and accurate computer produces a decision-making system far in advance of any manager's individual capabilities. It also reduces the size of the 'too-hard file'.

Just as engineers have traditionally bought their own calculators, taken them from job to job, and learned to use them with familiarity and ease, so too is the computer with financial modelling system a tool the professional manager should consider as a personal asset. It takes a little time to master such a system but, once acquired, the skill is indispensable.

For this reason a manager's computer should be a personal system with which he is totally familiar, and which he takes from job to job. At the moment you may not think that economically reasonable, but talk to an engineer about his calculator or computer, then look at computer price trends, and you'll see — it can't be long before you buy your computer. □

— Les Bell

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Managing Editor: Tony Blackie

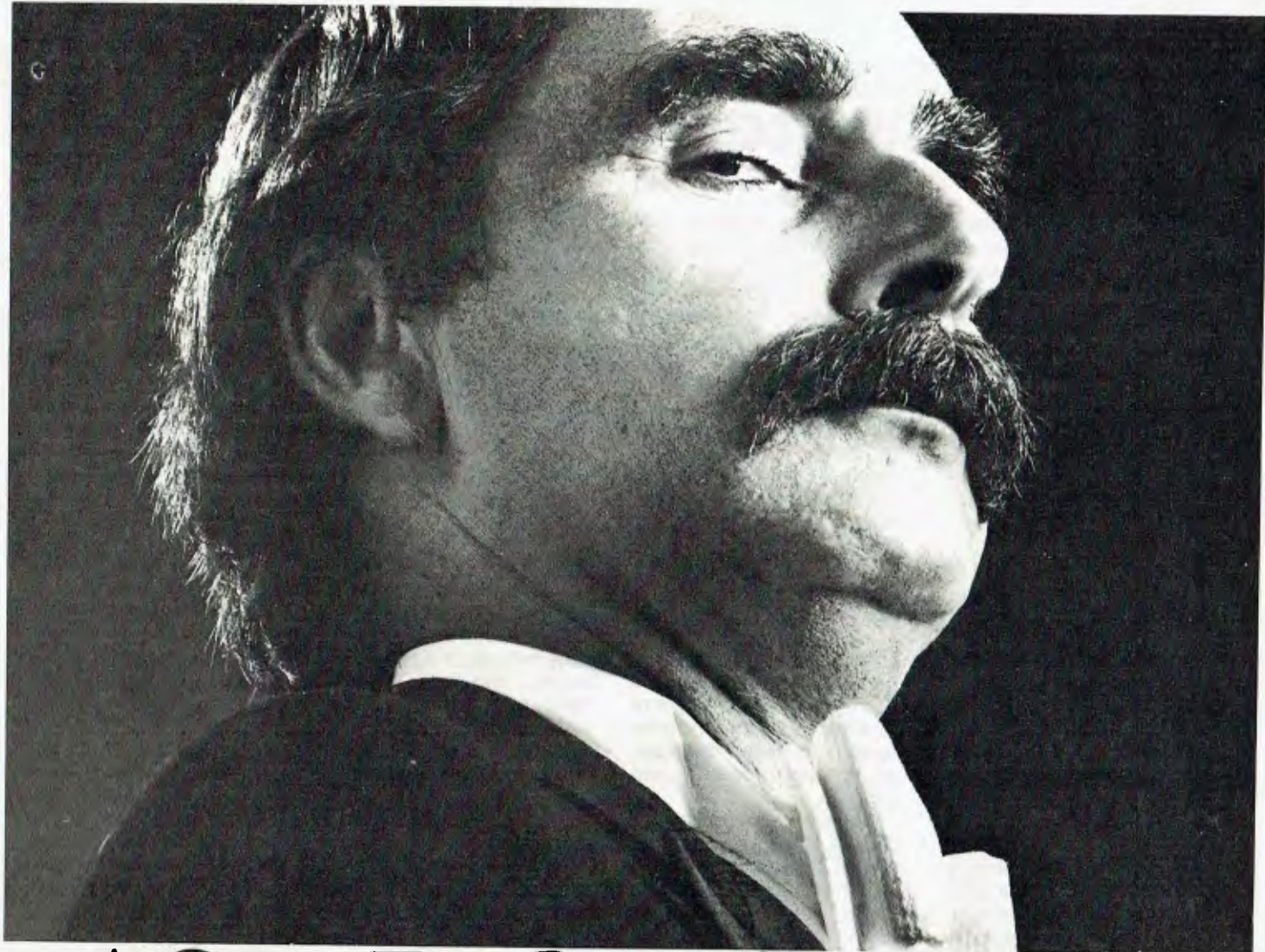
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YOUR COMPUTER is published monthly by White House Publishing Group Pty. Ltd., under licence from Motor Word Pty. Ltd. OFFICES: Editorial and Advertising, 706 Military Road, Mosman, NSW. Phone: (02) 969-7000. Postal Address: PO Box 216, Spit Junction 2088. MANAGING DIRECTOR: Sue Ransom. PUBLISHER: Matt Whelan. New Zealand advertising agents: NEWZTEL, second floor, Bowen House, 7 Bowen St, Wellington. Phone 73-8758. Typeset by Hughes Phototype, Mosman, NSW (02) 960-1797. Printed by The Litho Centre, Waterloo, NSW. Distributed nationally by Gordon and Gotch. Registered for posting as a publication - Publication number NBP 4384. See Page 98 for information on copyright, contributions, reader services and subscriptions. * Recommended and maximum price only. ISSN 0725-3931. **Source Mail:** Les Bell TCY314; Matt Whelan TCY267.



A Case For Discrimination.

Discriminating computer users don't want the *best known* word processing software. They want the *best* word processing software.

Hewlett Packard, for instance, spent 9 months comparing 7 microcomputer word processing software systems—including the most popular brands—for distribution with the HPI25 microcomputer.

Hewlett Packard's conclusion: Spellbinder is superior to every other system evaluated.

The reason? Spellbinder's unrivalled ease-of-use and superior capabilities. Spellbinder requires fewer keystrokes for entering and editing text, and provides more flexible printing options without changing the way you enter text. Spellbinder and an inexpensive microcomputer easily rival dedicated word processing systems costing up to *three times* more.

In addition, Spellbinder offers features for mass mailing and for professional legal texts. The price also includes forms handling and "boiler plate" features to store and merge commonly used documents, forms, and paragraphs.

Best of all, Spellbinder's lofty capabilities are available at a very competitive price. In fact, some of the bigger names in word processing packages demand a much higher price, for a package with far fewer features.

Hewlett Packard wouldn't settle for less than Spellbinder. You should be just as discriminating. See your nearest computer dealer for a demonstration of Spellbinder.

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your computer news

New Accounting System

A NEW turn-key business accounting system tailored to meet the requirements of small to medium Australian businesses has been developed and released by the TCG Group.

Called OS-BUS, the system provides a package of four interactive (self-updating) modules — general ledger, creditors, debtors, order entry, and stand-alone payroll and inventory.

The system is designed to run on Ohio Scientific hardware using 20 cm floppy or hard disks. The minimum requirement is 48K dual 20 cm floppy, moving up to multi-user hard disk systems.

OS-BUS is an integrated system designed for use by small businesses or book-keeping services.

It was developed late last year for release in January and follows Ohio Scientific's policy of integrating the functions of sales outlets with those of systems houses as developers of locally-oriented application software, according to Mr Mike Barraclough, a director of TCG, Australian distributor of Ohio Scientific equipment.

"By providing users with custom designed software from local firms users gain both local support and a system tailored to their specific needs. This approach eliminates the need for users to alter their business operations and controls to meet the requirements of canned software," Mr Barraclough said.

OS—BUS provides for up to 100 clients and branch accounting allows for multiple divisions or profit centres. Flexibility of the system allows the user to define his own report formats. Account numbers and groupings are also determined by the user.

The general ledger will produce income statements, balance sheets, monthly transaction reports and a monthly

detailed general ledger. Debtors provides either balance brought forward, or an open item system integrated with order entry, and produces customer statements, aged trial balance, optional service charges and mailing labels.

A sales code categorisation is provided and service codes for posting to appropriate ledger accounts. Creditors offers automatic cheque writing or manual cheque writing facilities, audit trails, and supplier status including current due invoices and cash requirements.

Payroll has been designed to fully automate the payroll procedure of any business and incorporates a number of features including employee record file, group certificate printing, tax calculations and payslips.

Sample reports include payslip, coinage analysis, payroll summary (week/month/year), employee records, tax table and flow chart. The inventory program is designed to permit the user to run a complete stock control inventory with real-time transactions and stock movement.

For further information contact the TCG Group on (02) 439 6477 or (03) 221 4176. □

TRS Farming

TODAY'S farmer has to be a businessman, and like his city counterpart, he looks to the best of modern technology to help solve his problems. Yet most businessmen and farmers believe, quite mistakenly, that they need a big budget to buy a microcomputer, and almost a university degree to operate one.

Tandy Electronics has the answer with its new Australian Farm Management software package. It sells for less than \$750. Add Tandy's TRS-80 Model III microcomputer and a line

printer and the farmer has a powerful computing system tailored to his exact needs.

The software package was developed in conjunction with Guyangal Stud by an Australian farmer to meet Australian needs. It uses tried and tested Tandy programs which are then 'personalised' for each farmer's individual needs, whether for cattle, sheep, pigs, agriculture or whatever.

The Australian Farm Management package, nicknamed TRSFARM by its users, gives today's farmer accurate and up to date yield, herd management and farm accountancy records. It handles tax records and even includes Tandy's Scripsit, a powerful word-processing program, so the farmer can produce letter perfect correspondence and documents every time.

The computer, printer and personalised software costs less than \$6000.

The Australian Farm management package of programs can be seen at any Tandy Computer Centre or ordered through any one of nearly 300 Tandy stores and dealers nationwide. □

Hand-Held computers

THE Computer Company has released hand-held computers from both Mitsubishi and Panasonic, early this year.

The release was designed to coincide with the opening of the first The Computer Company retail outlet in Australia. Operating on similar lines to the successful sewing machine franchises developed by its parent, Singer Company, The Computer Company shops will, however, cater primarily for professional personal computer requirements.

"Of the wide range of Panasonic and Mitsubishi systems which will be available through these outlets, the two hand-held computers

are very significant because of their power and capability," said Mr John Barsing, manager of franchise operations for The Computer Company.

The larger of the two computers is made by Mitsubishi. About the same size as a portable transistor radio/cassette player, it is an 8 bit microprocessor-based system with 30K of random access memory and one megabyte of plug-in bubble memory.

Weighing less than 1.5 kgs it features a full alphanumeric keyboard and a 40 character 5 by 7 dot matrix display.

The Mitsubishi hand-held computer is already in extensive use in the US, said Mr Barsing. Its applications include stock control, van sales activities and meter reading by public utilities.

The Panasonic hand-held computer is an integrated hardware and software package which has the ability to do anything other personal computers can do, Mr Barsing said.

It measures 22.7 by 3.0 by 9.5 cm, weighs only 397 grams and incorporates a 6502 microprocessor running at 1 MHz.

Prominent features include:

- 65-key keyboard with two-key rollover;
- uninterrupted storage of all user programs and other data through use of a unique 'power-down' circuit;
- 2 Kbytes of programmable memory, expandable to 4 Kbytes internally or any practical limit (up to a theoretical limit of 4 megabytes) externally, by adding programmable memory peripherals;
- 16 Kbytes of internal ROM with sockets for four program capsules containing up to 64 Kbytes of application programs or data;
- a built-in nickel-cadmium battery pack which supplies all power to the unit;
- an internal set of application programs which include a

four-function calculator and a free-form file system and editor.

For further information, contact: The Computer Company, 4 Cliff St, Milsons Point, NSW 2061. Tel (02) 436 1733. □

PASS Package

THREE years of development by Dr Carl Reuter, formerly head of the faculty of Computer Instruction at the University of Wisconsin, has paid off with the release in Australia of the PASS (Professional Authoring Software System) by Bell and Howell.

Bell and Howell has long been involved with audio-visual and training aids, and not surprisingly, sees training as being increasingly important to business in the future.

PASS is a highly sophisticated software package which uses 'English language' prompts and questions for the creation of CAI (Computer Aided Instruction) courses tailored to specific training objectives. It can be operated by people with no prior programming skills or computer knowledge.

PASS runs on the Apple II, with the addition of a special interface which allows the computer to control a Pioneer/DiscoVision video disk player. In this way the course designer can integrate existing training material into the computer presentation, allowing pres-

entation of more complex material than the computer graphics would allow.

The system will also interface to a graphics tablet, allowing the creation of complex graphics without the usual point-by-point digitization, as well as printers for hard copy reports and the like.

In a demonstration at the launch of the system, a test subject ran through a session which taught recognition of road signs and then presented a test of what had been learned. Other demonstrations showed how video material of cars in typical driving situations can be integrated into the computer presentation, based upon the video disks built-in 'intelligence' being able to locate any required section of the disk in a few seconds.

PASS is not cheap: the disk player and screen cost around \$4000; add to that, say, \$3500 for the Apple. In addition, the PASS system and licence costs \$15,000.

However, considering the massive investment Australian business makes in training every year (particularly institutions such as banks and retail groups) you can see it could make large savings, as well as improving productivity.

For further information, contact the AV—Video Group, Bell and Howell Australia, GPO Box 4778, Sydney 2001. □



Bell and Howell's microcomputer-based training system PASS.



Morrow Decision I

THE NEW Morrow Designs Decision I computer has been launched in Australia by Automation Statham. The Decision I, based on an advanced Z-80 CPU card which offers dynamic memory mapping and task protection similar to that found on mainframes, is available in a wide range of memory and disk storage configurations.

The basic Decision I box includes a 14-slot S-100 bus, switched-mode power supply, three RS-232C ports, a double parallel I/O port suitable for direct connection to an OEM daisywheel, real-time clock, 8-level interrupt controller, and the CPU. It is priced at \$1725.

Memory (150 ns static) can be added at \$775 per 64K card, with full extended addressing or bank select switching. Three disk controllers are available, offering storage ranging from 400K mini-floppies to 26 Mbyte Winchester disk.

Compatible drives include 20 cm floppies and mini-Winchesters, and 13 cm micro-Winchesters. The 13

cm drives can be mounted in the main cabinet, while the deluxe system has a 20 cm floppy drive and a 20 Mbyte mini-Winchester mounted in a separate cabinet.

Complete systems (that is, box, memory and disks) are supplied with CP/M 2.2, Microsoft BASIC and WordStar included in the price. Also available at \$495 is Micronix, a multi-user and/or multi-tasking operating system which is compatible at the system call and library level with Unix Version 6. Micronix includes a CP/M emulator, allowing the use of CP/M programs in pipes.

Other software includes an extended version of Whitesmiths C (\$700), C with Pascal preprocessor (\$900) and Micronix with C and Pascal together at only \$995. Also available are CalcStar, DataStar and other CP/M compatible software at competitive prices.

The company welcomes inquiries from OEMs and quantity buyers. Contact Automation Statham, 47 Birch St, Bankstown 2200. Phone (02) 709-4144. □

Vector's Tape Drive

DICKER Data Projects has introduced its first tape storage product, a 15-Megabyte cartridge device for back-up and archival storage service with the company's Winchester disk microcomputer systems.

Designated SafStor TD-15, the new tape drive uses 0.6 cm tape cartridges to back-up and restore data to or from Vector Winchester based systems. Downloading (data transfer from disk to tape) and uploading (data transfer from tape back to disk) as well as a number of other operations are accomplished under program control.

Program control features of the tape drive include provisions to add operators comments to the tape, printout of tape file directory and op-

erator notification Winchester-based systems.

One SafStor command performs high-speed tape backup of all files contained on the Winchester hard disk. Another command lets the operator store only selected files on tape. The Vector SafStor then provides a very convenient method of archival storage.

One cartridge represents nearly three times the storage capacity of a 5-Megabyte hard disk.

The SafStor TD-15 is a quiet and compact desktop unit designed to blend into any office environment. The cabinet measures 21 cm in width, 17.8 cm in height, 35.6 cm in depth, and is finished in Vector Beige to match other systems components.

For information, contact Dicker Data Projects, 78

Captain Cook Drive, Caringbah, NSW 2229. Tel. (02) 525 4707. □

Farmplan Finds Home

FARMLAN, the Australian-owned micro-computer software producers for the agricultural industry, has announced that Orange, in central NSW has been selected as its corporate headquarters.

Chairman of the board of directors, Mr Peter Nivison of "Mirani", Walcha, announced the decision recently and said: "It is quite proper that, as Farmplan is dedicated to rural computer applications, our headquarters should be situated to provide easy access for our clients and for us to retain contact with the needs of the rural sector."

At the same time, Mr Nivison announced the appointment of Mr Mike Calvert as

general manager of the company.

All enquiries to: Farmplan, 64 McNamara St, Orange, NSW 2800. □

Magic Multi-Port

APPLE users will be glad to hear about Multi-Port, a useful add-on designed and built locally by none other than *Your Computer* contributor Bref Ruhl.

Multi-Port is an 'extension lead/adaptor' which links the single internal Apple games I/O port to six external sockets, allowing simultaneous fitting of a variety of devices, such as games paddles and joysticks.

It has it all over the hard-to-find (and expensive) American equivalents, and will appeal to all those users who are forever having to open their computers to change

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from paddles to joysticks to keyboard modifications and back again.

And it's not just the arcade programs — nor the variety of keyboard mods — which use the games I/O port these days.

It's the centre of attention in the latest efforts to prevent software piracy: BPI accounting programs and Lothlorien Farming educational software both use a protection circuit which must be installed in the port for the programs to run (hardware protection is a lot more difficult to duplicate...).

Another recent port user is the remote slide projection control which comes with the Micromodeller financial planning package.

Multi-Port is attractively presented in a black box with six numbered sockets set into

the facia, each with its own LED indicator light. The sockets are activated by setting a rotary switch to the socket number required; for those applications where piggy-backing is required, sockets five and six can be switched-in together.

Not long after ours arrived we had our various joysticks, paddles and keyboard mods plugged in (we do admit to 'testing' the odd game or two, purely for the magazine of course).

The verdict? Terrific. Not only does it work as it should, it also keeps the famed office idiot's fingers out of the Apple — it's a risk having him at it, let alone *in* it.

There is one observation to be made: some software protection circuits jumper two or more pins in the socket and must be removed when using

the other sockets. This is, however, much easier to do with the external Multi-Port than without.

It's a well-made product and should soon be available from most Apple outlets. At \$54.50 it's certainly better value than similar products we've seen.

If you want one, contact your local Apple dealer. If he doesn't have one, you'd better tell him to get in touch with Bref Ruhl, at GPO Box 1498, Sydney 2001. □

New Typing Tutor

TYPING TUTOR 2, a new version of the original Typing Tutor, is now available on diskette for Apple.

Typing tutor's special features make it an invaluable program for individuals who want to improve their typing, and for School instruction. □

The Typing Tutor has a combination of individualised lessons and paragraph drills. Special routines check the speed and provide instant feedback on weak spots and mistakes. This information is incorporated in subsequent lessons automatically.

Users who have typed before can take a test to determine at what point they should enter the system.

Progress of up to 49 students can be monitored through the teacher mode. Three typing tests are provided. These can be changed, and up to five more can be added. Typing Tutor 2 is available for \$27.50 from Seahorse Computers of Camden, NSW.

The TRS-80 version of the original Typing Tutor is still available on cassette for \$17.90. □

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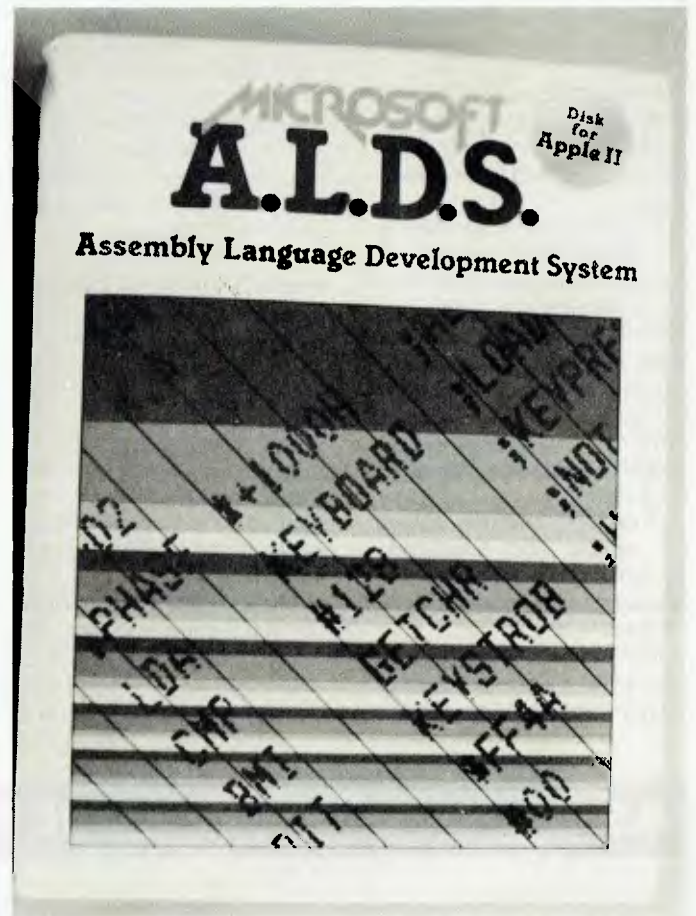
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YC9



Microsoft's versatile Assembly Language Development System for the Apple.

An Easy TASC

THE Applesoft Compiler TASC is Microsoft's latest product for the Apple. TASC compiles BASIC programs into machine code for a speed increase of two to 20 times, depending on the program content.

Seahorse Computers of Camden, near Sydney, can show TASC with an impressive demonstration disk. At \$200, it is a real aid for serious programmers.

Significantly, Seahorse programmer Nick Dunn has altered TASC so it does not clash with the Apple Toolkit. This enables the graphics routines in the Toolkit to be used and then compiled for exciting speed graphics.

Another Microsoft product, A.L.D.S., lets Apple owners program in three different Assembly Languages — Z80,

8080 and 6502 — all on one computer. ALDS contains a powerful macro assembler featuring:

- Relocatability and conditional assembly
- A versatile linking loader allowing ALDS programs to link to others written in any of Microsoft's languages
- A special debugger for 6502 programs
- A cross-reference facility, and
- A utility for transferring CP/M files to Apple DOS

ALDS requires an Apple with a Microsoft Softcard and at least one disk drive.

The Apple version is available from Seahorse for \$157.50, while an 8080/Z80 version for the Tandy Model I is available for \$98.69 with comprehensive manuals. Contact Seahorse on (046) 66 6406. □

Sharp New Sord

MITSUI Computer Systems (Australasia) has announced the latest in the Sord range of personal computers. The M23 Mark III has already recorded sales of 20,000 units since its release in Japan last year, and at the launch, we could see why.

The M23 is modular, with a set of connectors at the back for plug-in ROM and CMOS RAM cartridges, as well as special hardware extensions such as a disk controller. The CPU cabinet contains a Z-80A microprocessor and a thumping 128 Kbytes of RAM, as well as video display circuitry and a keyboard.

The system is normally supplied with dual 13 cm diskettes, providing a total of 646 Kbytes of storage, a Sanyo OEM green screen and one of three printers: 80 char 150 cps dot matrix printer, 180 cps dot matrix or 40 cps correspondence quality daisy wheel printer.

The system can run BASIC, Cobol, FORTRAN, Pascal and assembler. A full range of applications software for small business is available. Also released with the M23 was a software package called PIPS (Personal Information Processing Simplified), which appears to be an integrated spread-sheet calculator, sort utility, database manager and graphics package. Mitsui claims that PIPS makes the programming of ordinary office or business tasks obsolete.

In a demonstration, PIPS certainly did look easy to use. We hope to bring a full review of the system soon.

The M23 has a number of other options, including colour graphics; but the real clincher is the screen and disk drives can be removed and replaced by a small flat 640 character liquid crystal display and a battery pack, providing a highly portable computer, weighing 3.8 kg. The M23 with screen, two

13 cm floppies and 150 cps printer will sell for \$6290 including sales tax, putting it squarely against the Apple III.

For further details, contact Mitsui Computer Systems, 7 West St, North Sydney, NSW 2060. Tel: (02) 929 9921. □

Retail/Wholesale Switch

JOHN F. Rose Computer Services is now a wholesale organization selling only to accredited dealers.

Managing director John Rose told YC that the move follows the establishment of Minimicro Supermart, the new retail division which will continue to operate from the old address, which is: PO Box 745, Crows Nest, NSW 2065. Tel (02) 439 1220. □

Little Big Board

MELBOURNE manufacturer Pulsar Electronics has released a single board computer which offers what must be the most computing power to the square inch currently available.

Called the Little Big Board, the 114 x 204 mm card contains a Z-80A microprocessor with 64 Kbytes of dynamic RAM, a floppy disk controller (takes 20 cm and 13 cm disks), two RS-232C ports and a battery backed-up real-time clock/calendar.

The card is expandable through an STD bus edge connector, which allows it to work with a wide range of cards from such manufacturers as Mostek and Pro-Log. The STD bus allows off-board DMA, up to 56K extra RAM, and multi-processor operation.

The card draws approximately 0.7 A at 5 V, and a few mA at +/- 12 V, making it feasible to build it into a terminal running off the terminal's power supply.

The card costs \$750, with a CP/M BIOS and additional software available for \$150. Pulsar Electronics is located at 323 Bell St, Pascoe Vale, Melbourne 3044. Tel: (03) 354 2125. □

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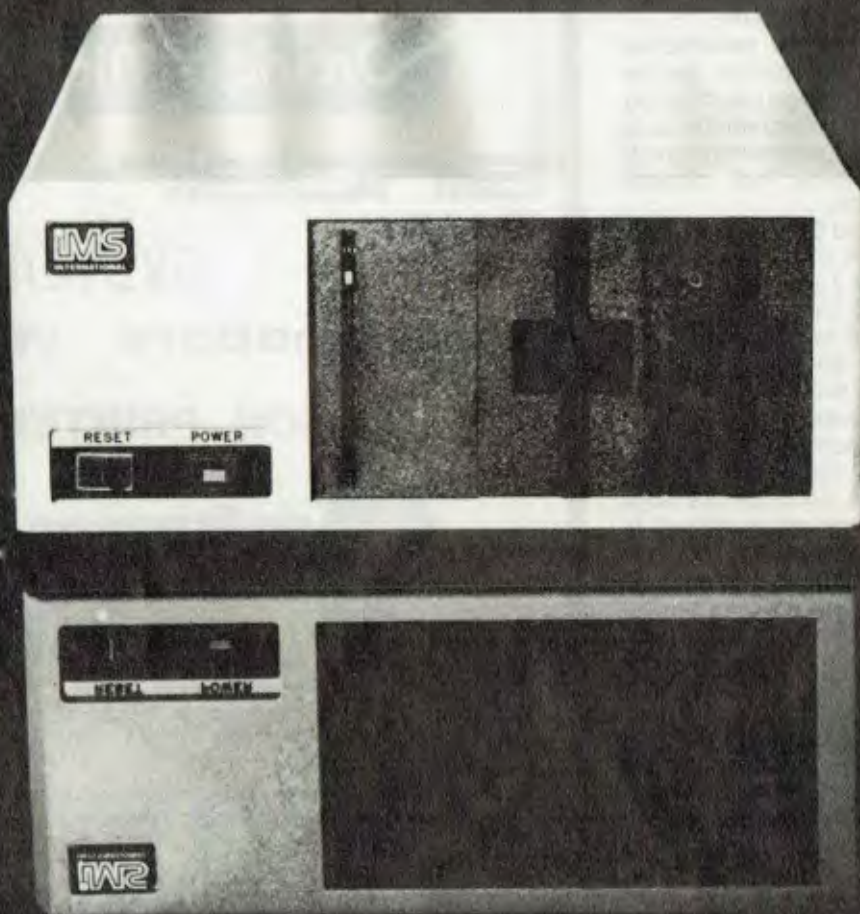
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The 5000 SX comes standard with lots of extras, starting with a fully terminated S100 mother board. Add to that 64K dynamic RAM modules, with parity, of course, and receptacles for your CRT and Printer that turn on with the main power switch.

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Languages: BASIC, FORTRAN, COBOL

Application Packages: FMS 80, WORDSTAR, Accounting Plus, all tailored to operate on the 5000 SX.

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There isn't room on this page to even scratch the surface of the IMS International story.

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Seminars for Business

MOEBIUS Computers, of Roseville on Sydney's North Shore, is conducting a regular series of seminars for prospective business users of the Apple II microcomputer.

The seminars, which are on the first Monday of every month, are held at Roseville RSL club, and cost \$10 per head. Additional seminars are held for people wishing to gain 'hands-on' experience before purchasing.

For further details contact John Hall on (02) 46-6521 ☐

Computer Prankster

AMERICAN amateur radio operator Kevin Mitnick has

found an inquisitive mind can get you into a heap of trouble.

Kevin's 'hobby' is accessing industrial computers; his exploits were the subject of a feature story in the Los Angeles Times.

Before the FBI and the courts moved in, Mitnick was able to access a computer belonging to US Leasing in San Francisco (necessitating nearly a quarter of a million dollars' worth of software repair), use computers at UCLA and USC, obtain sensitive material from Digital Equipment's main computer in Massachusetts and gain use of business computer systems all over the United States.

Getting the access codes and computer passwords got

to be a science and an obsession with Mitnick. Some codes were obtained by simply going through a firm's rubbish to find old printouts — and, hopefully, confidential access information printed right on it!

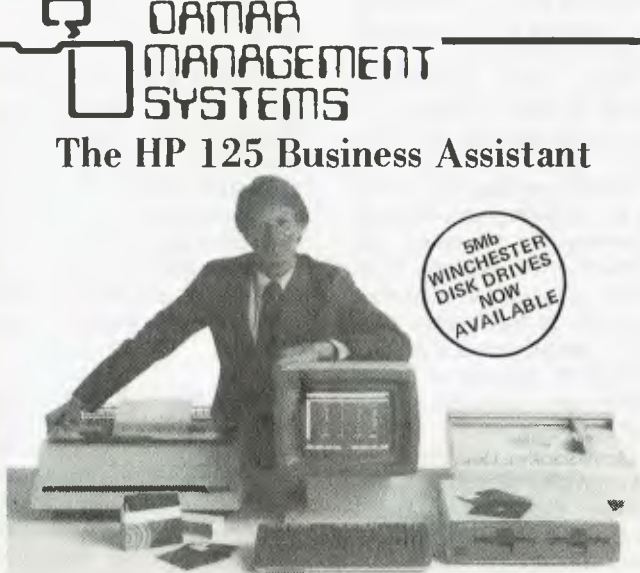
Some codes were obtained by simple trial and error. Posing as an official, Mitnick was able to get connection information to access computerized criminal intelligence information available to law-enforcement agencies.

He received the US Leasing code by telling the firm on the phone he was a computer repairman! Once Mitnick was found by authorities to have a Pacific Telephone employee badge in his possession,

while the newspaper article said phone company manuals he obtained could have enabled Mitnick and his friends to shut down much of the phone service in Los Angeles! He even painstakingly compiled a manual that listed the connection procedures to industrial computers all over the country — including airline and reservation systems!

Kevin is out of the computer accessing business now, having been shut down by the courts and the FBI. Why did he do it? Just for kicks, the same thing that motivates many teenagers.

He was only 17 years old when all of this occurred. ☐



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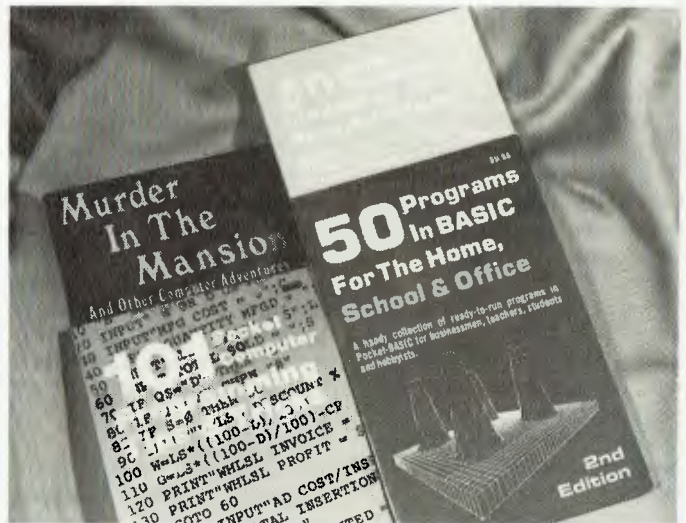
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Tearless Programming

THE educational aspect of modern computer technology has long been ignored. Too often the closed world of hardware, software and interface has presented such a daunting face to the small businessman or student that they have not recognised the full potential of the computer to their applications.

Many small businesses could do with the help of a pocket computer to help them save time and overcome problems, yet they are put off by the daunting task of programming. To overcome this problem, Powerchip Software, Australia's foremost importer of top quality software, has announced the first release of a series of books which have taken the United States by storm.

Specifically designed for the novice computer programmer, these books provide an inexpensive opportunity to learn about programming.

Aimed at use with the Tandy TRS-80 and the Sharp PC 1211, probably the two best pocket computers available in Australia, these books provide an easy to follow, step-by-step guide to programming using BASIC language, the easiest computer language to follow.

The books cover both business and entertainment applications for either the small

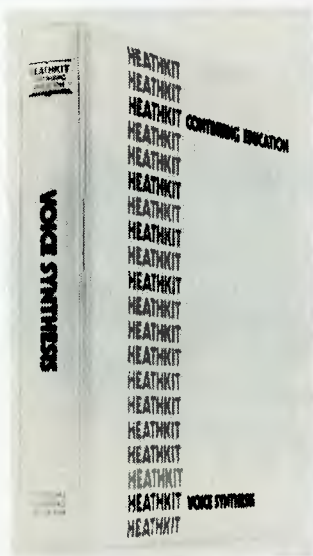
businessman or student. Although they are specifically intended for use with the Sharp and Tandy models, with only minor changes to the programs they can be modified to operate on other, larger computers, thereby increasing their versatility.

Some of the business programs provided include Profit Estimator, Invoice Totalling and Wages and Over-time. All are ideal for the small merchant who can see his business growing but as yet cannot justify the use of a large computer.

Each program sets out the steps to follow and gives a sample run so you can see what form the final program will take.

There are 12 books in the current series. They can be bought either individually or as a package. Individual books retail at \$9.95. Titles in the series include *101 Tips and Hints*, which gives an outline of some of the shortcuts, *Programming for the Home School and Office*, which covers many useful areas and *Murder in the Mansion*, a new game which will have the entire family involved.

For further details, Powerchip Software may be contacted at PO Box 32, South Caulfield, Victoria 3162, or on (03) 529 2884.



Voice Synthesis Course

Are you on speaking terms with your computer? Warburton Franki has announced the release of a new Heathkit/Zenith Voice Synthesis Course, EE-3403, which teaches you this state-of-the-art technique in an easy-to-follow format with hands-on experiments.

The five-unit Heathkit/Zenith course consists of a 250-page text filled with experiments in voice synthesis, chip sets and other electronic components necessary to perform these experiments. It teaches digitized voice synthesis (fixed vocabulary with human voice qualities), and phoneme voice synthesis, which allows the user to reproduce any English word.

The Voice Synthesis Course includes complete chip sets for both digitized and phoneme voice synthesis:

- the digitized chip set contains both a ROM chip and a processor/synthesizer chip featuring a more than 200 word vocabulary;
- the phoneme set is all on one chip.

The five units of the course cover voice production and voice patterns; digitized speech, including linear and logarithmic coding, delta modulation and variable

slope delta modulation; speech synthesis by linear predictive coding; the phoneme speech synthesizer (PSS), and advanced programming of the phoneme speech synthesizer.

The course teaches the basic software and hardware necessary for breadboarding computer synthesized speech and the programming and interfacing needed for both digitized and phoneme voice synthesis. It prepares the individual to write machine code programs tailored for the ET-3400 and ET-3400A trainers.

Upon completion, students will be able to make their ET-3400 Microprocessor Trainer (required to complete the course; not included) talk.

For more information on the EE-3403 Voice Synthesis course, as well as many other electronics and computer-related courses, write to the Warburton Franki office in your state's capital. □

Personal Computer

3M AUSTRALIA, the country's largest computer media supplier, will offer its own brand of personal computers in a move into the computer hardware market.

The range of five mini/micro computers, priced from \$1000-1500 to about \$6000, will be sold from a large number of retail outlets, nationally.

Four computers will be made for 3M in a private label deal with a Japanese company which has sold thousands of personal computers in the European and US markets, said national sales and marketing manager of 3M's Data Recording Products Division, Mr John Threlfall.

Mr Threlfall said the 3M computers had been designed for small business use, unlike many personal computers designed for the hobbyist but used in business.

Such hobbyist-derived computers generally do not have parts quality, reliability

and expandability needed in business, said Mr Threlfall. The 3M range would be "genuinely professional machines", each with an in-built 13 cm disk drive. The base model would have a 32K RAM CPU/keyboard. The other models, with two in-built 13cm disk drives, would have 60K RAM CPU/keyboards.

He said agreement was near with another manufacturer to supply the cheapest computer in the range — a small but powerful model for the hobbyist.

Mr Threlfall said the introduction of personal computers was a development of a product range which includes the Trendcom 3M printers, the Datasouth printer, the HCD75 data cartridge system and the family of 3M 20 cm compact disk drives.

He predicted computer hardware would become very important for 3M in the next five years and forecast wider use in the industry of 12.5 cm and 20 cm fixed disks.

3M Australia was in an ideal position to capitalise on such growth, as virtually the only company in Australia with manufacturer's backing for products, Mr Threlfall added. □

Smallest Single-Board

DIGITAL Equipment has introduced the computer industry's smallest 16-bit wordlength single-board computer (SBC) in Australia and New Zealand.

The compact size of Falcon SBC-11/21 makes it ideally suited for build-in applications by original equipment manufacturers (OEMs) where space is at a premium. The new low-end member of Digital's microcomputer family is priced at just under \$600 in Australia in quantities of 100 and just under \$800 in New Zealand.

According to Werner Faets, microcomputer business manager for the South Pacific region, the Falcon SBC-11/21 provides design-

ers with the power and flexibility of 16-bit wordlength single-board computers.

"We are targeting the new board toward the market space traditionally held by 9-bit boards. Falcon brings full 16-bit computer power to application areas where cost and size — what we call form factor — previously made it impractical to use the longer wordlength microcomputers."

The new Falcon SBC-11/21 is aimed at dedicated ROM-based applications in such areas as laboratory instrumentation, manufacturing monitoring and control, process control, robotics and medical devices. Dimensions are 13.2 by 22.8 cm, enabling integration into instruments and control machinery where space is critical. The Falcon SBC-11/21 interfaces to the LSI-11 microcomputer bus and is the low-end member of Digital's microcomputer family.

The heart of the new single-board micro is the T-11 chip, designed and manufactured by Digital's Semiconductor Engineering Group in Hudson, Massachusetts, USA. The T-11 employs the latest MOS/LSI (metal oxide silicon/large scale integration) semiconductor technology.

The chip contains the equivalent of 13,000 transistors on a silicon area about four one-hundredths of a square inch in area. It is instruction-set compatible with Digital's popular minicomputer, the PDP-11.

The basic Falcon is supplied with 4 Kbytes of RAM. The minimum configuration has 4 Kbytes of RAM, provisions for up to 32 Kbytes of erasable programmable ROM, two serial and a 24-line parallel input/output ports, real-time clock and interface to the LSI-11 bus.

For further information, contact Digital Equipment Australia, Chatswood Plaza, Railway Street, Chatswood, NSW 2067. Tel (02) 412 5232. □

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PET 4016

FEATURES

The PET 4016 offers an IEEE parallel port and an IEEE-488 bus for disk and printer communications. Also included is an eight bit parallel user port with "handshake" lines. The PET supports two Commodore C2N cassette ports for external cassette input and output. Each PET 4016 includes 18K of ROM containing BASIC and a machine-language monitor. The BASIC interpreter is activated when you turn on your PET 4016 - no loading is necessary.

12" SCREEN

40 characters wide by 25 lines long.
128 ASCII plus 128 graphic characters
8x8 dot matrix characters
Green phosphor screen.
Brightness control.

KEYBOARDS

74-key professional keyboard.
Separate calculator/numeric pad.
Upper-case alphabetic characters.
Shift key gives 64 graphic characters.

MEMORY

PET 4016: 16K (15359 net) random access memory (RAM).

POWER REQUIREMENTS

Volts: 240v
Cycles: 50HZ
Watts: 100

SCREEN EDITING CAPABILITIES

Full cursor control (up, down, left, right).
Character insert and delete
Reverse character field
Overstriking
Return key sends entire line to CPU regardless of position

INPUT/OUTPUT

Parallel port
IEEE-488 bus
2 cassette ports
Memory and I/O expansion connectors

FIRMWARE

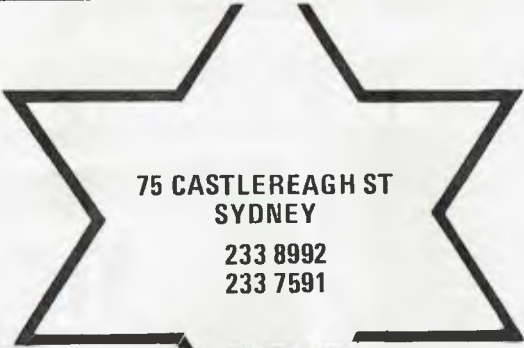
18K of ROM contains:
BASIC (version 4.0) with 9-digit floating binary arithmetic
Tape and disk file handling
Machine language monitor

PHYSICAL SIZE

Height: 14"
Width: 16.5"
Depth: 18.5"
Shipping Weight: 46lbs

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Is a printer that must be seen to be believed. It features unmatched correspondence quality printing, and an ultra-high resolution bit image graphics capability.

Then the ability to print up to 233 columns of information on 15" wide paper to give you the most incredible spread sheets you're ever likely to see.

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NEW



The Apple III is a powerful desktop computer that will solve complex problems and increase personal productivity. If you are a manager, engineer, financial analyst, accountant, or other professional - and you're looking for an affordable answer to your computer needs - you owe it to yourself to view this machine. Price on application.

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YC9



THE MODEL BUSINESS

Plans are nothing; planning is everything
 — Dwight D Eisenhower

EVERY business requires a budgeting system to keep track of company financing and growth.

In some small companies the budget can be maintained in the owner's head; in larger companies an accountant may produce huge paper charts projecting cash flows and investments; in the largest companies the data processing department may provide a financial planning program for use by senior management.

The advent of the microcomputer has changed all that. There's now a new way available to, and beneficial for, all three.

Financial planning using a commercial software package — selling for as little as \$200 — is at one time both a simple yet extraordinarily powerful solution to this universal problem.

In this article we examine several of the most popular financial planning and modelling packages available on microcomputers, from several viewpoints - ease of use, range of applicable problems, convenience of output, versatility, and so on.

The packages under consideration are: Visicalc, the progenitor of the ubiquitous 'fi-

The low cost of microcomputers and the availability of easy-to-use software makes it possible for every businessman to use a personal computer as a decision-making tool. One of the first areas where this is happening is in financial planning and modelling. YOUR COMPUTER investigates...

nancial spreadsheet' programs; Supercalc, a similar program available for a larger number of machines; CalcStar, another spreadsheet program with advanced capabilities; Planfin and Profin, two new planning packages for budgeting and capital project planning respectively; Desktop/plan II, another Apple modelling program; MicroModeller, a planning and analysis package which features graphic display; Panaplan, an advanced package for the Panasonic range of computers; and Target Planner, a sophisticated planner which falls

between the 'spreadsheet' and 'structured' camps.

The objective is not a point-by-point comparison; rather it is to provide some basic information as to which package will best suit particular uses and users.

Basic Principles

The packages described here are intended as 'decision support' tools for executives.

While none could ever claim to provide answers out of a hat, they give the manager the ability to manipulate many more variables and more complex relationships, while freeing the creative side of the mind to build and examine the model.

Perhaps most significantly, their ability to carry out all the repetitive re-calculation and leg-work promotes an inquisitive approach to the budgeting task.

The fact you can ask 'what-if' questions — and get an immediate answer — encourages you to do exactly that; even if you don't find a better alternative you'll gain a better understanding of the figures and the impact of the variables.

	A	B	C	D
1: Acme Widget Co: 5-year Forecast				
2: Quarter	1	2	3	
3:				
4: Product A: Widget				
5: Sell price	19.95	19.95	19.95	
6: Volume	20000	21000	22000	
7: Revenue	399000.00	418950.00	439800.00	
8:				
9: Var cost	6.75	7.09	7.44	
10: Fixed cost	20000.00	20000.00	20000.00	
11: Cost of goods sold	155000.00	168837.50	184093.34	
12:				
13: Profit contribution	244000.00	250112.50	255806.66	
14:				
15: Product B: De-luxe				
16: Sell price	24.95	24.95	24.95	
17: Volume	1500	1575	1654	
18: Revenue	37425.00	39296.25	41261.06	
19:				
20: Var cost	9.47	9.94	10.44	
Source location C6, Adjust B6?				
(A= Adjust.), A(s)k for Adjust., V(alue)s				
D2:1.05*#6				

Preparing the Acme Widget Co's budget
(see story below).

Visicalc Version 3.1

Visicalc is the original spreadsheet calculator program. More recent planning software draws much of its format and style from this trend-setting success story.

It is available for the Apple II and III, Tandy TRS-80, Commodore CBM, Atari 800, Hewlett-Packard HP-85 and HP-125 computers, and possibly others as well. Our Acme Widget Company example illustrates how a Visicalc model could be set up.

Visicalc's spreadsheet is always visible on the screen. The four keyboard control arrows (two with an Apple II) move the cursor anywhere on the screen; when it reaches the edge, the worksheet 'moves', figuratively speaking, to keep the cursor in sight. A simple command will move the cursor anywhere in one jump.

With the cursor positioned over an empty cell, the user is ready to make an entry. This can be text, entered simply by typing it, or a number or formula, which is generally signalled by an initial plus sign or number. Text can happily appear in the middle of a row (or column) of numbers — it has a numeric value of zero.

As an entry is made it appears on an edit line at the top of the screen, so that errors can be corrected. Once the entry is complete and correct, it is transferred into the worksheet (by hitting the return key or one of the cursor control keys) and the cursor moves on to the next entry.

Also at the top of the screen is a line showing the current coordinates of the cursor, the format of the entry (on which more later), the entry type (value, label or repeating label — such as a line) and the

Budgeting For The Acme Widget Company...

A simple example of how a financial planning package is used as an 'electronic spreadsheet' might look like this:

ALBERT SMITH, marketing manager of the Acme Widget Company, has to prepare a forecast, showing quarterly figures for the coming five years. This year, for the first time, he plans to use his personal computer to prepare the forecast.

His manual calculation method is to estimate sales volumes for the company's two products and multiply this by their respective prices, giving the revenue for each product. He then calculates the cost of the goods sold, based upon two elements; the fixed cost and the variable cost per unit (we did say this would be a simple example).

Subtracting costs from revenue gives each product's profit contribution. Adding these gives the company's net income before tax. Next, he calculates depreciation on capital equipment, as well as investment allowance, and subtracts these from NIBT to give the taxable income. He calculates the tax at 46 percent of taxable income and subtracts this from the NIBT to give profit after tax.

This tedious calculation is repeated for each quarter — a waste of Albert's time. Worst of all, supposing Albert wants to investigate the effects of a price cut he has to repeat all the calculations again, from the point at which the change is introduced.

For this reason, budgets have never been regarded as exploratory tools.

Enter the Personal Computer

This year, Albert has a personal computer on his desk. With the aid of his financial spreadsheet program, the report will be done in a few hours.

Instead of the analysis sheets Albert would normally use, the program turns the computer's display into a window on a gigantic electronic analysis sheet. It has rows running across the sheet and columns running down. Columns are lettered from A to Z and then from AA to BK, while rows are numbered 1 to 254.

Numbers can be entered anywhere on the sheet and, most importantly, so can formulae — whenever a formula is entered, it is immediately calculated out and the result displayed. The formula itself is always stored, however, ready for recalculation if the figures it relates to change.

At the left of the screen, column A will be used to label the various rows (Price, volume, Revenue, and so on). Columns B onwards will be used to contain the figures for each quarter of the five-year plan, while the top few rows will be used for ancillary information, added later.

Moving down column A from location A4, Albert enters his labels:

Product A: Widget
Sell price
Volume
Revenue

Var cost
Fixed cost
Cost of goods sold

Profit contribution

With the labels in place, Albert starts entering data.

Moving to location B5 (opposite 'Sell price'), he enters the figure: 19.95. In the location below (B6) he enters the volume: 20,000. B7 will contain the first quarter's forecast revenue; here he enters B5*B6

— the computer automatically multiplies together his price (B5) and his volume estimate (B6) and displays the result at B7.

It also stores the relationship B7 = B5*B6, so whenever B5 or B6 is changed, B7 will automatically be recalculated and displayed.

Moving down to the costs section, Albert enters the variable cost per unit at B9 (6.75), and the fixed cost at B10 (20,000). The total cost is variable cost times volume, plus fixed cost, so Albert keys this in as B9*B6+B10. The answer automatically appears.

Finally, the profit contribution (B13) equals revenue (B7) minus cost of goods (B11), so Albert keys in B7-B11.

That completes the calculation for product A for the first quarter; this must be repeated for the next 19 quarters. The first thing to do is to number the quarters across the top of the sheet. Moving to B2, Albert keys in the first quarter number, 1. Moving on to C2, he defines the next quarter number in terms of the previous one: B2 + 1. The number 2 appears, correctly.

Albert's next command illustrates the tremendous power of the spreadsheet calculator. Using the **replicate** command, he copies that formula from C2 right across the sheet as far as U2, indicating that the formula is to be relative rather than an exact copy. Thus D2 equals C2+1, E2 equals D2+1 and so on.

This produces the digits 1 2 3 . . . 19 20 across the top of the sheet — a simple example which gives some insight to the potential power of the replicate command.

At this stage Albert intends to keep the price constant, but forecasts that volume will increase by five percent per quarter. By using the same replicate command on row 5, he makes C5 equal B5, D5 equal

contents of the entry under the cursor.

It is important to distinguish between the contents of an entry and the displayed form of that entry on the worksheet/screen. An entry will often contain a formula, for example, but the display will show the result of the calculation. The entry contents line, on the other hand, will show the formula explicitly.

Below the entry contents line is the prompt line. As commands are entered into Visicalc, the prompt line will change to display the possible next commands. Each Visicalc command begins with a slash (/); as the slash is entered the prompt line changes to show the choice of letters which the program will then accept. Once one of these is chosen, the line changes to prompt for more information, guiding the user.

Each location on the spreadsheet, or a row or column, can be formatted to display information in a particular way. An entry can

be formatted for display as an integer, in dollar-and-cents format, left or right justified, global format (same as rest of sheet), default (usual format for that entry type) or for graphical display.

Visicalc has a rich set of commands. Briefly, these are:

/b Blanks an entry, without affecting its format

/c Clears the entire worksheet, ready for a fresh start

/d Deletes either the row or column on which the cursor lies

/e Enters *edit mode*. This copies the contents of a location to the edit line, where it can be altered before being returned to the current location.

/f Sets the format of an entry, as described above.

/g Global commands, allowing the user to set the column width, global default format, order of calculation (row/column first), and automatic or manual recalculation when an entry is changed.

/i Inserts a row or column.

/m Moves a row or column from one position to another.

/p Prints a report (to printer or disk). The report may be a subset of the complete sheet, and various flexible options are provided for setting up the printer.

/r Replicate: allows entries to be copied. Replication allows a range of entries to be copied. It will ask whether copied formulae should always refer to the same absolute locations or whether the source is relative to the destination (for example, always the preceding column).

/s Storage commands, allowing the saving and loading of files.

/t Allows the setting up of title areas at the top and/or left of the screen. No matter how far the screen is scrolled, these will stay on the screen, so titles are always visible above or to the left of the appropriate entries.

/v Returns the Visicalc version number.

/w This command allows the screen to be split into two windows, either horizontally or vertically. This allows entries which are widely separated on the worksheet to be brought together for comparison.

/- Repeating labels are often used to draw lines (----- or =====) on the screen to break up reports.

Obviously, the user has considerable control over the worksheet. The replicate command, in particular, is exceptionally powerful, allowing huge expanses of blank worksheet to be filled in in a few seconds.

The formulae which can be entered into any location can use any of the arithmetic operators (+, -, *, /) as well as the exponentiation operator. Expressions can include constants or can refer to the previously-calculated contents of another cell. As well as these operators, Visicalc includes a comprehensive selection of functions.

A function name is preceded by an @ sign during formula entry. Some of the functions operate on a collection of values known as a *list*. A list consists of a series of entries and ranges of adjacent entries, such as B2..B5 (the second to fifth entries in column B). This facility is particularly useful when entering additional rows, as they will often be automatically included into a function list.

The functions include many of the standard calculator functions, such as SIN, COS, TAN and their inverses, plus PI, ABS and INT. Other are uniquely designed for spreadsheet calculators, and include:

SUM Calculates the sum of the values in a list.

MIN Calculates the minimum value in a list (also MAX).

COUNT Counts the number of non-blank entries in a list.

C5, and so on, copying the price into each column.

Volume is just as easy: C6 should be five percent greater than B6, so at C6 he enters $1.05*B6$. Then he uses the replicate command to copy the formula across the next 18 columns, again indicating relativity, so that each entry is 1.05 times the preceding one.

All the figures appear in the right places. Copying the revenue calculation is easy, too; the replicate command copies the formula across the columns, so each cell contains the product of the two cells immediately above it.

By repeating the replication commands, Albert copies the cost calculations, too — all the figures are now filled in for Product A.

Here's where the program's power really starts to show. By using the replicate command three more times, he can copy the complete set of calculations for product A into a separate area of the worksheet. Then, simply by changing the initial variables, the complete calculation is repeated for product B in less than two minutes!

The final deductions and tax calculations are a simple exercise.

With all the relationships between the rows (variables) and columns (quarters) defined, Albert can then change any of his initial assumptions and the sheet will be recalculated showing the effects.

For example, a price rise might be due on both products two years in the future. Albert can simply key in the new prices in the appropriate column. Because of the way this model is constructed, the new values will be carried into the following quarters.

The construction of this aggregate col-

lection of formulae, relationships and data (which we call a model) frees Albert to think creatively about the relationships.

For example, is assuming a flat five percent growth per quarter over-simplistic? With previous manual methods of calculation, this was a pointless question — Albert had little chance of correctly calculating a whole row of exponential growth figures anyway.

With the spreadsheet calculator, however, the formula need only be keyed in once, then replicated. It can be tested against historical data to prove its validity, and accepted or rejected.

This is the essential quality of the spreadsheet calculator — its capacity to let the user play with the model and fine-tune it. The user does the creative thinking while the machine does the repetitive dog-work. Even for first-time users a model can be set up more quickly than manual calculation. For example, it took longer to write the above account than to do it!

Not all of the financial planning packages operate in this way. The 'spreadsheet' approach requires that the executive develop his own model. That's not always necessary, and it requires a time investment to master the commands of the package.

PLANFIN, for example, interacts with the user through a question-and-answer session, based on a pre-destined internal model. Thus the user need not know any special commands to operate the system, nor need he spend time setting up the model.

Every package has its pros and cons, which is why we have examined each separately, pointing out the benefits, and where they exist, any drawbacks (though anything has to be better than manual calculation!) □

Supercalc Commands

B(link)----->Removes contents of cells.
C(opy)----->Copies contents of cells.
D(elete)----->Deletes entire row or column.
E(dit)----->Allows editing the contents of a cell.
F(ormat)----->Change display format of cells, rows, or entire worksheet.
G(lobal)----->Change global display or calculation options.
I(nsert)----->Create new row or column.
L(oad)----->Read worksheet (or portion) from disk.
M(ove)----->Swap rows or columns.
O(utput)----->Display contents or values of cells on printer, console or disk.
P(rotect)----->Prevent future alteration of cells.
Q(uit)----->Exit SuprCalc.
R(eplicate)----->Reproduce partial rows or columns.
S(ave)----->Write worksheet to disk.
T(itle)----->Lock first rows or columns against scrolling.
U(nprotect)----->Allow alteration of protected cells.
N(indow)----->Split or unsplit the screen display.
Z(ap)----->Clear worksheet and all settings.

AVERAGE Calculates the average of the non-blank entries in a list.

LOOKUP Picks the entry from a list which corresponds to a particular value. This function allows the creator of a model to create lookup tables for, say, volume discounts.

NA Gives a 'Not Available' display for this location and all locations which depend upon it in their calculations.

ERROR Gives an 'Error' display in this and all dependent locations.

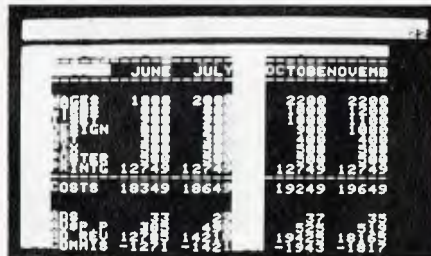
Visicalc 3.1 also provides a set of functions for dealing with Boolean (that is, true/false) conditions. These include AND, OR, NOT, IF, ISNA and ISERROR as well as the usual comparison operators.

The full flavour and power of Visicalc is almost impossible to describe to someone who has never used it. The program has a logical consistency and elegance which makes it easy to use. Once you've used it, you can see why it has taken the personal computing world by storm.

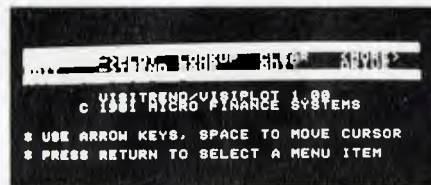
A major factor in the success of Visicalc is its documentation. The user's manual is designed as a course, with four lessons which guide the user through all the program's features.

The earlier Visicalc manuals suffered from badly thought-out typographics, making it easy to lose your place in a tutorial; at that stage the machine often wouldn't do what you expected. The latest manuals are much improved and very much thicker.

An important benefit of the Visicalc manual (for the Apple II, at least) is it also gives information on setting up the computer, care of floppy disks and so on. This means the owner who is purely interested in running Visicalc can virtually forget the computer manuals!



Visicalc's split screen brings opposite ends of the model together. Putting your figures into graph form — Visitrend/Visiplot is a comprehensive analysis/plotting package.



Onward and Upward

Although Visicalc will produce a beautifully-formatted report (amaze your bank manager!), it still basically consists of a dense table of figures. As we all know, humans are best at pattern recognition, so figures always have more impact if they're converted into charts or graphs.

Visicalc distributor Personal Software, never one to ignore another market, has the answer. VisiPlot will convert planning data into full-colour charts and graphs on the screen of an Apple personal computer. The package will produce line graphs, bar charts of several varieties and the ever-popular pie charts, even with a slice cut out.

For many managers, Visiplot charts could make the difference in a presentation to the board or senior management. Nothing, but nothing, succeeds like a line moving from bottom left to top right!

Included in the package is VisiTrend, a statistical analysis program which can

perform various kinds of regression analyses, curve-fitting and so on.

Supercalc

Supercalc, by Sorcim, is a spreadsheet calculator very similar to Visicalc, but intended to operate on computers using the CP/M operating system — machines like the Xerox 820, Wang, DEC VT-18X, as well as the many S-100 'boxes' with external terminals.

Installation of Supercalc basically consists of choosing the terminal type from a menu, providing some information on the printer width and so on. The INSTALL program then patches Supercalc in the appropriate places and it is ready to run.

Supercalc is philosophically similar to Visicalc. Because it is intended for 80 column by 24 row terminals it is able to display more information at one time. The status information is at the bottom of the screen, but otherwise the display is similar to Visicalc's.

Many of Supercalc's commands are different in detailed operation from Visicalc's. For example, the replicate command is rather more powerful, and where many of Visicalc's commands only operate on the location under the cursor, Supercalc commands will operate on any cell (including the cursor cell).

Perhaps Supercalc's most obvious feature, particularly if you read Sorcim's advertisements, is the '?' key, or help feature. If at any stage the user needs assistance, this will provide a capsule summary of possible actions and definitions.

For example, after pressing '/' to initiate a command, pressing '?' will produce a listing of commands with explanatory notes. After a command is selected, pressing '?' again will produce more detailed information on that particular command.

This help feature means that, once the basic tutorial material has been covered, the Supercalc manual can be relegated to the bookshelf, except in rare cases.

The primary differences between Visicalc and Supercalc are differences of detail. The worksheet is organised in exactly the same way and commands are entered with a '/' prefix. However, when the first letter of the command is entered, Supercalc will complete the word on the entry line as confirmation.

Supercalc does not have as rich a set of functions as Visicalc — in particular, it is lacking the CHOOSE function.

On the other hand, Supercalc's implementation of formatting and editing commands is rather 'nicer' than Visicalc's. For example, Supercalc allows the width of an individual column to be altered, which is not possible with Visicalc.

Another useful feature is the ability to 'protect' rows, columns, blocks or individual entries, making it impossible to over-write them. Such protected entries are displayed at half brightness or some

other highlighting method, depending on the terminal used.

The concept of a 'block' is new with Supercalc. A block is a rectangular area of cells, specified by the coordinates of its top-left and bottom-right corners. Blocks can be copied, loaded, protected and otherwise manipulated.

Supercalc distinguishes between numbers, formulae and text at entry time by a simple method: text begins with a " symbol. Text can be up to 110 characters in length; it will be 'hidden' behind an adjacent cell if the cell is occupied, otherwise it will be displayed.

Formatting is slightly more refined than with Visicalc; numbers may be left or right justified, as may text, and column width may be 0 to 126. Formatting may apply to an individual entry (highest level of priority), rows, columns or globally (lowest level of precedence).

The Supercalc manual uses a tutorial approach, with 12 lessons. The latter section of the book is devoted to reference material. A reference card is also provided.

Interestingly, three sample worksheets are supplied on the disk and one of these, which calculates the performance of an air curtain at the door of a freezer, illustrates the potential non-financial applications of what most people would see as an exclusively financial package.

Target Planner

Target, from Advanced Management Strategies, is based on a spreadsheet, although it takes a slightly different approach to the entry of data and formulae. It 'feels' rather more like a language than a spreadsheet calculator.

Target, which is able to run on virtually any machine which uses the CP/M operating system, operates in five different modes.

On power-up it asks the user a few questions about the format of his model, then displays a menu of possible activities.

At this stage the user can create a model, get a disk directory, erase, load or store a model, continue working on the current model, change the initial parameters, or exit. Target frequently returns to this main menu.

When you choose to create a model, Target goes into entry mode and blanks the screen. The model can now be entered, line by line. Target uses three kinds of commands for creating models: LINE commands, COLUMN commands and HEADING commands.

A line command always begins with the word 'LINE', followed by the line number. This is then followed by the line name. After the name, Target will usually expect an equals sign, followed by a sequence of data values or a formula.

The use of line numbers allows extra lines to be inserted anywhere, after the fashion of BASIC line numbering. In addition Target includes a simple (but effective) editor which can be used to change lines.

After entering the model, the user will probably return to the main menu to save the model, then CONTINUE. To obtain the results of the model, the user types RUN, and Target will begin calculating the model. The results will appear on the screen, formatted in columns. The display can be moved up and down using the 'U' and 'D' keys to examine a large model.

An attractive feature is the use of the ESC key to switch the display back and forth between the model (DISPLAY mode) and the results (RUN mode).

If the number of rows or columns exceeds the capabilities of the screen, the cursor control arrow keys can be used to move the display around for examination.

Where the Visicalc-style calculators refer to entries by their coordinates, Target generally refers to an entire line at once. For example:

```
?LINE 7 MNTHLY'PROD= 90 90 100 80
?LINE 8 LABOR'COST= LINE 7 * 4.00
```

Target also uses relative column referencing. An example, based on an accounts receivable collection schedule:

```
?LINE 1 MNTLY'SALES= 100 200 400 300
?LINE 2 CASH'SALES= .10 *
MNTLY'SALES
?LINE 3 RCPTS'30DAY= .70 *
MNTLY'SALES[-1 COLUMN]
?LINE 4 RCPTS'60DAY= .15 *
MNTLY'SALES[-2 COLUMN]
?LINE 5 RCPTS'90DAY= .05 *
```

```
MNTLY'SALES[-3 COLUMN]
?LINE 6 MNTLY'RCPTS= SUM OF
LINES 2 THRU 5
```

If you ran this model the resultant print-out would look like this:

```
LINE 1 MNTLY SALES 100 200 400 300
LINE 2 CASH SALES 10 20 40 30
LINE 3 RCPTS 30DAY 0 70 140 280
LINE 4 RCPTS 60DAY 0 0 15 30
LINE 5 RCPTS 90DAY 0 0 0 5
LINE 6 MNTLY RCPTS 10 90 195 345
```

Target's print menu offers considerable flexibility in output formatting.

A subsection of a report can be isolated for printing; the number of columns, lines per page and printer width can be specified; and the user may print to a disk file for subsequent editing if required.

The model itself can contain a number of formatting commands, including PRINTDATE, UNDERLINE/OVERLINE and SKIP. These allow the detailed format of a report to be predefined.

As well as the results, the model itself may also be printed for analysis and refinement away from the machine.

Target is a large system comprising multiple program files and overlays; so it is apt to become disk-bound at times, and the user can find himself twiddling his thumbs while waiting for the disk drives to stop whirring.

We also gained the impression from the way Target's prompts operate that it is written in some dialect of BASIC. It always requires the user to press 'RETURN' and can be rather pedantic about matching responses at times.

For example, on quitting the system, it asks for a confirmatory YES/NO response. It will not accept 'Y', 'y' or yes — just YES. If you're used to more forgiving

```

TARGET MODEL NAME: BUSYTALC  #= 882  C= 6  H= 1  D= 2  MODE:  DISP
BUSYTALC
A DIVISION OF IMPERSONAL PRODUCTS
PROJECT ANALYSIS
-----

```

	YEAR '1	YEAR '2	YEAR '3	YEAR '4	YEAR '5
20.0 INVEST	9000.00	0.00	0.00	0.00	0.00
21.0 TOT'INVEST	9000.00	9000.00	9000.00	9000.00	9000.00
22.0 INT'FACTOR	1.00	0.85	0.72	0.61	0.52
23.0 IND'PV	3798.09	4570.84	6062.02	7533.47	10224.20
24.0 TOT'PV	3798.09	8368.93	14430.90	21964.40	32188.60
25.0 NPV	-5201.91	-631.07	5430.95	12964.40	23188.60
26.0 DEPREC	1800.00	1800.00	1800.00	1800.00	1800.00
27.0 TOT'FLOW	5598.09	7177.46	10190.30	14067.00	21386.40
28.0 NET'FLOW	-3401.91	7177.46	10190.30	14067.00	21386.40
29.0 CUM'FLOW	-3401.91	3775.54	13965.90	28032.90	49419.20
30.0 PAYOUT	1.00	2.00	2.51	2.51	2.51

Target Planner falls somewhere between the "do-it-yourself" modelling packages and the pre-designed plans.

programs Target can seem rather tedious.

While this is a minor irritation in the main system, Target's installation program uses similar prompts in a most unforbearing and tedious manner; we installed the program twice and wild horses couldn't force us to do it again. Black marks to the designer for bad human engineering.

Target can be installed on virtually any CP/M system with a minimum of 56K of memory and one disk drive of at least 180K capacity. Some systems will require two disk drives. The TGTGEN utility will set up the program to drive the user's terminal or, if the terminal is not on the menu, the appropriate control codes and key definitions can be patched in.

Once installed, Target is certainly easy to use and quite powerful. The documentation covers all the functions in depth, although the manual organization isn't too hot. There's also a quick reference card and a selection of sample models to practice on.



Visiplot uses Apple's graphics to advantage.

One thing still puzzles us, though — Target kept rejecting one particular model as 'incalculable'. It was a demo supplied with the program!

Panaplan

Panaplan, sold by The Computer Company for its Panasonic range of small business computers, is based on a spreadsheet approach and has an unusually extensive range of functions and commands.

(Not Quite) 101 Ways To Use Your Planning Package...

WHAT CAN you do with a financial modelling package or spreadsheet calculator such as Supercalc or Micromodeller? Here's a few suggestions:

For financial analysis:

- Forecasts of territorial potentials
- Sales forecasting by leading indexes, such as Dow-Jones
- Sales forecasting by projection of trends
- Sales department budgeting by product, by rep, by customer
- Inventory increase or decrease budgets
- Production budgets
- Capital expenditure budgets
- Cash budget
- Profit and Loss budget
- Small business accounting
- Tax records
- Cash flow analysis

Other business applications:

- Advertising media analysis
- Forecasts of market demand based on market factors
- Sales distribution analysis
- Expense account management
- Insurance analysis
- Commission calculations
- Management training
- Warehouse space analysis
- Statistical research
- Inventory control
- Quality control analysis
- Queuing theory
- Regression analysis
- Stock market analysis
- Price Lists/structures

Scientific and Technical:

While most of the attention is focussed on business/financial applications of these packages, bear in mind that they can be used for virtually any type of calculation:

- Fourier analysis of temperature gradients
- Field theory
- Motoring log-books (fuel consumption, distances, costs) analysis

Panaplan is a menu-driven system. At the right edge of the screen a list of possible command groups is displayed and, when a selection is made, this changes to a sub-menu of possible commands. The system continually prompts the user through a status display at the top of the screen.

Panaplan has several advanced (and in some cases unique) capabilities.

For example, it can deal with two sheets at once — one in memory, being worked on; the other a completed report on disk. In this mode, Panaplan can read single values or whole rows or columns from disk into the model under construction.

This feature offers a range of useful possibilities, permitting such functions as consolidation of departmental budgets or reports, extension of a forecast unit sales schedule (from a sales model) by unit price to give revenue by product and so on.

When constructing forecasts, a common requirement is to input an increasing series of, say, sales figures. Where spreadsheet calculator programs use replication of a formula to perform this function, Panaplan's ENTER command allows the user to choose between entering discrete values, a constant applied to all time periods, an initial value and percentage growth factor, or an initial value and increment.

Commands are grouped into several menu selections: Format, Data, Math, Finance, Print, Status, Help, Utility, Program, Stats, and Tables.

The formatting commands allow the user to enter descriptive headings for each row and column; specify various options such as spacing, decimal places, underlining and so on; display options and commands for each row/column; and change the order of rows/columns.

Data entry commands allow the entry of data as described above, entry of formulae, the reading of data from other tables, and editing of entries.

The comprehensive mathematical commands include the usual arithmetic functions, as well as some unusual ones such as CUMULATE, which calculates the cumulative sums of a row or column (don't confuse this with SUM). Other commands include NEGATE, INVERT, ROUND and more.

Panaplan is particularly strong on financial commands. Built-in functions will automatically calculate a depreciation schedule, an interest repayment schedule, or the internal rate of return of a series of cash flows. The DCF command is also provided to discount a series of cash flows. Other interesting commands include RATIO, % OF TOTAL, PCT, LEAD and LAG.

The status and utility commands handle miscellaneous functions such as clearing

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P.O.A.

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The deadly, intricate dances of the space quarks will fascinate you in this hi-res arcade thriller. Careful study is necessary if you are to survive to upper levels.

P.O.A.

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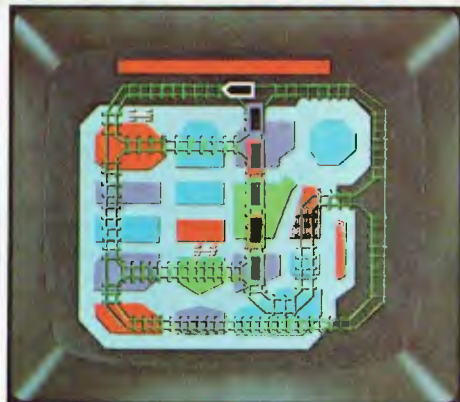
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This finger-pounding arcade game requires you to mutate hostile aliens into a benign life form even as they attack from all sides. But watch it! One slip and the friendly ones become deadly once again.

P.O.A.

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P.O.A.

All products require 48k Apple II or Apple II plus and one disk drive, 13 or 16 sector controller. Apple & Apple II are trademarks of Apple Computer Co.

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E994 CD 1B E0 CALL LE01B
E997 FE 0A CP 00AH
E999 29 14 JR Z,LE9AF-\$
E99B F5 PUSH AF
E99C DB FF LE99C IN A,(0FFH)
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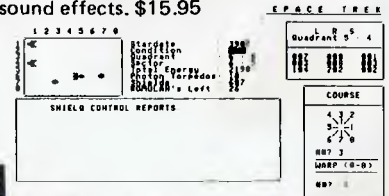
GAMES:

CRAZY DRIVE — An adventure game with graphics! If you like exploring strange towns by car, this is for you. You have a choice of 70,000 "Crazyvilles" to visit, each having a different street plan. Written in ASM. \$15.95

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this is all about! Highly graphical and with sound effects. \$15.95



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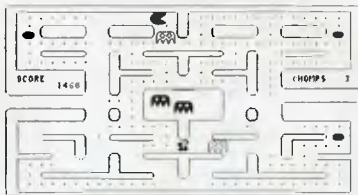
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YC 9

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```
MEM=5.959K      MODE=NORMAL  ORDER=R/O ROW=1-24 COL=1-5
ROM 1 (Assumptions:) <--
ENTER COMMAND: 35=FORMULA *****
```

ROW	Year 1	Year 2	Year 3	Year 4	Year 5	60 FINANCE;
---	1	2	3	4	5	61 SET DEPR
1 Assumptions:						62 DEPRECIAT
2 Net operati	13.0	14.0	15.0	16.0	17.0	63 SET LOAN
3 Depreciatio	1.0	110.0	10.0	25.0	0.0	64 LOAN
4 Mortgage in	1.0	120.0	0.0	30.0	15.0	65 DCF
5 Property pu	150.0	0.0	0.0	0.0	0.0	66 IRR
6 Income State						67 RATIO
7 Net operatin	13.0	14.0	15.0	16.0	17.0	68 % OF TOT
8 Depreciatio	4.0	4.0	4.0	4.0	4.0	69
9 Interest ex	18.0	17.9	17.9	17.9	17.8	70 PCT
10 Taxable inco	-9.0	-7.9	-6.9	-5.9	-4.8	71 K PCT
11 Income tax	-3.6	-3.2	-2.8	-2.3	-1.9	72 LAG
12 Net income	-5.4	-4.8	-4.1	-3.5	-2.9	73 LEAD
13 Spendable In						74
14 Net operatin	13.0	14.0	15.0	16.0	17.0	75
15 Mortgage pa	18.2	18.2	18.2	18.2	18.2	76
16 Income tax	-3.6	-3.2	-2.8	-2.3	-1.9	77
17 Spendable in	-1.6	-1.0	-0.4	0.1	0.7	78

Panaplan gives real power to both experienced and novice users.

the data (while leaving row/col descriptions and memorised commands intact), setting the number of rows or columns, setting computation order and recalculation of the sheet.

A specialised set of commands deals with the manipulation of data from external files: the GET command retrieves a row, column or entry; the Y-T-D function calculates the year-to-date total for a range setting specified for a table on disk and brings the result into the current row or column in memory; and the MERGE command adds together two tables of dissimilar format, based on a comparison of the descriptions in each table.

A particularly interesting capability of Panaplan is its ability to execute programs composed of strings of its normal commands. Using this facility it is possible to create a program which sets up a worksheet, fills in default values, prompts the user to enter the critical variables, and finally, calculates and prints the complete worksheet.

This allows use of the program by completely inexperienced users, filling in a pre-created model without any knowledge of the model whatsoever.

Statistics commands will calculate moving averages, apply exponential smoothing to a row or column, and compute the mean and standard deviation of a series of rows or columns.

The Panaplan commands seemed at first to be rather awkward, but Tom Jensen of The Computer Company, who demonstrated the system to us, had no difficulty in selecting the commands quickly and easily.

MicroModeller

Possibly the most sophisticated program of those reviewed, MicroModeller was written by British company Intelligence (UK) Ltd. It is sold here by Intelligence Australia.

MicroModeller is available in two versions to suit most machines: one is written in UCSD Pascal for the Apple II; the other, in Pascal/M, runs under CP/M on the HP-125, NEC PC8001, Panasonic, ABC, Superbrain, Altos and other systems.

MicroModeller can handle up to 1919 cells in memory, or over 32,000 cells in a 'virtual memory' mode. In this mode intermediate results are stored on disk, so it is recommended that a hard disk be used for maximum speed.

The program's advanced consolidation features and ability to handle multiple spreadsheets has enabled at least one user to produce monthly reports on 80 companies.

MicroModeller is made up of eight major subsystems, which operate on separate logic, data and report format specification files.

The initial model is entered using MicroModeller's line-oriented text editor, which has a comprehensive range of commands for the manipulation of models. These include the ability to produce 'pretty-printed' listings, concatenate files, globally search for and replace strings, and do sophisticated 'in-line' editing.

The logic file consists of comments, row definitions, row calculations and column calculations. Row definitions consist of a row number and name enclosed in single quotes, and are used to define input variables. A row calculation is a row definition followed by a row expression. Rows are

referred to by integer numbers, while real numbers (numbers with a decimal point) are taken as constants.

A wide range of operators and functions is provided, including the usual arithmetic operators. Also provided are SUM; financial functions such as NPV, MULTINPV (computes several NPVs at different discount rates), IRR, IRRPERPET (assumes perpetual cash flow), PAYBACK (computes payback period for a cash flow), DEPR (straight line or declining balance, with/out automatic switchover), SYD (sum-of-the-years-digits depreciation), INTEREST, PRINCIPAL, PAYMENT and BALANCE, which calculate mortgage-type loan amortisations; and LOSSCF, which computes a year-by-year tax loss carry-forward.

Other functions provided include Fortran-style comparison operators, AND, OR, MIN, MAX, THRU and LOOKUP. There's also a set of cross-column functions such as LAG, LEAD, SPREAD, CUM, and COL (which refers to a specific column within a row).

Once the logic file has been created, it is actually compiled by the 'logic analyst'. Once compiled, a file can be used repeatedly to run a model.

The data file is set up by the data entry subsystem. Values can be typed in for each time period in a row, or a starting value and a growth rate can be specified. The same value can be applied repetitively. An update command can be used to change only those columns required, while the system can also interpret text editor files.

The matrix handler subsystem is used to manipulate data, perform calculations and solve those 'what-if' questions. The very sophisticated commands of this subsystem are used to actually run a model, as well as performing other transformations on the data in the work area.

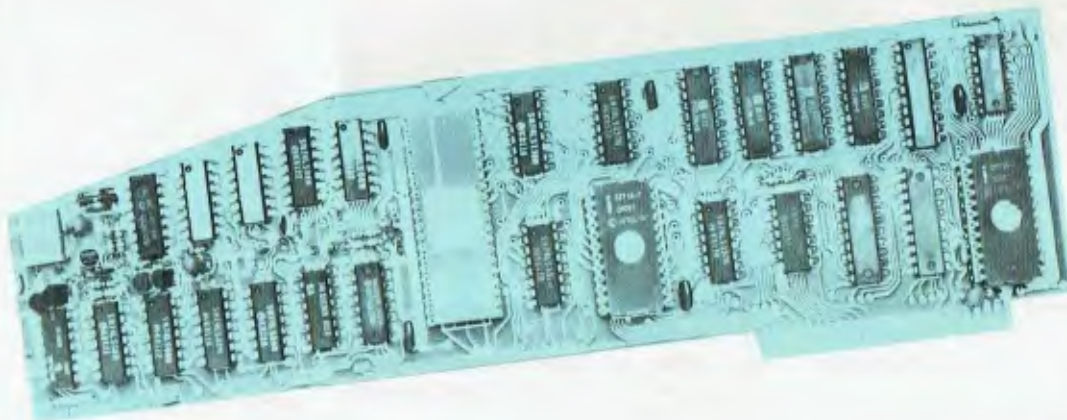
For the analyst who has a good grasp of numerical linear algebra, the matrix handler's 'raw' commands allow entire files to be added, subtracted, multiplied and divided. The system can also solve sets of simultaneous equations. In addition, there are simpler data manipulation commands, allowing information to be abstracted from and saved to other files, values changed, and rows and columns changed by a specified amount or percentage.

These features of MicroModeller make it particularly strong in the area of sensitivity analysis and calculation of year-to-date variance from forecast. As Roger Walker of Intelligence Australia pointed out to me, MicroModeller is not so much a spreadsheet calculator as an accountant's pad, with its ability to operate on multiple files representing an extra dimension of a problem.

Reports are printed using a report

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generator which offers considerable flexibility in the layout of a report. Numbers can be formatted to print with or without commas, with brackets or minus sign to indicate negative numbers and a whole range of other options. Many of the formatting commands have similar effects to the print formatting commands (often 'dot' commands) of a word processor. Text and information such as the date, case name and comments can be prompted for and inserted into the report.

Like Panaplan, MicroModeller has the ability (called the GEN facility) to preprogram and execute strings of commands, so a completely untrained user can run a model prepared by an experienced modeller. The GEN commands include #when and #endwhen commands which permit control of execution flow, as well as prompting and computational statements.

Perhaps the most impressive facility in MicroModeller is its graphics generator, which can abstract information from results files and produce colour bar charts, line graphs and pie charts. Charts can be separately created, or graphics specifications can be created to display results from different runs of the same model.

Best of all, charts can be combined with sections of reports into a slide presentation which can be taken into a meeting and used in exactly the same way as a conventional slide show (right down to the hand-held remote controller which is part of the package).

MicroModeller's documentation is well-organised and extensive. Organised primarily for reference rather than a tutorial style, it is terse but easy to follow.

Intelligence Australia will be supporting the system with training seminars and a consulting service for complex applications.

Planfin/Profin

These two programs, which arose from work done by the NSW Institute of Technology's Dr Robert Graham, have recently been released by new Sydney software house AY Systems, an offshoot of the international accounting firm Arthur Young and Co.

The smaller of the two packages, Planfin, has been designed for such functions as product marketing and market planning, where budget preparation, cost analysis and variations, income projections and discounted cash flows are of key importance.

Profin, on the other hand, is a larger and more sophisticated package designed to assist executives who are directly involved in the evaluation of financial investments, particularly large capital projects.

According to the company's managing director, Mr Richard Cousins, they are positioned "between the simple-to-use systems that offer very limited facilities

and the advanced and flexible packages that require a lot of learning and often some computer experience".

Both packages are dedicated to specific job functions and the 'model' logic is embedded in the program, so the user does not have to construct a model. The programs are menu-driven at the entry level, but prompt the user with questions from there on.

AY Systems claims most executives with a clear understanding of their own job but with no computing experience, can start to meaningfully use both systems with as little as five to 10 minutes training.

Planfin allows the manager to model a number of products over monthly, quarterly or annual periods. Product volumes may be entered as a base volume with a growth rate, or as specific volumes. The base selling price for each product may be entered as Australian dollars or as a foreign currency with conversion factor. Inflation percentages may also be entered.

For each cost category, the cost may be entered as a cost per unit, a percentage of revenue for a product, a fixed cost or specific cost values; together with provision for increases and inflation.

Interest or depreciation may be entered as specific values with provision for percentage variations. Options are provided for entry of an income tax rate and discount rate for cash flows (which may be received in the middle or at the end of each period).

Once all this data has been entered, Planfin will generate an operating income statement and net income and discounted cash flow report, either to the printer or the screen for review.

An interesting provision is the automatic logging of the dialogue between program and user, so the user can later print this out to review his assumptions

and thought processes as the model was filled in. Cases may be saved on disk and recalled for revision.

Profin provides for more sophisticated analysis, usually of capital projects over a much greater time scale (up to 30 years). The major input items are:

- Revenue — based on product volume and price with appropriate growth/inflation options.
- Costs — expenses and product costs expressed in the same way as for Planfin.
- Capital Expenditure — capital expenditures entered as specific values with options related to the percentage depreciable, investment allowances, straight line or declining balance depreciation and inflation.
- Equity — specific equity values may be entered.
- Debt Categories — specific debt values and applicable interest rates together with repayments expressed as blended (principal and interest), interest only, fixed payments or specific values.
- Tax — as well as a normal income tax rate, a supplementary tax may be expressed as a percentage of taxable income, a percentage of revenue, or with specific payments.

Reports may be produced to screen or printer. These include: Income Statement, Interest Schedule, Capital Expenditure Report, Tax Schedule and Discounted Cash Flow Analysis. As with Planfin, Profin prompts the user continually, and incorporates the model in the program itself. In addition, if the user is unsure what response is required, a help facility will provide explanatory notes at the bottom of the screen (this is also provided in Planfin).

It may be supposed that the integration of a pre-defined model into the program makes it less flexible or applicable to only a small set of problems. This is partly cor-

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PROJECT FINANCING
-----

YOU MAY CHANGE:-
1. REVENUE
2. COSTS
3. CAPITAL EXPENDITURES
4. EQUITY
5. DEBTS
6. TAX PAYMENTS

YOU MAY PRINT:-
12. INCOME STATEMENT
13. INTEREST SCHEDULE
14. CAPITAL EXPENDITURE REPORT
15. TAX SCHEDULE
16. DISCOUNTED CASHFLOW ANALYSIS
17. ALL REPORTS

YOU MAY DISPLAY:-
7. INCOME STATEMENT
8. INTEREST SCHEDULE
9. CAPITAL EXPENDITURE REPORT
10. TAX SCHEDULE
11. DISCOUNTED CASHFLOW ANALYSIS

YOU MAY ALSO:-
18. SAVE THIS CASE ON DISK
19. CHANGE CATEGORY NAMES
20. RETURN TO MAIN MENU

ENTER YOUR OPTION
  
```

Profin's menu — helpful to the user.

rect, but bear in mind the time involved in creating a model to handle some of the functions built into these programs (particularly some of the interest calculations), as well as the time involved in learning to use a modelling language.

It also seems likely that Profin could handle the majority of business planning problems. It has already been used for applications ranging from planning the finances of a sheep station to evaluating the re-opening of a gold mine. Also bear in mind the old saw — "A good plan today is better than a perfect plan tomorrow".

Documentation was not yet ready when I saw the programs but, by their nature, they will require very little. The programs use current Australian financial terms, so the prompting is easy for a finance executive to follow.

Both programs run under the CP/M operating system and have been installed on Apple II (with Softcard and Vision-80 card), HP-125, Xerox 820 and DEC VT-18X. Installations for the Wang and IBM Personal Computer to follow. Other machines will also be supported.

CalcStar

CalcStar is manufactured by MicroPro International Corporation, those wonderful people who brought you WordStar. Written in Pascal (as were many of the programs we saw), it offers an accuracy of 14

digits, with a 127 × 255 spreadsheet.

CalcStar follows WordStar's format of displaying a menu of commands at the top of the screen, with 10 rows of the spreadsheet immediately underneath, then about four rows of information and the editing line for input. With the menu disabled, 15 rows can be displayed.

The program basically falls into the same category as Supercalc and Visicalc, although it does not adhere as closely to the 'Visicalc standard' as Supercalc. Its functions basically offer the same facilities: for example, text can be right or left justified, or (a unique capability) centred. Column widths and precision can be set, but there aren't as many other formatting options as the other 'calcs'.

Automatic recalculation is not provided: this will not bother many people who find the pauses while the program recalculates already slows up their data entry.

Replication operates in a similar way to the other 'calcs', with absolute or relative field references. A useful capability is to be able to force some field references to remain constant, so for example, if the line +SUM(A3 A7)+A8!*B17 is replicated, all the variables except the reference to A8 will be translated relative to the new position. The ! symbol forces constant field references.

CalcStar offers a number of unique and well-thought out functions: for example,

spreadsheets can be merged, allowing overlays to be created for common problems. The 'what' function will provide the row and column headings when they are not displayed on the sheet. Alternatively, the row and column headings can be 'locked into position' on the screen in the same way as Visicalc.

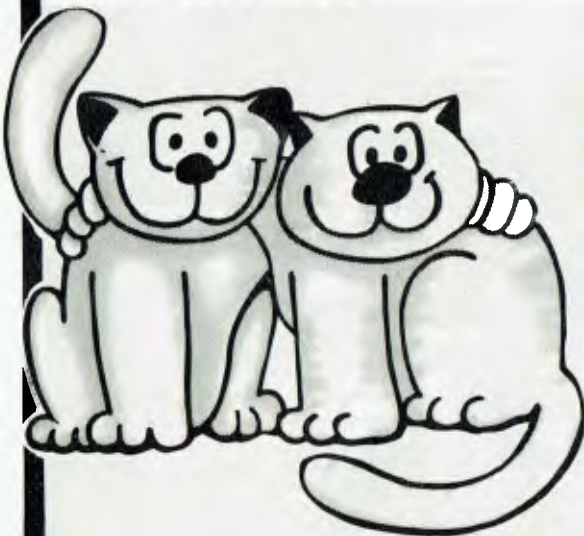
Conditionals are provided, and rows/columns can be inserted. An interesting feature of the 'delete' command is that it will not allow the deletion of a row or column which has dependent calculations. All references to the 'redundant' row/column must first be deleted so it really is redundant.

A significant advantage of CalcStar is that it uses similar control keys to WordStar, particularly for cursor movement. This means those who are familiar with WordStar will find CalcStar easy to learn.

An interesting facility, similar to the 'programming' facility of Panaplan and MicroModeller, is CalcStar's Auto mode. In this mode the creator of a model can lay out a 'path' around the independent variables of the model; subsequently, a user can set the auto mode and the program will follow that track, only allowing him to change those critical variables. This is time-saving and fool-proof.

CalcStar has a large set of functions: all the usual functions are there, with the notable omissions of trig functions and

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DISK	\$70
TAPE	\$60

FRIEND 2 - Mailing List

This is a dual disk based system for the 4000 series microcomputers. It caters for 2,100 records per data disk and offers sort and select facilities. It will also be available shortly for single disk systems.

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LOOKUP. Most business users would have no use for trig functions, unless they want to do some complex analysis of seasonal variations, but LOOKUP is a handy function.

One function which is unique to CalcStar is the linear regression function REGR. This will perform a linear regression analysis on two sets of data, returning the mean of the first set in the target cell.

After that, three functions can be used: PROJ will calculate a projected value for the dependent variable, given a value of the independent variable; DEPD provides the reverse function, calculating the value of the independent variable required to produce a particular value of dependent variable; and SLOPE, which gives the slope of the straight line fitted to the dependent variable data set.

The two sets of data need not 'line up', allowing the regression analysis to include leads and lags, a particularly useful trick. One suggestion back to Micropro: instead of making the result of the REGR function be the mean of one data set, why not return the correlation coefficient? This would provide a measure of the 'goodness of fit' of the regression, a figure which is not presently available. The mean can easily be calculated by the SUM and CNT functions.

CalcStar was designed to be compatible with WordStar, and can print a text file to disk for subsequent editing. In addition, a file can be disk-printed with commas to delimit the fields, making it compatible with BASIC and other languages.

Another interesting point arising from the WordStar Compatibility: CalcStar can be installed very simply for a range of different terminals, but if you've already installed WordStar, the installation program can read the terminal control codes out of your copy of WordStar and plug them into CalcStar. For non-standard terminals, this makes installation a snap!

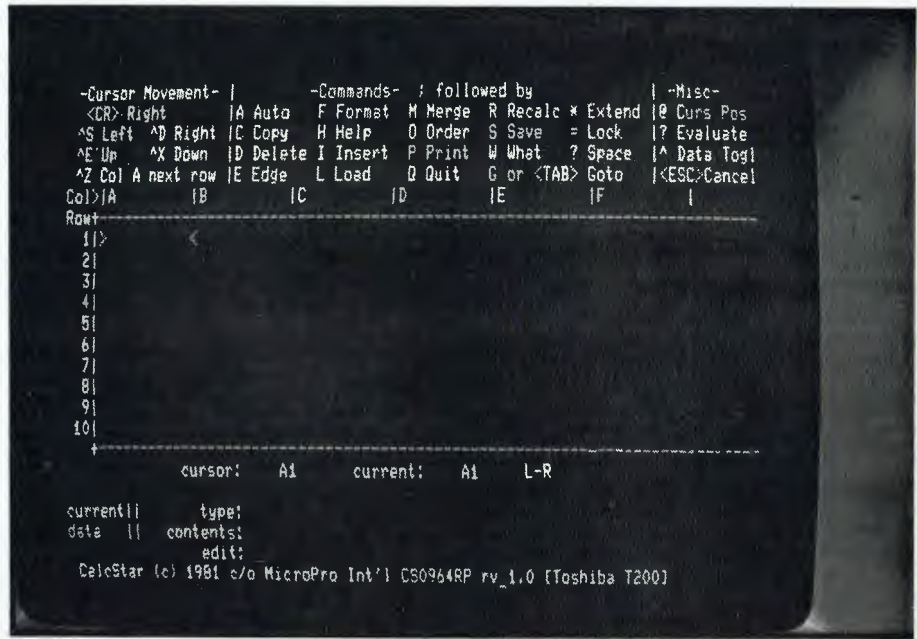
Disk files can be password protected under CalcStar. This is a good idea when you consider that financial analysis programs are the key to some extremely sensitive data.

The print facility offers a number of options, including all/part of a sheet, comments, ordinates at the edges and user-set page breaks.

CalcStar documentation is written in an easy-to-follow, chatty style. The examples are good and provide clear instances of the way the program can be used for different applications, such as inventory control and advertising research.

The program is easy to use, logical, and comes with examples which can be put to work immediately. □

* * *



MicroPro's CalcStar — similar elegance to WordStar, and a lot of power.

PROJECT FINANCING

INCOME STATEMENT

	1981	1982	1983	1984	1985
PRODUCTION					
LPG	0.000	0.000	0.290	0.360	0.360
PRICE					
LPG	250.000	280.000	313.600	351.232	393.380
REVENUE	0.000	0.000	90.944	126.444	141.617
COSTS					
ROYALTY	0.000	0.000	11.823	16.438	18.410
FIXED	5.000	5.000	5.000	5.000	5.000
TOTAL COST	5.000	5.000	16.823	21.438	23.410
OP. INCOME	-5.000	-5.000	74.121	105.006	118.207
INTEREST	7.500	25.875	22.037	17.624	12.549
DEPRECIATION	12.825	22.764	17.642	13.673	10.596
TAX PAYMENTS	0.000	0.000	0.000	3.966	43.728

PRESS RETURN TO CONTINUE (PRESS Esc TO RETURN TO MENU)

A Profin Income Statement report, directed to the screen.

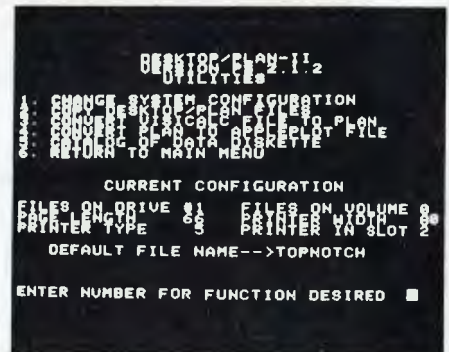
HP-41C Financial Decisions Pac

ALTHOUGH it is not a full financial modeling package, in the sense of doing two-dimensional analysis, we felt it was worth including the HP-41C Financial Decisions Pac software because it is still a worthwhile time-saver for the executive.

The pac actually consists of a plug-in module for the Hewlett-Packard HP-41C(V) pocket calculator. It contains a number of programs which are instantly accessible, and which deal with time and money problems.

The major program in the pac is MONEY, which can solve a huge range of problems involving up to five standard compound interest variables: n (number of time periods), i (interest rate), PV (present value), FV (future value) and PMT

Desktop/Plan 11 utilities — part of a menu-driven package for the Apple designed for the non-computerist executive.



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Phone: (02) 525 5022

Computerworld Darwin,
Smith Street,
Darwin, NT. 5790.
Phone: (08) 981 4029

Pittwater Computer Sales,
Suite 13, 9 Bungan Street,
Mona Vale, NSW. 2103.
Phone: (02) 997 4495

CW Electronics,
416 Logan Road,
Stones Corner, QLD. 4120.
Phone: (04) 397 0808

Southern Information & Robotics,
11 Burns Avenue,
Fulham Gardens, SA. 5024.
Phone: (08) 43 7981

Datasoft,
Suite 3, 870 Beaufort Street,
Inglewood, WA. 6052.
Phone: (09) 271 7169

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

(payment). Once three or four of these are known, they can be keyed in and the fourth or fifth calculated.

MONEY will calculate these variables for such financial transactions as mortgages, lease (with/out buyback), savings accounts, pension funds, amortization, annuities and others.

A second program, AMORT, will calculate and display (or print) an amortization schedule for a loan, calculating the interest and principal portion of each payment as well as the remaining balance.

Three programs calculate the Internal Rate of Return, Modified IRR and Net Present Value of up to 239 individual cash flows or 119 groups of cash flows. The Modified IRR program discounts negative cash flows at a safe rate, but assumes positive cash flows are re-invested at a somewhat higher rate.

Depreciation schedule can be calculated by three different methods — straight line, declining balance, or sum-of-the-years-digits.

The remaining programs calculate the number of days between two dates, using either a 365-day year or a 360-day financial year, and perform a number of calculations associated with bonds and debentures.

All the programs work well and at reasonable speed. The documentation is excellent — up to the usual HP standards — with considerable explanation of the cash flow diagrams and sign conventions used by the MONEY program.

All the programs use the alphanumeric display capabilities of the HP-41C to prompt for information and to identify results.

If your forecasting requirements won't justify a personal computer, then an HP-41C with printer and the financial Analysis Pac could be the answer at a total price less than many of the software packages listed here. □

Spreadsheet Calculator Suppliers

Visicalc: Your local Apple dealer. Our review copy came from City Personal Computers in Sydney.

Supercalc: Our copy was supplied by Archive Computer Services, Clayfield, Brisbane, Qld.

CalcStar: John F. Rose Computer Services Pty Ltd, PO Box 745, Crows Nest, NSW 2065. Tel: (02) 439 1220

Target: Computer Campus Pty Ltd, 11 Rundle St, Kent Town, SA 5067. Tel: (08) 42 4826

Planfin/Profin: AY Systems Pty Ltd, 4th floor, 1 Help St, Chatswood, NSW 2067. Tel: (02) 419 6077

MicroModeller: Intelligence (Australia) Pty Ltd, 62 Shepherd Street, Chippendale, NSW 2008.

Panaplan: The Computer Company, 4 Cliff Street, Milsons Point, NSW 2061. Tel: (02) 436 1733



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The problem with most personal micros, such as the TRS80 and APPLE lies not just much in the basic machines, but in the cost of expansion. Once you have mastered the base machine, getting it to do any more is very expensive.

MicroBee gets around this by having a special plug-in top board. We call it the Core Board. The MicroBee is supplied as standard with a Core Board which takes up to 32K RAM (16K supplied), 16K ROM BASIC, and a further 12K ROM (for Monitor Program, Networking ROM, or your own custom ROM programs). A factory change fits a new Core Board so you have 48K RAM, an 80x24 screen format, and are ready to run CP/M 2.2 with disc drives.

MicroBee is a new generation design. It is designed to grow painlessly in the ways we have found most computer enthusiasts will want to move.

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Because it's Z80 based, MicroBee has a huge software base. And it's a base which we're improving all the time. MicroBee runs all the MicroWorld BBASIC software.

Newly released software for March includes: Editor Assembler in ROM Write machine code software on your MicroBee. BEEBUG monitor lets you examine and modify memory. Supplied with full operator's manual. Preprogrammed ROMs fit straight onto your MicroBee. **\$49.50**

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Trek Take command of the USS Enterprise and destroy Klingons from surrounding galaxies.

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No hidden extras with MicroBee! You get full case, power supply, IC sockets, 16K BASIC in ROM, 20K Continuous Memory RAM, full function keyboard and much more. Don't buy a computer kit which has less.





SELL YOUR PLAN

- With Colour Graphics



By Fred Symes

BEFORE computers, the pencil and paper brigade from the accounts department dreaded the management call for the figures that would allow senior decision-makers to plan budgets, predict sales and profit trends and generally keep tabs on the corporate financial situation.

Then along came IBM, Facom, ICL and others with their electronic wizardry. The accountants were able to press a couple of keys and out would come inordinate lengths of folded paper covered with seemingly endless columns of figures. Here was fast, accurate information, much of which it was not physically possible to produce before the coming of the computer.

However, this plethora of information sometimes created problems of comprehension. There was just too much for the mind to take in and convert to meaningful reports.

That's probably an over-simplification of the situation, but it is true that faced with row after row of figures, there were some managers who preferred to play hunches rather than try to make an evaluation from the supplied information.

Well, the backroom boys have come up with a development that makes it much easier to comprehend the information that computers make available to business. It's called computers graphics.

In a nutshell it means the information can be programmed for reproduction in graphic form. This allows the decision-makers to see at a glance past and present results and the most likely results of the future.

The boffins have taken it a bit further now. It is possible today for the graphics which appear on the monitor to be photographed on 35mm slides, 250 by 200mm transparencies for use in slide presentations and overhead viewing.

The sole provider of this service in Australia at present is Execuplan Software Australasia, at 45 Macquarie Street, Sydney. That's where *Your Computer* met Mr Kim Ong.

Broad Application Spectrum

Execuplan is also the Australian agent for the Interactive Financial Planning System (IFPS) produced by America's Execucom Systems Corporation. IFPS is used by such organisations as 3M, Dow Corning, Honeywell, The Quaker Oats Company, Shell Oil, Allied Bank of Texas and a host of other national and multi-nationals.

The spectrum of application of IFPS is broad. Areas include profit and loss analysis and planning, corporate financial statement integration, capital budgeting, cash management, tax planning, consolidation reporting and marketing strategy planning.

Particular features of the system are the immediate availability of answers to a number of "what if" questions, and a sensitivity and impact analysis which allows the planner to determine how the situation responds to variations in key parameters.

Risk analysis is another invaluable

service provided by IFPS.

The graphics produced by the system are clear, easy to read and in attention-grabbing colour.

However, having the graphics on the monitor is one thing; being able to project the same information onto a large screen for leisurely viewing in the boardroom, at a sales conference, or having it reproduced in the company annual report is another.

And that's where Execuplan comes into the um, ah, picture. With Execuplan you can obtain a colour transparency or slide at remarkably little cost; and you can either ask Kim Ong's people to do the job, or you can do it yourself — it's that easy.

Execuplan can convert financial, or just about any other information for that matter, into graphics.

The information to be processed is provided by the client and fed into the Execuplan system. The graphic conversion shows up on a colour monitor. A digitizer coupled to the computer allows the generation of a wide variety of graphic representations, including cartoons and illustrations for more interesting and informative presentation.

Electronic Reproduction

What appears on the monitor can then be reproduced, via an electronic signal, to camera film. It is not simply a matter of setting up a camera in front of the screen and clicking the shutter.

A plotter is also part of the Execuplan equipment, so that clients can get paper copies. In all, the choice of medium is 35mm slide, large overhead transparency or paper copy.

There is a choice of up to 64 character fonts, including Hebrew, Greek, Russian and Roman. The graphics images, once created, can be stored and later retrieved for editing, merging, overlaying or scaling.

With a little help from Execuplan staff even a non-computer person can generate their slides quickly — at the press of a button in fact. If clients so wish, they can hire the equipment on an hourly basis.

It is also possible for the client information to be fed into the Execuplan system via an acoustic coupler. Execuplan is compatible with just about any computer.

Artwork can be previewed before committal to film or paper, so clients can ensure the final production is correct, thus saving time and expense. Mistakes can be spotted and changed with ease on the monitor. □

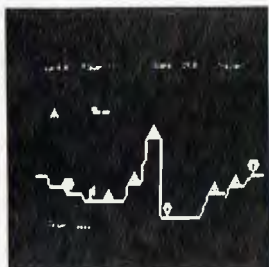


PENETRATOR

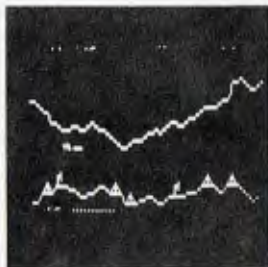
"IF YOU ONLY BUY ONE GAME THIS YEAR - MAKE IT THIS ONE!"

MISSION IMPOSSIBLE!

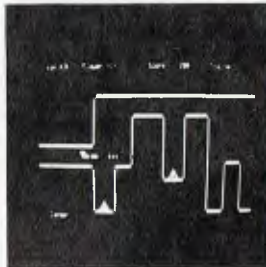
DESTROY THE ENEMIES ILLEGAL NEUTRON BOMB CACHE



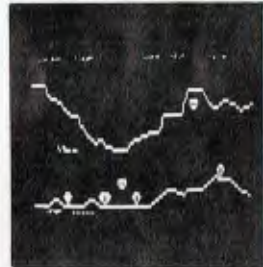
Stage One: Enemy defence rings loom in rugged mountainous countryside! **Warning** a strong network of radar stations are sending guided missiles to destroy you!



Stage Two: Enemy defences underground! Penetrate the treacherous caverns but watch out you have limited manoeuvrability



Stage Three: Fly through hazardous vertical corridors **BEWARE!** Enemy missiles in silos. You'll need all your skills!



Stage Four: Few of our Fighters have survived but rumours are of shifting missile sites and enemy paratroopers waiting in ambush! With your Mission accomplished you now have to go back in reverse order!

RED ALERT! Your danger level continues to build as you penetrate further into enemy territory through the four stages. Unless you destroy the radar stations your lighter plane will reach a critical point and evasive action will be difficult!

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2 cassette pack. Plus 16 page Booklet.



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The Training Mission allows you to start at any of the four stages, with unlimited "lives". When you have successfully completed the selected training stage, Space Research Centre staff will automatically place you in the next highest Stage. Successfully completing Stage Four puts you in the "return mode" where you must pass through the same stages in the reverse direction and order.



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You are the pilot of **The Eliminator** a space fighter of the Defender Class. It has lightning fast response and is armed to the teeth with awesome firepower. But you are outnumbered! And your attackers are keen. Your only options are victory or a grave in space.

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YOUR COMPUTER regrets that Star Fighter was priced incorrectly for Jan. and Feb. Please note price at \$39.50. +\$1.00 p.p. SORRY.

yz/3

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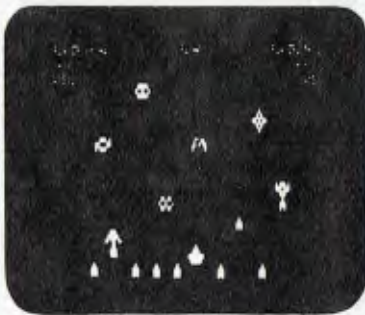
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\$19.50 DEFENSE COMMAND

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Big Five has done it again! Now the most popular arcade game has a fascinating new twist. The Invaders are back. You are alone, valiantly defending the all important nuclear fuel cannister stockpile from a convoy of thieving aliens who repeatedly break off and attack in precision formations. An alien passes your guard, swiftly snatching up a cannister and flying straight off. Quick! you have one last chance to blast him out of the sky. Great action and sound!



The Beginner's Guide 1

Easing Your Way Into Computing

Learning to live with a computer is an interesting, if at times frustrating experience. When there's no pressure to get things done, you can learn at your own pace. But when you want to get some work done, problems will start to arise. LES BELL points out a few shortcuts to save you time and anguish...

THE FIRST problem for most people is just deciding which computer to buy.

Here's where a little experience would help, but the only way to gain experience is to own and use a computer. Sounds familiar, doesn't it?

Small computers are not the universal panacea many advertising men would have you believe. Putting a computer on your desk is not going to lift your productivity by 100 percent overnight. Rather, for the first few months, everything will be that much harder as you try to figure out how to do it on the computer.

For this reason it's best to gain your experience with a computer 'off-line', so to speak, in an application where time is not critical. Keep doing your time-critical jobs the old way, which is much less subject to unforeseen delays. Start learning to use the computer on new jobs or, better still, at home.

One way of increasing your knowledge before buying your computer is to buy a short-term, low-cost substitute which will allow you to learn the basic principles of computing, as well as discover whether you have any natural aptitude. Buying a cheap computer as a hobby model will give you some idea of the capabilities of these machines, as well as acquainting you with the jargon which is, unfortunately, a necessary part of the computer world.

Reading books and magazines does

JOIN A COMPUTER CLUB TO MEET
OTHER USERS & GAIN EXPERIENCE.....



The Beginner's Guide 1

not provide a sufficiently dramatic learning experience for you to thoroughly acquaint yourself with all the terminology. In other words, you have to do it.

Beware, however! The cheap computer is less powerful than the real thing. No one can deny that a 48K Apple with two disk drives can do more than a ZX-81, even with its 16K memory module and plug-in printer. To get a true impression of the capabilities of the various computers on the market, you should talk to owners of each, or at least have a hands-on demonstration.

This is where computer clubs can be very helpful. They provide an excellent opportunity to meet other users of the machines you are contemplating, as well as a forum for questions and problem-solving.

Choose An Expandable Computer

The problem with a number of lower-cost computers is they're not expandable; you can only go so far, then you've exhausted the machine's capabilities and have nowhere else to go.

The problem with most computers is not the power of the central processor, unless you want to have multi-user or multi-tasking capability. It's the selection of peripherals, and possibly more importantly, software, which makes the difference.

The first thing to consider is the amount of memory you will need for your applications. Most computers can now be expanded to a total of 64K RAM/ROM; and you're unlikely to need more. If you can't get more than 32K into the machine, you're facing a significant limitation.

The next most important consideration is the availability of disk drives and supporting software. If you're using a computer in a business application, cassette storage is just not on for most jobs. With mini-disk drives becoming cheaper and cheaper, most users aspire to disk drives fairly soon after buying their computer.

The amount of software available is important, too. Every piece of software you run on your computer makes that original hardware investment more profitable. Is there a lot of activity in the software market for your intended machine? If there's not, your machine will often be sitting idle.

Other peripherals may also enter the equation. Can you easily interface a printer? How about extra serial ports for a modem? Perhaps a real-time clock would be useful for many of your programs. How

about parallel input from burglar alarm switches? Does your program need a graphic display?

The availability of such peripherals may be important to your future applications, so bear them in mind. Also, it pays to keep the cost of a complete system in mind — some systems are more expensive for the basics, but cheaper to expand.

Stick To One Language

Many computers now have a selection of programming languages. The Apple, for example, supports three versions of BASIC, plus Pascal, FORTRAN, PILOT, FORTH, C and others.

Don't fall into the trap of trying to master a number of languages at once. In the words of that hoary old saw, 'Better the devil you know...'

Okay, so BASIC has its faults, but you can still do a lot with it. If you keep working with it you'll learn a lot of useful techniques and outright tricks which will help you do things you'd originally thought impossible.

Be Aware Of Contexts

With the appearance of microcomputers on executive desks, new users are increasingly thrown upon their own resources in coming to grips with the machines. After observing the struggles of many new users to bend the machines to their will, I have realised one of the biggest hurdles to overcome is context dependency.

Most new users see the computer as a machine, designed to function in a repeatable and consistent way. This is not quite right, as most programmers know. The computer hardware is simply a supporting medium in which the software lives. Every program has its own unique characteristics which are reflected in the operation of the hardware/software combination.

Although every program operates repeatably and internally consistently, almost every program uses the console keyboard in a different way. Take line editing, for example; the operating system usually provides simple functions for backspacing, retyping a command line, erasing a line and starting anew. Many programs which use operating system calls for console I/O take advantage of this facility.

But many other programs (such as BASIC interpreters) do direct console I/O, and provide their own line editors, which operate in a totally different way. On the same system there may be a line-oriented editor utility, which has yet another set of

commands. Finally, on many microcomputer systems there may be a screen-oriented word-processor style editor, with yet another set of commands and syntax.

Even the simple act of exiting a program when it all gets too much is a trial for the new user. On my personal computer, a modest collection of software boasts the following bewildering array of exit commands: control-C, SYSTEM, E, control-K, X, CR, GO, RETCPM, BYE, /q and others.

Even correcting a typing error involves a decision: does this program use a left arrow, the DEL key or BACKSPACE?

All this seems quite natural when you've been doing it for years. But to the newcomer it seems as though his computer is schizophrenic, faulty or just inconsistent. The beginner has to learn that the result of an action, or keystroke, depends upon the context it occurs in; that is, the program he is using determines whether his machine really is schizophrenic, or even polyphrenic.

Worst of all, the salesman never mentions this, and the manuals usually take it for granted — surely the user knows he is using a program, not a computer?

Use Application Packages

Programmers have an old saying about re-inventing the wheel.

If someone else has already done what you want to do, and done it properly, then stand on their shoulders and use their software. For example, most computers will run financial modelling systems like those reviewed elsewhere in this issue.

Other applications packages include accounting packages, word processing software, database management systems, mailing list managers and more. Often such packages — at prices from \$50 to \$1500 — represent astonishing value for money, particularly considering the money they will save you.

If the right software is not available, then you'll have to write your own. Start simple; add the whiz-bang features later. If you can, adapt someone else's program.

Being well-informed helps. Read magazines and books about computers (please ignore our vested interest here).

In a rapidly-changing field like this one, books are out of date almost before they are printed. Of course, the basic principles of computing are still valid, and if you want to learn BASIC for example, a good textbook is one of the best ways to go. □



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Confessions of a Computer Salesman

We asked our resident computer salesman, SANDY PETERS, where he thought computer buyers were going wrong. There are laws that prevent us printing what he said. But after a little thought, he came up with the following advice, based on what he sees (and, some say, endures) every day...

I'M A computer salesman. I come in daily contact with people who want to buy a home or small-business computer. This article is intended to help you identify your needs and find a computer which will satisfy those needs.

In the computer business there are many systems available for you to choose from. If there was such a thing as the 'best computer', as some salesmen would like you to believe, then that computer would have no competitors to speak of. Today there are many computers — because each covers a different need.

What are some of those needs? Let's break them down into categories:

- Price of the computer and the peripherals. That is, how much can I afford? If I have a budget of \$500 there is no point in looking at an Apple, Peach, Atari or PET. More on this later.
- Application — is it for business, pleasure or both?
- Sophistication — am I able to utilise the *extra high zapping utility code destructor ramset, and the romiest coverall standard interceptor?* In other words, do I want a racing car to drive me to work?
- Expansion cost — what if I want to add to the machine later; can it be expanded, and if so will it still be capable or cost effective?
- Software — is it what is wanted, is it available and from where?
- The manufacturer's service and support history.

Now we have some guidelines. How can they be used, and what do they mean?

First, let's clear up any misconceptions which might have arisen from reading the list.

Buying a computer is a case of sometimes having to make trade-offs. The purpose of this rdHcle hs to help you in that area as well as helping you get around the confusing jargon and sales pitches which confuse you more. This article is not intended to steer you towards any specific computer over another.

If you want that, see me in the store and I'll try to sell you a . . .

What You Can Afford

The first criterion is what can you afford. Just as when you're sitting down ordering a car, those extras are always appealing.

You need to allow for those extras. What use is a \$700 computer if you can't afford the cassette unit, or the television set?

Be price realistic — if you want the world for a dollar you'll only be buying problems.

Price is important, but it needs to be matched to the computer's task. There is no way a cashbook, stock control or payroll program can be run on a Sinclair ZX-80. And before I get letters from those of you who are aware of such a program, I would like to say that even if it were possible it would not be practical.

Just imagine the scene: a \$12,000-a-year secretary with an 80 wpm typing speed entering details of your stock on *that* keyboard. The phone rings...“can I speak to your accounts department please?”... Yes?...“could you give me the current balance of my account?”...Just a minute (or two) while I check our computer. Forty minutes later, after three unsuccessful loads of the cassette, the customer will probably have realised you'll never know if his account gets paid or not.

You may laugh, but people *have* asked me if they can run business programs on

the Sinclair.

On the other side, if I want a computer for game playing, then dual 20 cm floppy disks or a 5 Mbyte hard disk would be a waste of money.

In other words, buy a computer suited to your needs.

The problem is to honestly evaluate what you need in a computer. Decide what you want before going into the marketplace — if you don't you are likely to be influenced, sub-consciously, by the first computer salesman seen.

Don't Confuse Him

Being human (we hope...), you are likely to pick up some of his jargon and promotional ability. When you deal with the next salesman you will draw upon some of this jargon — naturally, you want to show you are not ignorant and cannot have the wool pulled over your eyes.

A good salesman is there to help you. If he can't identify your need, or cannot demonstrate his product, how can he help you? But if you start asking him whether or not the system has an XYZ-compatible interface, does it run MPC, or Tom Jones' cashbook program, he is automatically on the defensive and will have to compare his system with another without doing the most important thing — *finding out what you want to do with your computer.*

So, effectively, confusing him doesn't help you.

Remember, you are the purchaser and you make the decision. The more facts you have the better your decision will be.

Okay, what are some of the pitfalls in buying a computer? The first is the comparison chart.

To say a computer is good because it has extra features like XYZ compatability, level X BASIC, cassette file-naming, and the ability to store moon shot data, means nothing if it won't print upside-down and you happen to need upside-down printing.



CHOOSE AN EXPANDABLE COMPUTER.... (ITALIAN MODEL SHOWN)

Check The Facts

The best way to judge whether or not these comparative figures are valid is by finding answers to these questions:

- Does the computer being promoted score favourably or equally in each comparison situation?
- If so, are there any omissions from the comparison list?
- Does the comparison give prices for a typical system without itemising the equipment included in that price. For example, *the cost of a complete business system is \$1234.*
- Check the (claimed) facts with the opposition — For example, if the article claims the opposition computer can only support two disk drives, ring a dealer and ask him how many it can support.

These comparison charts bring up

some of the hidden problems you will have in choosing a computer.

Now, let's talk about some of the major misconceptions.

The **microprocessor**. There have been countless arguments on which microprocessor chip is the best, and don't look to me for an answer. To be blunt, I don't know.

However, if a salesman (or anyone else) tries to tell you the Z-80 or 8080 or 6502 is better than another chip be on your guard, especially if this is the mainstay of his argument.

The speed of the microprocessor, or whether it is stack orientated or whatever, is useless if the company which made the computer as a BASIC which is inefficient. If my little computer is two nanoseconds slower than Tom Brown's what does it matter, as long as it does what I want.

Use And Abuse Of RAM

With a microcomputer, the 8 bits give me a maximum of 64K for my machine to use (this is not a section for those smarties to write do the editor about bank selectability).

The average buyer can get around the confusion of those magic figures quoted by asking a simple question — how much of the RAM is available for me to use? And, if I run disk unit, how much then?

The use of RAM figures is like a car salesman saying his car has a 5000 cc engine while the opposition's has only a 4000 cc engine, what you really need to know is how fast it goes.

Disk storage capacity has an important part of any system. However, sometimes too much emphasis is placed on this area.

Some computers have only 55K available for use on each drive, while others can store up to 500 — both on 13 cm mini-floppies. You need to look at the system and your own needs before deciding that storage capacity is the most important part.

Yet if storage space is going to be important do you make sure you know it — one factor which makes the right initial decision particularly important is the cost of expansion. If you don't choose the right system for your needs, you'll probably spend a fortune upgrading it and still be unhappy.

The Secret

The secret to success in computer buying is knowing what you want.

Don't rush out and buy a computer just because you've decided to buy a computer — time spent examining the market and finding what suits you will be a better investment than a 40 percent discount on the wrong machine.

Don't believe in love at first sight — in this field whatever you see first will seem brilliant. Look listen and learn; *then* go shopping. . .



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Production costs have now been absorbed due to fantastic response — YOU REAP THE BENEFIT!!

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Yes, this makes the full 16K computer with 9K basic on tape, transformer and IC sockets — only — **\$287**

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Designed for computer applications where 'Basic' programming is not required. Kit supplied with Eprom Monitor and 16K RAM.

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CASE (Cat. H-3200) New and in stock \$39.50

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BASIC program (interpreter) on cassette

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BASIC program in EPROM (set of 3 IC's)

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S-100 Expansion K-3606 \$19.50

Character Generator (upper/lower case)

NOW SAVE \$20 WAS \$69.00 K-3607 \$49.00

Construction manual **SAVE \$3.00 WAS \$12.50 B-3600 \$9.50**

BASIC manual SAVE \$5.00 WAS \$14.50 B-3602 \$9.50

48K on board (2 sets of IC's) X-1186 \$59.90

Photo shows the basic board with the following options: S-100 expansion, IC sockets and a full 48K of memory.

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Check the Super 80 against all others

	SUPER 80	OTHER
* IS IT S-100 EXPANDABLE	<input checked="" type="checkbox"/>	<input type="checkbox"/>
* DOES IT EXPAND TO 48K ON BOARD	<input checked="" type="checkbox"/>	<input type="checkbox"/>
* DOES IT HAVE RF OUTPUT FOR TV CONNECTION	<input checked="" type="checkbox"/>	<input type="checkbox"/>
* WAS IT FEATURED IN ELECTRONICS AUSTRALIA — AUSTRALIA'S LEADING ELECTRONICS MAGAZINE	<input checked="" type="checkbox"/>	<input type="checkbox"/>
* IS IT AVAILABLE EX-STOCK	<input checked="" type="checkbox"/>	<input type="checkbox"/>
* HAS IT SOLD OVER 1300 AND BEEN PROVEN AGAINST TEETHING TROUBLES	<input checked="" type="checkbox"/>	<input type="checkbox"/>

CHECK OUT THESE FEATURES: * Relay operates cassette unit automatically * 2K Monitor program supplied * Character generator giving full 64 characters, 32 characters x 14 line screen * Spare IC positions for prototyping and user customising * RF modulator inbuilt, connects to your TV set * Optional S-100 provision * Keyboard can be remotely mounted if required * 12MHz quartz crystal * Optional 9K SUPER BASIC in ROM plug in facility * Full size professional 60 key keyboard * Inbuilt power supply * 16K RAM on board plus provision for on board expansion to 48K * Inbuilt cassette interface

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Purchase this kit and inspect it for up to 7 days. If you do not wish to go ahead and construct this kit, simply return to us in the condition supplied and your money will be refunded in full.



This is what Reg Hesse, Technical Officer of Gladesville had to say about 'Super 80' "I enjoyed building the Super 80 project and felt it worthwhile, of immense educational value and quite easy to construct. It worked as soon as I turned it on and has provided many hours of enjoyment".

Very Advanced design — but works with any TV set!

The 'Super 80' offers a specification that we believe just cannot be bettered at the price. It uses the popular Z80 Microprocessor IC, a professional keyboard and has direct RF output so that you can use the computer with any TV set (you don't need to purchase a special video monitor).

Easy to build

Even though we would not recommend this kit to the raw beginner, it is very easy to build. Any person who can use a small soldering iron and can solder neatly should have no difficulty in construction. This is because of the unique double side board design which means there is virtually no other wiring. The board is covered with professional 'solder mask'; this makes soldering much easier without the problems of bridges, etc. Once the components are soldered onto the board in their marked positions over 98% of the construction is completed. Even if you cannot get the completed kit to work, we have a special "Sorry Dick it doesn't work" repair service to assist you.

NEW lower price, higher specification - how is it done?

Most computers sold in Australia are manufactured in the U.S.A. where extremely high labour rates prevail - and you pay dearly for this on built up units. With this computer kit, you provide the labour and therefore save a fortune. And remember, this computer does not have a small toy-like calculator keyboard but a full size professional typewriter keyboard.

Advanced programming capability

One of the most popular computers in the world (the Tandy TRS-80 Level 1) only has 4K of BASIC. The BASIC we have with this unit is a large 9K. When you consider that our popular Sorcerer computer (over 2,000 sold) only has 8K BASIC and sells for over \$1,000, it is obvious that by building yourself, you are saving real money.

Electronics Australia/Dick Smith design

This is not a half baked design with no back up. The resources of Electronics Australia, Australia's most popular electronics magazine, and Dick Smith Electronics have combined to design and bring you this kit in the interests of computer enthusiasts actually building and not just buying. The design is fully Australian.

Imagine how much you will learn!

Most computer enthusiasts can program a computer but would have absolutely no idea of how to build one. By building this kit you will learn both the technical side of construction, how it works and then how to program. What a fantastic background for a future.

Sectional construction

We have designed this kit not only for the serious computer user but also for first time users like the student or hobbyist. This is why we have a short form kit which may be added to as you build (and as you have the money!). For example, you may build the computer originally and operate it with 'BASIC on tape' and then add 'BASIC in ROM', add the S-100 and provide other parts at a later stage.

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DSE A193



Keep On Trekking!

Computer games will come and go, but a few are classics and will never die, writes LES BELL. Here he urges a revival of the greatest game of all — no, not croquet — Star Trek. . .

THE HISTORY of computer games is as long as that of computers. Back in the 18th Century, philosophers were fascinated with the idea of chess-playing automatons and a few were even built (frauds, naturally).

This fascination continued and flared

up in the late 1940s, when many of the early pioneers of computer science — John Von Neumann, Norbert Wiener, Alan Turing and others — devoted considerable thought to the problem.

But right from the earliest days people were playing much simpler games on computers; simple number-guessing games and the like. It wasn't long before the game of noughts and crosses (tic-tac-toe) was automated, while in the sixties reasonable draughts-playing programs emerged.

In the late sixties the game of Space War appeared at Massachusetts Institute

of Technology (MIT) and rapidly began to spread.

When the first BASIC interpreters appeared for microcomputers, Space War, revamped and renamed Star Trek, appeared within months. Of course in the early days only very fortunate hobbyists could play it, as the program required vast amounts of memory — as much as 32K (shock, horror!).

Star Trek has been blamed for the loss of more working man hours, through the distraction of programmers, than any other program (though Adventure must be close). Once you've played it you'll know why.

No Graphics Is No Hassles

Being designed to be played on ordinary computer terminals, Star Trek doesn't have any fancy graphics. But for all that, it manages quite nicely, as the photographs show.

Here's how it works.

You are the captain of the *USS Enterprise*. Your mission is to destroy a certain number of klingons in a certain number of stardates, with the support of a number of starbases, at which you can refuel and repair damage. The number of klingons, stardates and starbases is a function of the difficulty level you assign yourself at the beginning of the program.

The galaxy is divided into 64 quadrants, eight down and eight across. Similarly, each quadrant is divided into 64 sectors. Naturally, *Enterprise* has commands which will let you move around the galaxy.

There are two sets of commands available to the player. The first set controls the ship itself.

They are: 1, Warp engines; 2, Short range sensors; 3, Long range sensors; 4, Phasors; 5, Photon torpedoes; 6, Shield control; 7, Damage control; 8, Computer on; 9, Damage repair; and 10, Communications.

The warp engines are *Enterprise's* prime mover. On issuing command 1, you will be asked to lay a course and a warp factor. The course is obviously the direction you want to move, while the warp factor governs the distance you want to move.

Here is one of the most important skills the captain of *Enterprise* must have. The galaxy is mapped in rectangular co ordinates (so many down, so many across), but *Enterprise* sets course and aims photon torpedoes in polar co-ordinates (turn to such-and-such an angle, move so many units).

Being able to convert one to the other is crucial.

Guessing The Co-ordinates

Actually, it's possible to guess the figures closely enough to succeed most of the time. For example, moving one sector across and one up is a course of 45 degrees and a distance (warp factor) 0.15

(near enough). If you want to calculate the values properly, there's the basic maths.

The course is calculated using a simple trigonometric formula.

$$C = \arctan(y/x)$$

where y is the number of units up (minus for down) and x is the number of units to the right (minus for left). So, to move three sectors to the right and four down, the angle is:

$$C = \arctan(-4/3) = -53.13 \text{ degrees.}$$

Now Star Trek expects all angles to be between 0 and 359.99 degrees, so add 360 to this to get the answer of 306.87.

Bear in mind $-y/x$ is equal to $y/-x$. This means some answers will be out by 180 degrees. You can spot this by remembering in which quadrant (in the trigonometric sense) your course should lie. So, to move three left and four down, we have:

$$C = \arctan(-4/-3) = 53.13$$

which is obviously wrong. In fact, the correct answer is $180 + 53.13 = 233.13$ degrees.

The warp factor is calculated using Pythagoras' Theorem. To move x across

and y up, square x, square y, add the two together and take the square root of the result. In other words:

$$W = \text{SQR}(x^2 + y^2)$$

So, to move three across and four down, our warp factor is:

$$W = \text{SQR}(3x3 + 4x4 = \text{SQR}(9 + 16) = 5$$

The best way to calculate these out is to use a calculator with rectangular to polar conversion; that takes care of the sign ambiguities. In the course calculation and performs both calculations at the same time.

Defending The Big E

The short range sensor scan shows the contents of the quadrant you occupy. *Enterprise* is indicated with an E, starbases with a B, and klingons with a K. Stars are stars, of course.

The long range sensor scan shows the contents of adjacent quadrants as a three-digit number. The most significant digit is the number of klingons, the next digit is the number of starbases and the least significant digit is the number of stars.

Enterprise has two weapons systems,

```

SHIELDS 500 ENERGY 2500.4 PHOTONS 10 STARDAYS 30.7539
COMMAND? 5

DIRECTION? 225

34.789 UNIT HIT FROM (5,8), LEAVING 465.211
72.5128 UNIT HIT FROM (3,3), LEAVING 392.698
22.8413 UNIT HIT FROM (7,1), LEAVING 369.857
(1,5) E
(2,4) .
(3,3) K
SHIELDS DEFLECT TORPEDO
COMMAND? 4

PHASERS LOCKED ON TARGET. ENERGY AVAILABLE= 2500.4
NUMBER OF UNITS TO FIRE:? 500

45.0075 UNIT HIT FROM (5,8), LEAVING 324.849
72.3199 UNIT HIT FROM (3,3), LEAVING 252.53
27.142 UNIT HIT FROM (7,1), LEAVING 225.388
103.84 UNIT HIT ON VESSEL AT (5,8), LEAVING 96.1603
71.6781 UNIT HIT ON VESSEL AT (8,8), LEAVING 120.322
71.725 UNIT HIT ON VESSEL AT (7,1), LEAVING 120.275
COMMAND? _

```

```

YOU ARE PRESENTLY BEING ASSIGNED TO A MISSION...
WITH A FAILURE FACTOR OF 12.5
GOOD-BYE, SIR...
OBJECTIVE: DESTROY 17 KLINGONS USING 4 STARBASES IN 40.2479 STARDAYS.

BE ADVISED, YOUR MISSION PROGRESS FACTOR IS 2.36753
THE TOLERANCE FACTOR FOR THIS MISSION IS [+/-] 13.125 PERCENT

QUADRANT (3,5)
SECTOR (1,7)

SHORT RANGE SENSORS
. . . . . E .
. . . . . * .
* . . . . * .
. . . . . * .
* . . . . * .
. . . . . * .
. . . . . * .
. . . . . * .

SHIELDS 0 ENERGY 3050 PHOTONS 10 STARDAYS 40.2479
COMMAND? _

```


phasors and photon torpedoes. It also has a defensive shield. The klingons have similar weapons (although they've never fired a photon torpedo at me.

Phasors automatically lock onto their targets. You control the amount of energy to fire, bearing in mind the distances of space will attenuate the phasor fire (presumably the inverse square law applies).

Consequently, only a fraction of your phasor fire will actually hit your target(s), draining their shield energy. When the klingon's shield energy reaches zero, he is destroyed.

Meanwhile, the klingon ship is firing back at you, draining your shield energy; so you have to keep an eye on that situation too. The idea is to destroy the Klingon ship without wasting energy.

Photon torpedoes are fired in a particular direction, which can be calculated as above. *Enterprise* will track the torpedo's course to its target. I'm not sure (I haven't looked at the code), but I think nearby stars exert a gravitational pull on photon torpedoes and can pull them off course.

The various systems on *Enterprise* can be damaged by phasor fire, so you might lose short-range scanners or communications, for example.

Many faults can be fixed by *Enterprise's* crew, while some can only be fixed at a starbase. The damage control and damage repair commands allow the player to control this aspect of the game.

The communications command allows radio contact to be established with Federation HQ or with the klingons (to accept their surrender, for example).

Finally, the computer on command changes the command menu to the computer functions, which are: 0, Galactic memory map; 1, General status report; 2, Photon trajectory; 3, New mission; 4, Present position; 5, Self-destruct; 6, Warp compass; 7, Mission progress report; and 8, Computer off.

These functions are primarily informative, and designed to assist the captain of *Enterprise*. For example, the computer can calculate the direction in which to fire a photon torpedo. But it still isn't perfect as it gives you a high and low estimate, between which you must choose the correct trajectory.

The galactic memory map is compiled by the computer from long range scans and shows the sections of the galaxy *Enterprise* has visited and knows about. This is particularly useful for finding starbases

when you're damaged or running low on energy.

The computer commands will provide other information, such as a progress report on your mission, your position and a warp-compass to remind you of how to express course headings. You can also request a new mission or, if *Enterprise* looks like falling into enemy hands, order the self-destruction of the ship.

The game is full of unexpected twists. For example, you can be up to your neck in klingons, fighting madly, when the computer will announce a starbase somewhere else is under attack and you have only a few stardates to save it! Allowing starbases to be destroyed is frowned upon by Federation Command.

Similarly, your navigation must be precise. You cannot pass through a star, for instance; *Enterprise* will automatically shut off its engines and delay you while they are restarted. This means there is quite a bit of close-range maneuvering to avoid stars (and get close to klingons). And long jumps across the galaxy are risky because there's more chance of hitting a star.

Games can take anywhere from 30 minutes to several hours, depending upon

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the level of difficulty chosen.

Looking On The Inside

In its internal workings, Star Trek is similar to Adventure. Many of the techniques it pioneered were used in adventures. The major difference is that adventure games depend upon what seems to me to be inspired guesswork (who

could predict letting the bird out of the cage would...), whereas Star Trek depends upon purely rational skills, which can be developed.

In particular, the ability to deal with the simple mathematics of navigation is the kind of thing some people enjoy but others don't. Still, you can still navigate by guesswork and do surprisingly well.

As it was originally designed for large time-share systems and was a pioneering game, Star Trek has now largely fallen by the wayside.

That's rather a pity because it's still a hugely enjoyable game and, as it's written in BASIC, you can tinker with it and add features yourself (as well as finding out how it works).

Star Trek is available for many machines. There's a huge version in the Creative Computing Book, *BASIC Computer Games* — and I do mean *huge*!

Several versions are available from the CP/M Users Group library; the version I've described above is STRTRK/3.ASC from Volume 21. And there's another version in that volume (miscellaneous MBASIC games).

I obtained my copy from the Mi-Computer Club, 55 Herbert Street, Artamon 2064.

The MiCC can also supply an Apple CP/M disk with the two Star Treks and some other games. The cost in both cases is \$10, including postage and packing. □

```

      . . . . * . . . K
SHIELDS 300    ENERGY 1361.43    PHOTONS 9    STARDAYS 38.6859
COMMAND? 8
COMPUTER ON--COMMAND? 4

QUADRANT (4,4)
SECTOR (1,5)
COMPUTER ON--COMMAND? 2
COORD      LOWDIR      HIGHDIR      DIST
-----
(8,8)      290.266      300.473      7.61577
(7,1)      232.961      239.189      7.2111
COMPUTER ON--COMMAND? 0
QUADRANT CODE MEMORY MAP
??? ??? ??? ??? ??? ??? ??? ???
??? ??? ??? 7 3 3 ??? ???
??? ??? ??? 1 8 3 ??? ???
??? ??? ??? 208 1 5 ??? ???
??? ??? ??? ??? ??? ??? ??? ???
??? ??? ??? ??? ??? ??? ??? ???
??? ??? ??? ??? ??? ??? ??? ???
COMPUTER ON--COMMAND? _

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7:00

WHRRR... WAKE UP MR SMITH PLEASE.....

UH... AHH SHUT UP YOU STUPID HEAP OF JUNK

* YOU'RE SPEAKING INCORRECTLY MR SMITH -

CHUGGA CHUGGA

ARR... OKAY! 1Ø?" I'M UP, I'M UP!" 2Ø END

* THANK YOU MR SMITH, NOW HAVE YOUR BREAKFAST.

1Ø?" HANG ON"

* YOU'RE LATE FOR WORK YOU MISERABLE HUMAN...

1Ø?" @MØ?"

OFFICE

* NOW GET TO WORK...

GET TO WORK

SYSTEM-ØØ MK II

1Ø?" THINK" 2Ø GOTO 1Ø

* COFFEE BREAK

URK!

1Ø?" MISSED 2Ø?" IT!" 3Ø END

THEN.....

PEEK

1Ø?" OOPS!" 2Ø?" I PEEKED WHEN I MEANT TO POKE!

* FOOL, YOU MADE A MISTAKE.....

PEEK ||

RUN

1Ø REM ***** WELL LETS SEE WHAT IT WOULD DO!

* NO, NO!

1ØØ?" TOO LATE"

* IDIOT... IDIOT... STOP *ØM SYNTAX ERROR

2ØØ?" OH DEAR"

* WHIZZ, CLUNK, BEEP * WHOOOOO HOO!

1Ø?" SAY, THIS ISN'T TOO BAD!

BUT OVER AUSTRALIA

CLICK, CLICK

THE MAIN COMPUTER WAS GOING HAYWIRE !!

UNTIL.....

DOO ABC

SHUTDOWN.....

AUSTRALIA WAS IN CRISIS - NO ONE KNEW HOW TO DO MANUAL LABOUR!

1Ø?" HOW DO YOU PROGRAM THIS THING?" 2Ø INPUT BØ

EVEN LES BELL COULDN'T FIX IT!

? ?

SO AUSTRALIA HAD TO GO WITHOUT THE COMPUTER - SO HOW DID THEY COPE?

BANG!

WELL AFTER WE LEARNT MANUAL LABOUR, THERE STILL REMAINED THE LANGUAGE..

SO LES BELL BROUGHT OUT HIS NEW MAGAZINE...

YOUR DICTIONARY

1Ø?" WHAT ON EARTH"

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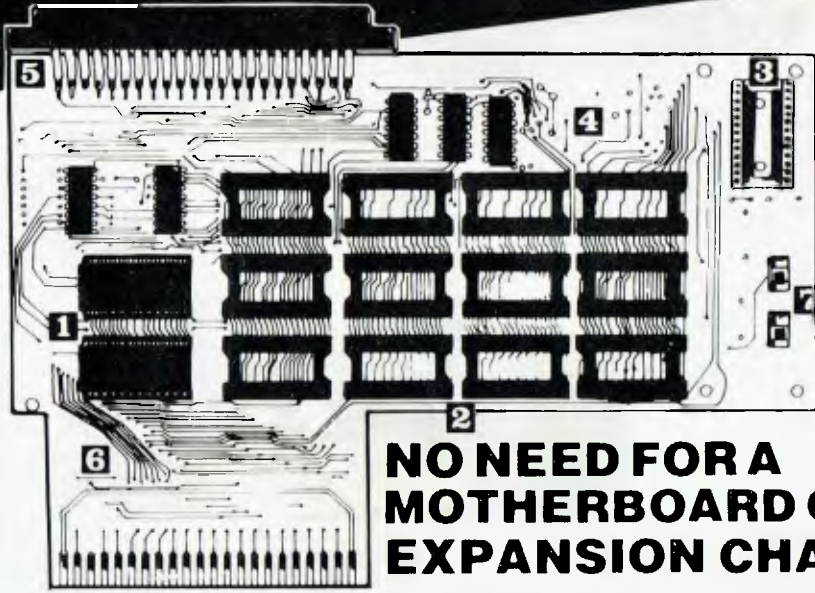
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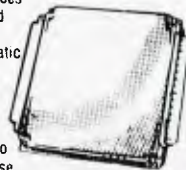
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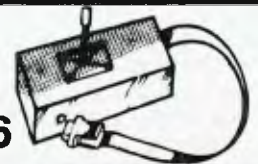
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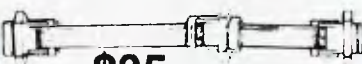


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VIC 20

MORE SOFTWARE ARRIVING ALL THE TIME

CAVERN OF MORDIA

WHERE FANTASY MEETS COMPUTER SCIENCE

by Stephanie Blackett

"YOU ARE dead", the screen said. It had taken three days, but I had succumbed at last to the hazards in the sinister Caverns of Mordia.

J.R.R. Tolkien's *The Lord of the Rings* has inspired two University of New South Wales scientists to create a fantasy war game for microcomputers called *The Caverns of Mordia*, a game as sophisticated and brain-teasing as *Space Invaders* is artless and mind-tenderising, and just as addictive.

The game is a lot of fun. I am witness to grown-ups transfixed before the cathode ray tube for hours, days, even weeks, defying Sharnoscet — the Evil Spirit of Mordia — and his monstrous minions.

One does need a home computer, preferably an Apple II, to actually play the game. But the game's manual is an art work in its own right. It is here that the authors, Hans Coster and Tony D'Assumpcao, have almost beaten Tolkien at his own game: fantasy.

Dr Coster, an associate professor of physics, developed the idea, wrote and endlessly elaborated and refined the program — and drew some of the illustrations. Mr D'Assumpcao did most of the drawings and printing. Together they constructed the monsters, hazards, goodies, baddies, equipment and weapons — and their context and histories.



The parts form a story, and a quest:

The adventurer must deliver the Orb of Power, on behalf of the mighty wizard Pallandoin, to beautiful Lady Elleda, who dwells in the mystical land of Locklorien.

Locklorien is under siege by the evil spirit Sharnoscet and will fall unless the orb reaches Lady Elleda.

To reach Locklorien the adventurer must penetrate Sharnoscet's liar, the caverns of Mordia, where he faces many monsters and hazards.

The game had me on tenterhooks. The program simulates each monster, hazard

and combat mathematically. The game is so multibranching that it was impossible for me to predict even the probable situation very far ahead. The program is so complex that it only just fits into the Apple microcomputer.

Before entering Mordia, the adventurer is given a net for trapping dragons, a dagger, the Orb of Power, the magic staff, the wand and a lamp. With gold, he can buy at the dwarf trading centres (near the entrance) a gas mask, the double-headed sword (magic) and lymphas (a magic food).

He will eventually find, if he stays alive long enough, flares to blind adversaries, the charm ring, more gold, the dragon ocular for assessing the strength and agility of dragons, and the mithril armour.

Powers Of The Magic Staff

Each piece of equipment has a special use, depending on the monsters and hazards confronted; these are often multiple and interacting. The magic staff, for example, is an artifact of the Great Ones of old: "Although it looks to be jet black at first glance, the staff is not really black as such but more a solid hole into which nothing enters and from which nothing escapes.

"Essentially evil, the staff is also very intelligent. A powerful spell has been put on this prince of the night by Pallandoin, so it is forced to aid you against its will.

Serpent



However, it can defy the spell on occasion, and if you invoke its power it may lash out against you, thereby causing you considerable damage. If the spell put on it by Pallandoin holds, however, it will eliminate all hazards and monsters in the room."

The mithril armour is made from "the most precious of all metals. No samples of this rare element can be found today, but it is thought that it is a very pure form of platinum crystals which only the elves knew how to work into items of incredible lightness and strength.

"Although never to be found in abundance, there were enough deposits of mithril in the caverns of Mordia to entice the greedy dwarves into mining them. Indeed mithril and gold mining were the mainstay of the economy during the prosperous, if brief, dynasty of the dwarves."

In the caverns live many monsters under the influence of Sharnoscet. As the adventurer descends deeper, the evil grows stronger and the monsters more menacing. Some monsters are found at all levels, their powers intensifying with depth; others of ever greater perniciousness appear at particular levels and beyond.

In the caverns the adventurer confronts orcs, who are belligerent but cowardly; dragons, who are powerful and can strike and breathe fire; trolls, who guard the mithril armour; vampire bats which move around, generally in swarms; balrogs, the

ultimate monster; demons, who curse you and sap your agility and strength; Araneida, a giant spider which lives in tunnels; cave goblins, who try to steal your dragon ocular; and serpents, which bite when disturbed.

With each encounter the adventurer acquires experience, which can be exchanged for strength and agility. The defeat of the monster depends on, and also adds to, experience.

Each species of monster has special characteristics which define its aggressiveness, combat ability, mode of attack, tenacity, strength and agility. The computer simulates these characteristics mathematically.

When a monster is encountered, there can be a variety of outcomes depending on whether the adventurer decides to attack or run, who strikes the first blow, the monster's characteristics, his present constitution, the weapon the adventurer chooses to fight with, the adventurer's own strength and agility, and the equipment he has acquired.

"In combat the dragon frequently strikes with his long tail to deliver a first blow. His most frightening feature, however, is his ability to breathe fire when provoked. It is precisely this devastating power of the dragons that enabled them finally to oust the dwarves from the caverns of Mordia. Fighting with their traditional axes, the dwarves could not cope with the long-reach fire-breathing attacks."

Indication Of Suicidal Tendencies

Balrogs are the most pernicious monsters. Engaging a balrog in combat without enough experience, strength, agility and the right equipment "is a sure indicator of suicidal tendencies on your part".

Cave goblins, however, are a complete change of pace:

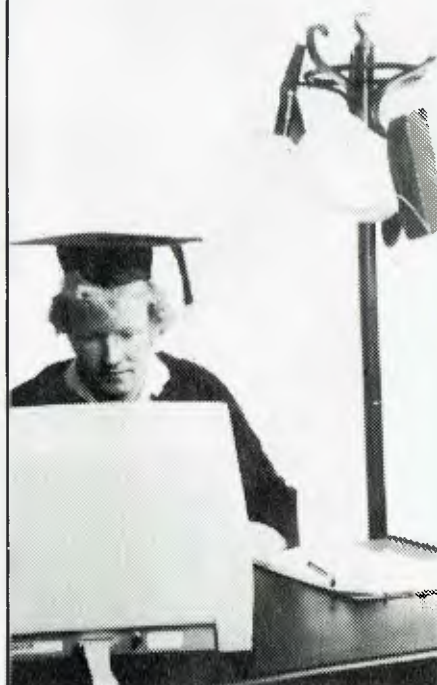
"These rather anaemic creatures are the descendents of the firece goblins that were the earliest known inhabitants of the caverns of Mordia."

The goblins were driven deeper into the caverns when the dwarves began mining mithril. Many were slain and more died of starvation.

The last goblin king used his dwindling magic power to forge the dragon ocular, which allows the adventurer to determine the constitution of any dragon he meets.

"The few cave goblins that remain, their physical and mental strength greatly diminished by generations of harsh conditions and inbreeding, do not pose a direct

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We failed with Albert Medwick.

"Modern office" he sneered. "What was good enough for my grandfather is good enough for me." Then he smiled.

"And data management — another one of them fancy terms I can do without."

Poor Albert. We obviously hadn't got through to him. He's locked in the past, ignorant of the technical and managerial changes that make today's administrators expert in fields that didn't even exist a few short years ago.

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threat to adventurers. However, stealth and furtiveness make up for what they lack in strength.

The cave goblins are undetectable because they are nearly invisible and move silently. They also have excellent senses of smell and hearing. Their eyes can see in the infra red, so they can detect others by their body heat; being cold blooded, they are not themselves subject to detection by this means."

They are master pickpockets. "They will always seek to retrieve and hide the dragon ocular when it is discovered. They can therefore indirectly hasten the end of an adventurer foolhardy enough to enter the sinister caverns of Mordia."

The adventurer faces other hazards: poisonous gas, holes in the ground, draughts that blow his lamp out, tremors and giant spider webs.

The skill in the game lies in making the right decision — or at least a safe decision — in each predicament. The choice is so wide and the ramifications of each decision so far-reaching that the game has the feel of chess, with fewer restrictions and more imaginative alternatives but less vision of what may lie ahead.

Dr Coster wrote the original program for fun, with his children, Adelle, 12, and Leonard, 13, in mind. The family is very fond of Tolkien.

He was one of the first people in Australia to have a personal Apple II. He bought it in 1978 to do scientific work at home. He also used these machines in his laboratory and realised their amazing capabilities.

The programs being written for the Apple II were not using it to its capacity, as seen from the gymnastics he could get it to perform in his lab.



More Than Frivolous

It became a challenge then to explore its talent for fun and games.

And he had a higher-level motive: computer games are far from mere frivolous entertainment, he said. They have contributed to science.

"In the past few years, software know-how has been accelerated by game playing programs involving strategic concepts which can be applied to more serious scientific work.

"Game playing has been an incentive for research in software which parallels the use of computers in scientific experiments."

Computer hardware has become smaller and cheaper, but the real boom in the application of computers to science and to games, Dr Coster says, has taken place in the software, which has outpaced the hardware.

"The Apple hasn't changed much in the last three or four years, but what can be done with it has changed enormously."

Over a year the adventure of Mordia was elaborated, becoming more and more complex in the integration of events. Friends — adult and child — flew in and out of the Coster house like blowflies to play in Mordia, some settling in front of the Apple for days or longer before they flew away.

Copies of the early program "floated around" at the University of New South Wales, Dr Coster said. His students played it in the lab whenever they thought they could get away with it. It even made its way into schools. Leonard's maths teacher had a copy he'd received from someone in Liverpool.

Mr D'Assumpcao, a keen adventurer, joined Dr Coster in the venture at this point, applying his talent for fantasy and artwork to help produce the manual. And the program became even more complex.

A computer shop then suggested Dr Coster sell the program and manual as a package to a commercial software house.

The game has been on sale commercially in Sydney for only a few months and costs \$59 for the booklet and disk. The booklet is printed on bright tangerine paper which cannot be copied by regular photocopying machines, while the program itself has an elaborate anti-copying formula. □

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A FEST OF APPLES

NATIONAL Apple distributor Electronic Concepts (Elcon) has pulled off a magnificent publicity coup to promote the Apple as the personal computer in the eyes of the public.

Under the banner of Applefest '82, Elcon's Rudi Hoess and his dedicated team planned and executed an all-Apple exhibition which filled two floors of Sydney's Centrepoint convention centre.

The idea was born while Rudi was in the United States in December. A phone call back to Australia set the wheels in motion, with Apple agreeing to pay at least part of the promotional costs. Dealers were contacted to take part in the exhibition and the Festival of Sydney Committee agreed to make it part of the Festival. A multi-station radio advertising campaign helped bring people through the doors.

The most important event of the Applefest was the (re-)release of the Apple III computer and the matching Profile five-megabyte hard disk. The III has given Apple a hard time as it strove to iron out the machine's bugs, but according to Apple executive Phil Roybal (here for the show) the problems have been solved.

In the meantime, he said, Apple has been shipping IIIs to software developers and others for more than a year to ensure the software vacuum would be filled.

The Apple III, which we first described in *Your Computer* last May, is designed specifically for the business and professional user. Although it uses the same microprocessor as the II (and can run Apple II software in an emulation mode), it can handle much more memory - up to 256 Kbytes. It has a full keyboard with a numeric keypad and an integrated disk drive.

The III uses an 80 character by 24 line display, a significant improvement over the II. The software is much improved, too, with a proper disk operating system called SOS (Sophisticated Operating System) and Business BASIC, Visicalc III, the Apple Writer III word processing package and other options.

But back to Applefest. Almost 40 exhibitors took part, all selling either Apples or products related to the Apple.



Electronic Concepts was obviously a major exhibitor, with the Apple II, Apple III and even a genuine original Apple I on display (complete with optional cassette interface!).

Among the more interesting of Elcon's products was a 6809 processor card for the Apple, allowing the machine to run a wide range of software including Micro-ware's OS/9, which bears a family resemblance to Unix.

Ampec Electronics displayed the Itoh range of printers, including the 8510, which was reviewed in the December issue. Ampec's Stead Denton recently gave us a preview of some forthcoming machines from Itoh, and we can tell you there is some interesting machinery coming down the track.

ACS Discovers The Micro

The Australian Computer Society was there, busily selling copies of its Small Business Computer Guide. It's good to see that the ACS realises micros exist; but its whole structure will have to change

radically before it becomes any use to the micro user.

Butterworths and the ANZ Book Company were there with their ranges of books, including Sybex and software from Hayden.

Case Computer Systems exhibited its new seven-colour printer. This is a magnificent little device which will run at up to 125 characters per second, is ideal for business graphics, computer aided design and even financial analysis (to see where you go in the red). Priced at just under \$2000, it is sure to be a winner.

City Personal Computers carried off something of a coup. Owner Peter Hatcher had just returned from England with stocks of a new line of peripheral cards from Digitek, including a cheaper PAL colour card with built-in RF modulator and obviously superior reproduction quality.

Another star on the CPC stand was the Multiport — stocks of this new extension adapter for the Apple games port disappeared during the show, and most sales were to dealers! The Multiport was locally designed and built, by YC contributor Bref Ruhl.

One of the busiest men at the show was David Diprose of Computer Galerie, whose stand was crammed with books, computers and software. The stand was also packed with people, so although I didn't get a chance to talk to David, I gather he would have thought the show a success.

Ian Phillips, of Computer Solutions, is the man behind the Zardax word processor. The Computer Solutions stand was well attended whenever I walked by, and reports from a number of users indicate why. One chap swears he'll never use anything else.

The Computerland chain of stores was well represented, with both Computerland Australia and Computerland of Sydney in attendance.

Control Data Australia is a division of the giant mainframe manufacturer; what many people don't know is it also offers third-party maintenance agreements on other equipment. It displayed the use of a logic state and timing analyser in examin-

ing the bus signals of an Apple.

The NSW Department of Education put on a display of how Apples are used in the classroom.

Electromedical Engineering displayed the Sendata range of acoustic couplers (reviewed in our September issue). If you don't have an acoustic coupler on your computer, it's something you ought to seriously consider.

Tasman Turtle Popular

One of the most popular exhibits was the Tasman Turtle display of Flexible Systems. The turtle is a small dome-shaped robot, attached to an Apple via an umbilical cable. It can move around, turn, beep and raise and lower a pen. By selectively moving and lowering the pen, the turtle can draw geometric patterns. Programmed in a simple language, the turtle is a fascinating introduction to computers.

Global Computers, of North Sydney, had the Padmede accounting system on its stand. At last we are starting to see useable accounting packages for small computer systems.

Jodi Rich, of Imagineering, had an innovative way of getting his company's name around. He sold T-shirts on the stand, but offered a special price to anyone who would change into one and wear it around the show! Imagineering has a huge range of software for the Apple, including both games and serious stuff.

Roger Walker, of Intelligence Australia,

was demonstrating the MicroModeller financial analysis package, which is reviewed elsewhere in this issue.

Printer manufacturers were particularly well represented: Diablo from Mitsui Computer Systems, the NEC Spinwriter from NEC Information Systems, Olympia and Olivetti electronic typewriters and the Epson range from Warburton Franki were all on display.

Brookvale-based Orbital Music's stand was easy to find — as long as you were within earshot. Its music synthesizer system was generating everything from symphonic string tones to farmyard animal noises!

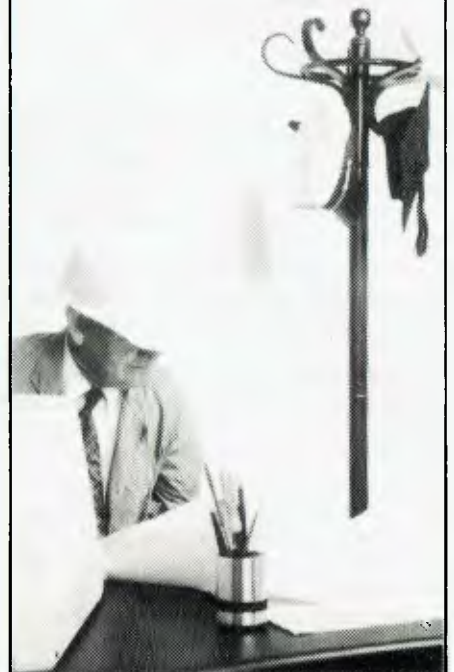
Six-S Business Advisory demonstrated its business, accounting and word processing packages. As satisfied users of Six-S software, we can attest to the quality of the accounting system; we hear the word processing pack for the Apple III is a ripper!

Zenith Education Software provided demonstrations of its educational courseware, which is finding wider acceptance daily in Australian schools.

Harry Harper, of Zofarry Enterprises, demonstrated the latest version of his Vision-80 video card — and it looked really smooth; we tested its communications features by logging on to the Mi-Computer Club Bulletin Board.

Among other interesting displays were those by NSW Institute of Technology School of accounting, the University of NSW, and the Spastic Centre of NSW. □

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**EDUCATIONAL
SOFTWARE
BUYERS GUIDE**

TANDY'S EDUCATIONAL COURSEWARE

by Dr John Barrett

THE Tandy Corporation has made a sizeable commitment to education micro-computing and computer literacy, as it obviously recognises a huge world-wide market.

This is reflected in Tandy's marketing structure and approach. Mr Mike Leehman has been appointed educational sales manager, to establish the educational division throughout Australia. He is based in Sydney.

Tandy has established ten computer centres, eight with classrooms. And there are 17 computer departments in its retail stores.

For example, at Crows Nest, where Mr David Brown made this review possible, demonstrations and information is given on the educational and business applications of the TRS-80 and peripherals by a well-trained team. Classes in BASIC and business applications are held in a specially designed and arranged classroom.

The computer classroom consists of a main 'host' computer equipped with disk drive, operating through the Tandy Network II Controller to 16 separate TRS-80 student stations. The unit enables the teacher to upload and download programs and to keep track of program transfers through LED indicators.

A similar system has been installed at Polding College, Castle Hill, where it is used extensively in training teachers for the New South Wales Catholic school system.

With the introduction of the Model III in 1981 and the Color Computer last January, plus the development of further software, we can expect Tandy to be well represented in the educational market in Australia.

However, the lack of colour in programs reviewed did not create any great disadvantage. Although some math graphs would have been more spectacular and possibly more interesting, I was able to concentrate on the key points and not just the show. I found the presentations, with large lettering, very clear and particularly easy on the eyes.

Solo Learning Approach

Tandy's approach has been to develop educational programs for business, home and school use. The difference in emphasis is that the Personal Education Software does not require a separate guiding teacher. It can be used by individuals in company training courses or at home, where learning can take place at a leisurely pace and where there is no threat.

This is particularly important for adult learners who probably suffered some 'traumatic' experiences in their early years of schooling especially in maths.

Programs are very well documented and come in a substantial ring binder (some had poor closure of the rings which became most frustrating as pages caught in the gap!) with specially-made holders for tapes and/or disks, as applicable. Each folder contains a good introduction, describing the program in general terms; a preface, giving more detailed features; and a detailed table of contents.

Content is excellent with each manual indicating the organisation of the teaching program and curriculum details. After a section on the structure of the program, a 'How to Use the Program' takes a user (usually the teacher) through a series of steps from loading the tape or disk to a well presented sequence of exercises, explanations and examples. Further details about educational aspects and computer programming aspects are then given.

Appendices come next, with full details of all lessons, content description and examples. This is usually followed with a section on Planning Your Application, which gives some ideas for appropriate use of the programs. It concludes with some 'technical' information on aspects such as making backup copy from disk or tape, and conversion and maintenance procedures.

For the presentation of computer program information, the sample runs photographs of what will appear on the screen, while the more detailed aspects of curriculum (content and concepts) provide invaluable information for the user. In fact

all producers of educational software would do well to present documentation of both the computer program's structure and function, and details of the educational curriculum in the pattern established by Tandy.

Personal Education Software

Programs in the category Personal Education software include:

Math I: Drill and practice of very fundamental multiplication, division, addition and subtraction. The thrust is repetition and review of basic arithmetic facts for beginners or those having difficulties with foundation maths operations.

Algebra I: Six self-paced lessons covering variables, constants, terms, expressions and use of parenthesis; equations, and how to solve them; real numbers; multiplication of factors; powers of signed numbers; formulas and factors; and quadratic equations.

Alpha Key: For 4-6 year olds, a drill and practice program which teaches the alphabet, using the computer keyboard.

Show and Spell: A game involving the mastering of fundamental spelling skills. An interesting package with some neat programming techniques.

IQ Builder: Covers some aspects measured in IQ tests, such as analogies, number series, vocabulary (synonyms and antonyms). Practice and progress testing is incorporated in the program.

Instruction in the BASIC computer language can also be included in the home/work/school category. Four BASIC programs are available for use with the TRS-80: Level I BASIC; Level II BASIC — introductory and advanced; and Disk BASIC Instruction, covering Model I DOS commands, random and sequential files and all disk additions to Level II BASIC.

Each program is an interactive self-paced course. However, a complete teaching package of programming concepts in BASIC (Level I), including a teacher's manual, 143 transparencies and a set of 25 workbooks, may be purchased from Tandy.

Any of the above programs would be quite suitable in school usage for self-paced learning, or as a component in a computer literacy course. They are the kinds of programs students can use outside the normal confines of the classroom — in recess or after school, in a section of the library or even in a student common room!

Computer-Managed Instruction

Tandy has one special program and two other components which provide classroom management assistance to the teacher.

K-8 Math: (For kindergarten to eighth grade.) With the use of a printer, the teacher is able to generate a number of hard copy worksheets for classroom use. Also, as indicated separately in this article, a substantial student management system can be employed to assign and keep track of a large group of students on the course.

Teachers Aid: This is a true management system which will calculate student grades; assign classroom seating; keep track of absences; store information on tardies, overdue books and report cards; and maintain up-to-date student personal information files for as many as 35 students.

As for testing, the program allows the entry of new raw scores, converts raw scores to letter grades (under teacher assigned weighting) and creates and saves a cumulative record.

Authoring Programs

There are two programs which act as facilitators of lesson preparation or in creating classroom tests:

Quick Quiz: Is a test creation program. It allows production of 40 multiple choice questions, with up to 4 choices per item. The test can be given to a maximum of 50 students. Each score is transferred to the TRS-80 (Model I or III) disk file for review at a later time.

The test created via the program can be modified in any way and be stored on disk. Students can do the test on computer, or multiple copies may be generated through the printer.

TRS-80 Pilot Plus: An author language based on PILOT which enables the user (teacher) to create or adapt courseware from an educational curriculum. Assistance is provided for graphics generation for CAI and student file handling for CMI (computer-managed instruction).

Your Computer will publish a review of author languages and packages in a future issue.

Research and Reporting

There are two Tandy program packages which could well be considered

aids to data processing for research or reporting purposes, these are:

Statistical Analysis: This consists of eight computer programs. Five programs are for describing data sets and conducting statistical analyses; two for preparing, updating and listing data files stored on tape; and one to help in selection of data samples.

Statistical analysis covers random sampling, descriptive statistics, histogram, T-tests, simple correlation and linear regression.

Advanced Statistical Analysis: As the name suggests this program builds on the areas mentioned about providing additional information where appropriate. The program also performs analysis of variance, multiple linear regression, time series analysis and CAI - square analysis.

Both programs are designed for people 'who know what they are doing', so the manual warns of some pitfalls for the unaware! However, particularly at the tertiary level, these programs could well provide valuable teaching aids in beginning statistics courses, for the analysis of data in laboratories or workshops, or for data analysis components in research courses.

Teaching And Learning Courseware

K-8 Mathematics with Student Management: This is a self-paced drill and practice program based on the number concepts of addition, subtraction, multiplication and division for kindergarten through to eighth grade. The main features of the program include:

- Student placement — the program (on request) will automatically determine the most appropriate grade and lesson level for a student.
- Skill building lessons — the program looks at students in a progressive manner and automatically advances each student as they master each lesson.
- Testing mode — the instructor has the option of testing a student at any time. The number of items may be varied and the student's response time during the test is shown at the end of the test.
- Student management — ensures the student is automatically presented with the appropriate lesson at each session and keeps a record of each student session. This can be viewed by the teacher at a later date.

Content is arranged as a general introduction to mathematics for kindergarten to third grade. Known as the Horizontal Program, it covers number concepts and addition and subtraction for first and second grades. Third grade then progresses to multiplication and division. Vertical program, the fourth operation, contains lessons of increasing difficulty for the remaining grades.

Specific computer program details are:

- Sessions can be set by the teacher to present a specified number of problems in a specified time.
- A time-out function — prompts appear on the screen after 15 seconds of non-answer delay.
- The comprehensive reporting system provided at the end of a session displays the total number of problems attempted, number correct, percentage correct, any promotion or demotion and average response time.
- In the test mode the teacher can have the computer either test each student in the class at the same lesson level or let the computer find the last lesson a student completed and test at this level. Control over the number of questions and time allowed is controlled by the teacher.
- A report on progress during skill building or even during a test can be obtained at any time.

Essential Math Program

Similar to the K-8 Mathematic programs the Essential Math Program package is designed to supplement classroom instruction by providing drill and practice for grades seven to 12 in addition, subtraction, multiplication and division.

All lessons for the four operations are sequenced in order of increasing difficulty.



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culty. In the number concepts programs provision is made for practice in a variety of skills and a variety of sequence. Such concepts as place value, rounding and factors are treated and consolidated in further lessons. These concepts are later extended to decimal numbers, prime numbers and prime factors and exponentials.

There are a total of 79 lessons — 45 in addition, subtraction, multiplication and division and 34 in number concepts.

Specific program features are essentially the same as K-8 math, except for the lack of automatic reporting and storage. A reporting function is provided which covers the total number of problems attempted, number correct, percentage correct and any promotions. However, these need to be transferred by the teacher to a student record sheet. It is to be hoped that this aspect would be improved!

The other good features such as placement, skill building and automatic promotion/demotion and self-pacing are included.

Advanced Graphics

The Advanced Graphics program consists of two math programs. — Plotting Functions and Plotting Polar and Parametric Equations.

The program is intended for use by sec-

ondary or beginning tertiary students in analysing equations and plotting their respective graphs. Problem solving including for example, or finding maxima and minima, x and y intercepts and inflection.

These programs are essentially tutorial in nature and allow students to explore various graph functions and such appropriate to mathematics and physics.

The manual takes the teacher or student through the various plotting functions where the domain may be changed or the graph exploded. Similarly, plotting of polar and parametric graphs is carried out with a great deal of flexibility and control in the hands of the user.

Plotting may be investigated by following the very well detailed exercises for both polar and parametric functions and relations.

Specific programming features include:

- The Selected Investigations, which can be modified to suit the specific problem being studied by the class.
- Similarly, additional investigations may be developed by modifying the computer program. The programming guide lists and defines the variable used. There is a line-by-line explanation of strategic steps.
- With the plotting functions it is possible to substitute other equation(s) for the ones contained in the programs (These must be written in correct BASIC).

- Changing the program is very simple. By replacing line 200 the effects of different equations may be explored. This is an example of good tutorial programming — a teacher with little computer experience can adjust a presentation to suit his/her own particular requirements.

Euclid Geometry Tutor

Essentially the Euclid Geometry Tutor is a tutorial program designed to help students prove geometry theories based on Euclidean postulates. The program can demonstrate an automatic solution, provide practice and give a quiz or test.

Quite an intricate computer program is involved, including a special input language for geometrical statements. That is ANGLE . . . is CONGRUENT . . . A teacher would need to know this before classroom use.

A number of command Options enable a user to make extensive use of the program for practice and assessment of achievement.

Interpreting Graphs In Physics

Position and Velocity Versus Time is a physics program which allows secondary students to study rectilinear motion. There are two sections to the program — Position Vs Time and Velocity Vs Time.

Continued on page 67.

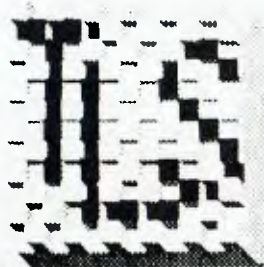
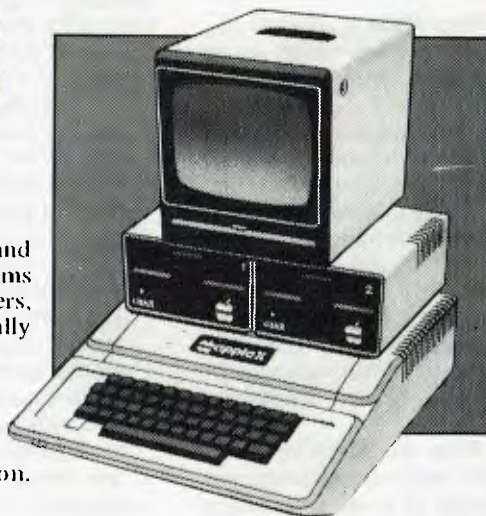


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LSI-024

HEARD ON THE BUS

By LEON YENDOR

THE United States Government, like any organisation of that size, generates some incredibly ridiculous and bureaucratic rules as a result of trying to achieve something in one policy area and not being able to see what harm is done to another.

The ramifications then spread to realms beyond, so let me relate for you the case as it affects us.

In order to protect the lead of the USA over the USSR and her allies in technological matters, and to deny the products of that technology to potential enemies of the USA, laws have been made to prohibit the export of products embodying advanced devices to such countries.

Now in order to monitor the export of these products, the US Department of Commerce requires exporters to have a licence which is supported by a declaration of ultimate destination made by the prospective importer. While this may seem a simple rule, it has problems which really do great harm to manufacturers in the US who are trying to do honest export business with countries like Australia. It also adds to the price *you* pay for the goods, and can delay shipments unduly.

The law allows shipments of goods not exceeding \$1000 to proceed without a licence. But for greater values a licence valid for one year is necessary, and this takes about four to six weeks for the exporter to obtain.

The dollar value of the exports is also a limitation on the term of the licence. Although you may think your licence is valid for a full year, this will not prove to be the case if your volume is higher than expected. In these circumstances you can suddenly find you cannot get out the goods you have ordered until a new licence is issued.

Of course if individual items are valued at less than \$1000, you can break up the shipment and pay the extra freight and handling charges.

Export Rule Stupidity

This is the first stupidity of the rule: if someone is prepared to pay enough then the goods can get out anyway! The second is that the renewal licence takes just as long to be issued as did the original.

While all of this nonsense is very frustrating to the importer, it also is a costly process for the exporter. Some manufacturers in the US refuse to make export sales and leave that business to export agencies.

Very good, you may say, have an agency handle a number of brands and we'll have less hassles with one licence than the number we'd need to deal with



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each manufacturer on an individual basis. Unfortunately, a look at the wholesale prices from these agencies shows their prices can easily be beaten in many cases by buying from a cut-price retailer over there.

I don't propose this as a solution for end-users, because only by buying from a local supplier can you expect any support or warranty which is needed. And one can see the effect the existing set-up generates if you try to find local dealers for any of the brands marketed in this way.

The end result of the attempt to protect the US high technology industries is that the US manufacturer is hampered in his efforts; and thereby, the US balance of trade is harmed.

As one US exporter observed, "the Department of Commerce is, in this context, as aptly named as the Department of Peace in George Orwell's 1984".

Exploitation Of The Situation

It would seem from examination of the above that it is becoming simpler for local manufacturers to compete with American products. While this is true, there are also some products which really cannot be viably produced in Australia in any case. While I welcome the chance for us to produce what we can, we would be hampered in putting together the broadest range of systems if we didn't have access to those other products.

What sickens me about the situation is that some US exporters are using the problems of exporting to wring out extra dollars. While the reality of the extra costs is handled by some in requiring minimum order values, others are pulling the percentage racket. Let me take one outstanding case.

Digital Research of California is the producer of a number of operating systems (notably CP/M and MP/M), utilities for th-

ese systems and a number of languages.

We would be foolish to believe that in a world where the de facto standard operating system for 8-bit micros is CP/M that we could just come up with a substitute. So what is DR doing?

Well, without any export licensing requirements it is putting on a loading for all export orders, not a fixed handling charge but a 10 percent loading on all software and 20 percent on manuals. Fair enough you might think, until you note that if you order one of its utilities, Despool, which lists at \$50, you'll pay \$5 for DR's trouble in handling a foreign customer. If you order DR's PL/-80 language package, however, it will take \$50, because the list price is \$500.

DR is not alone in this racket, but in the hardware field the competition will take care of the greedy. But I'd probably be less upset if its packages were perfect. They are good, but as the charges have gone up the quality really has not.

In general we cannot afford to go some other way, so DR will no doubt continue for some time to use the monopoly situation to wring out the extra cash.

Proving The Case

To prove the case that while DR is getting fatter (sales of more than \$5 million last year) its products are not getting better, I'll take just one example — its new CB-80 Basic compiler.

This is potentially a really great package, allowing old programs to be compiled into fast, tight code and making provision for new ones to be written in a structured, self-documenting manner. It costs \$500 (plus the \$50 fine for being foreign) and as usual the initial release had some bugs.

Like a number of people who've been around a while, I decided to wait for the next version, after the 'me firsts' had done the bug finding for the factory and most were killed. Imagine the reaction of a friend of mine who, on beating me in with my order, received version 1.1 and promptly found any program with transcendental functions caused the linker to hang forever. While no program of this magnitude can be tested for all combinations of generated code, letting out a compiler with such a bug is nothing short of negligent or amateurish.

I call people who overcharge for stuff like that squirrels. They had better get fat while their summer lasts, because they are inviting someone to do a better job for the same price or at least as well for less. When that happens, there will come a long, cold winter. □

Vibco Engineering — A Case Study

VIBCO Engineering often receives suggestive phone calls from people who misunderstand the nature of the 'vibratory materials' it produces.

In fact this company, situated in Auckland's Manurewa, specialises in the design, manufacture and installation of high-technology engineering equipment, concentrated mainly in the fields of air pollution control and materials handling.

The company, once a wholly owned subsidiary of a large public company which had 79 other subsidiaries, was bought out by its employees in 1981. It manufactures the only polymer-based chemical pumps in Australasia and is the sole active licensee producing monomer cast-nylon products in the South Western Pacific.

As a subsidiary company, Vibco had problems. Head office was 600 km away and accounts took between 90 and 120 days to come through. Historical accounting records didn't exist, so the company's idea of whether a profit or loss had been made was pretty vague.

There were problems too with cash flow. Debtor control was carried out from head office. Because the company was so

big and diversified, this job was often delayed.

On the initiative of the managing director, Ron Ackroyd, the Auckland branch became the first of the company to turn to a microcomputer to solve these problems.

Ron's training was in mechanical engineering, so he went to the computer experts to help him explore the possibilities available. He took part in a continuing education course at Auckland University called 'Acquiring a small business computer'.

The course covered what to look for in a small business machine, what its capabilities should be, what capacity it should have and what after-sales support would be available.

An up-to-date list of the machines available in Auckland was provided. There were 64 to choose from.

Choice Is Made

Ron finally chose a Canon BX-1 computer. He was familiar with their office equipment and the firm offered excellent software and machine service. The machine was leased for three years, with the company having the option of buying it for one monthly lease payment at the end of that time.

The terms of the lease included insur-

ance, maintenance and complete replacement of the machine if it is not satisfactory. The lease is tax deductible.

Once it had been leased the machine was immediately set to work to do the company's debtors ledger, statements and aged trial balance. Within eight hours of taking possession of the machine Vibco had loaded the debtors ledger and printed the first run of statements.

Also purchased with the computer was an accounting package for producing a general ledger, profit and loss statement and balance sheets, salaries and wages.

To ensure that no mistakes were made in the statements, the old conventional ledger machine system was continued for three months, so for this time there were two statements produced for each debtor. The only mistake discovered was one on a ledger machine statement.

At the same time Ackroyd used a commercially available salaries' program to do salaries and wages for monthly, weekly and hourly paid workers.

Design Work Too

As well as for general office business the computer is also invaluable for use in engineering design. Suitable software is not commercially available so the firm employs

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an outside programming service.

So far, two major programs have been designed. One is the high-efficiency pollution-control cyclones, those big inverted cones used to extract dust from air.

The principle involved is based on cyclonic motion, which is a vortex of moving air. The cyclones are used in heavy industry, such as steel works and dairy factories.

The design of such cyclones formerly involved several hours of manual labour. Now, data concerning the volume of air to be cleaned, the pressure available and the particle size of the dust, is fed into the computer. The machine calculates the cyclone's size, prints out a table showing all the cyclone's dimensions, calculates the weight of the steel to be used in manufacture and calculates the cost of the steel. A complete printout appears approximately one minute after the data has been fed in.

The machine is also being used to design heavy industrial fans. The input data required is the volume of air to go through the fan, temperature, pressure and height above sea level of the fan's prospective location.

From this data the machine calculates a criterion number, from which a fan type is

chosen by the operator. The machine calculates and prints fan dimensions, critical speeds and horsepower required.

The computer also designs the drive; designs are being arrived at so quickly the operator can afford to repeat the calculations for different types of fans. In the final analysis he chooses the one which is best suited to the task and uses the least power.

Formerly, all fan design was done by a professional engineer who had to make many value decisions and consequently had to be very experienced. The work, with the aid of a slide rule, took several hours. Now, thanks to modern technology, a junior draughtsman can do the same work in a few minutes, with a better end result.

Production Control

The computer is also being used at Vibco Engineering for production control.

The company staff, in conjunction with the programming service, is in the process of designing and developing a package which will analyse and record the labour and materials used in each project. This program will print reports which will enable management to keep a very close watch on the cost of labour and materials. Prior to this method of assessment, pro-

duction control had involved three people recording and collating the information. Reports were tedious to assemble and often late.

The debtors ledger now appears two weeks earlier. The profit and loss statement is run on the 14th day of the following month — up to 120 days earlier than previously.

Vibco Engineering is doing extremely well as a shareholder worker-owned company. Such companies are not common in New Zealand, but this one, employing 21 people, will have a sales total this financial year of about \$1.4 million. And its Canon BX-1 computer is playing no small part in that.

Ron Ackroyd, the managing director, spent some years of his working life in plastics manufacturing; his daily concerns involved such articles as underarm-deodorant containers. Now he gets an enormous amount of job satisfaction, involved as he is in the production of commodities vital for the continued success of the industrial world. And he's making money. □

—Helen Pollock

SMOP, a Rotorua microcomputing company, has put into production a digital race analyser known as the Totebuster, and is

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aiming for world-wide sales. The machine sells for just under \$NZ300, including all taxes.

The Totebuster has some powerful backing. It is actually built to SMOP's design by the giant Japanese calculator manufacturer Shinwa.

On top of this, it has received the vociferous endorsement of New Zealand's Mr Racing, Glyn Tucker. He is the former keeper of the Stud Book, and currently the nation's number one race commentator and soothsayer.

According to Tucker, the Totebuster completely eliminates the possibility of punters "backing horses that can't win".

The Totebuster is remarkable for its compact design. It includes both visual and thermal print out reader. Its CMOS microchip means it can operate for 12 hours continuously, without the need for re-charging.

The development of the Totebuster was only made possible by the availability this year of the CMOS chip, according to the man who developed the system, Melvin Poulsen.

A US based systems specialist, Poulsen originally arrived here to work on SMOP's commitment to pharmaceutical microcomputing. But the Australasian horse racing frenzy led him and SMOP'S

English-born managing director Robin Churchman to seek a consumer opportunity in computerising punting.

The Totebuster is now on sale in New Zealand and Australia. It will be sold in Europe very shortly.

This is how it works: you enter the variables on a digital input. The more favourable the variable, such as rider, weather, horse, owner, trainer, track, jockey, then the higher rating you give a particular horse. On a scale of one to nine you begin at one and move upward, depending on the form.

The little machine can hold memory for the largest number of race entries generally held in Australia or New Zealand. After all the details and value judgements of the runners have been entered, you press another digit, and get your readout. The Totebuster lists the likelies in order of preference — one, two, three, four, and so on.

The initial response from the punting market is promising. According to Glyn Tucker, the discipline imposed by the Totebuster stops punters and their advisors (the racing writer fraternity) from 'waffling'.

Melvin Poulsen etched the program on the microprocessor using an Intel development machine. Shinwa then mass

produced the microprocessor and subsidiary chips. The Totebuster has been developed entirely from scratch. Even the moulds for the stylish casing were made for SMOP by Shinwa.

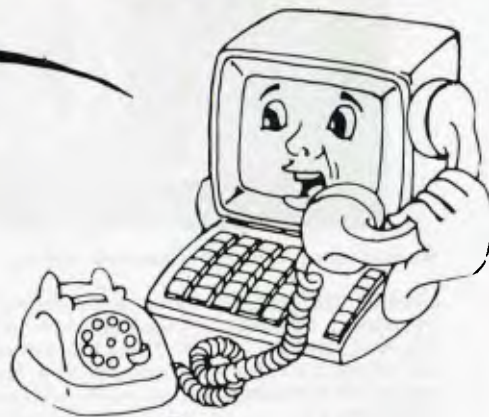
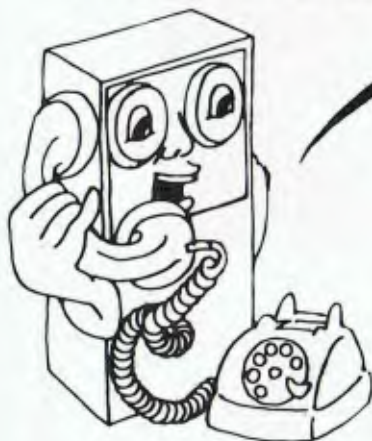
The key thing now is for Totebuster to get the general endorsement of the punting public. The machines are now available on sale in chain stores and electronics shops. The price is reasonable for New Zealand, and initial demand is brisk. There has been television advertising, featuring Glyn Tucker.

The one to nine digital scale of evaluation seems to allow enough latitude for judgement. However, to be operated correctly, the system does call for quite a data base of personal knowledge on form, such as the track records of jockeys, and mounts, plus track knowledge, and understanding of trainers, and even owners.

One of the outstanding aspects of the product is the slickness of the total package. For the \$NZ299 price, Totebuster comes equipped with its own re-charger and a shoulder-sling.

Even more unusual is the fact that the tiny Rotorua development firm got such wholehearted backing from Shinwa, the world's largest manufacturer of 'other brand' calculators — more than 100,000 a week. □

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The 700 Series Acoustic Modem

- Now data bases like AUSINET, CSIRONET, MIDAS & THE AUSTRALIAN BEGINNING are just a phone call away.

If you own a computer system that's been built up from different boards — like an S-100 bus system, for example — then you'll probably find it difficult to remember just what bits connect where, and where you have to jump to run a particular routine. According to LES BELL, the solution is clear-cut; it's

DOCUMENTATION OR DISASTER

The Choice is Yours!

I DON'T know about you, but my computer is in a constant state of flux. There are always new bits and pieces being plugged into it and old ones coming out.

In particular, I'm forever changing I/O driver software, especially the video board driver. As a result, I've never been quite sure of what software and hardware I'm actually using at a given time.

The whole thing came to a head a couple of years ago. I'd recently installed my disk drives and was virtually rewriting whole chunks of I/O code when I realised I couldn't remember which wire was which from the keyboard. Nor was I sure exactly where the memory-mapped video board was located. More to the point, I wasn't quite sure where the manual that would tell me was located!

It took me a day of searching through piles of magazines, tracing ribbon cables, peeking and poking memory locations, and generally fiddling, until I was sure I really knew what was located where and how the keyboard was connected. A whole day wasted, when I could have been playing Star Trek!

I learned my lesson. Ever since then I've kept folders full of notes and updates to documentation. Last month I did another update, moving my keyboard input to another port and installing a new video board driver. This time it only took a morning, and I knew exactly where I was at all times — because my documentation told me.

When you buy your computer system, or any part or board, you will generally receive some manuals, schematics or other documentation; although I've heard of people buying stuff without manuals —

and suffering for it. These manuals are the bare essentials.

De-Bugging The Manual

The first thing I do when I get one of those 32-page stapled manuals is to pull the staples out, punch three holes in the left edge, and put the pages in a ring binder. Schematic diagrams receive special treatment — I reinforce the holes with pads, because they'll take a pounding.

Next (and I still haven't plugged the board in yet) I compare the markings on the dip switches with the notation given in the tables in the manual. Often, switches are marked on/off, while the switch setting tables are marked open/closed or 0/1. Worst of all, they don't always correspond in a logical fashion. After working out which is on and which is off, I mark the manuals so they correspond to the switches. This saves a lot of time and confusion later.

Generally, I also add a little map of the board to the manual, showing the locations of S1, S2 and such. Often, they're not marked on the board, and having the information in the manual helps.

Finally, in the case of a memory board, for example, I record the settings for the board as I install it. This means, should I later move the board to a different location or change some settings, I can restore the system quickly.

Although this might seem a long diatribe on the subject of simple switches, remember just one switch being in the wrong position can render the system completely inoperative, with no clues as to what's wrong.

The only solution, in the total absence

of documentation, would be to permute the settings on upwards of 60 or 80 switches. At the rate of one every 15 seconds, that would take 550 billion years! My conclusion is it's worth a few moments to jot down switch settings!

Noting The Colours

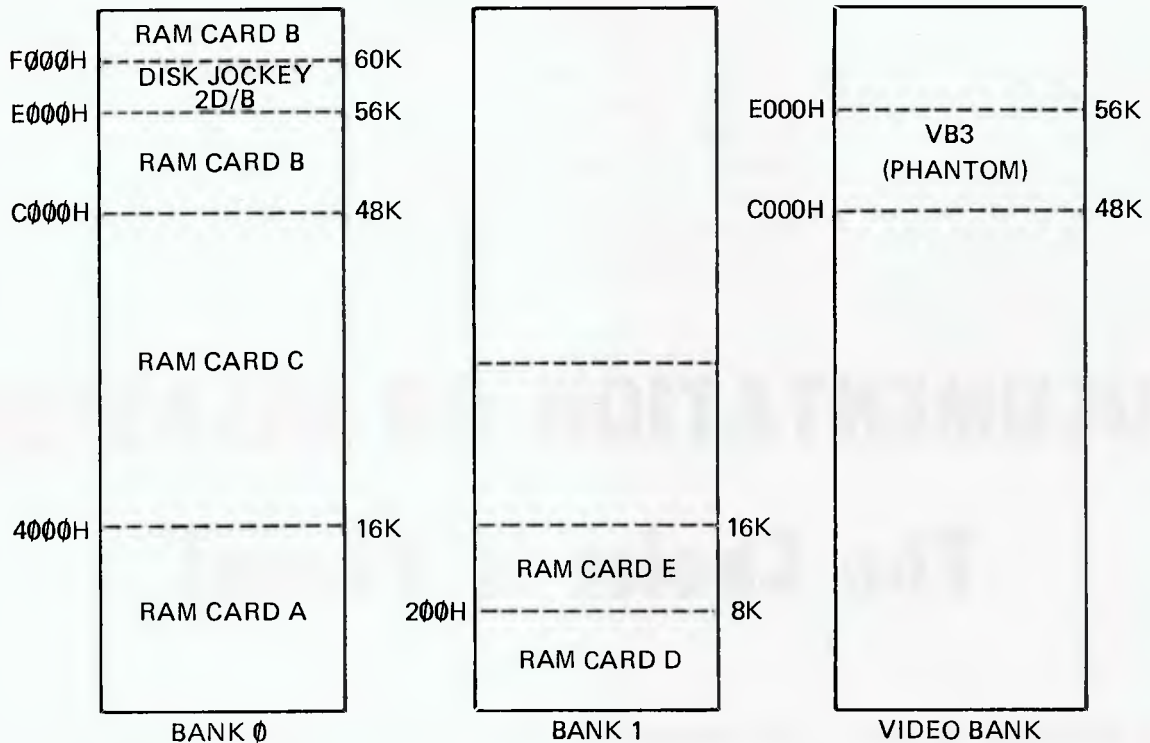
Next, I make a note of the colours of the ribbon cable attached to each connector, and what the signal is. On a keyboard connector, for example, I note which bit of data goes to which pin, and what colour the cable is. Some manuals notate data bits as D0 to D7, others D1 to D8. I always re-number drawings to use D0 to D7, minimising confusion.

Likewise, I don't just mark a pin 'keyboard strobe'. I also say whether the strobe is negative or positive-going. On a keyboard input port, I note whether it expects negative or positive strobe. And on the port documentation, I note which bit signals data available, and whether it goes high or low. Just to make it super-easy to use, I also note the short routines used to read the keyboard status and data (and put the routines in a library file on disk).

On serial ports, I find it useful to stick to the EIA RS-232C standard pin connections. But I'm also careful to note whether the connector is wired as a modem or as data terminal equipment. If I deviate from that arrangement, for example to bring power through the connector for an acoustic coupler, I make careful note of that too.

Any special connectors I make up, such as DIN connectors for joysticks, are also described; together with a description of

System Memory Map



Memory Maps are very important when trying to establish faulty memory chips, or, what program goes where.

what pins (and signals) connect where on the input port, and what signals appear on what bit of the port.

An essential part of my library is a TTL logic data book. The best is the Texas Instruments book, although Fairchild's is pretty good too. It can be extraordinarily frustrating when a manufacturer's schematic doesn't show pinouts and you have to refer to the data books.

I generally check to see whether boards have any special purpose LSI (large scale integrated) circuits, or any unusual one, then obtain copies of the data sheets and file them with the manuals. Often manufacturer's manuals don't explain the internal operations of some of the ICs they use, so the IC manufacturer's data sheets and application notes are particularly helpful.

This applies particularly to devices like disk controllers, programmable interfaces and interval timers, interrupt controllers and, of course, the CPU itself.

On The Soft Side

All these tips are most useful to the hardware hacker who is forever taking things to bits and changing them around. For the software guy, things can be just as awkward, if not worse.

With hardware you can always trace back along wires or printed circuit board tracks. With software the same process can be done, but it's very hard work.

With commercial software, I always bind the manuals so they can be opened flat, because I *know* I'll be spending hours searching through them for some arcane piece of software trickery. With well-written commercial software there isn't much need for extra documentation (and with games not much desire to document them), so most of your documentation work, like mine, will probably be in the area of I/O drivers.

To start with the I/O drivers of the operating system first: in the case of CP/M, your system should be supplied with the source code of the BIOS (the Basic I/O System), so you can freely modify it (unless you write your own, of course). Manufacturers who supply a preconfigured CP/M without BIOS source code are, more often than not, trying to hide a rather scrappy implementation.

If the source is not available for some other reason (such as Microsoft's unwillingness to reveal the secrets of the Soft-card), then at least the manufacturer should supply some other way to allow patching of device drivers (Microsoft did, though it still makes me feel uncomfortable). Without these facilities, you're doomed to disaster.

Customising Your BIOS

When customising your BIOS, do it by updating the source and commenting it, not by means of object code patches —

they're merely band-aid measures. Once your CBIOS is relatively stable and bug-free, print out a .PRN file of it for reference purposes. Make notes in the source about any hardware dependencies, including which status bits appear where on what I/O port.

All source code should be liberally commented in any case, regardless of the language used. All hardware dependent features, such as cursor control strings, should be defined at the top of the program to make subsequent changes easier. Better still, put all your hardware definitions into a separate file, which you can include into your programs either at compile time or using a text editor.

In the case of languages, I buy the recommended texts which complement the manual. In the case of most Pascals, that's the *Pascal User Manual and Report*; for C it's *The C Programming Language*, and so on. These should be kept close at hand for those late night bug-hunting sessions.

Really, that's what most of this article is about. If anything can go wrong, it will happen late at night, when your capacity to remember details is severely impaired; and when, with a deadline looming, panic is apt to strike in.

Having everything written down as a precautionary measure will make those problems so much easier to overcome. □

Continued from page 60.

A student progress report may be gained at any time.

The simulation exercises help students understand such concepts as position, speed, velocity, displacement and acceleration. The programming guide lists all variables and a line-by-line explanation of strategic steps. Some understanding of motion is required before entry to the program. A knowledge of graphic representations also helps.

Special features in the programming include:

- A graphic presentation of data.
- A summary report on progress — number of tries, percentage correct for first, second and more than two attempts for both Position Vs Time, Velocity Vs Time and total scores.
- An excellent feature of both graph representations is a tabulated summary of concept achievement for position, speed, velocity, displacement and acceleration, appropriate to each equation.

Graphical Analysis

Graphical Analysis of Experimental Data

Mathematics and physics program which allows secondary students to solve problems by graphically analysing experimental data. Up to 50 data pairs from an experiment may be used

Graphs are plotted from the experimental data, while numerous options are available for analysis of the graphed results.

Essentially, this package is a model building program and problem solving tool for analysing and presenting the results of any data pairs. The manual provides 15 Selected Investigations as examples. These range through problems of motion, heat and temperature, light and energy, electrical circuits, chemical reactions and population growth.

Special features in the programming:

- The computer's timer may be used in experiments where accurate time measurement is essential.
- Graphs of data for independent and dependent variables are plotted.
- Options for graphical data analysis include adding new data points or eliminating bad data points; computing intercepts, slopes and equations; testing with various functions; and prediction.

General Features

The following programming techniques are to be found in most of the Tandy courseware, depending on the kind of input and special requirements of each instructional package.

- Correct inputs are reinforced in a way appropriate to the level of the user. These may often be overridden by push-

ing any key, which immediately presents the next exercise. This is an excellent self-pacing feature and gives a good feeling of being in control of the learning event.

- An incorrect answer is 'flashed' on the screen, giving immediate feedback and allowing a second try. Should this response also be incorrect, the correct answer is given.
- Specific point of input is cued with the cursor. In lower level mathematics courses, 'borrowing' or 'carrying' is also given a cue.
- Appropriate error messages are displayed if an incorrect key (that is, alphabetic instead of numeric) is pressed.
- Time period delays in not answering can often be excluded or adjusted by the teacher.
- In the CAI programs automatic promotion/demotion is based on percentage correct for a minimum number of problems.
- In any maths program the concept to be learned or tested is the same for each lesson, although the numerical values change as they are randomly generated.

The Inevitable Bugs

Even small bugs can be irritating, making you wish you had your Mortein spray handy! What is amazing, of course, is that with all the research and development they still survive. You may dismiss the whole package because of slack programming, but this would be far to harsh.

In general, these programs are well organised instructional material and display some quite good features. Small mistakes may just serve to show how difficult it is to go from the idea stage, through the curriculum design stages, through the flow charting, programming and debugging, through numerous trials and research and eventually come up with an operational and viable program. And on the commercial side, it still has to be educationally general enough to find a spot in the market place!

As Tandy points out, these programs have been developed to support and supplement existing teaching. Their philosophy is to utilize advanced technology to improve the teaching/learning process, by providing appropriate hardware and software.

I found these programs to be well constructed and well documented. They are quite usable in schools and colleges, in the work setting or at home.

It is important, however, for classroom use — like any other resource — that teachers do their homework and are familiar with appropriate application, how the program is constructed, and its abilities and limitations. □

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War games master Roger Keating at work.

The Desk-Top General

WARGAMES often change the character of the people playing them, Roger Keating said, as he explained what he does for a living.

"Their involvement becomes so intense that they take on the characteristics related to the strategy needed to win.

"For example, in the game Diplomacy, if you're Italy you're non-aggressive because that's the only way Italy can win. If you're Russia or Turkey, you pick someone to be friends with, to serve your own

purposes, but you're basically aggressive".

Roger Keating, 32, works at home in Waverley, Sydney, creating wargames full-time for Apple II microcomputers.

His games are now produced and marketed by an American company, Strategic Simulations Incorporated. They are also sold in Australia — imported from the United States.

Mr Keating used to be a high school mathematics teacher with a penchant for computing. He came to Australia from New Zealand nearly five years ago, taught at Cranbrook School for four years and resigned when he realised he could make a living from his 12-years-old hobby.

It is no coincidence Roger Keating was an A-grade chess player in New Zealand. It was from chess that his interest in wargames developed.

He has devised three games so far, with a fourth gestating. Each is far more complex than the one before it, reflecting his own development, he says, as he incorporates in each new game what he has learned from the previous one.

His first game, Conflict, is played solitaire. It is "A company-level simulation of a battle between a modern combined



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arms force a well-equipped rebel force," says its rule book.

The second game, Operation Apocalypse, can be played by one or two people in about three hours. It is "an operational-level game made up of four scenarios" each representing a battle on the Western Front between the Allied and German forces in 1944-45.

The third game, Southern Command, for one or two players, was reviewed in *YC* in January. It is a simulation of the 1973 Yom Kippur War fought between Israel and Egypt in the Sinai; and is historically accurate.

"By playing the game you come to realise what really went on in that battle" Roger Keating said.

He is interested in how Jews and Arabs will react to Southern Command. He explained that the game is carefully balanced so it is skill and not program bias which produces victory for either side.

Friends have told him they think the game is weighted in Israel's favour. Not so, he says.

"I like to play Egypt. The game is programmed to bring down the aggressive player; the computer assumes he doesn't know what he's doing. People who play Israel are usually too aggressive. The people who play Egypt have more chance of winning if they aren't aggressive. The program favours the person who sits back and waits."

The Game — Counter-Attacks

A wargame player must learn to modify his behaviour, Mr Keating says. All his games are ready with a counter-attack when the computer sees aggression based on weakness and not on sound strategy and tactics.

"The more you know about war," he said, "the more you realise that the intelligence of the people in control — the generals and politicians — is just ordinary."

It is important to Roger Keating to know about war. It is a case of facing the reality of today's world.

He disagrees with the arguments of both pacifists and warmongers.

"Pacifist ideals tend to lead to war. They produce a vulnerability that is attractive to a power like the Soviet Union."

Some people turn off as soon as he mentions his wargames. They have not thought things through, he says. They don't want to know.

If I didn't know about war it would drive me crazy," he explained.

The warmongers, including many wargame enthusiasts, expect him to be gungho for war. These are the people who say it would do young people good to go to war — to toughen them up.

They don't know what's real either, Roger Keating says.

Defence spending is vital insurance

against war, he believes. Western countries should spend all they can; otherwise the world won't be here for solutions to be found to all the other social problems.

It is nuclear weapons development that has prevented a large-scale war since World War II.

The Value of Wargames

The US Army knows the value of wargames, he says. He showed me one which he said cost millions of dollars to develop. Some games have Soviet doctrine programmed into them to predict how the Soviet Army would respond in different situations.

"To make a living from computer wargames you must have access to the

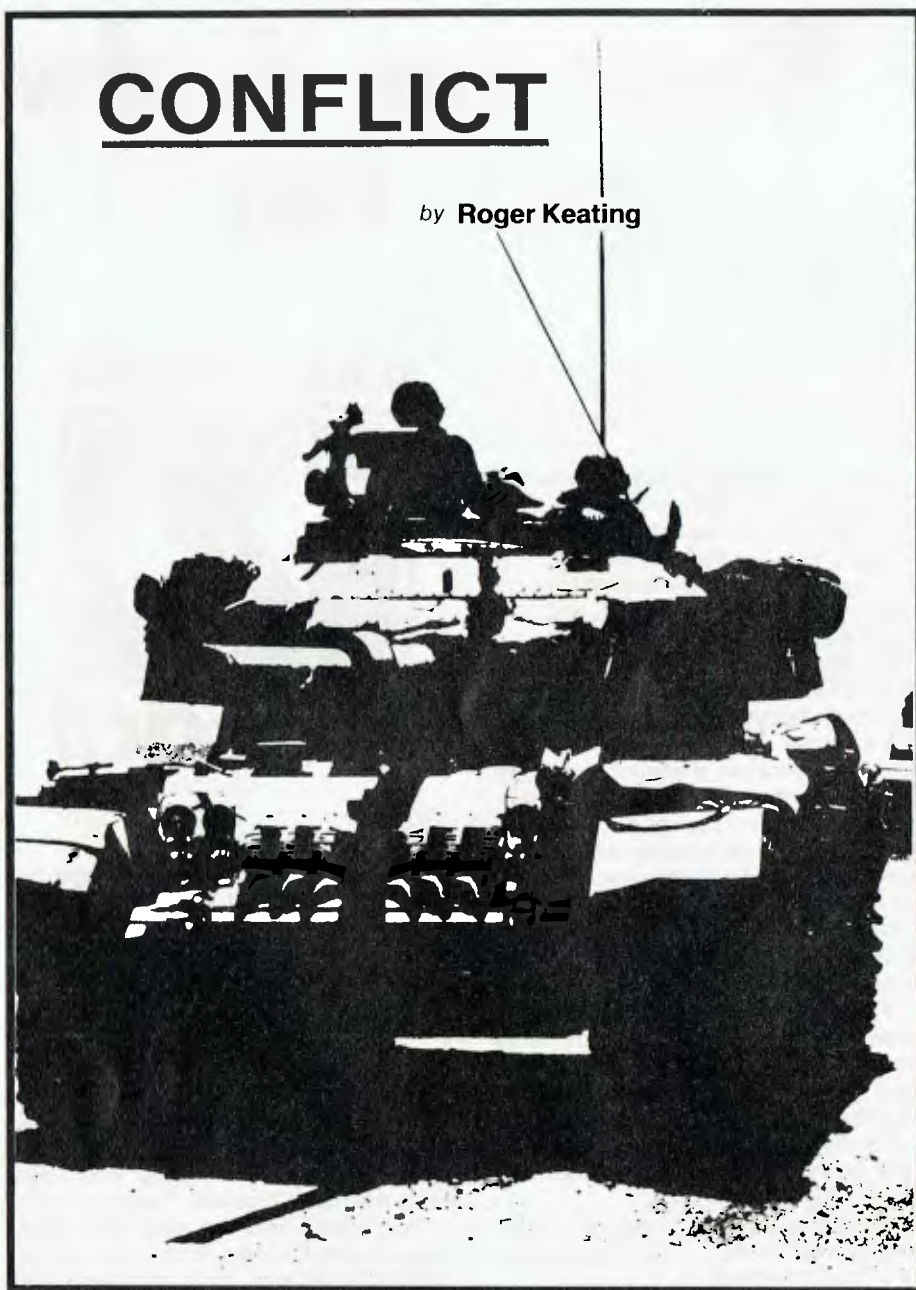
US markets," Mr Keating said. "Only about three companies in the world are producing the same sort of thing I am." He is hoping for a chance to live in the US because the game scene in Australia is moving too slowly. It is developing fast in America.

Keating says he is often tempted to write the odd funny comment into his programs.

"But it doesn't go across," he said. "You don't joke in wargames; it doesn't pay to be funny."

What does one pay for his games? Conflict costs \$40, Operation Apocalypse \$60 and Southern Command \$45.

"Forty dollars is about the right price. People will take money out of their wallets and buy the game — and it covers costs nicely. Sixty dollars is too much." he said. □



After last month's tour de force of listings (you did read last month's installment of Basic for Birdwatchers, didn't you?) LES BELL continues his tutorial saga with a snappy little piece about random access files. . .

Basic for Birdwatchers

Part VI

WE'VE NOW seen how sequential files can be used to store information and how the computer can sort information into order.

These concepts are very important in organising information on a computer, particularly for rapid access later. But you have probably spotted the drawbacks of sequential files. First, we have to load the entire file into memory to sort it, and second, the only way to find a particular record is to sequentially search through the file until it's located.

Random access files will help us to get around these problems. The solution to the second problem is implicit: instead of sequentially searching a file, we can randomly access any part of it. Our earlier use of an index will help us with the first objection: instead of loading the entire file into memory and sorting it, why not have an index file which says where in the main file each record is stored, and then sort the index?

Of course there is a penalty for random access. We must always use the same length of record, and we must be a little bit more picky in defining our field lengths. But that's a small price to pay.

With the solution to our problems in sight, let's press on and learn about random access files.

A random access file is opened for both reading and writing, using our old friend the OPEN statement:

70

your computer



tutorial

```
170 OPEN "R", 1, "FILENAME.DAT"
```

Now from here on in it's not going to be that easy, I'm afraid! To use random access files you must understand a little about how BASIC accesses the disk and how the operating system organises the disk.

Keeping Track Of Floppy

For convenience I will use the IBM standard single-density 20 cm floppy disk as our example, but the basic principles apply to all disks, whatever their size. Each disk has 77 **tracks**. These are concentric rings where the read/write head actually puts the data. Each track is split into 26 **sectors**, each containing 128

bytes of data. Now we can access any block of data, provided we know which track and sector it's in.

A special area of the disk is usually set aside for the **directory**. This tells the operating system where each file starts and how long it is.

In random access files, each read or write (GET or PUT statement) transfers an entire sector of 128 bytes. (If your machine uses 256-byte sectors, don't worry, the operating system automatically **deblocks** a 256-byte **physical sector** into two 128-byte **logical sectors**).

The sector is read off the disk into a buffer space maintained by BASIC, and which you should have already set up using a FIELD statement.

All data in a random access file is treated as string data. Thus any numbers in the file have to be converted into numeric data before being used in calculations. BASIC contains special functions to do this. Conversely, numbers must be converted into strings before being written to random files.

When storing strings into an I/O buffer, you must use the special functions LSET and RSET. This is because the fields are fixed in length and these functions automatically cope with strings that are too short or too long.

How Many Files, Sir?

Most BASICs allow 15 or so files to be

...Last Month we promised something new...

WE...?

...UH...WELL, SO I DID...AH...

READY MONTY?...

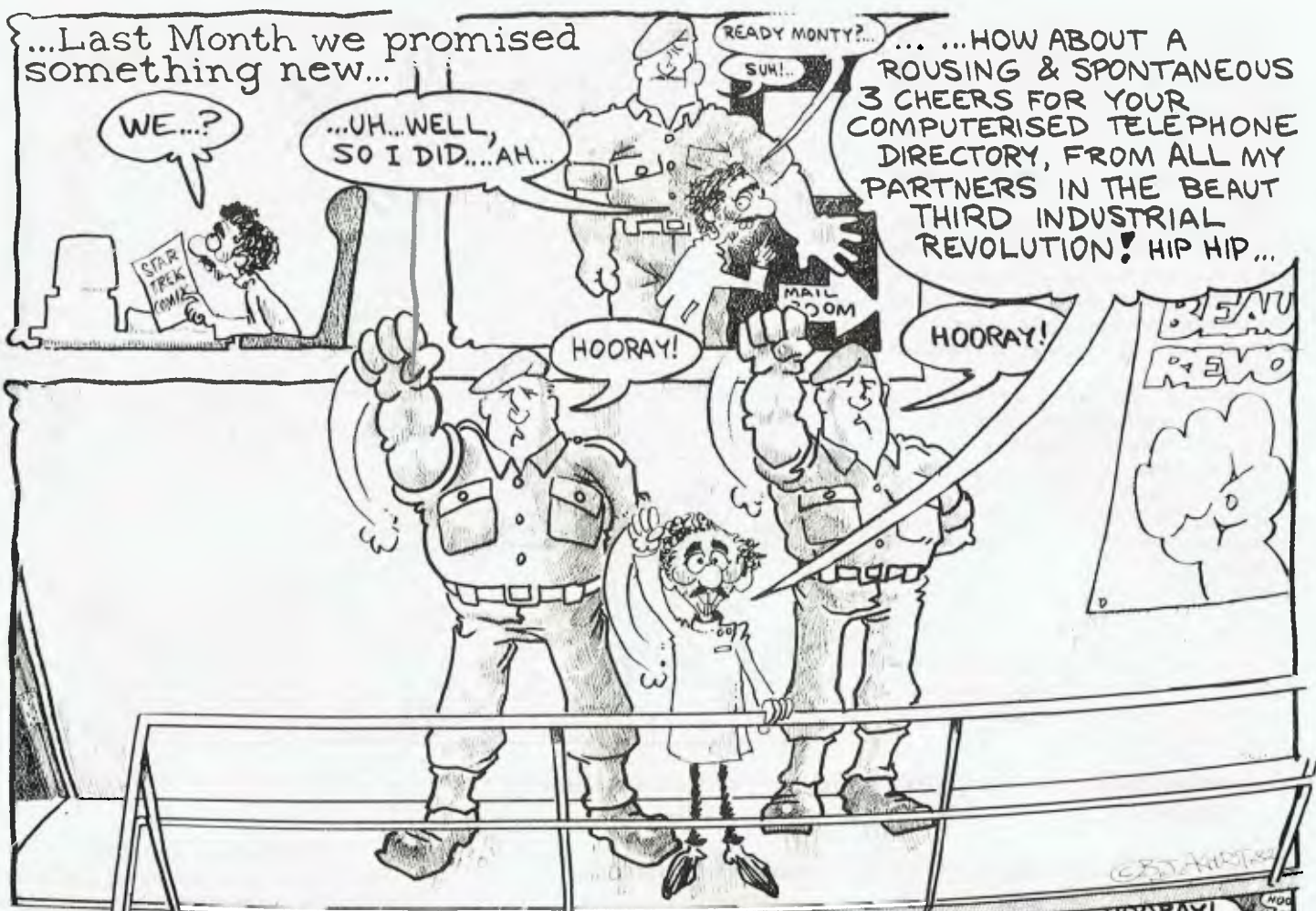
SUN!...

... ..HOW ABOUT A ROUSING & SPONTANEOUS 3 CHEERS FOR YOUR COMPUTERISED TELEPHONE DIRECTORY, FROM ALL MY PARTNERS IN THE BEAUT THIRD INDUSTRIAL REVOLUTION! HIP HIP...

HOORAY!

HOORAY!

REV
REV



open at one time. TRS-80 disk BASIC asks the user, at power-up, how many files he will be using, because each file has to have an associated buffer in memory: if you're not using the buffer, it's just so much wasted space. Not many programs would have as many as 15 files open at once.

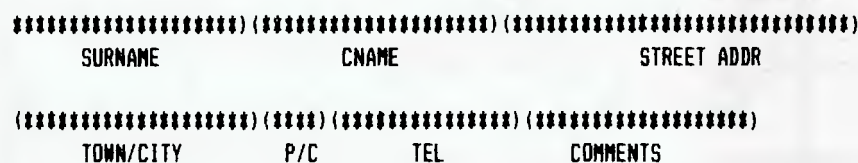
The OPEN statement sets up a 128-byte buffer for that particular file. The next thing you must do is say what information goes where inside that buffer. You should decide this during the early stages of designing your program, by writing a **record definition**.

Here's a typical record definition for a name/address/telephone number file:

- Surname 20 bytes (characters)
- Christian names 20 bytes
- Street address 30 bytes
- Town/city 20 bytes
- Postcode 4 bytes
- Telephone 15 bytes
- Comments 19 bytes

Total length 128 bytes

If you like, you can visualise the buffer as a strip of memory containing the various strings which will represent the different fields of the record:



Fields Within A Buffer

Using the same string variable names as the mailing list program, here's a FIELD statement to set up the buffer this way:

```
180 FIELD #1,20 AS N$, 20 AS C$, 30 AS
    A1$, 20 AS A2$, 4 AS PC$, 15 AS T$,
    19 AS CM$
```

This statement 'slices up' the buffer for file 1 so the appropriate number of characters is allocated for each string variable.

Note: we have now reserved these string variables for a special usage and we cannot use them in the ordinary ways we use other string variables. For that reason, it is generally wise to use special names for disk-buffer variables, so the ubiquitous N\$ is used in the program generally, while NF\$ is the file buffer variable (FN\$ cannot be used, as we'll see later).

So it might be better to write:

```
180 FIELD #1,20 AS NF$, 20 AS CF$, 30 AS
    AF$, 20 AS BF$, 4 AS PF$, 15 AS TF$,
    19 AS DF$
```

Although these string names are not as meaningful as the others, they are less



1017 is logically empty. Be aware of this problem!

So You're Mismatched, Eh?

How do you know where the end of a random file is? The answer is random files don't really have a length — they just end somewhere after the last record. Consequently, the EOF() function doesn't work on random files; trying to take the EOF() of a random file will usually return a 'File Mismatch Error'.

To help with applications where you want to read right through a file, MBASIC provides a function, LOF(n), which returns the number of records in random file n. So you can write:

```
140 FOR N=1 TO LOF(2)
150 GET #2,N
160 REM DO PROCESSING
.
.
270 NEXT N
```

This will read through the file and process the contents of every record. Don't be surprised if many of them turn out to be garbage!

Numeric values are not quite as easy to handle as strings, however. In fact in random files, numeric values must be stored in a compressed string format. They are converted using the MKI\$, MKS\$ and MKD\$ functions.

When using FIELD to set up a buffer, you must be sure to allow for the correct number of bytes (characters) for the data type:

likely to be used accidentally as conventional variables.

Okay, so how do we read from a random file? Having opened the file and FIELDed it, here's how to read the 37th record:

```
330 GET #1,37
```

That will read the record into the buffer. You can now PRINT NF\$, and the name should appear on the screen. Likewise PRINT TF\$ should print the phone number.

All of this assumes there is 37th record of course. If you don't have many friends you may not have a record number 37. In that case, what you get back will either be garbage, or possibly an error message.

One of the most convenient features of a random file is not every record need contain any information. In fact, there can be thumping great gaps in your file. Again, if you access a non-existent record, you'll generally get back garbage.

The disadvantage of this arrangement is non-existent records still take up space. If you create a random file, and then insert record number 1 followed by record number 1017, the file will occupy 1017 by 128 bytes — totalling 127 Kbytes — even though the space between records 1 and



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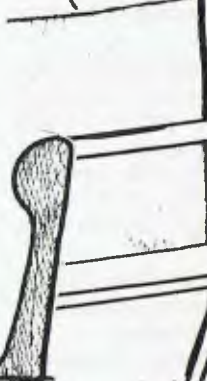
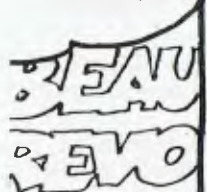
Integer : string MKI\$ 2 bytes
Single-precision : string MKS\$ 4 bytes
Double-precision : string MKD\$ 8 bytes

When reading numeric variables back from a random file, they must be converted back into numeric form. Once again, MBASIC provides special functions to accomplish this:

String : integer CVI
String : single-precision CVS
String : double-precision CVD

Those are the basic principles of handling random files, for simple cases at least. With this information we will proceed (next issue) to a couple of more realistic examples: a computerised telephone directory and a small database management system. □

BEAUTIFUL
IP HIP...



UNDERSTANDING ASSEMBLER PART II

your computer



tutorial

In part II of his *Assembly Language series* LES BELL introduces the instruction set of the 8080 microprocessor.

THE INSTRUCTION set of a computer falls into functional groups — data transfer instructions, arithmetic instructions and so on. This month we'll break down all the 8080 instructions into their functional groups, with a brief description of each for reference and a table giving their hex and decimal opcodes.

This installment in our series is not intended to impart a complete understanding of the 8080 assembly language. We simply want you to read through the instruction set and see the kinds of operations that are possible. Later, we'll start using them.

The instructions which move data from memory into and out of the processor are called the **data transfer group**.

All registers are eight-bit and register pairs can contain 16-bit values, often addresses, especially in the case of the HL pair.

Here are some abbreviations you'll need to know: **rdest** is the destination register (where the data is going to); **rsource** is the source register (...coming from); **bdata** is byte data (8 bits); **wdata** is word data (16 bits); **rp** is register pair.

There are three register pairs, BC, DE and HL. In assembly language, they are referred to by the first of the two registers, B, D and H.

MOV rdest,rsource: Moves the con-

tents of the eight-bit source register to the destination register. The source remains unchanged.

MOV rdest,M: The HL register pair is assumed to contain a memory address. This instruction moves the contents of that location from memory, into the destination register.

MOV M,rsource: This instruction moves data from the source register into the memory location addressed by the HL register pair.

MVI rdest,bdata: The Move Immediate instruction loads the specified register with the data specified in the instruction.

MVI M,bdata: The Move to Memory Immediate instruction puts the specified data into the memory location pointed to by the HL register pair.

LXI rp,wdata: The Load Register Pair Immediate instruction loads the specified register pair (B, D or H) with the 16-bit word which forms byte 2 and byte 3 of the instruction. Remember the 8080 reverses the order of these bytes, so the least significant byte comes first, then the most significant.

LDA addr (Load Accumulator Direct): This instruction loads the accumulator directly from the address specified.

STA addr: This instruction stores the

accumulator contents directly into the address specified.

LHLD addr: Loads the HL register pair directly from the address specified, and the byte following it.

SHLD addr: Stores the contents of the HL register pair directly into memory.

LDAX rp (Load Accumulator Indirect): This instruction specifies either the BC or DE register pairs, which are assumed to contain the address of a location in memory. The contents of this location are moved into the accumulator.

STAX rp: The contents of the accumulator are stored into the memory location pointed to by either the BC or DE register pair.

XCHG: This instruction exchanges the contents of the HL and DE register pairs.

Arithmetic Group

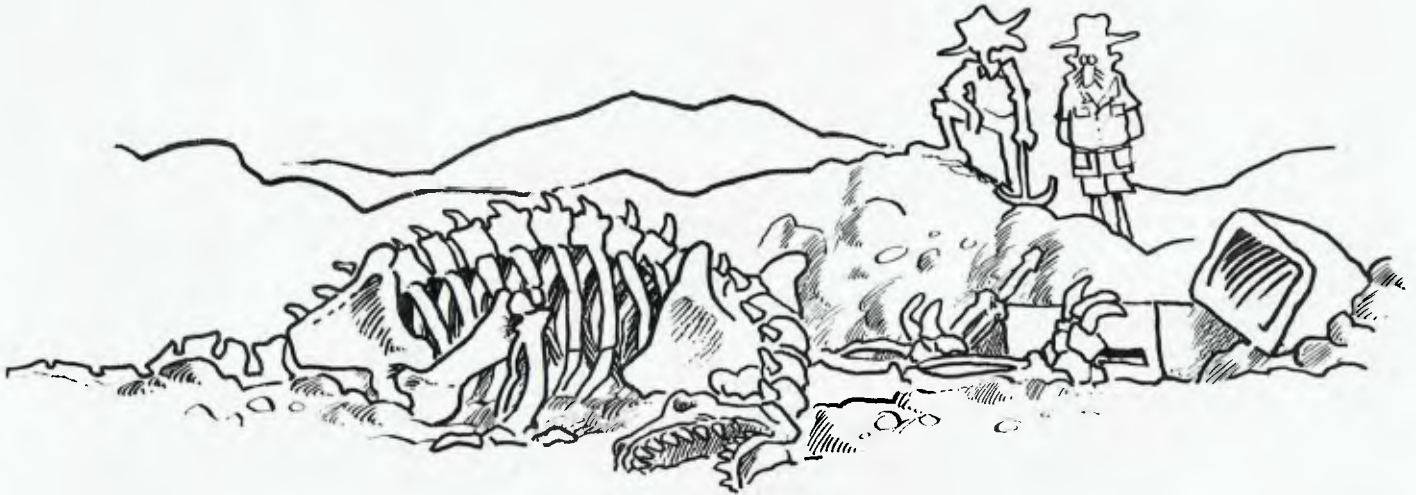
These are the instructions which operate on the accumulator, together with the contents of other registers or memory. In each case the results of the operation are placed in the accumulator and, unless otherwise indicated, the flags are set to reflect the result of the calculation. There are five flags: **Zero**, **Sign**, **Parity**, **CarrY**, and **Auxiliary CarrY**.

Subtractions are performed using two's complement arithmetic and set the carry flag to indicate a borrow and clear it to indicate no borrow.

ADD rsource: Adds the contents of the source register to the accumulator.

ADD M: Adds the contents of the memory location pointed to by HL into the

SO THE DINOSAURS WIPED THEMSELVES OUT TRYING TO PERMUTE SETTINGS...



accumulator.

ADI bdata (Add Immediate): Adds the data specified in the instruction to the contents of the accumulator.

ADC rsource (Add with Carry): Adds the contents of the specified register, plus the carry bit, into the accumulator.

ADC M: Adds the contents of the memory location pointed to by HL, plus the carry bit, into the accumulator.

ACI bdata (Add with Carry Immediate): Adds the data specified in the instruction, plus the carry bit, into the accumulator.

SUB rsource: Subtracts the contents of the specified register from the accumulator.

SUB M: Subtracts the contents of the memory location pointed to by HL from the accumulator.

SUI bdata: Subtracts the data specified in the instruction from the accumulator.

SBB rsource (Subtract with Borrow): Subtracts both the contents of the specified register and the content of the carry flag from the accumulator.

SBB M: Subtracts both the contents of the memory location pointed to by HL and the content of the carry flag from the accumulator.

SBI bdata: The data specified in the instruction and the carry flag are both subtracted from the accumulator.

INR rdest: Increments the contents of the destination register by one. Does *not* affect the carry flag.

INR M: Increments the contents of the memory location pointed to by HL by one.

DCR rdest: Decrements the contents of the destination register by one. Does *not* affect the carry flag.

DCR M: Decrements the contents of the memory location pointed to by HL by one. Does not affect the carry flag.

INX rp: Increments the contents of the specified register pair by one. *No* condition flags are affected.

DCX rp: Decrements the contents of the specified register pair by one. *No* condition flags are affected.

DAD rp (Double-precision Add): Adds the contents of the register pair specified into the HL register pair. *Only the carry flag* is affected. This is a 16-bit addition. Note that DAD H adds HL to HL; that is, it doubles HL.

DAA: Following the addition of two BCD numbers using the ADD or ADC instructions, the result will be incorrect. The DAA instruction converts this result into a valid BCD number.

Logical Group

This group of instructions performs logical operations on registers and memory. Again, the accumulator is involved in all instructions, and the flags are affected, unless noted.

ANA rsource: The content of the specified register is ANDed with the accumulator. The carry flag is cleared.

ANA M: The contents of the location pointed to by HL is ANDed with the accumulator. The carry flag is cleared.

ANI bdata: The data specified in the instruction is ANDed with the ac-

accumulator. The carry and auxiliary carry flags are cleared.

XRA rsource: The contents of the specified register are exclusive-ORed with the accumulator. The carry and auxiliary carry flags are cleared.

XRA M: The contents of the memory location pointed to by HL are exclusive-ORed with the accumulator. The carry and auxiliary carry flags are cleared.

XRI bdata: The data specified in the instruction are exclusive-ORed with the accumulator. The carry and auxiliary carry flags are cleared.

ORA rsource: The contents of the specified register are inclusive-ORed with the accumulator. The carry and auxiliary carry flags are cleared.

ORA M: The contents of the memory location pointed to by HL are inclusive-ORed with the accumulator. The carry and auxiliary carry flags are cleared.

ORI bdata: The data specified in the instruction are inclusive-ORed with the accumulator. The carry and auxiliary carry flags are cleared.

CMP rsource: The flags are set as though the data in the specified register were subtracted from the accumulator, although the accumulator remains unchanged. The Z flag is set if the two registers are equal, and CY flag is set if the accumulator is less than the register.

CMP M: As for CMP rsource, except that HL is used to point to the memory location to be compared.

CPI bdata: The flags are set as though

the data specified in the instruction were subtracted from the accumulator, although the accumulator remains unchanged.

RLC: The contents of the accumulator are rotated left one position, and both the carry flag and least significant bit of the result are set to the value shifted out of the most significant bit. Only the carry flag is affected.

RRC: The contents of the accumulator are rotated right one position, and both the carry flag and the most significant bit of the result are set to the value shifted out of the least significant bit. Only the carry flag is affected.

RAL: The accumulator contents are rotated one position left through the carry flag. Only the carry flag is affected.

RAR: The accumulator contents are rotated one position right through the carry flag. Only the carry flag is affected.

CMA: The contents of the accumulator are complemented (1 to 0, 0 to 1). No flags are affected.

CMC: The carry flag is complemented. No other flags are affected.

STC: The carry flag is set to 1. No other flags are affected.

Control Flow Group

These instructions control the sequence of operation of the processor. Jumps may be unconditional or conditional. Unconditional jumps simply load the program counter with the new value, whereas conditional jumps examine the status of the flags to see whether a jump should be performed. The conditions which may be specified are as follows:

- NZ Not zero
- Z Zero
- NC No carry
- C Carry
- PO Parity odd
- PE Parity even
- P Plus
- M Minus

JMP addr: Unconditional jump to the address specified in the instruction.

Jcond addr: Conditional jump. For example, JPE is jump on parity even, JZ is jump on zero, JNZ is jump on not zero.

CALL addr: Jump unconditionally to the address specified, leaving the return address on the stack. This is the address of the next instruction that would have been executed in the normal course of events.

Ccond addr: Conditional call instruction; example, CZ is call on zero.

RET: Return from subroutine by removing return address from stack and jumping to it.

Rcond: Conditional return.

RST n: Call to one of eight specially defined locations in memory, where the target address is eight times the value of n.

PCHL: Load the program counter with the value in HL.

This group of instructions manipulates the stack, performs I/O and performs other miscellaneous operations.

PUSH rp: Push the specified register pair onto the stack.

POP rp: Pop the the specified register pair off the stack.

PUSH PSW: Push the Program Status Word (that is, accumulator and flags) onto the stack.

POP PSW: Pop the Program Status Word off the stack.

XTHL: Exchange the contents of HL with the two bytes on top of the stack.

SPHL: Load the stack pointer with the value in HL.

IN port: Input a value to the accumulator from the eight-bit port specified.

OUT port: Output the value in the accumulator to the port specified.

EI: Following execution of the next instruction (often a RET) interrupts will be enabled.

DI: Following execution of the next instruction, interrupts will be disabled.

HLT: Halts the processor.

NOP: No operation is performed. This instruction is used to leave space for debugging, and to pad out timing loops.

Assembler Pseudo-Ops

These are instructions to the assembler, and do not generate any code.

ORG addr: Sets the assembler code pointer to generate code starting at this address.

END: Ends a program.

EQU: Sets the value of a label.

SET: Sets the value of a label, and allows it to be changed afterwards (unlike EQU).

DS n: Reserves n bytes of storage space.

DB bdata: Defines a data byte, or string of data bytes.

DW wdata: Defines a data word, reversing the order of the two bytes.

This completes our introduction to the 8080 instruction set. Next month we shall begin writing programs in earnest.

Opcode	Hex	Octal	Decimal
ACI	CE	316	206
ADC A	8F	217	143
ADC B	88	210	136
ADC C	89	211	137
ADC D	8A	212	138
ADC E	8B	213	139
ADC H	8C	214	140
ADC L	8D	215	141
ADC M	8E	216	142
ADD A	87	207	135
ADD B	80	200	128
ADD C	81	201	129
ADD D	82	202	130
ADD E	83	203	131
ADD H	84	204	132
ADD L	85	205	133

Opcode	Hex	Octal	Decimal
ADD M	86	206	134
ADI	C6	306	198
ANA A	A7	247	167
ANA B	A0	240	160
ANA C	A1	241	161
ANA D	A2	242	162
ANA E	A3	243	163
ANA H	A4	244	164
ANA L	A5	245	165
ANA M	A6	246	166
ANI	E6	346	230
CALL	CD	315	205
CC	DC	334	220
CM	FC	374	252
CMA	2F	057	047
CNC	3F	077	063
CNP A	BF	277	191
CNP B	B8	270	184
CNP C	B9	271	185
CNP D	BA	272	186
CNP E	BB	273	187
CNP H	BC	274	188
CNP L	BD	275	189
CNP M	BE	276	190
CNC	D4	324	212
CNZ	C4	304	196
CP	F4	364	244
CPE	EC	354	236
CPI	FE	376	254
CPO	E4	344	228
CZ	CC	314	204
DAA	27	047	039
DAD B	09	011	009
DAD D	19	031	025
DAD H	29	051	041
DAD SP	39	071	057
DCR A	3D	075	061
DCR B	05	005	005
DCR C	0D	015	013
DCR D	15	025	021
DCR E	1D	035	029
DCR H	25	045	037
DCR L	2D	055	045
DCR M	35	065	053
DCX B	0B	013	011
DCX D	1B	033	027
DCX H	2B	053	043
DCX SP	3B	073	059
DI	F3	363	243
EI	FB	373	251
HLT	76	166	118
IN	DB	333	219
INR A	3C	074	060
INR B	04	004	004
INR C	0C	014	012
INR D	14	024	020
INR E	1C	034	028

Opcode	Hex	Octal	Decimal	Opcode	Hex	Octal	Decimal	Opcode	Hex	Octal	Decimal
INR H	24	044	036	MOV E,B	58	130	088	PUSH PSW	F5	365	245
INR L	2C	054	044	MOV E,C	59	131	089	RAL	17	027	023
INR M	34	064	052	MOV E,D	5A	132	090	RAR	1F	037	031
INX B	03	003	003	MOV E,E	5B	133	091	RC	DB	330	216
INX D	13	023	019	MOV E,H	5C	134	092	RET	C9	311	201
INX H	23	043	035	MOV E,L	5D	135	093	RLC	07	007	007
INX SP	33	063	051	MOV E,M	5E	136	094	RM	F8	370	248
JC	DA	332	218	MOV H,A	67	147	103	RNC	D0	320	208
JM	FA	372	250	MOV H,B	68	148	096	RNZ	C0	300	192
JMP	03	303	195	MOV H,C	61	141	097	RP	F0	360	240
JNC	D2	322	210	MOV H,D	62	142	098	RPE	E8	350	232
JNZ	C2	302	194	MOV H,E	63	143	099	RPC	E0	340	224
JP	F2	362	242	MOV H,H	64	144	100	RRC	0F	017	015
JPE	EA	352	234	MOV H,L	65	145	101	RST 0	C7	307	199
JPO	E2	342	226	MOV H,M	66	146	102	RST 1	CF	317	207
JZ	CA	312	202	MOV L,A	6F	157	111	RST 2	D7	327	215
LDA	3A	072	058	MOV L,B	6E	156	104	RST 3	DF	337	223
LDAX B	0A	012	010	MOV L,C	69	151	105	RST 4	E7	347	231
LDAX D	1A	032	026	MOV L,D	6A	152	106	RST 5	EF	357	239
LHLD	2A	052	042	MOV L,E	6B	153	107	RST 6	F7	367	247
LXI B	01	001	001	MOV L,H	6C	154	108	RST 7	FF	377	255
LXI D	11	021	017	MOV L,L	6D	155	109	RZ	CB	310	200
LXI H	21	041	033	MOV L,M	6E	156	110	SBB A	9F	237	159
LXI SP	31	061	049	MOV M,A	77	167	119	SBB B	98	230	152
MOV A,A	7F	177	127	MOV M,B	70	160	112	SBB C	99	231	153
MOV A,B	78	170	120	MOV M,C	71	161	113	SBB D	9A	232	154
MOV A,C	79	171	121	MOV M,D	72	162	114	SBB E	9B	233	155
MOV A,D	7A	172	122	MOV M,E	73	163	115	SBB H	9C	234	156
MOV A,E	7B	173	123	MOV M,H	74	164	116	SBB L	9D	235	157
MOV A,H	7C	174	124	MOV M,L	75	165	117	SBB M	9E	236	158
MOV A,L	7D	175	125	MVI A	3E	076	062	SBI	DE	336	222
MOV A,M	7E	176	126	MVI B	06	006	006	SHLD	22	042	034
MOV B,A	47	107	071	MVI C	0E	016	014	SPHL	F9	371	249
MOV B,B	40	100	064	MVI D	16	026	022	STA	32	062	050
MOV B,C	41	101	065	MVI E	1E	036	030	STAX B	02	002	002
MOV B,D	42	102	066	MVI H	26	046	038	STAX D	12	022	018
MOV B,E	43	103	067	MVI L	2E	056	046	STC	37	067	055
MOV B,H	44	104	068	MVI M	36	066	054	SUB A	97	227	151
MOV B,L	45	105	069	NOP	00	000	000	SUB B	90	220	144
MOV B,M	46	106	070	ORA A	B7	267	183	SUB C	91	221	145
MOV C,A	4F	117	079	ORA B	B0	260	176	SUB D	92	222	146
MOV C,B	48	110	072	ORA C	B1	261	177	SUB E	93	223	147
MOV C,C	49	111	073	ORA D	B2	262	178	SUB H	94	224	148
MOV C,D	4A	112	074	ORA E	B3	263	179	SUB L	95	225	149
MOV C,E	4B	113	075	ORA H	B4	264	180	SUB M	96	226	150
MOV C,H	4C	114	076	ORA L	B5	265	181	SUI	D6	326	214
MOV C,L	4D	115	077	ORA M	B6	266	182	XCHG	EB	353	235
MOV C,M	4E	116	078	ORI	F6	366	246	XRA A	AF	257	175
MOV D,A	57	127	087	OUT	D3	323	211	XRA B	AB	250	168
MOV D,B	50	120	080	PCHL	E9	351	233	XRA C	AC	251	169
MOV D,C	51	121	081	POP B	C1	301	193	XRA D	AD	252	170
MOV D,D	52	122	082	POP D	D1	321	209	XRA E	AE	253	171
MOV D,E	53	123	083	POP H	E1	341	225	XRA H	AC	254	172
MOV D,H	54	124	084	POP PSW	F1	361	241	XRA L	AD	255	173
MOV D,L	55	125	085	PUSH B	C5	305	197	XRA M	AE	256	174
MOV D,M	56	126	086	PUSH D	D5	325	213	XRI	EE	356	238
MOV E,A	5F	137	095	PUSH H	E5	345	229	XTHL	E3	343	227

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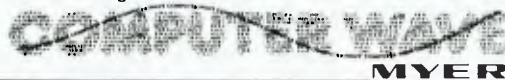
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LINTON-SIMPKINS

THAT DEVOTEE of the violin and what the Americans call nose candy, one Mr Sherlock Holmes, was always at odds with the official police from Scotland Yard. He was often at some pains to explain the police's unfortunate errors to his long-time friend Dr Watson (strange relationship that).

How amused the good Holmes would have been to hear the men who work at the headquarters of the London Metropolitan Police have decided to implement a computer network to aid the London fuzz in crime solving.

You might ask why New Scotland Yard is called New, or even why it is called Scotland Yard at all, since the Scots have been a relatively law abiding race for several years now. Well, at least since the passing of those evil phoney Scots comedians and the arrival of Mr Billy Connolly.

I can't tell you why it is New, but it seems likely that the place should really be called Scotland Hard from the old word where goods especially coals, were landed in London from the north.

Actually all this doesn't matter a dropped bit, but I thought you'd like to know. Anyway the rest of this isn't really too exciting; it has to do with practical computer applications, which are usually dull.

The Scotland Yard, or Hard (which I prefer as while those London policemen are wonderful they are also a fairly hard lot, as you will know if you watch the 'Sweeney') application is to be a computer-aided dispatch and message switching system. It is intended to enable the bogies to arrive at the scene of the crime before the photographers from the News of The World and Mr Sherlock Holmes and companion (it was all a rotten lie, they were just good friends).

The system will be installed and commissioned later this year. It will enable the police to respond to emergency calls more rapidly, by providing information to dispatchers enabling them to see the location and current commitments of available police in the proximity of the emergency.

To do this the system will have a central computer and seven mini-computers as network nodes and front enders. Considering the avowed interest of this magazine and its friends who enable us to live in relative luxury, the central computer will hold most interest for us.

It will be a Univac 1100/62. The Univac 1100/60 series is really a gigantic network of microprocessors, living in symbiosis like the legs of a jellyfish. In effect the one New Scotland Yard will use is two of these gigantic networks joined together.

Ah, Some Logic?

Univac, almost alone among computer sellers of the traditional size, has a logical model numbering system for its 1100 series, and that two on the end (1100/62) signifies that the system has two central processors. Mind you, the way the 1100/60s are organised, one is a mite hard pressed to see how the thing could be considered as merely a dual processor system at that.

But if that description of the fuzz central machine isn't enough, it will be fitted with a number of devices called by Univac DCP 40s, or Distributed Communications Processors. The DCP 40s will enable the police network to talk to almost any other network it wants to, without causing the 1100/62 to become personally involved.

The DCP 40s are also aggregations of micros rather in the style of the receipts of

the human brain. When completely installed the Scotland Hardware will support 600 terminals in police stations around London, via the seven minicomputer nodes. The minis will be V77-800 minis, the type Univac took over the care and responsibility for when it bought Varian a few years back.

Intimate Involvement

It is interesting to think how intimately Univac is involved in police computing in many countries around the world. Using older equipment, the Pennsylvania State Highway patrol has had a similar system in use for a number of years, while the police in Manila had a Univac installation run by the prettiest commissioned police officer I ever saw. When she took over the installation she had never seen a computer and had been a Philippines film star until a few weeks before joining the police!

The Gendamerie Royale du Canada, otherwise the Royal Canadian Mounted Police, have a central computerised crime information and records system which uses or used to use Univac equipment. The CIA and the FBI are also Univac users, as are the Korean CIA and other such places (perhaps there's a message there).

But in order to show Univac isn't a one-sided operation — in fact it's an equal opportunity seller — it also has installations at race tracks in Mexico. These are under the suzerainty of the Honoured Society and an even larger installation in Miami Florida, to



help the society's treasurer, one Mr Lanskay, run the operation's money transactions.

Meanwhile back here in Australasia the police haven't been idle at computerising their systems. The NSW police have a Criminal Records and Information system based on what must be two very tired Univac 9400s. The Victorian police have a similar system based on two Varian supplied but now Univac V77-600s.

Strange Announcement

In Queensland, where pedestrianism can be illegal, the police have been dragging their computerised feet a mite but are preparing systems to run on the Queensland government's large Univac 1100/80 system.

The purchase of the 1100/80 by Queensland was made or at least announced in a rather strange way, over a regular radio current affairs program. Even then the order was announced for an 1100/40, as the /80 hadn't been announced by Univac. However, the announcement of the new model, the worldwide announcement, was made in a Sydney newspaper. Like many things in Queensland, the order was handled differently to other states.

The computer system handling the issuing and collection of parking fines in NSW is operated by the police but is a Datapoint, so Univac must not be blamed for those particular cures. □

Frank's People



HAVING recently fallen from power in the big computer field and joined the strength, I wasn't on the Christmas party lists of the big boys this year. But I did make it to the annual Datec/Harry Douglas at-home for the mainframe

users.

It was a quiet little bash with not more than half the mainframe industry in the house at any one time. The other half could have fitted but wasn't on the list.

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THERE are quite a few enterprising people around the world, it seems, who are dreaming up some very interesting subroutines in BASIC and in machine language for the ZX80.

In the interests of disseminating these ideas to users in this country — most of them originate overseas where people have had longer to play with the machine — all credit for these subroutines goes, of course, to their originators, though I may change a line here or there.

The first one is a machine language subroutine to change the first PRINT statement in your program to inverse video, and is by Martin Robinson. He suggests Poking the codes between address 17000 and 17370, so it could be called by the command GOSUB USR (17000). Here are the codes to be Poked into memory: 1,44,64,10,254,1,40,6,198,128,2,3,24,244,201.

David Bailey has another method of obtaining inverse video, this time as a BASIC subroutine:

```
1000 FOR A = 16428 (note: can be extended for longer strings)
1010 POKE A, PEEK (A)+128
1020 NEXT A
```

David Bailey has another, this time a copyright protection device. It involves creating a line number 0 (zero) containing the author's name (or other identifying symbols). Once this is done, line 0 cannot be EDITED or deleted in any way other than re-writing the whole program.

Enter this: 1 REM xxxxxx xxxxxx (your name minus the first character, for example: ohn Batty)

Then in command mode enter; POKE 16425,0 then POKE 16426,xx(chr\$ code of the missing character, for example: J×47)

With my name as an example this will create ; 0 JOHN BATTY which cannot be removed. The normal program can follow on with no ill effects.

Lost RAM Address

While loading in a machine language subroutine recently, my favourite niece decided she was going to have a conversation with me, so I lost track of my current RAM address. Was the last entry POKE 17111,24 or was it POKE 17112,244? I came up with this short check program for reading POKED subroutines:

```
10 LET A× 17100 (or your SUBR. start address)
20 PRINT PEEK (A);“ ”;
30 LET A = A+1
40 GOTO 20
```

This will print out all the op-codes in your program in an easy to read fashion, allowing you to verify them before they could crash the main program. If the main program has already been entered, make the test program line numbers 1 to 4 and do your check before you RUN. Of course once you have tested, delete or jump the test program.

Okay, you have your main program entered and you are wondering where in RAM is free space enough to hide that machine language program. Use this subroutine of mine, located after the last line number of your program (renumber it to suit) and access it by line 1 GOSUB xxxx or GOTO xxxx.

```
10 PRINT “BITS NEEDED?”
20 INPUT P (note: here enter the number of bits your m/1 SUBR uses up)
30 LET A=17000 (note: Sinclair advise 17000—17370 is usually free, but you can try elsewhere)
40 FOR X=A TO A+P
50 IF PEEK(X)=0 THEN NEXT X
60 IF NOT PEEK (X)=0 THEN LET A=A+P
70 NEXT X
80PRINT P;” BITS FREE ADDRESS “;A;” TO “;P
```

The only way you will get a printout from this is if the machine can find the number of free consecutive bits you are looking for. Not very ingenious, but people often miss the simple way of doing something.

That's enough subroutines for the time being. I don't know how many of you have noticed, but ever since the Zx81 hit the market here, everyone seems to have dropped us ZX80 users like hot potatoes.

This month's program, Level Seven, is a science-fiction type scenario set just after The Bomb has gone off.

By chance, you are standing next to an elevator entrance to a military bunker. You are told you must reach Level Seven to escape the radiation which is slowly seeping into the bunker.

Unfortunately, you must take pot luck with the different elevators as you do not know where they lead and some levels are periodically sealed. There are also hidden gravity shafts which will whisk you back to the shaft — to a large dose of radiation. A dose larger than 15 units is lethal. Have fun trying not to get fried! □

Level Seven

```
10 LET R=1
20 PRINT “REACH LEVEL 7”
30 PRINT “TO ESCAPE RADIATION”
40 PRINT
50 GOTO 110
60 CLS
70 PRINT “GRAVSHAFT PUTS YOU”;
80 LET R=R+2
90 IF R>15 THEN GOTO 410
100 PRINT “BACK”;
110 PRINT “ON SURFACE.RADIATION POISONING “;R;” UNITS.NL TO ENTER LIFT”
120 INPUT X$
130 CLS
140 LET L=RND(8)
150 LET C=RND(20)
160 LET S=RND(5)
170 IF L=8 AND C>18 THEN GOTO 70
180 IF L=8 AND NOT C>18 THEN GOTO 140
190 PRINT “LEVEL “;L
200 IF L=7 AND C<6 THEN GOTO 390
210 IF L=7 AND NOT C<6 THEN GOTO 130
220 IF S=5 THEN LET R=R+1
230 IF S=5 THEN PRINT “LEVEL SEALED.NO EXIT.RADIATION POISONING NOW AT “;R;” UNITS.NL”
240 IF R>15 THEN GOTO 500
250 IF S<2 THEN PRINT “DENIED ENTRY.MOVE ON.NL”
260 IF S=5 OR S<2 THEN INPUT R$
270 IF R$=“ ” THEN GOTO 130
280 IF C<9 AND C>2 THEN PRINT “GO LEFT”
290 IF C>11 THEN PRINT “GO RIGHT”
300 IF C<12 AND C>8 THEN GOTO 350
310 IF C<3 THEN GOTO 60
320 INPUT T
330 CLS
340 GOTO 150
350 PRINT “ANOTHER LIFT.NL”
360 INPUT A$
370 IF A$=“ ” THEN GOTO 130
380 STOP
390 PRINT “SAFE”
400 STOP
410 CLS
420 PRINT “BACK TO SURFACE.RADIATION POSISONING NOW “;R;” UNITS.DEAD”
430 STOP
500 CLS
510 PRINT “LEVEL “;L;”.RADIATION DOSE NOW “;R;” UNITS AND LETHAL.YOU ARE DEAD”
520 STOP
```


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Newcastle Microcomputer Club; Gordon Johnson, Electron Microscope Unit, University of Newcastle. Phone (049) 68 5045 (Work).

NSW 6800 User Group; 27 Georgina Avenue, Keiraville, NSW 2500.

Sorcerers Users Group; PO Box E162, St. James 2001. Ian King, 15 Forest Avenue, Wahroonga 2076. Phone (02) 48 6072.

TI-99/4 Home Computer Users' Group of Sydney; S. Andersen, PO Box 101, Kings Cross, 2011. Phone (02) 358 6662.

QUEENSLAND

Brisbane Youth Computer Group; A. Harrison, PO Box 396, Sunnybank 4109.

Commodore Computer Users Group of Queensland; Mrs D.D. Dillon, PO Box 127, Stones Corner, 4120.

Iree Microcomputer Interest Group; N. Wilson, PO Box 811, Albion 4010.

Superboard Users Group, Ed Richardson, 146 York Street, Nundah, 4012.

SOUTH AUSTRALIA

Adelaide Micro User Group (TRS-80 and System 80 Users); R.G. Stevenson, 36 Sturt St, Adelaide 5000.

South Australian Apple Users Club; The secretary, SAAUC, c/- The Bookshelf, 169 Pirie Street, Adelaide, 5000.

South Australian Microprocessor Group

Inc (SAMG); The Secretary, PO Box 113, Plympton, 5038. Phone (08) 278 7288.

VICTORIA

Apple Users Society of Melbourne; G Halprin, Phone (03) 859 5835.

BUG 80; Burwood Users Group, PO Box 46, Blackburn South 3130.

Compucolor Users Group; L. Ferguson, 12 Morphett Avenue, Ascot, Melbourne 3342.

Geelong Computer Club; Peter McKeon, PO Box 93, Geelong 3220.

KAOS (Ohio Scientific); David Anear, 49 Mil-lewa Crescent, Dallas, 3047.

National ZX80 Users Club; 24 Peel St. Col-lingwood, 3066

Northern and Western Suburbs Computer Users' Group; contact CP/M Data Systems, 284 Union Rd, Moonee Ponds, 3039. Phone John King (Secretary) (03) 338 9304

SMUG; SCORD M100 users, Robin Miller, 60 Winnmalee Drive, Glen Waverley 3150.

Sorcerer Computer Users (Australia); Sec-etary, PO Box 144, Doncaster 3108.

WESTERN AUSTRALIA

Sorcerer Computer Users of Australia; The Secretary, 90 King George St, South Perth 6151. Phone (09) 367 6351

CU WEST (WA Compucolour/Intecolor User Group); John Newman, 8 Hillcrest Drive, Darlington, 6070.

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THIS MONTH I have had a large variety of games to evaluate, so I could only deal with some of them. I hope to review the others at a later date.

The first three are Arcade-style games, the other is a multiplayer battle game.

Beer Run

Beer Run, by Sirius Software, appears at first to be very similiar to Apple Panic, with ladders and different levels. The similiarity continues with you having to try and avoid the 'guzzlers' and the 'bouncers'. If you happen to run into any of these nice chaps you will find yourself falling off the platform to your death.

But that is where the similiarity ends.

Your aim is to catch the Artesians, fun-loving creatures who will drop cans of beer from above for your refreshment. For each beer you can catch one point is added to your score.

You are a beer-runner at the bottom of the Sirius building. Ladders and lifts are used to climb upward to reach the roof. If you reach the roof a blimp will pick you up and transport you to the Olympia, next door. Once in the brewery your chances of catching an Artesian are greatly enhanced.

While this may appear easy, believe me it is not. The higher you get up the first building the harder it becomes to avoid the drunks and bouncer. Beer Run is a definite improvement over Apple Panic, and is more involved.

David's Midnight Magic

While Beer Run is an extension of Broderbund's Apple Panic, David's follows on from Raster Blaster, and is also a definite improvement.

It is a pinball game with much more advanced screen display. It has dual flipper controls, upper and lower playing levels, tilt mechanism, roll overs, multiple ball play, electronic deflectors and many special effects.

According to Broderbund's Gary Carlston, Bill Budge (who wrote Raster Blaster) requested him to delay the release of David's Midnight Magic, because Bill felt it would kill the sale of his program. This may have been an over-reaction by Budge, as Raster Blaster is an excellent game and is still worthwhile for those who do not already have it.

International Grand Prix

This is a variation of the arcade car driving simulations. The aim is to negotiate your car through a series of

marker posts on each side of the roadway. The sensation of movement is achieved by updating location of these posts on the screen. The faster you go, the faster these posts appear.

In addition to the track display there is a console at the bottom of the screen. In this is displayed a tachometer, gear indicator, fuel gauge, and lap timer,

Apart from the console, the program also has very good sound effects. As the motor reaches maximum revolutions in each gear the sound becomes louder. From this sound you take your cue to change gears.

If in doubt you can check your instruments. However, this means you have to

Games Software Report Card

Program:	Beer Run			
Made By:	Sirius Software			
Available for:	Apple II			
Ratings:	excellent	good	okay	well, maybe
Ease of Use		✓		
Speed	✓			
Entertainment value		✓		
Educational value				✓
Documentation		✓		
Value-for-money	✓			
Holds interest for	Hours			
Price:	\$32.95			

Games Software Report Card

Program:	InternationalGrand Prix			
Made By:	Riverbank Software			
Available for:	Apple II			
Ratings:	excellent	good	okay	well, maybe
Ease of Use		✓		
Speed		✓		
Entertainment value		✓		
Educational value			✓	
Documentation			✓	
Value-for-money		✓		
Holds interest for	Hours			
Price:	\$31.50			

take your eyes off the course and this can be fatal.

IGP gives you five different race tracks to test your skills on: Oulton Park, England; Warwick Farm, Australia; Karlskoga, Sweden; Riverbank (Riverside for the purists, but the software company happens to be called Riverbank), USA; and of course Monaco. Each is a reasonably faithful reproduction of the twists and turns of these tracks.

At the top of the display, just prior to approaching the various parts of the track you are told the name of the corner, so you can take the appropriate action.

You are given the option of choosing the track, the number of laps, the amount of fuel and the conditions prior to starting.

Dark Forest

Dark Forest is a strategy game for one

to six players. It follows a similar pattern to Global War, by Muse software.

You start the game by setting up one of four boards, where you choose a castle to defend and search. Each player has the same aim — to find the three lost treasures before the other players.

But life is not as easy as it would appear. If you spend all your time searching, you are liable to be invaded by the other players or the Gruds, who are against everyone.

After each player chooses his castle, he is rewarded with a number of armies. He places these strategically, with the aim of protecting his castle and gaining as much territory as he can, so he can generate more armies. The greater the amount of territories you own, the greater the number of armies you are granted each turn.

You can gain territory from other players or the Gruds by attacking them. Of course the larger the number of armies you have on a territory, the better your chance of defeating the enemy.

There is one factor, however, over which you have no control. That factor is the Specter, who randomly decides to take a man for his pleasure from anyone. This reduces the number of men you have, if you are lucky enough to be chosen.

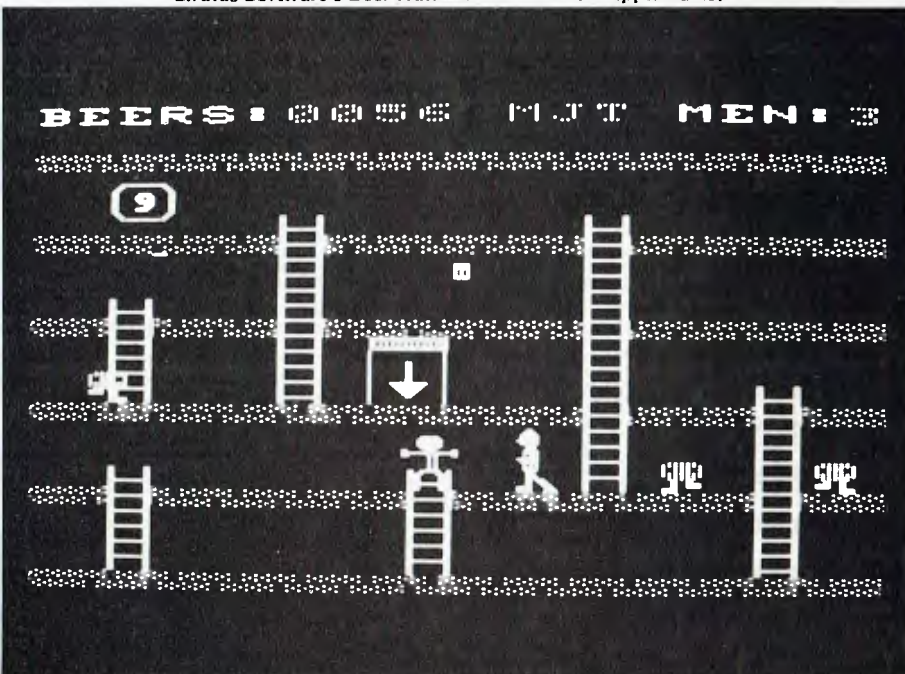
On the credit side there is a friendly magician who can create men for you. However, he does not necessarily give you extra men if you have lost them to the Specter. He may even give them to your enemy.

Dark Forest is a game you can spend some time at to develop various strategies. It is particularly interesting because you can play with other people. The single player game can also be interesting, but the best way to play is to have a few others play with you.

Games Software Report Card

Program:	David's Midnight Magic			
Made By:	Broderbund			
Available for:	Apple II			
Ratings:	excellent	good	okay	well, maybe
Ease of Use	✓			
Speed	✓			
Entertainment value		✓		
Educational value				✓
Documentation			✓	
Value-for-money	✓			
Holds interest for	Hours			
Price:	\$36.95			

Sirius Software's Beer Run — more fun than Apple Panic.



Some Other Games

The other games I was not able to review in depth included:

Empire 1, by Interactive Fantasies, the first of a three-part scientific/fantasy game. It looks good but will take a lot of time to master and evaluate.

County Fair is an arcade shoot-em up game. Fun if you like that type of game.

Dragon Fire is an adventure/fantasy game using lo-res graphics. It's very popular in the USA.

Alkemstone, by the same company as Dragon Fire (Level 10), is a maze adventure. It was number four in the fantasy

stakes in the USA for December.

Kaves of Karkhan is a hi-res adventure/fantasy game. It was number three in the USA for December.

Goblins, by Highlands Computer Services, is a hi-res adventure in the same mould as Creature Venture and Oldorf's revenge.

Bug Attack is a very good arcade game. I enjoyed playing it and hope to review it late.

Mad Venture is a classic words-only adventure with a new twist. Great for those adventure players.

Softporn Adventure is another classic words-only adventure which has a delightful twist. The aim is to seduce three women. Tops with those I know have it and number three in the USA for adventure games.

Finally, as a side point, Ultima and Wizardry (reviewed in January) were number one and number two in the USA in December. Wizardry was number 11 in the overall top 30 on its first time in.

Games Software Report Card

Program:	Dark Forest			
Made By:	Sirius Software			
Available for:	Apple II			
Ratings:	excellent	good	okay	well, maybe
Ease of Use		✓		
Speed		✓		
Entertainment value		✓		
Educational value			✓	
Documentation			✓	
Value-for-money		✓		
Holds interest for	Hours			
Price:	\$31.50			

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YC 9

your CP/M computer

— by Bill Bolton —



I'M CURRENTLY trying to get a remote CP/M system up on-line — starting date will depend on when Telecom can approve a permit to connect and supply an auto answer modem.

It will be much the same sort of system as Trevor Marshall's temporary RBBS. In the interim I'd like to get some idea of who would use such a system.

Let me know if you're interested...

Compatibility With I/OS

The following is a discussion of the compatibility between I/OS and CP/M, presented both for interest and because I disagree with some claims made for I/OS.

I/OS is a well-written and useful operating system with a number of extensions over CP/M. If you need any of its special features its certainly worthwhile looking at.

But there are two points at issue in the discussion which I'd like to make quite plain right from the start. First, there is the compatibility between I/OS and CP/M and, second, there is the advisability of end users moving away from the default industry standard. The version of I/OS discussed is the current release, version 2.34.

I disagree with claims that I/OS is *totally* compatible with CP/M 2.2. This simply isn't so: there are a number of non-trivial differences between I/OS and CP/M which will mean there are a potentially large number of useful CP/M utility programs which will not run under I/OS

The following statements about compatibility are extracted from page 25 of Section III of the I/OS Manual, as recently supplied to one I/OS purchaser. The grammar is theirs:

"This is not to claim or state any approval of Infsoft or I/OS by Digital Re-

search or Cromemco. And not to make any claims or warranties as to the suitability of any product produced for CP/M or CDOS to be run with I/OS.

Some overlap does occur with MP/M's extended calls.

WARNING:

No program that 'knows' about internal features of CP/M can reasonably be expected to run under I/OS. This means anything beyond the normal DOS call at 5 and the branch table pointed to by 0.

One significant problem that has occurred with many CP/M programs that do not run under I/OS, is insufficient stack space was allowed. Some programs allow only 5-10 bytes of stack room, before other data gets overwritten. Since I/OS uses 16 bytes of user stack before it switches to its own stack, this can cause significant problems."

At least Infsoft is reasonably clear on some (though by no means all) important aspects of incompatibility with CP/M; but what does that stuff about the 'internal' features of CP/M mean?

User Areas

I/OS doesn't support user areas at all. With CP/M on floppy disks, user areas are not all that useful, because the storage capacity of the disks is limited. However, I do find it hard to contemplate effectively using any sort of hard disk system without user areas. As well as not supporting BDOS function calls 31 (DPB) and 32 (USER), functions calls 37 (RESET DRIVE) and 40 (WRITE RANDOM WITH ZERO FILL) are not supported by I/OS. Okay, there are compatibility problems between CP/M and I/OS: who, then, should use I/OS? From my point of view I/OS is probably a better proposition than CP/M for a system OEM who is packaging turnkey systems for a specific commercial market sector.

This part of the computer marketplace is such that there are few problems with compatibility. The customer is supplied with a complete software package to fulfil his total business requirement and most, if not all, software support comes from the original vendor.

I/OS comes with a good range of system utilities, wider than those supplied with CP/M, and has a number of very useful extra features.

However, there is a large base of public domain (read minimal cost) CP/M programs from the various user groups which can provide similar, if not greater, facilities on a CP/M system. The point here is that you have to work at getting these utilities

for CP/M, whereas I/OS has them ready to go.

The I/OS documentation is also much better than the Digital Research documentation.

The Default Industry Standard

I think there is probably little point in an existing CP/M user upgrading to I/OS. The CP/M 3 project is still underway at Digital Research. When it is introduced Infsoft will have to go through another 'catch-up' cycle to bring I/OS up to a reasonable degree of compatibility.

To reiterate a point made previously in this column, the great majority of programmers working in the CP/M market write programs for a 'Digital Research CP/M' environment. As such they will use the system facilities provided by the current release of CP/M. The sophistication of CP/M programs is increasing all the time and more and more use is being made of the newer facilities in CP/M 2.2.

Users of 'compatible' operating systems run the risk of finding the latest 'whiz bang' CP/M applications program won't run on their system. With more programs doing internal checksums it is even getting more difficult to patch commercial software to overcome minor incompatibilities.

New Users' Group Volumes

CP/M users' group volumes 55 through to 75 have been released. These volumes are most of volumes 1 to 26 of the SIG/M users' group, with some duplication due to later volumes updating earlier volumes removed.

The SIG/M volumes include material from the Pascal/Z users' group. There are about 25 more volumes in the SIG/M users' group which should eventually appear in the CP/M group's collection. □

Osborne CP/M User Guide

THE long-awaited CP/M guide from Osborne has finally appeared; and it was worth the wait!

The Osborne range of books on micro-processors has maintained a consistently high standard in terms of content, and more recently has had a high standard of presentation as well.

One of the major obstacles to the new CP/M user is the documentation supplied by Digital Research. All the information needed is there, but finding and understanding it is quite another matter for a first-time user.

The purpose of the book, by Thom Hogan, is twofold. First, it covers all the

aspects of CP/M which need to be understood to start using it. Second, it has the more subtle aim of raising the level of understanding of the reader to a level where he can begin to make some sense of the Digital Research documentation.

The book has eight chapters and seven appendices. Chapter 1 is called Introduction to CP/M and Operating Systems; it is a painless guide to operating system terminology and getting CP/M started. Chapter 2, CP/M Built-in Commands, also covers the filenaming conventions and command line editing conventions, while Chapter 3 discusses the DR-supplied CP/M Transient Commands — including an excellent and understandable description of the complex range of PIP options.

Assembly Language Utilities, in Chapter 4, covers ASM, DDT and LOAD, including a good introduction to assembler terms and getting the most out of DDT. Chapter 5, Other Transient Programs and CP/M, covers an area most CP/M books have avoided: utilities supplied with CP/M but customised for specific hardware en-

vironments, such as COPY, FORMAT, MOVCPM, SYSGEN. There is also a discussion on available high level languages and word processing programs.

Extensions to CP/M are covered in Chapter 6, MP/M, CP/NET and CP/M Derivatives. This is a brief overview of the newer and more complex products from Digital Research and at least it recognizes some of the CP/M derivatives, such as CDOS, SDOS, IOS, TPM and some of the special CP/M implementations for TRS-80, Heath and so on.

Technical Aspects of CP/M, Chapter 7, includes some advice on modifying your BIOS and using BDOS functions.

Chapter 8, Putting It All Together: The Systems Approach, is in one sense the best chapter in the book. The author has specified what is realistically needed to use CP/M effectively, then given a detailed explanation of the specification. There is also a brief but good section on getting yourself organised.

The appendices cover ASCII character codes, CP/M version differences, CP/M prompts, diskette selection, annotated

bibliography and address of the companies mentioned in the book. There is also a good index.

Throughout the book there are numerous examples of command interactions used to demonstrate points raised in the text. The style is easy to follow without being too 'chatty'. As well as the specific information about CP/M, there is a lot of excellent, practical advice on good micro-computer operating practice. While the book is definitely aimed at CP/M beginners, it will still be interesting to experienced CP/M users as a reference.

I did spot one obvious mistake. Chapter 3 (page 56) says files with the SYS attribute set are available to all user areas. This is not correct: files with the SYS attribute set are available only in the user area where they are located.

Overall I rate this the best book I have seen on CP/M. *Osborne CP/M User Guide*, by Thom Hogan; published by Osborne/McGraw-Hill, 1981; ISBN 0-931988-44-6. My copy came from The Technical Bookshop, Castlereagh St, Sydney and cost \$16.90. □

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HELLO there all you PET Lovers. This is Errol The Cat, your new Commodore "Whizzpuss" from Melbourne.

Unfortunately, our friend Peter Sandys has retired from writing this column and is now writing the Apple column. I'm sure you will all join me in giving Peter a cheery vote of thanks and wish him all the best for the future.

This month I have stealthily examined the new Commodore 2031 single disk drive unit. An impressive unit this, being virtually half a Commodore 4040 dual disk.

The 2031 has the capacity to store 174,848 bytes of information and is both read and write compatible with the 4040 unit. It has its own inbuilt DOS Version 2.0. The 2031 DOS Version, called 2.6, has a few extra features needed to support a single unit.

A maximum of three sequential files can be open at any time, or one relative file and five random files, or a mixture of these file types to the limit of the six memory buffers available. Error status is retrieved by PRINTing 'DDS' or by OPENing the command channel and INPUTing the error message. When an error is detected, the single LED will flash until the disk status is queried.

Copy commands function in the same manner as other Commodore drives, with the exception of not being able to backup or to copy files from one unit to another. However, there is a transfer utility program which allows you to copy from one 2031 to another unit. CPUs with BASIC 4.0 will find that backup operation will result in error '31'.

The drive is a Shugart 390 mechanism — the same as the 4040 unit. The 2031 is light and compact, being in a square box cabinet with the power switch, power connector and IEEE port located at the back.

I found the 2031 great as a communications aid using the public domain software Orion and Dumb One. But you can't send and save files using a cassette unit.

The price is a starter — \$749 including sales tax. This means you can have two 2031s for less than a 4040! I was very impressed and believe this unit to be a must for any current cassette user.

```

LINE# LOC CODE LINE
0001 0000 ;*****
0002 0000 ;*
0003 0000 ;*
0004 0000 ;* 'DUMP' ROBERT MITCHELL - 27/01/82
0005 0000 ;*
0006 0000 ;*
0007 0000 ;*****
0008 0000 ;THIS ROUTINE WHICH WILL TRANSFER WHATEVER IS ON THE SCREEN TO A SUITABLE
0009 0000 ;PRINTER HAS BEEN WRITTEN FOR THE 3000/4000/8000 COMMODORE MICROCOMPUTER
0010 0000 ;THE ROUTINE WILL WORK WITH ANY MX-80 OR MX-100 PRINTER, BUT USERS WILL
0011 0000 ;HAVE VARYING DEGREES OF SUCCESS WITH OTHER PRINTERS, DEPENDING ON HOW
0012 0000 ;THEY ARE INTERFACED, AND THE CHARACTER CODES USED BY THAT PRINTER.
0013 0000 ;PLEASE NOTE THAT THE ROUTINE IS SELF CONFIGURING WITH RESPECT TO SCREEN
0014 0000 ;SIZE AND VARIOUS ROM TYPES I.E IT WORKS ON ALL COMMODORE CPU'S.
0015 0000 ;TO USE THE ROUTINE, SIMPLY TYPE IN THE LISTING WITH AN EDITOR, OR IF AN
0016 0000 ;ASSEMBLER IS NOT AVAILABLE, USE THE MONITOR TO ENTER THE OP-CODES
0017 0000 ;[NUMBERS IN THE THIRD COLUMN] INTO THE MACHINE. AT THE MOMENT, THE
0018 0000 ;ROUTINE IS RESIDENT AT THE TOP OF MEMORY, [32K] BUT THIS CAN BE CHANGED
0019 0000 ;BY SIMPLY REASSEMBLING THE ROUTINE, OR ENTERING IT AT A DIFFERENT
0020 0000 ;STARTING LOCATION USING THE MONITOR [THE ROUTINE USES RELATIVE
0021 0000 ;ADDRESSING THROUGHOUT]. IF YOU TYPE IT IN AT A DIFFERENT LOCATION, BE
0022 0000 ;SURE TO ALTER THE INTERRUPT VECTOR I.E. :
0023 0000 ;POKE AAAA+2,AAAA+11-256*INT((AAAA+11)/256) AND
0024 0000 ;POKE AAAA+6,INT((AAAA+11)/256)
0025 0000 ;WHERE AAAA IS THE NUMBER [IN DECIMAL] YOU DECIDED TO LOCATE THE ROUTINE
0026 0000 ;IN MEMORY.
0027 0000 ;TO START THE ROUTINE, SIMPLY TYPE IN 'SYS AAAA', AND FROM THEN ON ALL
0028 0000 ;YOU HAVE TO DO TO DUMP THE SCREEN IS PRESS THE 'SHIFT' AND 'OFF/RVS'
0029 0000 ;KEYS SIMULTANEOUSLY. IF FOR ANY REASON THE ROUTINE IS DISENGAGED E.G.
0030 0000 ;THE IRQ VECTOR IS RESET, THEN SIMPLY TYPE IN 'SYS AAAA' AGAIN.
0031 0000 ;
0032 0000 ;
0033 7E90 78 ;*32400
0034 7E91 A9 9B LDA #<START ;DISABLE INTERRUPTS DURING SETUP
0035 7E93 85 90 STA 144
0036 7E95 A9 7E LDA #>START
0037 7E97 85 91 STA 145 ;SET IRQ VECTOR TO BRANCH TO PRINTER ROUTINE
0038 7E99 58 CLI
0039 7E9A 60 RTS ;RETURN TO BASIC
0040 7E9B A5 98 START LDA 152 ;SHIFT KEY PRESSED?
0041 7E9D D0 0D BNE START2
0042 7E9F AD 51 C3 LDA 50001
0043 7EA2 C9 30 CMP #48
0044 7EA4 D0 03 BNE INTER2
0045 7EA6 4C 2E E6 JMP $E62E
0046 7EA9 4C 55 E4 INTER2 JMP $E455 ;NO - JUMP TO INTERRUPT SERVICING ROUTINE
0047 7EAC AD 51 C3 START2 LDA 50001
0048 7EAF C9 30 CMP #48
0049 7EB1 D0 09 BNE COMP2
0050 7EB3 A5 97 LDA 151
0051 7EB5 C9 08 CMP #8
0052 7EB7 F0 0C BEQ BEGIN
0053 7EB9 4C 2E E6 JMP $E62E
0054 7EBC A5 97 COMP2 LDA 151
0055 7EBE C9 12 CMP #18 ;OFF/RVS KEY PRESSED?
0056 7EC0 F0 03 BEQ BEGIN
0057 7EC2 4C 55 E4 JMP $E455
0058 7EC5 08 BEGIN PHP ;SAVE PROCESSOR STATUS AND REGISTERS
0059 7EC6 48 PHA
0060 7EC7 8A TXA
0061 7EC8 48 PHA
0062 7EC9 98 TYA
0063 7ECA 48 PHA
0064 7ECB AD 51 C3 LDA 50001
0065 7ECE A2 00 LDX #0
0066 7ED0 C9 30 CMP #48
0067 7ED2 D0 04 BNE FILE2
0068 7ED4 86 D1 STX 209 ;NO FILE NAME FOR PRINTER
0069 7ED6 A6 D9 LDX 217
0070 7ED8 86 D9 FILE2 STX 217
0071 7EDA A9 04 LDA #4
0072 7EDC 85 D2 STA 210 ;STORE LOGICAL FILE NUMBER
0073 7EDE 85 D4 STA 212 ;STORE DEVICE NUMBER
0074 7EE0 A9 FF LDA #255
0075 7EE2 85 D3 STA 211 ;NO SECONDARY ADDRESS
0076 7EE4 AD 51 C3 LDA 50001
0077 7EE7 C9 30 CMP #48
0078 7EE9 D0 06 BNE OPEN2
0079 7EEB 20 24 F5 JSR $F524
0080 7EEE 38 SEC
0081 7EEF 80 03 BCS SETUP
0082 7EF1 20 63 F5 OPEN2 JSR $F563 ;OPEN FILE TO PRINTER
0083 7EF4 A2 04 SETUP LDX #4
0084 7EF6 20 C9 FF JSR $FFC9 ;SETUP CHANNEL FOR OUTPUT
0085 7EF9 A9 00 LDA #0
0086 7EFB 85 00 STA 0
0087 7EFD 85 01 STA 1
0088 7EFF A9 B0 LDA #128
0089 7F01 85 02 STA 2 ;SETUP LOW/HIGH ADDRESS OF SCREEN
0090 7F03 A4 00 LDY 0 ;ACTUAL ROUTINE BEGINS HERE!
0091 7F05 B1 01 LDA (1),Y ;GET A CHARACTER FROM SCREEN
0092 7F07 29 7F AND #127 ;TURN OFF REVERSE SCREEN FLAG
0093 7F09 C9 5B CMP #91 ;IS IT A GRAPHIC?
0094 7F0B 00 04 BCC OK ;NO - KEEP GOING
0095 7F0D A9 20 LDA #32 ;YES - SUBSTITUTE A SPACE
0096 7F0F D0 0F BNE OUTPUT
0097 7F11 C9 00 CMP #0 ;IS IT AN '8'?
0098 7F13 D0 04 BNE CONV ;ND - MANIPULATE ASCII VALUE FOR PRINTER
0099 7F15 A9 40 LDA #64

```

```

LINE# LOC CODE LINE
0100 7F17 D0 07 BNE OUTPUT ;OUTPUT 'Q'
0101 7F19 C9 20 CONV CMP #32 ;IS IT UPPER CASE/NUMERIC
0102 7F1A B0 03 BCS OUTPUT ;YES PRINT IT
0103 7F1D 18 CLC
0104 7F1E 69 60 ADC #96 ;ADD MAGIC NUMBER TO LOWER CASE LETTERS
0105 7F20 20 D2 FF OUTPUT JSR SFPD2 ;OUTPUT MANIPULATED CHARACTER
0106 7F23 A5 00 LDA 0
0107 7F25 C5 D5 CMP 213 ;END OF SCREEN LINE
0108 7F27 F0 05 BEQ NEXT ;YES SEND CARRIAGE RETURN/LINEFEED TO PRINTER
0109 7F29 F6 00 INC 0
0110 7F2B 38 SEC
0111 7F2C B0 D5 BCS GET ;GET ANOTHER CHARACTER
0112 7F2F A5 D5 NEXT LDA 213
0113 7F30 C9 4F CMP #79
0114 7F32 F0 0E BRQ COL80
0115 7F34 A5 01 LDA 1
0116 7F36 C9 C0 CMP #<33728 ;END OF SCREEN? [LOW BYTE]
0117 7F38 D0 14 BNE NEXT2 ;NO CONTINUE
0118 7F3A A5 02 LDA 2
0119 7F3C C9 83 CMP #>33728 ;END OF SCREEN? [HIGH BYTE]
0120 7F3E F8 2E BEQ FINISH ;YES - WINDUP
0121 7F40 D0 0C BNE NEXT2
0122 7F42 A5 01 COL80 LDA 1
0123 7F44 C9 80 CMP #<34688 ;END OF SCREEN? [LOW BYTE 80 COL]
0124 7F46 D0 06 BNE NEXT2 ;NO CONTINUE
0125 7F48 A5 02 LDA 2
0126 7F4A C9 87 CMP #>34688 ;END OF SCREEN? [HIGH BYTE 80 COL]
0127 7F4C F0 20 BEQ FINISH ;YES - WINDUP
0128 7F4E A9 00 NEXT2 LDA #0 ;NO - GOTO NEXT LINE OF TEXT
0129 7F50 85 00 STA 0
0130 7F52 18 CLC
0131 7F53 A5 01 LDA 1
0132 7F55 69 01 ADC #1
0133 7F57 65 D5 ADC 213 ;ADD LENGTH OF SCREEN LINE TO GET TO NEXT LINE
0134 7F59 85 01 STA 1
0135 7F5B A5 02 LDA 2
0136 7F5D 69 00 ADC #0
0137 7F5F 85 02 STA 2
0138 7F61 A9 0D LDA #13 ;CARRIAGE RETURN/LINEFEED SEQUENCE
0139 7F63 20 D2 FF JSR SFPD2
0140 7F66 A9 0A LDA #10
0141 7F68 20 D2 FF JSR SFPD2
0142 7F6B 38 SEC
0143 7F6C B0 95 BCS GET ;GET ANOTHER CHARACTER
0144 7F6E A9 0D FINISH LDA #13 ;WINDUP SECTION- SEND CR/LF SEQUENCE
0145 7F70 20 D2 FF JSR SFPD2
0146 7F73 A9 0A LDA #10
0147 7F75 20 D2 FF JSR SFPD2
0148 7F78 A9 04 LDA #4
0149 7F7A AE 51 C3 LDX 50001
0150 7F7D E0 30 CPX #48
0151 7F7F D0 05 BNE CLOSE2
0152 7F81 20 AE F2 JSR SF2AE
0153 7F84 D0 03 BNE CLOSE2+3
0154 7F86 20 E2 F2 CLOSE2 JSR SF2E2 ;CLEAR ACTIVE CHANNEL
0155 7F89 68 PLA ;RESTORE PROCESSOR REGISTERS AND STATUS FROM STACK
0156 7F8A A8 TAX
0157 7F8B 68 PLA
0158 7F8C AA TAX
0159 7F8D 68 PLA
0160 7F8E 28 PLP
0161 7F8F AD 51 C3 LDA 50001
0162 7F92 C9 30 CMP #48
0163 7F94 D0 03 BNE INTER3
0164 7F96 4C 2E E6 JMP SE62E
0165 7F99 4C 55 E4 INTER3 JMP SE455 ;JUMP TO INTERRUPT SERVICING ROUTINE
0166 7F9C .END

```

ERRORS = 0000

SYMBOL TABLE

SYMBOL	VALUE	SYMBOL	VALUE	SYMBOL	VALUE	SYMBOL	VALUE
BEGIN	7EC5	CLOSE2	7F86	COL80	7F42	COMP2	7EBC
CONV	7F19	FILE2	7ED8	FINISH	7F6E	GET	7F03
INTER2	7EA9	INTER3	7F99	NEXT	7F2E	NEXT2	7F4E
OK	7F11	OPEN2	7EF1	OUTPUT	7F20	SETUP	7EF4
START	7E9B	START2	7EAC				

END OF ASSEMBLY



Tasty Titbits

My mate Robert Mitchell has produced for me a screen dump program. PET lovers who have had problems dumping screen output to various printers will find this software a great help.

Catty Comments

Commodore chief Nigel Shepherd recently visited COMDEX in Las Vegas. Once again, I heard the VIC stole the show. I just wish (like hundreds of others) that I could get my paws on the wretched machine.

Roger Davies of 'Twitching Human Dynamo' fame has got himself a furry companion, namely a dog called Sheena — after his favourite singer. Ah! What it is to be a PET lover.

Rumour has it Commodore is restructuring its dealer network. My fur is bristling!

Guess what? Several major corporations have recently standardised on the Commodore as their in-house micro. Eat your core out Apple!

Well that's all for this time. Next month I hope to look at the VIC 20 — Commodore willing! Otherwise, I may examine the new Micro Mainframe. Dear oh dear! I shall have to brush up on my COBOL and FORTRAN.

Free readers' classifieds*

FREE CLASSIFIEDS: are for readers only, not commercial organisations. Classifieds of 20 words or less accepted free of charge; for classifieds of more than 20 words the first 20 words are free, then it's 20 cents a word.

Black and white prints may be included if suitable for publication, and will be charged for at \$10 each photograph.

More than one ad in one issue will be treated as a single ad and charged accordingly.

COMMERCIAL RATE: Minimum 20 words, at 35 cents a word. Photographs \$20 each.

PRINT or type your ad clearly and legibly, double-spaced, and include separately your name, address and phone number for our records or checking purposes even if these details aren't all to be included in your ad.

Send it to *Your Computer Readers' Classifieds*, PO Box 216, Spit Junction, NSW 2088

Sell: Super 80, 16K RAM, S100 expansion interface, Eprom Basic, box, power supply, manuals and cables. \$440.00 (02) 628 7569. 5-11pm.

Sell: Super 80 16K complete with all IC sockets - ready to use, tape and books - urgent sale \$380.00 o.n.o. Phone (02) 522 5699.

Complete TRS80 (level 2, 16K) System with green screen, Hi-res, books and over \$700. software. Worth well over \$2000. Sell \$1600. Robert Wilson (02) 587 3590.

Pnakotic Software:

Apple II Joystick - \$33.95;

Game Port Expander - Use four Paddles without modification - \$32.95;

Rubik's Cube Solver - Super fast graphics - \$24.95;

The System Analyst - RAM, Disk, Monitor, Paddle Tests, More - \$29.95; (Programs require 48K/DOS 3.3)

Send payment to: Pnakotic Software, 21 Leabrook Drive,

ROSTREVOR,
ADELAIDE 5073.

(Prices include Postage/Packing)

Sell: Heathkit H77 Floppy Disk; in kit form complete and full documentation \$700; Write to: W Vasak, 11 Gwyther Ave, BULLI. NSW. 2516.

Microline 80 Printer in new condition with original packing. Must sell at \$600. Phone Collin a h at (049) 52 6374.

Sell: TRS-80 Model 1 Level II Basic 16K (just serviced by Tandy) \$500., plus green monitor (new) \$150.; Tandy cassette plus leads \$50. Owner leaving Australia hence low price. Steve (03) 46 5631 (bh).

SINCLAIR ZX-80 As new, with programs and tapes. Urgent sale! \$150. Tel: 909 8632.

Sargon II Chess Patch Program for TRS 80/System 80. Modifies and improves Sargon. Now you can save and load unfinished games. Plus 50 authentic chess problems on a cassette data file. For details, send S.A.E. to: B Fripp, 30 Castlecor St, FERNY GROVE 4055.

ZX80, 16K RAM, \$130. worth of software, complete with power supply and leads. Total value \$530., sell for \$400. Ph: P. Riley (02) 570 8504.

System 80 16K, green screen, 2nd cassette games and books all for \$750.00 with warranty. PH: Chess (03) 879 3581 (ah).

APF - Complete system incl. colour monitor, 24K RAM, disk drive, much software on tape and discs. \$1800 ono Phone: (03) 368 2298 (bus. hours).

Sell: System 80 printer (1 year old) \$330.00 Steve (03) 46 5631 (bh).

Run CP/M on your Model I TRS-80. Omikron board allows both Basic and CP/M on your TRS-80. Includes CP/M manual, Omikron board, & instructions. Requires 5 1/4 inch disk drive. Includes membership in users club. \$250. Steve (03) 46 5631 (bh).

TRS80 Programs: Lunar Lander, Robot Attack, Cosmic Fighter, Night Flight + others. Books: Games, Microsoft decoded. \$10 @. Scott O'Keefe (02) 523 2238.

Wanted: Accounts receivable program for 48K CP/M 2.2 Sorcerer MkII. Ring Tony (02) 818 1122.

SHUGART SA400 35 track single sided disk drive perfect condition with manual, suit TRS80 etc . . . \$225.00 Phone: (03) 749 3460.

For Sale: Sorcerer MkI 32K, Monitor, two cassettes, Dev Pak, heaps software, TRS-80 I/Face \$1300 ono. Steve Pullan (02) 625 0598.

TRS80 Model 1 Level 2 48K Pertec disk drive. Double density expansion interface. RS232. Many mods, extras. Cost \$3500 Sell \$2200. Phone ah (047) 36 4136.

Sell: MICROACE computer with expanded memory. Hardly used. Incl. mains adapter, manual, leads, programs. Value \$230. Sell \$150. Phone: (002) 23 1773.

For Sale: CIP Ser. II, 8K RAM up to 40K on board, Dabug III ROM Monitor, Sound port, RS232 port, two graphics modes, software controlled keyboard. All manuals. Games cassettes extra. \$500.00. Ph: 9am-1pm (03) 387 6960 or 6pm-11pm (03) 429 7385.

Sell: Teletype KSR 35 excellent condition 20 MA current loop I/F, \$200 o.b.o. Also full set manuals for Teletype Mod. 32 & 33 \$25.00 o.b.o. Norm (03) 534 1192.

LATEST Casio calculator/computer system; FX702P 2K RAM, manuals, program library, FP10 miniprinter, FA1 cassette interface. (plus owner software) \$400.00. Ph: (03) 602 1688. ext. 222 (bh) John.

ZX80, mains adapter, Invaders cassette plus "30 programs for the ZX80" book \$185.00. Contact a. Philpott. Tasmania (002) 61 2800.

your computer text file

International Section

IN YOUR August 1981 edition, I read a very interesting article headed Computer Literacy or Bust.

In this article I was very interested in Professor V.X. Glenhill's book *Discovering Computers*.

I would be very grateful if you would give me some information on the book and how I can get hold of a copy.

HAKAN KARADAGLI
Izmir, Turkey

Your Computer'e olan ilginiç için
tesekkurler.

You see, we are international—Ed.

The Great Price Debate

I READ with interest Mr Bref Ruhl's comments and Mr Julian Barson's reply about the price of Sinclair ZX81 computers. Unfortunately Mr Barson did not give any information about how he arrived at the figures quoted, because they do not compare well with advertised prices in British magazines.

Sinclair Research has advertised ZX81 computers for £69.95 and 16K RAM pack for £48.95. These prices seem to include VAT, and were in *Computing Today* magazine for September 1981.

Acorn Computer has advertised the Acorn Atom in *Electronics* and *Computing* for £150 plus VAT or £174.50 (8K ROM and 2K RAM I think).

These prices suggest VAT is 16%, and that is used in later calculations. The 12K + 12K Acorn Atom price was £289.50 including VAT.

The current conversion rate is 0.5986 for \$ to £Sterling.

The ZX81 is advertised in Australia for \$350 with tax and in Mr Barson's comments for \$230 without tax. The Acorn Atom (another of Mr Barson's computers) is advertised by Microbase at \$780 incl tax for the 8K ROM and 4K RAM (!) and \$965 for the 12K plus 12K, including tax.

Using Mr Barson's figures I have taken a rough stab at prices less tax by deducting 10 percent.

These figures do not agree with Mr Barson's claim of 53% increase. Is there a large customs charge, or does Sinclair Research charge Mr Barson a price which is above the UK retail price? Someone somewhere is putting a hefty slice of the local price in his pocket and making the equipment over twice as expensive here as in the country of origin.

Perhaps, you will be unable to pursue this investigation because you rely on advertising for some of your income, and advertisers do not like to be criticised. For the same reason I do not expect to read any objective comment on the fuss over the Apple price conflict and the American parent company intervention.

Thank you for your time. □

JOHN ANSELM
Stawell, Vic

As well as expressing his opinion to Your Computer, John Anselmi wrote direct to Sinclair Research in Cambridge, England. Sinclair replied to Mr Anselmi and sent a copy of that reply to us:

Dear Mr Anselmi,

Thank you for your letters of 15 and 21 November on the subject of the purchase price of our products in Australia.

We recognise that the retail prices are higher than in the United Kingdom, but there are good commercial reasons for this.

To begin with freight costs between UK and Australia are very high, especially since we use air-freight. In addition supplementary carriage costs and customs clearance, warehousing and so on, are considerable. Subsequently the import agent has to pay import duties and customs clearance of six percent, and the retailer 17 percent as sales tax.

Australia is supplied by our London export agents and the product must, therefore, bear three sets of margin to cover handling and other costs, including costs of advertising and distribution in Australia itself.

We have carefully reviewed the retail price in all our markets, and we are convinced that these prices are fair, considering the service and sales support which we require from our distributors.

I would like to point out that the Sinclair ZX81 computer has been exceptionally successful in Australia and, in my view, this vindicates our pricing structure.

Yours sincerely,
A.R. Rand

Itoh's You This!

YOUR ARTICLE on the Itoh 8510 printer purchased was not complete; please can you be more specific.

I recently purchased this machine but cannot find any helpful documentation. I have an Apple and would like to dump graphics on to the printer. It is a good printer in itself, but information is not readily available on what commands it accepts from the Apple.

I have the multifunction card interface and Z80 card; these are very good to work with but the documentation on these is brief compared to other products. Please would you publish more information on these products, especially the printer.

Also do CP/M programs printed by you run on Apple CP/M?

This letter was printed on the Itoh 8510 it does an excellent job.

J.P. Schiller
Happy Valley, SA

Born Of Frustration?

REGARDING computer tellers and Mr Linton-Simpkins' column (*YC January*), the Bank Officers Association might well be justified in disapproving of these electronic marvels and of shooting same.

However, bank officers shouldn't for a moment believe that these machines were invented to save money. They were clearly invented by one of the hundreds of people who have to wait 10 minutes to make a simple transaction while the junior sales assistants from the local chemist and cake shop deposit their day's takings and arrange the small change.

Now, if I could just train the machine at North Sydney to stop eating my plastic cards...

R. MORIATY
Lane Cove, NSW

Computer	UK price less tax	UK price in \$A	Aust price in \$A	% increase.
Acorn Atom 8K + 2K	£150	\$251	\$700	180%
Acorn Atom 12K + 12K	£248	\$415	\$869	109%
Sinclair ZX81	£60	\$100	\$230	130%
Sinclair 16K memory	£43	\$72	\$138	92%

your computer glossary

Absolute: Located at a fixed address in memory.

Access: To read or write from a location in memory, or a file, or disk.

Accumulator: The major register of a CPU, in which arithmetic and logical functions are performed. Some computers have several registers which can function as accumulators; in others some registers can perform a subset of the full set of operations.

Address: A memory location which can contain data or an instruction.

Algol: Algorithmic Language, an early computer programming language for mathematical applications. Widely used in Europe, embodied early structured programming concepts and was a precursor of Pascal.

Algorithm: A set of instructions which define a method of obtaining some result (usually mathematical). A cooking recipe is an algorithm, as is a knitting pattern.

Alphanumeric: Composed of either letters or numbers or both.

Analogue (Analog): Representation of a value by a voltage or some other measurable datum, rather than a binary or other representation based on counting.

Apple: The Apple 11 computer is a computer based on the 6502 microprocessor with an integrated keyboard. Noted for its colour graphics capabilities, which make it popular with schools.

Application: What you do with your computer.

Array: A set of values under a common variable name, which are accessed through a subscript. For example A[1] is the first item in array A, A[2] is the second, etc. A[N] is the Nth item.

ASM: Assembler, also a suffix added to assembly language file names to distinguish them from other files with the same name.

Assembler: A program which converts assembly language into its corresponding machine (or object) code, which can be executed by the computer.

Assembly Language: A language in which each machine code instruction is represented by a short mnemonic which is much more comprehensible to the programmer. For example, the 8080 machine code

```
10010110]
in binary, is
[SUB L]
```

(subtract L from accumulator) in assembly language. Each line of assembly language becomes one machine instruction.

Assign: To make one thing equal to another, e.g. [A = B] assigns the value of B to A.

Atom: An indivisible component of a data structure.

Attribute: A property possessed by some object, such as a file. Often attributes take the form of restrictions, such as a file being read-only.

Backup: An extra copy of a disk, tape or file taken as a precaution against damage of the original.

Backus Normal form: A special language (a metalanguage) used to describe precisely the grammatical rules of another language.

Base: The lowest number inexpressible in a given number system.

BASIC: Beginners All-purpose Symbolic Instruction Code. Invented in 1970 at Dartmouth College by Kemeny and Kurtz as a teaching language, it has since been enhanced in its more exotic forms into one of the most sophisticated yet easy-to-use languages available on personal computers. Its major rival is Pascal, which has the added virtue of stressing structured program design.

BDOS: Basic Disk Operating System. The major functional component of the CP/M DOS.

Binary: The system of counting in 1s and 0s used by all digital computers.

Binary Search: A method of searching for an entry in a table by successively halving the table until all that's left is the desired entry.

Binary Tree: A form of data structure in which entries are tagged on at the end of the appropriate branches.

BIOS: Basic Input/Output System. The part of the CP/M operating system which is different for each machine and provides any special I/O routines for disks, terminal, printer, etc.

Bit: Binary Digit. Either 1 or 0.

Boot: To load the operating system into the computer from a disk or tape, either initially or subsequently after running a program.

Bootstrap: To use one short program to load a longer loader program which then loads the operating system.

Branch Instruction: A program instruction which causes the computer to jump to another instruction, usually fairly close by.

Buffer: An area of memory used for temporary storage while transferring data to or from a peripheral such as a printer or a disk drive.

Bug: an error in a program. Makes programmers itch.

Bus: A set of wires over which, data, addresses, or control signals are transferred between the central processor and memory or I/O devices.

Byte: A computer word eight bits wide. A byte in memory can hold a character or a binary number between zero and 255 (or — 128 and 127), or a computer instruction.

C: A programming language, developed at Bell Labs, which is particularly convenient for writing system utility programs.

Case Statement: An instruction found in some high level languages which allows control to pass to one of several subroutines depending on the value of a variable. For example, the BASIC statement

```
ON X GOSUB 100, 200, 300
```

will jump to line 100 if X = 1, 200 if X = 2, 300 if X = 3.

Call: A jump to a subroutine which leaves the return address on the microprocessor stack, so that when the subroutine is finished executing, control returns to where it left off.

CBASIC: A commercial version of the BASIC language, running under the CP/M operating system. Doesn't use line numbers on every line, and is compiled, rather than interpreted like Microsoft BASIC.

CCP: Console Command Processor. The part of the CP/M operating system that reads a command line and sorts out what it means.

Chain: To automatically run one program after another.

Character: A letter or number, or in some circumstances, a control code such as "carriage return".

Checksum: A running total of the characters in a file, recorded or transmitted with the file so that errors can be detected.

Code:

Absolute: Machine instructions which are intended to be loaded and executed in a particular area of memory.

Object: Machine instructions, as distinct from the source code from which it was generated.

Reentrant: Code which can be used by several users at once, keeping separate variables for each.

Relocatable: Code which can be loaded and run anywhere in the computer's memory.

Source code: A program written in assembler, or a high level language such as BASIC, which must then be assembled or compiled to produce the object code which can actually be executed.

Cold Boot: To start up a system from scratch, loading the operating system from disk or tape.

Cold Start: See Cold Boot.

COM file: In CP/M parlance a command file, that is, a machine code program that can actually be run.

Command: An instruction from the console for the system to do something.

Comment: A note added into a program to help the reader (or programmer) to understand its operation. Does not affect the program's execution in any way.

Compiler: A program which accepts as input a source file written in a high level language, and produces as output an object file containing the machine instructions which are actually executed.

Computer: Are you serious?

Concatenate: To join two strings together, one after the other.

Conditional: A test; for example, is X greater than Y: IF X is greater than Y

```
THEN GOSUB 500 (BASIC)
```

or, if the carry flag is set, jump to location NEXDIG:

JC NEXDIG (Assembler)

Conditionals are one of the most powerful features of any computer language.

Console: The keyboard and screen from which the operator controls the computer.

Control characters: Codes which perform functions like acknowledging correct receipt of a message or requesting retransmission of an erroneous message. Control characters are defined as part of the ASCII and similar codes.

Copy: To duplicate, usually for backup safety.

CP/M: A disk operating system for 8080 and Z80 based microcomputers. Allows the user to store information and programs in named files, as well as managing disk storage and input/output functions. Other disk operating systems include TRSDOS (on TRS-80) and DOS 3.3 (for Apple).

CRT: Cathode Ray Tube. Usually refers to the screen of a video terminal or the terminal itself.

Data: Information to be processed by, or output from, a program.

DDT: Dynamic Debug Tool. A program that assists the user to find errors in machine code programs.

Debug: To locate and fix errors.

Decimal: Based on ten.

Delete: To erase.

Device: A piece of equipment such as a printer or tape drive which the computer uses.

Directory: A list of the programs on a disk (or occasionally tape) together with necessary information, such as length and location.

Disc: A flat, circular magnetic surface on which the computer can store and retrieve data and programs. Is fast compared with tape, particularly when access is not one item after another.

Disk drive: The mechanical assembly which rotates the disk and positions the read/write head.

Disk Operating System: A program which operates one or more disk drives automatically and manages the system.

Display: The computer's output device at the console, usually a TV-like display of letters and numbers; sometimes the computer can draw on the display.

Double Density: A method of recording twice as much information on a floppy disk.

Dump: To list out the contents of memory or a disk.

Echo: When the computer inputs a character from the keyboard, it then sends it back to the display so that you can see it was received correctly.

ED: An editor program; part of CP/M.

Editor: A program which lets you alter and correct source files and other documents.

Erase: See delete.

Error Message: Tells you something went

wrong, and sometimes what.

Execute: To run a program; to follow its instructions.

FIFO: First in, first out.

File: A continuous collection of characters (or bytes) saved on a disk or tape for later reloading.

Fixed Point: Counting in integers only. Usually limited to small values, and restricted in accuracy, giving rise to ridiculous answers such as $9/5 = 1$.

Flag: A variable, sometimes a single bit, which can have only two values, used to indicate some condition.

Floating point: The kind of arithmetic used in scientific calculators.

Floppy disk: A disk, made of thin flexible mylar, and enclosed in a card jacket, which can be used for magnetic storage. There are two varieties; eight inch and $5\frac{1}{4}$ inch. These can typically store somewhere between 140,000 and 3 million bytes (characters).

Focal: Formula Calculator. A simple language, rather like a small BASIC, found on some mini and microcomputers.

FORTRAN: Formula Translation. One of the first computer languages, and beginning to show it.

Function: A sub-program that processes variables in some well-defined way.

Garbage Collection: The process of going through memory or disk space, reclaiming all the unused space.

Global: A variable which is known to all the parts of a program. See local.

Grammar: The formal rules of a language.

Hard Disk: A disk made of hard material, larger, faster and more fragile than a floppy disk, and capable of storing 70 million bytes or more.

Hard Copy: Printout.

Hardware: The bits of a computer you can kick, as opposed to the programs you can only swear at.

Hashing: A method of reducing the size of a table which otherwise would have mostly empty entries.

Hexadecimal: The method of counting to the base sixteen. Or the method of splitting binary digits into groups of four, which is the same thing. In hex, you count: 0 1 2 3 4 5 6 7 8 9 A B C D E F 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F 20 21 22.

Identifier: A label, or the name of a variable.

Iff: If and only if.

Index: A variable which usually points to an entry in a table or list.

Index Register: A processor register which is used to access tables and lists in memory.

Indirect Addressing: Referring to a variable which actually contains the address of another variable.

Input: To get data into the computer.

Instruction: A step the computer can perform.

Integer: A whole number.

Intermediate Code: A special kind of object code which cannot be run directly on the computer, but must be interpreted.

Interpreter: A program which examines source code a line at a time, decides what it means, and then does it. Compare with compiler.

Interrupt: To electronically drag the computer away from what it is doing in order to respond to some time-critical situation.

I/O: Input/Output.

Jump Instruction: Normally, control proceeds from one instruction to the next, one after the other. A jump instruction passes control, not to the following instruction, but to some other. Jumps can be conditional.

Kilo-: Prefix meaning one thousand.

Kilobyte: 1024 bytes (Kbyte).

Kilobaud: 1000 baud (kbaud).

Label: A word which identifies the destination of a call or jump instruction, or simply identifies some location in memory.

Language: The set of instructions, and rules for stringing them together, which you use to instruct the computer what to do.

Library: A set of programs, or sub-programs.

Line Number: A number at the beginning of a line, which identifies it in a similar way to a label.

Line Printer: A high-speed printer for computer output.

Link: Part of a data item in a list, which tells the computer the location of the next data item.

LISP: A list processing language, much favoured by the artificial intelligence community.

List: A sequence of consecutive data items.

Load: To transfer some data or program into the computer memory.

Locate: To "fix" a relocatable code so that it will only run if loaded in a particular location.

Logical Device: A device as the computer "sees" it: what the computer regards as the "list device" may be one of several "physical devices", such as a line printer or teletype.

Loop: To repeatedly execute a sequence of instructions; part of a computer program that is so executed.

Machine Language: The binary codes the machine actually executes.

Macro: A user-defined sequence of instructions which can be inserted anywhere in a program.

Macroassembler: An assembler which can utilise macros.

MBASIC: Microsoft BASIC; the BASIC used in the TRS-80, PET, Apple 11 and so on.

Memory: Where the computer stores data and programs internally for fast access.

Menu: A display which offers the operator a choice of several alternatives.

Microcomputer: A small computer based on a microprocessor.

glossary

- Microprocessor:** The central processing unit of a computer, built into a single silicon chip.
- Mini-diskette:** A 5¼ inch floppy disk.
- MP/M:** A multi-user version of CP/M.
- NAD:** A name and address file maintenance program.
- Numerical analysis:** The art and science of number crunching.
- Object Code:** Machine code.
- Object File:** A file containing object code.
- Object Module:** An object file containing part of a program, ready to be linked to others.
- Octal:** the system of counting to base eight, or grouping bits in threes.
- Offset:** To load an object file somewhere it will not run, in order to edit or modify it.
- Open:** To give the operating system the characteristics of a file so that it can subsequently read or write it.
- Operand:** The number an operator (+, -, etc) operates on.
- all work. See Disk Operating System.
- Operator:** An arithmetic function or some other function which alters variables.
- Optimization:** Making a program work better (or faster, or using less memory).
- Output:** What the systems produces.
- Packed Data:** Data which shares the same address, and has to be unpacked before use.
- Page:** A length of memory, typically 256 bytes.
- Parameter:** A constant which sometimes has to be varied.
- Parity:** An extra bit on the end of a character or byte for error detection.
- Pascal:** A modern structured language which may eventually rival BASIC in popularity.
- Password:** A secret word the system may demand of you before allowing you access to certain (or all) programs or data.
- Patch:** A temporary (ha,ha) fix on a bug.
- Peripheral:** A piece of equipment the computer uses, like a printer, disk drive, or modem.
- Peripheral Driver:** A program which outputs data to a peripheral and controls it.
- Physical Device:** See Logical Device.
- PIP:** Peripheral Interchange Program. A CP/M utility for copying files between devices.
- PL-1:** Programming Language /1. A good general purpose commercial language.
- Pointer:** A variable used for indirect addressing.
- Polish Notation:** A method of separating operators and operands; e.g. + 5 4 is Polish Notation for 4 + 5.
- Poll:** To ask a peripheral if it requires service.
- Postfix Notation:** Also known as Reverse Polish Notation, this is similar to Polish; 4 5 means 4 + 5.
- Preprocessor:** A program which does part of a job to make life easier for the program which follows; e.g. a macro processor before an assembler.
- Printer:** Gets computer output down onto paper.
- Priority:** The resolution of which interrupt is serviced first if two should arrive at the same time.
- Process:** A program.
- Program:** A sequence of instructions which can be understood, and ultimately followed, by a computer.
- Prompt:** A message asking the operator to supply information.
- Queue:** A list in which entries are made at one end, and removed from the other.
- R/O:** Read Only; cannot be overwritten.
- RAM:** Random Access Memory.
- Random Access Memory:** The computer's internal memory which is used to hold running programs and data. The computer can both write and read RAM.
- Read Only Memory:** Memory used to store programs, which can not be erased or overwritten.
- Reader:** Paper tape input device.
- Read/Write Head:** The small coil which reads and writes on the surface of a disk.
- Reconfigure:** To reorganise the I/O or other aspects of a system.
- Record:** A set of related data items. For example, an employee's name, address, payroll number and pay rate would form a record.
- Recursion:** The ability of functions in some languages to call themselves.
- Redundant:** Not needed or taken for granted.
- Reentrant Code:** Code which can be used by several programs simultaneously, keeping separate data for each.
- Register:** A location in the processor capable of performing logical or arithmetic functions on the contents.
- Relocatable:** Capable of being moved in memory.
- Relocatable Object Module:** Part of a larger program consisting of many such modules, all linked together and located.
- Resident:** Permanently in the system.
- Reverse Polish Notation:** See Postfix.
- RPN:** See Reverse Polish Notation.
- Run:** To execute a program.
- Save:** To store a program on disk or cassette (particularly BASIC).
- Schedule:** To decide at what stage a process should run (of an operating system).
- Screen:** See CRT.
- Sector:** A section of data on a disk.
- Simulation:** Making one system behave like another.
- Software:** Programs.
- Source Code:** The original text form of a program.
- Source File:** A file of source code.
- Source Language:** The language the source code is written in, e.g. BASIC, Assembler, C.
- Sort:** To arrange items of data in order.
- Spool:** To output a file to a peripheral, usually either a printer or tape.
- Stack:** A list in which both entries and removals are made at the same end. A micro-processor usually has a hardware stack which is used to save subroutine return addresses, temporary storage of data, and to pass variables between subroutines.
- String:** A sequence of characters.
- Submit:** To put the system under control of a file of system commands.
- Subroutine:** Part of a program which can be accessed from several points within the program.
- Symbol:** The name of a variable or a location in memory.
- Symbol Table:** A table constructed by an assembler or compiler to give the addresses of all variables and labels in a program.
- Symbolic Name:** A label.
- System:** A collection of hardware and software, possessed of the property that the whole is greater than the sum of the parts.
- System disk:** A disk carrying the operating system.
- Teletype:** An electromechanical printer/-keyboard.
- Timeshare:** Running several programs on a system simultaneously.
- Track:** The area under the read/write head during one rotation of a disk.
- Transfer:** To move data.
- Transient:** A program that is only in memory for a short time before being overwritten. Often, the only program that is not a transient is the operating system.
- Tree:** A list in which each data item may refer to several others.
- TTY:** See Teletype.
- Unix:** A multi-user, multi-tasking, multi-programming operating system, expected to appear on microcomputers before long.
- User:** One of the people connected to the computer.
- Utility:** A program of use to most users.
- Variable:** Named quantity that can take on different values.
- Verify:** To check that data written on a disk or tape can be read again correctly.
- Warm boot:** To reload the operating system a second or subsequent time.
- Word:** The amount of data fetched from one memory location. Typically one byte, but can be two on recent processors.
- Word Processor:** A system for manipulating, editing, printing and formatting texts files.
- WordStar:** A proprietary word processing program.
- Write Protect:** To remove the cover from the notch in a floppy disk so that it cannot be written on.
- Zilog:** Manufacturer of the Z-80 and Z8000 microprocessors.
- Z80:** A popular 8-bit microprocessor.

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advertisers index

AED	62
Applied Technology	33
BS Microcomp	9
Case Communication Systems	IFC
CISA	82
City Personal Computers	18
Commodore	17
Commodore Dealers	32
Compshop Australia	36
Computer Campus	49
Computer Galerie	98
Computer Ware	78
Computer Wave	63
CPU Applications	49
CPU Computers	49
Customised Technology	26
CW Electronics	84
Damar Management Systems	13
deForest Software	78
Dicker Data Projects	53, 55, 57
Dick Smith Electronics	42, 43, 59
Electro-Medical Engineering	64
Electronic Concepts	IBC
Ensoft Developer	80
Gloster Software	67
Hitachi	OBC
Imagineering	10, 25
Magmedia	78
Mi Computer Club	15
Microprocessor Applications	46
Micro Base	11
Microcomputer House	30
Micro Visions	80
3M	47
Modern Office &	
Data Management	54
Osborne	89
President Office Machines	87
SI Microcomputer	12
Six S Business Advisory	8
Software Source	5
System Software	81
System User & Management	13
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Vision 80	28
Warburton Franki	39
Zenith Education Systems	87

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