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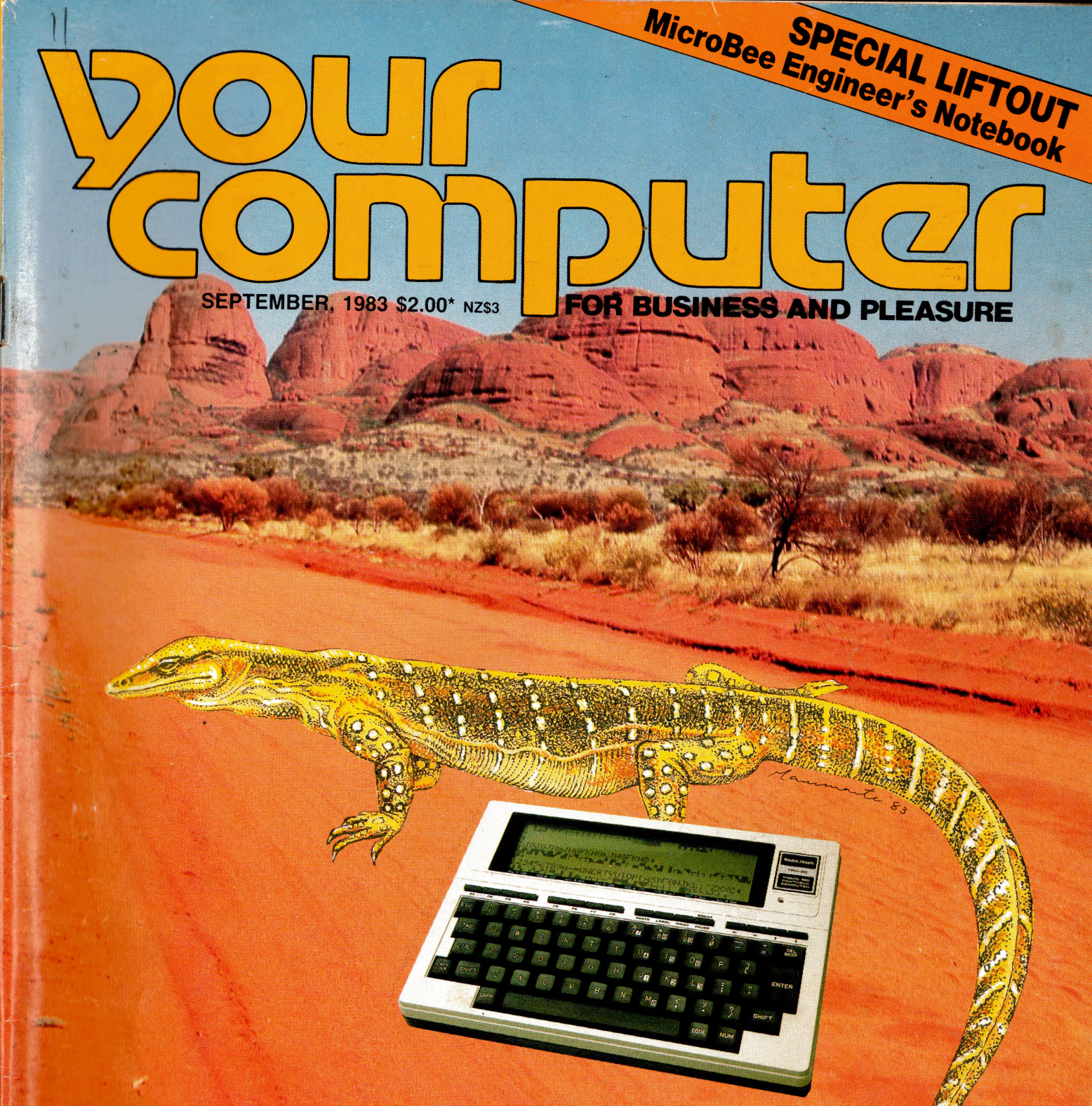

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Go-Anywhere Computers
The TRS-80 Model 100 and the Osborne Executive are representatives of the growing breed of travelling computers. The Model 100 is small enough to fit into a briefcase, but has as much power as many a desktop micro. The Executive resembles its older brother the Osborne I (right down to looking like a sewing machine when it's all packed up in its case), but contains a few important upgrades, including CP/M 3.0.

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MicroBee Engineer's Notebook
This mine of information for MicroBee owners doesn't replace the machine's technical manual, but since it's written by Max Maughan, Engineering Manager at Applied Technology, there's sure to be some fascinating hints and tips in it to help you get the most out of your MicroBee.

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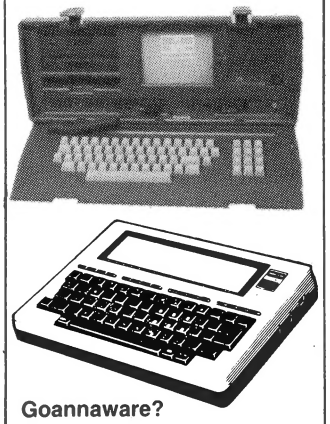
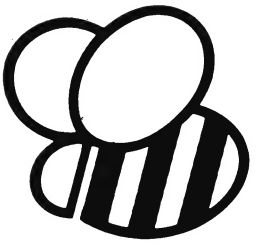


Goannaware?
If you want a computer to go anywhere you go, take a look at the TRS-80 Model 100 or the Osborne Executive. The Model 100 will fit in a briefcase with room to spare but still has some pretty powerful capabilities, while the Executive offers a few updates and improvements on the original - and very popular - Osborne I portable computer.



MicroBee Engineers' Notebook - all the hints you've ever wanted about getting the most out of your 'Bee. It was compiled by Max Maughan, Engineering Manager at Applied Technology, the manufacturer of the MicroBee.

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Glossary Of Computing Terms
We try to print our glossary regularly to help beginners to the micro maze, but lack of space means it appears less often than we'd like. We managed to squeeze it in this month though. □

editorial

Just before we went to press, IBM released its National Manpower Study of the Data Processing Industry, commissioned from consultants Urwick International. The report is a fascinating document, and I'll probably return to it next month, as it raises a number of issues of great relevance to our readers as users, programmers or future programmers of computers.

While the report is undoubtedly of great value, there is a fundamental problem in the way it was conducted which renders its results of dubious value in the larger context of all computer operations. Specifically, the problem is with the way the sample of organisations included in the survey was selected.

Urwick International maintains a database of organisations with mainframe and minicomputers, and it was from this database that the sample for the survey was drawn. The vast majority of these organisations employ more than 100 people.

However, over 60 per cent of the Australian workforce is employed by companies with under 100 staff. The most recent figures I could obtain showed that there are 750,000 businesses in Australia with under 100 employees.

These are the very companies that are now buying small computers as prices drop. If each small computer requires on average one skilled person to support it, and if only five per cent of small businesses buy a computer, then we will require an additional 37,500 people with some degree of technical expertise. Since the survey forecast a total population of skilled manpower of 72,617 for 1983, it must be obvious that the Manpower Study figures could be seriously skewed.

Already these trends are evident. Of all the trainees in the ACS industry training program, 70 per cent were from microcomputer companies and only 30 per cent from the traditional computer companies. As I circulate in the microcomputer world, I am encountering an increasing number of ex-mainframers. All this points to a shift away from the mainframe to the micro.

While part of the manpower problem will be alleviated by the 'user-friendliness' of microcomputers, so that end-users can do their own work on them, there can be little doubt that we face a major crisis in training both technical support staff and users. More on the National Manpower Study next month.

– Les Bell

Editor: Les Bell
Art Director: Michelle Mabbott
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National Advertising Manager: Richard Pakalnis
Victorian Sales Manager: Mel Godfrey
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Managing Editor: Matt Whelan

EDITORIAL: Jeff Collerton, Carson Creagh, Natalie Filatoff. **CONTRIBUTORS: Australia** – Brendan Akhurst, Shane Anderson, Dr John Barrett, Bill Bolton, Lloyd Borrett, David Brudenall, Geoff Cohen, Andrew Farrell, Richard Pakalnis, Jim Reeves, Jeff Richards, Bref Ruhl, Peter Sandys, Phil Scott, Rod Stevenson, Greg Stringer, Keith Stewart, Dom Swinkels, Leon Yendor **New Zealand** – Peter Isaac. **United States** – Daniel Montague.

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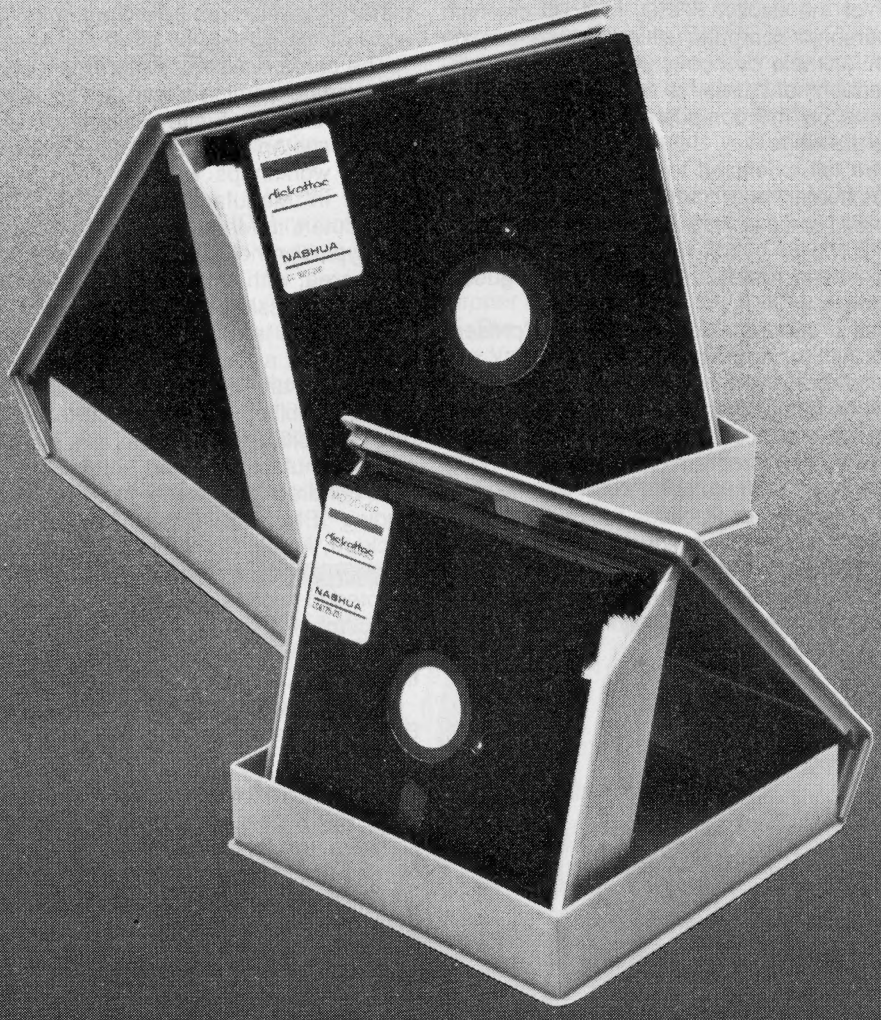

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your computer news

Your Own Personal Robot

FUTURETRONICS AUSTRALIA has the exclusive Australian distribution rights for the American firm Androbot Inc's personal robots.

FRED, TOPO and BOB are personal robots which have been conceived and designed for home use to interact socially, to entertain and to teach.

The junior member of the family, FRED, is a 30 cm high attachment to your personal computer which (who?) can be guided round the floor or table by commands from the computer. A drawing pen attachment turns his artistic talents loose; while you draw patterns on the computer screen, he reproduces them as precise drawings.

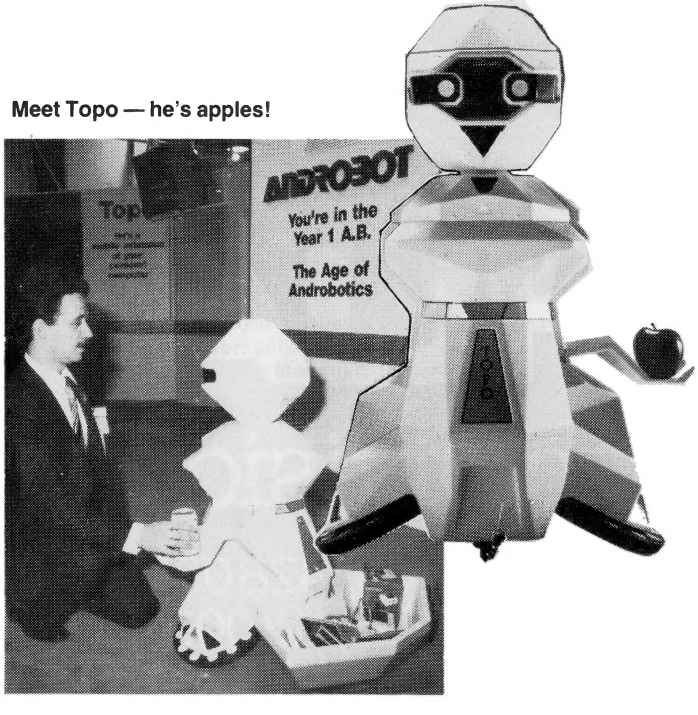
TOPO is a one-metre tall extension to your computer. Just acquaint him with your home, then control him via your computer keyboard or joystick; communications are via infrared link relays. For example, "Topo to patio" will send him scurrying over a previously memorised route to serve drinks to guests from his optional Androwagon.

Topo has an optional programmable voice, and at present software is available for him for Apple computers.

BOB is the senior member of the robot family, and is independent of a computer; he has 'brains on board'. He can 'see', 'remember', 'walk' and 'communicate' based on the computer software with which he's been programmed. Two Intel 8086 microprocessors are the basis of these abilities.

You can even get a Programmer Package for BOB to allow you to create a personal robot with unique capabilities and 'personality' - a reflection of your own mind and imagination.

For more information on the personal robot family, contact Noel Thurlow at Futuretronics Australia Pty Ltd, 1076 Centre Rd, Oakleigh 3166. (03) 579-2011. □



Meet Topo — he's apples!

Tenth Australian Computer Conference

THE MAJOR EVENT of the calendar for the computer industry will be the 10th Australian Computer Conference in September. Here are the details; if you're in Melbourne, don't miss it.

Melbourne's Royal Exhibition Building will be the venue for the Tenth Australian Computer Conference and its associated exhibition, which run from September 26th to 30th. The Conference will be opened by the Prime Minister, Bob Hawke.

The conference will feature 72 lecture sessions, six technology update seminars and seven workshops, covering everything from 'A Finite Difference Algorithm for Achieving Naturalistic Animation' to 'War Stories of Selling Software'.

The workshops cover 'Microcomputer Modelling', 'Computers in Manufacturing and Design', 'Office Automation', 'Computers in Medicine' and 'Computers and Society'. The format typically includes presentations by four or five specialists in an area, with substantial time allowed for questions and audience discussion.

Of special interest to senior school students and their parents will be a Careers and Education Forum running from 4 pm to 6 pm on Thursday 29th September.

The exhibition, which is said to be six times larger than any other exhibition held in Australia, features a wide range of computer manufacturers and software and service organisations. One hundred and twenty-five organisations are exhibiting, including IBM, ICL, Prime, Burroughs, Wang, DEC, Hewlett Packard, Apple, Commodore, Tandy, NEC, Sigma Data, Wicat, Barson Computers and others. Almost the entire Great Hall is devoted to micro suppliers.

A number of associated events will be held, including a computer poker competition and a computer art and logo competition.

Further details from 10 ACC on (03) 598 5157, or from PO Box 4063, Mail Exchange, Melbourne 3001. □

Kaypro II Software Available

KAYPRO II owners now have a source for utility and games software for their machines. Recognising that most Kaypro owners are not experienced with CP/M, *YC*'s Kaypro columnist Jeff Richards has taken some of the more useful public domain CP/M programs, set them up for the Kaypro, added some custom-written utilities and games, and made them available on disk.

Three disks are available so far, two being utilities and the third a games disk. Programs include a disk cataloguer, improved file display, file copy and file delete programs, utilities that make Perfect Writer easier to use, and MODEM7.

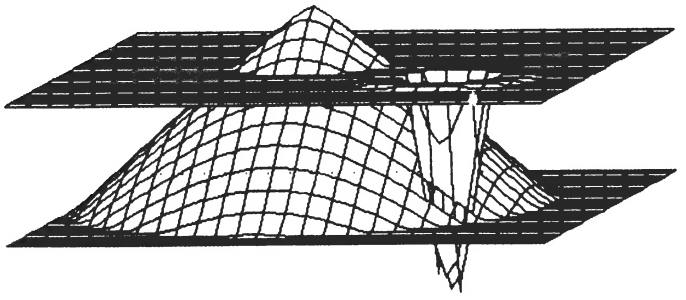
The disks come with a general documentation file, as well as documentation on the individual programs, and are priced at $15 each. To order, or for more information on the disks, write to 25 Bowline St, Jamboree Heights 4074. □

The Final Word

IN OUR REVIEW of the word processing program The Final Word in *Your Business Computer*, August issue, it was stated that the version reviewed was 1.0.

Reviewer David Vaughan has since informed us that the version referred to was in fact 1.1, a recent update to the program which has fixed various bugs in the earlier release.

The Final Word is available from Software City, 1/27 Forge St, Blacktown 2148. (02) 621-4242. □



An example of the graphics produced by the NEC Pinwriter.

New Printer Range From NEC

NEC INFORMATION Systems Australia (NECISA) recently announced the first member of a new range of low-cost, high-quality dot matrix printers.

Called the 'Pinwriter' family, the model announced was the Model P1, a 25 cm carriage, 180 cps printer with a Centronics-compatible interface and an 18-pin head.

High-density print (at 90 cps) is obtained from the staggered arrangement of the 18 pins (two by nine), which allows dot overlapping – claimed to produce a print quality approaching that of letter-quality printers.

The P1 features friction feed as standard, with an optional tractor feed and semi-automatic cut sheet guide.

The recommended retail price is $1221 including tax. For more information contact NECISA, 99 Nicholson St, St Leonards NSW. (02) 438-3544. □

News From Imagineering

IMAGINEERING is now importing the Visiword word processing program for the IBM-PC and PC-XT hard disk systems. Visiword allows the user to create and edit documents quickly through the use of clearly labelled keys (Visicorp supplies a special keyboa. l overlay with the program), and simple-language menu commands with leading prompts and messages on the screen.

Visispell provides comprehensive spelling verification for Visiword-generated text, using a master dictionary of over 100,000 words. A 'personal' dictionary of up to 15,000 words can be customised to include non-dictionary words such as proper names and industry terms.

The suggested retail price of the Visiword program is $630; the Visispell program is $380.

Imagineering has also released a range of Australian-written programs for the VIC-20 and Commodore 64 home computers. The products are available under the Mission Control label, and include a range of colourful, fast-action games.

For more information contact Imagineering, 3/579 Harris St, Ultimo 2007. (02) 212-1411. □

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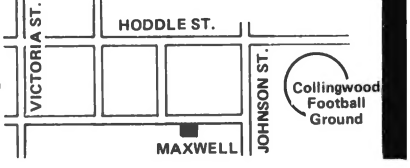

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Hewlett Packard chose Spellbinder over all other CP/M wordprocessors.

Why?

Hewlett Packard conducted exhaustive research before selecting a CP/M wordprocessor program to run on their HP125 business computer. The result? Spellbinder was judged superior in all key areas. Here are some of the reasons:

Spellbinder is fully customizable. Function keys and cursor keys really work on Spellbinder! This means faster training and more efficient use.

The most useful and workable mailing list capabilities. Sort by post code then merge any individual information from a mailing list into text.

Powerful sorting facilities. Sort clients by income and then print out a list in order of income with telephone numbers. Sort alpabetically or numerically. Eg. Print up mailing labels for only NSW customers from an all states list and have them sorted by post code.

Note: These facilities are built in.
They are not expensive add-ons.

Boilerplating. The user can create entire documents by specifying the numbers of pertinent paragraphs on a master 'boiler plate' file and printing them in any order.

Advanced printing features. Includes the ability to print in two columns and to print multiple documents.

Forms generation facilities. Create a template that 'looks like' your invoice. Spellbinder will show you where to fill in the blanks – then print just the information on your pre-printed stationery.

Ease of use. The three interactive levels of help are fully customizable so they are right for YOUR system. You can even view other documents on your disk without disturbing your current text.

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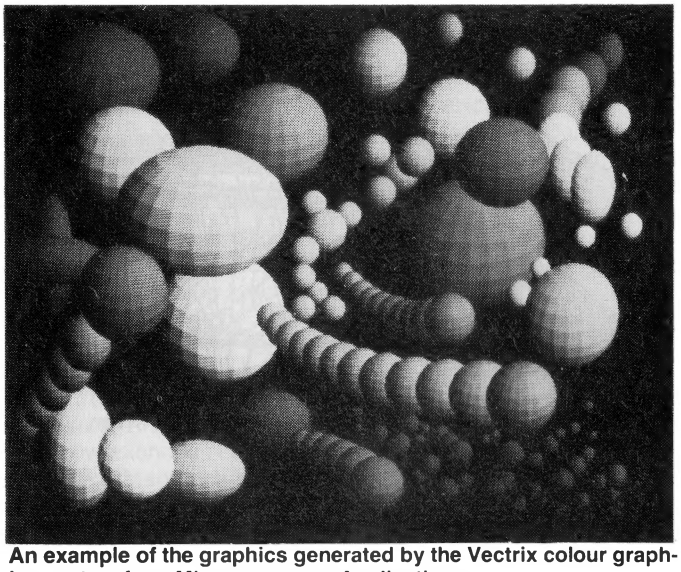


An example of the graphics generated by the Vectrix colour graphics system from Microprocessor Applications.

Vectrix High-Res Graphics

VECTRIX, a high-resolution colour graphics system released in Australia by Microprocessor Applications, is priced just under the $10,000 barrier.

Among the possibilities offered by the system are video animation, low-cost business and presentation graphics, computer-aided instruction systems, medical image analysis and computer-aided design (CAD).

One software package offered on the system is Autocad, a two-dimensional general purpose CAD system suitable for architectural and landscape drawings, mechanical, electrical and chemical drafting, structural and civil engineering, and electronic circuit design.

A bi-directional zoom facility allows working on the drawing at any level of detail. More than 50 commands built into PROM enable the Vectrix to create dots, arcs, lines or polygons and to manipulate colours from a colour look-up table.

For more information contact Microprocessor Applications at 48 Rutland Rd, Box Hill 3128. (03) 890-0277. □

Kaypro 4 personal computer — one of the new Kaypros.

New Computers From Kaypro

PRESIDENT COMPUTERS, Australian distributors of the Kaypro II portable personal computer, has announced the introduction of the Kaypro 4 and Kaypro 10 portable computers.

The new Kaypro 4, which will be priced at $3695, is designed for use with double-sided double density disks with 394 kilobytes of storage per disk.

The Kaypro 4 employs the 8-bit Z80 microprocessor and has a full-featured standard keyboard with 72 keys including 20 programmable keys, plus a 14-key calculator-type numeric keypad.

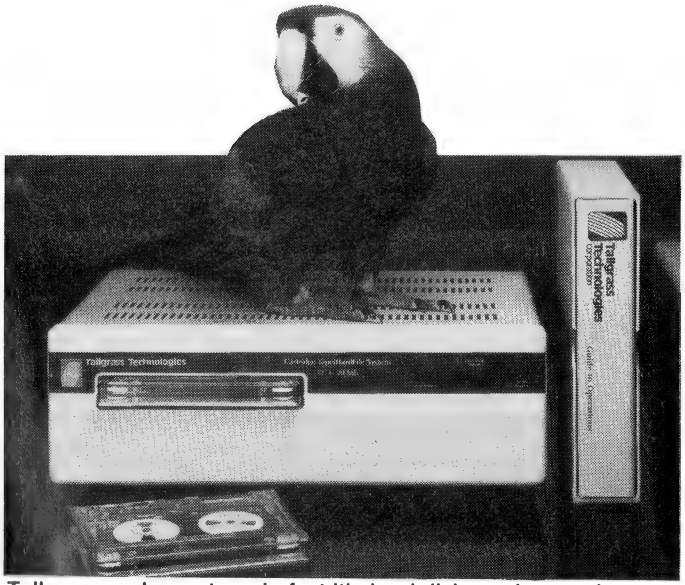
The Kaypro 10 – which features an in-built 10 megabyte hard disk – is also an 8-bit Z80-based computer, with bit graphics, which can intermix text and graphics. The keyboard is detachable, with features similar to the Kaypro 4's keyboard, and the 23 cm green phosphor screen has adjustable brightness and reduced intensity for two-tone graphics, and full-page display of 80 columns by 25 rows.

The Kaypro 10 has one parallel Centronics-type interface for a printer, two RS232C serial ports for serial printer and modem, as well as provision for connection of a light pen.

The Kaypro 4 and Kaypro 10 are compatible with the existing lines of Kaypro, and the double-sided double density disks for the Kaypro 4 can be used interchangeably with the single-sided double density disks normally used on the Kaypro II.

New software makes it possible for the Kaypro to read and write files of Osborne, TRS-80 Model I and Xerox.

For further information contact President Computers, 100 George St, Hornsby 2077. (02) 476-2700. □



Tallgrass and parrots — in fact it's hard disks and streaming tape subsystems for the IBM-PC.

Tallgrass And Your IBM-PC

TALLGRASS TECHNOLOGIES Corporation of Kansas has formed a subsidiary company in Australia to market its high-capacity hard disk drives designed for the IBM personal computer and its lookalikes.

The corporation manufactures high-performance Winchester subsystems with streaming/file-by-file integrated tape back-up. These subsystems, designed by Tallgrass and known on the US market as 'Hardfiles', are distributed in that country through computer franchise chains and independents.

The Tallgrass subsystems provide IBM-PC users with several formatted hard disk capacities ranging from 6 (Model TG-3006) to 70 megabytes (Model TG-3170). All devices have an integral tape drive, which uses an ANSI-standard tape cartridge.

Model TG-3006 has a recommended retail price of $4506; the model TG-3170 is $9226; and a 12M unit retails here for about $5161. For more information contact Dr David Marchioni on either (02) 712-2010 or 411-3154. □

How can I write better software, faster? Write it in BASIC/Z!

BASIC/Z. A new standard in compilers for the CP/M system. BASIC/Z is the most powerful implementation of the BASIC language on CP/M. BASIC/Z generates executable machine code compatible with 8080, 8085, Z-80 under CP/M 80 and 8086/8088 processors under CP/M 86 and MS-DOS.

Syntax testing as you type. BASIC/Z has a powerful program editor with built in syntax testing as you type. Time saving features include global search and replace, fifteen local edit commands and extensive debugging facilities. Line trace, error line retention, and the unique ability to 'single step' a program with a continuous display of selected variables are just a few of the features which will save you time.

Multitiered error handling allows your program to trap logical errors, including previously fatal BDOS errors. Only BASIC/Z can trap that 'BDOS ERROR ON A: READ ONLY' **before** it happens.

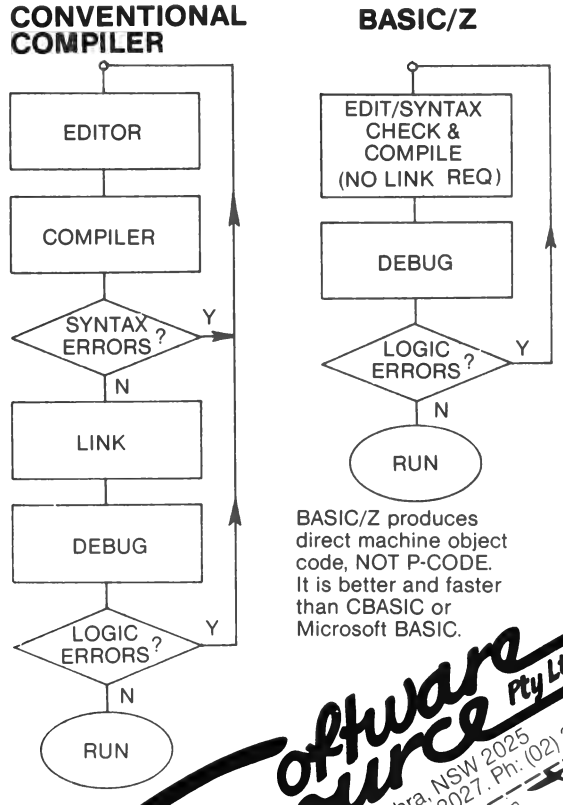
Printer/terminal customizing is built in. The runtime library of BASIC/Z (included in the package) includes installation routines for the majority of CP/M machines on the market. Your software will have near universal application without further modification. Just one set of programs will run on practically any hardware.

Unsurpassed accuracy. Floating point numerics with a range of 1E-61 to 1E+61, with a choice of precision from six to eighteen digits. All floating point maths are performed in decimal (BCD), avoiding rounding off errors.

Powerful executive functions aid programming. Using SORT, it can sort 2,000 elements in two seconds. User defined functions are fully recursive, support multiple arguments and may contain an unlimited number of statements.

No Royalties. BASIC/Z has no royalties nor runtime charges. The license agreement confers the right to distribute support software such as the BASIC/Z runtime module and the installation hardware configuration utility, subject only to specified copyright acknowledgements.

What does it all cost? BASIC/Z documentation & Software: $495* inc. tax. Available from your computer supplier of from Software Source direct. Available on 21 days approval (if software seal not broken). Or clip out the coupon and send in for further details.



BASIC/Z produces direct machine object code, NOT P-CODE. It is better and faster than CBASIC or Microsoft BASIC.

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Briefly . . .

■ System One, the Australian-produced computer system, will now be distributed by a dealer network. All the System One equipment is parameter-driven, and considerable scope is said to exist within each module to 'fine-tune' the package to the user's requirements. System One is on (02) 267-2388.

■ Australian minicomputer manufacturer D.D. Webster Electronics has received an order for seven of its Spectrum 11 minicomputer systems to aid design, research and development of the plastics industry in the USA. The $70,000 order has been placed by another Australian company, Moldflow (Aust) Pty Ltd, whose software packages for the computer-aided design of plastic injection moulds will run on the Webster systems. For details phone (03) 729-8444.

■ The MOTORS transport package, marketed in Australia by Engineering Technical Services, is a state-of-the-art microcomputer-based transport planning package covering all phases of highway and public transport analysis. Ring ETS on (08) 223-6160.

■ Apple Computer Australia is making arrangements for Control Data to be its third-party maintenance organisation in Australia. The agreement will result in users having access to a nation-wide, on-site maintenance service. More details from John Smith at Control Data on (03) 268-9500.

■ Comtech Services has released new microcomputing software running under CP/M for civil engineering and surveying. More information from Mr R.J. Wegener, (08) 223-6160.

■ A new desktop computer system designed specifically for use in the accommodation industry has been announced by the Hotel Restaurant and Club (HRC) group of companies. Called Auto Host, the system was developed in Australia and is supplied and supported by HRC's Servit offices throughout Australia. It is being marketed to run on the IBM-PC. For more information contact Brian Wickens on (02) 517-1166.

■ Omnisoft has a range of mail order software for the ZX81, including games and applications programs. The programs are written in BASIC and machine code. Catalogues are available free if you send an SAE to Omnisoft, 428 Nelson Rd, Mt Nelson 7007.

■ AED Microcomputer Products now supplies a general purpose swivel and tilt VDU monitor base, usable with the majority of popular video monitors. Contact AED on (02) 681-4966.

■ Wiser-Microsoft has released several new products, falling into four main groups: 16-bit languages for MS-DOS; MS-DOS version 2.0; Multi-Tool Word – a powerful new word processor; Multi-Tool Budget and Multi-Tool financial statement 'templates' for Multiplan. Details can be obtained from Wiser Laboratory on (02) 451-9445.

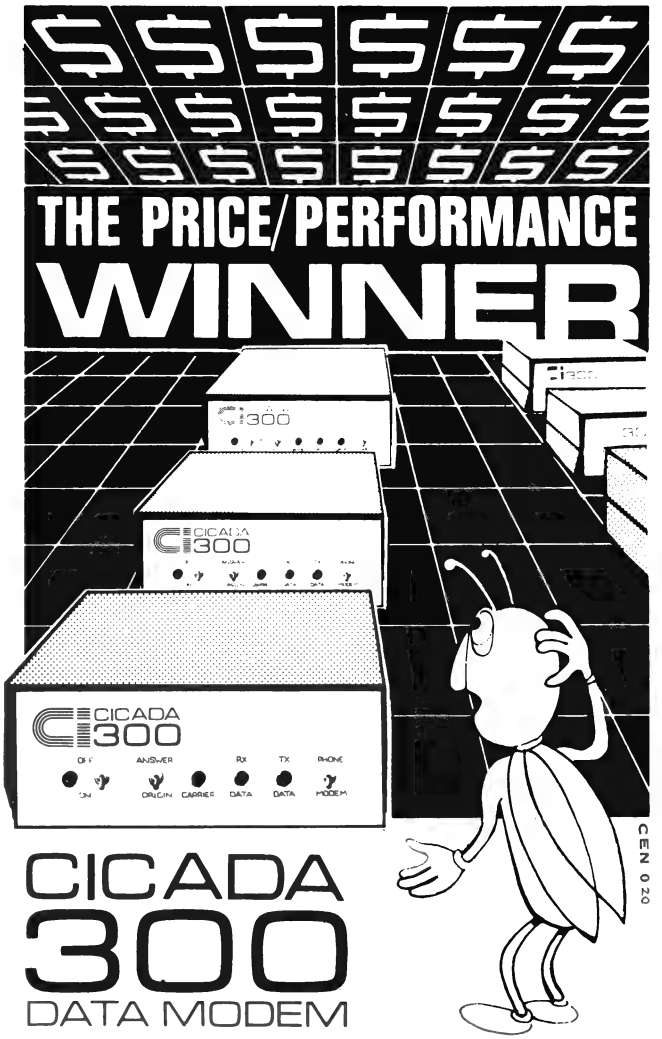
■ Education programs are now available from Dorsett Educational Systems (Australia) for the Atari 400 and 800. You can get a list of programs by sending an SAE to Dorsett Educational Systems, PO Box 99, Toorak 3142.

■ Apple Computer has just announced a new mono video monitor called the Monitor II, for use with any Apple II, II+ or IIe. It features a 30 cm anti-reflective screen, 24 lines by 80 columns, high-res graphics, and a tilt mechanism for adjusting the angle of the screen. You can reach Apple on (02) 888-5888.

■ Support for the attachment of IBM communications products to Telecom's Austpac switched network was announced by IBM Australia recently. The announcement follows extensive testing in this country of the IBM X.25 communications support. More information from IBM on (02) 234-5678.

■ Topology Network has developed a communications card for the IBM-PC which allows the attachment of a communications controller, true Z80 multi-processor, memory expansion (128K) and four serial I/O ports. The board contains 64K of RAM. Details from HAL Computer Products on (03) 429-5796.

■ The Myer Emporium has signed an agreement with ICL to become a Traderpoint dealer. From August Myer stores in Melbourne, Brisbane, Adelaide and Perth will begin marketing the ICL Personal Computer, the DRS Wordskil 8801 word processing system and the DRS 20 Model 25 distributed office system. For more information contact Brian O'Shea on (02) 929-0411. □



Australian-designed to outperform $300.00 acoustic modems, new Cicada 300 is the improved, compact 300-Baud, answer-and-originate data modem for direct phone connection and computer interface with either RS232C or V24/V28 systems.

With Telecom Authorisation number C83/37/1011, Cicada 300 ensures efficient, minimal-cost use of local, STD and ISD telephone facilities for communication between computers and data bases.

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Discovery 500's desktop multi-processor, multi-user computer.

Discovery 500 Desktop

DISCOVERY 500, a desktop networking computer for business, science and industry, has been released in Australia by Archives Computers.

The Discovery 500 is an S100 desktop single or multi-user system offering both 8-bit and 16-bit microprocessors and up to 26 megabytes of inbuilt hard disk storage. The basic system costs just under $9000.

The Discovery can use the Z80 8-bit processor or the 8086/8087 16-bit chip option, and its disk storage can be expanded to 128 megabytes.

Available with the system is a series of Dataflex-based programs, which enable all seven users to be able to enquire on or update the same database at the same time. With database files all data needs to be entered into the system only once, and each user can call on this information from many applications programs.

The Discovery 500 complements the Discovery multi-processor 16-user system which, according to Archives, has been installed in over 70 sites since its release late last year.

Archives, which is to begin operation in New Zealand shortly, can be contacted on (03) 699-8377 and (02) 922-3188. □

International Computer Exhibition In Perth

PERTH WILL be the venue next year for Australia's first international computer exhibition. The exhibition, which will be held from May 22-25 at the West Australian Institute of Technology (WAIT), will be linked to a conference organised by WAIT's computer department and the Australian Computer Society.

Microcomputers will be a feature of the exhibition, but visitors will also see the latest in home robots, network systems, software and new product releases.

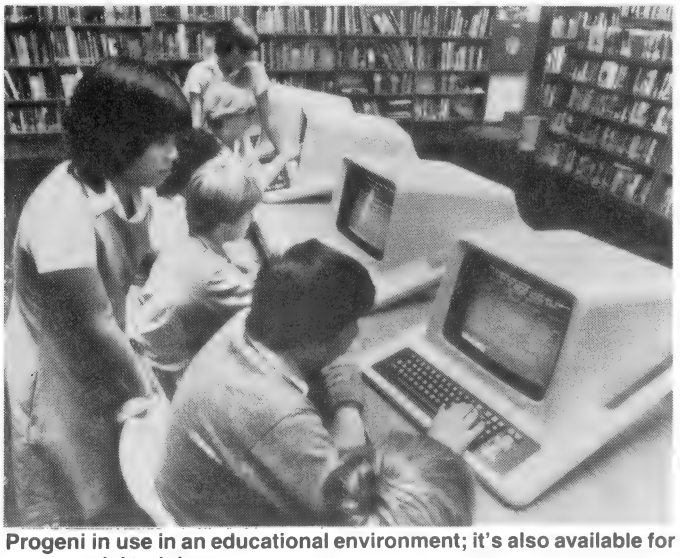
For further details contact John Palmer on (09) 350-7390 or Shaun Smith on (09) 325-0111. □

Awaken The DEAD

SOFTWARE SOLUTIONS has upgraded its Disk Editor and Diagnostics (DEAD) program, which was reviewed in *Your Computer*, May 1983. Versions of this program will soon be available in 16-bit form for CP/M-86 and MP/M-86.

The company has also released upgrades to the Cash Flow System software, and a new manual for OCAS Version 1.3, its Office Costing Analysis System. XMIT/RECV for 13 cm disks is a utility which enables file transfers to be made between a large variety of disk formats.

For more details contact Software Solutions, 11 Ormond Rd, Elwood 3184. (03) 531-4607. □



Progeni in use in an educational environment; it's also available for commercial training.

Progeni Educational Software

THE POLY system, distributed in Australia by Progeni Systems Ltd, is specifically designed for use in schools. There are over 100 courseware modules, designed by practising teachers and produced by software professionals for the entire school curriculum, including 'computer awareness'.

Poly's graphics are particularly easy to use, as the screen can be handled as a series of overlaid transparencies. This allows text to be superimposed over graphics or vice versa without any 'wipeout' occurring.

The Poly workstation is a cabinet connected to the network disk drive by a single cable, making set-up both simple and fast. Once connected to the network the 'broadcast' facility allows training material to be distributed to all workstations simultaneously, giving the teacher the option of selecting the course material or letting students select their own.

The Poly system can also be used for training staff in the commercial area.

Progeni is at Suite 6, Level 4, Chatswood Plaza, Chatswood 2067. Phone (02) 419-6300. □

VZ200 Software Starts Coming

INDEPENDENT SOFTWARE production for Dick Smith Electronic's new VZ200 computer is proceeding apace, with Janson Family Enterprises jumping into the market with three software packages: Spelling Aid and Spelling Tutor, Games Pack 1 (four programs) and Horse Racing Development System program.

Each package is cassette-based and costs $12, including postage. However, Janson Family Enterprises is offering the three programs free to the first three readers of *Your Computer* who have a VZ200 program printed in the magazine.

For more information on the programs, contact Janson Family Enterprises, PO Box 397, Dapto, 2530. □

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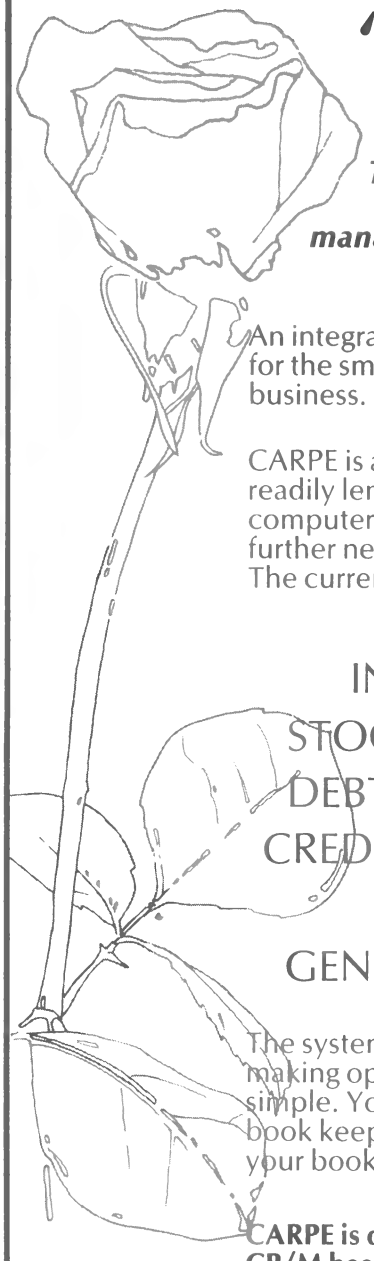

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An integrated accounting system for the small to medium size business.

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The system is menu-driven making operation extremely simple. You can computerise your book keeping without terrifying your book keeper.

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CARPE is designed to run on CP/M based systems. Computers such as the IBM PC, Kaypro, Columbia, Osborne, Morrow, Sigma and more.

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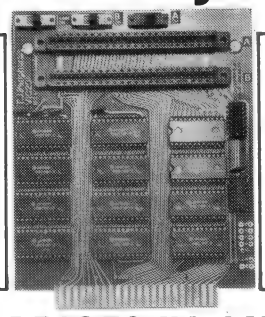

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Computerland, Top Ryde Shopping Sq, Top Ryde (02) 808 2666
Computer Lighthouse, 320 High Street, Penrith (047) 31 4429

VIC
Computers 2000, 14 Young Street, Frankston (03) 781 4244
C.W. Computerware, 305 Latrobe Street, Melbourne (03) 602 1006
The Computer Factory, 136 Bridge Street, Richmond (03) 428 5714

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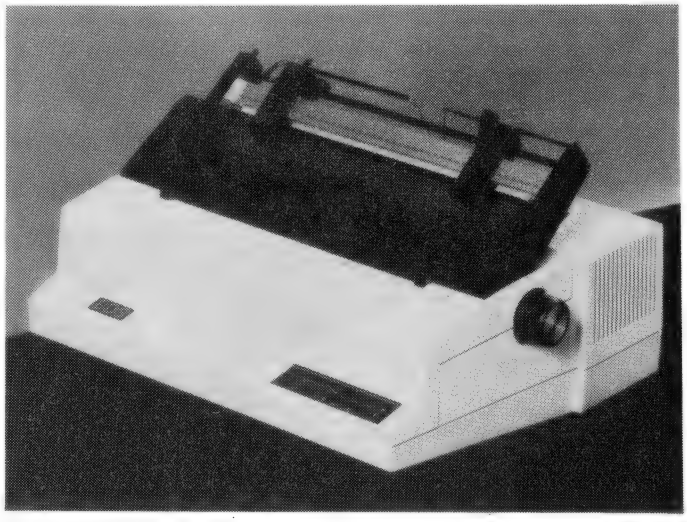

The Model LQ-55 printer from BDS.

New BDS Letter-Quality Printer

NEWEST ADDITION to the BDS line of computer printers is the Model LQ-55 letter-quality printer, which carries a lifetime guarantee on the print head.

The LQ-55 is said to be compatible with all word processing packages, and prints bi-directionally at 55 cps.

A variety of typestyles is available using standard Diablo 630 wheels. The print wheel mechanism rotates a full 90 degrees to allow easy print wheel changes. The LQ-55 uses either multi-strike mylar, nylon or dual-colour nylon ribbons.

For more information contact BDS Computer Australia Pty Ltd, 445 Toorak Rd, Toorak 3142. (03) 241-8901. □

The personal computer workstation from Data Decor.

Portable Workstation

EVEN SMALL computer systems tend to lose their portability when assembled, and tend to sprawl over every available space. Data Decor has released a low-cost personal computer workstation designed to reduce the space the system takes up and return some of its portability to it.

The workstation carries the keyboard, disk drives and VDU on the main work surface, with the printer within easy reach. The printer paper is carried on a steel rack at the back of the workstation, and has a second 'paper catcher' for continuous printouts.

Data Decor is at Waterloo Place, Richmond 3121. (03) 428-3842. □

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Ergonomics Book

A NEW AND comprehensive book on the ergonomic aspects of office automation is available from the Swedish Computer Company (SCC).

Jointly edited by a panel of international experts, *Ergonomic Principles in Office Automation* is claimed to be a definitive statement on human factors in the office environment, including equipment, software, organisation, health and safety.

Published by Ericsson Information Systems AB, of Sweden, the book further extends the company's concern for ergonomics in the data-processing field.

Priced at $30, *Ergonomic Principles in Office Automation* is available from the Swedish Computer Company, 84 Christie Street, St Leonard's, 2065, phone (02) 438-3999. □

Hawke To Open 10 ACC

THE PRIME MINISTER, Mr Hawke, will open 10 ACC – the Tenth Australian Computer Conference – which is to be held at the Royal Exhibition Building in Melbourne from September 26-30.

The exhibition site of 10 ACC will occupy close to 20,000 square metres and the rest of the Exhibition Building will be devoted to the lecture programme, which will comprise 72 lecture sessions, six technology update seminars and seven workshops.

Further details of the lecture programme can be obtained from 10 ACC, PO Box 4063, Mail Exchange, 3001, or by phoning (03) 598-5157. □

New Retail Inventory System

A COMPREHENSIVE Retail Inventory Control System (RICS) has been released by Melbourne-based software house Denman-Croft Software, a company which specialises in developing complete systems.

RICS is written in dBase II, a high-level database system, and is available on any CP/M or MP/M-based hardware. A minimum of 10M hard disk storage is required.

Features include: automatic purchase order generation, complete inventory control, multiple suppliers per item, full cost budgeting, stock transfers, returns, integrated creditors control, printing of price tags and financial and sales reports.

RICS has been designed to completely computerise the inventory management function of any business; up to 15,000 different stock items are allowed with many groups.

For further information or a demonstration of RICS call Geoff Collishaw on (03)527-3443. □

Educational Noticeboard

POSTGRADUATE Open University runs a series of radio courses which are broadcast over the University of NSW radio station.

'Using a computer in a small business', costing $.17.50, starts on September 5. 'COBOL Programming' ($35) and 'Microprocessor Applications' ($27.50) both begin on October 5.

Full details of these and other courses are available from the Division of External Studies, University of NSW, on (02) 662-2691, or by writing to PO Box 1, Kensington 2033. □

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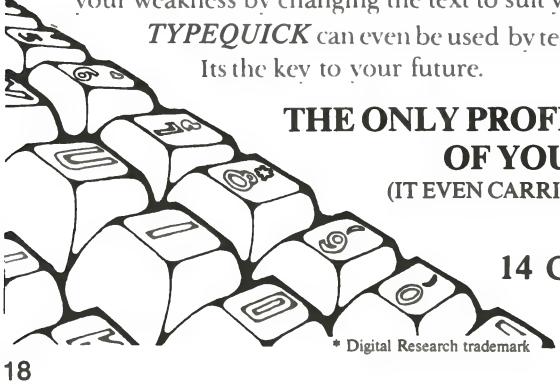

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While the trick in selling personal computers may be to 'hype' the features, the trick in owning one is to ensure that it does what you want it to do today and that it will grow as your needs grow.

In the Japanese tradition, we have aimed to perfect those computer components that have a real application in the workplace.

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Japan's high technology industry will often purchase an innovation from another country and then vastly improve it for their own use.

For instance, the processor in our T300 is the Intel 8088 — the same one that IBM uses.

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Briefcase Bombshell

Tandy's TRS-80 Model 100 — one of several new Tandy releases.

A few months ago, you may recall, Les Bell editorialised about the future of portable computers, that train of thought having been set off by the new Hewlett Packard 75C which had just been released. Well, the future is now, and Tandy is up there with the front runners thanks to its new TRS-80 Model 100.

THE MARVELLOUS little TRS-80 Model 100 is small enough to fit in one corner of a briefcase, yet powerful enough to replace a lot of bigger hardware.

Just 300 mm by 215 mm by 45 mm, the M100 runs a full Microsoft BASIC interpreter, appointment scheduler, address filer, text editor and communications utility. It also has built-in interfaces for a Centronics printer and a serial port for communications or a printer, and has up to 32 kilobytes of battery backed-up memory.

Despite the small size, the M100 keyboard is very usable; for example, I'm already typing at full speed, after just a few minutes. It's quite a comprehensive keyboard, too; the only key missing seems to be line feed. Although there's no room for a numeric pad, some of the keys do double duty with the numeric lock key.

Above the main keyboard is a row of definable/defined keys. Eight are programmable, and the remainder call for globally useful functions such as paste (used in block moves), label (reveals the functions on the function keys), print (a 'screen' dump) and pause. The remaining keys are for cursor movement.

Above the keyboard is the device that makes the machine possible, an eight-line by 40-character liquid crystal display. This has full upper and lower case characters – with descenders – as well as some graphics characters. The display is quite easily readable, and this is assisted by a control on the side of the machine which somehow adjusts the polarisation of the display so that the user obtains maximum contrast from all angles with no compromise.

At the back edge of the machine are a cassette port, in the form of a seven-pin DIN socket, a parallel printer port and a standard RS-232C port. The only problem with the RS-232C port is that the case cut-out around it is not big enough for most DB-25 plug shells. I got around that temporarily by removing the connector shell while testing the machine, though a more permanent solution would be to cut around the connector with a Stanley knife. Tandy doubtless wouldn't thank me for returning its machine in that condition, however, even if I do consider it an improvement!

The left side of the box has a connector for an optical wand, which leads me to the conclusion that software could be published in bar-code form for the M100, while on the right side are the on/off switch and display control, together with external 6 V inlet.

On first power-up, the machine displays a menu of built-in commands and files, if there are any. Filenames can be up to six characters with a two-letter extension which is usually supplied by the machine as a create-time default. The .BA extension indicates BASIC programs and the .DO extension indicates a document file, created by the M100 text editor.

At the menu level, the user can move the cursor around (using the cursor control keys) and hit ENTER when he/she has selected the application or the file he/she (oh dear) wants to work on, or alternatively type the command on the prompt line.

BASIC enters Microsoft Extended BASIC, ready to accept a new program. TEXT enters the text editor, and prompts for a file name. TELCOM enters the telecommunications options, ADDRSS will (if it can find file ADRS.DO) enter the name and address application, while SCHEDL similarly seeks the file NOTE.DO.

Moving the cursor over any other file in the menu will either run the program – if it is a BASIC program – or will invoke the text editor on the document.

Getting Down to BASICs

The version of Microsoft BASIC in the Model 100 is the latest generation of that venerable piece of software. Naturally it contains all the usual BASIC commands and statements, so I won't go into them here.

It also contains a number of less familiar statements, some of them introduced on machines like the IBM-PC and the TRS-80 colour computer, some of them completely new.

First of all, this version of BASIC views all the peripherals in and around the computer as files. So, for example, the screen can be opened as a file by the name 'LCD:', and subsequent output directed to it. The same applies to the line printer, 'LPT:'. Files can be stored in RAM, using the full filename 'RAM:ACCTS.DO' or on tape: 'CAS:ACCTS.DO'.

This extends to the RS-232C com- ▶

munications port, except that here the file name is not actually a name, but the operating parameters of the port: baud rate (up to 19200 baud), word size, parity, stop bits and XON/XOFF status. Thus to open the comms channel at 300 baud, eight bits per character, no parity, one stop bit and XON/XOFF disabled, the statement would be: *OPEN "COM:38N1D" FOR INPUT AS 1.*

Another relatively novel feature of the M100 is the fact that it is entirely interrupt driven. That this is so is evident from the type-ahead buffer which allows the user to enter commands while a program is still executing, a particularly appropriate feature for a machine which is intended to be a time-saver.

But the implications of this design feature are much deeper. BASIC includes a number of statements which give the user access to the logical (though not the physical) interrupt structure, and these can be used to make the machine considerably smarter.

For example, recall that the machine has eight function keys: the KEY statement allows the user to assign any string expression to each of those keys. This can be used to eliminate tedious typing by, for example, loading key six with the string "EDIT"+chr$(13). The SCREEN statement turns label display on or off on the bottom line of the screen.

Furthermore, each key can be connected to the interrupts through the KEY (n) ON/OFF/STOP statement. ON enables interrupts while OFF disables them; STOP disables an interrupt, but will hold any incoming interrupts in a 'pending' condition so that when the KEY ON statement is executed the interrupt will be processed.

This is done through the ON KEY statement, which allows subroutines to be run independently of whatever other activity is currently under way. At its least, this facility can be used as a simple menu processor; at its most powerful it will allow totally asynchronous processing of several events at once.

A similar facility allows control of the communications port. It is possible to set up a subroutine (target of an ON COM GOSUB statement) which will automatically copy input from the communications port into a file and return to whatever was under way when the file started to arrive.

Perhaps the most common use of this interrupt facility, however, will be with the unit's built-in real-time clock. This displays the date, day of the week and time at the top of the menu, but its major application is from within BASIC.

Three pseudo-variables, DATE$, DAY$ and TIME$, contain the current date, day of the week and time. These are in string format, and I was interested to note the date is in the European style (by now I am resigned to month/day/year format and the use of day/month/year seems novel).

These variables can be used to set the time and so on from within BASIC, and can of course be displayed from within programs. Most powerful, though, is the ON TIME$ GOSUB, which allows the user to – in effect – set an alarm. This will only apply when a program is running, however, and only the most recent ON TIME$ statement will take effect, imposing a limit of one alarm.

This could be overcome by writing a program which reads a file of alarm times and sorts them into order, then uses the first time as the subject of the ON TIME$ statement. When that alarm falls due, it reads the next alarm time and uses that in the ON TIME$, and so on. Such a program, despite its obvious utility, is not part of the documentation supplied with the unit.

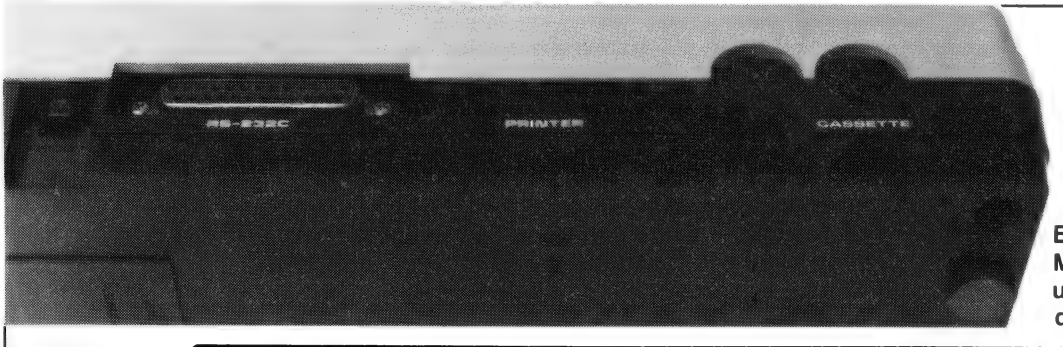
Graphics On The M100

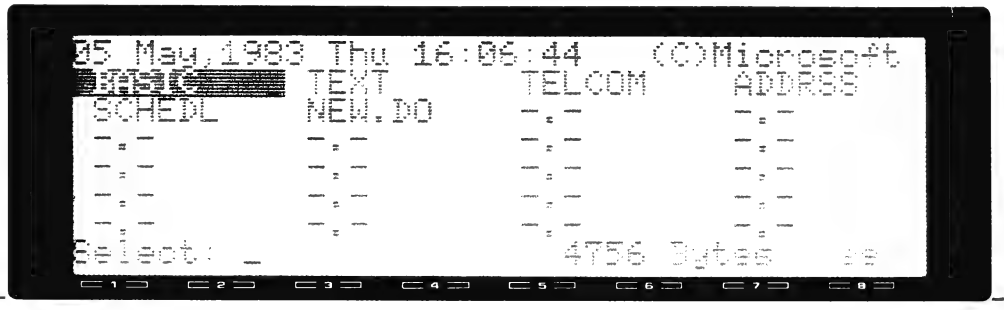
The M100 also has graphics capabilities. The screen is pixel addressable, with 240 by 64 resolution, and the BASIC has PSET and PRESET statements which will turn individual pixels on and off. This is augmented by the LINE command, which will draw lines and boxes, with optional fill. Several other statements are used to drive the system's features:

Sample program:

```
4   C = 4:P4 = 240/C/4:E = 2.7182818
5   CLS:P1 = 6.28:LINE(0,32)-(239,32):
    FOR I = 1 TO 4*C-1:GOSUB 100:NEXT I
6   X1=0:Y1=32
7   PRINT@16,"Oscillating spring"
10  FOR I = 0 TO 239
15  X = I*P1/(240/C)
20  X2=I:Y2=32-90*E^-(I/120+1)*SIN(X)
25  X1=X2:Y1=Y2
30  NEXT I
40  FOR I = 1 TO 10000:NEXT I:MENU
100 LINE(I*P4,30)-(I*P4,34):RETURN
```

IPL	Defines a BASIC program which runs on power-up
LCOPY	Copies the screen contents to the printer (except graphics)
MAXFILES	Sets or returns the number of files which can be open
MAXRAM	Returns address of top of installed memory
MENU	Returns to the Model 100 main menu
POWER	Sets the automatic power-down period or prevents power-down or powers down





Back view of the TRS-80 Model 100, plus a close-up of the liquid crystal display.

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There is also a number of commands for interfacing to machine code subroutines. The M100 has a CALL statement which allows the user to pass parameters to the processor, and also has the ability to save and load machine code files in RAM or on cassette. This will avoid a lot of messy fiddling with PEEK and POKE. Finally there are statements for beeping and generating sound.

One feature of this machine that will be of particular interest to surveyors and other field workers is that variables without a type declaration tag default to double precision, and it looks as though the transcendental functions operate in double precision too (unlike MBASIC, where transcendentals only return single precision results). At least, my HP-41CV and the M100 agree about sin(pi/4), where MBASIC 5.21 is out at the seventh decimal place.

Text Editing

The text editor built into the Model 100 is a very neat little piece of software indeed. The cursor keys move the cursor around the document, and any characters typed are inserted into the text at that point. The DEL/BKSP key will delete characters behind the cursor.

The display has a word-wrapping feature, which makes it easy to read, and carriage returns need only be inserted at the end of paragraphs (sound familiar?).

The user-definable keys default to some pretty useful functions; to see them at the bottom of the screen, the LABEL key will toggle the key definitions on and off.

For example, the F7 key will enter SELECT mode. Now the cursor can be moved around the screen, and everything between the starting point and the current cursor position will be displayed in inverse video (inverse liquid?). The user can now either CUT (F6) or COPY (F5) that area of text. In both cases, the delineated text will be transferred into the paste buffer, but with CUT the original text will be deleted as well.

Now the cursor can be moved to a new location, and the text inserted there by pressing the PASTE key. In fact, one can store a list of system commands in the paste buffer, switch to BASIC, press PASTE, and watch BASIC execute the commands one after the other: call it a pseudo-SUBMIT, input redirection or whatever.

Accelerated commands allow the user to quickly SELECT or move to the end of a document or to the top. Similarly, a FIND command can be used to move quickly to a string and find repeated occurrences of a string.

As a bonus for users of larger systems, control codes can be used for all the above commands plus some others: ↑E moves the cursor up, ↑X down, ↑S left, ↑D right, ↑A a word to the left, ↑F a word to the right (a word to the wise: this seems a most sensible and familiar arrangement, unlike some; perhaps this can be the final word in this debate, as it's an uphill struggle for perfectionists), and the prefix ↑P will even allow the user to embed control characters in the file for printer control.

Other control keys will move the cursor up or down in screenfuls, and to the left or right end of the current line. Files can be saved or loaded from RAM or cassette tape.

One of the nicest features of the system is that the editor can be invoked from within BASIC, providing a full-screen editing facility which is miles better than the standard MBASIC line editor.

The editor is also used to create the ADRS.DO and NOTE.DO files which are used by the ADDRSS and SCHEDL applications.

Scheduling And Organising Addresses

This is, regrettably, where the M100 falls down – or stands out, depending on your point of view. The scheduler and address maintenance applications are basically just the FIND command from the text editor working behind the scenes on an undisplayed file.

The ADRS.DO file, for example, just consists of lines of name and address information in completely free format, except that each line constitutes a record. There is no attempt to force a file format on the user. To find the address of a particular person, you use the FIND function, which will locate and display all records containing that particular name.

So, if you're looking for Bert Smith's address, you search for Smith, and may also come across people living in Smith Avenue or Smithtown, as well as all the Smithers family or whatever. Generally, however, this won't happen, as the files most people will maintain on this system won't grow that large.

The scheduler is the major disappointment. I had visions of an integrated software system which would automatically remind the user of appointments, sort jobs by priority and completion date/time, automatically slot meetings into the first available free time and generally be a kind of portable secretary/personal assistant/amanuensis.

No such luck. It's exactly the same as the ADDRSS function. The manual does show some neat ways of using the NOTE.DO file, however, by inserting symbols into the lines, and it does give a general-purpose file sort utility which will doubtless prove to be useful. But for the most part the potential of the system is unrealised. One alarm function only –

and that only within a running program – really wastes the potential of the real-time clock in the machine.

On the other hand, simplicity is definitely a virtue. I've lost track of the times I've lost things in a database and been unable to find them because of the lack of a global search like this one. And, of course, the user has complete control over file formats and special symbols, and can make whatever use of them he or she pleases.

Communicating

This is one of the nicest features of this machine. Just plug in a modem and you can log straight into whatever you want: Bulletin Boards, timeshare services, whatever.

The TELCOM application allows the user to alter the parameters of the serial port, though the default is the usual 300 baud set-up everyone uses. With this done the user can go on-line and, in this mode, can view the previous screenful of information, flip between half and full-duplex operation and can also upload or download ASCII files.

I plugged in an RS-232C cable, with YAM running on my main system, and was immediately able to upload and download files with no difficulties whatsoever. The M100 boasts probably the most foolproof communications facility I've yet seen. The only drawback is that the internal format of files uses a carriage return only at the end of lines, with no line feed, and this means a bit of messy conversion at the remote computer. This can be fixed by the APCON file converter program in the August 1981 issue of *Your Computer*.

Documentation

The manual supplied with the machine is up to the usual Radio Shack standard. It's quite well organised, with tutorial material at the front and reference material towards the back. There are several omissions from the manual: for example, when I went hunting for the explanation of the PRINT command, which is pretty well exclusive to Radio Shack machines, it was missing from the manual.

The M100 also has a quick reference guide, which contains a terser version of the material in the manual.

For those who've been wondering what's under the bonnet of the machine, here's the pay-off. The processor is an 80C85, the CMOS (read low-power if you're non-technical) version of the 8085 microprocessor. This makes it compatible with previous TRS-80 computers, except that some Z-80 code won't run (I've always said 8080 code is more general than Z-80 code, but you wouldn't believe me).

Lots of programmers are familiar with the 8085, and this, coupled with the ability of the machine to handle machine code files (suffix .CO), means that features of the machine at present not used by or handled clumsily through BASIC will become available.

The clock speed is 2.4 MHz, quite adequate for a computer of this size. For those who rely on benchmark figures as an indication of what they're buying, here's the oil:

Prime number benchmark (double precision): 35 min 20 sec
Prime number benchmark (single precision): 33 min 24 sec

So What Do We Have?

To sum up, then, what we have here is a very neat little computer. I think the designers could have taken better advantage of the clock features and implemented the scheduler functions more usefully, but apart from that my only complaints are that there isn't enough room around the RS-232C connector for most DB-25 plugs, that there isn't a linefeed key on the keyboard, and that files don't contain LFs. The local price – it starts at just over $1000 – is high, particularly as the on-board modem standard on the American home-market model is not included.

On the plus side, there's no other truly portable computer around with an eight by 40 display, a full keyboard, serial and parallel ports, that much memory and a proper, well-known processor. The BASIC is excellent, with high accuracy and a good turn of speed plus a wide selection of statements, and the text editor is well up to portable standards.

The Model 100 will be attractive to a variety of users, for example surveyors and other people who need a portable computation facility, as well as sales people with insurance or investment companies who may need to do calculations in the field. The communications facility will make it easy to communicate with head office computers.

For all these reasons and more, the Model 100 is sure to be a huge success. □

SPECIFICATIONS AND REPORT CARD

Unit:	Radio Shack TRS-80 Model 100 Portable Computer
Made by:	Somebody in Japan for Radio Shack
Processor:	80C85
Clock Speed:	2.4 MHz
RAM:	8 or 24 Kbytes plus optional 8K pack
ROM:	32 Kbytes (we think!)
I/O:	Parallel printer port, RS232C port
Languages:	BASIC
Keyboard:	Full QWERTY, good feel, cursor controls, eight function keys, no LF key
Display:	8 lines by 40 characters, upper/lower case
Graphics:	240 x 64 pixels, plus graphics character set
Peripherals:	Bar code reader
Expansion:	Connector in base of unit, but nothing announced yet
Best points:	Portability, RAM storage of files, BASIC precision
Worst points:	Doesn't effectively use clock facilities, RS232C port needs space around it for plugs to fit right

Ratings:	**excellent**	**very good**	**good**	**poor**
Documentation:		•		
Ease of use:	•			
Functionality:	•			
Support:		•		
Value for money:		•		

Extras included:	None
Options:	6 V plug pack
Price:	$1099
Review unit from:	Tandy Electronics

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Osborne's OSBORNE Lookalike

When you're on a good thing in this business, there's no future in sticking with it – while you do, the opposition will be copying it, and adding a few bells and whistles. After 18 months of the trend-setting Osborne 1, the company has added some bells and whistles of its own . . . Les Bell reports on Osborne's latest release.

GOOD THINGS come in small packages, they say, and no doubt Adam Osborne holds that principle dear to his heart. The Osborne 1 was a tremendous success – for a time it seemed that everyone on the Source was using one – but the times change, users become more sophisticated, competitors get wise, and so a new model has been on the cards for a while.

So here is the Osborne Executive, a new all-singing, all-dancing whiter-than-white upgrade from the original O1. The Executive has a lot in common with its illustrious ancestor, but a lot of differences too. They start with the external appearance.

When closed up, the Executive looks very like the blue Osborne 1, except for a bulge at the back, under the carrying handle, which is a fan (now stay cool, Adam – I wasn't going to mention overheating problems). The Executive retains the familiar sewing-machine format, but once open the differences become apparent.

First of all there's the screen, always a tricky point for Osborne. Adam always maintained that the O1 screen was fine, and he may have been right, but an awful lot of customers were convinced *they* were right in wanting a bigger screen, and it was their money . . . so the Executive has a larger screen, an 18 cm (7-inch) amber type, mounted slightly to the right of centre.

Although the screen is bigger, it now has a full 80 by 24 format, so the character size seems to be about the same as on the O1. That suits me; it was never the size I objected to, it was the horizontal scrolling that bothered me, causing a kind of eyeball shake I later came to term 'Osborne Ocular Oscillation'. The Executive fixes that fine.

To the right of the screen is a grille for air flow and the on/off switch, while to the left are a pair of slim-line 13 cm (5.25 inch) floppy disks. These are double density, with a capacity of 185 Kbytes under CP/M. Underneath are a pair of serial ports for modem and printer, and a GPIB port which doubles as a Centronics printer port. Back to the right are the video connectors – there's now a composite video out connector.

Returning to the disk drives: you can't see it, but there's another important fact about them – the ability to read and write other formats, such as Osborne single density, Xerox single density, IBM double density and DEC double density. This is particularly important for software availability, and also for large organisations which may have several brands of computer and find incompatibilities to be a major problem.

That's all that's obviously different about the Executive; the remaining differences are all under the bonnet. The processor is still a Z-80A (though there is a 16-bit option on the way), but it's got a bit more up its sleeve. The Executive has a total of 124 Kbytes of bank-switched RAM. Big deal, you say; there's no software to take advantage of the banks, so what's the point.

The point is that the Executive uses CP/M Plus, aka CP/M 3.0, which is able to make excellent use of the additional space. The RAM is split up so that bank 0, which consists of 64 Kbytes of RAM, is reserved for the operating system's use and is not available to the user. It contains the CP/M BIOS, a portion of the BDOS, disk and interrupt buffers.

Bank 1, which is all available to the user, is 60 Kbytes of RAM. Thus the system offers a 60 Kbyte TPA, which many readers will realise is several K more than is possible with a standard CP/M 2.2 system. Bank 7 contains the 4K by 12 bits (actually 4K by eight plus 4K by four) devoted to the screen RAM, and bank 8 is the character generator RAM and bootstrap ROM. The memory banking scheme is extremely ingenious as it allows various banks to overlay each other using a kind of 'phantom' scheme.

The gist of all this is that CP/M 3.0 is able to use a large chunk of bank 0 for disk buffering, including the disk directory and track buffering. The result is a considerable improvement in disk speed.

The Software

I think it would be true to say that the majority of Osborne buyers are less concerned with portability than with value for money. Certainly when the O1 was released in the US, it was the $US1495 price tag that attracted all the attention, particularly in light of the software included, and not the handle at the back.

For that reason, it's natural that the major part of this review should be devoted to software, particularly since most of the software is fairly new. We know the hardware works.

As mentioned above, the operating system is CP/M 3.0. This contains a number of improvements over CP/M 2.2, and brings with it a few pitfalls of its own – mostly, though, the news is good.

Many of the commands are different from 2.2. For example, the STAT command has gone, replaced by options on the SHOW, SET and DIR commands. The basic DIR function is built into the system, but more sophisticated options will automatically call for the DIR.COM file.

For example, the command DIR [EXCLUDE] *.COM will display file sizes and attributes (system, read-only, and so on) for all non-.COM files on the current drive and user area.

The DEVICE program allows the user to assign physical status to logical I/O devices much like STAT used to do; only the PUN: and RDR: devices have gone, replaced by AUXIN and AUXOUT, which have testable status and are more useful for things like (at last) device-independent terminal emulation and file transfer programs.

In addition, DEVICE allows the user to set parameters such as the terminal width and height. Utilities such as DIR will take account of the width by reformatting their output into fewer columns for narrower screens, and similarly many of the programs can be set up to 'page' through their output, 22 (or whatever) lines at a time.

The disk directory under CP/M 3.0 can contain optional date and time stamps for files, as well as a disk label which will enable applications programs to recognise a particular disk (if anyone ever does write applications programs that do that). It also supports password protection on files.

CP/M 3.0 comes with the MAC macro assembler, RMAC relocatable macro assembler, LINK linker, LIB librarian, and SID debugger. This software, which is much more sophisticated than the old ASM assembler and DDT debugger, is required to make any modifications to the operating system – not that many Osborne owners will do that.

So CP/M 3.0 is quite a bit different from 2.2 – the question is: will enough people write applications software that uses the additional facilities of 3.0 to make it worth having? Certainly now that Osborne is supporting it, the odds are much improved.

The remaining software is largely similar to that on the O1, with a few notable differences. WordStar 3 is now supplied, with the added features of column move and delete operations, decimal tab and other good stuff Osborne owners didn't have before.

CBASIC and MBASIC are the same reliable old favourites they've always been, but the latest release of Supercalc 1 now has an eXecute command which makes it programmable, and an additional program called SDI, which can transfer SuperCalc files to and from either comma-delimited files (*a la* MBASIC) or SDF files, which apparently are a superset of the VisiCalc DIF format.

The other major addition to the software package is the Personal Pearl database system, which by all accounts is a very neat little package indeed. It's similar in concept to InfoStar, in that the user creates a form on the screen and the system builds a database behind it, without the user needing to be aware of fields, records and other such troublesome concepts.

Personal Pearl is supplied on ten diskettes, and will require an entire box of diskettes just to make working copies. Fortunately, the user is prompted through this entire process by a 'Welcome' program. Once the working diskettes have been made, the user can set about using the program, or investigating the applications which have already been set up on the sample diskettes.

Here's the major drawback with small diskettes as used by the Osborne and other machines: you have to keep swapping diskettes when working with a large system like Personal Pearl. With any large applications like this, and especially with databases, either 20 cm disks

The Osborne Executive — value for money in a portable format.

or preferably a hard disk are essential. This also applies when transferring files between a word processor, spreadsheet, database and other languages or applications. Still, bigger disk drives are more expensive and often it's a case of 13 cm or nothing.

The Personal Pearl system seems to be quite versatile; it has the ability to create forms for data entry, produce reports and maintain a relational database. In particular, it is possible to read certain Personal Pearl reports into a SuperCalc worksheet for further analysis – a particularly useful facility.

The remaining piece of software that comes with the Osborne is the UCSD p-system operating system. In this case, it's just the operating system with its editor and a few utilities, and not the compiler or assemblers.

The p-system has never appealed to me as an operating system because of two factors: its tedious menu-driven operation, and the fact that it does not have dynamic file allocation, which means that files are pre-allocated, and if they grow to their limit the user has to do something about it. However, there is some very interesting applications software available for the p-system, and it has the advantage of being to a large extent hardware-independent.

In Use

The Executive is a rather nice machine to use. I personally don't like the keyboard; it's too spongy for my typing style, which was acquired on other keyboards. The display is not bad – though I'd still like a slightly bigger screen, and there was just the slightest shake on the characters – barely noticeable, though.

At first I found it difficult to adjust the brightness and contrast controls to achieve the right balance between full and half intensity, but after the machine had warmed up it seemed a lot easier.

The other funny thing that happened was that a couple of times when I left the machine switched on for some time while I worked on another, when I returned to the Osborne it had hung and had to be reset – and even then, the reset was unreliable and the machine would not reboot. This lock-up never happened during use, however.

In other respects, the Osborne Executive is a fine machine. The Osborne staff have put a lot of effort into customising the software supplied so that it all takes advantage of the machine's features. In addition, the documentation supplied is very well organised for the first-time user, though I feel it would be less satisfactory for the more technical type who wants to get into the innards.

In particular, there is virtually no technical documentation for CP/M 3.0. Occasionally in the command descriptions there are references to various kinds of control blocks, RSXs and so on, but nowhere are these described in detail. The user really will need the Osborne Executive Technical Manual, a separate publication, or perhaps the Digital Research manuals. ▶

The documentation supplied breaks into two areas: the Guides, which are tutorial in nature, and are paperback volumes in a slipcase, and the Reference Guide, a ring-bound volume several inches thick. Between them they certainly provide enough information for the average user.

One feature I particularly appreciated was the additional information supplied on getting the various programs to work together; using SuperCalc to massage Personal Pearl reports, for example. Another helpful feature of the Guides is that material is divided into Basic, Intermediate and Advanced Levels. This allows the user to pick up just what he/she needs to know the first time around, and go for more depth later.

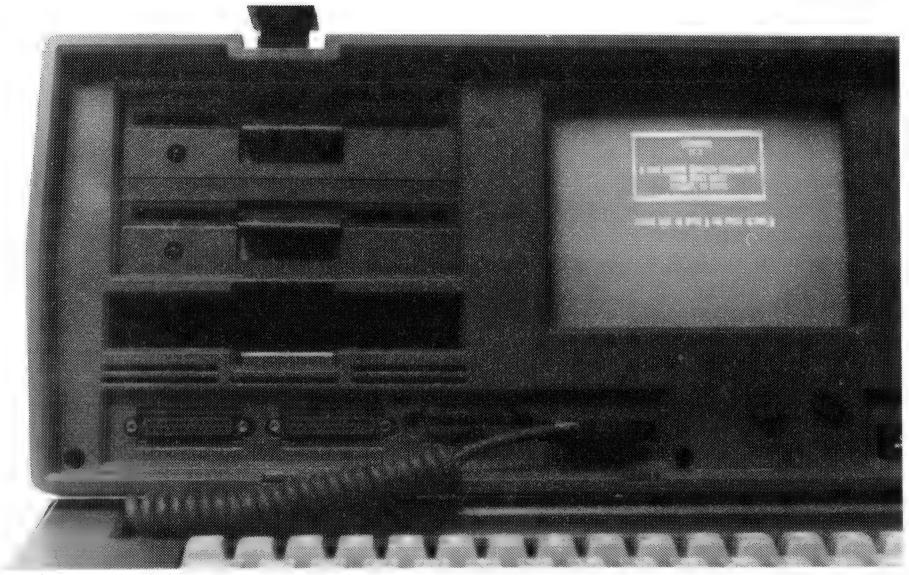
More On The Way

Osborne Australia hasn't yet announced when the 16-bit option will be released locally (in fact, we hear none have been shipped to dealers in the United States yet anyway), but says it will offer Executive buyers a no-penalty upgrade.

The new machine is $3995, the 16-bitter will be $4995, and an upgrade kit (including a new, IBM-style keyboard) will sell for $1000.

The 8088 processor is designed to turn the Osborne into another 'IBM-compatible' machine. It will support MS-DOS and CP/M-86.

All in all, then, the Executive is an excellent addition to the Osborne line. I expect it to be popular in large organisations, probably at the management level, as its name suggests, but also with small businesses which can put the Personal Pearl database to good use. □



A close-up of the Executive's disk drives, screen, and peripheral connections.

SPECIFICATIONS AND REPORT CARD

Unit:	Osborne Executive
Made by:	Osborne Computer Corporation
Processor:	Z-80A
Clock speed:	4 MHz
RAM:	124K
ROM:	8K
I/O:	Two serial, one parallel/GPIB ports
Languages:	MBASIC, CBASIC
Keyboard:	Full QWERTY plus numeric pad and cursor keys
Display:	80 x 24, 7 inch, amber
Graphics:	User-definable character sets in RAM
Best points:	Value for money, portability, CP/M 3.0
Worst points:	No major failings

Ratings:	**excellent**	**very good**	**good**	**poor**
Documentation:		•		
Ease of use:	•			
Functionality:	•			
Support:		•		
Value for money:	•			

Extras included:	Software
Options:	External monitors, battery pack, etc.
Price:	$3995
Review unit from:	Osborne Computer Corporation

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Which Solver? TK!Solver

Remember your school mathematics? Hours spent re-writing equations and wondering how that variable suddenly got over there? Les Bell reviews a package for the IBM-PC that does it all for you.

TK!Solver is an advanced package for the IBM-PC.

VISICALC really was a tremendous innovation; so many spreadsheet calculators are available on personal computers (and even mainframes) now that it's hard to remember just what a giant leap VisiCalc was.

The same thought will probably apply in a few years' time to TK!Solver – but for the moment, it's not hard to see that it's another huge step forward.

TK!Solver is another VisiCalc – a program of blinding simplicity in concept (though the execution isn't so easy) which saves users hours of work. It's a major breakthrough, not in number-crunching, but in analysis. Where VisiCalc allowed numerical investigation of a problem (what-if), TK!Solver allows analytical study.

It's hard to describe exactly what TK!Solver is. Primarily it's an equation manipulator, but it does a lot more than that. It automatically solves equations; the user plugs in the known values and the program produces the unknown ones. Most significantly, it does this not for a single equation at a time, but for a system of equations.

You might recall, during your schooldays, manipulating equations – multiplying both sides by the same value, adding the same amount to both sides – in order to transform an equation to solve an unknown variable. Well, that's what TK!Solver does, quickly and reliably. If I'm having trouble describing it, it's because I don't remember my own schooldays that well. . .

Perhaps all will become clearer as we examine the program. So far, TK!Solver is only available for the IBM-PC, but other versions are undoubtedly in the works. Like VisiCalc, it is supplied on a copy-protected disk; fortunately two disks are supplied, and a further safeguard is that once the program is running the master disk can be removed from the drive and replaced by a working disk.

Running A Program

The program is run by typing TK at the PC-DOS command line. A copyright notice then appears, and after the user hits return the remainder of the program will load and run. The screen clears, and then two working areas, called 'sheets', appear.

At the top of the screen is a status line which displays the current cursor position, the column the cursor is in and the contents of the cell under the cursor. Below that is a message: 'For Help, type ?', which is the prompt and error display line, and then come the two sheets.

The TK!Solver program manipulates information on a number of sheets, but only one or two of them are visible at any time. In this case, the two most important sheets are visible: at the top, the Variable sheet, and below, the Rule sheet.

The Variable sheet is broken into columns of varying width, which contain the variables being worked on. From the left, they are headed Status, Input, Name, Output, Unit and Comment. The Status column indicates whether the last attempt to solve the problem resulted in valid solutions for the variables.

If a variable is an input to the equation system, its value is typed into the Input column. If it is a solution, its value will appear in the Output column. The Unit column will show the unit of measurement which the input or output value is measured in – though this is not necessarily the unit the calculation is performed in, as we shall see.

The Name column is generally filled in automatically by the program as the Rule sheet is filled. The Rule Sheet has only two columns, a Status column at the left, and then the Rule column itself.

The Heart Of The Matter

The Rule sheet, and in particular the Rule column, is the heart of TK!Solver. The user simply types in equations about the system under investigation. As each is entered, any variables appear in the Variable Sheet, for values to be entered later.

The TK!Solver program accepts equations exactly as they would be written on paper, unlike conventional programming languages, which require that only a single variable appears to the left of the equals sign. This is because in a programming language, the '=' indicates assignment, not equality.

In TK!Solver, this limitation does not apply. Any equations can be typed in, such as

```
a + b = c * d
s = .5 * g * t ↑ 2
2 * s = g * t ↑ 2
```

At its simplest level, one can simply type in a few equations, enter the input variables, press the ! (solve) key, and presto! out pops the answer. However, TK!Solver is capable of a lot more than that.

As in VisiCalc, TK!Solver commands all start with a slash (/), and many are similar, such as the storage (/S) commands which load and save files. The semi-colon moves the cursor between the two windows on the screen, and the /W command will bring other sheets to the screen or return it to being a single window.

The bulk of a user's work will be done on the Variable and Rule sheets, certainly in the early stages of creating and testing a model. Once the basics are in place, the user will pay more attention to other sheets.

Probably the most immediately useful is the Unit sheet. This contains all the units in use in the model, together with conversion factors; it is headed From, To, Multiply By, Add Offset. So, for example, the miles-km conversion would contain 'mi', 'km' and '1.609': to convert from miles to km multiply by 1.609. The offset addition is required in cases like Celsius to Fahrenheit.

TK!Solver can convert any unit to any other through a maximum of two rules on the Unit sheet. Thus if you define miles in terms of yards, yards in terms of feet and feet in terms of inches, the program can convert miles to feet, but not miles to inches. This is easily overcome by making one unit a standard from which all others are derived; then all conversions will work correctly and quickly.

As mentioned above, the Variable sheet displays a unit for each variable, and the displayed value is measured in those units. However, the calculation may be performed in a different unit, which is a blessing for engineers who find that formulae work out a lot more neatly in metric and SI units, but that the real world is still working in feet, inches and furlongs per fortnight.

When a unit of measurement is first entered into the Variable sheet, it is accepted as both the display unit and the calculation unit. By 'diving' into the Variable sheet with the '›' command, the user can examine and change other details of a particular variable, such as the display and calculation units.

Defining The Problem

Once a model has been defined, it can be solved. The known values are placed in the input fields of the appropriate variables, and the action key (!) is pressed. This calls the Direct Solver into action, and it will try to manipulate the equations so as to solve for all the unknown variables.

Quite often, this happens first time, but it is not uncommon to strike difficulties with the way the problem is defined. This will come about in two different ways.

Sometimes, there is simply not enough information to solve all the variables. Either an equation is missing, or the equation is there but the program cannot derive enough values to solve it. In the latter case, providing a different selection of known variables will generally provide a solution, if that is possible.

Another problem comes about when a model is over-defined. Here, the program discovers that a particular variable can be calculated from two different equations, giving two different answers; in other words, that two equations in the model are inconsistent. In this case, the problem should be rearranged, generally by removing input values.

This will require a fair degree of experiment; I built a model relating the resonant frequency, Q and component values of a tuned circuit from a number of different equations, and in the early stages at least found that I was walking a tightrope between over-defining and under-defining the model.

Iteration

In some cases not enough of the input values will be known, or a variable may occur twice in an equation and must be solved implicitly. This is generally the case whenever polynomials are involved. In this case TK!Solver can often find a solution using iterative techniques.

To use the Iterative Solver, the user must make a first guess at the likely value of an output value. This is done by entering an input value together with a G in the Status field. When the action key is pressed, the Iterative Solver will be called into action, and will attempt to solve the set of equations once, then plug the output value back into the input and repeat the process.

If iterative solution is possible, the successive guesses will converge on the correct answer, and eventually the difference between successive guesses will fall within the tolerance set on the TK!Solver Global Sheet, signalling that the process is done.

Alternatively, the model may converge only slowly, or may diverge, moving away from the correct answer, or may just sit and oscillate between two values. In some cases, a better initial guess may solve the problem, or just restarting the iteration again to continue the slow convergence may fix it. In other cases, some rethinking may be necessary.

Of course, in the case of polynomials TK!Solver is actually hunting for a root. In the case of quadratics, there may be two real roots, two equal roots, or – and this is when the fun starts – the roots may be complex conjugates. TK!Solver is not equipped to handle complex numbers, although there is a hint in the manual that a future version will be, at which time the electrical and electronic engineering community will be able to make much better use of the program.

In any case, the TK!Solver manual contains quite comprehensive treatment of the principles by which the Iterative Solver works, together with suggested techniques for overcoming problems through various kinds of algebraic manipulation.

Lists

Providing one solution to a problem is all very well, but generally the users of this kind of program are interested in the dynamic properties of a system. For example, a process control specialist probably doesn't care what the exact output of a controller is at a particular time, but is very interested in whether it is going up or down, and how fast.

TK!Solver allows the user to examine the behaviour of variables over a range of values through the creation of Lists. By diving into the Variable sheet, the user can associate a variable with a particular list, and a further dive will allow him/her to examine and set up that list.

Each list contains a number of values in a particular unit, which may vary in a linear fashion or may just be a random list. In the first case, the user can fill the list by specifying the first and last values; the program will automatically interpolate the rest.

When a model is solved using the List Solver, the input values for a particular variable are read from the variable list, and the results of another variable are placed into the list associated with that variable. The List Solver will make use of the Direct or Iterative Solver, as appropriate.

Thus in modelling, say, the behaviour of some kind of non-linear electronic circuit, we can vary the input over a range of voltages and see how the output varies. Most importantly, TK!Solver allows us to set up tables for comparison, or better yet, prepare simple graphs from the lists.

Primitive Graphics

The graphics capabilities of TK!Solver are fairly primitive, although many of its users are likely to be the kind of numerate individuals who are less impressed by presentation than by content. For those using TK!Solver in the business world, it may be handy to know that TK!Solver can read and write DIF format files as used by VisiCalc and VisiTrend/Plot, which means presentation level graphics are possible, and VisiCalc can be used for further or preliminary processing.

The program has a wide variety of built-in functions, including the expected maths functions as well as some unusual ones like the vector dot product and business functions such as net present value.

Finally, TK!Solver has a User Function sheet, which can be used to set up user-defined functions. These are expressed in numerical form, as otherwise ▶

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they would simply be placed on the Rule sheet, n'est-ce pas? (*You may be able to baffle us with your knowledge of maths, Bell, but the French we just don't believe* – **MW**).

This system can handle step functions, discrete functions (which are just lists of arguments and results) and all kinds of non-linear functions. Basically, TK!Solver uses these as look-up tables, but will also apply interpolation where appropriate.

Other Commands

TK!Solver also has a number of commands to cover things like inserting and deleting rows, copying rows, setting up print formats and the like, but these all work as well as you would expect them to and are really not relevant to this discussion.

More importantly, the storage commands allow the user to save sections of a model – such as the Unit sheet – for use in other models, and Rule sheets and Variable sheets can be merged to assist in model-building. This makes it easy to refine and adapt models with time.

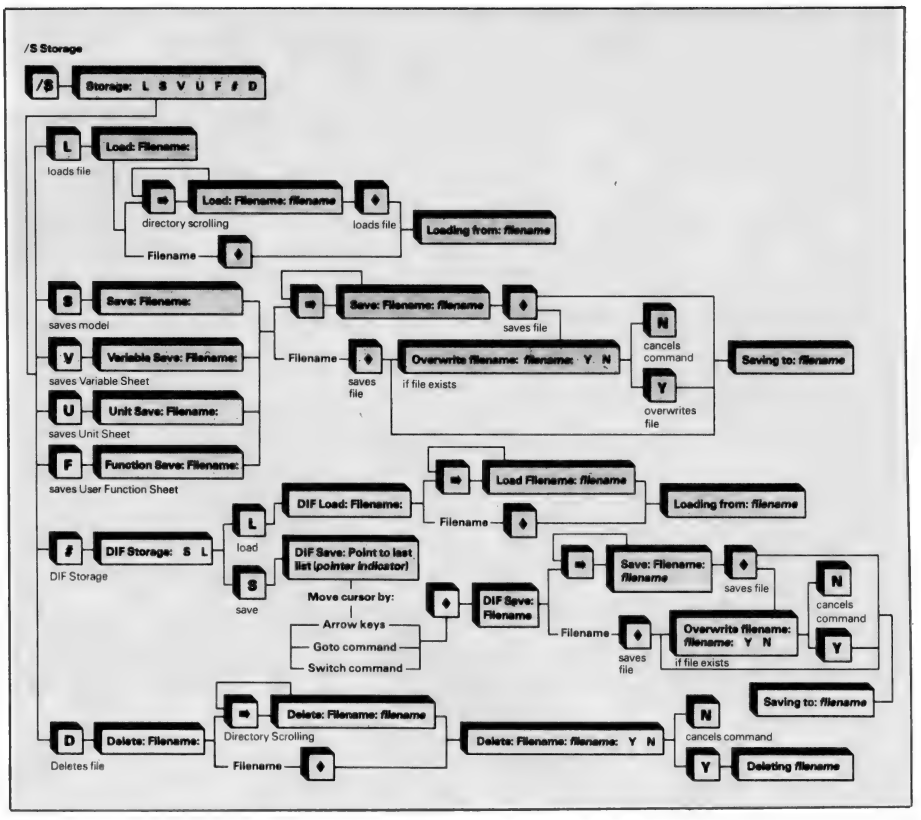
For those who can see the benefits of this kind of analysis, but don't feel up to creating their own models, Software Arts is publishing a series of TK!SolverPacks on selected subjects. The first two, on Financial Management and Mechanical Engineering, are now available. Each contains a dozen or so pre-defined models for such areas as compound interest calculations, discounted cash flows or, in the Engineering Pack, heat transfer, elastic bending and others.

Perhaps more than their face value as self-standing models, the 'Pack' models will be of use as examples of how full-scale, fully-featured models can be constructed, together with demonstrations of advanced TK!Solver features.

Furthermore, Software Arts has signed an agreement with McGraw-Hill Publishing whereby McGraw-Hill will immediately begin to produce and market TK!SolverPacks based on the technical books in the publisher's extensive catalogue. Initially, the Packs will be based on major reference handbooks in chemical, civil, electrical, electronic and mechanical engineering, but future projects will be selected from the full McGraw-Hill catalogue of technical, professional and business titles.

An Unhelpful Flaw

The most obvious flaw in TK!Solver is the Help command, which is not up to the standard of the rest of the package. This requests a topic to be searched for, and then seems to perform an extremely slow keyword search. Generally I found it was quicker to use the manual – huge though it is – than to rely on the Help function. Software Arts should take a look at the SuperCalc Help function to see how it should be done.



Flow chart for TK!Solver's storage option.

The documentation is excellent, absolutely excellent. There's an Introductory Guide, an Instruction Manual which contains tutorial material, and a Reference Manual, together with a huge wall chart showing the various sheets and commands and how they are related – plus a Reference Card. The whole manual is a couple of inches thick, although the program is so logical and well-structured that I hardly needed to refer to the manual at all after completing the tutorial.

Ten Out Of Ten

In summary, then, reviewing TK!Solver is rather presumptuous. To say that it does some things clumsily would be a niggardly statement, since it is very much to the authors' credit that it does what it does at all. Therefore ten out of ten to Software Arts.

Describing the various commands and sheets of the program does not really give a feel for what it can do. If you feel you could use this kind of program, I urge you to go to a computer store and see a demonstration, or better still, try it out for yourself. You will be impressed. □

SOFTWARE REPORT CARD — TK!SOLVER

Program:	TK!Solver
Made by:	Software Arts Inc.
Useful for:	Any algebraic manipulation; engineering, science, finance, etc.
Hardware required:	IBM-PC

Ratings	**excellent**	**very good**	**good**	**poor**
Documentation:	•			
Ease of use:	•			
Speed:		•		
Functionality:	•			
Support:	•			
Value for money:	•			

Extras included:	TK!SolverPacks: Financial Management and Mechanical Engineering — $225 each
Price:	$850 including tax
Review copy from:	Personal Computer Centre, 142 Gawler Place, Adelaide 5000. (08) 223-2688.

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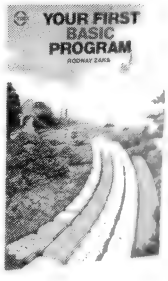

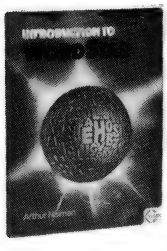

***Introduction to WordStar*™ by Arthur Naiman** ($22.50) An indispensable fingertip guide recommended for beginners as well as experienced users. It teaches you, step-by-step, how to edit copy, create and merge files, even design special print effects.

***Your First BASIC Program* by Rodnay Zaks** ($14.95) At last, a book designed for the first-time computer user who wants to learn how to program. It is simply written, educational, beautifully illustrated and fun to read.

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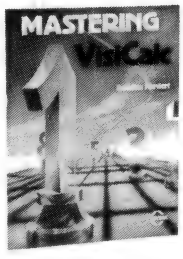
***Mastering VisiCalc** by Douglas Hergert** ($22.50) Tells you how to get the most from your "electronic spreadsheet," for tasks ranging from planning to examining projection scenarios.



SYBEX books are available at bookstores and computer stores everywhere. But if you experience difficulty OR if you wish to receive regular information on new books, contact the distributor, ANZ BOOK CO, 10 Aquatic Drive, Frenchs Forest, NSW 2086. (02) 452 4411.

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PROGRAMMING THE 8086/8088 by James Coffron ($27.95). Written clearly enough for the inexperienced programmer yet complete enough for the expert.

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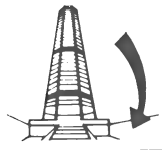

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Written in machine code. Requires VIC-20 with 8k expansion and joystick.
On Cassette

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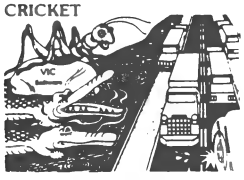

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KnowledgeMan - Database plus Spreadsheet.

The big problem with spreadsheets is that the information they massage has to come from somewhere. The new breed of spreadsheets such as Lotus 1-2-3 solve this by tacking a database onto the spreadsheet. Les Bell examines a program that does the reverse.

UNTIL YOU'VE USED a database management system you won't believe just how good they are. If you're used to maintaining a database of information in various files and then writing special programs (half of each program being file declarations) to produce reports, you are in for a pleasant surprise.

In particular, if you have acquired a vast reserve of information you may be champing at the bit for easy ways to analyse it using statistical techniques, spreadsheets and other software packages. It is possible with many of the newer spreadsheet packages to read in data files from other applications, usually by passing them through some kind of file conversion process; inevitably a tedious, tricky process.

Wouldn't it be great if the database management system, the spreadsheet calculator and a good general purpose language for analysis were all part of the same package? The people at Micro Data Base Systems obviously thought so, as they have released a new package called KnowledgeMan which fits that description, and is now available in Australia through HiSoft in Melbourne.

The people at HiSoft are writing a lot of software for the IBM-PC, much of it using KnowledgeMan. Since they were using so many copies of the package and were impressed by its performance, HiSoft has been appointed distributor for the product. MDBS is perhaps best known for its CODASYL model network database systems for micros, which have earned an enviable reputation for quality and performance up to mainframe standards, together with a reputation for being the most complex software in the micro world.

KnowledgeMan (short for Knowledge Manager) is not that complex, but it's still far in advance of simpler database packages. It incorporates mainframe-style features for security, such as password protection and access codes for a table or any of its fields, and a query language that is similar to IBM's SQL/DS, together with all the forms and report handling features you could use - plus an integrated spreadsheet calculator.

The KnowledgeMan database is a relational model based on multiple tables. It seems to be loosely modelled on dBASE II in some ways, but I would guess that it's more likely that both dBASE II and KnowledgeMan have borrowed features from another much larger program. In any case, Knowledgeman is considerably more advanced than dBASE.

Vital Statistics

Just to quote some vital statistics, KnowledgeMan allows up to 65535 records per table, 65535 characters per record and 255 fields per record. An unlimited number of keys per table can be indexed, and an unlimited number of tables can be open at once. An unlimited number of elements per screen or report form are permitted, program length is unlimited and working variables are unlimited. In case you're wondering at our wanton use of this word 'unlimited', we mean, of course, unlimited by the program in comparison with the hardware you are using.

At the simplest level, KnowledgeMan commands are similar to dBASE II's. For example, a form can be created using the commands AT, PUT and GET; sound familiar? Other facilities are quite different. In fact, one great improvement over dBASE is the use of the LET statement in place of dBASE's several ways of assigning values.

KM's forms can also make use of CRT terminal attributes such as blinking, reverse video and background/foreground colours. This can make data entry a much simpler process for untrained users.

KM has several kinds of variables: fields, which are part of database tables; cell variables, which are part of the spreadsheet; working variables, for intermediate calculations; and pre-defined variables, of which there are two kinds – environment variables which control the KM working environment and utility variables which contain data such as the date and the current user name.

One of the environment variables, E.SIGD, controls the number of significant digits used in calculations, and reducing the precision will speed up number-crunching work considerably.

KnowledgeMan is memory intensive; all work is done there, and it is possible to save the entire contents of memory, the working environment, to a disk file and reload it later to resume work.

Unlike dBASE, which makes all variables global, KM allows the user to explicitly declare variables (as well as macros and forms) to be local to a particular procedure. And it has real arrays.

Variables can be of the types string, numeric (with up to 14 digits precision) or logical. KM has a rich set of functions, including ROOT, which finds the root of a polynomial within set bounds, MATCH for string matching, SIN, ARCSIN and others. These are more than I would expect to find in a database package: in fact, even PL/I doesn't have a ROOT function!

KM supports automatic macro expansion, which means that whenever a macro name is encountered in a command line, it is expanded, unless quoted (" "). This allows the user to effectively expand the language in whatever direction is required by creating new commands.

Database Files

KnowledgeMan creates and uses tables in a similar way to dBASE II, although the commands are slightly different. For example, a table is defined with the DEFINE command, and records are appended with the CREATE command. Since multiple tables can be USEd at once, there is a FINISH command to release tables, and a DEFAULT command to indicate which table is the default one.

One interesting feature is that KM automatically encrypts data files, so that if they are listed using operating system commands, their contents cannot be viewed. The chances are that it simply ▶

Hard Disk Micro Decision

The Hard Disk Micro Decision is a professional CP/M based computer system that comes with the hardware and software needed for the large or small business. It offers all the word processing, financial planning and programming tools needed to increase personal or business productivity. The hard disk option allows the use of large data bases, increases data transfer speed, and obviates the need to constantly swap diskettes.

Hardware Features

★ Z-80A CPU operating at 4MHz
★ 64K internal RAM
★ Double density floppy disk
★ 5 Mbyte (formatted) Winchester
★ Two serial ports
★ Software programmable baud rates
★ Centronics printer port
★ Intelligent VDU
★ Green screen
★ 22 user-programmable function keys
★ Detachable keyboard
★ Reverse video/dual intensity

Standard Software

★ CP/M 2.2 with enhanced BIOS
★ Wordstar 3.0 wordprocessor
★ Correct-It spelling checker
★ Personal Pearl data base manager
★ LogiCalc electronic spreadsheet
★ Microsoft BASIC 80
★ Bazic
★ Pilot
★ Micro Menus
★ Games Disk
★ Disk Utilities

Options

★ Integrated Accounting System
★ Cash Flow System
★ Full range of CP/M programs
★ Other disk sizes

Even though significant hardware enhancements have been made, the special features of the standard Micro Decision such as "virtual drive" and user-friendly error messages have been retained. Disks from other machines such as the Osborne 1, Xerox 820, IBM PC and now Osborne Double Density can be read and written.
The Micro Decision was designed with the first-time computer user in mind. A menu program reduces complex system commands to one or two keystrokes, and a clearly written user manual explains the hardware and software features of the system.
The Hard Disk option was developed in Australia by Microtrix and is only available from recognised Morrow dealers. Upgrades to existing MD2 systems are possible. Microtrix also manufactures a full range of multi-user multi-processor systems. Please contact us for more details.

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performs XOR encryption using the user's password as a key, but that's enough to deter casual browsers.

Each user has a number of access codes, and each table has read and write access codes. Only when these match can the user access the table. Similar access codes can be applied to each record and even each field.

Each field in a table can be defined by type and length (*a la* dBASE), and also by using a picture for editing the contents, as in PL/I and COBOL. Table definitions can be copied easily using the IMPRESS command, and viewed using the SHOW command.

Tables can be INDEXed and SORTed in much the same way as in dBASE. Most importantly, the SELECT command (which extracts a subset of a table and forms a new table), STAT (statistics) and CONVERT (which writes an output file in a nominated format) will operate on multiple tables with a single command. The underlying relational database operations, such as 'join' and 'project', are carried out automatically.

The SELECT command offers a vast number of combinations and permutations including conditional retrieval, listing with editing, display of only unique values, sorting of the output table, insertion of control breaks, statistics and other parameters. Thus it is possible to construct commands like:

SELECT FNAME, LNAME, WHRATE FROM EMPLOYEE,

FROM DEPT WHERE DEPT.DEPTNO = EMPLOYEE.EDEPNO

GROUP BY DEPTNO ORDER BY ASCENDING DEPTNO, WHRATE + BONUS.

The statistics commands will produce statistics for each field of a table, such as sum, average, variance, standard deviation, minimum and maximum. The STAT command behaves just like the SELECT command, except that statistics are output, rather than a table.

The CONVERT command behaves in a similar manner, but will output the resulting file in one of three formats: as a standard ASCII text file for subsequent editing or inclusion in a document; as a DIF file for use with Visi-series products, or as a BASIC-compatible file. It also consolidates multiple files and will write a block of a spreadsheet.

KnowledgeMan provides powerful commands for working with forms, both on screen and printer. The AT, PUT, GET, PUTFORM and GETFORM commands allow easy screen handling, and forms defined by AT, PUT and GET can also be used for reports sent to the printer.

The Spreadsheet

The KnowledgeMan spreadsheet allows the use of a 256 by 256 matrix of

cells, which is larger than many currently on the market. Its capabilities are broadly comparable to those of Supercalc and Multiplan, but it has a number of interesting extensions.

For example, the full KM programming language is available within the spreadsheet for the definition of cells. Thus complex decision-making sequences or iterative solutions are possible. Pictures can be assigned to cells, allowing powerful formatting, and terminal facilities such as inverse video can be assigned to a cell. One useful feature is the ability to ring the terminal bell whenever the cursor enters a particular cell.

The KM programming language is dBASE-like; many of the commands are the same, but there are a few more. For example, the dBASE DO is replaced by PERFORM, which sounds a bit up-market but does much the same thing. dBASE programmers will find the language familiar, but will have to keep reminding themselves of the extra possibilities.

KM on IBM-PC

The implementation of KnowledgeMan for the IBM-PC is quite effective. It makes use of the cursor control keys as well as assigning 40 different strings to the function keys. These can later be changed by the user.

However, the sheer size of the system is its biggest drawback. It is supplied on three double-density disks, and the user who doesn't have a hard disk will have to do a fair bit of disk shuffling. To get the full benefit of KnowledgeMan, you'll need as much memory as you can afford, plus a hard disk. The XT would be a good idea.

It all works quite quickly, but tends to get a bit disk bound, as it uses virtual memory techniques and loads overlays frequently.

The documentation is well organised, with plenty of cross-referencing and vertical bars down the side of the page to indicate the level of difficulty of the material. Though I followed it okay, I would reckon the use of a lot of technical terms right from square one would intimidate many users. In fact, it's a bit like reading a philosophy textbook in places, as you try to remember how a sentence started!

Nonetheless, the documentation is a good compromise between reference and tutorial material, and there is an introductory section to get the user up and running quickly.

Summarising

In summary, then, KnowledgeMan is an extremely advanced package. It offers all the conventional facilities of database management packages in a very good implementation, plus additional statistical features and a spreadsheet calculator. The implementation is to a very high standard, and the package generally gives the impression of quality of design and execution.

It's not as easy to use as some packages on the market, but is considerably more powerful. □

SOFTWARE REPORT CARD

Program:	Knowledgeman
Made by:	MDBS Inc.
Useful for:	Database management, commercial programming
Hardware required:	IBM-PC or similar 16-bit machine running PC-DOS, MS-DOS or CP/M-86

Ratings:	**excellent**	**very good**	**good**	**poor**
Documentation:		•		
Ease of use:		•		
Speed:		•		
Functionality:	•			
Support:		•		
Value for money:		•		

Extras included:	Utilities for password management, run-time code encryption, installation
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Review copy from:	HiSoft, 71 Kooyong Rd, Nth Caulfield 3161. (03) 509-9683.

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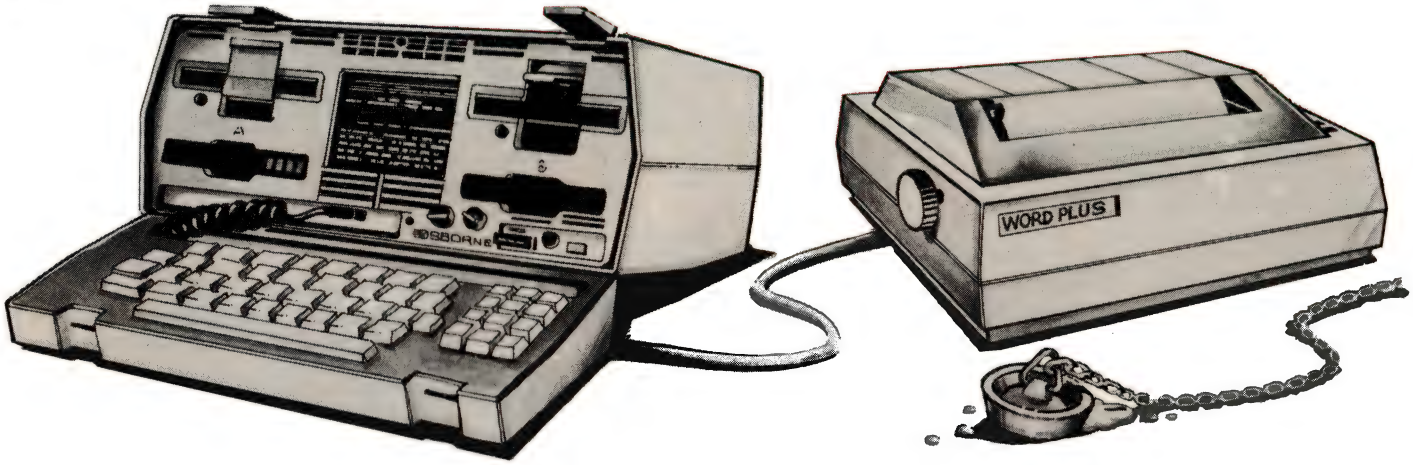

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The Word Plus Printer

The Word Plus Printer is a dot matrix printer fitted with both tractor and friction feed for continuous or single-sheet paper. The matrix is a high quality 9X9 dot – with true desenders, 96 characters, four character widths, italic and graphic characters gives plenty of flexibility.

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- 5" Green phosphor CRT.
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- Operates on International voltages.
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OSBORNE 1 Optional Extras.

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Optional Software

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The MathStar program performs the basic arithmetic functions (addition, subtraction, multiplication, division) of rows, columns, or formulas in your document.

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Simply ask the program to check your document.
The result? You can easily spot and correct inconsistencies that might detract from your work.

DocuMate/Plus. Simplify the creation of the table of contents and reference index.
You simply note the points you want indexed as you write.
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It's that easy.

Footnote. Tremendously simplifies the project of numbering and spacing footnotes in your document.
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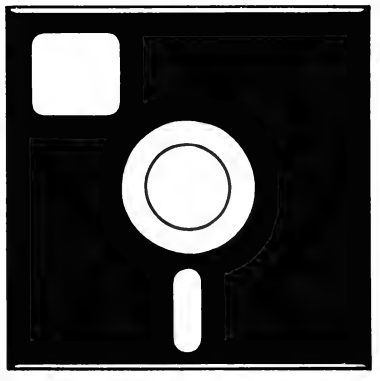
Spell – Catch Those Mistakes!

Anyone who has to write documents of any length knows how impossible it is to avoid spelling errors – especially if you're a 'hunt and peck' typist. Ross Lane looks at a spelling checker program for word processing applications.

your computer



SOFTWARE REVIEW

I DO A data processing course by correspondence, which means I have to write an assignment every week. They are proofed by being given to my wife, who marks all the spelling errors and bad grammar she can find, and then I go through the document again (often finding more errors in the process) and then I hand it back to her . . . and so on.

After all this, I still receive the assignment back from Tech with nasty remarks about my spelling mistakes!

The available spelling program I knew of (Spellguard) was $300-plus and that was a little more than my budget would stretch to. I had received some copies of CP/M User Group disks from Software City in Blacktown and knew they handled the Software Toolworks range of software. I had bought Adventure (by Software Toolworks) some time before and was very pleased with it, so I thought I'd try the spelling corrector program Software Toolworks makes, called Spell, as it was only $70.

The disk containing Spell arrived a couple of days after I ordered it, and the first thing I did, after backing it up and filing away the master, was read the manual. This is 21 pages of instructions printed by what appears to be a daisywheel printer in a looseleaf format. It contains instructions on setting up Spell on both HDOS and CP/M operating systems with 48K to 64K of memory. The second page contains instructions for backing up your disk (luckily I'd done it right!), and the manual on the whole is clear and concise.

The disk contains six files. SPELL.COM is the Spell program itself; AFFIXTAB.SPL contains prefixes and suffixes; PATCHES.SPL is a list of patchable locations. The other three are dictionary files: DICTNARY.64K, DICTNARY.48K and DICTNARY.48S. As you would guess, these are used for different sizes of memory. To use Spell you have to select the dictionary that is the right size for your system. If your system has 56K or more of memory then the DICTNARY.64K file is suggested.

This file is renamed DICTNARY.SPL and the other DICTNARY files can be deleted. The DICTNARY file contains the main dictionary of 18,500 words (in the 64K dictionary). The size of the file is dependent on memory, not disk size, because of the way in which Spell works. It loads the entire dictionary into memory and matches the words in the file against it. This is augmented by the table of suffixes and prefixes in AFFIXTAB.SPL, which gives Spell a true vocabulary which is much greater than the number of root words in the dictionary. (The manual suggests 40,000 plus).

The easiest method of using Spell is just to type SPELL and follow the prompts that appear on the screen. First it asks you what file is to be proofed. When the filename is supplied, Spell loads the file into memory and starts to tell you how many words have been read and how many mismatched words have been found. The number of words read increments by hundreds. According to the manual, the file is proofed at the rate of 4000 words per minute, which seemed about right when I timed it roughly.

When the file has been proofed, Spell displays the first word and asks what you want to do with it. You have five choices: I = ignore the word, M = mark the word in the document, A = add the word to the dictionary, R = add the root of the word to the dictionary, and S = start from the beginning again.

At the end of this, you are asked if you want to mark the file and update the dictionary. Spell will only accept two answers for this, y(es) or n(o). If you type n, Spell promptly shows you its first mismatched word again; otherwise (with an answer of y) it will mark all the words you've told it to, and if you've added any words to the dictionary, it'll write an updated dictionary, and delete the old one.

Outside Wordstar

If you're running Spell from inside Wordstar (using the R command) then this the only way in which Spell can be run. However, if you're using Spell from the CP/M A> prompt, a number of options are available.

Output from a Spell RUN is redirectable, which means you can send the list of mismatched words to a file or to the printer. This is done by using a >L switch (list misspelled words without asking questions) and then entering > filename. Other switches enable you to change the character that marks misspellings, the extension for the back-up file, and so on.

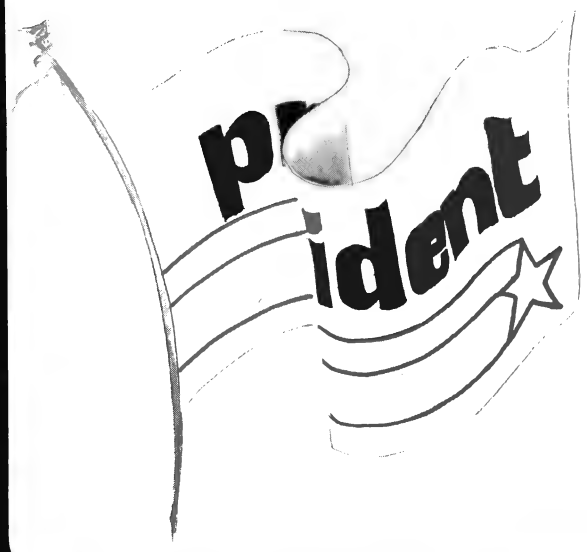
You can create new dictionaries with specialised terms; I created one for the purposes of this article that contains words like AFFIXTAB, CP/M and Blacktown. You can even create new prefix/suffix tables to be used instead of AFFIXTAB.SPL (for English instead of American spelling, for example).

Special characters your text processor uses for soft hyphens can be ignored by using a >I switch, but Spell knows about Wordstar so I've never had to use this option. The default marking symbol is a # but this can be changed by using a >M switch. Any of the options can be made permanent by patching the program with DDT, using the locations given in PATCHES.SPL.

It's worth noting that this program will mark errors in a document, but it won't offer a correct spelling for the candidate word. It can't do this because of the way in which it determines the correct spelling. Spell 'hashes' each word in its dictionary seven times. Each generated number is a memory location, which is filled with a one. (The area of memory used is initialised to zero.) When each word is obtained from your text file for comparison, it is hashed using the same seven algorithms, and the seven memory locations are checked. If one of these locations contains a zero, then you have a misspelled word. This prevents the program from offering you a correct spelling, as it only has a table of ones and zeroes to compare with, not a dictionary of actual words.

Another side-effect of this method of creating a dictionary is a dependence on memory size. Adding words to this dictionary doesn't expand the size of the

Continued on page 113



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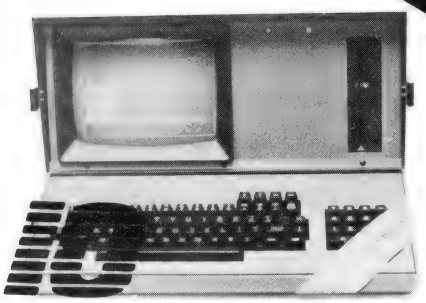

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DULMONT MAGNUM
ON OFF
SHIFT RESET
F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11 F12 HELP
ESC 1 2 3 4 5 6 7 8 9 0 LF
TAB Q W E R T Y U I O P
CTRL A S D F G H J K L @
LOCK Z X C V B N M

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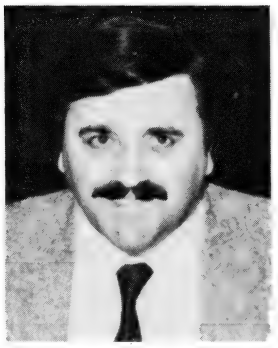

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your computer text file

Educational Group

I AM A teacher and educational consultant working in the field of computers and computer education. This involves the use of computers across the whole school curriculum, not just computer studies.

I own an Apple II but work with a variety of different micros. There seems to be a proliferation of clubs for individual types of machines but there are many different types of computers in use in schools across Australia.

Despite the different machines in use, teachers and others working in the educational field are basically concerned with similar types of programs. I know of one group, VACE (Victorian Apple Computers in Education), but this specialises in one type of machine in one state.

Could teachers in any state who are working with computers contact me at Bright School, PO Box 30, Bright, 3741, to see if there is enough interest to perhaps form an Educational Users' Group. This would help keep teachers in touch with each other to facilitate software development.

JOHN KERR
Bright, Vic

Cream Turns Sour

HAS THE cream turned the Peach sour? Sitting here at almost midnight and feeling a little more than frustrated, as computer users often tend to be after a "session" on the thing, I felt desperately in need of writing in a few words to your magazine simply to "get it off my chest" (if it serves no other purpose).

My particular harassment lies with the much-acclaimed Hitachi Peach, though, to be fair, it's not so much with the machine but rather with the disk drives and the operating system – someone, please, write one that goes. It seems to me that the operating system doesn't work well enough. In fact, it's lousy. After hearing the story about how Hitachi lost the MicroSoft manuals, I feel the same has happened with the operating system. It's bad!

Files: Rolls off the top of the screen, the only solution is to press the reset button.

Diagnostics: None.

Arrays: Try playing around with large string arrays that need a fair bit of cleared memory. Graphics blocks will appear on the screen before too long, replacing letters that used to be there!

Disks: I'm getting soft errors about every hour of operation.

Format: Impossible.

Manuals: Two months later and I'm still waiting.

Please get your act together, Hitachi. You have a machine that has the best potential of any currently in Australia and yet it's falling through your fingers!

PHIL SEFTON
Lavington, NSW

Kaypro Solutions

BEING a Kaypro owner, user and enthusiast, I must express my thanks that you are including a Kaypro column in *Your Computer.* However, I feel a couple of points arising from your April edition warrant re-examination.

If you were to set up a disk as mentioned in Jeff's Table One, it would be impossible to either format or print anything. I'm sure the absence of the file PF.COM is merely a typesetting oversight.

An alternative arrangement to that proposed by Jeff is to place these files on disk:

AFFIXTAB.SPL
DICTNARY.SPL
PF.COM
PF.DAT
PP.COM
PS.COM
PW.COM
PW.SWP (33 kilobytes)
PIP.COM
STAT.COM

This arrangement allows for the creation, editing, spell-checking, formatting and printing of a document with all necessary programs on the one disk.

The deletion of the MENU.COM and the PW.HLP files will prove no hindrance, once the operator becomes familiar with the workings of Perfect Writer. It is no great burden to call each module of the program direct from CP/M. The 33-kilobyte swap file will be adequate for most writing needs.

Any formatted disks can now be used in the other drive to store Perfect Writer files up to the full capacity of the disk.

Another useful combination of files for the Kaypro is to PIP the following on to one disk:

BASICLIB.REL
COPY.COM
OVERLAYB.COM
PIP.COM
PW.COM
PW.SWP (65 kilobytes)
SBASIC.COM
SYSGEN.COM
USERLIB.REL

This combination completely fills one Kaypro disk and is used by me to edit and compile SBASIC programs. For programming, fancy printer enhancements are not required, and hard copy can be produced using the CP/M "type" command. Most users would find that these two disks would meet all their day-to-day requirements for writing, programming and most frequently used CP/M utilities.

DAVID HILL
East Bentleigh, Vic

Osborne Hints

AT LAST, some information for Osborne 1 users. However, there is one problem with the information regarding setting up CP/M to default past the sign-on and directly to the CP/M prompt: there are two BIOS routines used by Osborne, and the location to be changed is in two different places.

The owner should save CP/M to disk, as instructed in the article. Then, using DDT, change the auto command to 00 (the original value is 01). The commands to use are:

For single-density:

'S2009', RETURN, '00',
RETURN,'.'RETURN

For double-density:

'S201C', RETURN, '00',
RETURN,'.'RETURN

Then Control-C and save, as the article suggests.

I have tested this on both single- and double-density and it does work.

One other "trick" I have learned is easy:

SAVE 0 LAST.COM

This simple but effective "program" recalls the last program run on the system, such as BASIC-80, when you forget to save the program you spent four hours perfecting. It works with most programs, but won't with a few, such as SuperCalc.

JOHN CLARK
Lindfield, NSW

Bells And Whistles

IN THE APRIL issue Rod McGregor wrote about the DEC VT-103, released some two years after Hartley Computer of Brisbane created a modified VT100 terminal, called the H-103.

The VT-103 consisted of a normal VT-100 serial terminal with all the bells and whistles, plus a small LSI-11 backplane. Into this are plugged an LSI-11 processor, 64 kilobytes of RAM, a PROM bootstrap module and a four-channel serial I/O board.

This unit is used as a slave intelligent workstation to a conventional PDP 11/03 with twin cartridge disk drives. A high-speed (38,400 baud) serial link connects the two processors. The operating system is RT-11 with some fancy device drivers added to make the workstation think it owns the disks, not just the serial link.

The DEC VT-103 is a VT-100 with an upgraded power supply, fan and the backplane. The purchaser can add whatever cards he wants to it. Mr McGregor's friend may be able to add an RX01-type drive and controller if there is room, possibly even a Heathkit one, but at what cost?

I can only agree with you that a Morrow Micro Decision, with the VT-103 as the terminal, would be a cheaper solution. (It could probably be financed by selling the surplus DEC boards).

DOUG ROSSER
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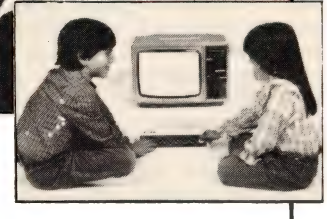

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Shoot 'Em Down

By Peter McKay

SKILL AND luck are the two crucial factors for the Shoot'em Down game. There are five different targets, each with a score of its own.

When the game starts, one target appears, plus your gun. You must move your gun under the target so that the bullet just swipes the left side of it.

If you are successful, the score you achieved will be displayed and another target will appear. If you take too long – the time allotted is inversely proportional to the score of the target – the target disappears and you have missed out.

There are five targets to each game, but this can be changed in line 12. At the end of each game, your score and the highest score (R) is displayed. If you receive the highest score, you must input your name.

There are two routines which might need explaining, because they involve PEEKs and POKEs.

The first one, involving lines 22, 310 and 320, calculates the time taken. This is done using the system variable frames, located at addresses 16436 and 16437.

The value stored in frames is increased by one every time the screen is scanned – that is, 50 times per second. By pre-setting frames with a known initial value, the length of the time can be obtained by comparing this initial value with the actual value (as done in line 22).

By subtracting the two values, the number of times the screen was scanned is obtained, while dividing by 50 gives the time in seconds. DF-CC is the other system variable and it is used to see if anything has been hit by the bullet. DF-CC contains the address of the print position; by PEEKing the address, the position at which the pixel is to be printed is checked, to see if a target is present. If so, the target explodes.

Happy shooting!

```
   1 REM "FIRE"
   2 LET TS=0
   3 LET S=0
   5 LET A=15
  10 LET A$="▄▄"
  12 FOR G=1 TO 5
  15 GOSUB 196
  20 PRINT AT 21,A;A$
  22 LET X=INT ((65535-PEEK 1643
6-256*PEEK 16437)/50)
  23 IF X=INT (20/R) THEN CLS
  24 IF X=INT (20/R) THEN NEXT G
  25 IF INKEY$="5" OR INKEY$="8"
 THEN GOTO 40
  30 IF INKEY$<>"5" OR INKEY$<>"
8" THEN GOTO 100
  40 IF INKEY$="5" THEN LET A=A-
1
  50 IF INKEY$="8" THEN LET A=A+
1
  60 PRINT AT 21,A-2;"        "
  70 GOTO 20
 100 IF INKEY$<>"F" THEN GOTO 20
 110 FOR I=2 TO ((21-Q)*2)+2 STE
P 2
 115 LET P=PEEK (256*PEEK 16399+
PEEK 16398)
 120 PLOT A*2+1,I
 122 IF P=151 OR P=148 OR P=141
OR P=128 OR P=8 THEN GOTO 150
 123 PRINT AT Q,W;Z$(R)
 125 UNPLOT A*2+1,I
 130 NEXT I
 140 GOTO 30
 150 LET S=S+R*10*(20-Q)
 155 FOR Y=1 TO 5
 157 PRINT AT Q,W;"▓"
 158 PRINT AT Q,W;"▒"
 160 PRINT AT Q,W;"▚"
 161 PRINT AT Q,W;"▙"
 163 NEXT Y
 164 PRINT AT Q,W;R*10*(20-Q)
 165 CLS
 170 NEXT G
 173 IF S>TS THEN GOSUB 3000
 175 IF S>TS THEN LET TS=S
 180 PRINT "YOUR SCORE=";S,,N$;"
HOLDS THE RECORD WITH ";TS
 185 PRINT AT 7,10;"GAME OVER"
 190 PAUSE 500
 195 GOTO 3
 196 IF G=1 THEN GOSUB 1000
 200 LET R=INT (RND*5)+1
 210 LET T=INT (RND*10)+1
 220 DIM Z$(5,1)
 230 LET Z$(1)="*"
 240 LET Z$(2)="="
 250 LET Z$(3)="$"
 260 LET Z$(4)="▒"
 270 LET Z$(5)="▓"
 280 LET Q=INT (RND*17)+2
 290 LET W=INT (RND*28)+2
 300 PRINT AT Q,W;Z$(R)
 310 POKE 16437,255
 320 POKE 16436,255
 400 RETURN
1000 FOR I=1 TO 20
1010 SCROLL
1020 PRINT TAB 6;"**SHOOT EM DOW
N**"
1030 NEXT I
1040 CLS
1045 SCROLL
1050 PRINT "THIS GAME INVOLVES S
HOOTING "
1060 SCROLL
1070 PRINT "TARGETS IN ORDER TO
GET POINTS"
1080 SCROLL
1090 PRINT "THERE ARE FIVE DIFFE
RENT TARGETS"
1100 SCROLL
1110 PRINT "EACH DIFFERENT TARGE
T HAS A"
1120 SCROLL
1130 PRINT "SCORE,THEY ARE FOLLO
WING......."
1140 SCROLL
1150 SCROLL
1160 SCROLL
1170 SCROLL
1180 PRINT "*-10 POINTS TIMES IT
S POSITION"
1190 SCROLL
1200 PRINT CHR$ 148;"-20 POINTS
TIMES ITS POSITION"
1210 SCROLL
1220 PRINT CHR$ 141;"-30 POINTS
TIMES ITS POSITION"
1230 SCROLL
1240 PRINT CHR$ 128;"-40 POINTS
TIMES ITS POSITION"
1250 SCROLL
1260 PRINT CHR$ 8;"-50 POINTS TI
MES ITS POSITION"
1270 SCROLL
1271 PRINT TAB 12;"CONTROLS"
1273 SCROLL
1275 PRINT "<- ""5""    -> ""8""
  FIRE ""F"""
1276 SCROLL
1277 SCROLL
1278 SCROLL
1279 SCROLL
1280 PRINT "PUSH ANY BUTTON TO S
TART"
1290 PAUSE 9999
1295 CLS
1300 RETURN
2000 SAVE "FIRE"
2010 GOTO 1
3000 PRINT "YOU JUST BEAT THE HI
GHEST SCORE  PLEASE INPUT YOUR N
AME"
3010 INPUT N$
3020 CLS
3030 RETURN
```

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HiLo

By Neville Predebon

THIS ADDICTIVE game is a simple routine: you have five or less chances to correctly guess a number chosen randomly by the computer. At one in 100 chances, it's pretty hard going...

It's made slightly easier by being able to trap the number as you play; by a hit-and-miss matter of elimination, it's possible to discover what limits the number is between, and so give you a fair idea of what it might be.

For example, if by the third guess you've established that the number is between 50 and 60, you've got a pretty good chance of getting it.

Of course, the restriction value in line 80 can easily be changed to give you more chances; the 5 in line 10 would then have to be changed to suit the new limit.

However, five seems a reasonable amount in which to make the round challenging, but still winnable. Eight would probably be a suitable highest limit.

Many changes could be made to the program to improve it, but this can bring down the wrath of the RAM god (unless you happen to have 16 kilobytes – the program was written on and for the one-kilobyte ZX81).

For a start, in the game as it stands, the player faces total wipeout if he misses even one number. This can be improved with the help of this insert:

86 LET T=VAL "T-(Z/2)" 88 PRINT "YOUR TOTAL IS $";T

This only gives the player a deduction to his other amount if he had been winning previously (half the amount last thought of by the computer). He is bitten, but he can still continue the game without having to start all over again. With this modification, the game can go on for a long time without stopping (unless the player keeps losing).

Another addition (again allowing for memory – a fair amount is taken up by the display) is one that tells the player the number of the round being played. This is done by adding these to lines

65 PRINT C;"-HIGHER" 75 PRINT C;"-LOWER"

With this, the player can more accurately plan his guesses by allowing for how many chances he has remaining.

To make the program more user-friendly, the following line could be included:

137 PRINT "VERY WELL"

This will also console continuous losers.

Doubtless that ZX81 users can think of further changes to suit their own programming style and taping purposes. This program is only presented so that you may add another program to your library, have some fun playing a stimulating game, and hopefully jog your writing and logic instincts so that you can improve this routine or write another on the same lines.

Above all, enjoy it.

```
10 PRINT "YOU HAVE 5 CHANCES TO GUESS THE AMOUNT IN
   THE JACKPOT($1-$100). A HIT WINS YOU THE JACKPOT,
   AND A LOSS MEANS BANKRUPTCY."
15 GOSUB VAL "145"
20 LET T=VAL "0"
25 LET C=VAL "0"
30 LET A=INT (RNDxVAL "9")
35 LET Z=INT (RNDxVAL "91")+A
40 PRINT "ENTER YOUR GUESS"
45 INPUT G
50 LET C=VAL "C+1"
55 IF G=VAL "Z" THEN GOTO VAL "95"
60 IF G(is greater than)VAL "Z" THEN GOTO VAL "75"
65 PRINT "HIGHER"
70 GOTO VAL "80"
75 PRINT "LOWER"
80 IF C(is less than)VAL "5" THEN GOTO VAL "45"
85 PRINT "YOUR CHANCES ARE OVER. THE AMOUNT WAS $";Z
90 GOTO VAL "125"
95 PRINT
100 PRINT "RIGHT. YOU/VE WON $";Z
105 LET T=VAL "T+Z"
110 PRINT "YOUR TOTAL IS $";T
115 GOSUB VAL "145"
120 GOTO VAL "25"
125 PRINT "AGAIN?"
130 INPUT A$
135 IF A$="YES" THEN GOTO VAL "15"
140 STOP
145 FOR N=VAL "0" TO VAL "99"
150 NEXT N
145 CLS
150 RETURN
```


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COMMODORE

Address List

By Simon Jones

THIS ADDRESS list can save up to 100 different names and addresses on an eight-kilobyte machine. This can be extended by changing the DIM statement on line 10.

The program will work on old-ROM Pets if you change all the POKE158,0 and WRIT158,1 statements to POKE525,0 and WRIT525,1 respectively.

In line 240, POKE243,122 and POKE244,2 are used for making routine work of the old ROM Pet's file-handling. These two pokes are also used in line 1180; they are used when you are opening a file to write data.

The routine from line 1180 to line 1420 is a good example of file handing on old ROM Pets. This is not necessary on new ROM and BASIC-4 Pets.

```
10 DIMA$(100),B$(100),C(100),C$(100)
20 PRINT"■";
30 :PRINT:PRINTTAB(8)"■****ADDRESS LIST****■"
40 PRINT:PRINT:PRINT:PRINT"WRITTEN BY
50 PRINTTAB(11)"S.JONES"
70 FORX=1TO1500:NEXTX
80 PRINT"■":PRINT:PRINT:PRINT:PRINT
90 PRINTTAB(5)"■****ADDRESS LIST****■"
100 PRINT:PRINT:PRINT
110 PRINT"■■RITE, ■READ, ■EDIT OR ■TERMINATE."
120 GETZ$:IFZ$=""THEN120
130 IFZ$="W"THEN180
140 IFZ$="R"THEN500
150 IFZ$="E"THEN770
160 IFZ$="T"THEN1430
170 Z$="":GOTO120
180 PRINTTAB(8)"■RITTING DATA■"
190 PRINT"INSERT AND REWIND DATA TAPE.":PRINT"HIT ANY KEY":POKE158,0:WAIT158,1
200 POKE158,0
210 PRINT"TO END DATA INPUT TYPE ■END■".
220 POKE525,0
230 REM "OPEN FILE TO WRITE DATA"
240 POKE243,122:POKE244,2:OPEN1,1,2
250 I=I+1
260 PRINT
270 REM"INPUT DATA AND WRITE DATA TO     CASSETTE BUFFER"
280 INPUT"NAME";A$(I)
290 PRINT#1,A$(I);CHR$(13);
300 IFA$(I)="END"THEN490
310 A=LEN(A$(I))+1:IF(0T+A)>=191THENGOSUB430
320 INPUT"ADDRESS 1";B$(I)
330 PRINT#1,B$(I);CHR$(13);
340 B=LEN(B$(I))+1:IF(0T+A)>=191THENGOSUB430
350 INPUT"ADDRESS 2";C$(I)
360 PRINT#1,C$(I);CHR$(13);
370 D=LEN(C$(I))+1:IF(0T+A)>=191THENGOSUB430
380 INPUT"PHONE NUMBER";C(I)
390 PRINT#1,C(I);CHR$(13);
400 E=LEN(STR$(C(I)))+1:IF(0T+A)>=191THENGOSUB430
410 GOTO250
420 REM FORCE GAP BETWEEN PHYSICAL RECORD
430 POKE59411,53
440 T=TI
450 IF(TI-T)<10THEN450
460 POKE59411,61
470 0T=0
480 RETURN
490 CLOSE1:CLR:GOTO80
500 PRINT"INSERT AND REWIND DATA TAPE.":PRINT"HIT ANY KEY WHEN FINISHED."
510 POKE158,0:WAIT158,1:POKE158,0
520 REM"OPEN FILE TO READ DATA FROM    TAPE"
530 OPEN1,1
540 PRINT"■";
550 PRINTTAB(8)"■READING DATA■"
560 I=I+1
570 INPUT#1,A$(I)
580 IFA$(I)="END"THEN630
590 INPUT#1,B$(I)
600 INPUT#1,C$(I)
610 INPUT#1,C(I)
620 GOTO560
630 FORV=1TO2:G=G+1
640 PRINTA$(G)
650 IFA$(G)="END"THEN740
660 PRINTB$(G)
670 PRINTC$(G)
```


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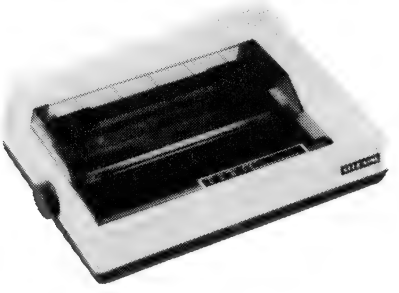
STAR PRINTER DP-8480

SPECIFICATIONS
Printing system — Impact dot matrix.
Interface — Centronics standardised parallel interface (TTL level) built in printer.
Matrix Character mode 9 x 7 matrix, Graphic mode 6 x 6 matrix.
Printing direction — Character mode Bi-directional printing with logical seeking function, Graphic mode Uni-directional printing from left to right.
Number of characters per line — 80/96/131 (40/48/66 for double-width characters).
Printing speed — 80 characters/sec.
Character set — JIS 160 codes/ASCII 96 codes + International character codes 64 graphics patterns.
Character size — 2.0 (W) x 2.6 (H) in mm in case of 80 columns/line.
Character space — 2.54mm (1/10 inch) in case of 80 columns/line.
Line space — 1/6, 1/8 or 1/12 inch.
Paper feed system — Friction type Friction feed, Tractor type Variable sprocket feed or friction feed.
Line feed speed — 7.5 lines/sec at 1/6 inch spacing, 10 lines/sec at 1/8 inch spacing.
Buffer capacity — 2K bytes.
Other important functions — Form feed, Diagnostic printing, No-paper detection, Buzzer.

SALE



ALPHA-80

SPECIFICATIONS
Functional specifications
Printing method: Serial impact dot matrix.
Printing format: Alpha-numeric — 7 x 8 in 8 x 9 dot matrix field.
Character set: 228 ASCII characters; Normal and italic alpha-numeric fonts, symbols and semi-graphics.
Printing speed: 80 CPS, 640 dots/line per second.
Line feed time: Approximately 200 msec at 4.23mm (1/6″) line feed.
Printing direction: Normal — Bidirectional, logic seeking. Superscript and bit image graphics — Unidirectional, left to right.
Line spacing: Normal — 4.23mm (1/6″). Programmable in increments of 0.35mm (1/72″) and 0.118mm (1/216″).
Columns/line: Normal size — 80 columns. Double width — 40 columns. Compressed print — 142 columns. Compressed/double width — 71 columns. The above can be mixed in a line.
Paper feed: Adjustable sprocket feed and fricion feed.
Paper type: Fanfold. Single sheet.
Interface specifications
Interface: Standard Centronics parallel. Optional RS-232C (SERIAL).
Data transfer rate: 4000 CPS max.
Synchronisation: By external supplied STROBE pulses.
Handshaking: By ACKNLG or BUSY signals.
Logic level: Input data and all interface control signals are TTL level.

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```
680 PRINTC(G):PRINT
690 NEXTY
700 PRINT"HIT ANY KEY TO CONTINUE."
710 POKE158,0:WAIT158,1:POKE158,0
720 PRINT"■";
730 GOTO630
740 PRINT"HIT ANY KEY TO CONTINUE."
750 POKE158,0:WAIT158,1:POKE158,0
760 CLOSE1:CLR:GOTO10
770 PRINT"■■EDITING MODE■"
780 PRINT"INSERT AND REWIND DATA TAPE.":PRINT"HIT ANY KEY":POKE525,0:WAIT158,1
790 POKE158,0
800 REM"OPEN FILE TO READ FROM TAPE"
810 OPEN1,1
820 I=I+1
830 REM"READ DATA FROM CASSETTE BUFFER"
840 INPUT#1,A$(I)
850 IFA$(I)="END"THEN910
860 INPUT#1,B$(I)
870 INPUT#1,C$(I)
880 INPUT#1,C(I)
890 X=I
900 GOTO820
910 CLOSE1
920 PRINT"HIT ■STOP/EJECT■ ON CASSETTE #1"
930 PRINT"INPUT NUMBER THAT YOU WANT TO EDIT.":I=0:I=I+1
940 FORA=1TO13
950 PRINTI;A$(I):I=I+1
960 IFA$(I)="END"THEN1010
970 NEXTA
980 PRINT"HIT  ANY KEY TO CONTINUE."
990 GETW$:IFW$=""THEN990
1000 GOTO940
1010 INPUT"NUMBER";W
1020 PRINT"■";W;"WAS THIS"
1030 PRINTTAB(7)A$(W)
1040 PRINTTAB(11)B$(W)
1050 PRINTTAB(11)C$(W)
1060 PRINTTAB(14)C(W)
1070 PRINT"■MAKE YOUR CHANGES NOW"
1080 INPUT"NAME";A$(W)
1090 INPUT"ADDRESS 1";B$(W)
1100 INPUT"ADDRESS 2";C$(W)
1110 INPUT"PHONE NUMBER";C(W)
1120 INPUT"■ANY MORE EDITING";Z$
1130 IF LEFT$(Z$,1)="Y"THEN930
1140 PRINT"■"
1150 PRINT"REWIND THE DATA TAPE.HIT ANY KEY WHEN   FINISHED."
1160 POKE158,0:WAIT158,1:POKE158,0
1170 REM"OPEN FILE TO WRITE DATA"
1180 POKE243,122:POKE244,2:OPEN1,1,2
1190 I=0
1200 REM"WRITE DATA TO CASSETTE BUFFER"
1210 I=I+1
1220 PRINT#1,A$(I);CHR$(13);
1230 B=LEN(A$(I))+1:IF(0T+B)>=191THENGOSUB1370
1240 0T=0T+B
1250 IFA$(I)="END"THEN1360
1260 PRINT#1,B$(I);CHR$(13);
1270 B=LEN(B$(I))+1:IF(0T+B)>=191THENGOSUB1370
1280 0T=0T+B
1290 PRINT#1,C$(I);CHR$(13);
1300 B=LEN(C$(I))+1:IF(0T+B)>=191THENGOSUB1370
1310 0T=0T+B
1320 PRINT#1,C(I);CHR$(13);
1330 B=LEN(STR$(C(I)))+1:IF(0T+B)>=191THENGOSUB1370
1340 0T=0T+B
1350 GOTO1210
1360 CLOSE1:CLR:GOTO80
1370 REM"FORCE GAP BETWEEN PHYSICAL      RECORD"
1380 T=TI
1390 IF(TI-T)<10GOTO1390
1400 P0KE59411,61
1410 0T=0
1420 RETURN
1430 END
```

Function Plotter

By Chris Allen

FUNCTION PLOTTER is a program that actually writes its own program lines. You enter the second half of a function definition line as a string input, and the section of the program from line 1001 to 1055 interprets the value of the string and converts it into a form usable by the VIC-20.

The VIC-20 – and many other microcomputers – saves memory by storing BASIC keywords in the memory with special token values, but as one number (in this case, 155).

For more information about how your VIC-20 stores the programs in memory, refer to the *VIC Programmer's Reference Guide* or *VIC Revealed.*

Line 1060 pokes the values for the line into the locations in lines two and four. The locations of these two lines is represented by the variable L.

As long as you don't change line one, the location lines of two and four will remain the same, no matter what you do to the rest of the program – the rest of the program simply plots the functions on the screen. You can easily modify the program to graph in low resolution with a different colour for each function.

```
1 SC=100:DIMF3(45),F2$(12),F2(12):GOTO6
2 DEFFNA(X)=:REM.....
4 DEFFNB(X)=:REM.....
5 REM MENU
6 PRINT"■■ FUNCTION PLOTTER"
7 PRINT"■1. CREATE 2 FUNCTIONS"
8 PRINT"■2. CREATE 1 FUNCTION"
9 PRINT"■3. PLOT GRAPH"
10 PRINT"■4. CHANGE SCALE"
11 PRINT"■5. EXIT PROGRAM"
12 PRINT"■■■WHICH DO YOU CHOOSE ?■"
13 GETA$:IFA$=""THEN13
14 IFA$="1"THENF=2:GOTO1000
15 IFA$="2"THENF=1:GOTO1000
16 IFA$="3"THEN20
17 IFA$="4"THENGOSUB200:GOTO6
18 IFA$="5"THEN:END
19 GOTO13
20 GRAPHIC2:COLOR0,1,1,2
25 DRAW1,0,512TO1023,512:DRAW1,512,0TO512,1023
27 REM VALUES FROM -5 TO 5. SMALLER STEP GIVES HIGHER RESOLUTION
30 FORX=-5TO5STEP.1
40 Z=INT(512+X*100)
50 Y=512-INT(FNA(X)*SC)
55 IFF<>1THENY2=512-INT(FNB(X)*SC)
60 IFY>1023ORY<0THEN75
69 REM ACTUAL PLOTTING OF POINTS
70 POINT1,Z,Y
75 IFF=0ANDY2>0ANDY2<1024THEN:POINT1,Z,Y2
80 NEXTX
85 REM HIT ANY KEY TO CONTINUE
90 GETZ$:IFZ$=""THEN90
100 GRAPHIC4 GOTO6
105 REM BY CHRIS ALLEN
110 END
200 PRINT"■■SCALE ="SC
210 INPUT"ENTER NEW SCALE";SC:RETURN
1000 L=1072:RESTORE
1001 REM OPERATORS, FUNCTIONS AND CORRESPONDING TOKEN VALUE
1002 DATA=,178,+,170,-,171,*,172,/,173,↑,174,INT,181,ABS,182,SQR,186,LOG,188
1003 DATAEXP,189,COS,190,SIN,191,TAN,192,ATN,193,RND,187,FN,165,DEF,150
1010 FORI=1TO6:READF1$(I):READF1(I):NEXT:FORI=1TO12:READF2$(I):READF2(I):NEXT
1015 PRINT"IN TERMS OF X■"
1020 INPUT"FUNCTION=";F$:I3=1
1030 FORI=1TOLEN(F$):FORI2=1TO12:IFMID$(F$,I,3)=F2$(I2)THEN1035
1032 NEXTI2:GOTO1040
1035 F3(I3)=F2(I2):I3=I3+1:I=I+2:NEXTI
1040 FORI1=1TO6:IFMID$(F$,I,1)=F1$(I1)THENF3(I3)=F1(I1):I3=I3+1:NEXTI
1042 NEXTI1
1050 F4=ASC(MID$(F$,I,1)):IFF4>=35ANDF4<=90THENF3(I3)=F4:I3=I3+1
1055 NEXTI
1057 REM POKE TOKEN VALUES FOR FUNCTION INTO LINE
1060 FORI=1TOI3-1:POKEL+I,F3(I):NEXT:POKEL+I,58:POKEL+1+I,143
1070 IFF=2THENL=1131:F=0:RESTORE:GOTO1002
1080 GOTO2

READY.
```


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COMMODORE

Mercuron

By Grant Woolston

THIS PROGRAM was designed for a 3000 series Pet, but it can be easily modified for a 4000 series by changing lines 420, 430, 450 and 460 – change the value 42 to 52 and the value 41 to 54.

The object of the game is to stop the Mercurons from landing by shooting them. If more than six Mercurons land, the game ends.

```
10 REM***MERCURON - BY G.WOOLSTON***
20 REM#####          ####
30 REM ### RECORD    ###
40 REM  ##    10     ##
50 GG=10:REM***GG IS HIGH SCORE***
60 REM*** SET VALUES FOR VARIABLES***
70 PRINT"(CLEAR SCREEN)":GOSUB1090
80 TI$="000000"
90 POKE59467,16
100 PRINT"(CLEAR SCREEN)"
110 A=33707
120 REM*** SET UP SCREEN DISPLAY***
130 FORXY=1TO100:Y=INT(1000*RND(1)+32767)
140 POKEY,46:NEXTXY
145 KK$="(CURSOR HOME)(21*CURSOR RIGHT)(3*CURSOR DOWN)"
150 PRINTKK$;:PRINT"S.O.S.(3*CURSOR LEFT)(6*CURSOR DOWN)FORCED LANDING"
170 FORI=33767-39TO33767:READJ:POKEI,J:NEXT
180 FORBL=32907TO33687STEP40
190 POKEBL,65:FORI=1TO5:GOSUB790:NEXT
200 POKEBL,32:POKEBL+40,65:NEXT
210 LL$="     (3*CURSOR LEFT)(6*CURSOR DOWN)
215 PRINTKK$;:PRINTLL$
220 POKE59467,0
230 X=INT(40*RND(1)+32807)
240 POKEX+40,75:POKEX+41,74:POKEX,233:POKEX+1,223
250 POKEX-1,32:POKEX+2,32
260 P=INT(40*RND(1)+32807)
270 IFE=:6THEN820
280 POKEP,133:POKEP+1,123
290 POKEA,65
300 REM***RANDOM MOVEMENT OF MERCURONS***
310 L=INT(1000*RND(1)+32727):POKEL,46
320 S=INT(2*RND(1)+1)
330 X=X+40:POKEX-40,32:POKEX-39,32
340 IFX>33687THENE=E+1:GOTO750
350 IFS=2THENX=X-1:POKEX+2,32
360 M=INT(2*RND(1)+1)
370 P=P+40:POKEP-40,32:POKEP-39,32
380 IFM=1THENP=P+1:POKEP-1,32
390 IFM=2THENP=P-1:POKEP+2,32
400 IFP>33687THENE=E+1:GOTO770
410 GETMU$
420 IFPEEK(151)=42THENA=A-1:POKEA+1,32
430 IFPEEK(151)=41THENA=A+1:POKEA-1,32
440 IFMU$="F"THEN530
450 IFPEEK(151)=42THENA=A-1:POKEA+1,32
460 IFPEEK(151)=41THENA=A+1:POKEA-1,32
470 IFA>33727THENA=33688:POKE33727,32
480 IFA<33688THENA=33727:POKE33727,32
490 POKEX,233:POKEX+1,223:POKEX+40,75:POKEX+41,74:POKEP,233:POKEP+1,223:
500 POKEX-1,32:POKEX+2,32
510 POKEP+40,75:POKEP+41,74
520 GOTO290
530 REM ***BULLET MOVEMENT***
540 POKEX,233:POKEX+1,223:POKEP,233:POKEP+1,223
550 POKEX-1,32:POKEX+2,32
560 POKEX+40,75:POKEP+40,75:POKEX+41,74:POKEP+41,74
570 POKEA,65
580 POKEX-1,32:POKEX+2,32
590 POKEX+40,75:POKEP+40,75:POKEX+41,74:POKEP+41,74
600 V=A-40
610 FORRF=70TO94:POKEV,81
620 IFV=X+40ORV=X+41THEN670
630 IFV=P+40ORV=P+41THENPOKE59467,0:GOTO710
640 V=V-40:POKEV+40,32:NEXTRF
650 POKE59467,0:POKEV,32:POKEV+40,32:GOTO290
660 REM ***SOUND EFFECTS FOR EXPLOSION***
670 POKEV,32:POKEV-40,42:G=G+1
680 POKE59467,16:POKE59466,100:FORI=1TO20:POKE59464,I:NEXT:FORR=20TO1STEP-1
690 POKE59464,R:NEXT:POKE59466,0:POKE59467,0
700 POKEX,32:POKEX+1,32:POKEX+40,32:POKEX+41,32:GOTO1050
710 POKEV,32:POKEV-40,42:G=G+1
720 POKE59467,16:POKE59466,100:FORI=1TO20:POKE59464,I:NEXT:FORR=20TO1STEP-1
730 POKE59464,K:NEXT:POKE59466,0:POKE59467,0
740 POKEP,32:POKEP+1,32:POKEP+40,32:POKEP+41,32:GOTO260
750 POKE59467,16:POKE59466,200:POKE59464,200:FORKL=1TO50:NEXT:POKE59467,0
760 POKEX,32:POKEX+1,32:POKEX+40,233:POKEX+41,223:     GOTO1050
770 POKE59467,16:POKE59466,200:POKE59464,200:FORKL=1TO50:NEXT:POKE59467,0
780 POKEP,32:POKEP+1,32:POKEP+40,233:POKEP+41,223:     GOTO260
790 POKE59466,254:POKE59464,10:POKE59464,200:POKE59464,50:POKE59464,244
800 RETURN
810 REM*** INVADED ROUTINE AND SCORE ***
820 FORT=33767-39TO33767STEP2:POKET,233:POKET+1,223:POKE59467,16:POKE59466,10
825 FORM=1TO75
830 NEXT
840 POKE59466,0:NEXT
850 PRINT"(CURSOR HOME)          (REVERSE FIELD)INVADED"
860 FORI=1TO500:NEXT
865 PRINTKK$"EMERGENCY(3*CURSOR LEFT)(6*CURSOR DOWN)BLAST OFF"
880 FORBL=33667TO32707STEP-40
890 POKEA,65:POKE59467,16:FORI=1TO5:GOSUB790:NEXT
900 POKEA,32:POKEA-40,65:A=A-40:NEXT
920 FORI=1TO2000:NEXT
930 PRINT"(CLEAR SCREEN)YOU HAVE DESTROYED "G" MARTIANS!!!"
940 PRINT"YOU LASTED FOR ";
950 PRINTRIGHT$(LEFT$(TI$,4),2)" MINUTES";
960 PRINT" "RIGHT$(TI$,2)" SECONDS":IFG>GGTHEN1020
970 POKE59467,0:PRINT"(REVERSE FIELD)     PRESS G TO CONTINUE OR S TO STOP   "
980 GETA$:IFA$="G"ORA$="S"THEN1000
990 GOTO980
1000 IFA$="S"THENPRINT"GOODBYE COMMANDER!!":END
1010 RUN80
1020 PRINT" YOUR SCORE IS THE BEST YET !":PRINT"    PLEASE ADJUST LINE 110-140"
1030 POKE59467,0
```


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```
1040 LIST20-50
1050 X=INT(40*RND(1)+32767)
1060 IFE=>6THEN820
1070 POKEX,133:POKEX+1,123:GOTO290
1080 REM*** INTRUCTIONS ***
1090 PRINTTAB(13)"(REVERSE FIELD)MURCURON"
1100 PRINT:PRINT" YOU ARE THE PILOT OF AN INTERSTELLER";PRINT
1110 PRINT"SPACECRAFT. YOUR MISSION WAS TO LAND ON";PRINT
1120 PRINT"MURCURY BUT ON ATTEMPTING TO LAND YOU";PRINT"WERE";
1130 PRINT" ATTACKED BY ALIEN BEINGS.";PRINT
1140 PRINT" I NOW LEAVE YOU IN THE POSITION TO ";PRINT
1150 PRINT"FIGHT AS MANY MURCURONS AS POSSIBLE.";PRINT
1160 PRINT"YOU MUST STOP THEM FROM LANDING ON";PRINT
1170 PRINT"THE SURFACE OF MURCURY BY SHOOTING THEM. ";:PRINT
1180 PRINT"IF MORE THAN SIX MURCURONS LAND THEN ";PRINT
1190 PRINT"YOU WILL BE FORCED TO LEAVE"
1200 PRINT"(REVERSE FIELD)                PRESS ANY KEY        "
1210 GET@$:IF@$=""THEN1210
1220 PRINT"(CLEAR SCREEN)              CONTROLS               "
1230 PRINT:PRINT:PRINT"'4' MOVES YOU LEFT";PRINT
1240 PRINT"'6' MOVES YOU RIGHT";PRINT
1250 PRINT"AND 'F' FIRES THE BULLET";PRINT
1260 PRINT"(REVERSE FIELD)    PRESS ANY KEY FOR THE GAME ITSELF"
1270 GET@$:IF@$=""THEN1270
1280 RETURN
1290 DATA85,64,70,67,68,69,68,70,67,70,100, 82,70,64,68,99
1300 DATA77,100,100,82,70,64,73,85,67,68,69,68,64,70,100
1310 DATA78,99,69,68,64,67,64,73,32
12310 DATA78,99,69,68,64,67,64,73,32
READY.
```

TANDY TRS80/SYSTEM 80

Paint Brush

By Ben Brown and Shaun Tennant

WITH Paint Brush, the aim is to draw patterns, pictures, pass messages or just doodle. A clearing mode allows movement without leaving a trail. You can check your position by pressing the colon key.

```
1 REM----------------PAINTBRUSH-------------------------
2 REM----------THIS PROGRAMME WAS WRITTEN----------------
3 REM----------BY SHAUN TENNANT (SHEEP)------------------
4 REM----------------AND BEN BROWN----------------------
5 REM---------------------------------------------------
10 CLS
20 CLEAR255
30 PRINT"
                P A I N T B R U S H

KEYS USED: 'ESC' OR UPWARDS ARROW
           'CTRL' OR DOWNWARDS ARROW
           ',' TO MOVE LEFT
           '.' TO MOVE RIGHT
           '@' TO GET INTO THE BLANKING MODE
           'P' TO GET OUT OF ";
32 PRINT"THE BLANKING MODE
           ':' TO SHOW POSITION
           'S' TO START AGAIN"
33 PRINT:PRINT
40 INPUT"X CORDINATE TO START AT";X
50 INPUT"Y CORDINATE TO START AT";Y
55 CLS
70 IF PEEK(14400)=16THEN Y=Y+1:IF Y>47 THEN Y=47
80 IF PEEK(14400)= 8 THEN Y=Y-1:IF Y<0 THEN Y=0
83 IF PEEK(14337)=8 THEN 1000
85 IF PEEK(14368)=4 THEN JS=1:IF Z<>1 THEN RESET(X,Y) ELSE SET(X,Y)
90 IF PEEK(14368)=16 THEN X=X-1:IF X<0 THEN X=0
95 IF PEEK(14340)=1 THEN Z=0
100 IF PEEK(14368)=64 THEN X=X+1:IF X>127 THEN X=127
101 IF PEEK(14337)=1 THEN Z=1
102 IF Z=1 THEN RESET(X,Y):GOTO 70
104 IF Z<>1 THEN SET(X,Y)
105 SET(X,Y)
110 GOTO 70
1000 CLS:GOTO33
```

Sideways Print

By Tony Hinde

THIS BASIC program was written as a demonstration for the sideways-print routine. In BASIC, the only way to move the entire screen quickly is to use the PRINT command, which moves the entire screen upwards. That's fine, except that most spaceships, planes, and vehicles don't look right moving down the screen.

To solve this problem, I wrote a short Assembly program and converted it to data so as to use it in BASIC. It works exactly like PRINT, except sideways, so it leaves a blank line on the right side of the screen.

The demonstration program is not too refined and is just an example. The object is to bomb the enemy (people, soldiers or robots); by pressing the space bar, you control your ship with the four arrow keys.

I have included the Assembly listing for the curious.

```
1 'MAKE SURE TO SAVE THE PROGRAM BEFORE YOU RUN IT !!!!!
10 CLS
20 'THIS LOADS THE SUBROUTINE    :FORX=31232TO31264:READA:POKEX,A:NEXT
30 DATA6,63,33,0,60,22,16,221,33,1,60,221,126,0,119,35,221,35,16,247,221,35,62,1
28,119,35,6,63,21,194,11,122,201
40 POKE16526,0:POKE16527,122
45 CLEAR1000:DELETE20-45:' THIS DELETES THE SUBROUTINE LOADER
50 A=0
55 PRINT@64,STRING$(63,188);
60 A$=CHR$(128)+CHR$(128)+CHR$(185)+STRING$(3,176)
70 PRINT@A%64+0,A$;
75 L=PEEK(15360+0+A%64+6):IFL=191ORL=188ORL=185THEN900
80 H=RND(3)-2:B=B+H:IFB>15THENB=15ELSEIFB<1THENB=1
90 PRINT@B%64+62,CHR$(191);
92 H=INT(RND(20)/20)%185:IFH=0THENH=128
93 IFB>1THENPRINT@(B-1)%64+62,CHR$(H);
95 P=PEEK(15359):IFP<>0THENGOSUB400
100 C=USR(D)
110 GOTO70
400 J=LEN(A$)
410 IF(P=32ORP=40ORP=48)ANDO>0THENO=O-1
420 IF(P=64ORP=72ORP=80)ANDO<30THENO=O+1
430 IF(P=8ORP=40ORP=72)ANDA>0THENPRINT@A%64+O,STRING$(7,128);:A=A-1
440 IF(P=16ORP=48ORP=80)ANDA<15THENPRINT@A%64+O,STRING$(7,128);:A=A+1
445 IFP=128THEN500
450 RETURN
500 V=A%64+O+67
503 U=PEEK(V+15424):IFU=185THEN827ELSEIFU=191THENRETURN
505 U=PEEK(V+15360):IFU=185THEN827ELSEIFU=191THENRETURN
507 RESTORE
510 FORX=1TO14
520 V=V+64:READG:PRINT@V,CHR$(G);
530 GOTO800
540 NEXTX
580  RETURN
800 U=PEEK(V+64+15360):IFU=128ORU=32THENPRINT@V," ";:GOTO540
810 PRINT@V," ";
820 V=V+64
825 IFPEEK(V+15360)<>185THENRETURN
827 RESTORE
830 FORX=1TO10
840 READG
850 PRINT@V,CHR$(G);
860 NEXT
870 RETURN
880 DATA46,44,94,58,33,73,61,56,88,42,42,42,42,42
900 K=A%64+O:PRINT@K,STRING$(6,166);:PRINT@K,STRING$(6,153);
910 G=G+1:IFG=50THENRUNELSEGOTO900

             00090 ; A PROGRAM TO PRINT IN <- DIRECTION
7A00         00100         ORG     7A00H
7A00 063F    00110 START   LD      B,63
7A02 21003C  00120         LD      HL,3C00H
```

```
7A05 1610      00130          LD      D,16
7A07 DD21013C 00140          LD      IX,3C01H
7A0B DD7E00    00150 LOOP     LD      A,(IX)
7A0E 77        00160          LD      (HL),A
7A0F 23        00170          INC     HL
7A10 DD23      00180          INC     IX
7A12 10F7      00190          DJNZ    LOOP
7A14 DD23      00200          INC     IX
7A16 3E80      00210          LD      A,128
7A18 77        00220          LD      (HL),A
7A19 23        00230          INC     HL
7A1A 063F      00240          LD      B,63
7A1C 15        00250          DEC     D
7A1D C20B7A    00260          JP      NZ,LOOP
7A20 C9        00270          RET
7A00           00280          END     7A00H
00000 TOTAL ERRORS

LOOP    7A0B
START   7A00
```

POKEing For Graphics

By Paul Wade

IN THIS program, POKEing to form screen graphics is done in lines 20 to 190, while line 200 writes the player information to the gaps left in the display.

Lines 210 to 230 randomly determine whether a target should appear and if it should come from the top or the bottom of the screen. Lines 240 and 250 draw the target at the bottom of the screen; lines 270 and 280 draw the target at the top of the screen.

Lines 290 to 340 update the number of shots fired, and line 350 tests to see which way the target is moving. The target is then erased (Line 360 or 400).

The game ends if either the fuel or the shots reach zero; if the hits exceed eight, extra fuel and shots are granted.

To stop the games from dragging on too far, extra time is only granted once. Lines 520 to 540 ask if the game is to be played again and, if so, reset the variables to their start values.

```
10 CLS:X=15360:F=300:S=10
20 FORI=0TO64:POKE(X+I),191:NEXT:POKE(X+77),191
30 FORI=95TO96:POKE(X+I),191:NEXT:POKE(X+114),191
40 FORI=127TO141:POKE(X+I),191:NEXT
50 FORI=178TO205:POKE(X+I),191:NEXT
60 FORI=242TO256:POKE(X+I),191:NEXT
70 POKE(X+269),191:POKE(X+306),191:POKE(X+319),191:POKE(X+320),191:POKE(X+333),1
91
80 POKE(X+370),191:POKE(X+383),191:POKE(X+384),191:POKE(X+337),191:POKE(X+434),1
91
90 FORI=447TO463:POKE(X+I),191:NEXT
100 FORI=496TO527:POKE(X+I),191:NEXT
110 FORI=560TO576:POKE(X+I),191:NEXT
120 POKE(X+589),191:POKE(X+626),191:POKE(X+639),191
130 POKE(X+640),191:POKE(X+653),191:POKE(X+690),191
140 FORI=703TO717:POKE(X+I),191:NEXT
150 FORI=754TO781:POKE(X+I),191:NEXT
160 FORI=818TO832:POKE(X+I),191:NEXT
170 POKE(X+845),191:POKE(X+863),191:POKE(X+864),191:POKE(X+882),191
180 FORI=895TO1023:POKE(X+I),191:NEXT
190 FORI=984TO999:POKE(X+I),32:NEXT
200 PRINT@67,"FUEL";:PRINT@117,"SHOT";:PRINT@835,"HITS";:PRINT@986,"COMBAT PLANE
";
205 IFINKEY$=""THEN205
210 A=RND(120)
215 FORT=1TO35:NEXT
220 IFA<5THEN240
230 IFA<10THEN270ELSE290
240 P=X+735:P1=0
250 POKEP,176:POKE(P+1),176:FORI=62TO67:POKE(P+I),131:NEXT
260 GOTO290
270 P1=X+159:P=0
280 POKEP1,176:POKE(P1+1),176:FORI=62TO67:POKE(P1+I),131:NEXT
290 F=F-1:IF F=0GOSUB500
300 F$=INKEY$:IF F$<>""THEN S=S-1
310 PRINT@71,"     ";:PRINT@71,F;:PRINT@121,S;:PRINT@839,H;
315 IFS=0GOSUB500
320 IF P=0 AND P1=0THEN 210
330 IFF$<>""THEN G=PEEK(X+480)
340 IFG=176 THEN H=H+1:C=1:G=0
350 IFP=0THEN400
360 POKEP,32:POKE(P+1),32:FORI=62TO67:POKE(P+I),32:NEXT
370 IF C=1THEN C=0:P=0:GOTO210
380 P=P-64:IFP=(X+95) THENP=0:GOTO210
390 GOTO250
400 POKEP1,32:POKE(P1+1),32:FORI=62TO67:POKE(P1+I),32:NEXT
410 IFC=1THENC=0:P1=0:GOTO210
420 P1=P1+64:IFP1=(X+799)THEN P1=0:GOTO210
430 GOTO280
500 IF M=1THEN520
510 IFH>7THEN M=1:S=S+10:F=F+200:PRINT@885,"EXTRA";:RETURN
520 PRINT@885,"FINISHED";
525 PRINT@795,"AGAIN(Y/N)";
530 T$=INKEY$:IFT$=""THEN530ELSEIFT$="Y"ORT$="N"THEN540ELSE530
540 IFLEFT$(T$,1)="Y"THENPRINT@885,"          ";:PRINT@795,"          ";:H=0:C=0:
S=10:F=300:G=0:M=0:A=0:GOTO205
```

Drawing Board

By Kim Henkel

DRAWING BOARD allows graphics to be drawn on the screen which can then be recreated on a printer. The instructions are included in the program.

The basis of Drawing Board is a routine to move a pixel around the screen with the arrow keys, either setting or re-

Continued On Page 75

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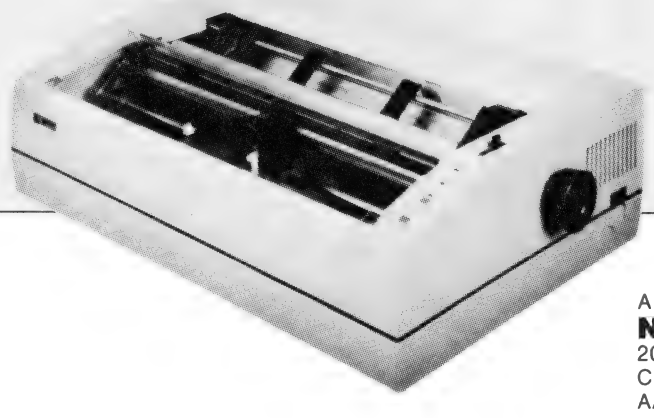

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Continued From Page 58

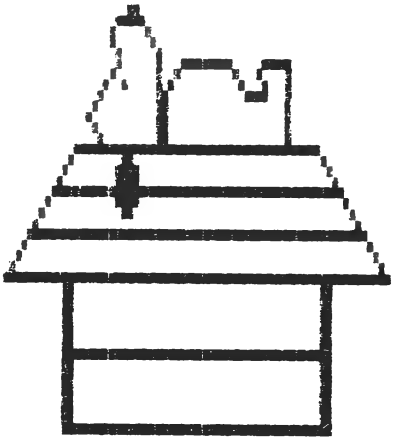
setting pixels as you go.

The program also has a short routine (line 30) to store the contents of the screen in a variable. The graphics can later be restored with the (R) command (line 31). These lines could be changed to save a screen to cassette.

I wrote this program for use with my Microline 80 printer, and I found that the hard copy looks more uniform if the printer is set at 16.5 characters per inch.

The program was written for a Model 1 TRS80, but it should work unaltered on similar micros.

```
2 REM ****************************
3 REM *      DRAWING BOARD       *
4 REM *      BY K. HENKEL        *
5 REM *          1983            *
6 REM ****************************
10 CLEAR2000:CLS:DIMZ(1024):GOTO280
30 FORZI=0TO1023:Z(ZI)=PEEK(15360+ZI):NEXT:RETURN
31 FORZI=0TO1023:POKE15360+ZI,Z(ZI):NEXT:RETURN
83 DEFINTD:D=PEEK(14400)
84 IF DAND8ZY=ZY-1ELSEIFDAND16ZY=ZY+1 ELSEIFDAND32ZX=ZX-1 ELSEIF
DAND64ZX=ZX+1
85 IF ZX)127ZX=ZX-1 ELSE IFZX(0 ZX=ZX+1 ELSEIF ZY)47ZY=ZY-1 ELSE
IFZY(0ZY=ZY+1
86 IF D=2CLS ELSEIFD=1RETURN
87 IF D)120SET(ZX,ZY):FORDZ=1TO1:NEXT:RESET(ZX,ZY):GOTO83
88 RESET(ZX,ZY):FORT=1TO1:NEXT:SET(ZX,ZY):GOTO83
100 POKE16383,100:GOSUB83
200 POKE16383,105
202 A$=INKEY$:IFA$=""THEN202
205 POKE16383,ASC(A$)+32
210 IF A$="S" THEN GOSUB 30
220 IF A$="R" THEN GOSUB 31
230 IF A$="D" THEN GOSUB 83
240 IF A$="P" THEN GOTO 260
250 GOTO 200
260 CLEAR1500:POKE16383,128:FORL=15360TO16382STEP64:C$=""
265 FORC=0TO63:C$=C$+CHR$(PEEK(L+C)):NEXTC
270 LPRINTC$:NEXTL:GOTO200
280 CLS
```



```
290 N=15751:BO=15360
300 PRINT@1,STRING$(62,137):PRINT@961,STRING$(62,164);
305 FORX=0TO1023STEP64
306 POKEBO+X,166:POKEBO+X+1,166:POKEBO+X+62,166:POKEBO+X+63,166
307 NEXTX
308 FORG=1TO5
310 PRINTCHR$(23);:PRINT@152,"D R A W";
311 FORT=1TO70:NEXTT
315 PRINTCHR$(28);:PRINT@152,"D   R   A   W";
316 FORT=1TO70:NEXTT:NEXTG
320 PRINT@194,"THIS PROGRAM ALLOWS YOU TO DESIGN GRAPHICS ON YOU
R COMPUTER.";:PRINT@258,"THERE ARE TWO MAIN MODES -DRAWING & INP
UT.";:PRINT@322,"DRAWING : USE ARROW KEYS TO MOVE PIXEL. HOLD SP
ACE TO RESET.";
322 PRINT@396,"(CLEAR) TO CLS.  (ENTER) TO CHANGE MODE.";:PRINT@
450,"INPUT   : (S) TO SAVE GRAPHIC.  (R) TO REDRAW GRAPHIC.";:PR
INT@524,"(P) TO GET HARDCOPY.  (D) TO RETURN TO DRAWING.";
350 PRINT@920,"PRESS ANY KEY";
360 A$=INKEY$:IFA$=""THEN360ELSECLS:GOTO100
```

APPLE

Beginning And Ending

By Michael Phillips

THIS MACHINE-language program finds the starting address and the length of the last BLOADed or BRUN machine-language program and display both of them in hexadecimal.

The program was made on a 48-kilobyte Apple, but it can easily be altered so that it will work on a 16- or 32-kilobyte Apple. I have listed the changes necessary for this.

To enter machine code, you type CALL-151 from either of the BASICs. Now type in the program exactly as it appears in Listing One, remembering to press the RETURN key after each line. If you have a 16-kilobyte Apple, typing in the following changes after you have typed in the program.

031A: 2A

031D: 2A

0330: 2A

0333: 2A

If you have a 32-kilobyte Apple, type in these changes:

031A: 6A

031D: 6A

033C: 6A

0333: 6A

To save the program on disk, type:

BSAVE FILENAME, A$0300, L$004C

To save the program on tape, you must be in machine language and type 0300.034BW.

LISTING #1

```
0300: A9 0B 8D F6 03 A9 03 8D
0308: F7 03 60 A2 00 BD 38 03
0310: 20 ED FD E8 E0 05 D0 F5
0318: AD 73 AA AE 72 AA 20 41
0320: F9 A2 00 BD 3D 03 20 ED
0328: FD E8 E0 0F D0 F5 A0 61
0330: AA AE 60 AA 20 41 F9 60
0338: C1 A4 A0 BD A0 A0 A0 A0
0340: A0 A0 A0 A0 A0 A0 A0 CC
0348: A4 A0 BD A0
```

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LISTING #2

```
0300-   LDA  #$0B      031B-   LDX  $AA72
0302-   STA  $03F6      031E-   JSR  $F941
0305-   LDA  #$03      0321-   LDX  #$00
0307-   STA  $03F7      0323-   LDA  $033D,X
030A-   RTS             0326-   JSR  $FDED
030B-   LDX  #$00       0329-   INX
030D-   LDA  $0338,X    032A-   CPX  #$0F
0310-   JSR  $FDED      032C-   BNE  $0323
0313-   INX             032E-   LDA  $AA61
0314-   CPX  #$05       0331-   LDX  $AA60
0316-   BNE  $030D      0334-   JSR  $F941
0318-   LDA  $AA73      0337-   RTS
```

File Reader-Writer

By R Badby

THIS PROGRAM was developed because of the need to keep notes during program development. All the sections are headed by REM statements, and these approximate the items on the menu list.

The program uses the string input function, so the comma and colon are not allowed. There are four format options available which are only effective if they occur at the start of the data input.

These options are:

Control-P: Starts a new paragraph. Control-T and 0: Starts a new line.
Control-T and a number: Starts data at tab(number).
Data input ending with fullstop: Five spaces before the next input.

Control-T and 0 plus Control-T and 55 will cause the data to start on a new line at the tab (55) position. This will be the 55th column in the printer, but will be a blank line and tab(155) on the VDU.

Editing of the individual data statements can be obtained by using the M (for modify) function. Of course, the format symbols such as Control-P or Control-T with 0 and Control-T with a tab number will have to be used at the start of the modifying input if needed. The five spaces after the period can be nullified by using a single space after the period.

Because this program is meant to be used to make and keep program notes, only the upper-case letters are used. The notes can be kept on text file or print-out, or both. Short data statements make corrections much easier. The maximum number of data statements that can be used on a single file is 99. The number of files is limited by the available disk space.

```
100  CLEAR : PRINT  FRE (X): HOME
110 FF$ = " THE FILE NAME MUST BE HERE!":FI$ = FF$: DIM A$(100): GOTO 1350

120  REM  READ FROM DISCFILE!
130  FOR J = 0 TO 99:A$(J) = "": NEXT :J = 0: IF FI$ = FF$ THEN  GOTO 1030

140  PRINT D$;"OPEN";FI$
150  PRINT D$;"READ";FI$
160  INPUT A$(J):
170 J = J + 1: IF J <  VAL (A$(0)) THEN  GOTO 160
180  PRINT D$;"CLOSE";FI$
200  REM CHECK THE FILE
210  HOME : INVERSE : PRINT "            FILE   CHECK.              ": NORMAL
     : PRINT :
220 K = 0:I =  VAL (A$(0)): IF I < 2 THEN  GOTO 1480
230 K = K + 1: IF A$(K) = "" THEN  GOTO 350:
240 C$ = A$(K) + "      ":P% =  PEEK (37):L% =  LEN (A$(K)):B$ =  MID$ (C$,
    2,2):T% =  VAL (B$):
250  IF P% + L% / 40 + 1 >  = 22 THEN  PRINT : INVERSE : VTAB 24: PRINT "U
    SE SPACE BAR        ";: GET Q$: NORMAL :K = K - 1: HOME : GOTO 240:
260  IF  ASC ( RIGHT$ (A$(K),1)) = 46 THEN A$(K) = C$
270  IF  ASC (A$(K)) <  > 20 AND  ASC (A$(K)) <  > 16 THEN  PRINT " ";A$(K
    ): GOTO 230
280  IF  ASC (A$(K)) = 16 THEN  PRINT  CHR$ (13);: CHR$ (13);: TAB( 10);:L%
     = L% - 1:
290  IF  ASC (B$) = 48 THEN  PRINT  CHR$ (13);:L% = L% - 2:
300  IF  ASC ( MID$ (C$,3,1)) = 20 THEN T% =  VAL ( MID$ (C$,4,2)):
310  IF T% > 0 AND T% <  = 9 THEN  PRINT  TAB( T%);:L% = L% - 2
320  IF T% > 9 THEN  PRINT  TAB( T%);:L% = L% - 3:
330  IF L% >  = 1 THEN  PRINT  RIGHT$ (A$(K),L%);: GOTO 230:
340  IF K <  = I THEN  GOTO 230
350  PRINT : PRINT : VTAB 23: PRINT "KEY'R'=REPEAT 'M'=MODIFY 'OTHER'=CONT
    .": INVERSE : PRINT "END OF FILE!--------------------  ";: NORMAL :
     GET Q$:
360  IF Q$ =  CHR$ (77) THEN  GOTO 400
370  HOME : IF Q$ =  CHR$ (82) THEN K = 0: GOTO 230
380  GOTO 1350
400  REM MODIFY THE FILE
410  HOME :K =  - 1
420 K = K + 1: IF K >  = I THEN  GOTO 480
430  IF A$(K) = "" THEN  GOTO 480
440 P% =  PEEK (37):L% =  LEN (A$(K)): IF P% + L% / 40 + 1 >  = 22 THEN  GOTO
    480:
450  IF  ASC (A$(K)) = 20 THEN  PRINT "<";K;">(TAB)";A$(K): GOTO 420
460  IF  ASC (A$(K)) = 16 THEN  PRINT "<";K;">(P!)";A$(K): GOTO 420
470  PRINT "<";K;"> ";A$(K): GOTO 420
480  PRINT : PRINT : VTAB 22: INVERSE : PRINT "KEY ABOVE '#'TO MODIFY  '0'
     TO CONTINUE": NORMAL : PRINT "           USE 'RETURN' KEY";: INPUT Q
    $:
490 Q =  VAL (Q$): IF Q > I THEN  GOTO 1480
500  IF  ASC (Q$) = 48 AND K >  = I THEN  GOTO 1350
510  IF  ASC (Q$) = 48 THEN  HOME :K =  ABS (K - 2): GOTO 420
```


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```
520 K = Q: IF  ASC (Q$) =  > 58 THEN  GOTO 1350
530  PRINT : HOME : PRINT "<";K - 1;">";A$(K - 1): PRINT "<";K;">";A$(K): PRINT
     "<";K + 1;">";A$(K + 1):
540  PRINT : PRINT "INPUT MODIFIED DATA <";K;">";: INPUT A$(K)
550  PRINT : HOME : PRINT "<";K - 1;">";A$(K - 1): PRINT "<";K;">";A$(K): PRINT
     "<";K + 1;">";A$(K + 1):
560  IF A$(K) = "" THEN A$(0) =  STR$ (K):I = K
570  GOTO 480
600  REM  SAVE TO DISCFILE!
610  IF FI$ = FF$ THEN  GOTO 1050
620  HOME : VTAB 5: PRINT "    ";FI$: VTAB 12: PRINT "IS ABOVE FILE  TO BE
      SAVED TO DISC?": VTAB 20: PRINT "KEY IN (Y OR N) ";: GET Q$
630  IF Q$ <  > "Y" THEN  GOTO 1350: PRINT :
640 I =  VAL (A$(0)): PRINT  CHR$ (13)
650  PRINT D$;"OPEN ";FI$
660  PRINT D$;"DELETE";FI$
670  PRINT D$;"OPEN ";FI$
680  PRINT D$;"WRITE ";FI$
690  PRINT A$(0):
700  FOR J = 1 TO I:
710 : PRINT A$(J)
720  NEXT J
730  PRINT D$;"CLOSE ";FI$
740  GOTO 1350
800  REM WRITE NEW FILE
810  HOME :I = 0
820  PRINT :I = I + 1
830  PRINT "235 CHARACTERS MAX. ZERO CHARACTERS ENDS"
840  PRINT "INPUT DATA @(";I;")> ";
850  INPUT A$(I)
860  IF A$(I) <  > "" GOTO 820
870 A$(0) =  STR$ (I)
880  GOTO 200
900  REM ADD-ON TO FILE!
910  HOME :I =  VAL (A$(0)) - 1: IF I <  = 1 THEN  GOTO 1400
920  GOTO 820
950  REM DELETE A FILE
960  IF FI$ = FF$ THEN  GOTO 1050
970  HOME : VTAB 5: PRINT "    ";FI$: VTAB 12: PRINT "IS THE ABOVE FILE TO
      BE DELETED? ": VTAB 20: PRINT "KEY IN (Y OR N) ";: GET Q$
980  IF Q$ <  > "Y" THEN  GOTO 1350: PRINT :
990  PRINT :
1000  PRINT D$;"DELETE";FI$
1010  HOME : GOTO 1350
1050  REM NAME THE FILE.
1060  HOME : VTAB 5: PRINT "TYPE IN THE FILE NAME.    ": PRINT : INPUT " "
     ;FI$
1070  GOTO 1350
1100  REM PRINT THE FILE!
1110 I =  VAL (A$(0)): IF I < 2 THEN  GOTO 1400
1120  HOME : VTAB 10: PRINT "PRINTER": PRINT : PRINT : PRINT  TAB( 7)"INIT
     IALIZATION": PRINT : PRINT : PRINT  TAB( 21)"STAGE!"
1130  PR# 1
1140  PRINT  CHR$ (9);"80N";
1150  PRINT  CHR$ (15)
1160  FOR K = 1 TO I
1170  IF A$(K) = "" THEN  GOTO 1300
1180 C$ = A$(K) + "      ": IF  ASC ( RIGHT$ (A$(K),1)) = 46 THEN A$(K) = C
     $
1190  IF  PEEK ( - 15873) <  > 132 THEN  GOTO 1190
1200  IF  ASC (A$(K)) <  > 20 AND  ASC (A$(K)) <  > 16 THEN  PRINT " ";A$(
     K);: NEXT
1210 L% =  LEN (A$(K)):B$ =  MID$ (C$,2,2):T% =  VAL (B$):
1220  IF  ASC (A$(K)) = 16 THEN  PRINT  CHR$ (13);: CHR$ (13); TAB( 10):L
     % = L% - 1:
1230  IF  ASC (B$) = 48 THEN  PRINT  CHR$ (13):L% = L% - 2:
1240  IF  ASC ( MID$ (C$,3,1)) = 20 THEN T% =  VAL ( MID$ (C$,4,2)):
1250  IF  PEEK ( - 15873) <  > 132 THEN  GOTO 1250
1260  IF T% > 0 AND T% <  = 9 THEN  POKE  - 16240,16: POKE  - 16240,48: POKE
      - 16240,( ASC ( STR$ (T%))):L% = L% - 2
1270  IF T% > 9 THEN T1% = T% / 10:T2% = T% - 10 * T1%: POKE  - 16240,16: POKE
      - 16240,( ASC ( STR$ (T1%))): POKE  - 16240,( ASC ( STR$ (T2%))):L% =
     L% - 3
1280  IF L% >  = 1 THEN  PRINT  RIGHT$ (A$(K),L%):: NEXT :
1290  NEXT
1300  PRINT  CHR$ (20)
1310  IF  PEEK ( - 15873) <  > 132 THEN  GOTO 1310
1320  PR# 0
1350  REM  DISPLAY AND SELECTION!
1360 D$ =  CHR$ (4): HOME : PRINT :
1370  PRINT D$;"CLOSE"
1380  INVERSE : PRINT "        FILE  READER - WRITER.          ":
1390  PRINT "CTRL'P'=NEW PARA'T'0=NEW LINE'T'#=TAB#":
1400  PRINT "========== MEMORY = "; FRE (0);" ==========": PRINT :
1410  PRINT : PRINT "1  LIST CATALOG."; TAB( 21)"6  WRITE NEW FILE.": PRINT
      : PRINT "2  GIVE FILENAME."; TAB( 21)"7  CHECK THE FILE.": PRINT : PRINT
     "3  READ DISCFILE."; TAB( 21)"8  ADD-ON TO FILE."
1420  PRINT : PRINT "4  SAVE TO DISC."; TAB( 21)"9  PRINT THE FILE.": PRINT
      : PRINT "5  DELETE FILE."; TAB( 21)"0  EXIT PROGRAMME.": PRINT : PRINT

1430  ONERR  GOTO 1480
1440  VTAB 20: FLASH : PRINT "-->";: NORMAL : PRINT "  ";FI$;: FLASH : HTAB
     35: PRINT "<--": NORMAL : PRINT : PRINT "    SELECT NUMBER FROM THE A
     BOVE!";: HTAB 37: GET S$:
1450  PRINT :S =  VAL (S$): HOME : IF  ASC (S$) = 48 THEN  GOTO 1530
1460  ON S GOTO 1550,1050,120,600,950,800,200,900,1100
1480  REM ERROR CAUSES!
1490  HOME : PRINT "*      POSSIBLE PROBLEM!": PRINT "       ============
     ====": VTAB 5: PRINT "*     FILE FORMAT WRONG!": VTAB 8: PRINT "*
      NO FILE IN MEMORY!": VTAB 11: PRINT "*     WRONG TYPE OF INPUT!":
1500  VTAB 14: PRINT "*     PRINTER SWITCHED OFF!": VTAB 17: PRINT "*
     FILE NOT ON DISC!":
1510  PRINT :
1520  VTAB 24: PRINT "*     USE THE SPACE BAR!  ";: GET Q$: GOTO 1350
1530  REM EXIT PROGRAMMING!
1540  PRINT  FRE (X): CLEAR : HOME : PRINT : PRINT : PRINT "      F I N I
     S H E D  ! ! !": END
1550  REM  LIST CATALOG  :
1560  PRINT D$;"CATALOG":
1570  PRINT : INVERSE : PRINT "USE SPACE BAR";: NORMAL : PRINT "        ";
      : GET Q$: GOTO 1350
1590  REM THIS PROGRAMME DEVISED      BY 'R E B ' OF BURWOOD.     DATED 20
     TH NOV.1982.
```

Debugging

By W Hughes

IT'S MUCH easier to debug a program if you have a printed listing. This program will list programs to the printer using the EXEC command, if it is placed in a text file using the CAPTURE program on page 76 of the Apple II DOS Manual.

You must not use line numbers less than 10. Unless the program is modified, line numbers above 32767 will not be listed. The program will list-up and run with either Applesoft or Integer BASIC programs. There is an accompanying machine-language program called MCLIST-P, which must be on the same disk as the EXEC text file.

Line 0 dimensions all string variables. Note: Control-D is placed in D$. Call-936 clears the screen and the PRINT statement prints the first line.

Line 1 simply BLOADS MCLIST-P.

Line 2 reminds you to set-up the printer and switch it on.

Line 3 allows you to put a comment at the top of the list, such as the one above the sample printout. Use it to explain what the listed program is doing. If you don't want a comment, simply return.

The print statement announces your choice and either quits or continues. If you haven't quit, line 4 prints a warning on the screen.

POKE 50,127 causes the warning to be printed flashing or in inverse video, depending on the character. POKE 50,255 returns output to normal and the following two POKEs reduce the text window to zero.

Line 5 switches on the printer, sets it to 80-column mode, prints LIST and tests to see if there is a comment.

Line 6 prints the comment. (It is only executed if there is a comment.)

Line 7 does the listing and line 8 uses the machine code to pass a bell code and a form-feed instruction to the printer.

The last line turns the printer off, sets the screen to normal and prints *IT IS DONE* on the screen, just to let you know it is finished.

Now to the machine code. Address $300 to $30A is a routine from the Epson MX printer/Apple II interface user manual. It is used to transfer codes from the Apple to the printer.

First, the codes must be poked into zero page location zero, and then a CALL is made to the sub-routine. The first instruction loads the code into the accumulator. The next two check the code in the accumulator with the contents of a location in the printer interface ROM.

If the code checks out, the fourth instruction passes the code to the printer. The next returns to the program that called the sub-routine. (The printer is assumed to be plugged into slot one.)

The other sub-routine starts at $30B and calls up the KEYIN sub-routine from the Apple monitor. It then stores the

APPLE

hexadecimal-code of the key you pressed in zero page location 07 and returns to the program that called the subroutine.

This program works on a 48-kilobyte Apple II with Epson MX-80F/T printer plugged into slot one. It has not been tried on any other systems.

The machine code that passes the bell code and form-feed to the printer may have to be rewritten to use another printer. Alternatively, if you're using Applesoft, you can pass these codes with the PRINT CHR$(x) statement, or delete line 8 altogether.

Something not yet explained is the purpose of the call 779 in line 3: It uses the second part of the machine-code subroutine to obtain a keystroke – if that keystroke was ESC, then the program will end.

```
JCALL-151
                                        MCLIST→P
*300L

0300-   A5 00       LDA   $00
0302-   2C C1 C1    BIT   $C1C1
0305-   30 FB       BMI   $0302
0307-   8D 90 C0    STA   $C090
030A-   60          RTS
030B-   20 1B FD    JSR   $FD1B
030E-   85 07       STA   $07
0310-   60          RTS
0311-   00          BRK
0312-   00          BRK
0313-   00          BRK
0314-   00          BRK
0315-   00          BRK
0316-   00          BRK
0317-   00          BRK
0318-   00          BRK
0319-   00          BRK
031A-   00          BRK
031B-   00          BRK
031C-   00          BRK
*3D0G
```

```
JLIST

COMMENT:- USE THIS PROGRAM IN A TEXT FILE TO LIST APPLESOFT OR INTEGER BASIC
 PROGRAMS TO PRINTER USING EXEC COMMAND.


0  DIM A$(1): DIM C$(255): DIM D$(1):D$ = "": CALL  - 936: PRINT "LISTING
     BASIC PROGRAMS TO PRINTER.": PRINT :
1  PRINT D$;"BLOAD MCLIST->P"
2  PRINT "IS THE PRINTER SWITCHED ON, LOADED WITH SUFFICIENT FAN-FOLD PAP
    ER AND READY TO  RECEIVE DATA?": PRINT "COMMENT:- ";
3  INPUT C$: PRINT : PRINT "PRESS ESC TO QUIT, SPACE-BAR TO CONTINUE": CALL
    779: IF  PEEK (7) = 155 THEN  END
4  POKE 50,127: PRINT "CAUTION LINE NUMBERS ABOVE 32767 WILL   NOT BE LIS
    TED.": POKE 50,255: POKE 35,0: POKE 33,0
5  PR# 1:SLOT = 1: POKE 1656 + SLOT,80: PRINT "LIST": PRINT : IF C$ = "" THEN
     GOTO 7
6  PRINT "COMMENT:- ";C$: PRINT :
7  LIST 10,32767
8  POKE 0,7: CALL 768: POKE 0,12: CALL 768
9  PR# 0: TEXT : PRINT "IT IS DONE.": END
```

MICROBEE

Safe Lock

By Paul Smith

SAFE LOCK will help you save Earth, by disarming some missiles which are ready for launching.

To do this, you must guess the combination of a safe, with the computer giving you some help. Once the safe is open, there is a choice of three buttons – two will set off the rockets, only one will disarm them.

```
 50 PRINT"******SAFE LOCK******"
100 REM
110 T=0
120 PRINT"THE FIRST NUMBER OF THE SAFE IS"
130 PRINT"BETWEEN 0 AND 100. GOOD LUCK."
140 A=INT(RND*100)
150 INPUT"WHAT IS YOUR GUESS?"D
160 T=T+1
170 IF D=A THEN 200
180 IF D<A THEN 210
190 PRINT"TOO BIG. TRY AGAIN.":PLAY 22:GOTO 220
200 PRINT"YOU GUESSED THE CORRECT NUMBER.":PLAY23,2:GOTO 220
210 PRINT"TOO SMALL. TRY AGAIN.":PLAY 24:GOTO 150
220 PRINT"YOU ARE NOT GOING FOR THE SECOND"
230 PRINT"NUMBER WHICH IS BETWEEN 0 AND 1000"
240 B=INT(RND*1000):B=0
250 INPUT"WHAT IS YOUR GUESS?"S
260 E=E+1
270 IF S=B THEN 300
280 IF S<B THEN 310
290 PRINT"TOO BIG. TRY AGAIN":PLAY 22:GOTO 250
300 PRINT" YOU HAVE CORRECTLY GUESSED THE SECOND NUMBER.":PLAY
    23,2:GOTO 320
310 PRINT"TOO SMALL.TRY AGAIN.":PLAY24:GOTO 250
320 PRINT"YOU ARE NOW GOING FOR THE THIRD"
330 PRINT"NUMBER WHICH IS BETWEEN 0 AND 2000."
340 C=INT(RND*2000):Z=0
350 INPUT"WHAT IS YOUR GUESS?"F
360 Z=Z+1
370 IF F=C THEN 400
380 IF F<C THEN 410
390 PRINT"TOO BIG. TRY AGAIN.":PLAY 22: GOTO 350
400 PRINT"YOU HAVE GUESSED THE THIRD AND FINAL NUMBER.":PLAY
    23,4: GOTO 420
410 PRINT"TOO SMALL.TRY AGAIN.":PLAY 24:GOTO 350
420 PRINT"COMBINATION"     " A     B     C
430 PRINT"TRIES            " T     E     Z
440 PRINT"THE SAFE IS NOW OPEN AND IN FRONT OF YOU ARE THREE"
450 PRINT"BUTTONS LABELLED 0,1 AND 2.  ONE OF THESE WILL DISARM"
460 PRINT"THE ROCKETS ABOUT TO BLOW UP EARTH BUT THE OTHER"
470 PRINT"TWO WILL LAUNCH THE ROCKETS IMMEDIATELY.GOOD LUCK!!!"
480 O=INPUT(RND*3)
490 INPUT"WHAT IS YOUR GUESS?"Y
500 IF Y=O then 510 ELSE 520
510 PRINT"CONGRATULATIONS!!!! YOU SAVED EARTH FROM ITS DOOM."PLAY
    0,12;18,2;16;16;18,2;16,4:GOTO 530
520 PRINT"YOU IDIOT!!! YOU JUST BLEW EARTH INTO A MILLION
    PIECES": PLAY 1,18
525 PRINT"THE CORRECT NUMBER WAS "O
530 INPUT"DO YOU WANT ANOTHER GO (YES/NO)"A1$
540 IF A1$="YES" THEN 100 ELSE 550
550 PRINT"BYE BYE FOR NOW.":END
```

MICROBEE

Topsy Turvy

By Richard Larkin

TOPSY-TURVY is a program that prints a keyboard's characters, then inverts them. These characters can be typed until BREAK or CONTROL-X is pressed. The program would be especially useful in educational fields, where the answers to questions could be printed upside-down.

```
100 REM TOPSY-TURVY
110 DIM A(15)
120 CLS:INVERSE:NORMAL
130 PRINT:PRINT:PRINT
140 REM PRINT PCG CHARACTERS
150 FOR X=132 TO 255
160  PRINT CHR(X);
170 NEXT X
180 REM TURN UPSIDE DOWN AND INVERT
190 FOR X=-1984 TO -1 STEP 16
200  FOR Z=15 TO 1 STEP -1
210   A(Z)=255-PEEK(X+(15-Z))
220  NEXT Z
230  FOR Z=1 TO 15
240   POKE X+Z,A(Z)
250  NEXT Z
260 NEXT X
270 PRINT:PCG
280 K1$=KEY:PRINTK1$;:GOTO280
```

Catch

By Steven Mileham

MY CATCH program makes use of the MicroBee's PCG feature, and uses about 940 bytes. I moved the characters using the CURS instead of POKEing because using too many POKEs confuses the whole machine.

Playing the game is fairly easy. The player uses the fullstop to move right and the Z key to move left. A spaceship is dropping things out and your boat has to catch them or else you lose a life.

The only other thing worth mentioning is that your boat doesn't appear on the screen until you press one of the direction keys.

```
100 CLS:LORES
110 FOR P=6 to 43
120 PLOT Ø,P TO 127,P
130 NEXT P
140 B=928:S=Ø:L=Ø
150 PCG
160 REM ********************** LEFT TO RIGHT
170 A=Ø
180 CURS A:PRINT"@;??JL"
190 I=INT(RND*58)
200 IF A=I THEN GOSUB 370
210 A=A+1
220 K1$=KEY$
230 IF K1$="." OR K1$="Z"THEN GOSUB 480
240 IF A=58 THEN 270
250 GOTO 180
260 REM ********************** RIGHT TO LEFT
270 A=58
280 CURS A:PRINT"L.???@"
290 R=INT(RND*58)
300 IF A=R THEN GOSUB 370
310 A=A-1
320 K1$=KEY$
330 IF K1$="." OR K1$="Z"THEN GOSUB 480
340 IF A=0 THEN 170
350 GOTO 280
360 REM ********************** BOMB
370 C=A
380 CURS C:PRINT"Ø"
390 C=C+64:CURS C-64:PRINT"@"
400 IF C=B+3 OR C=B+4 OR C=B+5 OR C=B+6 OR C=B+7
    OR C=B+8 OR C=B+9 THEN LET S=S+20:NORMAL:CURS 1,6:PRINT
    S" ":LORES:PCG:RETURN
410 IF L=5 THEN PLAY 1;2;3;4;5,4:NORMAL:CURS 24,8:PRINT"E N
     D  O F  G A M E":END
420 IF C=A+960 THEN LET L=L+1:NORMAL:CURS 1,8:PRINT L" ":
    LORES:PCG:RETURN
430 K1$=KEY$
440 IF K1$="."OR K1$="Z"THEN GOSUB 480
450 GOTO 380
460 RETURN
470 REM ********************** BOAT CONTROL
480 IF B=896 THEN LET B=898
490 IF B=948 THEN LET B=946
500 CURS B:PRINT"@@4ØØØØØ8@@"
510 IF K1$="."THEN LET B=B+2:RETURN
520 IF K1$="Z"THEN LET B=B-2:RETURN
530 END
```

Attack Of The Zargons

By Mark Morris

THIS PROGRAM makes extensive use of the MicroBee's memory-mapped display, using the POKE command. A random number between zero and 15 is generated in line 440 to determine the amount of Zargons to be destroyed.

An array is next set to store their screen accesses, also determined by a random number. The array is then stored under the variable name H().

Lines 410 to 430 create the PCG characters for the crosshairs. Movement of the crosshairs is achieved by the subroutine appearing from line 600. Keyboard input is by the key command in line 610. Since the view on the screen is out of an imaginary space fighter, the crosshairs actually remain stationary, and instead the Zargons move in the opposite direction to the one that has been chosen, to enhance the effect.

The Zargons also move independently, and this movement is determined by a random number generated in the subroutine starting at line 1050. The position is changed accordingly by lines 1060 to 1100.

Use the W,A,S,Z group of keys at the left of the keyboard to move up, right, left and down respectively. To fire, use the Q key. Lasers come down from each corner of the screen, travelling towards the crosshairs at the centre of the screen, and are accompanied by a click from the speaker:

OUT(02),0:OUT(02),255

I have included two machine-code sub-routines which are poked into memory by lines 150 to 190. They start at memory location 2A00H (10752D) and fill every byte to memory location 2A22H (10796D).

The first sub-routine, accessed by USR(10752), is used to create sound-effects for the title and in the event of a hit. The second sub-routine, accessed by USR(10781), fills up the screen quickly – a couple of microseconds, in fact – with inverse asterisks in the event of a hit also, to simulate an explosion. The Assembly files for these two sub-routines are listed:

```
ASSEMBLY FILE ONE: SOUND EFFECTS. Starts at 2A00H (10752D)

ADDR   CODE    LINE   LABEL   MNEM    OPERAND

2A00           00100          ORG     2A00H          ;Origin
2A00 3E0F      00110          LD      A,0FH          ;Load A with 15
2A02 D303      00120          OUT     (03),A         ;Wake up speaker
2A04 1600      00130          LD      D,0            ;Load D with 256
2A06 3E40      00140 SOUND    LD      A,40H          ;Load A with 64
2A08 D302      00150          OUT     (02),A         ;Turn speaker on
2A0A 4A        00160          LD      C,D            ;Load C with D
2A0B 0D        00170 DELAY1   DEC     C              ;Decrement C
2A0C 20FD      00180          JR      NZ,DELAY1      ;Go if not zero
2A0E 3E00      00190          LD      A,0            ;Load A with zero
2A10 D302      00200          OUT     (02),A         ;Turn speaker off
2A12 4A        00210          LD      C,D            ;Load C with D
2A13 0D        00220 DELAY2   DEC     C              ;Another delay
2A14 20FD      00230          JR      NZ,DELAY2      ;Loop until zero
2A16 15        00240          DEC     D              ;Decrement delay count
2A17 2803      00250          JR      Z,BASIC        ;If zero, jump to BASIC
2A19 C3062A    00260          JP      SOUND          ;Else go again
2A1C C9        00270 BASIC    RET                    ;Return from USR command
2A06           00280          END                    ;End
00000 Total errors

BASIC   2A1C    DELAY2  2A13    DELAY1  2A0B    SOUND   2A06

ASSEMBLY FILE TWO: FILL SCREEN. Strats at 2A1DH (10781D)

ADDR   CODE    LINE   LABEL   MNEM    OPERAND

2A1D           00100          ORG     2A1DH          ;Origin
2A1D 1604      00110          LD      D,4            ;Load D with 4
2A1F 2100F0    00120          LD      HL,0F000H      ;Load HL with screen start
2A22 362A      00130 FILL     LD      (HL),2AH       ;Load HL address with 42
2A24 23        00140          INC     HL             ;Increment HL
2A25 7D        00150          LD      A,L            ;Load A with L
2A26 B7        00160          OR      A              ;Test for zero
2A27 20F9      00170          JR      NZ,FILL        ;Go if not zero
2A29 15        00180          DEC     D              ;Decrement pointer
2A2A 20F6      00190          JR      NZ,FILL        ;Go if not zero
2A2C C9        00200 BASIC    RET                    ;Return from USR command
2A22           00210          END                    ;End
00000 Total errors

BASIC   2A2C    FILL    2A22
```

MICROBEE

```
00100 REM **************************
00110 REM * Attack of the Zargons *
00120 REM * (C) M. S. Morris 1983 *
00130 REM **************************
00140 REM ** Poke machine language sound routine into RAM **
00150 ZONE 10:FOR A=10752 TO 10796
00160 READ B:POKE A,B:NEXT A
00170 DATA 62,15,22,128,211,3,62,64,211,2,74,13,32,253
00180 DATA 62,0,211,2,74,13,32,253,21,40,3,195,6,42,201
00190 DATA 22,4,33,0,240,54,170,35,125,183,32,249,21,32,246,201
00200 DATA "A","T","T","A","C","K","  ","O","F","  "
00210 DATA "T","H","E","  ","Z","A","R","G","O","N","S"
00220 REM ** Print title on screen with lasers **
00230 LET E=1:CLS:LORES:POKE 62432,5
00240 READ F1$:PLOT 64,4 TO 40+E*2,44:CURS 21+E
00250 PRINT F1$:PLOTI 64,4 TO 40+E*2,44:USR(10752)
00260 LET E=E+1:IF E)21 THEN 270 ELSE 240
00270 PRINT:PRINT:REM ** Intstructions **
00280 PRINT ,"    Welcome to 'Attack of the Zargons'. "
00290 PRINT ,"It is a game of quick reflexes, and is based"
00300 PRINT ,"on the space pilot theme. Your  screen  will"
00310 PRINT ,"show a cross-hair in the centre of it.  This"
00320 PRINT ,"will be your aim marker."
00330 PRINT ,"    To move up, down, left or right, use the"
00340 PRINT ,"W,Z,A,S  keys  respectively .  Remember that"
00350 PRINT ,"when you, for example, move left,the rest of"
00360 PRINT ,"the screen will move right. Good Luck!!"
00370 PRINT:PRINT TAB(19);"* HIT SPACE BAR TO CONTINUE *"
00380 POKE 62432,32:IF KEY()" " THEN 380:REM ** Loop here for input **
00390 CLS:INVERSE:NORMAL:REM ** Clear PCG memory **
00400 REM ** PCG's for cross-hairs on screen **
00410 FOR C=64528 TO 64543:POKE C,24:NEXT C
00420 FOR D=64544 TO 64559:POKE D,0:NEXT  D
00430 POKE 64552,255:POKE 64553,255
00440 LET G=INT(RND*15):IF G(3 THEN 440:REM ** Zargons **
00450 DIM H(G):FOR I=1 TO G:LET H(I)=INT(RND*960)+6140
00460 NEXT I:REM ** Positions of Zargons on the screen **
00470 FOR J=1 TO G:POKE H(J),7:NEXT J
00480 REM ** Main loop: controls movement of Zargons **
00490 FOR K=1 TO G:PCG:ON ERROR GOTO 490
00500 CURS 28,8:PRINT "BBB":CURS 34,8:PRINT "BBB"
00510 CURS 32,7:PRINT "A":CURS 32,9:PRINT "A":NORMAL
00520 REM ** Test if the target is in cross-hairs **
00530 IF H(K)() -3617 THEN 570
00540 FOR L=1 TO 5:PLAY 23:POKE H(K),135
00550 GOSUB 610:PLAY 24:POKE H(K),7
00560 IF H(K)() -3617 THEN 570 ELSE NEXT L
00570 POKE H(K),32:GOSUB 1060
00580 GOSUB 610:POKE H(K),7
00590 NEXT K:GOTO 490
00600 REM ** Subroutine to control cross-hairs and firing **
00610 M0$=KEY:IF M0$="" THEN RETURN
00620 M=ASC(M0$):IF M=81 THEN GOSUB 700:RETURN
00630 REM ** Check if key-in up, down ,left or right **
00640 IF M=87 THEN FOR N=1 TO G:POKE H(N),32:H(N)=H(N)+64:POKE H(N),7:NEXT N
00650 IF M=65 THEN FOR N=1 TO G:POKE H(N),32:H(N)=H(N) +1:POKE H(N),7:NEXT N
00660 IF M=83 THEN FOR N=1 TO G:POKE H(N),32:H(N)=H(N) -1:POKE H(N),7:NEXT N
00670 IF M=90 THEN FOR N=1 TO G:POKE H(N),32:H(N)=H(N)-64:POKE H(N),7:NEXT N
00680 RETURN
00690 REM ** Fire lasers at the target **
00700 LET O=1:FOR P=1 TO 28 STEP 4
00710 CURS P,O:PRINT "\":CURS 64-P,O:PRINT "/"
00720 CURS P,16-O:PRINT "/":CURS 64-P,16-O:PRINT "\"
00730 OUT (02),0:OUT (02),255:REM ** Speaker click **
00740 CURS P,O:PRINT " ":CURS 64-P,O:PRINT " "
00750 CURS P,16-O:PRINT " ":CURS 64-P,16-O:PRINT " "
00760 O=O+1:NEXT P:Y=Y+1
00770 REM ** Check if target has been hit **
00780 FOR Q=1 TO G:IF H(Q)()-3617 THEN NEXT Q:RETURN
00790 IF H(Q)=-3617 THEN POKE H(Q),32:G=G-1
00800 V=0:POKE 10774,20
00810 CLS:USR(10752)
00820 LET H(Q)=H(Q)+INT(RND*64)
00830 USR(10781)
00840 USR(10752)
00850 LET V=V+1:IF V)3 THEN 860 ELSE 810
00860 X=X+1:IF G(1 THEN 870 ELSE CLS:RETURN
00870 REM ** Game over message, prints rating **
00880 CLS:UNDERLINE:CURS 12,5
00890 PRINT "******** CONGRATULATIONS ********":NORMAL
00900 PRINT:PRINT:PRINT ,"      You have completed your mission!!"
00910 PRINT ,"You have destroyed";X;" Zargons using";Y
00920 PRINT ,"lasers."
00930 LET Z0=FLT(X)/FLT(Y)*100:REM ** Percentage **
00940 PRINT ,"Your rating is      "!
00950 REM ** Detect skill level and print on screen **
00960 Z=INT(Z0):IF Z(20 THEN PRINT "Hopeless Rookie"
00970 IF (Z)20 AND Z(50) THEN PRINT "Lowly Freighter Pilot"
00980 IF (Z)50 AND Z(80) THEN PRINT "Skilled Fighter Pilot"
00990 IF Z)80 THEN UNDERLINE:PRINT "SQUADRON COMMANDER"
01000 NORMAL:PRINT ,"And a score of:      "!
01010 PRINT USING F8.2 Z0;" X":CURS 15,13
01020 PRINT "Would you like another game (Y/N)"!
01030 LET A1$=KEY$:IF A1$="" THEN 1030
01040 IF A1$="Y" OR A1$="y" THEN 390 ELSE CURS 0:END
01050 REM ** Subroutine to determine direction **
01060 R=INT(RND*5):REM ** Direction **
01070 IF R=1 THEN LET H(K)=H(K) -1
01080 IF R=2 THEN LET H(K)=H(K)+64
01090 IF R=3 THEN LET H(K)=H(K) +1
01100 IF R=4 THEN LET H(K)=H(K)-64
01110 RETURN
```


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BASIC

Text Tidier

By Roger Browne

THIS SIMPLE text formatter is useful for tidying up text files, and no special commands are needed. The program should run without change on most microcomputers.

```
1000 rem format 0.0
1010 rem (C) 830303 liana microcomputing
1020 rem 13/98 Pacific Hwy, St Leonards 2065
1030 rem permission to use, not to sell

1100 close
1110 clear 2000

1200 rem #1: input file
1210 rem #2: output file

1300 rem LINLTH: maximum output line length
1310 rem ILIN$: input line being processed
1320 rem OLIN$: line to be written out
1330 rem FILE$: file name
1340 rem WRD$: leftmost word from input line

1990 '----------

1999 rem set LINLTH to the desired print width
2000 LINLTH = 72
2010 OLIN$ = ""

2100 line input "Input file?  "; FILE$
2110 open "I", 1, FILE$
2120 line input "Output file?  "; FILE$
2130 open "O", 2, FILE$

2200 if eof(1) then 9900  'endup
2210    line input #1, ILIN$

2300    rem remove trailing blanks from input line
2310    if len(ILIN$) <= 1 then 2350
2320       if right$(ILIN$, 1) <> " " then 2350
2330          ILIN$ = left$(ILIN$, len(ILIN$) - 1)
2340          goto 2310
2350    if ILIN$ <> " " then 2400
2360       ILIN$ = ""

2400    if ILIN$ <> "" then 7000
2410       rem print empty line
2420       gosub 10000  'flush output buffer
2430       print #2, ""
2440       goto 2200

7000    if left$(ILIN$, 1) <> " " then 7300
7010       rem retain leading blanks on input line
7020       gosub 10000  'flush output buffer
                        )
7100       OLIN$ = OLIN$ + " "
7110       ILIN$ = mid$(ILIN$, 2)

7200       if left$(ILIN$, 1)    " " then 7300
```

```
7210          goto 7100

7300    rem process input line word-by-word
7310    ILIN$ = ILIN$ + " "

7400    rem transfer leftmost word from input line
7410    WRD$ = left$(ILIN$, instr(ILIN$, " ") - 1)



7420    ILIN$ = mid$(ILIN$, instr(ILIN$, " "))

7500    rem if new word won't fit, flush output line
7510    if len(OLIN$) + len(WRD$) <= LINLTH then 7600
7520       gosub 10000  'flush output buffer

7600    OLIN$ = OLIN$ + " " + WRD$
7610    rem this puts a spare blank at the start of the line - remove later

7700    rem remove leading blanks from remainder of input line
7710    if len(ILIN$) < 2 then 7750
7720       if left$(ILIN$, 1) <> " " then 7750
7730          ILIN$ = mid$(ILIN$, 2)
7740          goto 7710
7750    if ILIN$ <> " " then 7800
7760       ILIN$ = ""

7800    if ILIN$ = "" then 7900
7810       goto 7400

7900    goto 2200

9900 gosub 10000  'flush output buffer
9910 close
9920 end

9990 '-----------

10000 rem flush output line if non-empty
10010 rem IN: OLIN$

10100 if OLIN$ = "" then 10900
10110    OLIN$ = right$(OLIN$, len(OLIN$) - 1)
10120    print #2, OLIN$
10130    OLIN$ = ""

10900 return

10990 '-----------
```

SHARP & TANDY PCs

Wordex

By S Corrigan

WORDEX is a text editor, designed to operate on the Sharp PC-1500 (or Tandy TRS-80 PC-2) pocket computer. It allows a text file, consisting of lines of text of up to 80 characters each, to be built up, edited, saved and loaded to and from cassette and printed.

The essential minimum system is a PC-1500 with eight kilobytes of RAM and a CE-150 printer/cassette interface. I recommend a CE-158 RS-232C interface, RS-232 video display unit and a Centronics printer.

To start up the program in order to write a new text file, enter the command RUN in the run mode. Alternatively, to continue working on a text file already in the PC-1500 memory, press DEF then SPACE on the PC-1500.

On start up, the program will prompt entry of the input/output mode – extended (E) or normal (N).

In the normal mode all interactive I/O takes place through the PC-1500 keyboard and display, while printouts are directed to the CE-150 printer.

In the extended mode interactive I/O takes place through the CE-158 RS-232 port and printout is directed to the Centronics port on the CE-158.

On start-up (RUN command), the program will also prompt entry of the number of characters per line and the total number of lines. This information is used to define the array used for the text file and will be used when saving the file on tape, so don't make it unnecessarily large. Likewise, when loading from cassette this information must match the same data on tape or ERROR 43 will result.

The program is controlled by ten two-letter commands. These are entered using the six function keys on the PC-1500 (in both I/O modes), by pressing the function key below the required command on the display.

There are two command menus; changing between menus is achieved by pressing F6 ('Other'). The two command menus are:

```
Function key:

F1   F2   F3   F4   F5   F6

Menu 1 command:

LO   RE   WR   SC   HE   Other

Menu 2 command:

PR   SR   IN   DE   ED   Other
```

The command functions:

LO: Load text file from cassette. When prompted for the number of characters per line and the total number of lines, this data must match that on the tape or ERROR 43 will result.

RE: Return the current line-pointer to the beginning of the text file.

WR: Write text into the file, beginning at the current line. In extended I/O mode, finish each line with carriage return, then linefeed. Wait for a beep before entering the next line. Also in extended I/O mode, the backspace key may be used to correct character errors. When finished, exit and terminate the file by entering **. If you don't wish to terminate the file at the current line, exit by entering WRITFIN.

SC: Scan through the file, line by line. Step down through the lines with the down-arrow key on the PC-1500, up with the up arrow, right (normal I/O mode only) with the right arrow and left (normal I/O mode only) with the left arrow. Exit by pressing the spacebar. Scan may be used to locate a line in order to delete the line (DE), edit the line (ED) or insert additional lines after the line (IN).

HE: Help. Displays a brief command summary. In normal I/O mode, step through using the ENTER key.

SR: Save the text file on cassette.

PR: Print the complete text file. When prompted for margin width, enter the required width in terms of number of spaces. When prompted for spacing, enter 1 for single-spacing, 2 for double-spacing and so on.

IN: Insert line or lines after the current line. The command will ask how many lines are to be inserted, then allow lines to be written into the file. When writing in lines, the same conditions apply as for command WR.

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DE: Delete the current line. The current line-pointers advance by one; consecutive lines may be deleted by entering DE commands repeatedly after the DELETED prompt.

ED: Edit line (extended I/O mode only). Allows individual characters in a line to be overwritten. The backspace bar and Control-I may be used to shift the cursor left and right respectively to the required character. Exit by pressing the ESCAPE key. Incidentally, there is a time delay after entering the ED command, caused by the process of breaking the line into individual characters.

WORDEX LISTING

```
 10 PAUSE "WORDEX 7/5/83"
 15 GOSUB "ST"
 20 " "GOSUB "IO"
 25 GOSUB "RE"
 30 BEEP 2:IF IO$="N"THEN 34
 32 PRINT CHR$ (10);"COMMAND?"
 33 OPN :SETDEV
 34 IF MC=1THEN "O2"
 35 "O1"WAIT 0:PRINT "  LO  RE  WR  SC  HE Other"
 38 IF IO$="E"GOSUB 980
 40 GOSUB "CM":IF CM=6LET MC=1:GOTO 30
 45 ON CMGOSUB "LO","RE","WR","SC","HE":GOTO 30
 50 "O2"WAIT 0:PRINT "  PR  SA  IN  DE  ED Other"
 55 IF IO$="E"GOSUB 980
 60 GOSUB "CM":IF CM=6LET MC=0:GOTO 30
 65 ON CMGOSUB "PR","SA","IN","DE","ED":GOTO 30
110 "RE"BEEP 2:PAUSE "START"
120 B=0:RETURN
145 "WR":BEEP 1:REM  WRITE
146 IF IO$="E"THEN GOSUB 800:GOTO 149
147 INPUT D$(0)
149 BEEP 1
150 IF D$(0)="WRITFIN"RETURN
160 A$(B)=D$(0):IF D$(0)="**"RETURN
170 B=B+1:IF B<MTHEN 146
180 A$(B)="**":BEEP 4:PRINT "OUT OF MEMORY":GOSUB "RE":RETURN
220 "SC"REM  SCAN
226 IF IO$="E"LET SL=N:GOTO 228
227 SL=26
228 P=1:BEEP 1:WAIT 10
229 IF P>1WAIT 0
230 PRINT MID$ (A$(B),P,SL)
232 D$=INKEY$ :IF D$=""THEN 232
233 D=ASC D$:IF D=32THEN 243
234 IF D=12LET P=P+1:IF P>(N-26)THEN 244
235 IF D=11THEN 240
236 IF D=10THEN 244
237 IF D=8LET P=P-1
238 IF P=0LET P=1:GOTO 230
239 GOTO 229
240 B=B-1:IF B<0LET B=0
242 GOTO 226
243 WAIT :RETURN
244 IF A$(B)="**"THEN 232
245 B=B+1:GOTO 226
246 "PR"REM  PRINT
247 GOSUB "FO"
248 B=0:IF IO$="E"THEN OPN "LPRT":CONSOLE 80,0
249 L1=0
250 IF A$(B)<>"**"THEN 260
252 IF IO$="N"RETURN
255 SETDEV KI,DO:CONSOLE 64,0,1:RETURN


260 LPRINT W$;A$(B):B=B+1:L1=L1+1
262 IF SP=0THEN 266
264 FOR FL=1TO SP:LPRINT "":NEXT FL
266 IF L1<LPTHEN 250
268 FOR FL=1TO 10:LPRINT "":NEXT FL
270 GOTO 249
300 "SA"REM  SAVE
310 BEEP 5:IF IO$="E"PRINT "FILE NAME?":INPUT FN$:GOTO 315
312 INPUT "FILE NAME? ";FN$
315 PRINT CHR$ (10);"SAVING ";FN$
320 PRINT #FN$;A$(*)
330 B=0:RETURN
332 "LO"REM  LOAD
335 GOSUB "ST":GOSUB "IO"
340 BEEP 5:IF IO$="E"PRINT "FILE NAME?":INPUT FN$:GOTO 345
342 INPUT "FILE NAME? ";FN$
345 PRINT CHR$ (10);"LOADING"
350 INPUT #FN$;A$(*)
360 B=0:RETURN
365 "IN"REM  INSERT
370 BEEP 1:IF IO$="E"PRINT "HOW MANY?":INPUT C:GOTO 375
372 INPUT "HOW MANY? ";C
375 D=0
380 IF A$(D)="**"THEN 390
385 D=D+1:GOTO 380
390 A=M-D
392 IF C>=ABEEP 5:PRINT CHR$ (10);"NO SPACE":RETURN
395 A=D:D=D+C
400 A$(D)=A$(A)
410 D=D-1:A=A-1
420 IF A>BTHEN 400
430 BEEP 4:PRINT CHR$ (10);"AFTER:":PRINT A$(B)
435 PRINT "WRITE ";C;" LINES"
438 PRINT "FINISH WITH WRITFIN":B=B+1
440 GOSUB "WR":RETURN
445 "DE"REM  DELETE
450 A=B
455 A$(B)=A$(B+1)
460 IF A$(B)="**"LET B=A:BEEP 4:PRINT "DELETED":RETURN
470 B=B+1:GOTO 455
480 "FO"REM  FORMAT
490 W$=""
500 BEEP 1:IF IO$="E"PRINT CHR$ (10);"WIDTH OF MARGIN? ":INPUT WI:GOTO 510
505 INPUT "WIDTH OF MARGIN? ";WI
510 IF WI=0THEN 560
520 X$=" "
530 FOR I=1TO WI
540 W$=W$+X$
550 NEXT I
560 BEEP 1:IF IO$="E"PRINT CHR$ (10);"SPACING? ":INPUT SP:GOTO 562
561 INPUT "SPACING? ";SP
562 IF SP=0THEN 570
564 SP=SP-1
570 BEEP 1:IF IO$="E"PRINT CHR$ (10);"LINES PER PAGE? ":INPUT LP:GOTO 580
575 INPUT "LINES PER PAGE? ";LP


580 IF IO$="E"THEN 590
585 INPUT "CSIZE(1-7)? ";CZ:IF CZ<1OR CZ>7THEN 585
586 CSIZE CZ
587 INPUT "COLOR(0-3)? ";CO:IF CO>3THEN 587
588 COLOR CO
590 RETURN
600 "HE"REM  HELP
605 PRINT "REturn to start of file"
610 PRINT "WRite text into file"
620 PRINT "Finish  with WRITFIN or.."
630 PRINT "Terminate file with **"
640 PRINT "PRint file contents"
650 PRINT "SCan file, line by line"
660 PRINT "Finish with sPace"
670 IF IO$="E"PRINT "PRESS RETURN FOR MORE":INPUT I
710 PRINT "DElete line,use after SC"
720 PRINT "INsert line, use after SC"
725 PRINT "EDit line,use after SC"
730 PRINT "SAve file on taPe"
740 PRINT "LOad file from taPe"
780 RETURN
800 D$(0)="":CA=0:CB=0
810 TP$=RINKEY$ :IF TP$=""THEN 810
820 IF ASC (TP$)=13LET CA=0:GOTO 810
830 IF ASC (TP$)=8THEN 855
840 IF ASC (TP$)=10THEN 870
845 IF ASC (TP$)<32THEN 810
850 GOTO 860
855 CA=CA-1:IF CA<0LET CA=0
857 GOTO 810
860 AA$(CA)=TP$:CA=CA+1
865 IF CA>CBLET CB=CA
866 GOTO 810
870 FOR I=0TO CB-1
880 D$(0)=D$(0)+AA$(I)
890 NEXT I
900 RETURN
940 "IO"BEEP 3:PAUSE "I/O MODE....."
950 INPUT "NORMAL(N) OR EXTENDED(E)";IO$
970 IF IO$="N"THEN 985
975 IF IO$<>"E"THEN 950
980 OPN "LPRT":SETDEV DO,KI:CONSOLE 64,0,1
990 ON ERROR GOTO 1000:RETURN
995 BEEP 3:INPUT "CE-158 CONNECTED(Y OR N)?";C$
996 IF C$="Y"OPN
997 RETURN
1000 BEEP 6
1010 PRINT CHR$ (10);"ERROR ";ERN ;" AT ";ERL
1020 END
1025 "ED"REM  EDIT
1030 IF IO$="N"THEN 1170
1050 CA=0:D$(0)="":CB=1
1053 AA$(CA)=MID$ (A$(B),CB,1)
1055 CA=CA+1:CB=CB+1:IF MID$ (A$(B),CB,1)=""THEN 1058
1057 GOTO 1053


1058 CA=0
1059 PRINT CHR$ (10);A$(B);CHR$ (11)
1060 TP$=RINKEY$ :IF TP$=""THEN 1060
1070 IF ASC (TP$)=9THEN 1110
1080 IF ASC (TP$)=8THEN 1140
1085 IF ASC (TP$)=27THEN 1155
1090 IF ASC (TP$)<32THEN 1060
1100 AA$(CA)=TP$:CA=CA+1:GOTO 1060
1110 CA=CA+1:IF CA>NLET CA=N
1130 GOTO 1060
1140 CA=CA-1:IF CA<1LET CA=1
1150 GOTO 1060
1155 PRINT CHR$ (13)
1160 CB=CB-1:GOSUB 870:A$(B)=D$(0)
1170 B=B+1:RETURN
1200 "CM"CM=ASC INKEY$ -16:IF CM<1OR CM>8OR CM=7THEN 1200
1210 WAIT :RETURN
2000 "ST"REM  INITIALISE
2005 CLEAR :BEEP 1:INPUT "CHARACTERS/LINE?",N
2010 IF N>80THEN PAUSE "TOO MANY":GOTO 2000
2030 BEEP 1:INPUT "TOTAL LINES?",M
2040 IF M*N>STATUS 0PAUSE "TOO MANY LINES":GOTO 2030
2050 DIM A$(M)*N:DIM D$(0)*N DIM F$(0)*N DIM AA$(N)*1
2060 RETURN
```

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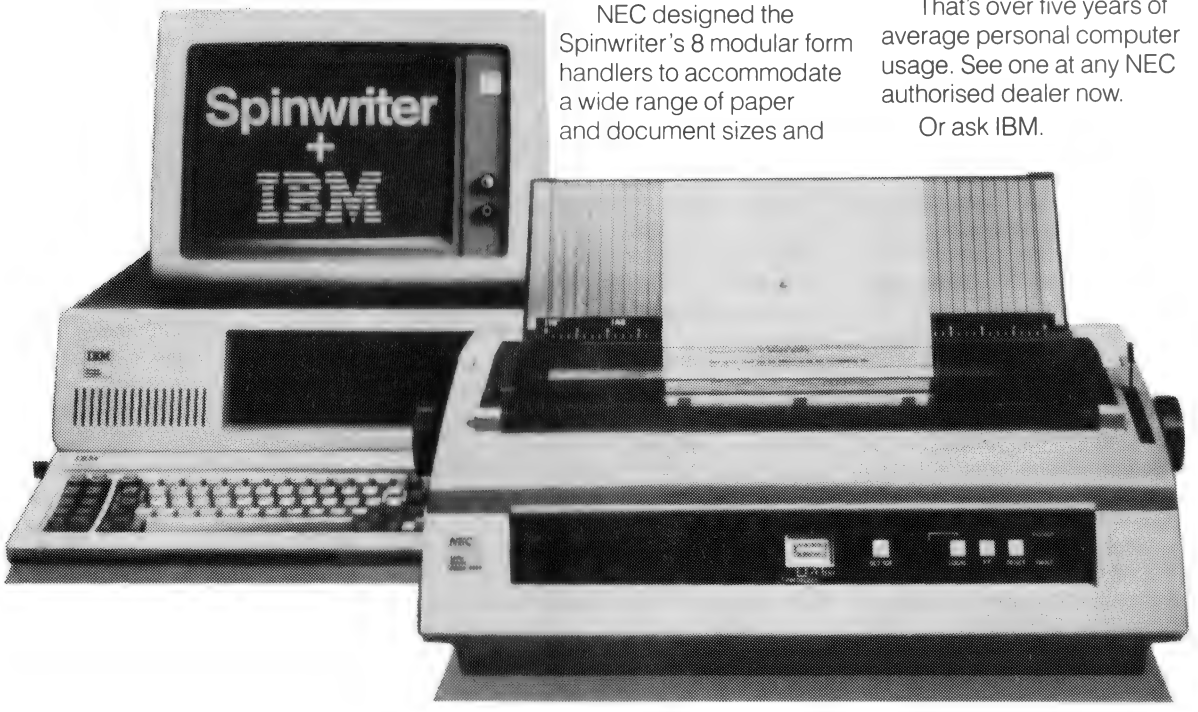

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Frankly Speaking...

Rambling through the words with Frank Lee.

HISTORY, they say, has a habit of repeating itself. One of the speakers at Sydney's Personal Computer Congress last March used a slide showing the growth of colour television (units installed) for a few years after its introduction. The distinctive shape of that curve was mirrored in the number of personal computers installed since 1976 – the point being that we might expect a similar penetration of the domestic market by personal computers in the same time span. IBM's Don Estridge, who also spoke at the conference, was equally convinced that the PC's near future would be measured in millions.

Predictions aside, history seems already to have done a similar trick in two quite dissimilar areas, although at roughly the same time. My Uncle Phil is a computer buff too, but he's been messing around with computers for a lot longer than I have. In fact, when you get him going, he's a storehouse of historical information (although I suspect his stories about Lady Ada's betting binge are second-hand and a mite apocryphal). I can (and sometimes do) recall the era of the miniskirt, but Uncle Phil really can remember the New Look of the early fifties.

What, you may ask, has the miniskirt or the New Look to do with computers? I'm glad you asked. For a start, miniskirts and minicomputers both alarmed the public by their joint appearance in the mid sixties. Interesting. But more interesting is the fact that over roughly the same time span, the length of women's dresses and the word lengths of popular computers have followed (dare I say it?) similar curves.

Most of us who began with eight-bit micros are aware of the real pressure to move up to the 16-bit world. We are made even more nervous by snippings in the literature about 32-bit micros lurking in the woods. Who knows, maybe there's a giant 64-bitter hiding just around the corner waiting to grab you, just as you've finally learned to ride your eight-bit roadster. And, of course, the predecessor to the eight-bit 8080 was Intel's 4040 – a four-bit micro designed for small electronic calculators. It might seem that these all developed from the primordial single bit, swimming freely in the universal primitive silicon soup.

Not so – at least according to Uncle Phil. We were enjoying a family get-together a few weeks ago, when in a rare moment of calm, my garrulous Uncle commenced to retell the stories of his misspent youth. Computers, it would seem, enjoyed surprisingly long word lengths in those early days. His first computer happened also to be Sydney University's first computer. Being Sydney's version of ILLIAC I, it was naturally known as SILLIAC.

Now it should come as no surprise to fans of 'Hitch-Hiker's Guide' to learn that SILLIAC had a word length of Forty Two! SILLIAC's arithmetic mill treated each word as six hexadecimal numbers (known in those degenerate days as *sex*adecimal). Incidentally, the binary core dumps resulting from a program abort were known then as 'sexy dumps'. And they worry about our generation.

As the fifties became the sixties, IBM stole a march with its 360, a 32-bit mainframe with a 'sensible' word length. Mind you, the instruction length varied from two bytes to six. At about the same time the first 'protominis' popped up.

Before Uncle Phil started pushing 32 bits on an IBM 360, he earned his living with a mutated washing machine known as the Bendix G15D. In his own words: that *was* a machine. It had *real* vacuum tubes – you could see them all glowing. And you could feel its raw power as its mighty main memory did 1800 rpm. The word length? 29! At least the first 'real' minicomputer had an even number of bits in each word (twelve, I believe). But 29! It's even prime.

Although it must have been a dog to program, Uncle maintains that there were sound engineering reasons for that extraordinary word length. For one thing, 29 bits isn't bad precision for most engineering applications. More particularly, it could be used to represent a signed seven-digit decimal (BCD) number.

The early seventies gave us 16-bit minicomputers. I remember the Data General Nova, the Varian, Interdata's Model 70, and Digital's PDP-11 with an operating system which was the precursor of CP/M. The Interdata was a kind of cut-down 360, still using variable-length instructions, and assembler codes borrowed directly from IBM's 360 series. The maximum address space of 64K afforded by 16 bits seemed (in those days) way beyond any practical needs of a single-user system.

And then, bingo, the micro. Generally described as eight-bit machines, they could still address 64K since the address bus was still 16 bits wide. It was the width of the data path which caused them to be given the 8-bit label. The trusty old 8080, as most readers will be aware, can do 16-bit arithmetic with its internal 16-bit registers.

So can somebody please tell me why micros using the 8088 are called 16-bit machines? After all, the data path is still eight bits wide. The 8086, on the other hand, really is a 16-bitter. That's the width of its data path.

Up And Down With The Skirts

Now, and this is my thesis: word lengths have been influenced by the length of the ladies' dresses. It's obvious. Uncle Phil has this old sepia-toned photograph of SILLIAC (circa 1954). The operator (that's my Aunty Marge) is wearing what was then considered to be a fashionable New Look creation. The hemline was six inches (15 cm) above the ankle. As time passed the hemline rose, and word lengths declined. Hem heights peaked in the mid sixties, word lengths reached a minimum in the early seventies (the lag due, no doubt, to design delays). Hemlines then dropped to midway between the New Look and the miniskirt, resulting in today's lengthening of words from eight to 16 bits.

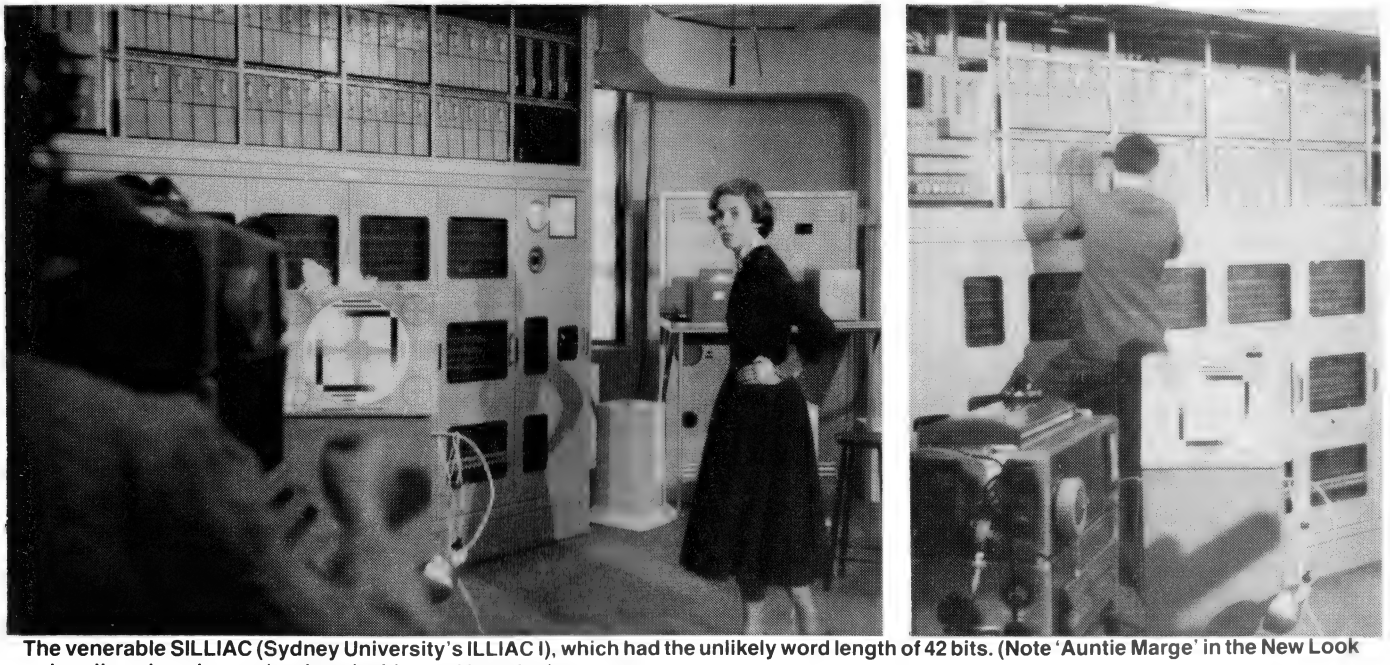
Clearly, there's a PhD waiting for the lucky researcher who is prepared to investigate these claims in a controlled quantitative manner. Double blind tests would be necessary, but might detract from the pleasure of the sheer research work necessary.

In Love With The Z80

Like most CP/M-80 buffs, I feel that I've grown up with a Z80 as part of my brain. I love its simplicity. I love the power of its instruction set. I can spell DDT, and like everybody else, I hate ED. BASIC is *out*, while C and PL/I-80 are *in*. I've been databased by BT-80, MDBS and dBASE II. I've been word processed by WordStar and Spellbinder, and VisiCalculated to the nth degree.

And now the fashion moguls of Silicon Valley dictate that eight is out and 16 is in. What am I to do with this wardrobe of practically unused eight-bit finery?

This month, dear reader, I must tell you that I have finally taken the plunge. The water was icy when I first jumped in, but now it feels just fine. Why don't you join me?



The venerable SILLIAC (Sydney University's ILLIAC I), which had the unlikely word length of 42 bits. (Note 'Auntie Marge' in the New Look — hemlines keeping up (or down) with word lengths.)

Looking And Leaping

Looking at the instruction set of the 8086 is like standing on the edge of the pool looking in. It looks cold and unfriendly. The mnemonics are in a foreign language. The assembler uses square brackets and operands like 'offset x + 1'. The only familiarity I felt was with the MOV instructions. So is it any wonder that I kept deferring the evil day?

It all began when generous Tom Cooper from President suggested I should 'get the feel' of the Columbia MPC by borrowing one for a week. As you know, the Columbia is one of the few micros which are generally recognised as being truly compatible with the IBM-PC. This particular unit was equipped with a five megabyte hard disk in place of the second mini-floppy drive.

The software included WordStar, the standard set of 'Perfect' packages (Perfect Calc, Perfect Filer), BASIC-A and Macro/86 Assembler – all running under MS-DOS. Since the word processing pair Perfect Writer and Perfect Speller were not yet available, the package included VolksWriter as an interim measure.

Also in the package was CP/M-86 (with the usual set of utilities supplied by DRI). The communications package PerTerm was supplied – both for CP/M-86 and for MS-DOS. The Kaga RGB high-resolution colour monitor required the use of an extra card in one of the eight available expansion slots.

Now this is not intended to be a review of the Columbia. Les Bell has already done that (*Your Computer*, March 1983). Perhaps when we've had a chance to make a careful comparison of the Columbia with the IBM-PC it might be appropriate to review Columbia's clone-claims. What follows is simply a record of how this naive user took the plunge into the sea of 16 bits.

System Software

The standard operating system MS-DOS has many similarities to good old CP/M-80. It even understands DIR, and there is a D.COM which looks very similar to the CPMUG XDIR.COM. Once into the application software, you wouldn't know what operating system was lurking in the background. WordStar did its usual thing, and some of this article was written with it. I found that this version pre-programs the Columbia's ten function keys to supply some of the more common control key sequences. The Columbia keyboard is also distinctly easier to use than my usual ADM3a. It's flatter, and decidedly more 'ergonomic'.

But the real crunch came when I tried to convert one of my pet CP/M-80 projects to run under CP/M-86 on the Columbia. It's one thing to run a few application programs under a different operating system – it's just a matter of reading the manuals, and of doing the right things. It's quite another thing to port a program from one type of CPU to another, especially when part of that program is written in 8080 assembler.

The program concerned consists of three PL/I-80 modules (a total of 1800 lines of code) and two assembler modules (2000 lines). To make matters more difficult, the program uses direct input/output calls and includes its own screen driver to provide for the characteristics of different VDUs. The screen driver is one of the PL/I modules. To bring this over to the Columbia seemed a mammoth operation for someone who knew next to nothing about either the 8086 or CP/M-86. Remember too, the Columbia was mine for just one week, a week with a number of other demands to make matters worse.

It was Uncle Phil who got me into this PL/I thing. "Real programmers use PL/I," he says (usually in the presence of some poor Pascal guru). He also says that "real programmers code in black ink", but he always seems to use a clutch pencil himself. Nevertheless, for a self-disciplined high-level language programmer, PL/I (especially PL/I-80) makes life a lot easier. More on PL/I-80 in later columns.

And so it was with fear and trepidation that I rang Bill Bolton (of these hallowed pages) at NECISA to see if I could borrow (and I say that sincerely, folks) a copy of PL/I-86 for a week.

Now let me say here and now in cold black print: *He Who Pincheth Software Deserve The Lurgy*. Further, He Who Pincheth **MY** Software deserves the Dreaded Rangoon Shipwright's Lurgy. Software piracy is no joke (Goons aside). I prefer to call it like it is – *theft*. Thanks, Bill, the copies are now all reduced to strings of E5H. If I ever get to have my own PC (or clone), I'll get PL/I-86 for sure.

Now it's one thing to borrow software, but copying the manuals is quite another. That's just not on. But not to worry – it seems that PL/I-86 is very little different from PL/I-80 in operation and performance. Bill's disk had a short READ.ME file detailing some of the known bugs in Release 1.0. Surprisingly, this was all that was needed for ▶

effective use of the system. According to READ.ME, PL/I-86 and its run-time library use the IEEE format for floating point numbers – somewhat different from the layout used by PL/I-80.

The first thing to do was to pipe Bill's PL/I system from my Z80 engine to the Columbia. Since Bill's disks were 20 cm, the only way to get the software to the Columbia was to use a communications link. Fortunately, the PerTerm package on the Columbia supports what it calls CPMUG protocol (Christensen protocol).

The single (standard) serial port on the Columbia is well documented in the manual. It is configured as a DTE (that is, it looks like a terminal), so we wired a cable to connect my Z80 system serial port (configured as a modem) directly to the Columbia port so that pins 1, 2, 3 and 7 corresponded. It was also necessary to tell the Columbia that all was okay by jumpering pins 6 and 20, and pins 4 and 5. Sirnilar jumperings were necessary on the Z80 end of the line.

Since I normally use MODEM7 (or at least a modified version of it) to talk to the MICC system and to Bill's RCPM, it was relatively simple to transmit the handful of files. For some reason, it was necessary to hold the transmission speed down to 1200 baud. Above that, strange things happened. It was also necessary to patch MODEM7 (yet again) to increase the acceptable delay when waiting for the returning ACK (acknowledgement) from the remote system. Since I keep a hard copy listing of the assembly of MODEM7, the easiest thing to do was to zap the offending byte with DDT. This latter problem was caused by delays at the Columbia end. On reflection, it may have been solved by avoiding the use of the Columbia's floppy, since the hang-up occurred whenever the buffer was physically written to the disk.

The files transferred included PLI.CMD, PLI0.OVR, PLI1.OVR, PLI2.OVR, LINK86.CMD, LIB86.CMD, RASM86.CMD and PLILIB.L86. Once on the Columbia, LINK86 and RASM86 were immediately renamed to the more familiar LINK and RMAC (names used under CP/M-80) as there was no danger of confusion with the CP/M-80 equivalents. The other files transferred were the source files for the program to be ported. Given the necessary fiddling with MODEM7 and the wiring, it now seems on reflection that this was the toughest part of the porting operation. The rest of the work was unbelievably easy, as you will see.

Unplugging the communications cable was a bit like cutting one's own umbilical cord! Once removed, it was an oddball feeling. I was committed to the 16-bit world.

Now CP/M-86 behaves very much like CP/M-80. A few disks were first formatted on the Columbia (nothing new here, except that FORMAT puts a system in for you without fooling around with SYSGEN). PIP was still PIP. STAT was still STAT, and DIR did what you'd expect DIR to do.

Unfortunately, there was no WordStar on any of the CP/M-86 disks from President – only an MS-DOS version. Not even an equivalent to ED80. The only available text editor was the dreaded DRI ED! It was going to be a long night. Furthermore, Bill had given me the horrors with stories of incompatibilities between PL/I-86 and PL/I-80. Apparently he had tried to compile some of his earlier PL/I-80 programs on the NEC APC without much success.

And so it was with some apprehension that I typed 'PLI SCREEN'. Now SCREEN.PLI holds my screen-handling goodies. If anything was likely to fail it would be this. Not so! It compiled without a hitch. Encouraged by this initial sortie, I made a few changes to the source code to make use of the escape sequences used by Columbia's CP/M. The revised version also compiled without error, and so did the remaining .PLI files.

Incidentally, the speed of compilation came as a bit of a shock. On my trusty Z80 system, I would normally start the compilation and linkage processes as a SUBMIT file, then go and make myself a large mug of decaffeinated coffee. Not so on the Columbia. Maybe it was the hard disk that did it. Columbia Data Products has put a massive hard disk controller card into the system; it has its own Z80 and heaps of RAM, so it must be doing some pretty sharp buffering. It is very fast compared to my Z80 system with its two 20 cm floppies. Perhaps we'll be able to run some comparative benchmarks between the Columbia and IBM's XT model for you at some time.

With three .OBJ files now on the hard disk (they would have been REL files under PL/I-80), the final conversion remained to be attacked. Just a simple conversion of 2000 lines of 8080 assembler code (written for DRI's relocating macro assembler RMAC) into equivalent 8086 code to suit RASM86. At this point I chose to retire gracefully. So ended Day One.

Would The Unthinkable Happen?

Four days remained for the unthinkable. Frankly, I hadn't a clue about the architecture of the 8086. Worse still, there was no manual describing RASM86 – not even Intel's handbook on the 8086. President had provided, however, the three standard texts which DRI includes with each CP/M-86 system. The System Guide contains a swag of assembler listings, which proved invaluable as a means for getting a quick overview of the machine architecture, although much of the text was initially gobbledygook.

The Programmer's Guide contains a quite readable account of programming for the standard assembler (ASM86) and on using GENCMD (the equivalent of LOAD.COM). I also started to bone up on the 8086 architecture.

The first thing I noticed on scanning the list of assembler mnemonics was the complete lack of conditional calls and conditional returns – beloved of 8080 hacks, but which can cause subtle, if not dangerous, coding practices. These would have to be handled by conditional jumps, of which there seemed to be an over-supply.

Since the 8086 uses a segment register to mark the actual start of a program, complete programs can be located anywhere in memory by resetting the appropriate registers. In practice, when converting from an 8080 program, all one needs to do is stick all the data items at the end of the source code, and to prefix them with a 'dseg' directive. If you are writing a raw assembler program you should put an ORG 100H just after the dseg to prevent your data from clobbering CP/M-86's goodies.

When calling CP/M-86's BDOS, you simply pop codes into the proper registers then execute an INT 224 instruction (instead of calling location 5). Most registers are saved, with the exception of the Extra Segment register (ES), so it's wise to PUSH ES before, and to POP ES after the INT 224.

There are more than enough registers in the 8086 to go around. I began the conversion process in quite the wrong way. Having discovered the LOOP instruction and the 8086's ability to repeat individual instructions, I discovered that two hours had already elapsed before even one page of code had been converted. Without some significant improvement, I was in for 80 hours of hard work, without any real assurance that what I was doing would work anyway.

It was at this point that I recalled reading somewhere that there is a translator available from DRI (called XLT86) which massages 8080 assembler files into their 8086 counterparts. So why not do the same thing manually? What was needed was some standard approach to mapping the registers of the 8086 onto those of the 8080, and of using a macro approach to the translation of individual 8080 instructions. So flicking the old brain out of neutral, it seemed logical to make the following correspondences:

8080 Register	8086 Register
HL	BX
DE	DX
A	AL
BC	CX
SP	SP

Now the DRI assembler requires that you specify, either explicitly or implicitly, the type attribute of each data item. Data types can be BYTE, WORD or DWORD (one, two or four bytes respectively). This means that an instruction like MOV can be used for a whole bundle of 8080 operations since the assembler knows what you want from the type of the first operand. Here are some examples:

```
8080 Assembler   8086 Assembler

LXI  H,0900H     MOV  BX,0900H
MOV  A,M         MOV  AL,[BX]
LDA  FRED        MOV  AL,BYTE PTR FRED
STA  ATILLA+1    MOV  BYTE PTR ATILLA+1,AL
```

Using correspondences such as those above, it wasn't too much hassle to use the dreaded ED to make appropriate global changes to the text as each new 8080 instruction turned up. For example, if the next line in the program was CPI 0DH, then it and all the CPIs could be corrected with ED's global search/replace. In particular, the CPI 0DH would then become CMP AL,0DH and so on.

Since the conditional and unconditional jumps looked much the same, I took a punt and left them alone. All the labels were 'cleaned up' by appending a colon to each one; ASM86 needs the colon to distinguish labels from operator modifiers. As it happened, this was the cause of the only assembly-time error. What I didn't know was that 8086 jumps are like the short jumps of the Z80 – they operate within a range of plus or minus 128 bytes. It was necessary to change the offending conditional jump so that it branched to a local label which then used the 'long-range' JMP to reach the required target.

The Bottom Line

The bottom line is this: given a reasonable amount of care, there is an excellent chance that your knowledge of the 8080 will carry you a long way in converting a program to 8086 form. If you have CP/M-86, then you also have DRI's documentation, which is really all that I had to refer to. The fact is that after the one assembly error was removed, and having linked all five object modules together with LINK86, the resulting CMD file worked flawlessly. The entire conversion process had taken a total of twelve hours from scratch.

In retrospect, Lady Luck was surely on my side. I've since discovered an ancient (July '78) preliminary release manual by Intel – the 'MCS-86 User's Manual'. It was lurking in a dusty corner of my bookcase, unnoticed and unopened. On page 2-2, it explains the correspondences between the 8080 and 8086 register sets, which fortunately correspond with the ones given above. It turns out that there is a one-to-one correspondence between the one-byte flag register of the 8080 and the low-order byte of the 8086 two-byte flag register. This means you can build the equivalent of the 8080 PSW by executing the LAHF instruction; This sets up AX with the equivalent structure of the PSW.

A trap worth noting is that you should not make a simple substitution for DCX and INX with the corresponding INC and DEC instructions unless you aren't interested in their effects on the flags. The problem only arises with two-byte operands. Whereas the 8080 DCX and INX leave the flags alone, the corresponding INC and DEC do affect the flags. As a result, XLT86 will convert an 8080 instruction like DCX D to the 8086 sequence:

```
LAHF          ;save flags in AH
DCR  DX       ;decrement DX
SAHF          ;restore the flags.
```

The Pressure Of Fashion

Naturally if converting by hand, you have the option of skipping the flag saving if you don't need it.

There is no denying the pressure of fashion. Quite apart from the objective arguments for the benefits of the 16-bit architecture (and they are quite substantial), the fact is that marketing forces will ensure its eventual dominance, at least for some time. Those of us with software already on the market or in production stages on eight-bit machines will need to bend with the wind to survive. It's no good making miniskirts if the real market lies elsewhere.

But like the producer of feminine fashion goods, we can still use our raw ma- ▶

terials for products now in demand, without too much loss of efficiency. Of course, if our product is written entirely in a common high-level language, then the problems of conversion are relatively minor.

A final word: This is just scratching the surface of the architecture of the 8086. It has some exotic string handling instructions, as well as operations involving segmented code. What we have been talking about is how to get your software moving quickly into the 16-bit marketplace.

Listing 1 shows my SCREEN.PLI as required by the CP/M-86 running on the Columbia. The internal comments describe the functions of the various entry points. Listing 2 is a file which should be included in the PL/I program which makes calls to SCREEN. The four entry points GETCH, PUTCH, LISTCH and BUFFER make direct CP/M calls via the 8086 assembler program given in listing 3. This latter program must be assembled with RASM86. Finally, the resulting object modules should all be linked with the command *LINK86 mainprogram,SCREEN,DIO* where 'mainprogram' is your main PL/I program (optionally followed by any other modules which it calls). With the Columbia's 128K of RAM, there was no need to invoke the 'additional memory' switch (A) during the linkage of my own program.

None of these listings pretends to be a paragon of style. They are intended to illustrate both the basics of linking assembler modules to PL/I, as well as some of the interface conventions (which are really the same as those under CP/M-80).

News From Gavilan

Gavilan Computer Corp (see our review of the Gavilan in the July issue) has announced that the LCD screen for its 8088-based portable computer has been redesigned for a full 80-column width. This battery-powered machine was introduced last April at Comdex, and was a popular exhibit at NCC a month later.

Former vice president of communications for Apple Computer Inc, F M Hoar, has joined Gavilan as director of communications. Hoar is responsible for advertising, public relations, investor relations and marketing research for the California-based microcomputer company. □

LISTING 1

```
screen:
      proc;
/* This is a PL/I version of the adjustable screen driver   */
/* presently set up for an IBMpc for screen mode 3.         */
/* It was developed on a Columbia with an RGB monitor.      */
/* The escape codes are peculiar to the IBMpc version of    */
/* CP/M-86 since they are processed within the BIOS to do   */
/* machine-dependent things within the PC.  My source for   */
/* codes is Columbia Data Products "MPC Operations Guide"   */
/* section 4.5.                                             */
/*                                                          */
/* Some of the code could be tighter, but I have learned to */
/* use explicit intermediate variables with specific        */
/* attributes to avoid compiler errors (which may not exist */
/* in PL/I-86).   Better sure than sorry.                   */

/* The following entry point outputs a byte to the console. */
/* If your application can avoid PUT LIST and PUT EDIT, you */
/* can save a lot of overhead by using this primitive to do */
/* all your console output.   The code is in DIO.A86 below. */

dcl
       putch entry(char) ext;
setup:
       proc ext;

/* Sets up console mode.  Here it is mode 3  */

call escape('a3');   /* Emits an escape code followed by 'a3' */
call normal;         /* As opposed to "enhanced" video.       */
call cls;            /* Clear screen.                         */
end setup;
escape:
       proc(arg);

/* Emits the standard "escape code" 01BH followed */
/* by the string argument (parameter).            */

dcl
       arg char(7) varying,
       z char,
       i fixed(7);
call putch('^['); /* Escape */
       do i=1 to length(arg);
       z=substr(arg,i,1);
       call putch(z);
       end;
end escape;
cls:
       proc ext;
call escape('E');
end cls;


home:
       proc ext;
call escape('H');
end home;

bell:
       proc ext;
call putch('^G');
end bell;


normal:
       proc ext;
/* set light green (or normal b/w intensity) */
call escape('b2');
/* on black backgnd */
call escape('c0');
end normal;

enhance:
       proc ext;
/* set strong yellow (or high b/w intensity) on black */
call escape('bn');
call escape('c0');
end enhance;



/* The following procedure positions the cursor according */
/* to the IBM PC conventions (which seem to match those   */
/* of the DEC VT-52 terminal).  The MPC Operations Guide  */
/* is a bit ambiguous when describing this function, but  */
/* the following code works just fine.                    */

cursor:
       proc(row,col) ext;
dcl
       (row,col,i,j) fixed(7);
call escape('Y');
i=32+row;
j=32+col;
call putch(ascii(i));
call putch(ascii(j));
end cursor;

/* The final screen procedure erases a line  */
/* from the cursor to the end of the line.   */

eeol:
       proc ext;
call escape('K');
end eeol;
end screen;
```

LISTING 2

```
/* The following "included" file declares the available   */
/* entry points supplied by SCREEN.PLI and DIO.A86.  The  */
/* calling program is therefore able to function in an    */
/* almost machine-independent manner, leaving the writer  */
/* to concentrate entirely on program logic.  If (for     */
/* example) the particular machine has no facilities for  */
/* enhancing parts of the display screen, then the SCREEN */
/* module would have been changed to perform no actions   */ ▶
```

```
/* for NORMAL and ENHANCE, but the main program logic     */
/* would remain unaffected.  The only thing to watch out */
/* for here is the actual screen size since calls to     */
/* CURSOR require specific row and column values.        */


dcl         /* SCREEN entries */
 /* SETUP performs any screen initialisation operations */
    setup  entry,

 /* CLS clears the whole screen and homes the cursor.   */
    cls    entry,
    bell   entry,  /* Sound warning */
    home    entry, /* Home cursor  */
    normal entry,  /* Normal video attributes */
    enhance entry, /* Enhanced video attributes */

 /* A call cursor(R,C); positions the cursor at row R,  */
 /* column C.  Home is at (0,0).                        */
    cursor entry(fixed binary(7),fixed binary(7)),
    eeol entry,    /* erase to end of line */

 /* BUFFER returns (an edited) line typed by the user.  */
 /* All the normal CP/M control keys do the right thing.*/
    buffer entry returns(char(80)var),

 /* LISTCH is similar to PUTCH, but sends the character */
 /* to the LIST device instead.  Again, this can be     */
 /* used as a primitive to avoid LIST and EDIT directed */
 /* input/output (since these facilities call in heaps  */
 /* of code from the linkage library).                  */
    listch entry (char),

 /* GETCH() returns a keystroke (unlaundered).  It will */
 /* wait until a keystroke is available.  The character */
 /* is NOT echoed on the screen.                        */
    getch entry returns(char),

 /* A call to PUTCH(z) will output the character to the */
 /* console device using CP/M's direct I/O facilities.  */
    putch entry (char);
```

LISTING 3

```
; This is the 8086 assembler moldule.  It should be assembled
; under RASM86 (the macro relocating assembler supplied with
; DRI's PL/I-86 package).

        cseg
;
; Nominate the external entry points
        public  getch
        public  putch
        public  listch
        public  buffer
getch:
; Set up a loop to wait for a keystroke
getch_x:
        mov     cl,6            ;a direct i/o call to bdos
        mov     dl,0ffh         ;specify input
        call    bdos
;result is in AL
        test    al,al           ;keystroke?  If not..
        jz      getch_x         ; .. then loop.
;Got one.
;We must return the single byte on the stack, and set the
;string length in the AL register.  The pushed string
;must, of course, lie beneath the return address presently
;on the top of the stack.
        pop     dx              ;save return value
        mov     ah,al           ;for return value
        push    ax
        inc     sp              ;so only 1 byte pushed
        mov     al,1            ;length
        push    dx              ;restore the return
        ret
putch:
;on entry, BX points to the parameter address list which
;in this case is just the address of the byte to be PUTCHed.
        mov     si,[bx]         ;Set the string source register
        cld                     ;Clear the direction flag DF
;SI now points to the actual parameter.  The next instruction
;behaves a bit like MOV A,M.  It puts the byte addressed by
;SI into the AL register, then increments SI by 1 since we
;have cleared the DF flag.  Conversely, the STD instruction
;sets this flag, causing LODS to decrement SI.
        lods    al              ;AL now holds the byte itself.
        mov     cl,2            ;indirect io via bdos
        mov     dl,al           ;the byte must go here for bdos.
        call    bdos            ;Could be JMP BDOS, but it's ....
        ret                     ; ... unsanitary.
;
listch:
;Output the passed byte to the printer.
;The logic is the same as for putch above.
        mov     si,[bx]         ;byte to print in AL
        cld                     ;set for auto increment
        lods    al              ;byte to be output
        mov     cl,5            ;list output
        mov     dl,al
        call    bdos
        ret
;
buffer:
; Return char(80)varying from input line.  We use the same
;linking conventions described above under getch.  The returned
;string must be on the stack, its length must be in the AL
;register, and we must preserve the return address (so we can
;get back, of course).
;
;The first thing to do is to let the user put his data into
;our line-input buffer.  The BDOS call 10 does this, and
;supports all the goodies like backspace, ^R, and so on.
        mov     dx,offset line  ;dx -> input buffer
        mov     cl,10           ;bdos input code
        call    bdos
;Now grab the return address for later.
        pop     bx              ;return vector
;Line now contains the input line.  We first test to
;see if the user has actually supplied any data before his
;carriage return (which signals the end of his entry).  Note
;that we have set the maximum length of the buffer in the
;first byte of LINE.  CP/M puts the actual length into the
;next byte (at LINE+1).  The string itself will follow from
;the third byte position of LINE.
        cld                     ;set for auto-incrementing
        mov     dx,offset line  ;DX addresses line.
        inc     dx              ;->actual length byte
        mov     si,dx           ;set source address
        lods    al              ;length to AL
;LODS also bumped SI, so SI points to start of input string
        test    al,al           ;is the input string null?
        jz      buf_exit        ;exit (with AL=0) if so, else ..
;Set the count in CX.  It controls the LOOP instruction later.
        mov     cl,al           ;maybe could use MOV CX,AL???
        mov     ch,0            ;This looked safer.
;Set SI -> tail of string
        add     si,cx           ;SI=SI+string length
        dec     si              ;   minus 1.
;set direction flag for decrementing since strings pushed
;onto the stack are actually reversed in memory!
        std
;Now do CX times {push the byte at SI to the stack}
buff_2:
        lods    al              ;and auto-decrement SI
        mov     ah,al           ;put into both halves in case
                                ;it's in the wrong half.
        push    ax              ;put both on stack
        inc     sp              ;then pop off one byte
        loop    buff_2          ;until CX=0
;(The LOOP decrements CX each time and branches to buff_2
;until CX is zero).
;
;You can probably come up with a neater solution by using
;the SI and DI registers to copy the string in one go.  The
;stack pointer could then be corrected by a single subtraction
;(i.e., do it without a loop).
;
;reset direction flag to normal
        cld
;all on stack, restore length in AL
        mov     si,dx           ;still -> length byte!
        lods    al              ;length
buf_exit:
        push    bx              ;restore the return
        ret
bdos:
        push    es      ;bdos clobbers
        int     224     ;no more call 05h's
        pop     es
        ret
;
;
        dseg
line:
        db      80
        db      0
        rb      80
;
        end
```

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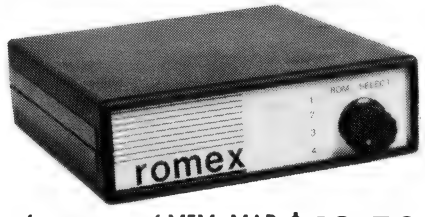

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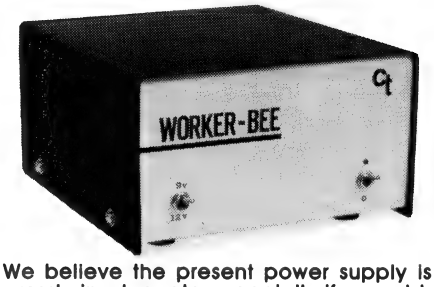

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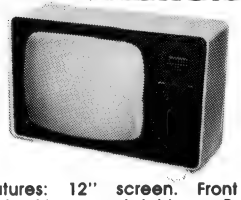

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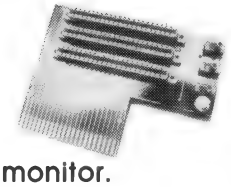

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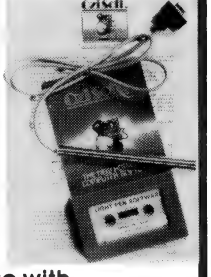

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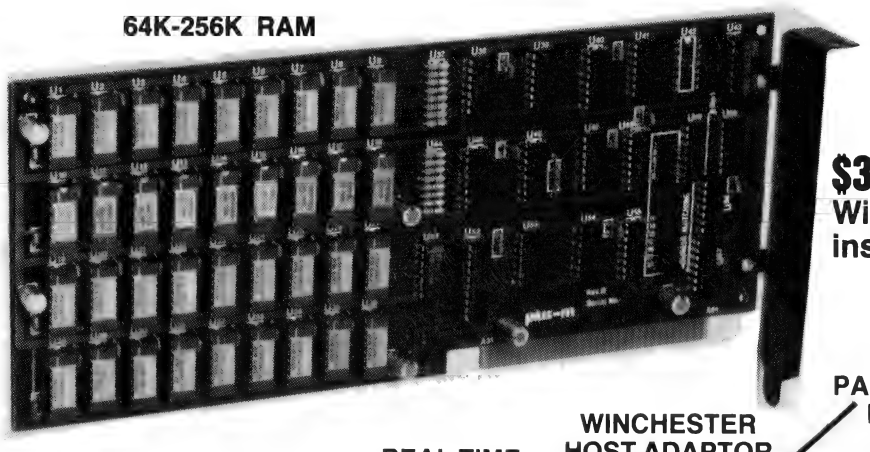

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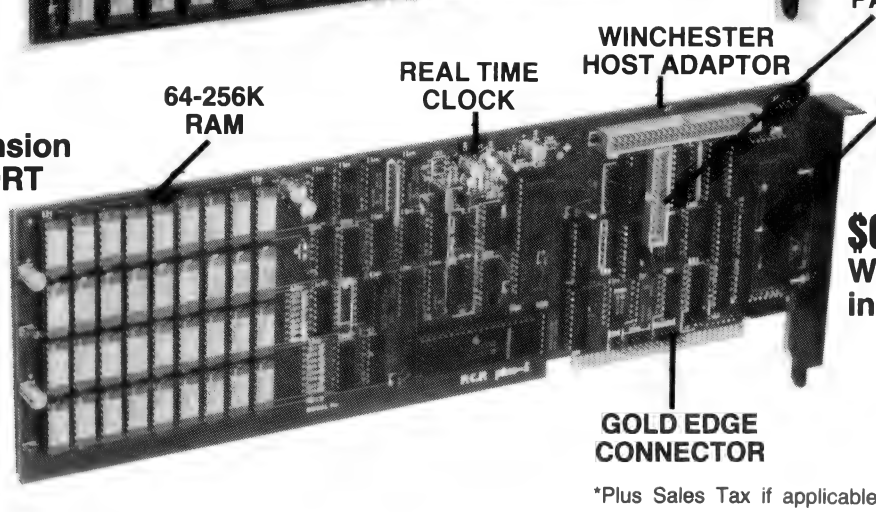

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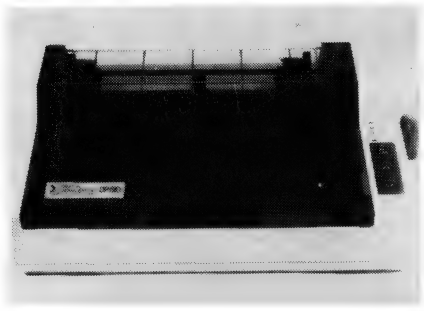

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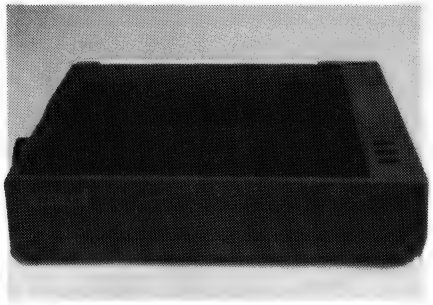

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Super Sords

Not many people know about Sord computers, even though they have been in Australia for several years. Dom Swinkels decided to rectify this situation.

SORD computers have been available in Australia for a couple of years but have not captured the attention of many potential users. I don't know why this is so, and feel they should be better known because of a number of fairly unusual features.

I don't own one myself (with my Peach, my wife's Apple and my son's VIC-20 there is little demand for another computer in our house) but I had to evaluate a SORD recently and was impressed by several of its features, so I offered to do a couple of items on it. Please write in with questions and comments about SORD machines if you are a current user or a prospective owner.

The name SORD originates from SOftware/haRDware, and expresses the philosophy of SORD Computer Systems Inc, which is that the combination of software and hardware is vital. This is clearly expressed in the PIPS software, which comes with the SORD machines and is available only for them. PIPS stands for 'Personal Information Processing System', and no discussion of SORD machines is complete without a detailed review of PIPS. However, that may have to wait until a future issue.

First a little history. The company was started in 1970 by Takayoshi Shiina, then a 26-year-old graduate of Tokai University, and in 1972, with a staff of 15, the company began production of small, low-cost computers in Japan.

From that small start the company has grown to the stage of now manufacturing computers in Ireland as well as Tokyo, and exporting them to 15 countries around the world. In Australia they are distributed by Mitsui Computer Systems, which is slowly starting to adopt a higher profile to make the machines better known. Now let's take a look at a specific machine and examine some of its features.

The SORD M23 Series

SORD M23 computers are Z80A-based machines running at 4MHz with 20 cm floppy disks (M23-Mk5), 13 cm mini-floppies (M23-Mk3) or the recent Sony micro-floppies, which are about 9 cm in diameter (M23P). The 9 cm Sony micro-floppy drives are built-in, while the larger floppy disk drives come as separate units.

Disk storage varies from 280 kilobytes/disk on the 9 cm micro-floppy (70 tracks by 16 sectors by 256 bytes) and 320K on the 13 cm mini-floppy (80 tracks by 16 sectors by 256 bytes) to 962 kilobytes/disk on the 20 cm floppy (74 tracks by 26 sectors by 256 bytes by two sides).

Now, before you think Z80 is old hat and lose interest, let me say that the M23 not only has a Z80A CPU but also four Z80 processors to control DMA and serial and parallel I/O operations. This allows great flexibility and considerable speed. What's more, it also has an AM9511 arithmetic processor, which performs the four basic arithmetic functions as well as SIN, COS and so on with a 32-bit floating point capability. This means that it can calculate a LOG in about 0.3 milliseconds or do a multiplication in about 80 microseconds.

The standard configuration is 128K of RAM with three expansion slots which take floppy disk controllers and other expansion modules, such as analogue and digital I/O boards and a GPIB instrument interface board.

Screen resolution is 25 lines by 80 characters and 640 by 200 dots for the M23P machine I tested. The new M23P machines have a resolution of 640 by 256, which is the same as for the Mk3 and Mk5 versions. Both monochrome and RGB colour monitors are supported, but to use the graphics capabilities an optional graphics board is required. This board mounts inside the console and does not use one of the three expansion slots. It also has no overhead on the system memory since it is fully self contained.

Several dialects of BASIC are available, which come on disk and are loaded as required. On booting the system you are therefore in the operating system and BASIC must be loaded like any other program. Since two new versions of BASIC have recently been issued but were not yet available for review, I will not comment on the BASIC language in detail until I have a chance to put the new versions through their paces. Other languages such as FORTRAN and Pascal as well as Assembler are available.

The BASIC can be used in the interpreted mode we usually associate with BASIC. However, when you have completely developed and debugged your program you simply issue the COMPILE command and a two-pass compiler takes the BASIC program currently in memory, compiles it to machine code and creates a disk file, which can then be run directly from the operating system level. The compiled version will generally run two to eight times faster, depending on the type of program.

This, together with the speed benefits of the arithmetic processor, makes the SORD particularly useful for number crunching applications. I therefore see it primarily as a scientist's or engineer's machine, and for any other applications which require a lot of computation. This is not to say that it does not make an excellent word processor or a good business machine; I'll be looking at those features of the machine in more detail later.

As a speed test I ran a prime number test which appeared in *Interface Age* some time ago and which is listed in Table 1. I found it took 865 seconds to run it on the M23P in the interpreted mode and 146 seconds when compiled. The latter time is the fastest I have seen for any machine, while the interpreter time is quite respectable – the same test took 979 seconds on the Apple and an embarrassing 1837 seconds on the Peach. Published times for various micros range from 585 seconds up, ▶

A complete Sord M23 system with keyboard, monitor, disk drives and printer.

using various BASIC interpreters. The VIC-20 turned in a surprisingly fast time of 900 seconds.

I am not suggesting this program is the most efficient way of finding all prime numbers less than 1000. Perhaps I can issue a challenge to see who can improve on the program and turn in the fastest time – I managed it in six seconds! The program must still print the prime numbers to the screen as they are found.

This test does not use any arithmetic functions and therefore does not show the benefits obtained from the APU. The full eight *Interface Age* benchmarks use various amounts of arithmetic and the resulting times vary accordingly. Mitsui will show you its results with some well-deserved pride, since they are faster than most of the machines on the market, including the 16-bit machines. If you want to test your own machine try calculating EXP(10) 10,000 times. The SORD M23P did it in 65 seconds in the interpreted mode.

The Manuals

No review of a machine is complete without some comments on the manuals. This is particularly true of Japanese machines, which often suffer from the additional disadvantage of poor translation.

The manuals for the SORD are a mixed bag. Some are excellent and appear to be well printed (I only saw photocopies of some of them), well laid out and thoroughly indexed. For example, the word processor manual not only has an extensive index in the back of the manual but in addition has a short index to the main commands at the bottom of each page. Thus no matter where you are in the manual you can rapidly find the section on any other command required. The PIPS manual uses the same technique – one which other manufacturers would do well to copy.

In contrast, the BASIC manual consists of a 500-page document which obviously contains a huge amount of information but is impossible to use. It has no index of any kind and even the table of contents is split into five parts located at the beginning of each of the five sections making up the manual.

For example, to look up something about sending output to the printer you must first know that this falls under the heading of 'Applications', which is Part 3 of the manual. Then you have to find the start of Part 3 to locate its contents and hence find that what you are looking for can probably be found in section 3.2, which starts on page 3-21.

When you have located the right place in the manual the information is generally clear and complete, but it can be a real job finding it. Obviously a two-part manual consisting of a tutorial section for beginners and a reference section with all BASIC commands in alphabetical order, with a common index to both, would greatly improve this manual and increase the popularity of the machine.

Perhaps the new versions of BASIC will be accompanied by a new set of manuals. The PIPS and word processor manuals show that SORD is aware of this need and we look forward to similar-quality BASIC manuals.

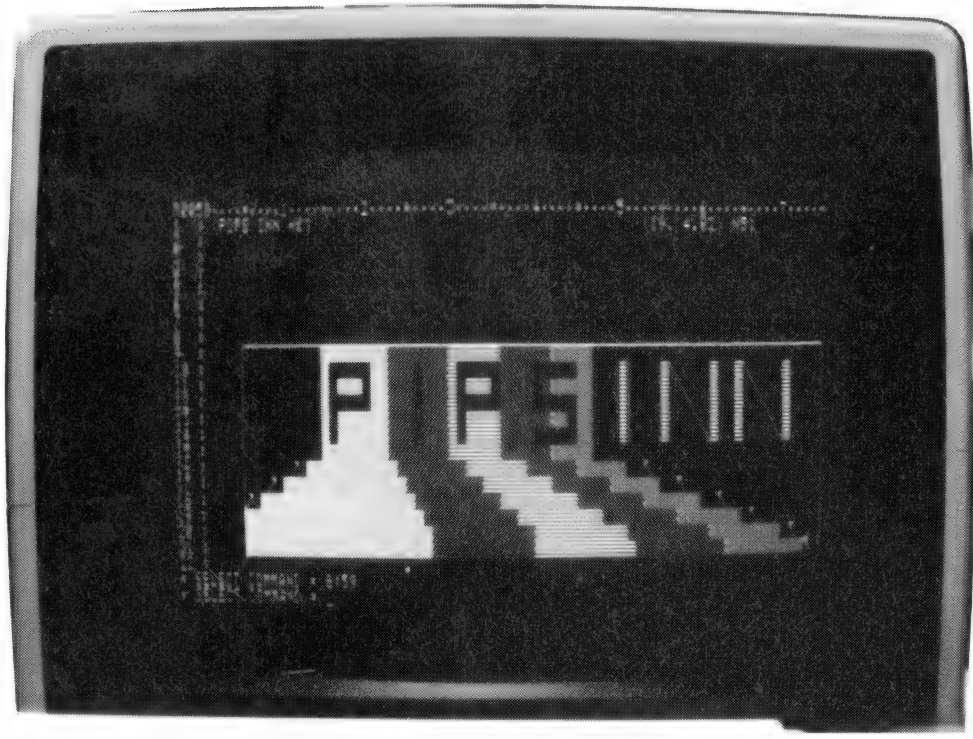
SORD Graphic Language

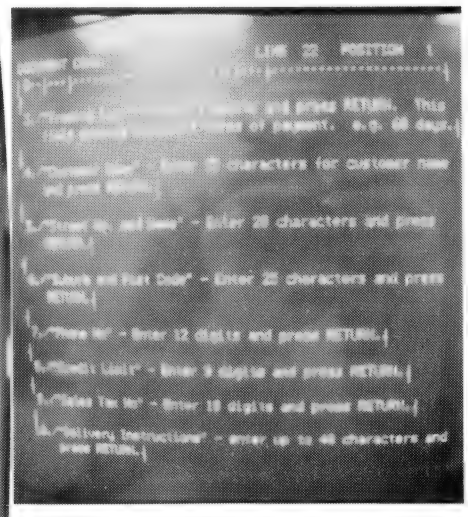
The SORD Graphic Language (SGL) does not come as part of the standard BASIC language but as part of the optional graphics board for the M23 series of machines. The manual is good and covers the M23, M243 and M343 machines.

The differences between machines are minor and consist mainly of additional commands available for the bigger machines; for example, the ZOOM command, which allows you to 'zoom in' on part of an existing picture, is only available for the 16-bit M343 machine. I will limit my comments to the results I obtained on the M23P machine.

All graphics commands are used in the PRINT 'graphics command' form, where the 'graphics command' is intercepted and interpreted by the graphics board. The program once developed can be compiled in the normal way, and increases in speed may be expected, particularly if significant calculation is done as part of the plotting routines.

After printing some quite meaningless ESCAPE sequences such as





Left: PIPS (Personal Information Processing System) software is supplied with the Sord, and is unique to it.

Above: A screen showing the clear instructions received from the software.

CHR$(27);"[=41" to turn off the text screen and initialising the graphics system (PRINT "GINIT"), we are ready to start drawing on the screen.

The current position (CP) of our imaginary pointer is 0,0 in a co-ordinate system which extends from 0 to 639 on the horizontal or X-axis and from 0 to 511 on the vertical or Y-axis. The 0,0 position is in the bottom left hand corner and 639,511 in the top right hand corner of the screen.

We can MOVE the pointer to a new X,Y position or DRAW a line in the current colour from the CP to a new pair of X,Y co-ordinates. The CP now becomes the new X,Y co-ordinates, and we can draw any number of lines with a single DRAW command by providing a continuous set of X,Y co-ordinates. The DRAW command remains in effect until ‹CR› is received by the graphics system. The CP is then the final set of co-ordinates received before ‹CR›.

Most commands have fairly obvious meanings such as CONNECT (connects two points specified as X1,Y1,X2,Y2 parameters), PLOT (plots a point at X,Y), CIRCLE, PIE, POLYGON, PAINT and so on. An interesting command is the ARC command, which is similar to the CIRCLE command, except that instead of using the CP as the centre of the circle, the CP lies on the circumference of a circle whose centre is at X,Y, specified in the ARC command.

Other commands are available to specify colour, line types, markers and so on. Characters can be plotted anywhere on the screen in various sizes and at various angles, and bar graphs can be drawn with a single command and the bars be shaded in various patterns.

Some of the most powerful and perhaps most difficult to grasp commands are placed near the beginning of the manual. Presumably this is because when preparing a graph these are the first commands to be specified. However, I think they will confuse the new user (like me) and should perhaps not be introduced until after some experience and some confidence has been gained.

The commands in question are WINDOW and VIEWPORT. The initial VIEWPORT and WINDOW are the entire screen and the co-ordinates are 0-639 and 0-511.

The WINDOW command allows us to change the co-ordinate system to suit your application, and if you are more comfortable with 0-1000 and 0-800 co-ordinates then the WINDOW command allows you to change the X- and Y-scales accordingly. One word of warning: if you change the co-ordinate system to be different from the proportions of the physical screen, then circles will become elipses.

The VIEWPORT command allows us to define a part of the physical screen (0-639 and 0-511) as a new screen, and all future graphics commands are limited to the new screen. Any commands which attempt to draw outside the new screen are clipped at the screen boundaries. If we have defined a WINDOW, then the same co-ordinates now hold in the new screen until a new set is defined by a new WINDOW command. The FRAME command is useful to draw a box around a new screen when we define one with the VIEWPORT command.

Clearly the WINDOW and VIEWPORT commands are very powerful, but as I said I found the explanations a little difficult and, I believe, incomplete in the manual.

Another point not made clear in the manual is that some commands require a space after the keyword (such as PLOT, DRAW, CONNECT) while others do not (like CIRCLE, PIE). The MOVE command works without a space when the X-co-ordinate which follows is positive but requires the space if it is negative. This is apparently because the print format for a positive number automatically includes a space, which is taken by the '-' sign of a negative number.

A further problem is that the system is very short on error messages and it appears that in most cases an error of the type I have just outlined will simply cause the system to ignore the command.

Well, what do I think of the SORD Graphics Language? It is the most powerful and the fastest graphics system I have seen for personal computers. The manual is good (not excellent) and I believe the system can be improved further with a more consistent use of spaces after each command word and with error messages. It would also be easier if instead of the PRINT 'graphics command' format the graphics commands could be used directly. Perhaps soon . . . □

```
10    REM . . . PRIME NUMBER TEST
20    LET T1 = TIME
30    FOR N = 1 TO 1000
40    FOR K = 2 TO 500
50    LET M = N/K
60    LET L = INT(M)
70    IF L = 0 THEN GOTO 120
80    IF L = 1 THEN GOTO 110
90    IF M < L THEN GOTO 110
100   IF M = L THEN GOTO 130
110   NEXT K
120   PRINT N;
130   NEXT N
140   PRINT "TIME ="; TIME — T1
```

Table 1. Test to find prime numbers to 1000.

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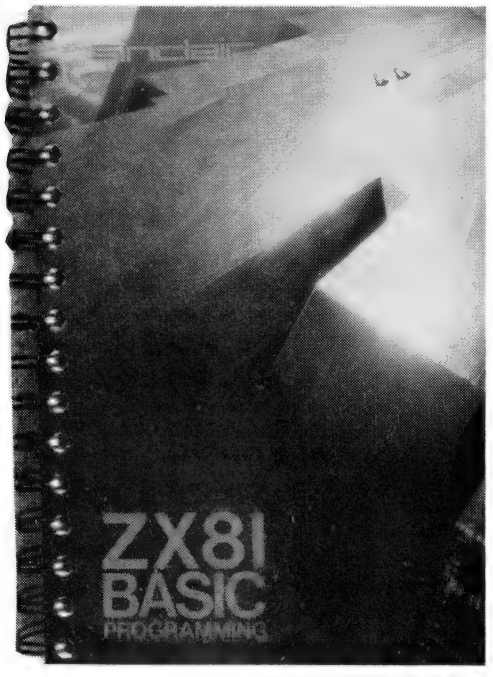

How I Rewrote The Language

By Benjamin Smith

In an attempt to improve on some of the facilities lacking in the Sinclair ZX81's BASIC, Benjamin Smith set about to devise a new programming language for the machine...

THE INTERPRETER for my new programming language, which I planned as an improvement on the Sinclair ZX81's BASIC, was written in a combination of machine-code and BASIC, using machine-code to add functions that cannot be simulated through BASIC and to improve speed where possible.

Eventually, the language was completed but, alas, it proved too slow to be of much use. However, some of its machine-code sub-routines can be effectively used through BASIC, and these are provided here.

For convenience, the routines are stored at the very top of memory, occupying 403 bytes from address 32364. This means the system variable, RAMTOP, must be set to this value and the system re-initialised before the machine-code can be loaded in. The following program will achieve this – type it in, then SAVE it before you RUN it:

```
  10 POKE 16388, 108
  20 POKE 16389, 126
  30 PRINT AT 7, 1;"< HIT NEWLI
NE TO RESERVE RAM >"
  40 IF INKEY$<>"" THEN GOTO 40
  50 IF INKEY$="" THEN GOTO 50
  60 NEW
```

FIGURE 1

To get the machine-code into RAM, type in the following program (be sure not to make any mistakes in the assignments to M$). Start your tape recorder in the "record" mode and type RUN; the program will save itself automatically, then load in the bytes of machine-code stored in M$ as two-digit hex codes.

Each time you load this program hereafter, it will run automatically. (Don't forget, you always need to first reserve memory by using the Figure One program.)

```
  10 FAST
  20 SAVE "LOADER"
  30 IF PEEK 16388<>108 OR PEEK
16389<>126 THEN GOTO 150
  40 LET M$="2A0C4011D6021022B4
0C93E0A3221402A1040110600197EFE4
03803D630D8FE40D0C630E52A0E40F53
E76BE200123F17723220E402A0E40ED5
B7B40A7ED52280AE1233A2140FE0A"
  50 LET M$=M$+"28CDC9ED5B0C4013
2121001901A502EDB0ED530E4006003E
001213210FC2E21260322394018D32134
40CB66280C2A0E407EFE762001233603
C92A0E407EFE762001233600C9CDDA7E
ED4B254021FFFFA7"
  60 LET M$=M$+"ED42C821FFFEA7ED
4220EAC9CD2B0FCDF97ECDDA7EED4B25
4021FFFFA7ED4228F121FFFEA7ED4228
E9CDBD0730E13E3FBE3016E5CDF97EE1
4E0600ED5B0E401AFE762001133E0012
C93E003221407EE5CD847EE118DD2A10
40110600193E00E5F5CD137F3E77B928
163E76B92808F1E1713CFE2028052318
E6F1E14F0600C9"
  70 LET M$=M$+"F1E1FE0028DA3D28
E5F53E3FBE38D32A0E40ED5B39401528
3E76141CBE28F8220E403E23BB20021E
02ED53394018B3"
  80 LET M$=M$+"2A1040110600197E5
2A1040114C00190D1B0603180E200913
2310F84E2346D1C923232310FD7EFE76
20E5010000D1C9"
  90 LET M$=M$+"11C0022A0C40237E
FE7628FA3600E5EB110100A7ED522804
EBE116EAC1C9"
 100 FOR I=32364 TO 32363+LEN M$
/2*(32364+LEN M$/2<=32767)
 110 LET P=(I-32364)*2+1
 120 POKE I, (CODE M$(P)-28)*16+
CODE M$(P+1)-28
 130 NEXT I
 150 SLOW
 190 PRINT
 200 PRINT AT 6, 0; "ERROR:"
 210 PRINT
 220 PRINT "  MEMORY NOT RESERVED
 FOR M/C.     PLEASE RUN PREPARAT
ION           ROUTINE, BEFORE
              ATTEMPTING TO LOAD
M/C."
 230 GOTO 230
```

FIGURE 2

Use Of The Routines

The machine-code consists of six sub-routines, at least five of which can be of use to the BASIC programmer (or may be called from other machine-code routines). This memory map gives a list of these routines, and their starting addresses:

Routine	Function	Starting address	
PRINT_1	Initialise for printing	32364	(7E6Ch)
PRINT_2	Print W$ on screen	32375	(7E77h)
GET_CHAR	Input a character	32528	(7F10h)
INPUT	Input a string (W$)	32602	(7F5Ah)
SEARCH	Search for 3-byte string	32690	(7FB2h)
CLEAR	Clear top 22 lines of screen	32737	(7FE1h)

FIGURE 3

Only the SEARCH routine may not be very useful.

The PRINT1 routine must be called at the start of a program, before any other routine is executed. It puts the value of the address after the last on the "user" screen (that is, the top 22 lines) into the unused system variable at address 16507 for use by the printing routine, which detects the end of the screen, in order to determine when to scroll.

The PRINT2 sub-routine prints out the contents of W$, which should be a character array and the first variable in memory, up to the first "non-printable" character (that is, having a code between 63 and 128 or greater than 191).

When the bottom of the screen (line 22) is reached, the display is scrolled up by one line. This routine isn't compatible with the BASIC print routine. Therefore, you must use the statement PRINT AT y,x; (y and x are legal parameters) after using PRINT2 before using the standard BASIC PRINT.

GET-CHAR waits for the user to type one character; the prompt is a flashing cursor in the next print position, which disappears as soon as the character is typed. Since the GET-CHAR routine uses PRINT2 to output the user's character, the same comments regarding compatibility with BASIC PRINT apply.

The code of the character typed in response to GET-CHAR is returned as the value of the USR that calls it. INPUT will input a string of up to 32 characters, with a flashing cursor as a prompt. The only cursor-control key available to this routine is RUBOUT and, as a result, there is no noticeable delay between the input of consecutive characters (unlike BASIC's INPUT). Therefore, characters may be entered at touch-typing speed.

The input is terminated by NEWLINE or upon entry of the 32nd character. Input is stored in W$ (see above) and its length is the result of the USR that calls it.

Finally, the CLEAR sub-routine clears the top 22 lines of the display (BASIC'S CLS clears all 24). This can be useful

if you're using the bottom two lines as a scoreboard.

A practical way of applying these routines is to set up a "skeleton" program, such as that below, which checks that the machine-code is in, calls PRINT1 and sets up W$ to initialise, and supplies mnemonic variables for each sub-routine to reduce the chance of error. You type your program from line 110 onwards, making sure to run the program from the beginning (line 10) whenever you execute it.

```
  10 IF PEEK 16388=100 AND PEEK
16389=125 AND PEEK 32766=201 THE
N GOTO 40
  20 PRINT AT 6, 0; "ERROR:"'''
"MACHINE CODE NOT LOADED."
  PLEASE START AGAIN."
  30 STOP
  40 DIM W$(64)
  50 LET X=USR 32364
  60 LET PRINT=32375
  70 LET GET=32528
  80 LET INPUT=32602
  90 LET CLEAR=32737
 100 LET E$=CHR$ 118
```

FIGURE 4

The following table lists the statements using the machine-code routines that correspond to standard BASIC, assuming the above "skeleton" program is being used.

Standard BASIC	Equivalent using machine code routines
PRINT A$;	LET W$ = A$ + E$ LET X = USR PRINT (A$< 64 characters)
INPUT A$	LET A$ = W$(TO USR INPUT)
INPUT A	LET A = VAL W$(TO USR INPUT)
CLS	LET X = USR CLEAR
(Inputting a single character; no true equivalent in ZX81 BASIC)	LET A$ = CHR$ USR GET

Note: Output from machine code PRINT always goes to position immediately after the last output. Machine code PRINT may be used in conjunction with BASIC PRINT AT, but not standard PRINT.

FIGURE 5

Below is a short sample program. Add it to the "skeleton" program and execute it; it's fairly self-explanatory.

```
 110 PRINT AT 6, 0; "NAME: ";
 120 LET A$=W$( TO USR INPUT)
 130 PRINT AT 21, 0; "HIT ANY KE
Y TO CONTINUE ... ";
 140 LET X=USR GET
 150 LET X=USR CLEAR
 160 PRINT AT 0, 0;
 170 LET W$="HELLO, "+A$+" ■ "+E
$
 180 FOR I=1 TO 150
 190 LET X=USR PRINT
 200 NEXT I
```

FIGURE 6

The machine-code is not relocatable and, therefore, may only be used on ZX81s with 16-kilobyte RAM or more; if you have more than 16 kilobytes, any memory beyond the first 16 kilobytes will not be available. The routines were designed for use on ZX81s with the so-called "improved" ROM, so they'll be unusable if you don't have this. To check if you have an improved ROM, type PRINT PEEK 54; the result should be 136. □

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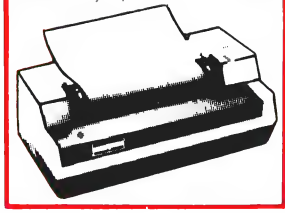

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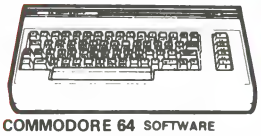

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By Jeff Richards

NOT ALL Kaypros have been supplied with a communications program to permit downloading of software from another computer or an RCPM service. This month we will discuss a method of downloading software that will at least get you started. Of course, the first piece of software to be downloaded should be a communications program, so that you only need to use this technique once.

For this procedure you will need to have access to a CP/M machine that has a serial port supported by the BIOS. The best source for such a machine, and an expert to drive it, would be a local computer club; however, your dealer may be able to put you in contact with someone who can help. Once you have used this procedure to load a communications program (for example MODEM7 or YAM) then you will be able to talk to any other similarly equipped CP/M computer, either by direct connection or via a modem and phone line.

You will need another computer that can send 8-bit serial data at 300 baud. The slow speed is chosen so that handshaking is not needed – the connection can be achieved with as few as three wires. The interface cable, connected to the Kaypro serial port, should have earth on pin 1, data coming into the Kaypro on pin 3, and a logical high on pin 5. This logical high would normally be supplied by a pin labelled DTR or RTS on the sending computer. If the sending machine cannot supply this signal, then a logic high is available on the Kaypro at pin 6. The data coming in to the Kaypro on pin 3 will probably come out of the sending computer on pin 2.

Programming With DDT

The communication will be established using PIP on the sending machine and a small machine language utility on the Kaypro. This utility will reside in high memory, and will load the data into memory starting at location 100h. We will then use the CP/M SAVE command to get this data into a disk file. To load and execute the small machine language program we will use DDT.

In the following discussion <RETURN> means 'hit the key labelled RETURN'.

Before starting we should check that there will be enough room on the disk to save the incoming program. On the Kaypro use STAT A: <RETURN> (for drive A) to determine the spare space on the disk. On the sending computer, use STAT filename. ext <RETURN> to discover the size of the file you wish to send. This file size is in Kbytes. It should be multiplied by four to give the file size in pages. Call this number *n* – we will need it later.

Now run TERM. This will achieve two results. First, it will confirm that communication has been established with the sending computer, and secondly it will reset the Z80 SIO (Serial Input/Output) device to the required configuration. To confirm that the link is working run PIP from the sending machine, with data directed to the output port from the keyboard. Type characters at the sending machine; they should appear on the Kaypro screen.

Type Control-D at the sending machine to reboot the Kaypro. The command to send characters from the keyboard to the output port of the sending machine would be PIP PUN:=TTY:, assuming that the port had been assigned the logical device PUN. It might instead be a LST or UL1. We will assume it is PUN in the following example.

Now we should enter the machine language loader program. The program is set out in listing 1. Enter it using the A command of DDT into location D000h. The command to invoke DDT is simply DDT<RETURN> and to load a program is AD000<RETURN>. Complete the loading by entering an empty line.

This program should not have to be reloaded unless power to the Kaypro is removed – resetting and rebooting will not affect it. Now run the program with the DDT command RD000<RETURN>. Before running it could be checked with LD000<RETURN>.

Now, Send The Program

The next step is to send the program down the line from the sending computer. Using PIP, and again assuming the output port is labelled PUN, the command would be PIP PUN:=progname.COM [O]<RETURN>, where progname is the name of the program you wish to send. The 'O' option tells PIP that it is dealing with an object code file rather than ASCII characters. Be patient. At 300 baud it takes time.

When the sending computer is finished the PIP prompt will again appear. During this time the Kaypro will have been apparently lifeless. Hit the reset button on the Kaypro and the disk will reboot. Before executing any programs type SAVE n progname.COM<RETURN> where n is the number of pages of program to be saved – the number we calculated earlier.

You can now examine the program using DDT or attempt to execute it. Most programs can be executed without disturbing the loader routine at D000h, so if it fails you can try again, and if it succeeds you can move onto other programs.

The above procedure is very much a brute-force method of downloading programs. However, if no other procedures are available then this sort of technique must be resorted to. As mentioned above, the first program to be downloaded should be a decent communications program.

For those who manage to get a communications program loaded, the addresses in the Kaypro for communicating with the serial port are given in table 1. The relevant data for configuring MODEM7 is given in table 2.

Boot-Protected Copies

It appears that the manuals distributed with the new software do not explicitly describe the procedure for making working copies from the 'boot protected' master disks. The trick is to follow the procedure in precisely the order detailed – Format, Copy, Sysgen.

The copy procedure copies track for track, so it produces a perfect image of the protected disk – protection and all. But if Sysgen is done after copying, then an unprotected version of the system is copied to the new disk, making it usable.

Sysgen affects only the system area – it does not disturb any data on the disk. PIP can also be used to copy files directly, but some disks are so full that there is no room for PIP. □

LISTING 1. Memory load from TTY port to address 100H.

```
D000  lxi h,100
D003  push h
D004  call fb32
D007  pop h
D008  mov m,a
D009  inx h
D00A  jmp d003
```

TABLE 1. Serial port driver addresses.

STATUS	FAEDh	(A=FFH or Z flag set means character is available)
INPUT	FB32h	(Character in A)
OUTPUT	FB38h	(Character in C)

TABLE 2. Serial port configuration.

Modem status port = 6
Modem data port = 4
Bit for ready-to-send = 4
Bit for ready-to-receive = 1
All logic is positive.

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Getting Friendly, Part Three

Living with Indexes

In the third part of this series, Jeff Richards presents a detailed analysis of the procedures involved in establishing and using resident array indexes.

RANDOM ACCESS file management facilities provided in Microsoft Basic-80 (MBASIC) provide a means of achieving extremely efficient data storage. However, techniques for accessing this data have to be correspondingly efficient to fully exploit the power of random access.

While not necessarily complex, these techniques are sufficiently different from techniques of sequential data access to justify careful attention. One such important technique is the use of an index to retrieve randomly stored data records.

The specific advantage of a random-access data storage system is that the program can access nominated data records anywhere in the file without reading through the file from the beginning. Clearly such a feature is of little use if we do not have some way of informing the program about a precise piece of data. Since most systems require this information in the form of a record number, we need some sort of device to convert a request for data into a request for a record number. Such a device is an index.

Indexes can be maintained in many ways, but as a rough rule we could say that those that are simple to create and maintain probably have limitations of size or speed of use, while those that allow for any size of file and provide high access speed are probably complex to maintain. In this article we will discuss two simple forms of index, both of which do the required job adequately and are reasonably easy to implement.

Before proceeding, however, it is important to review the reasons behind the need for an index. When dealing with random storage of data records we have decided that if the system is allowed to nominate the physical storage location for a new data record then we can build into the 'ADD' routine a fairly simple procedure that uses file space as efficiently as possible without requiring regular file re-organisation.

In addition, the only information available from the 'ADD' routine is the numeric record number of the item stored. Although this record number could be used for all future references to the data item, it is easier if we are able to assign our own reference – something that is readily identifiable with the data concerned and which fits in with other data processing tasks. Thus we need an index – a device to convert the name we have chose for the data item to the record number at which the system has chosen to store it.

An alternative file allocation routine could have been built into 'ADD' procedure to force the data record into some specific file location based on its assigned name. This does away with the need for an index, or, more correctly, replaces the physical index with an indexing procedure. Such procedures will not be considered in this article.

In considering the form of the index we must consider what it is required to do. The first requirement is to enter the name we have assigned to the data item

concerned. This name is called a 'key', and the structure of the index may impose restrictions on just what these keys can consist of. Having entered with the key, we need to extract the record number at which the data item (corresponding to the key) has been stored. Thus the index will consist of pairs of data items – a key and a record number.

The simplest index will be a string array with a number of elements equal to the number of available records in the file. The value of the element in the array is the key, and the array number of the key entry will be the record number at which the corresponding data record is stored. Such an index will work, but is missing the most important element of an effective index – the ability to find any key (and its associated record pointer) with a minimum of searching.

If we sever the link between the array position and the record position then we need a different means of storing the record number of the data record associated with each key. This can be easily accomplished with a matching numeric array. In this structure it is possible to re-arrange the key array, as long as the pointer array is correspondingly shuffled, to facilitate speedy searching for particular keys. The easiest way to achieve this is to sort the key array into ascending sequence and search it with a binary search technique. Tables 1 and 2 show the structure of a simple array index and a paired-array index respectively.

This technique has some significant advantages and one drawback. First, the index array is easy to create and maintain. In fact, it is so easy to create that it is possible not to bother storing the array to disk, but to recreate it each time the file is opened. Secondly, searching the array for a matching key is extremely fast.

To achieve this speed it is necessary that the array is in memory the whole time, as any speed gains through using the index would be lost if the index could only be accessed as a disk file. This requirement may make the sorted array technique unusable where the file is large and memory is restricted.

However, within these limitations the sorted, memory-resident array index is very powerful. The example presented here assumes that the index is stored in a file called INDX which consists of 12-byte records, each containing ten bytes of key and a two-byte integer. Each time the data file is opened the index file will be read into two memory arrays – K$() for the keys and P() for the pointers. The file does not need to be sorted; as the ADD and DELETE procedures are completed the revised arrays are written back to the INDX file.

The only other housekeeping procedure needed is a small routine to rebuild the arrays from the main data file. This is needed if the INDX file should be lost, and would be most frequently used after a power failure, when the system has updated the main data file but has not rewritten the arrays to INDX.

Listing 1 is a suitable ADD routine. This assumes that a master file consisting of a linked free list will store the data records, and the index is in a file called INDX. The array is searched in the routine at 200 to 240. Otherwise, the routine is exited with the array position for the new key. All array entries above the new key position are shifted up one, then the record is inserted into the masterfile.

Finally, the key (I$) and the pointer returned by the masterfile-add routine (R) are inserted into the array. The routine at 400 writes the array back to INDX when either the masterfile is filled or the

operator indicates END. The ADD procedure does not handle the situation of allowing the masterfile to grow beyond the initial maximum size, but this could be incorporated provided the array was dimensioned adequately.

Listing 2 is a record delete routine. It follows the same structure as ADD, except that the search routine 'fails' on a 'not found' rather than a 'found' condition. If the key is found then the subroutine at 2000 is called with the record number (R) to be deleted. Then all array entries above the deleted record are moved down one. Again, the array is written back to disk when the operator indicates END.

The master file insert and delete subroutines are identical to the earlier examples. For the ADD procedure the routine requires the record (R$) and returns to the position at which it was stored (R). The DELETE procedure requires the record number to be deleted (R).

The example of rebuilding the index from the data files uses the standard Microsoft sort, but any suitable sort algorithm could have been used. It works by simply passing through the master file to build an unsorted array, sorting the array, and then writing it to the INDX file (see listing 3).

In the ADD procedure we have included a test to see if the key already exists in the index. This prevents the system from creating two records with the same key. The advantage of this is that for any one key, there will only be a single record returned. In some applications this may not be suitable – it may be preferable to have several data records with identical keys.

The sorted index array copes with this alternative with only one limitation – the sequence in which data records with identical keys will be retrieved is not always predictable. It depends in part on how carefully the ADD procedure maintains the initial sequence, but it is very difficult to force the REBUILD procedure to recreate the index entries with identical keys in their original relative positions.

This difficulty can be avoided by altering the search algorithm (for instance, in the DEL procedure) to find all occurrences of the key and ask the operator which one is required for processing.

A second extension of the index procedure involves multiple keys per item. In this index structure two or more keys are attached to each data record. After the record has been inserted into the file, each of the keys is entered into the index with the same pointer. Thus the data record can be located by searching for any one of the keys.

The keys in this scheme will be either in the same key category or in different categories. An example of keys in the same category would be if Bill Bloggs were added to the file with keys of BILL and WILLIAM. In this case, any searching for Mr Bloggs in the file could be done using either key, and the system would make no distinction between the two. Indeed, the system need not even be aware that there are two keys which point to the same data record (but the REBUILD procedure would have to be advised).

If the keys are in different categories then slightly different procedures apply. In this case Mr Bloggs may be known as BILL and also as Y27-1-33. We can call these his name key and his code key. When accessing Mr Bloggs' data record we would usually specify whether we are using a name key or a code key. With this major distinction available to the search procedure we can take some steps to ensure that the search time is minimised. The most obvious way to do this is to split the two keys into separate indexes. So if we are hunting for Y27-1-33 then we will only search through the code-key index, and would not have to wade through all those names.

An alternative procedure is to maintain all keys in the one index, but to attach an identifier to each key to indicate ▶

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its key-type. If this identifier is the first character of the key then the major sequence of the index will be the key-type, and only one additional level of search will be added to the SEARCH procedure.

Frequently, this key-type indicator will be an ASCII character, allowing about 250 key-types. The leading character is added to the key by the system each time a key is created or accessed, and stripped off each time a key is presented to the operator, so the operator is largely unaware of its existence.

This technique of key-type identifiers for multiple keyed records is often used for database management systems. Setting up the system involves attaching a name to each key-type and specifying the field in the record from which the key is to be built. From this information the system can build its own multiple keys from each data item, attach the appropriate key-type indicator and store the compound keys in its index.

Memory-resident sorted array indexes are an effective way of managing keyed data files. They are easy to use and can be easily recreated if destroyed. The maximum size of file that can be handled in this manner will be determined by the size of each key and the number of keys per item, but despite its simplicity, this technique can be effective for quite large databases. □

TABLE 1. Simple Key Array

INDEX		DATA FILE	
Array No.	Key entry	Record no.	Record Data
1	BILL	1	Bill Bloggs
2	JIM	2	Jim Jones
3	ALAN	3	Alan Adams
4	DAVE	4	David Doe

TABLE 2. Sorted Key Array

Array No.	Key Array entry	Pointer array entry
1	ALAN	3
2	BILL	1
3	DAVE	4
4	JIM	2

Listing 1 - ADD procedure.

```
10   DEFINT A-Z
20   OPEN "R",#1,"MAST",80
30   OPEN "R",#2,"INDX",12
40   FIELD #1,2 AS NXT$,2 AS MAX$,2 AS CNT$
50   FIELD #1,80 AS REC$
60   FIELD #2,10 AS KEY$,2 AS POINTER$
70   GET #1,1
80   COUNT=CVI(CNT$):MAX=CVI(MAX$)
90   DIM K$(MAX),P(MAX)
100  FOR I=1 TO COUNT
110   GET #2,I
120   K$(I)=KEY$
130   P(I)=CVI(POINTER$)
140  NEXT I
150  PRINT "ADDING RECORDS"
160  INPUT "Key = ",I$
170  IF I$="END" GOTO 400
180  IF LEN(I$)>10 GOTO 160
190  J$=STRING$(10,32):LSET J$=I$:I$=J$
200  LO=1:HI=COUNT
210  NOW=0
220  PREV=NOW
230  NOW=(LO+HI)/2
240  IF K$(NOW)=I$ GOTO 380
250  IF K$(NOW)<I$ THEN LO=NOW+1 ELSE HI=NOW-1
260  IF PREV<>NOW GOTO 220
270  I=NOW
280  FOR J=COUNT TO I STEP -1
290   P(J+1)=P(J)
300   K$(J+1)=K$(J)
310  NEXT J
320  R$=I$+STRING$(70,I$)
330  GOSUB 1000
340  P(I)=R
350  K$(I)=I$
360  IF COUNT=MAX GOTO 400
370  GOTO 160
380  PRINT "ALREADY EXISTS
390  GOTO 160
400  FOR I=1 TO COUNT
410   LSET KEY$=K$(I)
420   LSET POINTER$=MKI$(P(I))
430   PUT #2,I
440  NEXT I
450  CLOSE
460  STOP

(Listing 1 continued)

1000 GET #1,1
1010 NXT=CVI(NXT$)
1020 MAX=CVI(MAX$)
1030 COUNT=CVI(CNT$)+1
1040 GET #1,NXT
```


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```
1050 FIRST=CVI(NXT$)
1060 LSET REC$=R$
1070 PUT #1,NXT
1080 GET #1,1
1090 LSET NXT$=MKI$(FIRST)
1100 LSET CNT$=MKI$(COUNT)
1110 LSET MAX$=MKI$(MAX)
1120 PUT #1,1
1130 R=NXT
1140 RETURN
```

Listing 2 - DELETE Procedure.

```
10   DEFINT A-Z
20   OPEN "R",#1,"MAST",80
30   OPEN "R",#2,"INDX",12
40   FIELD #1,2 AS NXT$,2 AS MAX$,2 AS CNT$
50   FIELD #1,80 AS REC$
60   FIELD #2,10 AS KEY$,2 AS POINTER$
70   GET #1,1
80   COUNT=CVI(CNT$)
90   DIM K$(COUNT),P(COUNT)
100  FOR I=1 TO COUNT
110   GET #2,I
120   K$(I)=KEY$
130   P(I)=CVI(POINTER$)
140  NEXT I
150  PRINT "DELETING RECORDS"
160  INPUT "Key = ",I$
170  IF I$="END" GOTO 360
180  IF LEN(I$)>10 GOTO 160
190  J$=STRING$(10,32):LSET J$=I$:I$=J$
200  LO=1:HI=COUNT
210  NOW=0
220  PREV=NOW
230  NOW=(LO+HI)/2
240  IF K$(NOW)=I$ GOTO 290
250  IF K$(NOW)<I$ THEN LO=NOW+1 ELSE HI=NOW-1
260  IF PREV<>NOW GOTO 220
270  PRINT "NOT FOUND
280  GOTO 160
290  R=P(NOW)
300  GOSUB 2000
310  FOR I=NOW TO COUNT
320   P(I)=P(I+1)
330   K$(I)=K$(I+1)
340  NEXT I
350  GOTO 160
360  FOR I=1 TO COUNT
370   LSET KEY$=K$(I)
380   LSET POINTER$=MKI$(P(I))
390   PUT #2,I
400  NEXT I
410  CLOSE
420  STOP
2000 GET #1,1
2010 NXT=CVI(NXT$)
2020 MAX=CVI(MAX$)
2030 COUNT=CVI(CNT$)-1
2040 PUT #1,R
2050 LSET NXT$=MKI$(R)
2060 LSET CNT$=MKI$(COUNT)
2070 PUT #1,1
2080 RETURN
```

Listing 3 - REBUILD Procedure

```
10  DEFINT A-Z
20  OPEN "R",#1,"MAST",80
30  OPEN "R",#2,"INDX",12
40  FIELD #1,2 AS NXT$,2 AS MAX$,2 AS CNT$
50  FIELD #1,80 AS REC$
60  FIELD #2,10 AS KEY$,2 AS POINTER$
70  GET #1,1
80  COUNT=CVI(CNT$):MAX=CVI(MAX$)
90  DIM K$(MAX),P(MAX)
100 FOR I=1 TO COUNT
110  GET #2,I
120  K$(I)=KEY$
130  P(I)=CVI(POINTER$)
140 NEXT I
150 S=1:L=10
160 FOR I=1 TO COUNT
170  GET #1,I+1
180  K$(I)=MID$(REC$,S,L)
190  P(I)=I+1
200  N=COUNT
210 NEXT I
220 GOSUB 280
230 FOR I=1 TO COUNT
240  LSET KEY$=K$(I):LSET POINTER$=MKI$(P(I))
250  PUT #2,I
260 NEXT I
270 STOP
280 BM=N:BT=N
290 BM=INT(BM/2):IF BM=0 THEN RETURN
300 BK=BT-BM:BJ=1
310 BI=BJ
320 BL=BI+BM
330 IF K$(BI)<K$(BL) GOTO 370
340 SWAP K$(BI),K$(BL):SWAP P(BI),P(BL)
350 BI=BI-BM
360 IF BI>=1 GOTO 320
370 BJ=BJ+1: IF BJ>BK GOTO 290
380 GOTO 310
```


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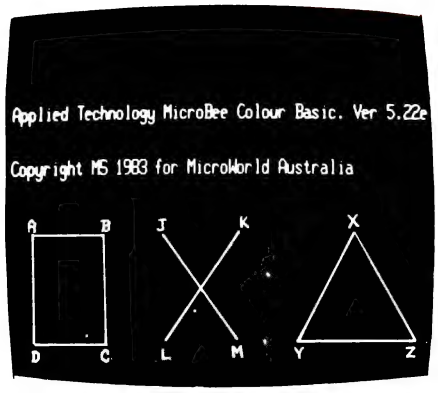

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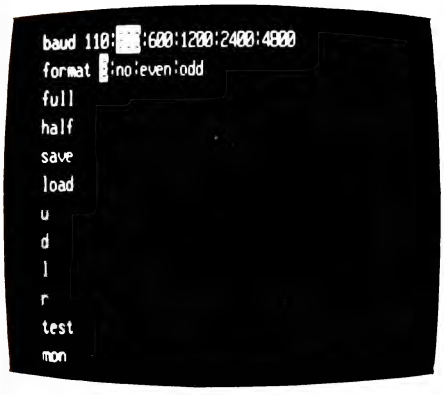

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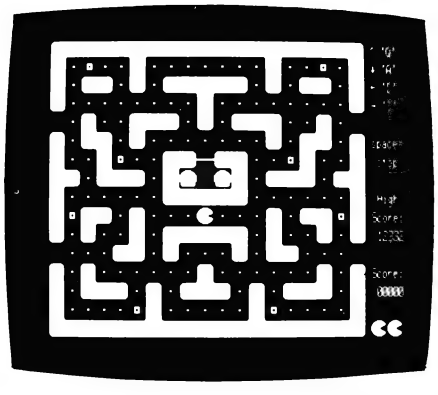

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your IBM computer

By Lloyd R Borrett

BY THE TIME you see this the IBM-PC will have celebrated its second birthday. I wonder if IBM had any idea of the impact this computer would have when it released it (overseas) back in August 1981. Certainly the entry of IBM into the personal computer market has been a major force behind the rapid expansion of the market in the USA.

Recently we have seen the introduction of software packages written to use the extra power of the Intel 8088/8086 chips. Until now the only packages available have been warmed-over programs that could be run just as effectively on an 8-bit system. The new generation of packages such as Lotus 1-2-3 have changed all that.

Lotus 1-2-3

Lotus 1-2-3 is an integrated system of programs capable of spreadsheet analysis, database management, graphics, report generation, limited word processing, file management, translation of file formats, and text and graphics printing.

Yes, all that in one software package. That's one benefit of using the power available on 16-bit systems; the other is that 1-2-3 performs most commercial and financial spreadsheet operations about four times faster than VisiCalc.

I have not previously seen a software package that can do so many things so well, and at the same time be so well implemented. A comprehensive tutorial diskette teaches the beginner how to use 1-2-3, and its human engineering, speed, power, and flexibility make it a joy to use.

1-2-3 improves on the VisiCorp trio of VisiCalc, VisiPlot, and VisiDex in both price and functionality. If you are considering buying any microcomputer for spreadsheet work, or just a spreadsheet program, check out 1-2-3 first. I'm sure you'll have second thoughts about what to buy. This package deserves its position as the number one best-selling program for the IBM-PC.

Keep in mind that Lotus 1-2-3 is just one of a new breed of advanced software packages that will become available on 16-bit microcomputers. Many software houses have realised how huge the PC market has become and are flat out developing new programs for it. With over 3000 programs already available for the PC, the future appears very rosy indeed.

DOS 2.0

I think I can now safely say that PC-DOS (MS-DOS) will be the operating system to dominate on 16-bit microcomputers for the next twelve months. I see the IBM-PC and the Wang Professional Computer being the two most successful systems in the Australian business market, and both IBM and Wang are actively supporting the use of DOS in preference to CP/M-86, the P-System, UNIX, and others.

The introduction of DOS 2.0 has solved a number of potential problems, and at the same time provided two of the most attractive features of UNIX: tree-structured directories, and redirection and piping of standard input and output.

The introduction of tree-structured directories is designed to improve the PC's use with a hard disk. DOS 1.10 treated each disk as a separate directory. Now this is fine for a floppy-disk-based system since the number of files is limited to 64 for single-sided disks and 112 for double-sided disks. However, when a hard disk is attached the user may want to store several thousand files.

You can appreciate the problems this could cause. The use of a DIR command would result in several minutes of watching file names scroll off the screen, and it would become very difficult to locate related files. The solution is tree-structured directories.

Although there are many different types of files, for the purpose of this explanation I'll place files into one of two categories: directory files and data files. A directory is a file that catalogues and contains information used to access other files. You can think of directories as the information desk in a library. Directories don't actually contain any usable information, but they do contain passageways to other directories and files. You use directories to organise your files, but not to store information in.

Data files are like the books in a library; they contain information, but they don't allow you mobility. You cannot use a data file to get to another file.

Directories are organised into a network resembling a family tree. A 'high' directory is superior to directories on lower branches of the tree. The top directory in the tree is called the root directory, and directories on lower branches are called subordinate directories.

You may add or remove directories, copy files from one directory to another, and instruct DOS to look in a specific directory to locate a file. It is like having several disks in a drive at once.

Piping Input And Output

DOS 2.0 allows redirection of standard input and output. Standard input is the keyboard, and standard output is the screen. By using special characters on the command line you can cause a program to receive its input from a source other than the keyboard, or to direct its output to a destination other than the screen. This temporary redirection is a handy tool for debugging.

The provision of piping of standard input and output allows the standard output of one program to be used as the standard input to another. DOS 2.0 acts as a 'pipeline' to direct the output of the first program to the input of the second.

Piping is the key to the success of UNIX. By combining single-purpose tools together via piping, many different functions can be easily performed. For example, by combining the DIR command with the SORT utility it is possible to produce a sorted directory listing:

```
DIR|SORT
```

The standard output from the DIR command is sent to the standard input of the SORT utility.

Other features introduced with DOS 2.0 include background printing, hard disk support, disk volume labels, installable device drivers, increased disk capacity, improved batch mode, and ANSI escape sequence cursor positioning.

Currently there is still some confusion as to which programs will work under DOS 1.10, DOS 2.0, or both.

Some programs written for DOS 1.10 will not run under DOS 2.0. Programs that don't make (or worse, bypass) the proper operating system calls, or that make direct BIOS calls, probably will not run under DOS 2.0. Given time the situation will become clear, and I see most users upgrading to DOS 2.0.

Multi-Function Boards

Readers of magazines such as *PC World, PC Magazine, Softalk for the IBM-PC* and others will be aware of how many different multi-function add-on boards are avaliable. Well, after a careful review I decided to go with the AST Research MegaPlus.

The standard board comes with 64 Kbytes of memory, one RS-232C asynchronous serial communications port, and a calendar clock with battery backup. I have optioned it up to provide a total of 256 Kbytes of memory, two serial ports, a parallel port, and the calendar clock. AST Research also produces another board called MegaPak with 256 Kbytes of memory, which can be piggybacked onto the MegaPlus board.

As a bonus, AST Research provides three valuable utility programs with the MegaPlus: SuperDrive, a disk emulation program allowing the use of part of the memory as a super-fast 'electronic disk drive'; SuperSpool, an intelligent print spooler allowing the output of files to a printer without tying up the PC; and ASTClock, a program to read the calendar clock and set the system date and time.

I am more than satisfied with the AST Research MegaPlus. The installation and operation guides for both the hardware and software are comprehensive and easy to follow. The board has provision for split memory addressing, which makes it possible to add more memory, yielding a total usable memory size of 832 Kbytes.

And how much does it all cost? I purchased the board via a mail order house in the USA for $US520. After the cost of currency conversions, five per cent duty and shipping costs, the final total was $A685. It makes me wonder about the level of mark-up that Australian dealers are placing on multi-function boards; one dealer quoted me $1500 to supply this same board.

Hardware And Software Prices

I purchased my PC from CompuThink, well before the official release of the PC in Australia. Now CompuThink has not become an IBM dealer, and yet is still able to import PCs into the country and sell them at competitive prices. I think it safe to assume that CompuThink is still making a reasonable profit on its sales. This led me to consider carefully the options open to me before purchasing more hardware and software.

When I asked some dealers why software packages such as Lotus 1-2-3 (listed at $US495 in the USA yet sold for $A895 in Australia) have such a huge mark-up, I was told all sorts of horror stories with 35 per cent customs duty and 20 per cent sales tax as the villains of the piece. (Note the USA list price is often far in excess of the price paid when actually buying an item.)

Well, I decided to test the water. As you have seen, I saved a bundle by buying the AST Research MegaPlus direct from the USA, but what about software? The following table shows the prices I was quoted by Australian dealers, compared to the price paid by buying direct:

	Dealer	Direct
Lotus 1-2-3	$895	$480
TK!Solver	$750	$300
Copy II PC	$85	$50
dBase II	$865	$580

As you can see, it is possible to achieve some huge savings. I would like to know how the Australian importers and dealers can justify their prices.

DOS 1.10 Diskcopy And Diskcomp Bugs

The DOS 1.10 version of the DISKCOPY and DISKCOMP utilities have a bug in them which only manifests itself when the user has a large amount of memory (320 Kbytes or more) and double-sided disk drives. They will both get into an error loop and try to read past the end of the source drive.

When you purchase Lotus 1-2-3 a program called FIXDOS is provided to patch DISKCOPY and DISKCOMP. For those of you without Lotus 1-2-3 I have included in this article the patches provided by AST Research.

A patch is a short program which alters the way the operating system usually handles a particular situation. I recommend the following procedure for applying patches.

Create a DOS diskette which contains the DEBUG utility and the program to be patched. Place this disk in drive A and boot the computer. After the patch is applied and the program tested, the new (patched) version can be copied over to your working diskettes. **Do not apply patches to your master diskettes – use back-ups only! Test the patched version before using it!**

In the following procedures, you enter all **boldface** text exactly as shown; **be sure to include spaces**. End each entry line with the 'enter' key. The computer responds with all other output.

```
A>debug diskcopy.com
-e861 e8 74 00
-e8d8 3d 51 00 72 02 b0 50 a2 36 05 c3
-rcx
CX 07D8
:7e3
-w
Writing 07E3 bytes
-q

A>

A>debug diskcomp.com
-e6ec e8 79 00
-e768 3d 51 00 72 02 b0 50 a2 95 04 c3
-rcx
CX 0668
:673
-w
Writing 0673 bytes
-q

A>
```

Potential Printer Problems

I advise those of you who are using Epson printers to check the settings of the two internal DIP switches. Both the Epson MX-100 III printers I have installed came with the switches set to select the French version of the International Character Set.

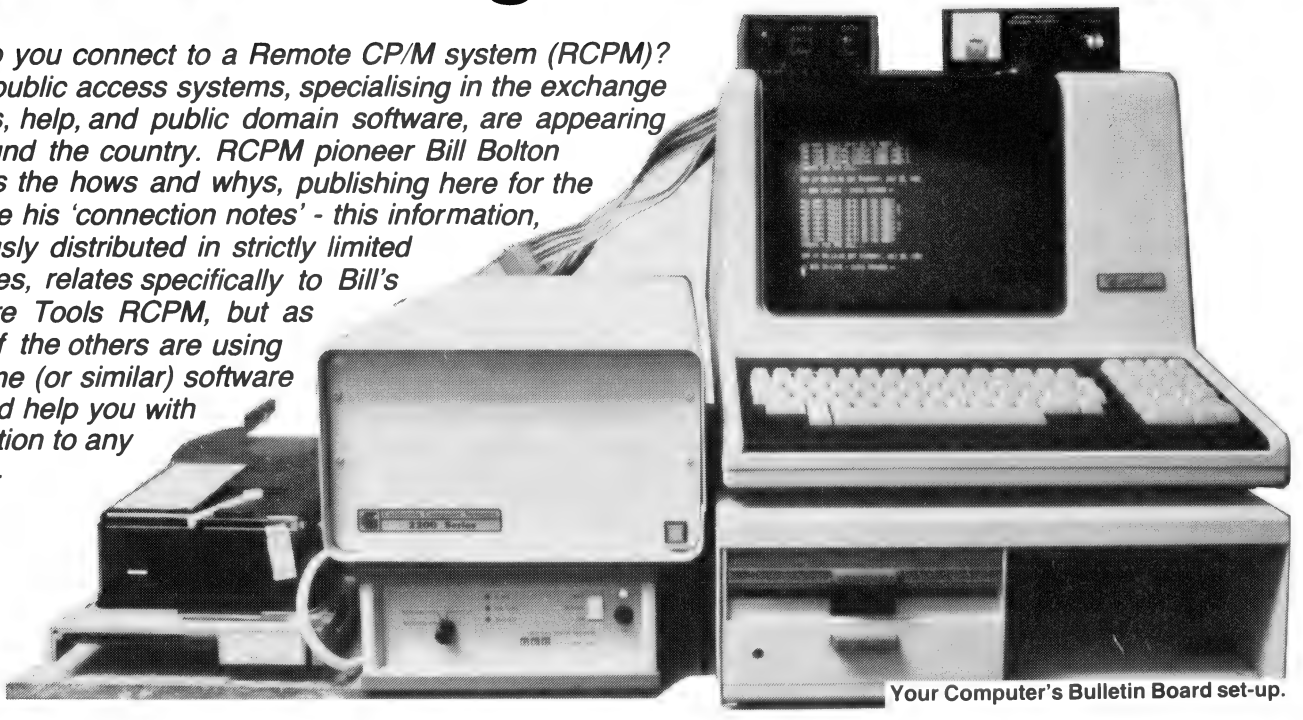
More Information

If you have any special areas of interest you would like to see covered in this column, please contact me via *Your Computer*, and I'll see what can be done.

Finally, I'm wondering how much interest there would be in a Melbourne IBM-PC user group. If you are at all interested in attending meetings of such a group, please let the magazine know. If there is sufficient interest I'll see what can be done about getting a group started. □

RCPMs - The Free Software Smorgasbords

How do you connect to a Remote CP/M system (RCPM)? These public access systems, specialising in the exchange of ideas, help, and public domain software, are appearing all around the country. RCPM pioneer Bill Bolton explains the hows and whys, publishing here for the first time his 'connection notes' - this information, previously distributed in strictly limited quantities, relates specifically to Bill's Software Tools RCPM, but as most of the others are using the same (or similar) software it should help you with connection to any system.



Your Computer's Bulletin Board set-up.

WHEN MY RCPM system first started, microcomputer data communications was a relatively new area for Australia, and I didn't want to spend a lot of time on the phone explaining the same basic communications facts to many users about how to connect to the system (there are better things to do in life).

The idea of a set of 'connection notes' grew out of the needs of these new users. As the notes were the only way to find out the number of the system, they acted as an initial filter in that you had to be motivated enough to send me an SSAE to get them. This made sure that the initial users really wanted to use the system and weren't just idly curious.

Since those heady, early days the situation has changed. There are now several RCPM or BBS systems running on the East Coast, with more planned to come on-line before the end of the year. The very existence of the Software Tools RCPM system has encouraged over 500 microcomputer users to get actively involved in data communications, and I'm sure the MICOM CBBS has had a similar effect in Melbourne (though the number of interstate callers on both systems is considerable).

Another major change has been the introduction of affordable direct connect modems in Australia. These modems have dramatically improved the reliability of data communications for the average microcomputer user. This is backed up by my system logs, which show the number of premature disconnects has plummeted since the introduction of cheap direct connect modems.

Now there are more systems and more opportunities to use an RCPM or BBS system, it seems appropriate to publish the 'connection notes' more widely, rather than keep a restricted circulation (besides, I suspect Matt Whelan plans to use them as a major part of the introductory material for the MiCC BBS documentation).

The Notes

Before we rush into the prosaic stuff about connecting to the system, let me explain *why* the RCPM system has been made available for your use. Basically it is to provide a means for the collection and distribution of *public domain* CP/M programs. The term 'public domain' means the programs are available for non-commercial use and copying with no copyright restrictions.

There is a great deal of public domain software from the USA available via the RCPM system. I hope you will find this useful, but I also hope you will contribute programs you have written to the public domain, via the system, in return.

The RCPM system also supports a message system which you can use to request help with software and hardware problems. This is a self-help system. As well as requesting help from the system you are asked to answer queries from others where you can.

I don't have much time to devote to maintaining the RCPM system, so if the thing is going to be useful you and the rest of the CP/M user community will have to be prepared to be 'givers' as well as 'takers' of information and software.

Okay, that's the end of the sermon – here's the stuff you were waiting for...

What Is On The System?

Lots of stuff. Catalogues for all the major CP/M user groups; CP/M, SIG/M, 'C', as well a growing collection of Australian-written programs (which are not available elsewhere). Utilities to search the catalogues; extensive on-line HELP facilities; a message subsystem so you can ask other users for help (and in turn help other users), and communications utilities in source code form to download.

You can request that the software in catalogues be put on the system so you can download it.

And best of all, it's all free! (You do have to pay your own communications charges, of course!)

What you need

You need a modem or acoustic coupler suitable for CCITT V21 'ORIGINATE' operation (such as a Dick Smith Dataphone, CI Cicada, DataSat World Modem, Modem Technology UDM 1200, Prentice STAR, Sendata 700 and so on), and you need to know how to use it.

The purpose of this article is not to tell you how to use the physical equipment you already have, though it does give a few hints if you experience problems. Your equipment supplier should have instructed you in the use of your data communications equipment; if you don't know how to use your modem/acoustic coupler find out about that *right now* before reading on.

If you intend to just plug a terminal into your modem/coupler then you need nothing else. If you want to use your whole computer as an 'intelligent' terminal you will need a program which will allow you to establish communication, using ASCII characters, with a remote computer. It is highly desirable that you have some means of saving ASCII text from the RCPM system as a file on your disk system. You will need this facility to be able to get access to better public domain communications programs which will allow secure protocol transfers of programs to and from the RCPM system. Some suitable CP/M communications programs to get you started are Telnet, Teled, Term, BSTMS, Microlink, PLink, Modem, Yam, RCPMLink and so on. Note that Telnet, Yam and Modem are public domain programs which may be available from any computer store which has disks from the various CP/M-based user groups.

If you don't already have a suitable communications program and are prepared to work a little at getting a good one, don't spend a lot of money buying one – get the cheapest one you can. Yam and Modem7 are available for downloading from the RCPM system at no charge – you just have to have some way of communicating with the system to start with.

If you already have BSTAM or Hite you can use those programs to download Yam or Modem7. BSTAM and Hite are only supported for binary file downloading and are far from satisfactory programs for use with a remote system; however, they will get you started. You will still need an ASCII communications utility if you intend to use BSTAM or Hite.

If you have an Osborne 1 computer ask your supplier about RCPMLink. It is written specifically for communicating with RCPM systems and will immediately give you full access to the program transfer facilities of the system. It is not expensive, about $50 to $60, and is well worth it.

The Osborne is a difficult machine to adapt programs like Yam or Modem7 to if you don't already have access to the system (it's easier once you get on, but how do you do it without a terminal program to start with?), so you can save yourself a lot of trouble by starting with RCPMLink. (Delta Computers of Bankstown, NSW, has RCPMLink, if you can't get it from your normal Osborne dealer).

If you have a CP/M-86 or MS-DOS computer such as the NEC Advanced Personal Computer or the IBM-PC, the Modem86 program is also known to work and will allow you to get going immediately with file transfers. It is imported by Software Source, at Bondi Junction in Sydney.

Please note that the only support I am able to provide on communications programs is *solely* provided through the RCPM system itself. If you have an unusual type of computer, you have to sort out your own way of getting a suitable communications program onto your computer.

Basic Information

The following information should be enough to allow you to connect to the system if you are already familiar with computer communications from using remote systems such as Midas, the MiCC bulletin board or other time-sharing systems.

If you don't understand it you will probably need to read the later sections for more details.

Phone number: (02)997-1836

Data format: 8 data bits,
1 stop bit,
no parity,
full duplex,
300 bps (baud)

Mode: Your modem/acoustic coupler needs to be in the "ORIGINATE" mode, CCITT V21 standard.

RCPM 'Opening Hours'

The system is on-line 24 hours a day. A brief period each day is taken for system maintenance, but this is done between calls as far as possible.

The system is now very popular and it's often difficult to get onto it. If you keep getting an engaged signal please don't give up; it means someone else is using the system, so just keep trying, you'll get through eventually.

Password

There is no formal password system at this stage, but you will need to know the name of Digital Research's standard debugger to gain access to the system. If you don't know the answer to this question you should find out from a CP/M user right away.

This is to satisfy a Telecom requirement that the service not be a 'general third-party message switching service' - it has been approved as a common-interest service for CP/M users, so you are expected to know a little about CP/M to get onto the system. If you are not a CP/M user it will be to your benefit to learn about CP/M to get the most out of the system in any case.

What To Expect To See

Normally you should get an 'echo suppressor' tone from the RCPM system within a few seconds of the phone being answered. This is followed after about four seconds by ANSWER carrier. You then have 25 seconds to establish ORIGINATE carrier from your modem/coupler before the system will decide that you must have been an accidental voice caller and stop sending carrier to you and reset itself. This is normally an ample period of time to get a handset into the cups of an acoustic coupler and establish carrier.

An acoustic coupler in the ORIGINATE mode will usually not produce carrier until it is successfully receiving carrier from the answering system.

Once you have established communication with the system you should see a message:

HOW MANY NULLS (0-9) DO YOU NEED?

If you do not see the message soon after placing your handset in your acoustic coupler (or putting your modem on line), the RCPM system is probably not getting a strong enough carrier from your modem/coupler. This may be due to poor line conditions, poor coupling with your acoustic coupler, 'packing' of the transmitter in your telephone, or other technicalities. See a later section heading for what to do if you experience 'no carrier' problems.

Remember that the RCPM system will always hang up on you after 25 seconds if it has not received carrier from your modem/coupler, and if this happens you will have to hang up and dial in again.

The 'HOW MANY NULLS' message means you have established contact with the RCPM system. If you see part of the message and then transmission stops before the '?' (or for that matter if it stops in the middle of something at any other time), it means the system is having trouble getting reliable carrier from your modem/coupler. You have 25 seconds to re-establish carrier before the RCPM system will reset itself.

If you lose carrier and re-establish it ▶

very often (greater than 25 times) the system will conclude that the line is unreliable and will abandon the contact by hanging up and resetting itself. See the later section on changing modem modes for a possible solution to bad line performance.

If you are using a CRT terminal you should respond to the HOW MANY NULLS question with 0. If you are using an 80-column video card on an Apple you may need nulls; some of these cards are slow, so you should try three nulls for starters.

If you're using a printing terminal you'd better play safe and say nine nulls the first time. If you find you're losing characters from the start of lines when using the RCPM system, increase the number of nulls next time you log in. Once you have answered the question it is not possible to change the number of nulls during a session. You will have to put up with the results or leave the system and log in again.

If you see the message but cannot get the RCPM system to accept your response, you should make sure your modem/coupler is producing carrier. If you're sure it is, then it probably means you're not set up for the right data format as specified above. The RCPM system may respond to anything you type by repeating the 'how many nulls' prompt; if this happens it certainly means your data format is incorrect, so you'd better hang up and get your act together.

If you see a string of garbage repeated every time you hit a key, this also means your data format is incorrect. If you see random garbage characters with no repetition, the RCPM system has probably stopped sending carrier to you.

Once you have successfully answered the first question you will be asked if your terminal can display lower case characters. If you answer 'N', all output from the RCPM system will be folded to upper case for you. This may produce a few odd-looking displays, as some of the utilities use characters such as a vertical bar to delimit information, and when folded to the upper case character set this gets changed to a backslash!

Changing The Modem Mode

After the 'lower case' question you will be asked:

DO YOU WANT TO 'FLIP' THE MODEM MODE?

Most first-time callers should answer 'N' to this one. 'Flipping' the modem mode means changing the RCPM modem to ORIGINATE mode while you simultaneously change your modem or acoustic coupler to the ANSWER mode. Some users may find that lines which were unreliable when they were in ORIGINATE mode are quite okay when the modems are 'flipped'.

You should only answer 'Y' to this 'FLIP' question if you have not been able to successfully complete a log-in while staying in ORIGINATE mode. Once you have committed yourself to a mode change (you get one chance to change your mind if you answer 'Y') you *cannot* change back to ORIGINATE mode at your end until you successfully complete the log-in and reach CP/M command level. At CP/M command level there is a command called 'FLIP' (what else!) which will allow you to change modes as often as you like.

If the mode change is successful you will see a message advising you so. If it was not successful the system will reset for the next call after 25 seconds and you will need to call again.

If you don't understand what 'ANSWER' and 'ORIGINATE' modes are all about or don't have a switch marked 'ANSWER' or 'ORIGINATE' on your modem or acoustic coupler, then just answer 'N' to the 'FLIP' question.

After answering the 'FLIP' question you get passed from the communications supervisor to the log-in program.

Logging In

The log-in program will ask you a question about CP/M (you get three tries to get it right) and then ask for your name and location. The first time you log in to the system you will be given some 'HELP' information and asked about the type of hardware and software you are using. Please answer the survey questions as accurately as possible, as it is important information to help me fine-tune the facilities of the system to the needs of the users (including you). You then get passed to CP/M command level.

The first-time log-in is rather lengthy, but from then on the system will only ask for your name and give you important or new information before passing you speedily to CP/M.

System HELP Facilities

The RCPM system has extensive HELP facilities available on-line to allow you to learn about the system and to enable you to use it effectively. You will be told about the most important currently available HELP files when you log in for the first time.

Help on THIS-SYS, Messages, Software, Modem and CPM22 were the most important ones available when I wrote this. Other HELP files you may find useful are available on-line as well. New HELP files are announced in the 'Information on latest programs', which is available during log-in or in the message subsystem.

Once you are on the system the HELP files will tell you everything else you need to know. You should read them carefully.

Hints On Using Acoustic Couplers

Many connection problems have been traced back to users not knowing how to use their acoustic couplers correctly. The major problem is 'packing' of the transmitter in the telephone handset.

It is *absolutely vital* that you lie your telephone handset on its side when using it in an acoustic coupler. 'Packing' means that the carbon granules in the transmitter (or microphone) of the handset become packed together by gravity and do not convert sound waves to electrical signals efficiently, so your coupler does not generate enough electrical signal, through your telephone, into the line to enable reliable reception of data at the remote system.

Sometimes giving your handset a sharp tap on the edge of a table helps – but not too hard! Another cause of low carrier level is that the handset is not pressed tightly into the cups of the acoustic coupler.

You may find you can access some remote systems without difficulty but not others. Telecom line or exchange problems are likely to be a contributory cause, but often attention to the details mentioned above can turn what was thought to be a bad line into a satisfactory one. If you do suffer from 'bad line' problems you may like to try a different time of day, as line conditions do seem to vary with time.

The End

Well, there you go. Though the notes are specific to the Software Tools RCPM system, you will find that most of the other RCPM and BBS systems have similar log-on procedures. The MICOM CBBS is the most dissimilar, though there is still a strong 'family resemblance'.

You'll find the numbers for all the free, public access systems (PAMS) at the end of my CP/M column in this issue of *Your Computer*. Why not give one a try soon!

A Copyright Notice

This material is copyrighted. This doesn't means I don't want it to be freely used by anyone wanting a handout to give to people on data communications with remote systems, it just means that I'd like you to ask me before using any of it. Thanks. (*That goes for the people who have been lifting Bill's material off the Mi-Computer Club system, too* – **Ed**). □

Continued from page 44

Spell – Catch Those Mistakes!

dictionary, but does slightly increase the chance that Spell will miss a correctly spelled word. This effect of adding extra words is much more noticeable in the 48K and smaller DICTNARY files. I use an Osborne 1, which has ample space to use the DICTNARY.64K file, so I haven't experimented with the smaller files.

You Still Need A Dictionary

A good dictionary (book-type, that is) is a necessary accessory to this program. You need it to check each candidate misspelling offered to you by the Spell program. Another point to watch for (with all other spelling programs as well) is that if you misspell a word but in doing so make another word in the dictionary, for example typing 'from' to spell 'form', Spell won't pick it up. In other words, you still have to proofread your documents to determine that all words are correct in context.

The main gripe I have with the program is that it ignores hyphens at the end of lines. This produces candidate misspelled words, like 'sideeffect' instead of 'side-effect'. You can allow for this, but it would be nice if the program treated soft and hard hyphens differently.

Conclusions

If I really needed specialised text processing spelling utilities, or had a lot more money (and disks with more than 184K each), I would get a spelling program with more options and abilities. Truthfully, though, I can't justify paying for one, so Spell will be a lot better than nothing for the job I need it to do.

This utility does exactly what it says it does. It finds misspelled words and shows them to you, at which time you can mark them in your text file. There are other programs that do this and much more as well, but if you're prepared to do a little looking-up in an ordinary dictionary, why pay three times as much? If you're in need of a simple to use and compact spelling program, Spell will do an excellent job. □

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your VIC computer

By Andrew Farrell

YOU MAY BE shocked to hear that the official price of a Commodore 64 is now $499, only $100 more than the VIC-20 when it was first released little more than a year ago.

The other good news is that the 1541 disk drive, the 1525 and 1526 printers and the 1530 datasette have also been reduced by considerable amounts. It looks as if now is the time to buy or cry!

One thing that looks fairly stable is the cost of software, which is continuing to improve in both quality and availability. Imagineering has just released a new range of cartridges, making some excellent games originally developed on the Atari and the Apple available for the VIC-20.

These games range in price from $39 to $69, and should be available in limited quantities from most Commodore dealers.

Gridrunner Sequel

Gridrunner addicts should watch out for Jeff Minter's latest creation, the follow-on to 'Gridrunner', called 'Matrix'. Although the basic idea has changed little, the game has increased greatly in speed and complexity.

For those not familiar with the original, the setting is a large energy grid deep in outer space, which is infested with enemy droids. Your mission is to rid each sector of the droids using your powerful gridrunner.

The droids attack in waves of increasing length, and weave their way toward you amongst randomly appearing pods. Unlike 'Gridrunner', you can now move your ship everywhere except the top four lines.

There are twenty different levels, in which you may meet anything from a Cosmic Casmeloid (similar to a mutant camel) to crazy Deflexors which send your fire bouncing off at weird angles.

'Matrix' is a great game and should be another winner for its author, Jeff Minter, at $21.95 for the VIC and $22.95 for the 64. Both versions are available from most Commodore dealers. Contact Progressive Software on (02)44-6393 for further details.

Graphics Editor

In my last column I mentioned how to go about designing your own graphics characters using scrap paper. I've included a program this month which will allow you to simplify this process even further. You can also design large pictures from several characters next to each other.

The controls are quite simple and allow one character at a time to be edited from a maximum of 64. A matrix of several characters may be displayed at the bottom of the screen.

Editing controls:

A – last character
N – next character
← – erase dot
space – fill dot
s – set matrix size
K – erase entire character
H – erase entire character set
1 – save set
2 – load set
D – display character

Adding extra commands, for example to transfer characters or merge two sets together, should be easy. Details will probably appear in this column at a later date.

The Save command simply saves the entire character set, starting from location 7168 to location 7679 as a sequential file. The Load command does the reverse.

How Compatible?

Many people have been asking just how compatible the Commodore 64 and the VIC-20 are. The answer is that most BASIC programs are fully compatible, except for screen, colour, sound and other special POKEs. The screen format may also need to be changed from the VIC's 23 columns to the 64's 40, or vice versa.

The main problem is that the cassettes are not compatible because the 64 operates at a slower speed than the VIC. Therefore the only way to transfer programs is by using a disk drive.

So far as hardware goes, all peripherals except those using the memory expansion ports are compatible; that includes printers, disk drives (1541), modems and cassette players, but not cartridges. □

```
READY.
0 POKE650,255:GOTO10
1 CS=PEEK(SC+N+(M*22)):CF=209:X=5:Y=5:V=1:W=1
2 POKE(SC+N+(M*22)),CF:GETR$:IFR$<>""THENPOKESC+N+(M*22),CS:RETURN
3 IFD<10THENCF=209:D=D+1:GOTO2
4 IFD<20THENCF=CS:D=D+1:GOTO2
5 D=0:GOTO3
10 OPEN2,2,2:POKE36879,8:PRINT"■■":SC=7680:GR=207:T=7168:CL=38400:BL=230:POKE368
69,255
12 CF=209:FD$="DEF"
15 D$="■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■":T$="■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■"
20 FORI=7424TO7431:POKEI,0:NEXT:PRINT"■";:FORI=1TO8:PRINTTAB(8)"■ "RIGHT$(STR$(I
),1):NEXT:PRINT"■──────────"
22 PRINT"■──────────────────────────"
30 PRINT"■"LEFT$(D$,10)"■"FD$" CHAR:                ←■■■■■■■■■■■■■■■"CN:IFGGTHENRETURN
32 PRINT"■──────────────────────────"
99 GOTO1000
100 FORI=0TO7:FORK=7TO0STEP-1
102 IFPEEK(T+I+(8*CN))AND2↑KTHENPOKESC+7-K+(I*22),BL:POKECL+7-K+(I*22),4:GOTO110
105 POKESC+7-K+(I*22),GR:POKECL+7-K+(I*22),1
110 NEXTK,I:RETURN
130 FORI=0TO7:PRINT"■"LEFT$(D$,I)LEFT$(T$,11)"■    ■■■■■"PEEK(T+(CN*8)+I)
135 PRINT:PRINT"■■■"LEFT$(T$,15)T+(CN*8)+I
140 NEXT:RETURN
150 DD=0:FORB=1TOY:FORC=1TOX:POKESC+((14+B)*22)+3+C,DD:DD=DD+1:POKECL+((14+B)*22
)+3+C,1
155 NEXTC,B
190 RETURN
800 GOSUB850:X=VAL(R$):PRINTX" BY";:GOSUB850:Y=VAL(R$):PRINTY;:IFX*Y>36THENPRINT
" BAD":R$="S":GOTO1070
810 PRINT" O.K":GOSUB150:GOTO1000
850 PRINT"■";:GETR$:IFR$=""THEN850
860 RETURN
1000 GOSUB100:GOSUB130
1010 POKE7916,CN:POKE38636,1:POKE7918,CN+128:POKE38638,4:GG=1
1011 GOSUB1
1012 IFR$="■"THENM=M+1:IFM>7THENM=0
1014 IFR$="■"THENM=M-1:IFM<0THENM=7
1016 IFR$="■"THENN=N+1:IFN>7THENN=0
1018 IFR$="■"THENN=N-1:IFN<0THENN=7
1020 IFR$=" "THENPOKESC+N+(22*M),230:POKET+M+(CN*8),PEEK(T+M+(CN*8))OR2↑(8-N-1)
1030 IFR$="K"THENFORI=T+(CN*8)TOT+7+(CN*8):POKEI,0:NEXT:GOTO1000
1040 IFR$="←"THENPOKESC+N+(22*M),GR:POKET+M+(CN*8),PEEK(T+M+(CN*8))AND255-(2↑(8-
N-1))
1050 IFR$="D"THEN1000
1055 IFR$="A"THENCN=CN+1:GOSUB30:IFCN>64THENCN=64
1057 IFR$="Z"ANDCN>0THENCN=CN-1:GOSUB30
1060 IFR$="H"THENFORI=7168TO7679:POKEI,0:NEXT:GOTO1000
1070 IFR$="S"THENPRINT"■"LEFT$(D$,13)"■■MATRIX:";:GOTO800
1075 IFR$="1"THENGOSUB9000:OPEN1,1,0:FORI=7168TO7679:PRINT#1,PEEK(I):NEXT:CLOSE1
:RUN
1077 IFR$="2"THENGOSUB9000:OPEN1,1,1 :FORI=7168TO7679:INPUT#1,Z:POKEI,Z:NEXT:CLO
SE1:RUN
1090 GOTO1010
1200 CN=(W-1)*X+V-1:PRINT"■"LEFT$(D$,10+W)"■D":PRINT"■"LEFT$(D$,12)LEFT$(T$,5+V)
"■■V"
1299 RETURN
9000 POKE36869,240: PRINT"■■■":RETURN

READY.
```

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your ZX81 computer

By David Brudenall

AT THE TIME of writing, the ZX Spectrum has still not yet reached our shores. I was recently talking to a local Sinclair dealer who was rather irate about the delays. He was promised a shipment in May or June, but by August he had still received no ZX Spectrums.

No one seems to know whether these delays are the fault of Barson Computers (the sole Australian distributor of Sinclair products), or Sinclair Research at the UK end. Meanwhile, my local dealer has to keep turning away people interested in the ZX Spectrum – he says some 60 people have come into his shop seriously interested in buying a Spectrum, only to be told that he has none in stock, and can't be sure when any will arrive.

I, as well no doubt as other readers of *Your Computer*, would be most interested to hear from Barson's the reasons for this delay – but perhaps an expected delivery date would be asking too much?

Of course, the longer Sinclair/Barson dawdle around, the more people will obtain the Spectrum by other means – normally by buying Spectrums from the UK. While it is all very well to say that Barson has to pay for local advertising, overheads and so on, and therefore has a good argument for being sole Australian supplier, if it can't get its or Sinclair's – act together and distribute the computers well enough, it must expect Australian buyers to look elsewhere to purchase.

Meanwhile (at time of writing), the much-awaited ZX Microdrive is almost ready for release in the UK. However, it will only be offered to the earliest purchasers of the Spectrum first, as they've been waiting the longest. Give the Microdrives a year or two, and they'll arrive here...

Software and add-ons for the Spectrum are being produced at an incredible rate in England. Evidently an interface is available to allow a normal parallel Centronics-interface printer to be used with ZX Spectrum. Cost? Thirty pounds ($70 or so).

'The Hobbit', by Melbourne House, for the 48K Spectrum, is gaining fame as probably the most sophisticated piece of software available for the Spectrum. 'The Hobbit' is a graphics/text adventure based on J R R Tolkien's classic of the same name. The player takes the role of Bilbo, the Hobbit. A copy of the book is included with the program to provide additional clues for the player. It can be obtained in Australia from Melbourne House (in Melbourne) for around $40.

The incredibly low prices of computers in the USA are likely to startle a few Australian computer owners – there the Timex equivalent of the ZX81 (the Timex 1000) can be purchased new for as little as $29.95 from places such as K-Mart. Quite a difference from the $250 Barson Computers charged for the ZX81 when it first reached Australia!

Sinclair computers aren't the only ones to get such massive price reductions – the VIC-20 sells for less than $100, along with the TI99/4A. The Commodore 64 is around $299 (the price of the VIC here). It's probably false economy to try and obtain a cheap home computer from the USA, however – they use the NTSC (Never Twice the Same Colour) television system, and thus will not work with Australian PAL television (or with Australian power supplies, for that matter).

Quickie Software Reviews

QS Defender, for the 16K ZX81 or 8K ROM ZX80: 'QS Defender', a product of the large UK software firm Quicksilva, is a version of the arcade game 'Defender'. Of course, much has had to be sacrificed from the original in this version (high-res graphics, colour, sound and so on), but the essential spirit of 'Defender' remains.

The controls work quite well, even if they take a bit of getting used to, and the movement is smooth and totally flicker-free (even on the 8K ROM ZX80 without SLOW mode).

It would be unfair to compare this game with its arcade counterpart too closely, because, after all, the arcade version is far removed from the ZX81's class. I'll therefore be treating this program as an original game, assessing it on its own merits.

The player's four controls – up, down, thrust and fire – are all situated close together on the top row of keys, which at first makes control rather tricky. As the player gets more practice the controls become easier to use.

The player's spacecraft is shown on the left of the display, and does not move right or left; rather, a moving landscape is shown progressing from the right to the left side of the screen. The aliens all appear from the right side of the screen and fire deadly 'laser bolts' which are all but impossible to dodge.

When the player keeps the thrust button pressed the strategy has to change somewhat. The moving landscape below speeds up, and the laser bolts fired by the alien ships slow down to the extent where they become mere obstacles to be dodged. While dodging the laser bolts, the player must still manage to shoot the aliens.

All in all, it is quite a challenging game, although not a terribly accurate imitation of the original. As a bit of escapist fun, 'QS Defender' must rank as one of the best games I have seen for the ZX81.

I obtained my copy from Rocksoft, GPO Box 5194 AA, Melbourne 3001. (03) 729 9647. Price $14.99. Rating: 7.5 out of 10.

Spectral Invaders, for the 16 or 48K ZX Spectrum: This program is an attempt to emulate the arcade Space Invaders as closely as possible. Unfortunately it doesn't quite achieve its aims, but is a good try nevertheless.

The screen format is fairly standard – rows of invaders predictably moving back and forth, slowly descending, and four bases at the bottom of the screen for your laser base to seek cover under.

There is some sound, but it's very quiet, and the sound effects tend to slow the program down, while also making the movement slightly jerky. There is also a slight delay between an invader/laser base being hit and its actually exploding. This can be off-putting, but one gets used to it in time.

The use of colour is okay, but nothing special. The display looks pretty awful in black and white, though, which is a pity (especially as I use a black and white television most of the time!). There is a facility for two players, but only one high score is saved, and this is only visible when the game is actually being played.

Overall, it's not too bad, but not nearly as good as the arcade version (I've never liked Space Invaders much anyway!). It's not expensive at only $8 (although this price may have increased since I ordered my copy.)

If you want a Space Invaders for your ZX Spectrum, this is a reasonably good cheap version to buy, but better ones may be available.

I got my copy from Computamart, 225/227 Oxford Street, Leederville 6007. Price: $8. Rating: 6 out of 10. □

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HAD A VISITOR the other day – Mike Newnham (Indian name: One-who-builds-plotters-in-garage-out-of-industrial -rubbish). A self-confessed Z-80 nut who has a lot of time for the Bee, Mike is the type of guy who loves sharing knowledge, and the more we share the more we all learn.

The following routines, which will help you in the day to day probing of the secrets of the Z-80, are Mike's contribution solely for your education.

ROM-Based Routines

Here is a short list of usable ROM-based subroutines within the Microbee. I say short because it can be your stimulus to find more ROM-based routines as part of that continuing education we spoke about.

```
(1) 0A75F'H'
    Generates one of 255 possible tones.
    Requires : 8 bit value in B reg. for frequency.
             : 16 bit value in HL for duration.
    Destroys : A

(2) 0DCB8'H' (EDASM)
    Displays contents of HL at location pointed to by DE
    Requires : HL to hold value for display.
             : DE to hold screen address for display.
    Destroys : A and BC

(2b)0DCBD'H' (EDASM)
    Displays contents of A reg. at location pointed to by DE.
    Requires : A to hold value for display.
             : DE to hold screen address
    Destroys : A and BC

(3) 0AB05'H'
    Writes 64 nulls + '1' and header information to tape.
    Requires : Header information set up at 0E9'H' and 0F1'H'
    to0FF'H'.
    Destroys : All regs.


(4) 0AACB'H'
    Reads 16 nulls + '1' and header from tape.
    Destroys : A and BC

(5) 0AAF8'H'
    Very long time delay.
    Requires : Nothing
    Destroys : A,BC and HL

(6) 0AAFD'H'
    Variation on (5)
    Load HL and B reg with values for the variable time delay.
    Requires : B and HL
    Destroys : A,BC and HL.
```

So when you find some more send them in. Share your knowledge.

Screen Break-Up

Here's a quickie to stop screen break-up when you're writing to the screen:

```
ADDR   CODE   LINE    LABEL   MNEM     OPERAND

                00100 ;    **********
                00110 ;  SIMPLE ROUTINE TO
                00120 ; ELIMINATE SCREEN BREAK-UP
                00130 ; WHEN WRITING DATA TO SCREEN
                00140 ; RAM. WAITS FOR VERTICAL
                00150 ; RETRACE BEFORE WRITING DATA.
                00160 ; PROVIDES APPROX. 400uS OF
                00170 ; WRITING TIME AT 2MHz CLOCK.
                00180 ;    **********
                00190
0400 DB0C       00200 RETR   IN A,(0CH)
0402 CB6F       00210        BIT 5,A      ;SEE IF HIGH YET
0404 28FA       00220        JR Z,RETR    ;BACK IF NOT.
0000            00230        END
00000 Total errors

RETR    0400
```

Bee-Bop A Bee

The following routine enables the user to generate 255 possible tones with the Bee.

The note generation routine requires two integers, which are passed in through the USR calls. The first of these integers, F, determines the frequency of the note, and must be a multiple of 256; for example, N*256 where 0<N<256. Note that frequency *decreases* as the value of F *increases*.

The other integer is T. This determines the duration of the note and can range from 0 to 65535. Duration of the note is directly proportional to T.

The first three lines of the program set up the machine code routine for note generation. This is called by the USR calls. Before the first USR call you must generate values for F and T. Once the data has been read in, lines 40-70 can be treated as a subroutine, with the values for F and T passed to it.

```
TONE GENERATION PROGRAM

10 FOR X=-3072 TO -3056
20 READ D:POKE X,D
30 NEXT X
40 REM  GENERATE F AND T HERE
50 X=USR(-3072,F)
60 X=USR(-3067,T)
70 STOP:REM or RETURN IF SUBROUTINE
80 DATA 237,67,15,244,201,197,225,237
90 DATA 75,15,244,205,95,167,201,0,0
```

Star Bees

Yes, another sound generator, but what would Star Wars sound like if all the imperial laser guns went PHLUT PHLUT!

The incorporation of a routine like this into your games will add a new dimension. *(Rod Serling you're not* – **Ed)**.

```
ADDR   CODE   LINE   LABEL  MNEM      OPERAND

0002           00100 PORT   EQU       2
0400 CD0680    00110 START  CALL 8006H
0403 FE1B      00111        CP 1BH
0405 C8        00112        RET Z
0406 CD0B04    00130        CALL TONE
0409 18F5      00140        JR START

040B 1660      00150 TONE   LD D,60H        ;LENGTH
040D 42        00160 TONE1  LD B,D
040E 3E40      00170        LD A,40H
0410 D302      00180        OUT (PORT),A
0412 10FE      00190 LOOP1  DJNZ LOOP1
0414 42        00200        LD B,D
0415 AF        00210        XOR A
0416 D302      00220        OUT (PORT),A
0418 10FE      00230 LOOP2  DJNZ LOOP2
041A 15        00240        DEC D
041B 7A        00250        LD A,D
041C B7        00260        OR A
041D C8        00270        RET Z
041E 18ED      00280        JR TONE1
0000           00290        END
```

The break in the listing is just to show where to start coding from when you incorporate this into a game (or anywhere else).

Screen Dumping

And just to finish off, Mike has given us two routines to dump hi-res/lo-res and bit image mode to an Epson MX80 F/T type III printer.

Thank you, Mike, for providing these routines, and thanks in advance for the routines to come. Mike Newnham will

your MICROBEE computer

By Richard Pakalnis

VERSION 1.0

```
00100 REM  THIS ROUTINE WILL SAVE HIRES OR LORES GRAPHICS
00110 REM  FROM THE MICROBEE TO PAPER VIA THE EPSON
00120 REM  MX80 TYPE III F/T PRINTER.
00130 REM   TIME FOR FULL SCREEN DUMP IS APPROX. 2 MINUTES.
00140 REM  TO USE THIS ROUTINE,MERELY DELETE ALL THESE REM
00150 REM  STATEMENTS AND INSERT YOUR GRAPHICS ROUTINE
00160 REM  BEFORE LINE 500. RENUMBER IF NOT ENOUGH ROOM.
00170 REM  YOUR ROUTINE WILL MERELY FALL THRU TO THE
00180 REM  TRANSFER ROUTINE.
00190 REM   THE M/C CODE ROUTINE IS NOT PUT INTO RAM UNTIL THE
00200 REM  GRAPHICS PROGRAM IS DONE AND READY FOR TRANSFER.
00210 REM  IT WILL THEN RESIDE FROM F400 'H' ON, SO IT
00220 REM CANNOT BE ACCIDENTALLY DESTROYED.
00225 REM
00230 REM ###### ENSURE THAT PRINTER IS ON LINE ######
00235 REM
00500 LPRINT CHR$(27);"@"
00510 FOR X=-3072 TO -3010
00520 READ D:POKE X,D
00530 NEXTX
00540 LPRINT CHR$(27);"3";CHR$(8)
00550 FOR L=1 TO 64
00560 LPRINT CHR$(27);"K";CHR$(0);CHR$(1);
00570 X=USR(-3072)
00580 LPRINT
00590 LPRINT CHR$(10);
00600 LPRINT CHR$(13)
00610 NEXT L
00620 DATA 6,16,17,64,0,213,42,61,244,229,126,33,0,0,17,128
00630 DATA 0,111,237,82,41,41,41,41,17,0,248,25,125,198
00640 DATA 15,111,197,6,16,126,205,69,128,43,16,249,193
00650 DATA 225,209,237,82,213,229,16,215,193,225,42,61,244
00660 DATA 35,34,61,244,201,192,243
```

VERSION 2.0

```
00100 REM  GRAPHICS DUMP ROUTINE FOR THE MICROBEE
00110 REM  FOR USE WITH EPSON MX80 WITH BIT IMAGE MODE.
00120 REM  This version differs from version 1.0 in that the
00130 REM  limit of 128 HIRES characters is effectively removed.
00140 REM  The user can generate on,paper,the equivalent of 1024
00150 REM  HIRES graphic characters.
00160 REM  This is achieved by generating one column
00170 REM  of characters,transmitting them to the printer,
00180 REM  initialising HIRES mode and generating a new column of
00190 REM  characters.
00200 REM  This continues to a maximum of 64 columns.The number
00210 REM  of columns is set in line 410.
00220 REM  Note that the Y values for point setting must
00230 REM  be generated or read between lines 270 and 320.
00240 REM
00250 S0=0:F0=7
00260 GOTO 360
00270 FOR A0=2 TO 100 STEP 2:A=INT(A0):FOR B0=S0 TO F0:X=INT(B0)
00280 REM INSERT GRAPHICS ROUTINE HERE
00290 REM  ROUTINE MUST CALCULATE Y VALUES FOR THE X VALUES
00300 REM  GENERATED IN LINE 270
00310 REM  SET POINTS HERE...
00320 NEXT B0:NEXT A0
00330 S0=S0+8:F0=F0+8:IF F0>511 THEN 350
00340 RETURN
00350 END
00360 LPRINT CHR$(27);"@"
00370 FOR X=-3072 TO -3010
00380 READ D:POKE X,D
00390 NEXTX
00400 LPRINT CHR$(27);"3";CHR$(8)
00410 FOR L=1 TO 64
00420 GOSUB 270
00430 LPRINT CHR$(27);"K";CHR$(0);CHR$(1);
00440 X=USR(-3072)
00450 LPRINT
00460 LPRINT CHR$(10);
00470 LPRINT CHR$(13)
00480 HIRES
00490 NEXT L
00500 DATA 6,16,17,64,0,213,42,61,244,229,126,33,0,0,17,128
00510 DATA 0,111,237,82,41,41,41,41,17,0,248,25,125,198
00520 DATA 15,111,197,6,16,126,205,69,128,43,16,249,193
00530 DATA 225,209,237,82,213,229,16,215,193,225,42,61,244
00540 DATA 35,34,61,244,201,192,243
```

become better known to you all as the months go by. At present I've got him writing a tutorial (not too heavy) on Z-80 assembler which he is testing on the Blue Mountains Microbee User Group in Sydney's far, far west.

If you're into assembler (I'm trying hard not to get involved) you must get hold of the Zilog publication 'Z-80 Assembly Language Programming Manual'; when you match it with Les Bell's articles on 'Understanding Assembler' all this will mean something.

Albury/Wodonga Bee Group

Just a quick note about the Albury/Wodonga MicroBee User's Group. I've received its first newsletter and am glad the group is still together. It has over twenty members at present and is growing slowly. The club at present runs on a no-subscription basis and meets informally on the first Monday of each month (except holidays) at the Albury High School, probably around 5 pm.

The convenor is Eric Eulenstein, (familiar name, that) on (060) 251 601, and his editor is Ric Pierce – you can call him on (057) 281 876. So if you live close, get to it; if you live afar, call them and give some encouragement. □

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By Bill Bolton

I'M OFF to the US for the SIG/GRAPH computer graphics conference in Detroit and a Digital Research Seminar on C, Access Manager, Display Manager and Concurrent CP/M-86 in Chicago. I hope to have a report for you on that next month.

This month I have delved into the (late, lamented) CP/M-NET newsletter file again for this piece by Jane Smith (the wife of CP/M-NET SYSOP Kelly Smith).

Computer Widows: To The Wives, Girlfriends, Hangers-on

When Kelly asked me if I would be interested in writing an article for his 'newspaper', my first response was "NO!". First of all, I have no training in article writing, and secondly, being a housewife, hanging around with the kids, dog, cats, and so on all day, doesn't tend to increase one's vocabulary. Well, maybe that's not quite true – I've learned lots of four-letter words, mostly in self-defence! But then, after thinking it over, I thought, "What the hell!" (there's one of those four-letter words!).

I think this 'home computer' thing started when Pertec (where Kelly works) loaned us a TRS-80 to play with at home. (*Kelly's Comment: They were having me evaluate it, to see if we could make one better and cheaper!*)

We had lots of fun playing games on it and even kind of missed it when it went back to Pertec. So Kelly put together a little system for us at home... It has ballooned from there to the point of adding a room onto our house for the computers, complete with its own air conditioning unit (God forbid they should get too hot!).

It probably wouldn't be too far off to say that 85 per cent of the time that Kelly is home, he is with the computers, another five per cent is spent thinking about it (you can always tell by that blank stare into space), probably seven per cent devoted to eating, sleeping, and so on, and maybe I get three per cent. I get the impression that the computer doesn't like me . . . it usually decides to crash just about the time Kelly and I are going to spend some time together.

An example of its dislike for me was the time Kelly went on a business trip for two weeks and left me in charge of running the computer. As soon as it figured out that Kelly had gone (and that didn't take it long), it decided to throw a fit and not talk to anyone when they called! So every time the phone rang I had to run into 'its' room and re-boot the system.

A good friend of Kelly's kindly came over to have a look at it. It ran fine for him all day, but as soon as he was in his car it said "DISK BOOT ERROR". The last thing I did before going out to pick up Kelly was to re-boot the system. The minute Kelly stepped in the door, it straightened right out and never to my knowledge played up like that again. I believe it's jealous and that was one of its little plots to make Kelly think that I'm the one with the loose screw . . .

I also find it difficult to join in conversations when Kelly's friends come to visit. They sit around and talk in a foreign language! I've tried to join in once or twice, and usually come up with some intelligent phrase (just to get my foot in the door) like, "Boy, something really funny happened on the way to the grocery store!" ... at which point (if they even hear me), I get a blank stare as if I'm the one talking in a foreign language! Then without even asking, "What was funny?" the conversation goes back to "SYSGEN" this, or "PIP" that, or "star-dot-doc".

Do you remember when we were teenagers and we'd invent some language such as 'Pig-Latin' to talk to our friends, so our parents wouldn't understand what we were saying? Sometimes I think that's what these guys are doing.

I'm also watching for the program 'star-dot-sex'. That'll mean it's finally programmed for sex, and there goes my three per cent.

To sum up, I must say I'm glad that you're at home, Kelly . . . even if you are with the computer.

Digital Research C Compiler

Some news on the DRI C compiler for 8086. It was written by Mike Lehman, the author of PASCAL/MT+, and is a completely new compiler with very good code optimisation.

Some of the preliminary stuff I've seen on it suggests that it should address a much larger piece of the 8086 address space than most other language products for the 8086/88. Terms like 'large' and 'medium' memory models are mentioned in addition to the already familiar 'small' and 'compact' models when talking about the compiler, so obviously larger address spaces than 64K of code and 64K of data are intended.

There will also be support for the C compiler from GSS graphics packages such as GSS-Kernel-86 and GSS-PLot-86.

Microsoft C Compiler

Microsoft has released its C compiler for MS-DOS. This isn't a new compiler (which was at first disappointing for me), but is a repackaging by Microsoft of the excellent 'Lattice' C compiler which I have referred to previously in this column.

Microsoft has added some new material on the MS-DOS interface to the manual, but has also dropped a few useful things that were in the Lattice documentation, such as the section which gave some hints on modifying BDS C programs to the Kernighan and Ritchie syntax used by the Lattice compiler. Oh well, I guess you can't have everything!

The compiler produces fast, reasonably compact code. It doesn't support 'float' and 'long' data types, though Lattice now has an extension package called the 'C Food Smorgasboard', which adds these in a manner reminiscent of the float and long extension packages for BDS C. Perhaps Microsoft will introduce the extension package as well?

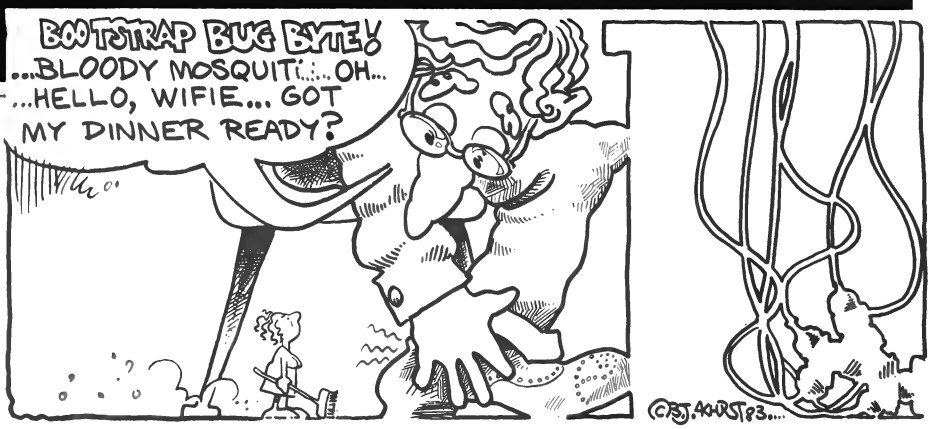
MS-DOS Version Incompatibilities

It seems that MS-DOS version 2 no longer supports system call 1BH, which returned disk allocation information under version 1. Most of the information previously yielded by this call is available from new facilities in the version 2 system interface, and I guess not too many programs would have used the call anyway, but it is a definite incompatibility.

John Latham and I spent the best part of a morning trying figure out why John's super MS-DOS to CP/M file transfer program was going wild under version 2 while it was OK under version 1 of MS-DOS. After giving up and retiring to peruse the documentation again, it became obvious what was fouling up.

John is now working at rewriting his program for version 2, but thinks that some of the features supported by the version 1 call may not be easily duplicated under version 2. I'll let you know how things develop.

Microsoft has now gone into print, in one of the IBM-PC magazines, with the statement that MS-DOS version 2 and PC-DOS version 2 are identical, so maybe there will now be better portability of programs between IBM-PCs and



other MS-DOS computers (if not between versions of the DOS).

Who Is Running CP/M-Plus?

Recently Les Bell and I were discussing CP/M+ and came to the realisation that we didn't know any computer users, outside computer companies, who were actually running CP/M+. There must be some of you out there! How about telling us what it's really like to use in the real world.

Has it met your expectations and are you using many of the new features? I'm particularly interested in hearing from anyone who is running a 'banked' version of CP/M+.

GSS-Graph

I recently had the chance to have a good look at the GSS-Graph package from Digital Research. There I was with an APC, the GSS-Graph manual and a borrowed HP7470 plotter that I'd never used before . . . I was reckoning that I'd be lucky to get one plot done by the end of the day.

I started out with the tutorial at the start of the manual, which took me through a hands-on exercise to build a pie chart, and within ten minutes had a quite respectable pie chart with clear headings displayed on the screen. The next move was to explode out one of the slices of the pie and add additional labels and comments. This was very easy to do.

Right, I thought, let's see how the plotter goes. There was a driver for the HP7470 in the GSX interface package from DRI, so I followed the instructions to install that in the ASSIGN.SYS file (about two minutes' work with an editor) and set the baud rate for the serial interface to the plotter. A quick read of the HP manual got the plotter set up (though I never did figure out why the plotter error light kept flashing at me; the plotter always worked okay).

I then invoked the output routine in GSS-Graph and selected the plotter as the output device. After a moment's pause I was prompted to change the paper in the plotter, and after acknowledging the prompt the HP7470 produced a very nice-looking pie chart in two colours. This was within an hour of starting up!

By the end of the day I had produced several charts of increasing complexity, leading up to a clustered bar chart with line graph overlay in seven colours, using a variety of lettering styles and fill patterns.

The GSS-package was still a pre-release version but performed well and was very easy to learn. The HP plotter interface worked beautifully first time and the correlation between what GSX put up on the APC screen and what it produced on the HP plotter was excellent. I'm very, very impressed with the whole GSS-Graph package. It's my first taste of really easy to use, portable graphics software on a microcomputer and now I want more.

Australian Beginning

The Australian Beginning memberships are now priced at $10 if you get them from the Beginning (some others are still selling the memberships for $100 so *caveat emptor*). The Beginning is making it easy to join up and at $10 (which includes some time as well) I reckon it's worth a look, even if you're not sure how much you could use it!

You can now leave mail for me via the Beginning; my user name is 'RCPM'.

PAMS News

SIG/M volumes up to at least 117 should be available from the Software Tools RCPM system (and maybe some of the others) by the time you read this.

I was talking with the SIG/M distribution co-ordinator recently and he tells me that the CP/M User Group is breaking away from Lifeboat Associates as its distribution point. It looks like SIG/M may handle distribution of CP/MUG material.

Discussions are also under way to make SIG/M the distribution point for the C User Group (formerly BDS C User Group) library. This means there would be one central distribution point for virtually all CP/M public domain software. The PASCAL/Z User Group and several other small User Groups already have SIG/M do the distribution for them.

From my point of view this is great news, not only because it makes my task easier, but also because it portends the end of an unfortunate 'feud' between the two major CP/M public domain software groups.

The Micro Design Lab RCPM now has a digital packet radio interface working into it as well as the phone line. I hope to get the SYSOP to give some details for a future column.

Now that there are four systems on line in the Sydney area, the load on the Software Tools RCPM has lightened and there are many more opportunities each day to log onto the system.

As more and more microcomputer owners discover the fascination of data communications on small systems, there are invariably some users who will abuse the privilege of free access to RCPM and BBS systems. This has not really been a problem for me on the Software Tools RCPM until recently, when an unfortunate series of 'incidents' on my system and others has forced a tightening up of security and of my interpretation of the (very few) rules which govern the use of the system.

I *don't* particularly like barring a user from accessing my RCPM system; however, I have already done it to several users who have behaved quite unreasonably towards me and other system users.

The point really is that none of the SYSOPs have to keep their systems on line. Any one of them can decide it's too much trouble and pull the plug at any time. Please behave reasonably when using any remote system and obey the instructions. In that way you help to protect a valuable, free community service!

PAMS Numbers

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Software Tools RCPM (ST-RCPM) – (02) 997-1836 24 hours
Micro Design Lab RCPM (MDL-RCPM) – (02) 663-0152 24 hours
Sydney Public Access RCPM (SPA-RCPM) – (02) 808-3536 24 hours
Melbourne CBBS (MICOM-CBBS) – (03) 762-5022 24 hours
Gippsland RCPM (GL-RCPM) – (051) 34-1563 24 hours □

By Rod Stevenson

WHEN I EXPLAINED how easy it is to send direct to America for a book or piece of software, I wasn't advocating that course necessarily to save money, but for the case where you are unable to find an Australian distributor. It may also save money, but that's not the issue.

As a correspondent has rightly pointed out, you *could* be asked to pay up to 63 per cent of the declared value for customs duty and sales tax, but if you can't get the product locally there's no other choice – except going without.

Often the Australian distributor has been licensed to copy the program here and import only the manual, thus saving the duty since there is none imposed on books.

Assembly Language Book

Having just read Bill Barden's 'More TRS-80 Assembly Language Programming', I'd like to repeat that I consider the best book for serious beginning assembler-ists still to be 'TRS-80 Assembly Language' by Hubert Howe. We in the Adelaide Users' Group use it as the textbook for our Assembly Language course for beginners because it covers such a wealth of varying topics within its wider frame of reference.

Reading this book privately will need work to get the most out of it, but at least it *is* all there to be got with some effort. There are no big gaps left in the coverage; it's just that this book is not bedside reading. But then if you have an urge to learn Assembly you probably already have other bedside reading!

If you work at Assembly, you'll get there; it's not really a mystery, it just seems that way. It's also not a slow learning curve – there is a 'threshold' to get over, and once you've understood the way of thinking it's no longer a mystery. Howe's book is the only one I've found that comes anywhere near pushing you over the edge of this threshold.

How Do You Think?

Having mentioned above the need to get into the right way of thinking for Assembler, let me say I consider this principle extends to the whole computing field. It seems to me that this is why there are so many complaints about the poor quality of manuals; you need to have an appreciation and feeling for computing *before* reading the manuals if you're to gain the necessary knowledge from them – which is a bit hard on beginners.

With this in mind manuals would perhaps be best written as tutorial texts, assuming no prior knowledge, but since most of them aren't, a good additional tutorial text will be a great help towards getting people into the right frame of mind.

System Games To Disk

With disk drives becoming cheaper – or hobbyists becoming more serious – I've had quite a few enquiries about how to put machine code games (which most good ones are) on to disk.

The trouble comes because the disk operating system always resides at the bottom of memory, where the game runs. There are many programs to move the game to a higher location for storage on disk and then move it back to its original position when it is run (DCV,

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VZ 200 PROGRAMMING

LMOFFSET, CMDFILE). Unfortunately, there are still problems with these because the DOS doesn't use the original ROM routines for keyboard driver or screen display, but the game doesn't realise this.

So the easy (although inelegant) method is to save the whole memory from 4000h to the end of the game as part of the game. Then the game will be running in what is effectively Level 2 memory.

The steps to do this are more complicated to explain than to do.

1. Use a tape-based monitor (such as MON-3) to move (*not* relocate) from 4000h to the end of the program to a higher memory – it's useful to make it an even displacement so you can find it easily again. So if you're using MON-3, type M4000 7FFF 8000 to move the whole 16K memory.

2. Write your own block move appendage to the end of the newly moved memory to move it back to its proper running location; for example:

```
LD HL,4000h
LD DE,8000h
LD BC,3FFFh
LDIR
```

3. Then add a jump to the normal entry address of the original program, such as JP 4400h.

4. Now boot DOS and load a monitor to save the block of memory from 8000h to C00Dh, this being the original program now moved plus the appendage you've added, as a CMD file with the entry point of C000h. If you're using MON-4, it's just C8000 C00D C000

Of course the more satisfying and more elegant – way is to find out just what's going wrong when run under DOS. As an example, I found that in 'Eliminator' the trouble is that the 33h ROM call to the keyboard driver looks at 401Eh to get the video driver address, which may not be 458h as it is under Level 2. So by changing the contents of 401Eh to 458h all was well. The same ROM call also looks at 4033h to see if there is a jump to a keyboard driver intercept there, so I returned that to its normal Level 2 contents.

The reason I explained this under the heading of games is that most other 'serious' programs will also need to be changed to save data to disk instead of to tape. This can be such a complex and time-consuming affair that it may be better to buy the disk version, which could well have additions and improvements anyway. ||

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Continued on page 129

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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.
Address: A memory location.
Algol: Algorithmic Language.
Algorithm: A set of instructions which define a method of obtaining some result.
Alphanumeric: Composed of either letters or numbers or both.
Apple: The Apple 11 computer is a computer based on the 6502 microprocessor with an integrated keyboard.
Application: What you do with your computer.
Array: A set of values under a common variable name, which are accessed through a subscript.
ASM: Assembler.
Assembler: A program which converts assembly language into its corresponding machine (or object) code, which can be executed by the computer.
Assign: To make one thing equal to another.
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.
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.
BIOS: Basic Input/Output System.
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.
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.
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.
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.
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:
Cold Boot: To start up a system from scratch.
Cold Start: See Cold Boot.
COM file: In CP/M parlance a command file.
Command: An instruction from the console.
Comment: A note added into a program to help the reader (or programmer) to understand its operation.
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.
Concatenate: To join two strings together, one after the other.
Conditional: A test.
Console: The keyboard and screen.
Control characters: Codes which perform functions.
Copy: To duplicate, usually for backup safety.
CP/M: A disk operating system for 8080 and Z80 based microcomputers.
CRT: Cathode Ray Tube.
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.
Directory: A list of the programs on a disk (or occasionally tape).
Disc: A flat, circular magnetic surface on which the computer can store and retrieve data and programs.
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 mangages the system.
Display: The computer's output device at the console, usually a TV-like display of letters and numbers.
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.
Error Message: Tells you something went wrong, and sometimes what.
Execute: To run a program.
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.
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.
Focal: Formula Calculator. A simple language.
FORTRAN: Formula Translation. One of the first computer languages.
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.
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.
Hexadecimal: The method of counting to the base sixteen.
Identifier: A label, or the name of a variable.
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.
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.

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.
Line Number: A number at the beginning of a line, which identifies it in a similar way to a label.
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.
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.
Loop: To repeatedly execute a sequence of instructions.
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 acccess.
Menu: A display which offers the operator a choice of several alternatives.
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.
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.
Operator: An arithmetic function or some other function which alters variables.
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.
Patch: A temporary (ha,ha) fix on a bug.
Peripheral: A piece of equipment the computer uses.
Peripheral Driver: A program which outputs data to a peripheral and controls it.
PIP: Peripheral Interchange Program. A CP/M utility for copying files between devices.
PL.1: Programming Language /1.
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.
Preprocessor: A program which does part of a job to make life easier for the program which follows.
Priority: The resolution of which interrupt is serviced first if two should arrive at the same time.
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.
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.
Schedule: To decide at what stage a process should run (of an operating system).
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.
Sort: To arrange items of data in order.
Spool: To output a file to a peripheral.
Stack: A list in which both entries and removals are made at the same end.**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.
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.
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.

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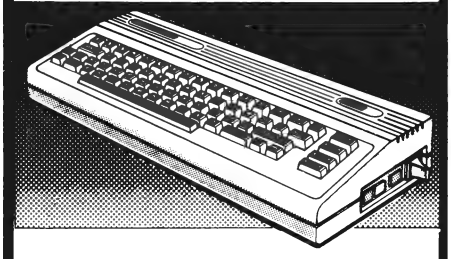

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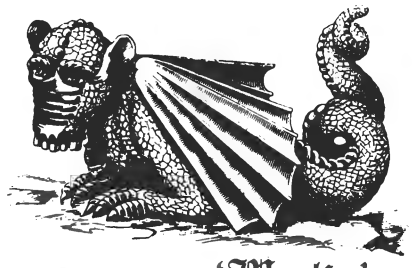

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Contributions By Telephone: Contributors who have modems and suitable software (in the MODEM7/YAM mould – see our stories on Christensen Protocols in the May and June 1983 issues) can arrange direct transfer to our computers, or obtain special contributor access to the Mi-Computer Club Bulletin Board system, which is on-line 24 hours a day, seven days a week.

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