Australian Personal Computer

3RD APC SHOW PREVIEW

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NEWSPRINT

What's happening at the 3rd Australian Personal Computer Show; a local area network for the Kaypro and another for the IBM; Hewlett Packard's cheap ink jet printer — all in this month's round-up of micro news. Refer to Chip Chat for the Computer Edge versus Apple appeal.

Wait no longer

OK, Melbourne. You've been patient — very patient, For two years Sydney has been the venue for the *Australian Personal Computer* Show. You've read about it in *APC* (naturally), most of the computer press and newspapers but it's your turn now.

Australia's biggest, brightest and best personal computer show comes to town. Next month, the World Trade Centre will be turned into an electronic smorgasboard. Just about every big name in the industry will be exhibiting including IBM, Apple, DEC and Commodore. The machines you've heard were launched at the March *Australian Personal Computer* Show will be there — the HP150 (Uncle Conrad) touch screen business computer, Apple's Macintosh, TI's talking Professional will all be there — as well as a number of new machines.

Epson hopes it will regain its position at the top of the lap-held market (look out for our verdict in a full Benchtest) with its PX-8. It could be said to be the HX-20 done right. Epson has done away with the preposterously small LCD, replacing it with a full 80-column screen of eight lines depth. The company has made a couple of otherwise decisions: dispense with the on-board printer, retain the on-board data cassette and adopt CP/M as the operating system. All this plus a wealth of applications software for a very reasonable price.

Hewlett Packard has also jumped into this marketplace as reported elsewhere in this month's Newsprint — so there's a chance you'll see it first at the 3rd *APC* Show.

On the software side, Ozisoft will have America's "game of the year" on show and Ashton-Tate's Australian agents have a few surprises in store. Without wanting to steal their thunder, the products are all in the database area of business software.

A couple of trends in the industry are reflected in the new packages: the first is towards multi-user software to take advantage of the ever-increasing number of local area networks and multi-user micros and then the success of Lotus 1-2-3 has made the king of the mass-market database suppliers realise the strength of a combined spreadsheet, word processor *and* database. Lotus 1-2-3 was the most popular business applications package in the US last year, making its authors wealthy beyond their wildest dreams. This year Lotus is launching an enhanced product called Symphony with which Ashton-Tate intends to compete. AT's new integrated business package will be launched at the Show — if you want to see the state-of-the-art micro software, it's all happening at the premier Australian micro show.

Apple hasn't stopped to rest either. Following the rowdy launch of Macintosh, the IIc arrival celebrations seemed quite tame. However, Apple has recognised the wisdom of Mortein's catch-cry and repackaged (Apple may prefer a word more descriptive of change which is partly justified) its IIe to produce the IIc. It has a very clean, appealing look about it and is better value for money than a IIe if you want a disk drive (which is included in the surprisingly small IIc package).

We could go on about more new products, but the point about this Show is that it's a totally new concept for Melbourne. If you want to see personal computers — from home computers right up to multi-user business machines — you'll only get one chance to see them all in Melbourne this year: at the 3rd *Australian Personal Computer* Show.

Promises, promises

The old Mattel micro, the Aquarius, won't lie down and die: its designer, Radofin, is pushing ahead on the basis that Aquarius is one of the cheapest home micros and the company insists that sales are booming throughout Europe, the Middle East, Far East, and Australasia.

For those of you who accidentally bought one because of a shortage of something else, the news is of promises — promises of a RAM pack to upgrade it to 36k, four colour printer, and a light pen.

Then later in the year, Rodofin promises to break your hearts, by launching the Aquarius II 'which incorporates a full typewriter keyboard and built-in Extended Microsoft Basic'.

Printing the difference

Tandy's inkjet printer is the best way I know of getting colour onto paper, and it does pretty well. However, not all programs can operate with Tandy peripherals, and Epson probably reckons that it will sell quite a few of its new $1,110 (excluding tax) colour (ribbon) printers.

The price is nearly $600 more than the Tandy, but it has the advantage of turning itself into a bog-standard Epson black ribbon printer unless told to do otherwise — which makes it very easy to use things like WordStar with it. Letters in blue or brown ink are very effective — when intentional. Sometimes, black ink is actually necessary.

Guy Kewney

NEWSPRINT

If you're thinking of buying a dot matrix printer, have a look at Hewlett-Packard's reasonably priced "ink-jet" printer. It uses the disposable printhead shown above which incorporates a thimble-shaped rubber bladder containing 3cc of ink (sufficient, according to HP, to print 500 pages of text).

The printhead has twelve microscopic nozzles each of which can supply a drop of ink on demand as the printhead scans across the paper. The droplets of ink are ejected by first rapidly vaporizing a tiny volume of ink. The vapor bubble quickly grows and gives momentum to the ink above the bubble, which in turn is propelled through a nozzle and onto the paper. The ink refills the nozzle automatically by capillary action.

The result is an eleven by twelve dot character matrix printing at 150 characters per second with a very low noise level.

The printer has a centronics parallel interface and sells for less than $800. The print head is priced at under $12.

IBM profit up

A 29% increase in IBM Australia's after tax profit in the year ended December 31st "reflected the strength of the company's product line and its technological leadership" according to Brian Finn, the Managing Director and Chief Executive Officer.

Total revenue in the period was $519 million and the number of employees was 2,871.

Aussi Apple card

A wholly designed and manufactured sprite graphics card for the Apple II has been released by Australian Video Presentations.

The card makes no use of the Apple's video circuitry. Using its own video processor and RAM it generates sixteen colours over thirty two 'planes'. These graphics 'planes' can best be envisaged as 32 pictures sandwiched together, the front picture having priority over the second and so on. This priority structure automatically creates three dimensional graphics with a claimed resolution far superior to that possible from the Apple's video circuitry.

Supplied with the card is a disk of utilities and demonstrations including sprite creation, sorting, movement and storage routines. Also included are display tables of hundreds of sprites, two character sets and two full colour demonstrations.

For more details 'phone (03) 699 7984.

Mini and micro packs of computer paper

Computer Print and Paper Co are now marketing a range of products for the home and small business computer user. These include micro packs of 250 sheets, 500 sheets, 1,000 sheets of 11 x 9½ word processing paper, true A4 size word processing paper, 11 x 15 plain and blue half shadow listing paper and computer address labels in packs of 2,000 labels.

These products are being marketed through retail outlets in most Australian states.

The company has recently moved to larger premises in Cheltenham, Victoria to allow for further expansion of their range.

Further details are available on (03) 584 5488.

NEWSPRINT

VIEW FROM AMERICA

Securing the future of videotex

By Chris Rowley

It's not as though Americans didn't have enough to worry about. But two recent entries on the National Fear Chart have really got people talking security wherever they come together in social groups.

First there was the unwelcome announcement that anything up to 35 serial murderers are abroad, or rather not abroad but right here at work among us, choosing their 'primarily female' victims at random. Then came horrible revelations of widespread sexual abuse of pre-schoolers at kindergartens with a dreadful case in Los Angeles to illustrate.

Americans are already the most heavily armed people that the world has ever seen. They own more Dobermann Pinchers than the rest of the world put together. Now it's predicted that they will press the microtext terminal into service in the desperate search for security.

We should note here that in the last 18 months ten or more police departments from Washington to San Francisco have installed computerised fingerprinting systems; the Japanese giant NEC is currently building one in Alaska.

It isn't a new idea. The FBI has fiddled around with it for ten years now but the real progress has come from software firms designing systems for individual police departments. The breakthroughs are coming in optical storage devices, and both NEC and the FBI are working on laser disks holding 12,000 prints apiece for mass storage.

The new systems have proved very effective. San Francisco's print units are working on a database of 3 million and used to manage 20 to 25 print IDs a month. Now they can claim 100 or more.

In addition city to city check-ups are just a phone call away. Then there was the good news from the Videotex '84 Show in Chicago. New devices and software were offered to bridge once and for all the gap between NALPLS (North American Level Protocol Syntax) Videotex code and ASCII microcomputerdom. The impossibility of using a micro as a videotex system terminal has been a crippling impediment to the growth of videotex in the US.

Of course, Network Nation has grown up anyway — there are now 400,000 subscribers to the big three ASCII micro network services: Dow Jones, Compuserve and The Source. These services are not cheap, costing typically $75 to join with monthly dues of $25 plus online fees (and don't forget the phone bill . . .). Videotex promises to be much cheaper, typically $10 a month as with Keyfax from Keycom, a joint venture involving Honeywell and Rupert Murdoch's News America Publishing.

At the show IBM unveiled PC/Videotex, which lets a PC for $250 or a PCjr for $220 decode NALPLS. AT&T was showing the $900 Sceptre, a dedicated videotex terminal, but the most exciting item was Toronto-based Arcor's $100 software cartridge that turns a $200 Commodore 64 into a videotex terminal.

Besides this there are videotex teleshopping services, like that of Comp-U-Card, which are beginning to make money. In the fourth quarter of 1983 Comp-U-Card made $880,000 on a turnover of $4 million — about double the previous year's figure. Comp-U-Card lists 60,000 products for shoppers seeking 25 per cent discounts by buying direct from the factory, and analysts predict a boom as soon as pictures can be included with details of the goods.

So the advent of PC-Eye, from Chorus Data Systems, must have been a pleasant surprise for teleshoppers. PC-Eye is a $500 plug-in board plus software that lets the IBM PC store video images from video cameras, recorders, or telecommunications. The short image acquisition time and the high-resolution offered by PC-Eye converts the PC into a low-cost full-scale image processor — just the thing for colour pictures of stereos and clothing, not to mention fingerprints.

Hence teleshopping's future seems bright, but it's the new area of telesecurity that may see the real boom. How long before the videotex security check — 'Just place your fingers on the touch pad' — becomes another aspect of having a nice safe day?

NEWSPRINT

The Web

President Computers has announced a local area network for the Kaypro range. Called 'The Web' it is one of the cheapest LANs ever produced and can be used to connect up to 255 users (although the suggested maximum is 20 users) at around $600 per user on top of the cost of the computer.

All models in the Kaypro can be connected to The Web to allow sharing of data and peripherals (each user can access every disk drive and every printer on the network).

President Computers is on (02) 476 2700.

LaserVision

Philips has hooked-up a laser disk and a micro to come up with 'LaserVision'. It's comprised of a Philips video disk player with a capacity of 34 minutes of moving pictures or 54,000 pages of information and a dedicated microcomputer which can recall either the moving video (and sound) or the frames of information stored on the disk. It is also capable of integrating data into the pictures retrieved from the disk to the Australian Teletext standard.

Philips thinks very highly of its system: "We are involved with the launch of a new medium as revolutionary in its way as either the photocopier or the facsimile machine". Prices start at $4,000.

Video training packages

Arthur Young and Company, an international accounting firm, has put together a set of self-teaching video packages for popular business programs such as Visicalc, Multiplan and Lotus 1-2-3. They are designed for use at home and proceed on a step-by-step basis teaching users how to set up their computer as well as run a particular software package.

Each training package includes a work book and video cassette with instructions and demonstrations and a student diskette with practical examples. Arthur Young has also set up a 'hot line' to provide support should users find themselves in a corner.

Prices are $295 for Visicalc and Multiplan and $345 for Lotus 1-2-3. Details on (02) 419 6077.

Nice idea, nasty name

Three to six year old children are the target market for a range of Apple educational software. Stickbear ABC, Numbers, Shapes and Opposites are designed to familiarise children with computers at an early age as well as to be educational.

Stickbear software was created by Richard Hefter, author and illustrator of over a hundred children's books, and produced by Xerox Education Publications.

Diana Ryall, Education Co-ordinator for Apple Australia assessed the programs with the following comments: "The Stickybear series of software is easy for children as young as three or four to operate and is supported with excellent colour graphics and animation. The presentation of each of the programs is also excellent . . ."

Systems Peripherals is handling the range in Australia. Telephone: (02) 568 3790.

Australian hard disk

Ron Harris, designer of the Australian produced Executive 816 briefcase computer, has just announced availability of a 10Mb hard disk model, the 816-10.

The standard unit, of which 400 systems have now been sold, has 1.6Mb of disk capacity. Available now from Porchester Computers, the Australian distributor, the new model has an inbuilt 10Mb hard disk and an 800k floppy unit.

Current owners of the 1.6Mb twin floppy system can have their units upgraded to the 10Mb hard disk model by dealing direct

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What the experts say:

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"We are impressed with the excellent implementation of Microsoft BASIC, full on-screen editing, repeat keys and easy-to-use graphics features." — Creative Computing, May 1983.

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NEWSPRINT

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For further information contact Porchester Computers on (03) 417 6999.

Micro allsorts

Four software publishers have licensed their computer learning programs in Australia.

Micro-Allsoft has announced immediate availability of: *Arnold-Wheaton* software, produced by the giant UK educational publisher and equipment supplier, EJ Arnold; *Widgit* programs for young children, starting with 'Alphabet' for two year olds, through to logical thinking introduction for ages up to ten; *Artic* programs covering French, Spanish and German vocabulary, each compiled by a language teacher; and lastly, *Sulis* educational software, a range of challenging programs covering English grammar, spelling and vocabulary, French tenses and vocabulary, and English history.

Announcing the availability of the new software, Mr Robert Polak, managing director of Micro-Allsoft said, "Each of the four publishers has one thing in common, namely that they all produce programs designed by qualified teachers who are also skilled in the design of computer learning software.

We are producing their educational software for use on a variety of machines such as BBC, VIC 20, Commodore 64 and Sinclair ZX Spectrum, all of which are becoming widely used in Australian schools".

The Spectrum is becoming a particularly popular home computer,' he added, 'and parents will appreciate the alternative of early learning programs instead of arcade games.'

Micro-Allsoft is on (03) 240 0156.

Faster 64 loading

Melbourne House's Pavloda system is a program developed specifically for the Commodore 64 which it is claimed enables cassette programs to be loaded at the same speed as programs from disk.

Pavloda is named after its creator Andrew Pavlomanolakos in much the same way Pavlova got its name.

Games presently available from Melbourne House to incorporate Pavloda are Horace Goes Skiing, Galaxy and Classic Adventure.

Forthcoming titles available with Pavloda will include The Hobbit, Star Trooper, Space Pilot, Cosmic Commando, Starbase Defence, Cybopron, Zodiac, Indian Attack, plus many more.

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NEWSPRINT

Netcomm Australia has announced an internally mounted direct connect modem for the Apple II and IBM PC. It complies with CCITT standards (ie, Australian standards) and includes such features as 300, 1200 and 1200/75 baud transmission rates and auto dial, answer and disconnect ability. In addition to the CCITT standard, the modem can support full US Bell standard transmissions allowing direct connection to US and European hosts or services. It sells for $495. Details on (02) 498 5577.

Foxy networking package

Yet another network product shows that the American assumption that: 'people will be using IBM PCs' when they design products, is assuming frightening importance.

Fox Research's '10-Net' is a very cheap way of adding a network to your IBM — assuming that other people in the building comply and also have IBMs.

Network will, one day, be the answer to the problem of people who want their own computers on their desks, and also want to share data with their colleagues. But first, the networks have to be universal, and they have to be cheap.

This one is cheaper than other nets which use variations of the Ethernet blueprint, because instead of the pricey co-axial cable, it uses a simple twisted pair of wires. But it does use Ethernet protocols, so it should be possible to connect a family of 10-Net micros to a family of Ethernetted machines without rewriting the code.

The answer to making a network universal, however, is less obvious. Fox has assumed that the PC hardware provides one likely standard. However, the other side of the assumption that everybody in the building has a PC (yes, possible) is that all of them buy 10-Net (no, not so likely).

So, in addition Fox has launched useful software, in the form of a multi-computer database, to run on the net.

The database is called 10-Base, and will appear familiar to any professional IBM mainframe user who has met Sequel (SQL).

More importantly, multi-user programs can be written with 10-Base, working over the network.

A network of PCs 10-Base and 10-Net will still (today) be a lot more costly than a multi-user microsystem with Unix, simply because the price of the PCs will be so

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- FULL DATA BASE
- SIMPLE SPREAD-SHEET
- SIMPLE WORD-PROCESSING
- MAILING LISTS
- STANDARD LETTERS
- LABELS

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META4 is suitable for a very wide variety of business, professional, academic and personal applications, such as

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PROFESSIONAL
MEDICAL, DENTAL, LEGAL, PHARMACEUTICAL, INSURANCE, FARMING

ACADEMIC
LIBRARY, STUDENTS, TIMETABLES, SCORES, BOOKS, BORROWERS, PAPERS, AUTHORS, REFERENCES, LECTURES, FORMULAE

INDUSTRY
VEHICLES, REPAIRS, MAINTENANCE, PRODUCTION

REAL ESTATE
PROPERTIES, ENQUIRIES, ADVERTISING, CLIENTS, RENT, COMMISSIONS

PROJECT
TASK LISTS, SCHEDULES, DIARY, MEETINGS, MANUALS, DOCUMENTN, TIMESHEETS, ESTIMATING, BUDGETS

Information from any or all of the above applications can be AUTOMATICALLY LINKED & CROSS-REFERENCED, since META4 is a true Data Base system.

BASIC CONCEPTS

META4 uses familiar concepts to aid you in it's use.

ROOMS — META4 has many rooms in it. Each room is used to store information about a different type of thing.

QUESTIONS & ANSWERS — when you go into a ROOM META4 asks you QUESTIONS about the type of thing (e.g. CUSTOMER INVOICE, PRODUCT etc) held in the ROOM and stores away your ANSWERS.

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DDORWAYS — You can move from ROOM to ROOM through DOORWAYS. META4 automatically relates information in one ROOM to information in the rest.

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META4 IS PORTABLE

Any application you develop under META4 will tun without change on any computer that META4 runs on.

EASE OF USE

- SIMPLE AND CONSISTENT
- HELP — 3 levels for the current
  - —BUILDING you are in
  - —RODM you are in
  - —QUESTION being asked
- 3 TUTDRIALS
  - —USING META4
  - —DESIGNING WITH META4
  - —META4 EXAMPLES

Designed from the ground up to be totally consistent and as easy to install, learn and use as possible.

META 4 IS EXTENDABLE

All the features of the system are fully extendable to your own applications. You can add your own BUILDINGS, ROOMS, DOORWAYS, and QUESTIONS. You can define your own maps, HELP text and tutorials.

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If you wish to sell your application you will have the widest possible market. We will evaluate your application and may assist in marketing it.

DETAILED FACILITIES

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- Powerful Selection & Reporting
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META4 (IBM-PC)	$595.00
META4 (MS-DOS)	$595.00
Non-Standard Disk Conversion	$50.00
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BBC Microcomputer
The teaching computer for those who have done their homework

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

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

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

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

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

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

You see, the BBC did their homework, too.

BARSON
computers

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

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

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☐ BBC Microcomputer
☐ Educational Software
☐ Games Software

1411/APC983

THE WORLD'S MOST EXCITING SCHOOL LIBRARY

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

Educational:

Art
Drawing. Painting.

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

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

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

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

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

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

French
Respondez. Comprenez.

Logical Thinking
Venman. Vennkid. Shape. Gate. Watchperson. Spanish Main. Cat and Mouse. Logic Games. Concentration.

Language Arts
Early Learning. Word Hunt. Word Sequence. Sentence Sequence. Unscramble Spell. Pattern Recognition. Quiz. Anagram. Box/Wordshape. Dictionary Game. Vocabulary Practice. Hang the Man. Spelling Test Creation. List of Spelling Tests. Vocabulary Tester.

Mathematics
Fractions. Tables. Number Balance. Number Sequence. Maths Topics 1. Ultracalc. Algebraic. Manipulation. Trains/Arithmetic. Snap/Fractions. Ergo/Arithmetic. Morless/Number Concept. Abacus. Moving Modules. Multiplication. Speed Drills: Addition, Subtraction, Multiplication and Division. Read Speed Drills. Clear Speed Drills. Dice Addition and Subtraction. Long Multiplication. Area and Perimeter. Factor and Base Games. Equations, Pythagoras and Directed Number Games. Pythagoras Rule. Processes. Skill Counter.

Music
Music. Advanced Music.

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

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

Word Processing
VIEW. Wordwise. Wordpack.

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

BBC MICROCOMPUTER / BARSON computers

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NEWSPRINT

much higher than the dumb terminals on the Unix system.

But with a good (cheap) imitation IBM, this sort of network could look like quite a powerful alternative, one day.

Fox is in Ohio, on (513) 433 2288, at 7005 Corporate Way, Dayton, Ohio 45459.

Guy Kewney

Bigger, faster, better, harder

Perhaps Commodore doesn't know what it's doing right. And that the best tack, in view of its current, enviable market position, is to keep doing everything it's doing, but just a little harder: keep promoting itself with that presumptuous jingle on the box, keep releasing lots of new products and keep telling everyone how marvellously the firm is going and how fantastic its products are. Perhaps some examples:

The $100 Calc Result spreadsheet is heralded by a press release containing the following sentence (Nothing preceding the sentence makes its claims any more ludicrous so don't think we're taking it out of context): "Plot a hundred points on a graph in two seconds, work out cash flows for the next year in one minute, prepare complicated quotations as fast as the customer's name can be entered." It then utters the gem: "Doing homework in subjects such as maths, science or economics is a pleasure."

Well, you can't do anything as described in the first example; not without a substantial amount of preliminary work. A preliminary sentence explaining this would have been in order.

We don't need to comment on the second example.

"Commodore is now set to become the first computer company in the world to post sales of more than $US1 billion in a year", pops up in another release appropriately headed 'Commodore Sets Another Record'. Last year IBM moved $US40 billion out the door, Hewlett Packard $US4.7 billion.

The fact that IBM also sold some typewriters etc and Hewlett Packard sold the odd calculator should not be used by Commodore to make a claim using the qualifying *"computer* company" (our italics) as a loophole.

Enough grumbling. Calc Result is a 64 column by 254 row spreadsheet for the Commodore 64. Calc Result Advanced for the 700 and 800 sells for $200 and

Commodore's Calc Result spreadsheet is priced from $100.

Myer announces the latest computer buzz-phrase...

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NEC DATABASE PACKAGE			
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OTHER SAVINGS			
NEC 8201 Portable Computer 16KB.	$695	**$650**	$45
NEC 8K RAM Memory Chip for NEC 8201.	$129.40	**$104**	$25.40
Epson HX 20 Computer.	$1400	**$999**	$401

All prices include Sales Tax.

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NEWSPRINT

employs split screens, windows, formula editing and global recalculations.

To conclude, we present another quote and it is from Commodore (about a new game): " 'International Soccer' is certainly one of the games which will grab the attention of young and old alike as it very much relies on the skill of the operator of the joystick".

It's all so clear now.

Small waves, big ocean

Chilling statistic: Commodore, worldwide, (gaining 'the largest installed base of any computer manufacturer') sold $630 million worth of computers last year.

IBM spent more than twice that on Research and Development.

Portable HP110 on the way

A slim, 9lb portable computer with MS-DOS, Lotus 1-2-3, a word processor and a terminal emulation package all in ROM has been introduced in the US by Hewlett Packard.

The $2995 portable, called the HP110, is based on the Intel 8086 chip and features an 80-column by 16-line Liquid Crystal Display that can show graphics at a resolution of 480 pixels across by 128 pixels down.

Since the machine uses the MS-DOS operating system and the 8086 microprocessor, Hewlett Packard has devised a way, called HPLink, in which the HP110 can connect up to an IBM or similar computer and gain access to either files created on the IBM (such as a WordStar document) or the hardware facilities of that system such as the IBM disk drive, an attached printer, or its screen. HPLink consists of a printed circuit board, which is installed in the IBM PC, a small disk-based program, and cables to connect the two machines together.

To make up for the lack of an integral disk drive, the HP110 features 382k of ROM and 272k of RAM. The RAM is totally available to the user when using the ROM-based applications.

Up to 176k of the RAM can be reserved for use as a RAM disk.

In addition to Lotus 1-2-3 and MS-DOS Version 2.1, the HP110 ROM contains: a simple word processor called Memomaker; a user-friendly front-end to MS-DOS called PAM (Personal Applications Manager) as used on the HP150 micro; and an asynchronous terminal emulation package. A 300 baud auto answer, auto dial modem is also built into the machine.

Although the HP110 does not feature any disk drives, popular programs such as Multiplan, dBase II and Mail Merge will be made available on 3½in disks. An external double-sided 3½in disk drive powered by batteries and capable of storing up to 710k will be sold by HP so that these programs can be used. The external disk will cost $795 in the US.

Although the HP110 has Lotus 1-2-3, the HP development team had originally designed the machine around Lotus Development's Symphony. Delays with the release of Symphony led to 1-2-3 being provided as a more

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Composite B/W video	Y	Y	Y
Composite PAL/NTSC	Y	Y	Optional
TV VHF output	Y	Y	Optional
RGB colour output	Y	Y	Optional
6 Apple compatible slots	Y	Y	Y
Upper/lower case	Y	Y	Y
Numeric pad	Y	Y	N
Auto repeat keys	Y	Y	Y

	Lingo 128	Medfly	Apple IIe
Cursor control pad	Y	Y	Y
Function keys	Y	Y	N
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NEWSPRINT

immediate offering. HP intends to offer an upgrade for users of the portable computer when Symphony is made available.

Robin Webster in the US.

Team approach to educational software

Two Sydney educational psychologists are turning their beliefs into a business with what they believe is a first in software for learning.

Their business, Computer Tutor, has recently released its first educational software program 'Basic Arithmetic and Algebra'.

The second, 'English: Sentence Construction', is scheduled for release in early June.

What's new about these programs (designed for use on a Commodore 64 or SX-64) according to John and Mary Ann Paynter is that they apply some very solid principles of learning never before applied in educational software.

John Paynter, managing director of Computer Tutor, says all other software he and his wife and partner Mary Ann have seen has been produced by teachers or programmers or both.

"What has been missing is the third vitally important and equally specialised area of knowledge — the psychology of learning. That's the key to a really effective piece of educational software.

"We have a team approach where the original content is supplied by a teacher, we supply the principles of learning and the programmer puts in the technical expertise that makes the programs work effectively for students in schools or in the home.

"For home use, its very much like having a private coach coming into the home but a lot less expensive", John said.

Content on the tapes or disks is geared to the NSW HSC syllabus for Year 11 and 12 students and has "already found much acceptance in the marketplace".

"We were particularly gratified that after our participation in the Centrepoint exhibition in March this year, people were buying our software first, then seeking our advice on the best hardware to go with it. We use the Commodore 64 ourselves and that's what the programs are designed for."

The learning principles being applied by the Paynters are the widely acknowledged Skinnerian principles "plus advances in this field over the last fifty years".

"The learning is not done on our programs by the drill and practice method of so much educational software, but through the teaching of real conceptual material," John points out.

Applying these principles, the Paynters plan to cover all the subjects of the NSW HSC syllabus inside the next two years.

Although professional and market place response to their product has already been "very, very encouraging", Mary Ann is also currently working with the Departments of Psychology and Education at the University of Sydney to get professionally valid test results on their programs.

"The principles we use have been more than amply proven in the last fifty years," she explains, "but our business philosophy is that we will continually test and improve our products, based on valid research.

"It's important not to say 'students who use this program learn better than others', but to really know that's true, and be able to illustrate why."

Computer Tutor programs are currently being distributed through Ozi-Soft but the Paynters are discussing distribution and marketing possibilities with several large multi-nationals.

Entrance stage right . . .

The Roadrunner, according to President Computers its Australian distributors, is "the ant's pants when it comes to a portable machine". The full colour brochure calls it "the first truly portable computer". Dulmont Magnum might find that disagreeable. The machine weighs just over two kilograms, is battery powered and has an 80 column 8 line LCD display. It has a CMOS cpu running a "CP/M compatible operating system" in 64k of memory.

Like the NEC 8201, the Roadrunner has removable battery-back RAM cartridges each of up to 16k. It also has program cartridges containing a text editor, Microsoft Basic and SuperCalc. Built into its 16k ROM are a couple of name/address/schedule type programs and a DEC VT100 terminal emulation package.

Parallel and serial ports are included in the (exclusive of sales tax) price of $1,799.

Yankee speak

On the 1st and 2nd of August, the Yankee Group will be holding its second seminar for '84 titled "The IBM Impact" at Sydney's Hyatt Kingsgate Hotel.

Topics include IBM Networking, IBM in the home and office automation. The attendance fee is $595. Details on (02) 399 8200.

THE CHIP CHECKER

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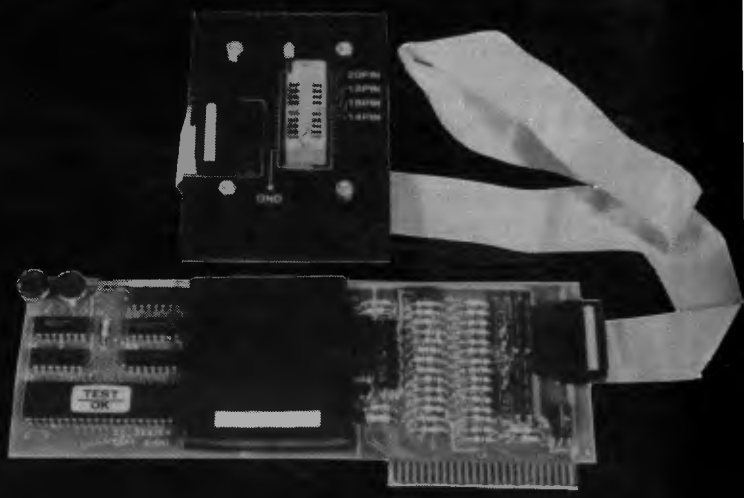
INTRODUCTION

With the rapid development in technology the incorporation of TTL ICs is implicit in the design of virtually anything electronic. Whether in the breadboard prototype stage or in the processes of maintenance, diagnosis of IC stability or failure is imperative. A simple chip swap situation may not be viable as known, working substitutes may not be in stock, or at hand.

The fault may be intermittent and due to an unstable IC. The "IC Tester" not only tests and verifies ICs. It also checks to see if the IC is unstable and responds appropriately. Furthermore, if the TTL chip has been scrubbed and if, inadvertently left with no identification, the TTL Tester will search and identify which type of IC it is.

Large IC Testers are very expensive and difficult to use. Therefore, we at Australian Video Presentation have decided to introduce to Australia the "TTL Tester", a user friendly diagnostic tool. Designed as an interface card for the Apple or compatible, it is inserted into any slot from 1 to 7. The accompanying software is inserted into the disc drive and the system is now ready to work for you.



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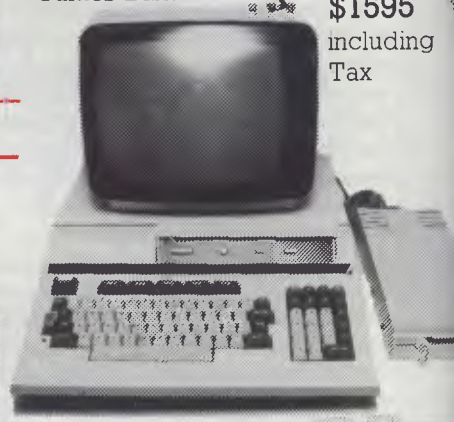

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Codewriter

Ever wanted to write your own software but have felt the task quite overwhelming? Simon Dillworth takes a look at a practical solution.

Codewriter provides the computer novice with a means of generating data entry programs almost painlessly. It is available for most of the popular micros including *(mais naturellement)* the Commodore 64, Apple and IBM PC. With it you can generate a data entry application including reports and menu driver within a few hours. Since all generated programs are coded in Basic any amount of further customisation can readily be made by those experienced with the language.

Installation

This review was done using the Apple II Plus configuration. Before loading Codewriter I had to install a Videx 80-column card and insert the protection device (known as a 'dongle') into my games port socket. The instruction booklet is written primarily for the computer layman, and although at times it may frustrate the well-weathered diodes-in-the-left-leg computer inveterate, it is not unbearable and serves its purpose adequately. The documentation that comes with Codewriter is standard for all micros and functional variations between models are documented in user notes supplied with the disk. These notes can be displayed on the screen by selecting the option in the initial menu. Besides this, Codewriter displays extremely useful help screens throughout, ensuring that the user is well assisted at all times.

Creating a screen layout

OK, so now the master diskette is in and the system is turned on. Codewriter expects a formatted disk in the second drive (what, you don't have two drives?) and will format one for you if you don't have one handy. The first menu offers three options: (i) create a screen layout, (ii) create an application and (iii) display user notes. Before creating an application program you must first design the screen it will use. Select option 's' to load the screen painter utility. Codewriter is commendably chatty and advises you what it is doing at any given instant. At this point we are courteously advised to wait since a program is being loaded. Soon you are presented with an almost blank screen with two lines at the bottom of the screen, the first tracks the column and row positions of the cursor and the second is used to communicate with the user. You can place your prompts anywhere on the screen, but the maximum number of characters in any field is 78 — sufficient for most purposes. The valid prompt field types are alphanumeric, date (in the form../../..), numeric and money (with a trailing '$' sign). Comments may be placed on the screen to enhance its readability. Once you are satisfied with your screen design press 'ESC' and Codewriter will begin 'reading' the screen. Certain prompt fields are highlighted in inverse video and you are asked whether they represent fields that are entered via the operator or should be calculated by the program. You may now save the screen layout and load it back later if you wish to change it. Give the screen a name, such as ADDRESSES, and save it to disk. The screen editing capabilities are quite sophisticated and easy to use. For example, if you wish to move a prompt from the fourteenth line to a position on the fifth line you do not have to wipe out the original prompt and rewrite it in the new position — you simply select the prompt and using four cursor keys move the prompt around the screen. Should the prompt bump into another field on its journey around the screen, Codewriter will 'JUMP' it to the next empty area in the direction it was being moved. Furthermore, since the application program reads the screen layout each time it is run, as long as you don't delete prompt fields or change the length of the input fields, you are free to move fields around the screen or change the comments.

Creating an application

Now for the action. Return to the master menu and select the 'create an application program' option. So that credit is given where it is due, you are now asked to specify who is designing the program. You must then give the screen file name — eg for a 'names and addresses' application this might be 'ADDRESSES'. Codewriter asks which disk drive the data files will reside on. If you really are a computer novice you may not immediately understand the significance of this question and so, courteously, Codewriter assists by stating what the considerations are. Codewriter now calculates the storage capacity of the disk you have selected and asks you to specify the maximum number of records that are to be created on the disk. If you select drive 1 for the data files your application will be able to run on a single drive system.

After specifying the title of your program you must indicate which field is to act as the key for retrieval purposes. In the case of ADDRESSES this would pro-

bably be 'name'. Codewriter does not insist that the contents of this field are unique for each record so you may store more than one address for the same person simply by creating multiple records with the same key, i.e. 'name'. At this point Codewriter will read through the screen layout and ask you to supply the editing rules for each keyboard entered field. These rules fall into five broad categories (i) General tests, eg 'no entry', 'not numeric' or 'numeric', (ii) data size tests, eg 'length > 4', (iii) number tests, eg '< 20', (iv) character tests eg '> "JO" and (v) contains tests, eg 'contains "ABC". Theoretically you can specify an unlimited number of rejection criteria for each keyboard entered field. For each test you can either use the default error message or assign your own. If you have defined any program calculated fields for this screen Codewriter will now ask you to specify the formulae that it should use to calculate them. For example, you may define the first program calculated field (pcl) to be equal to the first keyboard entered field (ke1) multiplied by the second keyboard entered field (ke2) viz pc1=ke1*ke2. Fields can be self-referencing, so that expressions such as pc1 = pc1 + (ke1 –ke2) are valid too. This feature could be used, amongst other things, to keep track of the number of times a particular record has been accessed eg pc5 = pc5 + 1.

Codewriter will then ask you what 'GRAND TOTALS' you want in the program. What does all this mean? As an illustration, say that you have just defined an invoice application and you wish to know what the total value of sales for the company is at any given point. To arrive at this value manually you would have to look through all of the invoices on file and add up all the sales figures. Codewriter will do this for you if you specify which field(s) are to be used in grand total calculations.

Shortly, the message 'Please wait — Codewriter working' appears and after a little whirring the Basic code that makes up your application is simultaneously generated and displayed at a disgustingly (for an overpaid Basic programmer that is) fluent rate. Go out, have a cup of tea — you've earned it — and return in five or so minutes to be told that 'Your program has been created'.

Now run your program, and after a bit of activity, the Main Menu of your first Codewriter program should appear. On this you should have seven main options: (i) File preparation — only run once to prepare the disk that will hold the data; (ii) Enter Data — gives the program operator a new and empty screen form to fill in; (iii) Update Data — gives the operator a chance to change any information already entered into a screen record; (iv) Look Up Record — specify the 'key' of the record you wish to view, eg 'SMITH'; (v) Search records — allows the operator to scan all or a series of selected records, so you can ask to see all records which have a value in a particular field that falls within a given range of values; (vi) Delete Record — remove unwanted records from the disk; (vii) Verify Grand Totals — check all grand total fields on the screen for accurate mathematic sums (the manual says that this is included because of 'occasional instances of the computer "rounding off" certain sums').

Report system

Once you've typed in a few thousand or so records you may wish to extract some 'meaningful' information from them. After carefully designing the important report formats in you head or on paper you can use Codewriter to generate the necessaries, taking care of such things as report headings, page numbering, multiple records per line or multiple lines per record, summary control totals including average, minimum and maximum values. Once you have decided what the report is to look like you create a design by a process that is very like creating a screen layout. Reports need not simply echo the contents of files either, you can specify fields as program calculated and, for example, report the value of a particular line of stock by multiplying the quantity on hand by its unit cost. Records can be retrieved on a selective basis, enabling you to ask such questions as 'Show me all debtors owing more than $200 who have not made any payments in the last 60 days and who are not related to one of the directors'.

Return in five minutes to be told that 'Your program has been created'

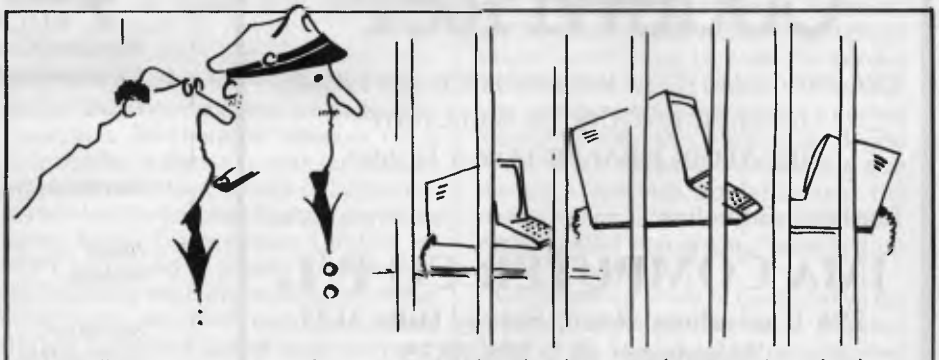
Codewriter gives you the option before a report is produced to sort the file on a particular field. This option could be used, for example, to order subscription labels by postcode.

Menu system

Once you have generated a few applications and reports you may find it useful to tie them all together by way of a Main System Menu. To this end Codewriter allows you to design and maintain your own menus.

Conclusions

To my way of thinking Codewriter has a lot going for it: it is well documented, well designed and well written, and has the power to generate some extremely useful programs. The fact that all generated programs are coded in Basic should be seen as a plus for a number of reasons. The first is that most people who know how to program know how to program in Basic and for those who don't and would like to, Basic is relatively easy to understand. The generated code is well commented and should prove no trouble to someone desiring to customise even further, this could provide a means of overcoming Codewriter's limitation of being able to look at only one file per program. Also, since every aspect of the application system runs in Basic, once it has been developed any part of it can be run without Codewriter. On the debit side, programs that run under Basic are typically not the speediest, yet I personally had no complaints about response times. If speed is of the essence, substantial improvements in performance can be achieved by compiling the code. If you are looking at buying a data base package for your micro, give Codewriter a good deal of thought. Prices start around $260 for the Commodore 64 and go up to around $600 for the Apple and IBM. Depending on your needs Codewriter could be the only sensible way to go.



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Microsoft's Word

Microsoft's new word processor for the IBM PC comes complete with windows and can be driven by a mouse. Its full of bells and whistles, says Jerry Sanders, but it wouldn't win any awards for ease of use.

Microsoft, the company that made its name with Microsoft Basic, now has a word processor in the family: Word, currently available for the IBM PC and XT under PC-DOS. priced at $499 this is only the company's second applications program; the first was Multiplan. Word offers 'live-screen' processing — the *what-you-see-is-what-you-get* philosophy extends to italics, bold face, underline and double underline characters — providing a high-res screen is used.

Word will appeal to those who need a range of document formats and print styles plus the ability to apply them to any document. A text created with Word can be reformatted by associating it with a user-defined style sheet. This reformatting takes place at the touch of a control key. Style sheets are more complex to set up and enable the user to type a variety of documents, memos, reports or even books; and produce the appropriate format repeatedly and consistently, down to the typeface, typesize and footnote conventions.

Word *can* be used with a mouse, and windows are standard: up to eight of which can be used to display different parts of the same document, or indeed eight different documents, simultaneously. There are no icons though, which gives Word a half-way status between traditional and modern user interfaces. Since word processing is a keyboard operation, the mouse doesn't make Word significantly easier to use.

Word comes in a clear perspex box which can be used as a prop by folding back the top. Two disks are included: a misnamed 'system' disk (see 'Documentation') and a program disk. Placing the 'system' disk in drive A after booting PC-DOS and typing Word gives rise to a double-vision display of the word MICROSOFT.

Also in the box is a manual and an A5 ring-binder containing 400 pages — at least a quarter of which is unintelligible. A quick-reference card completes the package. This, too, is unfortunately named. The 'card' is on thin glossy paper and far too flimsy to stand up to the amount of use intended for it. It's hardly 'quick' — being double-sided and packed with tiny print.

No key stickers or overlays are included in the package. Many keys can be user-defined, while others are straightforward mnemonics, but a set for the function keys would have been useful.

Word is menu, not icon, driven. It has two modes: Edit and Command, the latter being known as ALPHA. This is consistent with Multiplan's mode of operation. On power up Edit mode is set. The ESCAPE key switches you through to ALPHA. To switch back to Edit the 'A' (!) key is used. A toggle on ESCAPE would have been slightly more logical.

Menus are organised in a tree structure by main command, and the same words (for example, FORMAT, INSERT, TRANSFER) appear on different menus. Sometimes the meaning of a command changes according to its position on the menu tree.

This bold concept only works if the user is as clued-up as the program; take the FORMAT command, for example. It appears on the ALPHA menu and also on the GALLERY menu. Sounds confusing? It is. According to the manual *'The EDIT FORMAT CHARACTER command is used to view or set formatting attributes of characters . . . The GALLERY FORMAT CHARACTER command is used to view or set the character attributes of styles with character usage, or to view or set the character attributes of normal style for characters in styles with paragraph usage.'* All clear?

On screen Word uses a framed window for text, with a four-line menu, information and command area beneath. This includes a 30-character window on a scrap buffer, a question mark for indicating with the mouse to help call up information (on the keyboard help is provided using Alt-H). Every time a DELETE or COPY command is issued, the selected text replaces the current contents of the scrap buffer. An UNDO command allows the last command issued to be reversed, so deleted text could, for example, be replaced *in situ* from the scrap buffer. You also get a percentage figure for free disk space and the name of the current document. In the GALLERY MENU this defaults to the name of the currently active style sheet: in GLOSSARY menu to the current glossary.

Placing this interface area at the bottom of the screen is a design fault. The natural tendency of the eye is to travel downwards, which is why well-designed word processing programs place information at the top of the screen, where it can be comfortably ignored until required.

Limitations

A window does not initially show a ruler or an indication of the current page, line or column number. A ruler may be displayed through the Window Options menu, but it will only show tabs and column widths. INSERT mode can't be toggled on/off with a straightforward control sequence. This is because you have to key in sub-menu options and use the tab and space bar keys to select the required option. Word falls into the dual interface (keyboard/mouse) operation trap: procedures which work well with the mouse cause extra work from the keyboard.

A point about hardware here. The IBM monochrome display monitor doesn't show the mouse cursors or the different character styles, as it is not a high resolution, bit-mapped display. However, *APC's* review machine was fitted with an adaptor which plugs between the monitor and the video output to give high resolution (green on black) display on a normal monitor in use with a colour card. The trade-off is a reduced main window size leaving a one-inch border around the screen which is lost to the application: single-spaced text is very squashed up on the display.

On power up, a set of control keys for onscreen character control is enabled (see Fig 1). These can be reconfigured and new ones added via the INSERT

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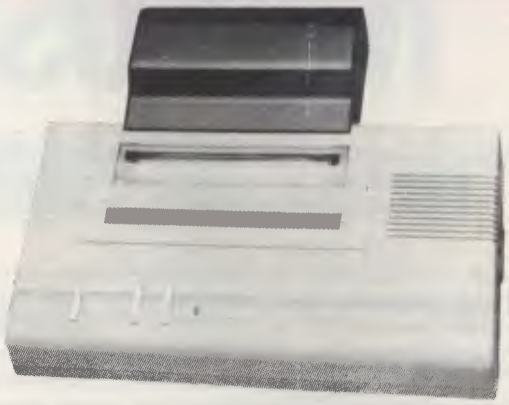

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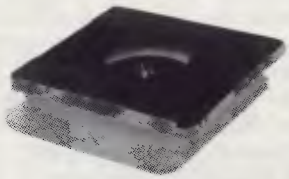

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Word's functions

Onscreen functions

Graphics characters	Yes
Multiple text windows	Yes
Set page width	Yes
Set page length	Yes
Auto page number	Yes
Search	Yes
Replace (optional/all)	Yes
Centre	Yes
Cut & paste	Yes
Define tabs	Yes
Justify/range l/r	Yes
Word wrap	Yes
Reformat para/page/document	Yes
Headers/footers/footnotes	Yes
Insert on/off	Yes
Backspace destructive	Yes
Live screen	Yes
Colour	No
Upper/lower conversion	No
Page/column/line/cursor position	No
Cursor position indicator	No

Disk/Utility System functions

Mouse option	Yes
Auto Back-up	Yes
Create document on open	Yes
Glossaries	Yes
Repaginate	Yes
Style sheets	Yes
Spellchecker	No
Auto save	No
Save to old file obligatory	No
Word/character count	No
Rename .bak files	No
Text buffer size	Virtual: Depends on RAM fitted
Maillist	Coming

Printing functions

Printer installation files	Yes
Justification	Yes
Variable line space	Yes
Proportional print	Yes
Print selected pages	Yes
Multiple copy	Yes
Paragraph protect	Yes
Columns	Yes
Type mode (direct print)	Yes (Without onscreen echo)
Sheet/continuous feed	Yes
Print=screen image	Yes
Background print	Yes
Headers/footers	Yes

command under the GALLERY menu, itself an option on the ALPHA menu. At any time ASCII graphics characters may be generated onscreen by holding down the Alt key and typing the character number on the numeric keypad. The character appears when the Alt key is released.

Character format	Alt + key
Normal	spacebar
Bold	b
Italic	i
Small caps	k
Strikethrough	s
Underline	u
Double underline	d
Superscript	+
Subscript	–

Figure 1 Direct Formatting Commands

Style sheets

By attaching a style sheet — a file with a .sty extension — to a document, the formatting parameters associated with the sheet will be applied to the document. Word comes with two pre-set style sheets: article.sty and draft.sty. A style sheet is attached to a document by selecting FORMAT from the main menu once the document is in use (or before starting the document). From the next menu select STYLE, and from the menu after that select SHEET. You are then prompted for the filename of that style sheet. On pressing return the sheet is assigned to the current document, and the chosen function sequences operate.

Long Divisions

Word uses virtual memory: the length of a document being limited only by the amount of free RAM and disk space. This can result (and did during Benchmarking) in a text file too large to be saved onto the disk. As well as the normal breakdown of a document into pages, paragraphs and characters, Word offers the use of Divisions. Within a document a new division can be defined with its own set of six parameters (see Fig 2).

Placement of page number
Page number sequence
Page number style
Margin sizes
Column number and layout
Headers and footers

Fig 2 Division variable parameters

Gallery

GALLERY allows a formatted document to be displayed at the touch of a button. On start-up Word has certain function keys pre-set to give live-screen attributes assuming a high-res monitor is used (see Fig 1). By choosing the INSERT function from the GALLERY menu, users may define their own mnemonic keystroke(s) so that the format required can be set before writing begins. A format chosen from a standard set can be customised through the FORMAT function of GALLERY, and each set of defined formats may be stored on disk as a .STY file as described earlier.

Disk management

Word defaults to listing its own files when requested to print a disk directory to the screen. Even then, it only lists files with a .DOC extension. Although automatic back-up on save is performed, Word — like WordStar — won't allow the user to load a file with a .bak extension. The rename function refuses to rename files with a .bak extension: if a .doc file is corrupted you have to quit Word altogether, rename the back-up copy under PC-DOS, and then load it all over again. If a directory of everything on the disk is required, there's no alternative but to specify '.' as the filename before actioning the command.

Documentation

The documentation attempts to explain mouse and non-mouse use of Word under subject headings. The same typeface and typesize is used for both varieties. This makes reading for either configuration annoying because it's not clear which relates to which. Considering that Word includes options for specifying different typestyles and faces, it's a case of do as the manual *says*, not as it *does*.

The manual gives up after teaching the user how to type in a couple of paragraphs and subjecting him/her to some very basic editing and blocking functions. Non-standard terminology is used: very annoying if you want to look something up. Don't waste time searching the index for load, merge or read: The word to look for in all cases is transfer.

Conclusion

Word is not for users who want standard word processing with a maximum of clarity and a minimum of fuss. It's full of bells, whistles — and even knobs if you use a mouse. The company's claim that you'll learn to use Word in no time at all is pure misinformation. Powerful features are available but you have to be prepared to sweat a little to achieve them.

Word merits an excellent rating for its lengthy list of facilities and operations, but it's no use a product having excellent features if it can only be used by people with programmers' brains. Beginners are well advised to steer clear but, if you're looking for a challenge, Word could well be for you.

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BENCHTEST

Sharp PC5000

Many major companies in the computer industry have competed to produce the definitive portable micro: practical and compact but with all the specifications of a desktop machine. Sharp, an innovator in the field in 1980 with the PC-1211 calculator, now presents the PC-5000, a powerful, battery-powered portable computer that combines complete functionality with many impressive features. Dick Pountain puts it through its paces.

Sharp has as strong a claim as anyone in this business to have been the pioneer of portable computing; the PC-1211 was the first pocket-sized 'calculator' to run the Basic as its operating language, and it pre-dated the current crop of lap-sized portables by three years. Since that first, Sharp has followed up with the more functional PC-1500 (with its novel miniature colour plotter) but the impetus in the portable business has transferred to the likes of Epson, Tandy and NEC with lap-held machines which feature full-sized typewriter keyboards and thus support word processing on the move.

Now, Sharp enters the fray once more with a bang. It has leap-frogged over the competition by launching a battery-powered, 8088-based MS-DOS computer which is larger than a modern portable typewriter and yet contrives to include a printer and display. It also uses state-of-the-art bubble memory cartridges for mass storage, a feature it shares only with the likes of Gavilan and Grid, machines costing three times the price of the PC-5000.

Hardware

The PC-5000 is packaged in a smart beige ABS case, which at first sight gives no hint that it contains a computer but rather resembles a portable typewriter. The illusion is dispelled by undoing two slide-catches at the front sides of the case, whereupon the forward half can be swung upwards revealing the keyboard while the underside of this lid contains the LCD display. Curiously, there is no carrying handle so transporting the machine is very inconvenient; it is just too heavy to sit under your arm like a Tandy.

The keyboard is a gem; its sculptured keys having the perfect combination of feel and click; they are well made with properly inlaid rather than stencilled legends. Layout is good, with large SHIFT keys, a huge RETURN key and all the control keys (CTRL, TAB, ESC, CAPS, ALT and DEL) sensibly sited and picked out in a dark brown colour. Two-key rollover and type-ahead allow full typing speeds to be maintained.

Above the keyboard is a row of 15 function keys. Eight of these are programmable function keys, used extensively by the tailored software; the rest include four cursor control keys, clear screen/insert, and two picked out in orange called ON and OFF. These are not, as one might expect, used to switch the computer on and off (this is performed by a standard rocker switch at the back of the case), but to put it to sleep. Power conservation is crucial on a battery machine and so whenever it's not in actual use you are recommended to hit OFF which puts it into a low consumption state with no display, to be revived when required with ON. However, this feature needs to be explicitly supported by the software and will not operate with just any old program. For instance, the Communciations package supports its use, so that the machine can wait for incoming modem traffic without running down the batteries; the word processor irritatingly doesn't.

Above the keyboard, on the front edge of the case is a small trap-door which conceals the single bubble memory cartridge slot. The actual media are small metal boxes (2in x 3in x ¼in) which fit onto an edge connector and are locked in place by a lever which also serves to eject them for removal. The boxes are in beautiful blue anodised aluminium and look as expensive as they are: they cost $260 each! Each cartridge stores 256k, which compares favourably with the size of floppy disks commonly fitted to portable machines. The manual refers to the capacity as 128k, so one must assume that these are a more recent upgrade containing two bubble chips instead of one. They are treated by MS-DOS as if they were floppy drives. Next to the trap-door are three small coloured LEDs, indicating low battery, power on, and bubble in action. The green light flashing as a bubble loads shows that the data rate is like that of a rather slow floppy disk drive.

The top of the case on the test machine was occupied by a removable hinged panel covering the optional thermal printer. This is a miniaturised thermal transfer dot matrix printer which uses a cartridge ribbon and typewriter-style friction feed. There are no moving pins in the print head; instead, heating elements cause carbon to be transferred from the special ribbon. Dot graphics can be printed from Basic, and there are two pitches for text, 12 or 10 char/inch (80 or 66 char/line).

Compact dual 5¼in disk drive unit.

The typeface is elegant and spindly with serifs, quite unlike normal dot matrix print. Packets of single A4 sheets of two kinds of paper, *viz* thermal transfer and heat sensitive were supplied. The former requires the use of a ribbon catridge, whereas the latter works without a ribbon by heat alone. In addition, the ribbon will work after a fashion with ordinary paper, though the transfer of carbon is not so good because of the rougher surface. Thermal transfer paper with the ribbon gave slightly better results than heat sensitive without, but both were better than cheap dot matrix impact printing.

I fed in ordinary typing paper and got a rather scruffy but legible impression, which might be useful if you were to run out of supplies in the Sahara Desert. The biggest drawback of the printer is its low (30cps) speed which makes the printing of a long document compare unfavourably with watching paint dry as a recreation. A bonus point though for

The well-designed keyboard is a pleasure to use and contains 15 function keys

quietness; it's almost silent in operation.

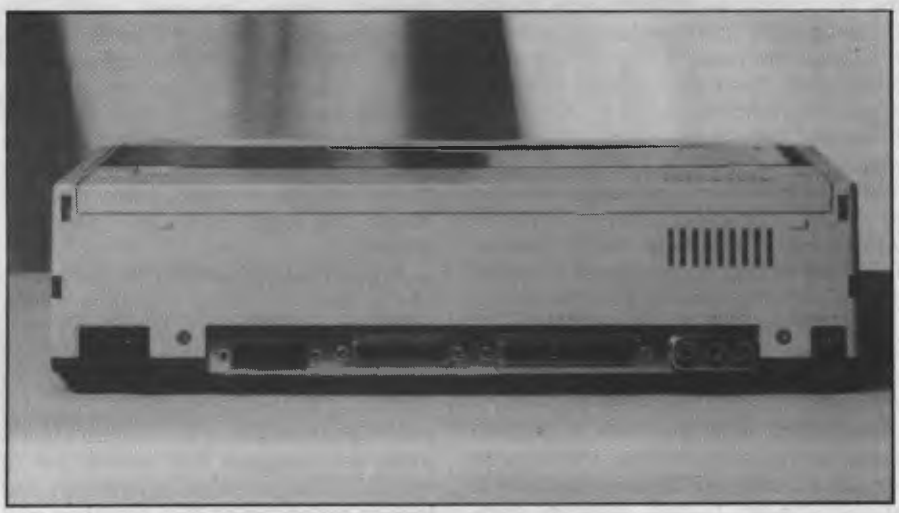
Behind the printer is a slim compartment containing the battery. Sharp has broken new ground by using a miniature lead cell (like a car battery) in place of the now common NiCad. This tiny unit (the size of a Mars Bar) holds charge for six hours continuous use and gives two years' service. The machine can be used with a mains adaptor which simultaneously charges the battery, taking 48 hours to achieve full charge. Alternatively, setting a switch on the back to CHG allows 'crash' charging in eight hours but the machine can't be used (suitable for overnight charging). Given these parameters it's clear that a certain amount of power discipline will be needed from the PC-5000 owner, and also that this machine can survive train and plane journeys but not prolonged use in the jungle or desert without special charging provisions.

The back panel of the machine is a busy area. At the far left are the power on and charge switches. Next to these is a Sharp proprietary serial port for use with a modem and other future peripherals. Moving along, we have a standard 27-pin D type RS232 connector followed by a parallel bus expansion socket for connecting disk drives and then standard EAR/MIC/REM mini-jack sockets for a cassette recorder. At the far right hand end is the AC mains adaptor socket.

Underneath the case are two compartments with screw fasteners which hold memory expansion modules. The PC-5000 comes with 128k of RAM fitted and two 64k expansion modules can be added to boost this to 256k. Alternatively, one of the slots may be used for the 64k ROM basic interpreter; small slide switches inside the compartment allow the memory map to be configured to suit the different options.

Between the expansion compartments is a small slide switch (fortunately well recessed) which disables the system master clock for long-term storage. The clock calendar has its own NiCad cell which is automatically recharged from the mains batteries in normal use.

The eight line by 80 column LCD display is fitted into the swivelling lid which covers the keyboard. The display can be set at different viewing angles by turning this lid to the appropriate position where it locks on a ratchet. This ratchet has a flimsy feel though and I found it generally wiser to swivel the display back to its full extent where it rests on the case and feels much more secure. A knurled thumbwheel hidden down at the right side of the case allows the contrast to be adjusted (a similar one next to it controls sound volume), but the contrast of this unit is adequate. The Epson and Tandy lap-helds are used in a horizontal position and so receive direct illumination from the room lights and oblique daylight from windows. The PC-5000 display is used either vertically or at most tilted at 45° backwards, and in neither position does it receive enough light unless you can arrange to sit with your back to a bright window or shine a lamp straight onto it. In addition, the clear plastic screen is highly reflective so the latter course creates as many problems as it solves. There is no way that this display can be read comfortably in anything less than outdoor daylight or a very well lit room. There appears to be no provision for TV or monitor output, though it could possibly be fudged through the serial port by performing brain surgery on the BIOS. The display is also quite slow to update which, when combined with the not excessively rapid bubble, makes for a rather sluggish response to, say, a directory request.



View from the rear

The typeface is attractive, with true descenders and comes in two weights: 'light', which is one dot thick, and 'bold' which is two dots thick. The use of light at the MS-DOS command level exacerbates the contrast problem; inside the word processor bold is used for text, and it's much more legible.

I can't tell you a great deal about the machine's insides because for the first time in my career I chickened out from taking a machine to pieces. Having removed the top case it became apparent that dismantling the rest was going to be a lengthy task and reassembling it possibly a non-terminating one. A typical small miracle of Japanese production engineering, it wastes not a cubic millimetre of internal space and gets the equivalent of most of an IBM PC in there. The main board is in the bottom of the case facing downwards so I can tell you nothing about the chips, but the PCB is a work of art with tracks little thicker than a spider's web in places. Sharp's specification sheet says that there is a second (8-bit) processor in addition to the 8088, and one could guess that this might handle the decoding of the bubble memory.

Untangling the memory map is no joke. According to the manual the PC-5000 contains 192k of ROM (64k 'System Program', 64k MS-DOS and 64k Basic!) which I find scarcely credible. The ROM-based MS-DOS is not a full version 2.0: the full version with all the transient commands is supplied on disk as an extra. Even more puzzling is that both the ROM-DOS and Basic require a bubble to be inserted before they can be used, which apparently must have MS-DOS, SYS and IO.SYS on it (another 35k of code). So what's in that 128k of ROM? Macintosh gets its whole windowing operating system into half that space! Maybe it's the code that blows the bubbles . . .

If you try to boot the system without a bubble, an error message says 'Press CR to start Basic without DOS.' Doing so reaps a fresh error, 'Invalid Basic version. Please load DOS . . . ' This, the manual politely explains, is a left-over from a previous version of the computer which had a non-DOS Basic; it would have been more polite still to remove such confusing nonsense.

In most respects the PC-5000 behaves like any desktop MS-DOS computer. I was supplied with a dual 5¼in

disk drive unit: this is not the old Sharp MZ-80FD but a much more compact unit using twin half-height drives, each with a formatted capacity of 360k. These worked well but made an alarming noise like a miniature chainsaw when in operation.

When using the bubble memory one is aware of some differences from an ordinary floppy system not the least of which is its complete silence. The bubble cartridges come from the factory preformatted and the DOS FORMAT command will give an error message if you try to use it on one. All the other DOS utilities work as normal though, including DISKCOPY and COPY (though you cannot DISKCOPY a disk to a bubble or *vice versa).* Bubble cartridges can be write-protected just like disks, by putting a silver sticker over a black patch on the side. The most unsettling difference is that the bubble 'drive' is regarded by DOS as being both devices A: and B:. This is not like a partitioned winchester though: drive A: is the default drive upon cold start and holds a single bubble cartridge. If you now log on to B: you will be prompted to insert a new cartridge into the slot, which the system then calls B:. This is done to allow backing-up of cartridges using only the single drive. If the same cartridge is left in place DOS will not complain, so you'd better keep a clear head if you're copying a lot of files by this method. The floppy drives are devices C: and D: and the system always boots from C:, if present, on power-up.

The version of DOS supplied is 2.00 with all its Unix style features such as hierarchical directories, pipes and filters. The MORE filter is especially appreciated with an eight line screen so I created a batch file called FILES.BAT to do a paged, sorted directory (containing DIR II SORT II MORE). As pipelines require writing to the bubble this took *28 seconds* to produce the first page of files, which was rather depressing. The MODE command performs some hardware specific tricks such as setting the display to 40 or 80 columns, initialising the internal printer for 80 or 66 characters and different line spacings, and setting up the parameters for the two serial ports.

By choosing to implement a standard disk operating system like MS-DOS, Sharp has lost some of the unique advantages of a portable computer. Although I assume that the RAM is all CMOS for reasons of power consumption, it's not possible to store files in non-volatile memory; everything must be saved to bubbles as, even if the RAM does preserve its contents, MS-DOS will clear the TPA on boot-up. A simpler operating system that used RAM files and merely saved a memory image to the bubble might have been more useful.

Software

The software Sharp is offering with the PC-5000 is all US produced, from Microsoft and Sorcim, but packaged with the Sharp logo. Microsoft has provided the DOS and a version of GW-Basic which is very close to that on the IBM PC, even down to the bit-mapped graphics routines. Sorcim has written the main applications suite, called the SuperTools. This is a set of four programs which are integrated via a menu-driven, front-end program which makes use of the function keys, and can exchange data via a common memory area called the Scratch Pad.

The four applications are: SuperWriter, a word processor; SuperCalc 2, the well-known spreadsheet; SuperPlanner, a diary and schedule program; and SuperComm, a communications program for transferring data between computers and logging onto bulletin boards and remote databases. At the time of this review I was only supplied with Superwriter and SuperComm.

The Master Menu, seen when the SuperTools are first booted, assigns the different programs to the programmable function keys with a set of onscreen labels. This is not wholly effective as the display is almost a foot away from the function keys and the eye cannot relate label to key; Sharp supplies blank card templates to label the function keys but these can only cope with one or two menu levels. Each application makes its own use of function keys and so menu nesting may go down to three or four levels. Function key F1 is reserved in all places as a Help key, and it produces help screens relevant to the latest operation performed.

In addition to the four application programs (actually five as the Planner is used again as a memo pad called Reminders), there are menu options to perform all the DOS housekeeping utilities, set the time and date, and to program an Alarm which prints a reminder message as well as beeping at the set time. A permanent display of the time and date is maintained on the Master Menu screen and also in the introductory screen of each application. The Master Menu can be reconfigured by the user by editing a file called SUPER.FIG, so that new applications can be added or deleted and the Help screens can be modified.

SuperWriter is a very usable word processing program with all the features one would expect on a professional system. It is controlled by a mixture of menu choices and direct commands; all cursor movement in the document is by WordStar-style control sequences, but more complex operations like search-and-replace and block moves are done from a menu of function keys. This gives a good compromise between ease for beginners and speed for experienced users. All the control codes are explained in a series of Help screens. The introductory screen invites entry of author and operator names and comments, in Wangwriter-style, and a history of each document can be maintained on disk. One very neat feature is the provision of a variable called %DATE which can be inserted in a document and is replaced automatically by the system date at print time. The option of creating automatic backup files is offered in the SAVE menu.

The principal limitation of SuperWriter is that it doesn't use virtual memory techniques, so the largest document that can be edited at one time is governed by what will fit into RAM. However, files can be chained for printing using the insert command and long documents can be edited in chapters or other smaller units. There are no mail-merge or spelling-check facilities.

SuperComm is a menu-driven asynchronous communications program which can drive either of the PC-5000's two serial ports. Since Sharp's own 10-key modem is only likely to be sold in the US, the RS232 option is of more relevance to Australian users. The program can be used at baud rates from 100 to 9600 with all the permutations of stop bits and parity, but the only protocols recognised are XON/XOFF or none. SuperComm can buffer up to 7500 characters in its session log, and the log can be inspected by scrolling either way with the cursor keys and saving to disk or bubble. Rather than merely using the PC-5000 as a dumb terminal, files can be created using any of the other tools and transferring to another remote computer. A trace facility allows a sequence of commands to be stored as an executable file, useful for automating the long complex log-on sequences required by some networks.

These Execute files can also be scheduled to run themselves, unattended, at a time set by the system clock. To use this facility it's necessary to have an auto-dial/auto-answer modem (not yet such common fodder in this country as the US). The idea of my computer phoning me up at a dinner party to tell me it's time to take the pills is pretty spooky anyway.

The Basic provided with the PC-5000 is, as mentioned above, very close to that used on the IBM PC, though rather slower according to the Benchmarks. Data types suppported are integer (16-bit signed), single and double reals (6- and 16-digit) and strings, and variables can be assigned these types explicitly with DEF statements or symbolic suf-

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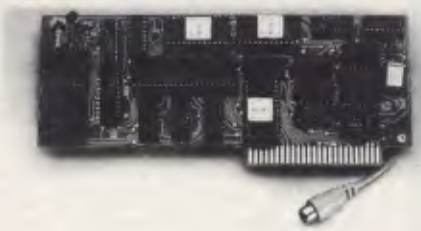

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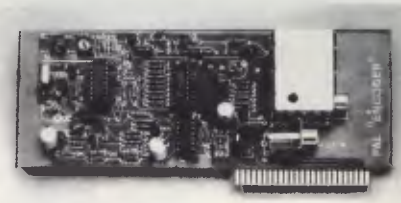

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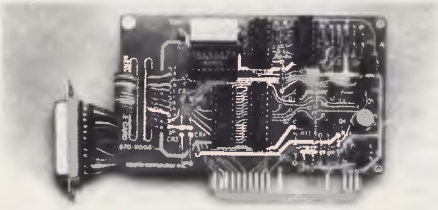

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Communications are directly supported in the Basic by means of the COM ON, COM OFF and ON COM GOTO/GOSUB statements which allow a Basic program to monitor the communications line and branch on the receipt of a call. By using COM STOP this monitoring can be postponed (that is, put into the background) so that important parts of a Basic program can execute undisturbed. When the next COM ON statement is reached, any communication received while COM STOP was in force will be remembered and may be acted on by ON COM GOSUB to a suitable handling routine. The size of the communications buffer can be reserved when Basic is first loaded by calling it with the /C option, for example, BASIC/C: 1000 reserves 1000 bytes.

Graphics are supported through Microsoft's Graphic Macro Language, in which objects are described by strings of single character instructions (U for Up, D for Down, L for Left, and so on). These strings are then used as parameters in the DRAW statement. CIRCLE will draw any ellipse, not merely circles, and LINE draws either between chosen end points or relative to last point plotted. Areas can be filled with the PAINT statement; there is even a COLOR which can only be black or white on the 5000 but it can also alter the weight of text. Sound is also well catered for with BEEP, SOUND and PLAY. The latter takes strings of characters in a 'tune definition language' analogous to that for DRAW and plays them as tunes. SOUND is programmable for frequency and duration but only a single voice is provided.

Both random access and sequential files are supported on the disks and bubbles, and sequential files on cassette tape.

The only concessions to structured programming are the now standard WHILE . . . WEND and IF . . . THEN . . . ELSE. The full screen editor is exactly as that on the IBM PC and is the best of its kind, allowing total freedom to edit anything at the cursor position: F and B cause the cursor to skip along by whole words only. It's the only Basic screen editor I've used that handles long lines that wrap around in an intelligent fashion. Single entry of keywords is possible using the ALT key with letters, and the function keys are programmed with direct mode commands like RUN and SAVE.

In principle, there is no reason why a variety of other programming languages shouldn't be run on the PC-5000, assuming one can get copies on the Sharp disk format. Pascal, Fortran, Forth, C, Cobol and various other compilers can now be obtained for DOS 2.0, and the PC-5000 has the memory to run any of them.

In perspective

Who could use the PC-5000? Bear in mind that apart from the size of the screen this computer is equivalent to an IBM PC, so in principle it should suit the same users with the added bonus of extreme portability. In practice, the small (and very slow) display makes the regular use of large spreadsheets something of a torture. The battery life is not long enough to recommend it for use in the outback, though it's plenty for a day away from the office. So the ideal user would seem to be a business person who does a lot of travelling and needs to take word processing, calculation and communications power along while the disk drives sit at home or in the office for archival storage of data. Alternatively, one can forego the disk drives altogether as long as there is another MS-DOS machine at the office with an RS232 port; the PC-5000 will then down and upload data from the mother machine when required.

The machine is very much more portable than an Osborne or Kaypro, and given the built-in printer, more fully functional than the Grid Compass at less than a third of the price.

It seems a pity that there is no provision for a full-sized monitor, since this would make the machine absolutely equivalent to its desktop rivals when at its home base.

What are the prospects for software supply? The choice of a 'standard' like MS-DOS is a good idea in principle, and there should be some third party software available more or less immediately. Don't however, assume that all the IBM PC software will automatically become usable. The bulk of well known US software for the PC is 'badly-behaved'; that is, it either talks directly to the hardware, bypassing PC-DOS, or at best it directly calls the IBM ROM BIOS which is copyrighted. Programs such as Lotus 1-2-3 need to be extensively rewritten to run on so-called 'compatible' MS-DOS machines.

Documentation

I was supplied with three manuals: the PC-5000 User Guide, the Professional Series Software manual (covering the Super-Tools) and a standard MS-DOS manual including the Macro-86 assembler.

The User Guide consists of a section on assembling the PC-5000 (including installation of the printer), a survey of DOS commands, and the Basic manual which occupies most of the book. The setting up section is clearly written and illustrated with diagrams, and it takes the first-time user in a reassuring manner up to the point of booting MS-DOS; whether the user has any idea what MS-DOS *is* or what to *do* with it, is another matter. Equally, an experienced user or programmer will find no technical information of any depth save for a half page specification chart of the sort more appropriate to a pocket calculator, and it is to be hoped that a technical manual exists for the use of software houses who intend to produce for the machine.

In short, the manual falls very far short of the sort of documentation produced by IBM or Apple, or even Sharp's own documentation for earlier machines, which though written in *pidgin* was very comprehensive.

Sorcim's SuperTools manuals are readable, informative and well presented, with proper indexes and large glossaries of terms so there should be no difficulty in using these programs. The MS-DOS manual is the standard Microsoft document with a few changes where appropriate to refer to the differences between bubble and disk; it is comprehensive concerning the DOS but again does not contain the low level information about the PC-5000 implementation that programmers will need.

Conclusions

The PC-5000 is a very powerful portable computer. It's the only machine around that combines a 16-bit processor, built-in mass storage and printer with briefcase portability. It is also good value for money considering that it offers all the functionality of a desktop MS-DOS computer. Its only serious competitors are the American 'executive' portables such as Gavilan and Grid, which cost much more.

Its weaknesses lie in the quality of the

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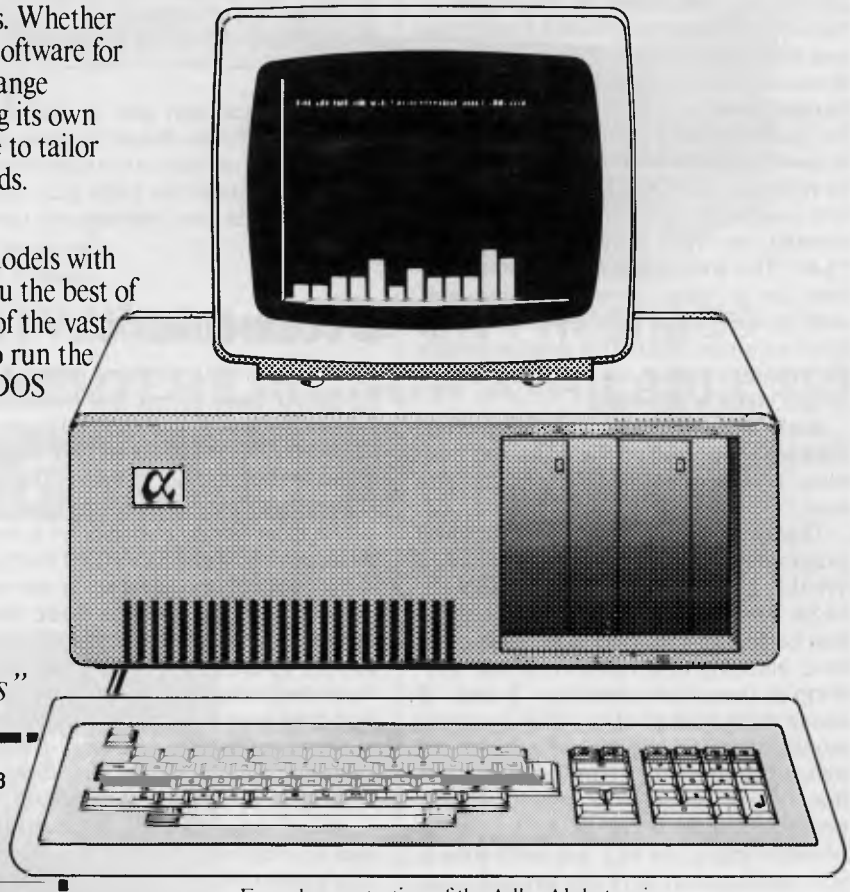

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FAAD 418

Sharp PC5000

display, which seems to be stretching the capabilities of LCD almost to the verge of impracticality, and the high cost of the bubble memory media. This last problem is likely to remain until they are in widespread use and very high volume manufacture.

Benchmarks

BM1	2
BM2	6
BM3	16
BM4	17
BM5	19
BM6	33
BM7	55
BM8	52

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

Prices (including Sales Tax)

PC-5000 (includes Basic ROM)	$2,595
CE-510P printer	600
Twin disk drive	1,750
Bubble cartridge (blank)	260
64 expansion RAM	220
SuperTools software	
On bubble	500
On disk	215
MS-DOS disk	140

Technical specifications

CPU	8088
Memory	RAM 128k Expandable to 256k or 192k with Basic ROM. ROM 128k + 64k Basic
Display	80 x 8 chars text, 640 x 80 dots graphics
Other I/O	Sound generator
Clock	Powered by own NiCad cell
Power source	Internal rechargeable battery or 250v AC with supplied adaptor
Ports	Sharp serial port RS232C 8-bit expansion port Cassette MIC,EAR,REM 1000 baud
Operating system	MS-DOS v 2.0
Dimensions	326mm x 305mm x 87.5mm
Weight	4.3kg

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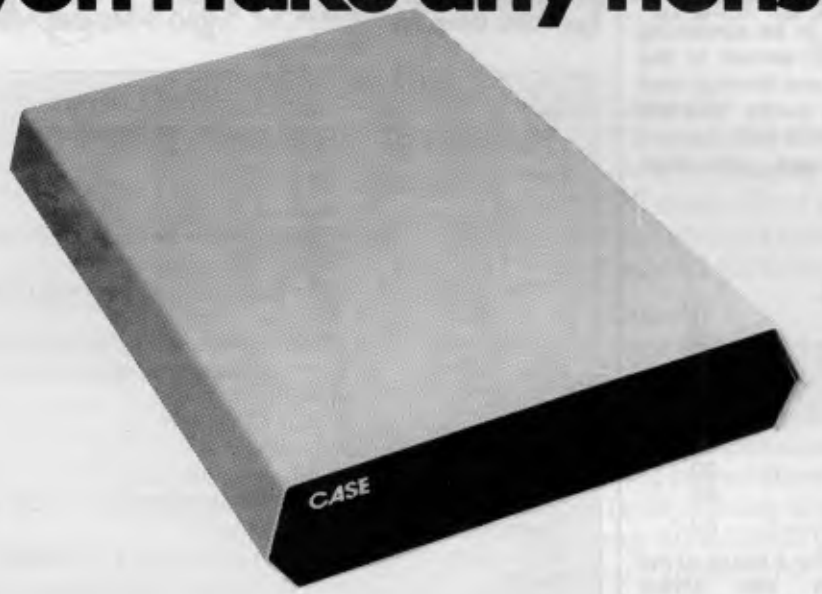

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Battle Stations

Got two VICs and a spare friend? Then you're ready to set sail for battleships — Chris Preston's computer version of the traditional game.

Battleships has been a pen-and-paper stalwart for years — but here's how all you VIC 20 owners can pass those rainy afternoons playing the game on your steaming micros.

Part of the design of the VIC allows the user port to be configured as an RS232 serial communications port, which is normally used to connect a printer or a modem. Under these conditions it is necessary to use an interface to convert the VIC's signal voltages, 0 and 5V to the RS232 standard voltages, —12 and +12v. However, if all you want to do is to connect two VICs together, then a short piece of cable is really all you need. Having done this you have the ideal set up for Battleships. The game is intended to run on two VICs (with at least a 3k expansion), but will also run on a 64 (although the screen messages need tidying up a little).

The principle of the game is quite simple: the two players each have a VIC linked by a cable and arranged so that they cannot see each other's screen. Each player has a number of ships (in this game he has one aircraft carrier, two destroyers and three frigates) arranged over a square battle area, and he has to guess the locations of his opponent's ships before his own are destroyed.

An aircraft carrier covers four squares, a destroyer two and a frigate only one. The battle area is divided into 9 x 9 squares, each of which has a coordinate to identify it. The top row are A1, B1, C1 to I1, the next row are A2, B2, C2 to I2 down to the bottom row A9 to I9.

Each player first of all sets up his own ships, then when both are ready, they take it in turns to shoot at each other's ships by typing in the co-ordinates of a square where they think a ship may be lurking. After a player has made a shot, the screen tells him whether he has scored a hit or not, and the square he shot at is changed to reverse video on his screen, so that he knows which squares he has already tried. In order to keep the size of the game down, some things are left to the honour of the players. You should make sure that the squares forming your aircraft carrier lie in a straight line, and the two players must take it in turns to fire.

It takes four hits (one on each of the relevant squares) to sink an aircraft carrier, two for a destroyer and only one for a frigate. The first player to sink all his opponent's ships has won the battle.

Before you can commence battle you need a cable to connect the two user ports together — Fig 1 shows the connections required. You should be able to get all the bits from your Commodore dealer, who will also make the cable up for you if you are not an expert at soldering. The cable itself should be proper computer-quality screened cable or ribbon cable and should not be too long (six feet is probably the maximum) and it should be kept well clear of mains leads, and TV monitors. Fig 2 shows the listing of the program. If you are running on a small VIC you should leave out subroutine 31000, which explains how to play the game.

Line 100 opens the channel to the RS232 port, and lines 110 to 130 set up a few variables; lines 1000 to 1080 give the introductory dialogue, and ask if you need instructions on how to play; lines 1100 to 1110 put the battle area on the screen, and lines 1120 and 1130 prompt for a ship type (A, D or F). depending on which ship was selected,

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  2 x RS232 Serial & 1 x Centronics (MD2, MD3) + High Speed Port MD11
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SOFTWARE SPECIFICATIONS.

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- New Word MD11
- Correct-it spelling checker
- Logicalc Electronic Spreadsheet
- Personal Pearl Data Base
- Quest Bookkeeper (Not available with MD2)

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the program jumps to 1300, 1500 or 1700 to enter the co-ordinates of each square for the ship. (Owners of 64s and large VICs may care to put some extra code in here to stop people cheating and spreading their aircraft carrier all over the screen instead of on four adjacent squares). As each square is entered, an 'A', 'D' or 'F' is put into the corresponding element of the array BF$(,). (The symbol '(,)' is our convention for referring to a two dimensional array.

Lines 2000 to 2020 check whether the setting up phase is complete. Line 2140 is quite interesting: because we are not using a true RS232 link, it is possible that once you had opened the channel, some garbage will come down the line before the other station is ready to transmit, if so, the RS232 software will think that there is a half-assembled character in the buffer, and will give a framing error when the real first character appears. 2140 tests to see if this has happened, and if so, a GET#1 clears the buffer. ST will show an error after this, but that does not bother us.

The game proper starts at 2200, which prompts the player for the co-ordinates of the square he wishes to attack, and line 2210 starts the cursor flashing. Line 2220 tests if a key has been pressed; if so, the player is making an attacking move and the program jumps to 2260. Line 2230 tests if the enemy has fired a shot. If not the program loops back to 2220. If a shot has been fired, X$ contains the X co-ordinate of the square under attack and line 2240 gets the Y co-ordinate. Line 2250 stops the cursor flashing and the program jumps to line 3000.

If the player is keying the co-ordinates of a square he wishes to attack, the program comes to line 2260, which inputs the co-ordinates. Line 2270 sends them to the other computer, and line 2280 waits for a message to come back giving the result of the shot. If C$ is 'M', then the shot missed; if 'H', then a hit was scored. A 'W' means that all the other ships have been lost and the player has won. Lines 2310 and 2320 tell the player whether he has hit or missed, and lines 2330 and 2340 change the square on his screen to reverse video so that he knows that he has already attacked that square. The array A%(,) normally contains zeros; a —1 in an element means that the corresponding square has already been fired at, and subroutine 36000, which displays a character in that square on the screen, will print in reverse video.

When the enemy fires a shot, the program comes to line 3000, which determines whether a ship has been hit or not. If a ship is hit, that square on the screen is blanked out, and the corresponding element in the array BF$(,) changed to a blank by line 3010. Line 3020 decrements N, the count of the number of squares left, and if it is zero it tells the player that he has lost the game, and sends a 'W' back to the other computer to tell it that it has won. If a hit or a miss has been scored, then an 'H' or 'M' respectively is sent back.

The program contains a number of

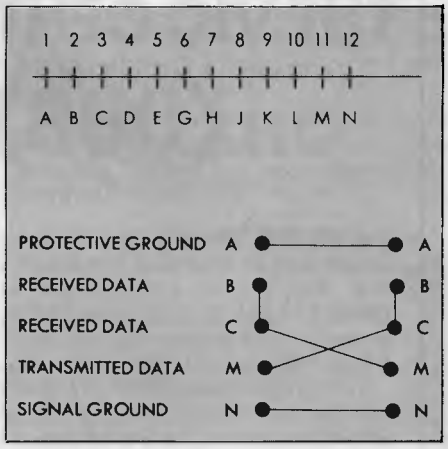

Fig 1 User port pinout (see page 152 of the Owners Manual)

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subroutines. 30000 displays the battle area on the screen; 31000 gives the instructions on how to play. Subroutine 33000 starts the cursor flashing, waits for a key to be pressed and then turns the cursor off and displays the character on the screen. The key pressed is returned in A$. Subroutine 34000 inputs the coordinates of a square, verifies that they are legal, and puts them into X$ and Y$. Subroutine 35000 tests if a square is occupied by looking at the relevant element in BF$(,). Subroutine 36000 puts a new character into an element of BF$(,) and displays the character in that square on the screen. If the square has already been shot at by the player, then the corresponding element of A%(,) will be set, and the character is displayed on the screen in reverse video. Subroutine 41000 displays a message on the bottom line of the screen.

Now you know how it all works, you're ready to have fun playing — and maybe tinkering with — the Battleships program.

```
100 OPEN1,2,0,CHR$(134)+CHR$(32)
110 CD$="
120 SP$="                    "
130 DIMBF$(9,9),A%(9,9)
1000 PRINT"       WELCOME TO VIC":PRINT"BATTLESHIPS":PRINT:PRINT
1010 PRINT:PRINT"DO YOU KNOW HOW":PRINT"TO PLAY (Y/N) ?"
1020 PRINTLEFT$(CD$,14);TAB(16);
1030 GOSUB33000:IFA$="N"THENGOSUB31000:RUN
1040 IFA$()"Y"THENPRINTCHR$(7);:GOTO1020
1050 PRINT"       FIRST SET UP YOUR":PRINT:PRINT"BOARD.":PRINT
1060 PRINT"DON'T LET THE ENEMY":PRINT:PRINT"SEE !!"
1070 FORI=1TO9:FORJ=1TO9:BF$(I,J)=" ":NEXT:NEXT
1080 FORI=1TO2000:NEXT
1100 GOSUB30000
1110 GOSUB41500
1120 PRINTLEFT$(CD$,21);"WHICH SHIP (A/D/F)  ";
1130 GOSUB33000:C$=A$
1300 IFA$()"A"THEN1500
1310 PRINT"A"
1320 IFA=1THENZ$="ONLY 1 CARRIER":GOSUB41000:GOTO1120
1340 FORI=1TO4:GOSUB41500
1350 GOSUB34000
1360 GOSUB35000:IFS$()" "THENZ$="THAT SQUARE OCCUPIED":GOSUB41000:GOTO1350
1370 GOSUB36000:N=N+1
1380 NEXT
1390 A=1
1400 GOTO2000
1500 IFA$()"D"THEN1700
1510 PRINT"D"
1520 IFD=2THENZ$="ONLY 2 DESTROYERS":GOSUB41000:GOTO1120
1540 FORI=1TO2:GOSUB41500
1550 GOSUB34000
1560 GOSUB35000:IFS$()" "THENZ$="THAT SQUARE OCCUPIED":GOSUB41000:GOTO1550
1570 GOSUB36000:N=N+1
1580 NEXT
1590 D=D+1
1600 GOTO2000
1700 IFA$()"F"THENPRINTCHR$(7);:GOTO1110
1710 PRINT"F"
1720 IFF=3THENZ$="ONLY 3 FRIGATES":GOSUB41000:GOTO1120
1730 GOSUB41500
1740 FORI=1TO3
1750 GOSUB34000
1760 GOSUB35000:IFS$()" "THENZ$="THAT SQUARE OCCUPIED":GOSUB41000:GOTO1750
1770 GOSUB36000:N=N+1
1780 F=F+1
2000 PRINTLEFT$(CD$,22);SP$;
2010 IFN(1THEN1110
2020 GOSUB41500
2100 PRINTLEFT$(CD$,21);"NOW WHEN YOUR ENEMY  "
2110 PRINT"IS READY YOU CAN"
2120 PRINT"START FIRING !!!";
2130 FORI=1TO2000:NEXT
2140 IFPEEK(663)()0THENGET#1,A$
2150 FORI=1TO3:PRINTLEFT$(CD$,20+I);SP$;:NEXT
2200 PRINTLEFT$(CD$,21);"FIRE AT SQUARE:  ";
2210 POKE204,0
2220 GETA$:IFA$)""THEN2260
2230 GET#1,X$:IFX$=""THEN2220
2240 GET#1,Y$:IFY$=""THEN2240
2250 POKE204,1:PRINT" ";:GOTO3000
2260 GOSUB34020
2270 PRINT#1,X$;Y$;
2280 GET#1,C$:IFC$=""THEN2280
2290 A$="MISS":IFC$="H"THENA$="HIT"
2300 IFC$="W"THENPRINT"  ";LEFT$(CD$,12);"YOU HAVE WON !!":GOTO3090
2310 Z$="  YOU HAVE A "+A$:GOSUB41010
2320 FORI=1TO1000:NEXT:GOSUB41500
2330 GOSUB35000:C$=S$
2340 A%(X,Y)=-1:GOSUB36000
2350 GOTO2200
3000 GOSUB35000:Z$="HIT":IFS$=" "THENZ$="MISSED":GOTO3030
3010 C$=" ":GOSUB36000
3020 N=N-1:IFN=0THENZ$="W"
3030 PRINT#1,LEFT$(Z$,1);:IFN=0THEN3070
3040 Z$="HE "+Z$+" YOU!":GOSUB41000
3050 FORI=1TO1000:NEXT
3060 GOSUB41500:GOTO2200
3070 PRINT"  HARD LUCK, YOU HAVE":PRINT
3080 PRINT"BEEN WIPED OUT!"
3090 PRINT:PRINT:PRINT
3100 PRINT"DO YOU WANT TO":PRINT
3110 PRINT"FIGHT AGAIN ? ";
3120 GOSUB33000:IFA$="Y"THENRUN
3130 END
30000 PRINT"   A B C D E F G H I "
30010 PRINT"  ┌─┬─┬─┬─┬─┬─┬─┬─┬─┐"
30020 A$="1 │ │ │ │ │ │ │ │ │"
30030 B$="  ├─┼─┼─┼─┼─┼─┼─┼─┼─┤"
30040 FORI=1TO8:PRINTCHR$(I+48);" ":A$:PRINTB$:NEXT
30050 PRINT"9 "A$
30060 PRINT"  └─┴─┴─┴─┴─┴─┴─┴─┴─┘"
30070 RETURN
31000 PRINT"  YOU HAVE THE FOLLOWING"
31010 PRINT"SHIPS:":PRINT:PRINT
31020 PRINT"1 AIRCRAFT CARRIER (A)"
31030 PRINT"2 DESTROYERS (D)":PRINT
31040 PRINT"3 FRIGATES (F)":PRINT:PRINT
31050 PRINT"THE ENEMY HAS EXACTLY":PRINT
31060 PRINT"THE SAME FORCES AS YOU"
31070 PRINT"DO."
31080 GOSUB32000
31090 PRINT"  BEFORE YOU PLAY, YOU":PRINT
31100 PRINT"EACH HAVE TO ARRANGE":PRINT
31110 PRINT"YOUR NAVY ON THE HIGH":PRINT
31120 PRINT"SEAS. THE BATTLE AREA":PRINT
31130 PRINT"IS REPRESENTED BY A":PRINT
31140 PRINT"GRID OF 9 X 9 SQUARES."
31150 PRINT"EACH OF WHICH HAS A":PRINT
31160 PRINT"REFERENCE.":PRINT
31170 GOSUB32000
31180 PRINT"  FOR INSTANCE THE TOP":PRINT
31190 PRINT"LEFT HAND SQUARE IS":PRINT
31200 PRINT"CALLED A1; THEN A2,":PRINT
31210 PRINT"A3, A4 ETC. ACROSS THE"
31220 PRINT"TOP OF THE BATTLE":PRINT
31230 PRINT"AREA."
31240 GOSUB32000:GOSUB30000:GOSUB32000
31250 PRINT"  AN AIRCRAFT CARRIER IS"
31260 PRINT"FOUR SQUARES LONG, A":PRINT
31270 PRINT"DESTROYER TWO AND A":PRINT
31280 PRINT"FRIGATE ONLY ONE.":PRINT
31290 PRINT"TO PLACE A FRIGATE":PRINT
31300 PRINT"AT SQUARE B5, FOR":PRINT
31310 PRINT"INSTANCE, YOU REPLY":PRINT
31320 PRINT"'F' TO THE QUESTION":PRINT
31330 PRINT"'WHICH SHIP?'":PRINT
31340 GOSUB32000
31350 PRINT"  YOU HAVE TO ENTER FOUR"
31360 PRINT"SQUARES FOR THE":PRINT
31370 PRINT"CARRIER AND 2 FOR EACH"
31380 PRINT"OF THE DESTROYERS.":PRINT
31390 PRINT"THESE SQUARES MUST BE":PRINT
31400 PRINT"IN A STRAIGHT LINE:":PRINT
31410 PRINT"YOU CANNOT HAVE":PRINT
31420 PRINT"BENT SHIPS!"
31430 GOSUB32000
31440 PRINT"  ONCE YOU AND THE ENEMY"
31450 PRINT"HAVE ENTERED ALL YOUR":PRINT
31460 PRINT"SHIPS YOU CAN START TO"
31470 PRINT"FIGHT. IF YOU THINK":PRINT
31480 PRINT"THAT THE ENEMY HAS A":PRINT
31490 PRINT"SHIP ON SQUARE F5,":PRINT
31500 PRINT"THEN ATTACK IT. IF YOU"
31510 PRINT"ARE RIGHT, YOU WILL":PRINT
31520 PRINT"HAVE A 'HIT', IF NOT":PRINT
31530 PRINT"YOU HAVE A 'MISS'":PRINT
31540 GOSUB32000
31550 PRINT"  A SHIP IS NOT SUNK":PRINT
31560 PRINT"UNTIL ALL OF ITS":PRINT
31570 PRINT"SQUARES HAVE BEEN HIT."
31580 PRINT"THE FIRST ONE TO LOSE":PRINT
31590 PRINT"ALL HIS SHIPS LOSES":PPINT
31600 PRINT"THE BATTLE."
31610 GOSUB32000
31620 RETURN
32000 Z$="PRESS A KEY FOR MORE":GOSUB41010
32010 GETA$:IFA$=""THEN32010
32020 RETURN
33000 POKE204,0
33010 GETA$:IFA$=""THEN33010
33020 POKE204,1
33030 RETURN
34000 PRINTLEFT$(CD$,22);"WHICH SQUARE  ";
34010 GOSUB33000
34020 IFA$("A"ORA$)"1"THENPRINTCHR$(7);:GOTO34010
34030 X$=A$:PRINTA$;
34040 GOSUB33000:IFA$("1"ORA$)"9"THENPRINTCHR$(7);:GOTO34040
34050 Y$=A$:PRINTA$;:RETURN
35000 X=ASC(X$)-64:Y=ASC(Y$)-48
35010 S$=BF$(X,Y):RETURN
36000 BF$(X,Y)=C$:IFA%(X,Y)THENPRINT"  ";
36010 PRINTLEFT$(CD$,1+2*Y);TAB(1+2*X);C$:RETURN
36020 PRINT"  ";:RETURN
41000 PRINTCHR$(7);
41010 11=(22-LEN(Z$))/2
41020 PRINTCO$;MID$(SP$,1,11);"  ";Z$;"  ";MID$(SP$,1,11-1);
41030 PRINT"  ":RETURN
41500 Z$="":GOTO41010
```

Fig 2 Battleships Listing for VIC 20 and Commodore 64

Unless you're an efficient touch-typist, the conventional qwerty keyboard can be a frustrating obstacle in the quest to master your micro. Conall Boyle unearths some historical facts and describes a future vision for this established means of communication.

The keyboard is, quite literally, the point of contact with your microcomputer. It also represents for many the first stumbling block. The layout of the keys is most illogical. How many millions of first time users have cursed the horrors of qwerty? And why is the keyboard set up like that? The simplest explanation, is that qwerty is the standard typewriter keyboard layout.

Qwerty is *the* standard layout throughout the known universe. Spain has it, Denmark has it, even Yugoslavia has it (but Y and Z inter-changed). Even those alphabets which look strange to English eyes — Greek, Cyrillic (Russian), and the like — use a local variant of the 'standard' keyboard. The only slight variation to this almost universal pattern is to be found on German and related language keyboards, where the Z and Y are switched.

It would be pleasing to think that this uniformity was based on widespread acceptance of the best available practice. Indeed, ask your average microcomputer user why such an inconvenient layout was chosen. Nine times out of ten the answer will be: it's the layout which allows the maximum speed of typing. Would that it were! The fact is that the keyboard layout as we find it today was designed, not to give the quickest typing speed, but to slow you down as much as possible.

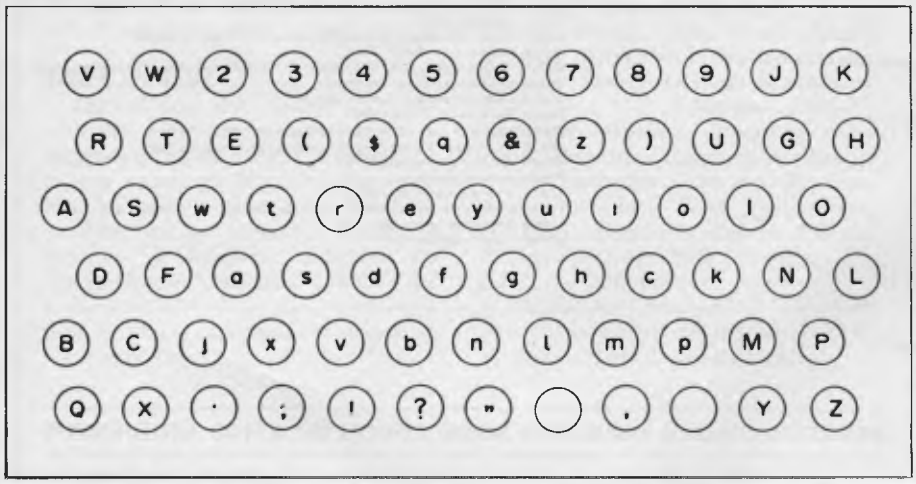

Fig 1 Caligraph keyboard

Beginnings

To discover the reason for designing the keyboard to be as *slow* as possible, we must go back to 1873. In that year C Latham Sholes (1819-90) finally perfected his design for a writing machine. He signed a contract with the Remington Gun and Sewing Machine Company of New York to produce 1000 of what he called 'Type-writers'. As with all inventions, Sholes was building on the efforts of those who had preceded him.

Nevertheless, his was the first commercially successful typewriter. In essential detail, the Sholes machine was similar to the mechanical typewriter of today.

But to make it work Sholes had to overcome many hurdles. One of the most intractable problems he faced was that of jamming keys. The engineering of the day was just not up to the task of making a smooth striking set of keys. At this point, Sholes engaged the skills of his brother-in-law, a teacher of mathematics, to design a keyboard layout. The aim was to ensure that letters struck one after the other, as far as possible from opposite sides. After much experiment, the familiar qwerty keyboard layout

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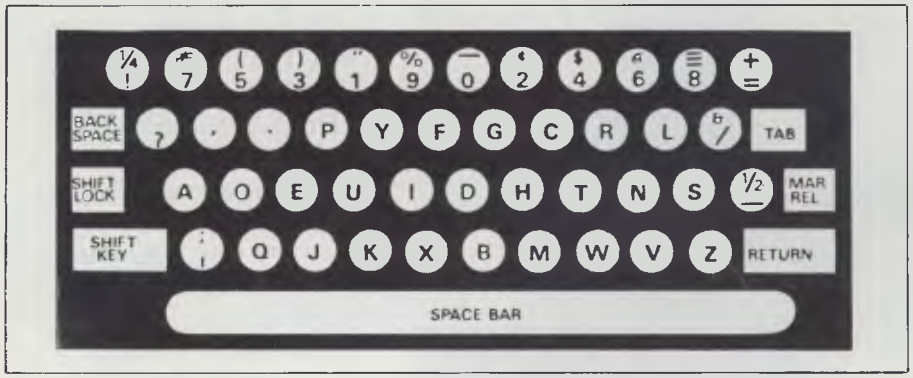

Fig 2 Dvorak keyboard

was born.

Sholes was guilty of a monstrous fraud concerning his qwerty keyboard. He had the nerve to peddle his machine as 'scientifically designed'. He omitted to mention, of course, that the keyboard was designed scientifically to slow you down!

Of course, Sholes was not the only inventor working on a machine to produce writing mechanically. Many other designs of typewriter, with different keyboard layouts, came on the market after 1873. However, a dramatic, and quite unplanned event in 1877 sealed the fate of the chief rival, the Caligraph keyboard (the layout of this alternative typewriter is shown in Fig 1). Instead of the four rows of keys with a shift for upper-case, the Caligraph had *six* rows of keys, with separate upper and lower-case buttons. The event which proved Sholes' to be superior was a speed typing competition. Frank McGurrin, a touch-typist who used the Sholes keyboard, challenged Louis Taub, a Caligraph typist, who used four fingers; the winner being whoever could copy the most script inside forty five minutes. The contest became what we would now call a 'media event'. The convincing victory of the Sholes typewriter was widely reported. After that the reign of qwerty was assured. Manufacturers quickly changed over to the now standard layout.

Fig 3 Sinclair keyboard

Reform

As time went by, it was realised that qwerty was not just a poor layout for speed and convenience, it was probably the worst possible layout ever devised. A major conference was held in 1905 to thrash out a rational alternative. Although there was little enough agreement on the proposed keyboard, it was the teachers of typewriting who voiced the loudest opposition to any change. They had spent a long time learning the existing layout, and were reluctant to change, whatever benefits the users might gain.

The next significant development is attributed to Dr August Dvorak of Seattle, Washington. In 1932 he announced his rational keyboard, which he claimed would increase typing speed by around 35%. The actual layout is shown in Fig 2. Despite its obvious advantages, the Dvorak keyboard did not catch on. It is still a contender as an alternative to the Sholes qwerty keyboard. In the administration of at least one state in the United States, the Dvorak (pronounced Di-vorack) keyboard is enforced on all office machines. Apart from this one exception, Sholes' qwerty keyboard reigns supreme.

Microcomputer explosion

The advent of cheap microelectronics had many effects. One was to make it relatively cheap and easy to adopt any form of keyboard layout. Electronic typewriters could be re-tooled to the Sholes, Dvorak, or any other desired layout. However, most people had been brought up on qwerty, and wanted a familiar layout. This was true even for machines like card-punches and VDU terminals, which were used mainly in the office environment.

The arrival in the mid-1970s of the microcomputer brought in a whole new category of keyboard users — the home computing buffs. With millions of computers already installed in homes, the

Fig 4 French telephone directory

time must fast be approaching where most keyboards are attached not to typewriters, but to microcomputers.

In this whole new ball game, what keyboard should be adopted? For Tandy and Apple the answer was simple — standard qwerty. PET tried a slight variation: all characters used in Basic, such as ?,(,) — all normally upper case — were on lower case. Sinclair, on the other hand, adopted his multi-function key method, whereby a single key could have up to six different functions (see Fig 3 for Sinclair keyboard layout).

French directory

So, the days of the qwerty keyboard may yet be numbered. One interesting proposal has come from France, where, in an effort to modernise the telephone system, an online telephone directory is to be made available to every subscriber. France has about ten million telephone subscribers, most of whom do not use a typewriter, and would be baffled by qwerty. In this new situation, the decision was made to go for an ABCDEFG layout — alphabetic order, in other words. A picture of an ABCDEFG keyboard is shown in Fig 4.

This layout has also been adopted for the French version of Teletext. This is not only to make the keyboard user-friendly; it is also an attempt to distance it from the typewriter.

Whether this attempt to replace qwerty with ABCDEFG is successful is now open to some doubt. The election of a Socialist government saw the telephone directory project severely curtailed.

Fig 5 Microwriter

Microwriter

You may have seen the virtues of an innovative, if somewhat pricey alternative, method of setting data into your computer/word processor being extolled in advertisements recently. This is based on the simple binary principle that six switches can give two-to-the-power-of-six combinations of code (that's 64 characters). The layout of the Microwriter is shown in Fig 5. You will notice that the keys are ergonomically positioned under each finger, with the thumb given a choice of two buttons. Characters are formed by pressing combinations of keys simultaneously.

To operate this device is not nearly as complicated as it sounds. I am assured that a few hours will convert users into speedy typists.

Voice input

Remember HAL, the voice controlled onboard computer in the film *2001, A Space Odyssey?* In the end. HAL got ideas above his space station and had to be dismantled. With his dying gasp, HAL gave us a tinny rendition of 'Mary had a little lamb'.

The idea of voice input has attracted much research effort, notably among the Japanese. After all, speech is how most of our communication is executed. It seems a natural extension of this to have voice input to the computer as well. At present, voice recognition systems are limited to a modest *(circa* 256 words) vocabulary. To teach the computer to respond to these few words, you have to train it to recognise your voice. There is still a long way to go before we have a HAL-like voice input, capable of decoding normal human speech.

As well as wondering whether a true voice input system will ever be possible, we might ask if voice input is really worthwhile at all. The implication that we might do away with writing in favour of speech would mean the end of all hard copy. Could we really do without our bits of paper?

Musical keyboards

The trendy present to have last year was a Casio VL Tone, which can be described as a calculator that thinks it's a piano! Fig 6 shows the layout. For $59 you get a device that plays tunes, a bit like an electronic organ. You can also record the notes you play, and play them back at will.

There's nothing startlingly novel in all this, especially for the 'Space Invader' generation. What I find fascinating is the historical echoes it creates. Remember C Latham Sholes, the inventor of the qwerty keyboard? Prior to Sholes, there were many attempts to perfect a mechanical writing machine. One reason why many of them came to grief was the impossibility of making a machine capable of working with the proposed keyboard. For the Beethoven generation, the most common keyboard was the piano. For exactly the same reason that qwerty was adopted for computers, early (unsuccessful) inventors struggled to make a piano-style typewriter.

Technically, it's now simple to achieve the early inventor's dream — a piano-style keyboard — but, as yet, I know of no manufacturer who produces such a keyboard.

One aspect of piano playing which is markedly different from typewriting is the number of notes/letters struck simultaneously. In typing, the letters are hit one after the other: an essential requirement for real-time mechanical typewriters. On the piano, notes are usually struck together, in the form of chords. Taken together with the Microwriter technology of simultaneous key pressing to produce letters, perhaps there is the germ of a *genuine* learn-to-play-the-piano-and-type machine. I await future developments.

Conclusions

Qwerty has been with us now since 1873. After dominating the keyboard for 111 years, perhaps the reign of qwerty is drawing to a close.

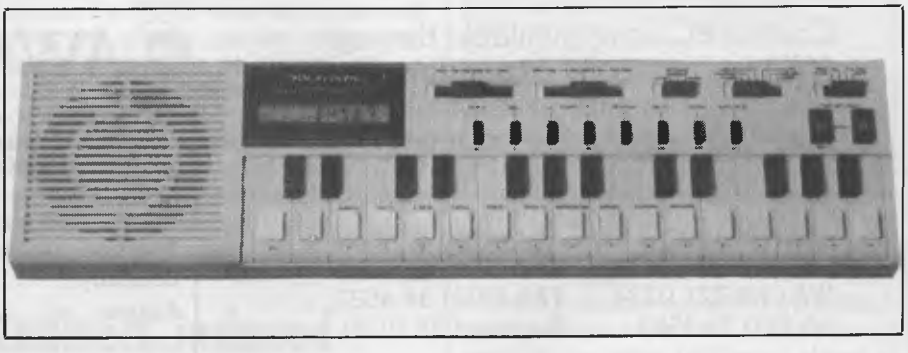

Fig 6 VL Tone keyboard/calculator

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LANGUAGES

TEACH YOURSELF ASSEMBLER

Paul Overaa completes his explanation of addressing with a look at the use of one address to 'point' to another. The three subroutines for last month's Connect Four game are also provided.

We can illustrate the general idea of indirect addressing with the following Basic example. You have a data file of one thousand items whose record lengths are 128 bytes long, and you wish to sort these items in order of bytes 6 to 20 of each record in order to perform processing.

An easy approach is to load just the fifteen bytes of interest from each record into a vector (one-dimensional array), INDEX$() and, in addition, create a 'tag vector', I%() to hold each record's 'record number'. Before sorting, I%() will contain the numbers 1 to 1000 in order. A sort is then performed and the I%() vector is rearranged to 'mirror' any physical (or logical) changes made in the index vector. After sorting, INDEX$() will be in the required order but INDEX$(5), for example, may not now relate to the 5th record of the data file. By searching through INDEX$() we effectively move through the data file in the sorted order but this is of little use unless we can access the corresponding data record. To do this, we use the 'tag' vector I%() that holds the corresponding original record numbers: the record number of the first record in the sorted order, whose index value is INDEX$(1), is found from I%(1). Similarly, the Xth item in the sorted order is obtained from I%(X).

We use the tag vector I%() to 'point' to the records in the data file. By using the Basic statement GET #1,I%(5) to obtain the fifth record in the new sorted order, we specify its address indirectly: in effect, the 'address' of the record in question is held in the variable I%(5).

Addressing an operand indirectly in an assembly language instruction is a similar exercise. We do not specify the operand's address, but rather the locations from which the address may be obtained. In the case of the Z80 and the 8080 processors, a form of indirect addressing known as 'register indirect' is available. It is a register pair, rather than a pair of memory locations, that holds the address of the operand.

On the 6502, the concept of 'zero page addressing' is used. 'Page zero' refers to the first 256 bytes of memory (addresses 0000 hex to 00FF hex), considered as a set of storage locations. A zero page address has the advantage that it can be specified with one byte (the high byte of the address will always be zero, and can be easily created as an 'implied high byte' by the processor).

Then, we could in theory use a zero page equivalent of Z80/8080 register indirect addressing. An indirect address held in a register pair of a Z80 processor would emulate an indirect address held in two bytes of zero page RAM on the 6502.

Things are slightly more complex because the 6502 does not, in general, implement simple indirect addressing. Instead, two forms of mixed 'indexed and indirect' addressing are available. One is called 'indirect indexed' and the other 'indexed indirect'. The single exception is the instruction JMP (address), which is a jump to the location specified by the contents of two bytes, address and address+1.

Indirect indexed

The 6502 uses the contents of the zero page byte specified within the instruction as the low order part of the indirect address. It also collects the contents of the next byte in the zero page and uses that as the high order part of the address. The indirect address obtained is then used as a base address for Y register indexing: that is, the contents of the Y register are added to the indirect address and it's this final addres that is used.

It may appear complicated as a single operation but it helps to consider the two stages as separate actions. The 'indirect bit' is simply the specifying and using of the zero page locations as a 'store' for the base address. Once this base address is available, the indexing is performed in just the same way as absolute indexing (described last month). The advantages are that we don't have to specify the base address at the time we write the program, and that we can, during execution of the program, modify the contents of the zero page bytes to 'point' to any number of different base addresses as required.

If we wish to load the accumulator with the contents of an indirect indexed specified byte, the instruction will take the form LDA (zero page address), Y. The zero page address specified is then used to obtain the base address for the indexing (the general idea can be seen in Fig 1). If the zero page bytes held the address corresponding to the byte labelled BASE, we would then access the Yth byte of the set BASE,BASE+1,BASE+2, etc.

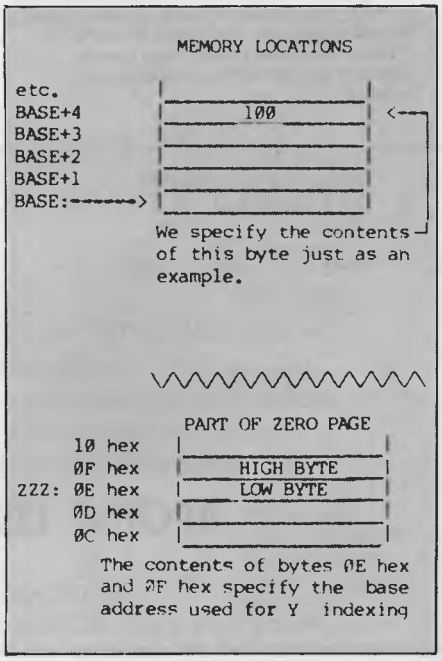

Fig 1 Obtaining the base address for indexing

If the Y register contained the value 4 then the instruction LDA (ZZZ),Y would result in the value 100 being placed in the accumulator.

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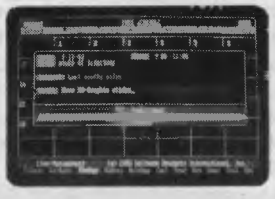

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Indexed Indirect

This addressing mode uses the 6502's X register and performs the indexing first. In this case, a table or 'set' of addresses is held in the zero page. The X register provides the index offset from the base address and the contents of this byte, plus the contents of the succeeding byte which are used as an indirect pointer to another memory location. The type of instruction format required can be shown as follows: to load the accumulator, use LDA (zero page address,X); to 'OR' the accumulator, ORA (zero page address,X) should be used.

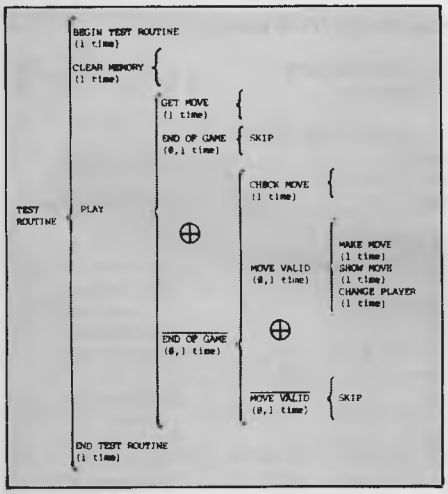

Fig 2 Test bed control routine

The requirement of a zero page address in both indexed indirect and indirect indexed addressing is a 6502 processor restriction and has nothing to do with the actual concepts of indirect addressing. Even bearing in mind such restrictions, you should be aware that the 6502 implementation of indirect addressing is substantially more powerful than the simple register indirect form available on the Z80 and 8080 processors.

Connect Four

Last month we developed routines applicable to the game 'Connect Four' (see Subroutines A, B and C). These are first steps in such a development, but even at this stage the routines must be checked to ensure they work. A common technique (and one that is frequently used) is to write short 'test bed' controller routines — short patches of code that use the subroutines under development in order to check their performance. To illustrate how we go about this we've written a routine to test the subroutines featured here. The first job is to sketch out a brief 'controller structure' using a Warnier diagram as shown in Fig 2.

Most of the statements in Fig 2 correspond to existing subroutines. The 'end of game' statements imply that we can detect the end of the game. This we cannot do since no playing strategy is available yet. With this in mind, we must be satisfied with either testing the routines by using an 'infinite loop', or terminating the controller program when a particular keyboard character is detected.

We choose the latter option and use a carriage return to signify the end of game condition. We also need a temporary 'show move' code, and for illustration purposes adopt a simple solution — output the row number representing the position in the given column that the latest move will occupy. In writing the controller routine the aim is only to test the subroutines we have written. The controller block starts by clearing the memory, then we collect a character with the 'get move' subroutine. If a carriage return is detected we end the program, otherwise we check the move. If the move is illegal (a move to a full column) we ignore it, otherwise we make the move on the internal boards and display it by outputting the 'row number'. Finally, we change the player before returning to collect another move.

We have not included a check to ensure that any column number entered lies between 0 and 6 as this method of identifying a move is only applicable during the development stage, where such checks are not absolutely necessary.

In all three cases we have kept the test bed program listings separate from the listings of the developed subroutines, making it easier to see the basic ideas behind the controller routine and also allowing us to view the subroutines 'in isolation'. If problems occur, one useful tip is to modify the controller routine to eliminate calls to any suspect sub-

SET UP BLOCK Z80 VERSION

```
CARRIAGE$RETURN     EQU  13
OPERATING$SYSTEM    EQU  5          ;Entry point
                    ORG  100H
                    JP   STACK
                    ORG  150H
STACK:              LD   SP,$—2
```

CONTROLLER ROUTINE Z80 VERSION

```
PLAY:       CALL  CLEAR$MEMORY
            CALL  GET$MOVE
            LD    A,C
            CP    CARRIAGE$RETURN
            JP    Z,FINISH          ;End of game
            CALL  CHECK$MOVE
            JP    M,PLAY            ;Illegal move so
                                      ignore it
            CALL  MAKE$MOVE
            LD    A,(HL)            ;Get row number
                                      for display
            OR    00110000B         ;Convert to ASCII
                                      equivalent
            CALL  OUTPUT$ROUTINE    ;'Show move'
            CALL  CHANGE$PLAYER
            JP    PLAY              ;Back for next
                                      move
FINISH:     JP    0                 ;Re-boot
                                      operating
                                      system
```

IN THIS AREA PLACE SUBROUTINES
TO BE TESTED
(INCLUDE ANY I/O ROUTINES REQUIRED)

WORKSPACE DEFINITIONS

```
ROW$POINTER$BASE:     DS  7   ;Bit marked
                              'counter height'
COUNTERS$IN$BASE:     DS  7   ;Numeric form
                              'counter height'
SWITCH:               DS  1   ;Identifies
                              current player
BOARD$BASE$A:         DS  7   ;Player A's board
                              bit map
BOARD$BASE$B:         DS  7   ;Player B's board
                              bit map
```

Fig 3 Test bed program Z80 version

routines. To be safe, you may prefer to start with a controller routine that just calls the 'clear memory' subroutine. Once this is working satisfactorily the 'get move' subroutine can be included. In this way, the controller routine can be built up one piece at a time.

Internal boards

The internal representations of the boards may be examined in several ways. We might write a routine to display the contents of the bytes in binary form, use the system monitor to examine the bytes in question, or use a dynamic debugging tool (CP/M's DDT program, for example) that allows examination of memory areas during execution of a program. The binary display routine makes a useful exercise, and you may like to think about how it can be programmed. If you're not sure, have a look at the article on the Warnier techniques published in January issue. A memory dump routine was developed which gives plenty of clues.

The layout of the test bed program is equivalent in all three processors (see Figs 3, 4 and 5). We start with a 'set up' block — defining equates, initialising stacks, and so on as required. The controller routine comes next, which makes calls to the various subroutines that have been developed. Immediately following this we place the subroutines we wish to test, including any other necessary routines: for example, any input/output routines needed. Lastly, we identify our data storage areas which 'sit' on top of the program.

An error crept into Fig 5 of last month's article.

The 6502 carry flag is CLEARED when the A register is < compared value. The BCC operands in the 6502 routines should therefore be changed to BCS.

SET UP BLOCK 8080 VERSION

```
CARRIAGE$RETURN     EQU  13
OPERATING$SYSTEM    EQU  5          ;Entry point
                    ORG  100H
                    JMP  STACK
                    ORG  150H
STACK:              LXI  SP,$—2
```

CONTROLLER ROUTINE 8080 VERSION

```
                    CALL CLEAR$MEMORY
PLAY:               CALL GET$MOVE
                    MOV  A,C
                    CPI  CARRIAGE$RETURN
                    JZ   FINISH          ;End of game
                    CALL CHECK$MOVE
                    JM   PLAY            ;Illegal move so
                                           ignore it
                    CALL MAKE$MOVE
                    MOV  A,M             ;Get row number
                                           for display
                    ORI  00110000B       ;Convert to ASCII
                                           equivalent
                    CALL OUTPUT$ROUTINE  ;'Show move'
                    CALL CHANGE$PLAYER
                    JMP  PLAY            ;Back for next
                                           move
FINISH:             JMP  0               ;Re-boot
                                           operating
                                           system
```

IN THIS AREA PLACE SUBROUTINES
TO BE TESTED
(INCLUDE ANY I/O ROUTINES REQUIRED)

WORKSPACE DEFINITIONS

```
ROW$POINTER$BASE:   DS  7    ;Bit marked
                               'counter height'
COUNTERS$IN$BASE:   DS  7    ;Numeric form
                               'counter height'
SWITCH:             DS  1    ;Identifies
                               current player
BOARD$BASE$A:       DS  7    ;Player A's board
                               bit map
BOARD$BASE$B:       DS  7    ;Player B's board
                               bit map
```

Fig 4 Test bed program 8080 version

SET UP BLOCK 6502 VERSION

```
CARRIAGE$RETURN     EQU  13
INPUT$ROUTINE       EQU  0FD1BH
OUTPUT$ROUTINE      EQU  0FDEDH
                    ORG  6000H
```

CONTROLLER ROUTINE 6502 VERSION

```
                    JSR  CLEAR$MEMORY
PLAY:               JSR  GET$MOVE
                    TXA
                    CMP  #CARRIAGE$RETURN
                    BEQ  FINISH          ;End of game
                    JSR  CHECK$MOVE
                    BMI  PLAY            ;Illegal move so
                                           ignore it
                    JSR  MAKE$MOVE
                    LDA  COUNTERS$IN$BASE,X ;Get row number
                                           for display
                    ORA  #00110000B      ;Convert to ASCII
                                           equivalent
                    JSR  OUTPUT$ROUTINE  ;'Show move'
                    JSR  CHANGE$PLAYER
                    JMP  PLAY            ;Back for next
                                           move
FINISH:             JMP  0               ;Re-boot
                                           operating
                                           system
```

IN THIS AREA PLACE SUBROUTINES
TO BE TESTED
(INCLUDE ANY I/O ROUTINES REQUIRED)

WORKSPACE DEFINITIONS

```
ROW$POINTER$BASE:   DS  7    ;Bit marked
                               'counter height'
COUNTERS$IN$BASE:   DS  7    ;Numeric form
                               'counter height'
SWITCH:             DS  1    ;Identifies
                               current player
BOARD$BASE$A:       DS  7    ;Player A's board
                               bit map
BOARD$BASE$B:       DS  7    ;Player B's board
                               bit map
```

Fig 5 Test bed program 6502 version

```
CLEAR$MEMORY:       LD   IX,COUNTERS$IN$BASE
                    LD   C,22
C$M$1:              LD   (IX+0),0        ;Set these bytes
                                           to 0
                    INC  IX
                    DEC  C
                    JR   NZ,C$M$1
                    LD   IX,ROW$POINTER$BASE
                    LD   C,7
C$M$2:              LD   (IX+0),1        ;Set these bytes
                                           to 1
                    INC  IX
                    DEC  C
```

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```
                JR    NZ,C$M$2
                LD    B,0          ;We set B and D
                                     to 0 in order
                LD    D,0          ;to use ADD HL,
                                     BC, later
                RET

          GET MOVE Z80 VERSION

GET$MOVE:       CALL  INPUT$ROUTINE
                AND   0FH          ;Mask upper four
                                     bits
                LD    C,A          ;Save column
                                     no. in C register
                LD    E,A          ;and as the board
                                     'A' offset
                LD    A,(SWITCH)
                ADD   A
                JP    M,G$M$1
                LD    A,E          ;Get column
                                     number back
                ADD   7            ;Board 'B'
                                     additional offset
                LD    E,A          ;Replace offset
                                     value in E
G$M$1:          RET

          CHECK MOVE Z80 VERSION

CHECK$MOVE:     LD    HL,ROW$POINTER$BASE
                ADD   HL,BC        ;Effective HL + C
                                     since B = 0
                LD    A,(HL)       ;Image of
                                     column's last
                                     move
                SLA   A            ;Left shift
                RET

          MAKE MOVE Z80 VERSION

MAKE$MOVE:      LD    (HL),A       ;Replace
                                     updated column
                                     image
                LD    HL,BOARD$BASE$A
                ADD   HL,DE        ;Now HL points
                                     into boards
                OR    (HL)         ;Create new
                                     board image
                LD    (HL),A       ;and replace in
                                     memory
                LD    HL,COUNTERS$IN$BASE
                ADD   HL,BC        ;HL now points to
                                     count byte
                INC   (HL)         ;Increase
                                     numeric count
                RET

          CHANGE PLAYER Z80 VERSION

CHANGE$PLAYER:  LD    A,(SWITCH    Get current
                                     player
                CPL                ,Complement
                                     the 'switch' byte
                LD    (SWITCH),A   ;Changed for
                                     next player
                RET
```

Subroutine A Clear memory Z80 version

```
CLEAR$MEMORY:   LXI   H,COUNTERS$IN$BASE
                MVI   C,22
C$M$1:          MVI   M,0          ;Set these bytes
                                     to 0
                INX   H
                DCR   C
                JNZ   C$M$1
                LXI   H,ROW$POINTER$BASE
                MVI   C,7
C$M$2:          MVI   M,1          ;Set these bytes
                                     to 1
```

```
                INX   H
                DCR   C
                JNZ   C$M$2
                MVI   B,0          ;We set B and D
                                     to 0 in order
                MVI   D,0          ;to use DAD
                                     instructions later
                RET

          GET MOVE 8080 VERSION

GET$MOVE:       CALL  INPUT$ROUTINE
                ANI   0FH          ;Mask upper four
                                     bits
                MOV   C,A          ;Save column
                                     no. in C register
                MOV   E,A          ;and as the board
                                     'A' offset
                LDA   SWITCH
                ADD   A
                JM    G$M$1
                MOV   A,E          ;Get column
                                     number back
                ADI   7            ;Board 'B'
                                     additional offset
                MOV   E,A          ;Replace offset
                                     value in E
G$M$1:          RET

          CHECK MOVE 8080 VERSION

CHECK$MOVE:     LXI   H,ROW$POINTER$BASE
                DAD   B            ;Effective HL + C
                                     since B = 0
                MOV   A,M          ;Image of
                                     column's last
                                     move
                ADD   A            ;Effective left
                                     shift
                RET

          MAKE MOVE 8080 VERSION

MAKE$MOVE:      MOV   M,A          ;Replace
                                     updated column
                                     image
                LXI   H,BOARD$BASE$A
                DAD   D            ;Now HL points
                                     into boards
                ORA   M            ;Create new
                                     board image
                MOV   M,A          ;and replace in
                                     memory
                LXI   H,COUNTERS$IN$BASE
                DAD   B            ;HL now points to
                                     count byte
                INR   M            ;Increase
                                     numeric count
                RET

          CHANGE PLAYER 8080 VERSION

CHANGE$PLAYER:  LDA   SWITCH       ;Get current
                                     player
                CMA                ;Complement the
                                     'switch' byte
                STA   SWITCH       ;Changed for
                                     next player
                RET
```

Subroutine B Clear memory 8080 version

```
CLEAR$MEMORY:   LDX   #22
                LDA   #0           ;Set these bytes
                                     to 0
C$M$1:          STA   COUNTERS$IN$
                        BASE—1,X
```

```
                DEX
                BNE   C$M$1
                LDX   #7
                LDA   #1            ;Set these bytes
                                      to 1
C$M$2:          STA   ROW$POINTER$
                        BASE—1,X

                DEX
                BNE   C$M$2
                RTS

        GET MOVE 6502 VERSION

GET$MOVE:       JSR   INPUT$ROUTINE
                AND   #0FH
                TAX                 ;Column number
                                      (0-6) in X now

                BIT   SWITCH        ;N flag set if B's
                                      move
                BPL   G$M$1         ;(Branch if A's
                                      move!)
                CLC
                ADC   #7            ;Board B needs
                                      additional
                                      offset
G$M$1:          TAY                 ;Board offset in Y
                                      now
                RTS

        CHECK MOVE 6502 VERSION

CHECK$MOVE:     LDA   ROW$POINTER$  ;Image of
                        BASE,X      column's last
                                      move

                ASL   A             ;Shift contents to
                                      left
                RTS                 ;'N' Flag set if
                                      illegal

        MAKE MOVE 6502 VERSION

MAKE$MOVE:      STA   ROW$POINTER$  ;Replace
                        BASE,X        updated

                ORA   BOARD$BASE$A,Y ;Create new
                                      board image
                STA   BOARD$BASE$A,Y ;and replace in
                                      memory
                INC   COUNTERS$IN$  ;Increment
                        BASE,X        numeric count
                RTS

        CHANGE PLAYERS 6502 VERSION

                LDA   SWITCH        ;Get current
                                      player
                EOR   #0FFH         ;Complement
                                      the 'switch' byte
                STA   SWITCH        ;Changed for
                                      next player
                RTS
```

Subroutine C Clear memory 6502 version

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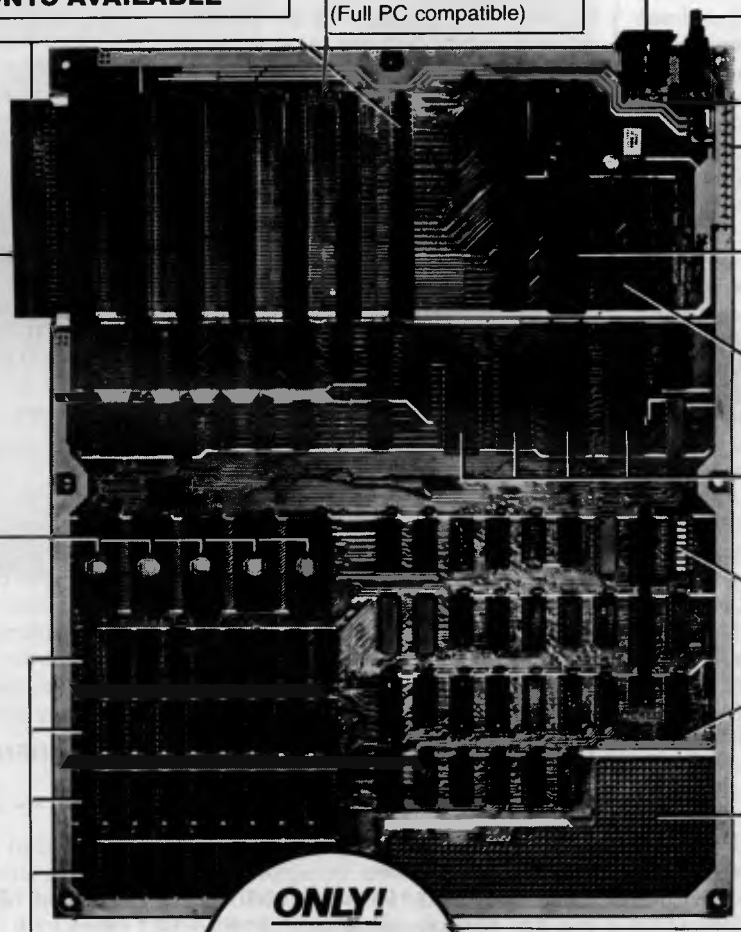

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Fifth Generation

Artificial Intelligence is a Japanese national industrial project, says Tom Sato.

Is the day approaching when we'll see HAL 9000, the computer that went mad in the film *2001*, appear with a 'Made in Japan' label on its back? Or will the Japanese find a better way of using the artificial intelligence they are developing? Either way AI — the development of the Fifth Generation computer system — has become a Japanese national project.

The Fifth Generation computers will be intelligent machines that can learn and reason, draw conclusions, make judgements and even understand natural languages. This last facility will enable computers to act as effective translators, something the Japanese badly need to cope with the language barrier with the West.

The whole project is the brainchild of a group of dedicated computer scientists, including Tohru Moto-oka of Tokyo University, Kazuhiro Fuchi of Electronics Technology Laboratories, and Hideo Aiso of Keioh University. They felt that despite various technological breakthroughs in the field of electronics made by the Japanese, they were far behind the United States in original research. Research carried out by the Japanese industries is very much product-orientated, and young scientists felt restricted. At the same time the Ministry of International Trade and Industry (MITI) wanted to coerce the Japanese computer industry into producing original products.

The MITI has considerable power over Japanese industry, and is the driving force behind its economic successes in recent years. A detailed plan for the Fifth Generation Computer project was published in 1981 by MITI which recommended the establishment of ICOT, the Institute of New Generation Computer Technology to carry this through.

Ten year plan

ICOT was formed the following year with Fuchi as head of operations. ICOT itself has only 40 staff, but they are top computer scientists lent out by eight of the biggest computer companies in Japan. These companies, which include Fujitsu and Mitsubishi, support ICOT with hardware, and when ICOT eventually creates the Fifth Generation computer system these companies will manufacture it.

ICOT divided its ten year plan into three stages. The first three years are devoted to recruiting experienced staff, collating past research and developing the hardware required to make the first step into serious business. The second stage involves developing the first experimental model, and the third, the development of full scale artificial intelligence.

ICOT is in its second year. How far has it progressed? Last December ICOT took delivery of a Sequential Inference Machine (SIM), a computer designed with current technology but used as a stepping stone for the development of the basic software for AI. The SIM was pioneered by Mitsubishi, the third largest mainframe manufacturer in Japan. It runs what the Japanese call Version 0 Kernal Language, an extended version of Prolog. Prolog allows programmers to write more logical and

```
10 DIM QA$(256)
20 QA$(1)="AN ANIMAL"
30 R=-1:A=0
40 R=R+1:PRINT "ARE YOU ";QA$(A+(2^R));"?"
50 Q$=INKEY$:IF Q$="" THEN 50
60 IF Q$="Y" THEN 120
70 IF Q$="N" THEN 100
80 R=R-1
90 GOTO 40
100 IF QA$(A+(2^R)+(2^R))="" THEN 180
110 GOTO 40
120 IF QA$(A+(2^R)+(2^(R+1)))="" THEN 150
130 A=A+(2^R)
140 GOTO 40
150 PRINT"WHAT KIND OF ";QA$(A+(2^R));" ARE YOU ";
160 INPUT QA$(A+(2^R)+(2^(R+1)))
170 GOTO 30
180 PRINT"ALRIGHT WHAT ARE YOU";
190 INPUT QA$(A+(2^R)+(2^R))
200 GOTO 30
```

Very simple programs can be used to demonstrate how computers can be made to appear intelligent. The AI aspect of this program lies not in the program itself but in what replies are given when it reaches a dead end in the tree. There are two of these, one for 'no' and one for 'yes'. When the reply is no and there is nothing further in the tree, the program comes up with 'OK what are you', or some such. For a yes reply and a dead end, the program takes the last question and asks for some descriptive input that describes it more. For instance, on first running the program answering yes will cause the reply 'what kind of an animal are you?' ('an animal' being the last section of the array QA$ used). To this it is possible to answer 'a cat', but a better answer is one that describes the animal being aimed at, such as 'a small furry creature' or 'a large scaly brute with fangs'. This gives the program, and the computer, the appearance of asking for clues towards some definite end. The bigger the binary tree and the more well thought out the answers/questions are, the more 'intelligence' the program seems to have.

hardware was simple in concept, it required an enormous amount of software. As the power of computers structured programs. ICOT will concentrate on the SIM computer this year.

Software crisis

Conventional computers rely heavily on high speed sequential methods, ie they execute statements one after another. The Japanese see the current very large scale integration (VLSI) technology as nearing its limit and the only way forward is to develop computers with new parallel processing architecture. The main hardware for AI, the Parallel Inference Machine (PIM), is now being developed and will replace the SIM computer when the project progresses to its second stage. This machine will enable simultaneous execution of two or more instructions.

So where is all this research leading? To put it crudely, the Japanese are trying to develop a 'thinking computer' which is one step nearer towards human beings. The previous generations of computers had a weakness in that, while the increases more sophisticated software becomes necessary requiring everyone to be a programmer. To solve this 'software crisis', the Japanese are developing a system that can stand on its own two feet. This will be a reasoning computer with a knowledge base, able to understand you without the bother of programming, and able to write its own software to carry out its tasks.

No substantial advances have been claimed by ICOT yet. This is understandable if you consider they are only half way through the first stage of development.

How is the Japanese industry reacting to all this? At a recent symposium entitled 'The Fifth Generation Computers and the Future' organised by the Japan Future Society, various opinions were expressed. Noboru Makino of Mitsubishi questioned the need for Fifth Generation computers at all when humans can reason better than machines. Ai-iso argued that the new generation computers will solve the 'software crisis' and make computers more accessible to more people. Sakyo Komatsu, science fiction writer and film maker, said the Fifth Generation computers should be used for personal use rather than by the authorities. Hajime Karatsu of Matsushita Telecommunication said the computers won't get tired and artificially intelligent computers will be very useful for things such as air traffic control.

Japanese economy

The Japanese are developing the Fifth Generation computers purely for economic reasons, unlike the Americans whose AI program is heavily defence oriented. The Japanese hope very much that the Fifth Generation computers will be used as *personal* computers, and some even say it may not be necessary for mainframes to be artificially intelligent.

The potential income from such micros would be enormous, and would give the Japanese huge advantages in terms of export. It would also render useless all software developed in the eighties. However, if Fifth Generation computers turn out to be as efficient as hoped, they could start replacing us. Could the SF nightmare come true? Are we going to end up as servants to a huge totalitarian super computer being?

For a start, how will the Japanese cope with AI? There is no doubt that the average Japanese has the same phobias about computers as the average Westerner, but industrial robots were also feared when they were first introduced. The mini industrial revolution of the 1970s gives a few clues to the Japanese response to AI.

Trade Unions in Japan were initially suspicious of industrial robots. They weren't sure about job prospects or what it would be like working with them. The workers now work readily with robots, who do the most arduous work, and they have total control over the robots.

AI could follow a similar pattern when it is introduced. Perhaps the machines will be used extensively in offices, cutting down on the laborious jobs done by secretaries.

However, the big question is will Japanese artificial intelligence have a consciousness and thought process similar to that of human beings? The answer is likely to be no, for the Japanese AI project does not extend to machine psychology. That will have to be left for the Sixth Generation Computer project now being planned in MITI.

The Japanese Government has always invested heavily in industries which guaranteed Japan's future prosperity, whether in cars, shipping or electronics. ICOT is 100 per cent funded by the Japanese Government, which intends to spend between $800m and $1,500m on the ten year plan.

Diophantine Equations

The topics dealt with in this column attempt to reach the frontiers of knowledge in number theory with the minimal background information. The problems posed therefore have no complete solution known to the author, and readers are encouraged to submit their attempts at solution, however incomplete they may seem.

Those readers who have been with us since the first Numbers Count back in February 1983 — 'Waring's Conjecture and a certain Diophantine Equation' — will recall that a Diophantine Equation is one which is solved in terms of integers only.

The first writer to study such equations in detail was Diophantus of Alexandria *c* 250AD. For example, the equation $x^2 y^2 = z^2$ yields the integer sided right-angled (or Phthagorian) triangles beginning with (3,4,5) and (5,12,13).

Problem

Here are three distinct problems in this field, indicating fundamental differences in the state of the art relating to each. Readers are invited to contribute.

(1) Consider $z(1 + xy) = x^2 + 2y^2$; this has only one known solution in integers, namely $x = 30905$, $y = 663738$, $z = 43$ due to ES Barnes. Further, LJ Mordell in *Diophantine Equations*, Academic Press 1969 writes: 'The only procedure seems to be to try if there is a solution for various values of z.' How does one best do this trying, and do we need all values of z?

(2) Consider $6y^2 = (x+1)(x^2 - x + 6)$ (those readers familiar with the Binomial Theorem will recognise this as $y^2 = 1 + x + x(x-1)/2! + x(x-1)(x-2)/2!$). This is known to have integer solutions for $x=2,7,15$ and one other non-trivial value of x($x=0$, and $x=-1$ are regarded as trivial). Find the fourth non-trivial x-value: it has only two digits — are there others?

(3) The Arabs *c* 972AD are believed to have been the first to study the pair of simultaneous Diophantine Equations

$$y^2 = x^2 + 5u^2$$
$$z^2 = x^2 - 5u^2$$

The solution $x=41$, $y=49$, $z=31$ and $u=12$ was published by Leonardo of Pisa 1220AD. A further solution $x = 3444161$, $y = 4728001$, $z = 113279$ and $u = 1494696$ is known, as is a yet larger solution involving 15-digit integers.

Theoretically, this problem is completely solved because algebraically every solution may be derived from Leonardo's by rational operations. See Uspensky and Heaslet, *Elementary Number Theory*, McGraw Hill 1939 pp419-427.

How efficiently can the above solutions be found using a computer? Readers are invited to submit a program, or suite of programs, to investigate the above questions. All submissions should include program listings, hardware descriptions, run times and output; they will be judged for accuracy, originality and efficiency. A prize will be awarded to the 'best' entry received by 15 July 1984. Please address all correspondence to Mr MR Mudge, C/- *APC*, 77 Glenhuntly Road, Elwood, Victoria 3184.

Absolute differences of Prime Numbers — February 1984

This problem proved to be exceptionally popular, attracting multiple responses from all states. The languages chosen included VSAPL under CMS in a 2 Mbyte virtual machine of a 4Mbyte IBM4331/2; Pascal on an Altos ACS 68000 with the Unix System III in multi-user mode; C-language on an IBM Personal Computer.

The prizewinner however, after a very careful evaluation, is Michael Robinson who addressed himself precisely to the problem as posed. Using Cobol written for a 16-bit micro, with assembly routines for the repetitive parts, the program was ultimately run on a Burroughs B22 up to $a_{110} = 103961$ and then in mortuary time on a B21. A very careful operations estimate was included and the entire study well documented. $a_{64} = 5940$ was reached in 4mins 42secs from approximately 6000 primes, the study being terminated at $a_{146} = 733576$ in 27hrs from 786575 primes, the last of which was 11975597. Empirical evidence for the Gilbreath conjecture is considerably strengthened by this computation, revealing for example, that around $a_{126} = 271621$ large differences are seen 'spreading like ripples in a sea of 0s and 2s.'

Perhaps those who submitted studies of this problem could communicate one with another via Maria Bokic at *APC*, with a view to a final assault on the a_n and its associated number patterns?

Note. Submissions can only be returned if a suitable stamped addressed envelope is provided.

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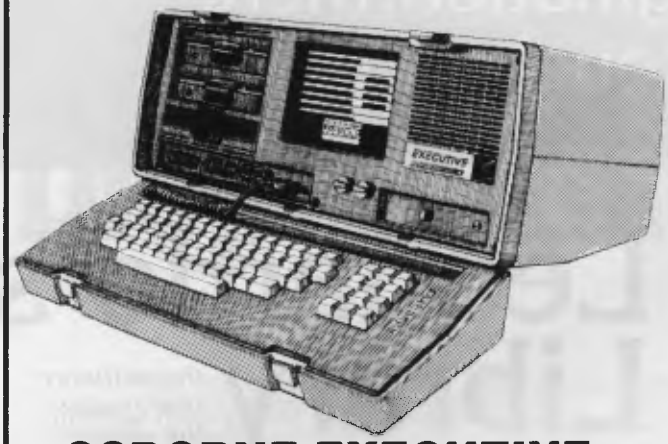

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Sinclair

Surya continues his look at graphics and sound on each of the machines included on the APC Basic Converter Chart (see November issue). This month, the Sinclair ZX81 and Spectrum.

Sinclair ZX81

The ZX81 produces black graphics on a white background. The graphics resolution is 64 x 44, the origin (0,0) being the bottom left-hand corner of the screen. Two graphics statements are supported: PLOT and UNPLOT.

PLOT x,y switches on (ie lights up) coordinate (x,y). UNPLOT x,y switches off the specified coordinate. Drawing lines is achieved using FOR-NEXT loops, thus:

```
100  FOR X=0 TO 63
110    PLOT X,0
120    PLOT X,43
130  NEXT X
140  FOR Y=0 TO 43
150    PLOT 0,Y
160    PLOT 63,Y
170  NEXT Y
```

would draw a box around the edge of the screen.

The ZX81 also supports a PRINT AT function (PRINT @, on most machines). The PRINT AT screen comprises a 32 x 22 grid with the origin — just to confuse — as the top left-hand corner. To print 'HELLO' in the middle of the screen, you would enter PRINT AT 11,13;"HELLO".

The ZX81 reserves the bottom two lines of the screen for input prompts, error messages, and so on; these lines are not accessible when programming in Basic, and so are not assigned coordinates.

Sound is not supported.

Sinclair Spectrum

Graphics:

The Spectrum is available with either 16k or 48k RAM, but there are no other differences between the two models.

The Spectrum supports eight foreground and eight background colours. The single graphics resolution is 256 x 176, but there are limitations when using colour. The graphics statements are as follows:

PLOT — PLOT x,y lights coordinate (x,y) in the current foreground colour.

DRAW — DRAW x,y [,a] draws a line from the last coordinate visited (using PLOT, DRAW or CIRCLE) to a point x coordinates to the right and y coordinates up. The values of x and y may be either positive or negative, and may be expressions and/or variables as well as literal numbers.

The value 'a' is optional, and instructs the computer to draw a curved, rather than straight, line. This value specifies the number of radians the line must turn through as it draws; if a is positive, the line will curve to the right, if negative to the left. As a rough guide when reading listings, if a = 2*pi, a complete circle will be drawn, a=pi then a semi-circle is drawn, etc.

CIRCLE — The Spectrum has a built-in function to draw circles. This is considerably faster than using DRAW, but less accurate, which is why you find the DRAW method used in some listings. To draw a circle, you state CIRCLE x,y,r where (x,y) are the coordinates of the centre of the circle and r is the radius.

CIRCLE also appears to contain a slight bug. After drawing the circle, the statement leaves the graphics cursor in — as the manual puts it — 'a rather indeterminate place'. For this reason, you will normally find a PLOT statement immediately following a CIRCLE. This is simply to put the graphics cursor in a known position rather than being a part of the display routine as such.

PAPER & INK — A wonderfully sensible idea; PAPER being used to set the backgound colour and INK the foreground colour. The format is the same in both cases, PAPER (or INK) z where z is the colour as defined below:

0 — black
1 — blue
2 — red
3 — magenta
4 — green
5 — cyan
6 — yellow
7 — white

BRIGHT — Sets the brightness of the colours. BRIGHT 0 being normal, BRIGHT 1 being extra bright.

FLASH — Flashes foreground colour. 1 = on, 0 = off.

INVERSE — Reverses INK and PAPER. 1 = on, 0 = off.

OVER — Allows overprinting. Normally, if you print (say) a letter 'X' and then an addition sign at the same position, the second character will obliterate the first. OVER allows the old character to remain visible, so that the above example would produce something like an asterisk (*). 1 = on, 0 = off. The only way to recreate this on other machines is to work out what the combined character would look like and see if your character set supports something similar. If your machine has the facility to support user-definable characters, then this is, of course, another way around the problem.

BORDER — The Spectrum has a border around the screen which the user cannot access for screen displays using Basic, but its colour can be reset using BORDER z, where z is as for PAPER and INK. BORDER has no equivalent on most machines and can be safely ignored when converting from a Spectrum listing.

Note that colour 8 can be used with PAPER, INK, BRIGHT and FLASH to set the respective attributes to 'transparent'. Colour 9 can be used with PAPER and INK to select automatically maximum contrast, thus each is set to white if the other is a dark colour and black if the other is a light colour. This would have to be done 'manually' on most machines.

When describing the resolution of the graphics screen, I mentioned a limitation when using colour. Plotting a particular attribute (colour, inverse, flashing, and so on) affects the whole of the character position, rather than just the pixel in question. Thus, you cannot have a steady blue line right next to a flashing green one, though you can have two lines sporting identical attributes running alongside each other.

The final graphics-related statement supported on the Spectrum is SCREEN$. This is a very useful feature which allows you to save the contents of the screen memory on tape. This can subsequently be loaded from tape in order to recreate the display. The format is SAVE "filename" SCREEN$ to save, and LOAD "filename" SCREEN$ to load. This is most commonly used to load title screens for display while the main program is loaded.

Sound:

Sound on the Spectrum is controlled using the BEEP statement, the onomatopeiac word BEEP being a pretty accurate description of the sound quality. The format is SOUND duration, pitch.

Duration is in seconds and pitch is in semitones: 0 is middle C, negative numbers are lower, positive numbers higher. Each octave, of course, spans 12 semitones.

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Operating Systems

In this second part of our series, Eric Bagshaw takes an overview of the OS market, showing just what is available and what you should look for.

When wondering 'which is the best operating system', the question 'for whom?', must be asked. The programmer and the end user will be impressed by very different things.

Simplicity of use, a good range of packages and an error-proof robust environment are of prime importance to the business user. The computer expert, on the other hand, will expect a vast range of sophisticated functions, a wide variety of languages and many system utilities. Both will want, in a multi-user application, password protection and proper file and record locking.

These will be some of the areas we'll be looking at in this, the second part of our overview of operating systems — delineating between the most common systems, the old favourites, and those tipped for future success, finally closing on the battle for middle ground.

All OSs will provide the basic disk file functions of copy, erase, directory listing and format, but the more sophisticated systems will incorporate many others. The larger systems now appearing on micros (Unix and Pick, for example) are here not because they have been trimmed down to fit, but because the micro has grown to encompass them.

The greatest jump in power comes when the move is made from single to multi-user. To have a 'safe' environment a whole range of guards then have to be incorporated. Password protection is needed, preferably with a number of access levels and, going still further, separate control over read, write and execute. Locking the protection against two users accessing the same information, also needs to be at a number of levels. To allow two or more users to work on the same file will require protection at record lock level, some only allow file lock or worse still disk lock.

OS History

Apple, Commodore and Tandy dominated the early years of the Australian micro business. The micro started life in just the same way as the mainframes are at present — very manufacturer dependent. However, to the surprise of many people, especially the powerful manufacturers, portability seems to have superceded the 'tied' approach.

This obviously can have many benefits for the humble user, but it does force the buyer into having to decide which operating system to go for. Some machines offer many operating systems; the IBM PC can run at least nine (at the last count!).

Of the three early manufacturer-specific systems, only TRSDOS from Tandy looked something like an operating system of today. The Commodore DOS (disk operating system) and Apple DOS 3.3, for example, both incorporated the file handling that you would normally expect to find in the programming language interpreter or compiler.

DOS 3.3 is the present version on the Apple II, and is a simple system. In addition to the basic commands, there is a facility to auto-load programs and some simple directing of output and file protection against deletion, but not password controlled. Facilities for loading, saving and executing machine code programs are provided. The SOS (Sophisticated Operating System), provided with the Apple III, improves on a number of facilities, but still falls far short of the claims its name suggests. It is device independent, and offers some input and output routing and it can also emulate DOS 3.3, which enables it to run all your old favourite Apple II programs (including the graphic games).

The latest in line, the Lisa, is so different that comparisons are difficult. The seven main applications (Lisa-calc, list, project, write, graph, draw and terminal) are intimately linked with the operating system to such an extent that applications and operating software totally blur together; this is no surprise, as it was the original design intention. For a discussion on the concept see the section on Smalltalk (Canon), the system on which the Lisa was based.

The first Commodore PET computer, the 2001, was a cassette-based system and therefore had no need for a DOS. Later versions (3000, 4000 and 8000 series) all included a steadily-improving operating system. Commodore DOS is part of the Basic stored on ROM, and hence it does not have the same 'feel' as the more conventional disk based systems that have separate command languages of their own. Despite this point, it has all the facilities associated with a simple operating system.

Tandy's TRSDOS has fallen from favour, which is a shame because compared with some of its rivals it was far more user-friendly. The system had help levels, both short and long error

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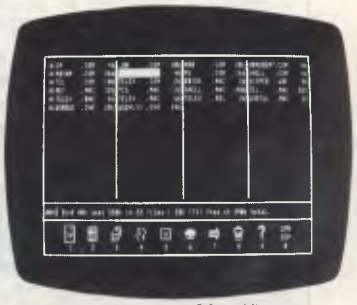

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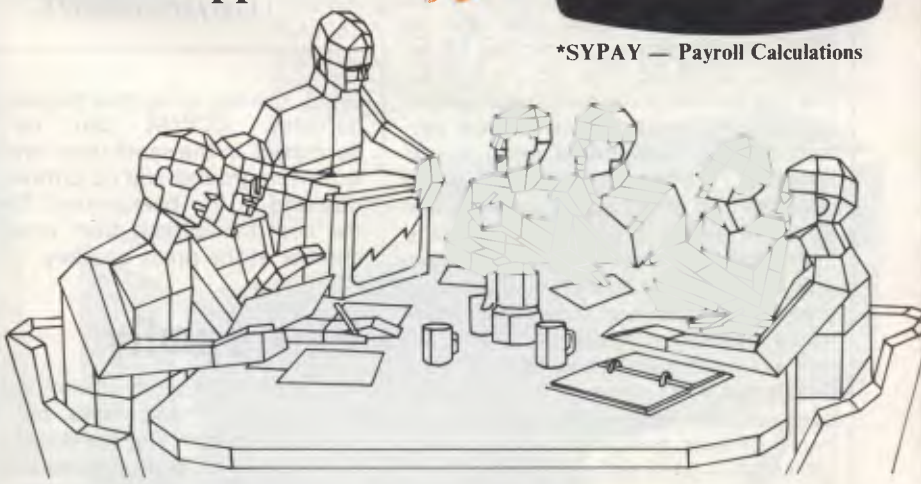

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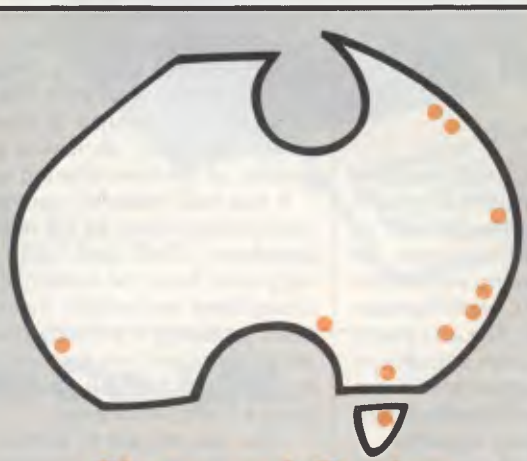

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All the above manufacturers are attempting, in varying degrees, to re-join the evolutionary main stream of microcomputing and avoid extinction. Apple has been able to support (although not from Apple sources) CP/M for many years, but the use of a Z80 card, and Lisa is soon to have Unix and CP/M-68. Commodore is reputed to soon be offering CP/M and Unix on its new series machines. Tandy's Model 4, an improved version of the Model III, now supports both CP/M and TRSDOS, and the Model 16 Unix.

The Digital Research family is probably the largest of the operating system families. It consists of the following units: CP/M-80, CP/M Plus (3), CP/M-86, Concurrent CP/M, MP/M, MP/M-86, CP/NET, Personal CP/M.

It all started in 1977 with Gary Kildall writing his own operating system for a simple disk system he was building for fun. The result was CP/M (Control Program for Microcomputers) which was written in 8080 assembler. This was capable of running on just three 8-bit chips, 8080, 8085 and the Z80, and although it had many faults it became the *de facto* standard, It is still with us today, after a number of revisions, but tends to be known as CP/M-80 (the '80' in 8080) to differentiate it from the 16-bit version, CP/M-86 (the '86' in 8086). The first version of the multi-user system MP/M for 8-bit micros was far from perfect, but we have heard good things about the 16-bit version, MP/M II. At the opposite end of the spectrum, Personal CP/M is about to be released for the 'home' computer on ROM. This is to be a little brother to the disk system, allowing greater interchange of software. There is also a networking system, CP/NET, but we have never seen this installed. On the 8-bit side, CP/M plus (or CP/M 3.0) has been released, which offers a number of improvements, bringing it into line with CP/M-86 — while still maintaining CP/M 2.2 compatibility.

The Microsoft Family

Just when Digital Research was happy to sit back on its laurels virtually free from competition, MS-DOS appeared and all hell broke loose. IBM, instead of developing its own operating system for the PC, went to Microsoft, world famous for its MBasic interpreter. The end result of this competition has been a quantum leap in the quality of documentation from Digital Research and rapid development (and improvement) of both systems.

Rather than concentrate on the systems in isolation, we are going to try and produce a compare and contrast section, using the top offerings from each company: MS-DOS 2 and Concurrent CP/M.

Both systems have time and date stamping in the disk directories, background printing (to a spooled disk file), automatic program loading and sophisticated disk handling using cache and hashed directories. Concurrent CP/M has a full range of pass-wording, good help levels and erase with query (eraq). MS-DOS 2 has many similarities to the multi-user system Unix, but it is not yet directly compatible. It has root directories, a sophisticated batch system, with utilities to sort out and find as well as conditionals.

In addition, the Unix-like 'Pipe' system to redirect input and output is also provided. The big difference though is concurrency. CCP/M can run four 'terminals' at the same time: one is real, in the foreground, and up to three are virtual and in the background. Therefore the user can switch from one task to another at the press of a key.

The Microsoft family has many useful prodigies to its credit; Unix is an operating system that is very hardware dependent.

Unix Family

Unix appears to be an operating system that arouses strong views, but not all good. While scanning the texts we have come across wide ranging opinions from people who think it is the best thing since sliced bread, and others who would not give it the time of day. It first appeared on a PDP-7 at Bell labs (a subsidiary of the AT&T company) in 1969. We heard that at a Unix conference it was originally called 'Eunuchs', as it was a castrated version of the time sharing system!

It has only recently appeared on the commercial scene, as US anti-trust laws prohibited AT&T until 1980 from making profits from the system. Prior to then universities and similar institutions had been receiving it virtually free. The system is large and requires a powerful 16-bit (usually 68000) machine with at least a 5Mb winchester.

Unix has helped to spread the popularity of the language it was written in, C, and Digital Research is re-writing all the CP/M systems in the language for portability. The system has many complex facilities ideally suited to the programmer and these will be covered more deeply in the next article.

Briefly, the system is very hardware independent; it has a directory tree-structure, and many input and output routing facilities. Its passwording is particularly good, with many options for access control. Its critics highlight the inconsistency of the command structure, its large size and lack of user friendliness. To some extent the latter point has been overcome by 'friendly front ends', or a menu such as on the Fortune system. Another early criticism was the lack of packages. Two years ago there were very few — a glance to the end of this article will show that this too has been remedied.

DPC/OS

A number of systems in the market place such as DPC/OS (BRIDOS and MMMOST and others) are very generous; rather than share a processor amongst a number of users, like Unix would, they give users one each. The situation historically was that 8 bits did not really have enough power to drive a number of users, hence the more powerful 16 and 16/32 bit chips. The other tack, which resulted in the multi-processor systems such as DPC/OS, was if an 8-bit can only drive one user, then provide one processor for each user.

In actual installations each user has a processor and 64k RAM, which for all intents and purposes is their own computer. Within the system itself are one or two other processors controlling the common resources such as disks and printers; therefore, until the disk is accessed the individual processors will be running at full speed and additional users on the system do not degrade performance. The extent at which disk usage effects the system depends upon the applications being run: systems such as word-processing have low access requirements, but an on-line enquiry system will make big demands.

One advantage can be the ability to use some of the popular single user software (in single user mode of course), and many of these systems offer CP/M compatibility. Taking the concept to its full conclusion, a number of systems are providing the more powerful 16 and 16/32 bit chips in addition to the 8-bit options for even more power, and for maximum flexibility a mix of operating systems within the same machine is also possible.

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P-System

P-System was developed in 1974 at the University of California in the midst of 'Pascal fever' — around that time, the Pascal language, according to the pundits, was going to sweep all languages away (Cobol, Basic and Fortran included) and be the dominant language, especially on micros.

The first installation was on the ubiquitous PDP/11 and then the Apple II, hence the system's greater popularity in the US, where the Apple had its largest sales. The system has now spread to virtually all the popular machines, and the P-Code can be produced from Basic and Fortran compilers in addition to Pascal. The system itself is quite easy to operate, as all the commands are via menu driven options. Additionally, Turtle graphics, one of the first portable systems, is available with the P-System.

Pick

An operating system that is hitting the news at the moment is Pick — developed by one Richard Pick while at CMC, to run on a Reality mini. It is designed around a database language and many of the commands are involved with these functions. Its nearest equivalent on a micro would probably be dBase II. We apologise to any Pick enthusiast at present ripping their hair out after reading that comparison, but most people have not studied database theory at university: Pick can interact with the stored data in the way that dBase commands can be directly typed to produce, for example, a sorted report. The language is known by a number of names, but usually English or Access, and the commands can be customised by the user to any key words they require.

Facilities to list, sort, count, sum and simple statistics are all included and this is supplemented by a greatly extended (Dartmouth) Basic. Down from the mini it runs on a number of powerful 68000-based micros and Pick is working on an IBM XT version, running under MS-DOS and linked to the 8087 maths co-processor. Pick has few packages as such, but according to the manufacturer, this is owing to the fact that applications can be built with great ease (using the database faciltities directly) to the user's requirements. To facilitate this for non-computer users, a type of program generator called System Builder is available.

Smalltalk

We have included Smalltalk here not because it is a mainstream operating system, but because it spawned a way of thinking which may well change the very design of operating systems.

Its first offspring was the Apple Lisa, and its relatives are the various window systems that are at present being heavily promoted. It started life at the Xerox research centre at Palo Alto in the US and the first 'product' we were aware of was a press release on the Xerox Star in mid-1981. This, like the Lisa (with which most of you will be more familiar) had a mouse and icons. An icon is a screen representation of a real world object, such as a waste bin. Files to be killed are 'pointed at' with the mouse and then moved over to the bin for storage; this can then be 'emptied' removing the files forever. The file can be retrieved before you empty the bin, just as in real life.

The battle

A directory in which over 3,000 disk-based packages have been listed, shows the operating system shares as:

Apple II	503
CP/M-80 and 86	1653
Lisa	16
MS-DOS/PC-DOS	952
P-Code	86
PET	252
TRSDOS	90
Unix	246
Rest	300

The total is over 3,000 because many systems run on a range of operating systems. The number in the 'rest' section consists of dozens of the less common manufacturer dependent and other systems.

These figures give an indication of the battle the operating systems are having for a place on your machines. The war is being fought for the middle ground — the popular market; there will always be a place for the specialist system, offering unusual (or little demanded) facilities to small numbers of users, but these have their own territories and are not 'enemies'.

Punditry can go wrong, so take all comments about the rosy future of one system and the death of another with a pinch of salt, magazine articles can have a self-perpetuating effect: a couple of pieces on system 'X' will produce interest in that area, and readers will want to find out more — hence more articles. This continues until the 'fashion' changes.

Perhaps a better guide to what is actually happening is the job ads. During the start of the Unix fad, as time went by more and more positions appeared for Unix and C programmers — this time they were right. The trend has swung away from manufacture-specific systems, and there does not appear to be any sign of it reversing soon.

However, the main reason for the success of MS-DOS is the IBM PC, which has (arguably) just become the most popular small business micro in Australia. In the US, in terms of numbers sold, it is head and shoulders above its rivals. IBM therefore has the power and the user base to change the face of micro-computing as we know it, if it chooses to do so. We are left at present, if we wish to select between the two front runners, with a difficult decision. Both are 'good' operating systems, so a selection must be made on the facilities offered. At present concurrency offers great advantages — but who knows what Microsoft has waiting in the wings. (Also keep your eyes open for Pick!)

The best route is first to opt, where possible, for suppliers who have provided in the past upgrade paths. Second, there is safety in numbers, a large user base will keep software suppliers interested for longer. If you are thinking of moving up to multi-user it would be wise to select even at the single user stage systems capable of an easy transfer.

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Cat

Dick Smith's answer to the Apple is a serious contender for your cash at $699. Simon Dillworth runs it through its paces.

Introduction

At a time when micro manufacturers' claims of compatibility with the Apple or IBM personal computers are rife in the micro industry, the arrival of yet another 'Apple compatible' machine from across the waters is unlikely to inspire many people. If on the other hand, you were to look at Dick Smith's latest entrant into this expanding machine category, firstly as a machine in its own right and then secondly as an Apple compatible, a somewhat different picture emerges. The CAT comes with a 106 paged User's Manual and a 203 paged Basic Reference Manual, written in clear English and set out in a logical and orderly fashion. No index is provided in either manual.

General observations

My first impressions of the CAT as I pulled it out of its foam nest was that it had been attractively designed and solidly constructed. The computer/keyboard is housed in a pleasantly two-toned brown plastic case that looks as if it could handle a lot of rough treatment. Most peripheral connection sockets are on the back of the unit with the exception of two located on the right hand side. Overall, the unit has a clean and uncluttered appearance.

Keyboard

The standard keyboard comes with eight large function keys which allow you to enter a whole command or sequence of commands with a single keystroke. In conjunction with the SHIFT and CTRL keys, up to 24 function keys can be used. Naturally, you can change the values of these keys from their factory defaults, eg, F5 may be defined to RUN RECEIPTS. The CAT has built-in 80-column firmware which can be switched on with a WIDTH 80 command or via program control. On the underside of the keyboard is a switch that allows you to select or de-select the 80-column option. The normal position is 80-COL but if you are running programs that make use of the 80-column display memory for other purposes, this switch may have to be set to 40-COL. Both upper and lower case letters are available in 40 or 80 column modes. The individual keys are made of tough plastic in one of three colours: light brown, bone or orange. The keyboard is ergonomically sculpted (curved) and has a very pleasant professional feel about it.

The standard keyboard includes a numeric keypad on the right. Also provided is a 'CAPITALS LOCK' key with a small red diode beneath it to remind you that it has been depressed lately. On the left of the space bar is an orange TAB key. The preset TAB columns are different for the 40 and 80 column modes, and it does not appear that these values can be changed by the user. Above the numeric keypad are situated four cursor control keys, with the aid of these the user can move the cursor to any point on the screen. Since the screen is 'active' when you are writing a Basic program these keys are extremely useful for editing programs —you don't suffer the

cruelty of having to retype entire lines containing only one incorrect character.

Setting up

On the back panel of the CAT can be found the following buttons, switches, dials and sockets:
(1) Power Socket and On/Off Switch
(2) Composite Video Socket — connection for a video monitor with composite video input, or for the RF modulator unit if a TV set is being used. A composite video cable is supplied with the CAT and will deliver both a video and audio output (via separate connectors) to a monitor.
(3) Cassette Socket — a connection post for the DR10 Data Cassette Player.
(4) Reset Button — press this to halt any program — will usually return you to Basic. Sensibly located away from mischievious fingers.
(5) Colour Defeat Switch — when switched to ON this 'kills the chroma carrier' and outputs only black and white to the composite video monitor or TV displays.
(6) System Bus — mainly used for system expansion, eg, the disk drive controller is plugged into this.
(7) Printer Bus — connection for a printer with a Centronics interface.
(8) RS232 Bus — connection for devices with a serial RS232 interface, eg, a modem or serial printer. The communciation speed can be set to one of eight values between 110 and 9600 baud.
(9) Sound Volume Control — by rotating this fully anticlockwise you can turn the sound completely off and continue playing your game of HYPERTWERP beyond midnight in a civically responsible fashion.

Plug-ins and add-ons

The number of potential configurations for the CAT is quite large. The following is a list of some of the components that can be added to the main unit: RS232 adaptor, communications modem, Graphic Plotter, 4 Colour Printer Plotter, Joy stick(s), CP/M Cartridge with a 48k/64k/ Soft Emulator, Cassette recorder, Multiple disk drives, 128k RAM Card, ROM Cartridge and RGB/com-posite/green monitor and Super System Expander.

Disk drives

Up to two CAT disk drives can be connected via a single CAT disk controller card. Each disk can hold up to 160k of information. The disk controller card is a little larger than a cigarette box, but much more robust and is easily plugged into the system bus at the back of the keyboard unit. The 'manuals' for both the disk controller and the single disk drive are no more than a set of installation instructions and brief device specifications. Also, while the disk drive manual instructions suggest that the two sockets at the rear of the disk controller card are labelled 'DRIVE 1' and 'DRIVE 2' they are not labelled at all. If you wish to get more detailed information on the use of this device you need to purchase the Technical Reference Manual for the CAT. On the positive side, the disk drive is sturdy, attractive and remarkably quiet in operation compared to many other drives.

Joy sticks

On the right hand side of the keyboard is a single socket for a twin set of joy sticks. Each joystick has two buttons and a central control stick which unlike many other joysticks, does not return to the central position after being released.

Monitors

Using the RF Modulator card plugged into the composite video socket I tested out the use of my TV as a monitor. The User's Manual advises that for best results you should use a proper monitor. This is absolutely correct. I found that although I could always read the screen, the interference was quantatively infuriating and grew more distracting whenever the disk drive was in action. Yes, I am aware that it is not any better with the Apple but it still annoys. Alternatively I tried out my composite video monitor — a CONIC green screen — and found that to get anything it had to be turned up to its fullest. Even then, certain half intensity images failed to register. Obviously some monitors demand stronger video inputs than the review CAT was putting out. Just something to bear in mind when selecting a monitor.

Apple software compatibility

On the right side of the keyboard is a cartridge slot which is used to connect hardware and solid state software modules to the CAT. One particularly interesting card that uses this slot is the Emulator Cartridge. If you wish to run Apple programs you require both this and an Apple licenced Filer program to load in the Apple operating system. Most Apple programs will then run unchanged on the CAT. Most, but not all — so check with a dealer if there is a specific package you wish to see run on the CAT.

Display modes

The CAT has five display modes: 40-column text; 80-column text; low resolution graphics; bit-image graphics and double resolution graphics. In the two text modes, inverse and flashing attributes are also available. In the low resolution graphics mode the screen is arranged in 192 horizontal lines of 280 pixels (picture elements) each. Six colours are available but there are certain limitations in the way these can be combined eg, two dots side by side will both appear white. In the bit-image graphics mode you get the same resolution as in the low resolution mode but there are no limitations on which of eight colours each pixel can assume. In this mode the screen takes its data from an area of 24k of RAM which is divided into sections of 8k each, representing each of the three primary colours (green, red and blue). Since all secondary colours can be made by mixing these colours in various ways, this appears a beautifully logical way of handling graphics memory. The double resolution graphics mode allows you to define 192 lines containing 560 pixels — a total of 107,520 — but the colouring rules are the same as for low resolution graphics mode (ie, limited).

Memory

The CAT uses the 6502A microprocessor (similar to the processor at the heart of the Apple) running at a speed of 2MHz — twice the speed of the Apple's. The 6502A processor is 8-bit and so is only capable of addressing a maximum of 64k of memory, but through a method called bank-switching the CAT is capable of addressing up to 256k of memory. Think of the regular 64k as being logically divided into four banks of 16k each — these would represent physical banks 1 through 4. Think of the remaining 192k of physical memory as being divided into another twelve physical banks (5 through 16 or 5 through F). By writing values into special I/O locations you can switch any of the physical memory banks into any of the four logical banks of memory. You could even use this feature to switch the physical bank containing the operating system (or kernal as it is called) out of logical memory. However, since the CAT would, in a manner of speaking, lose its mind and do indecent things to your program this is not recommended in the literature.

Cat

Additionally, there exist a number of software switches that can be used to perform such system functions as (i) read printer busy, (ii) read high resolution switch, (iii) write data to sound generator, etc etc.

The system kernel

The kernel is the 'soul' of the computer — it is its operating system. In reality this soul is a program that sits in the top 16k bank of logical memory, alongside the Basic Interpreter and internal input/output vector locations. Similarly to Apple's monitor the system kernal can be entered by typing CALL -151 RETURN. The kernel's prompt is the familiar asterisk and from here commands that perform such system functions as examining or changing the contents of memory locations, and moving and comparing blocks of data can be entered. This is pretty low level stuff really and should appeal mainly to system programmers and other assorted masochists. For most normal people the system kernel is appropriately invisible.

Basic

CAT Basic is an extended version of Microsoft's Basic; it is run interpretively and automatically loaded in from ROM at power up. Basic variable names can be up to 40 characters long for both numbers and strings. Additional to the standard Basic command set are commands that control the CAT's graphics, colour and sound capabilities: FLASH causes screen messages to alternate between character and background colours; HCOLOR sets the colour of subsequently plotted graphics; HPLOT draws lines or dots; PAINT fills a screen region with a particular colour; SHLOAD loads a shape table into memory. Shape tables may be used to define two dimensional shapes eg, a box or curve that can be subsequently displayed and rotated by the kernal; DRAW plots a pre-defined geometric shape from the shape table; ROT specifies the angle at which a shape is rotated on the screen; SCALE increases or decreases the size of the shapes created by DRAW; XDRAW erases a drawn shape without erasing its background; and SOUND produces sound through the internal sound generator. The four parameters to this command are PITCH, DURATION, CHANNEL NUMBER (1 to 3) and VOLUME. With this command, a little musical intuition and taking large liberties one could set the CAT into an endless recital of Bach's Toccata and Fugue in D Minor.

Conclusions

Overall, the CAT is an attractive computer. At $699 for the basic unit, its speed, excellent graphics, extended Microsoft Basic, versatility, and solid construction alone make it a computer worthy in its own right. With memory being bank-selectable the disadvantage of being only an 8-bit machine is not as noticeable as in some machines where a maximum of 64k is addressable. The fact that it can be made largely compatible with the Apple or CP/M machines further adds to its appeal. Someone at Dick Smith is at this very moment compiling a list of those Apple and CP/M programs that can run without modification on the CAT (to help make your decision to buy the CAT even easier). If you think you need the Apple, at roughly twice the cost of the CAT, you need to carefully examine your reasoning. If you want an Apple because you already own five and need it to run all of your existing software, the CAT is possibly not for you. If, on the other hand, you want an Apple so that you can run a specific piece of software or simply because you have always bought Christian Dior shirts and would not dream of buying anybody else's, you should weigh up the overall advantages and disadvantages before parting with your money.

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NEWCOMERS START HERE

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

Probably the first thing you noticed on picking up this magazine for the first time was the enormous amount of unintelligible-looking jargon. In the words of *The Hitch-Hiker's Guide to the Galaxy:* Don't panic! Baffling as it may sound, the jargon does actually serve a useful purpose. It's a lot easier to say VDU, for example, than 'the screen on which the computer's output is displayed'. This guide is intended to help you find your way around some of the more common 'buzzwords' you're likely to come across in the pages of *APC*.

For those completely new to computing, let's start with the question: What is a microcomputer? We can think of a micro as: a general-purpose device in contrast to a typewriter, which can only be used for typing; a calculator, for performing calculations; a filing cabinet, for filing information, to name just a few of its functions. A micro can do all these things and more.

If it's to be of any use, a general-purpose device needs some way of knowing what to do. We do this by giving the computer a set of logical instructions called a *program.* The general term for computer programs is *software.* Every other part of a microcomputer system is known as *hardware:* 'If you can touch it, it's hardware'.

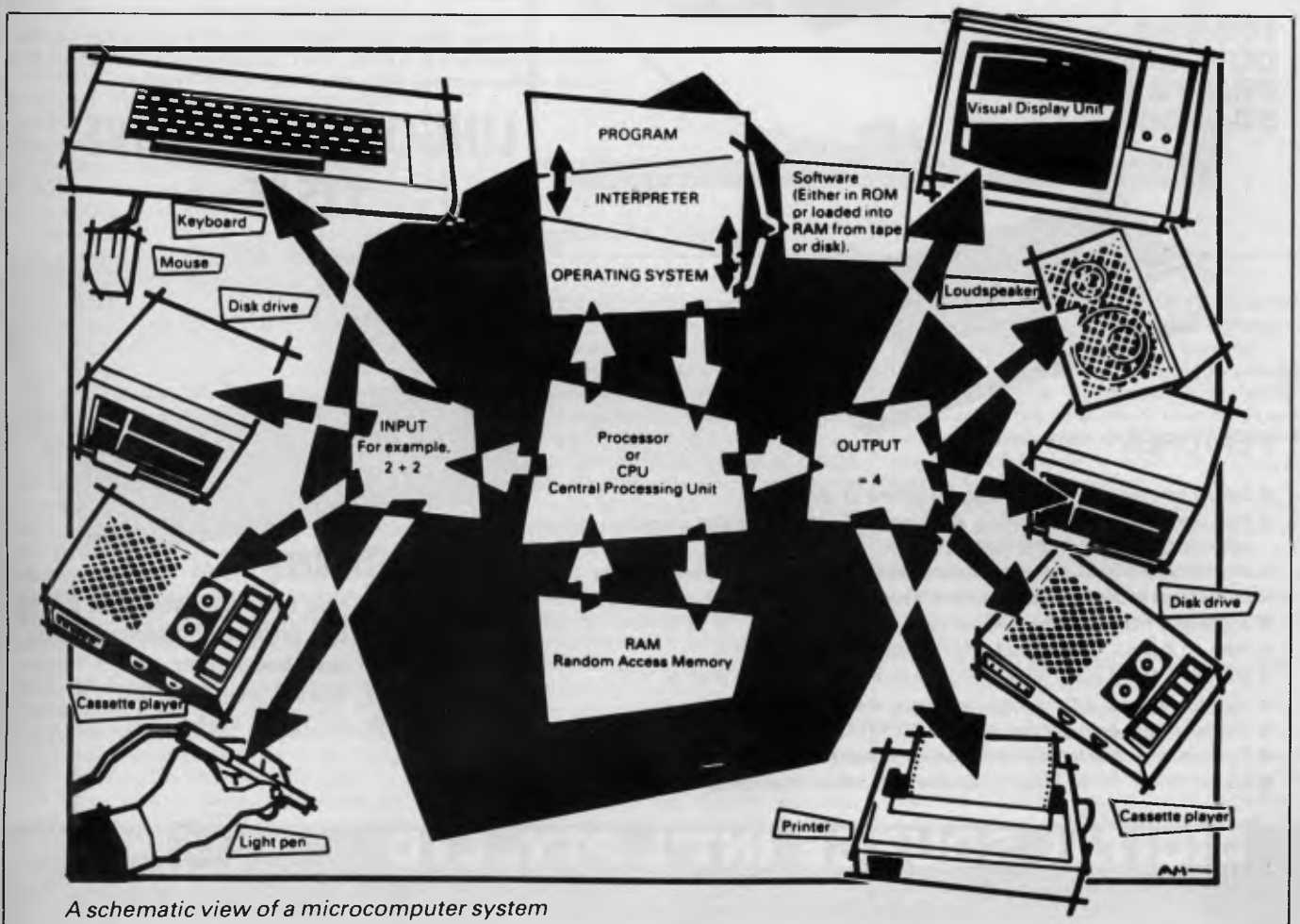
Programs must be written in a form the micro can recognise and act on — this is achieved by writing the instructions in a *code* known as a *computer language.* There are literally hundreds of different languages around, the most popular of these being *Basic.* Basic is an acronym of *B*eginners' *A*ll-purpose *S*ymbolic *I*nstruction *C*ode. Although originally intended as a simple introductory language, Basic is now a powerful and widely used language in its own right.

Other languages you're likely to come across in *APC* are *Forth, Pascal, Logo, C* and *Comal* to name but a few. These are known as *high level* languages because they approach the sophistication of a human language. You'll also see references in *APC* to the *low level* languages, *assembly language* and *machine code.* We'll look at these in a moment.

The heart of a micro, the workhorse, is the *processor* or Central *P*rocessing *U*nit (*CPU*). The processor usually consists of a single silicon chip. As with computer languages, there are a number of different types of processors available, the *Z80, 6502, 6800* and *8088* being just a handful (literally!) of the types in common use. The processor is nothing magical — it's just a bunch of electronic circuits. It's definitely not a 'brain'.

As it's electronic, the processor's circuitry can be in one of two states: on or off. We represent these two states by *binary* (base two) notation, the two binary digits (known as *'bits'*) being 0 and 1. It's possible to program computers in binary notation, otherwise known as machine code (or machine language) programming.

Machine code is called a low level language because it operates at a level close to that 'understood' by the processor. Languages like



A schematic view of a microcomputer system

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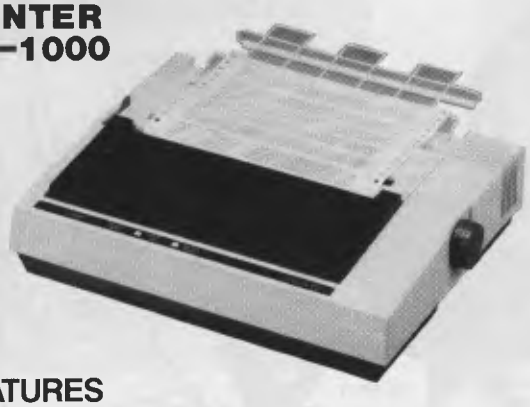

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Basic are known as high level languages because they are symbolic, operating at a level easily understood by people but not directly understood by the processor.

Between high level languages and machine code is a low level language known as assembly language, or colloquially, *assembler*. This is a mnemonic code using symbols which the processor can quickly convert to machine code.

Since everything has to be converted into binary form before the processor can make sense of it, we need some sort of code to represent each character to be processed by the computer. In order to simplify communication between computers, a number of standard codes have been agreed on. The most widely used of these codes is the American Standard Code for Information Interchange, *ASCII*. This system assigns each character to a decimal number which the processor can then convert to its binary equivalent.

A program written in a high level language must be converted into binary before the processor can carry out its instructions. We could of course do this manually, but since this is exactly the sort of tedious job computers were designed to do for us, it makes much more sense to write a program to do it.

There are two types of program to do this translation for us.

The first of these is a *compiler* which translates our whole program permanently into machine code. When we *compile* a program, the original high level language version is called the *source code* while the compiled copy is called the *object code*. Compiled programs are fast to run but hard to edit. If we want to change a compiled program, we either have to edit it in machine code (extxremely difficult) or we have to go back to a copy of the source code. For this reason there is a second translation program: an *interpreter*. An interpreter waits until we actually *run* (use) the program, then translates one line at a time into machine code — leaving the program in its original high level language. This makes it slower to run than a compiled program, but easier to edit.

There are two unusual Basic words you're likely to come across: *POKE* and *PEEK*. When you program in a high level language, you are normally unable to choose in which part of the machine's memory the processor will store things. This makes programming easier as you don't need to worry about memory locations, but slows down the program since the processor has to 'look up' addresses for you. Using the POKE command, however, you can 'poke' a value directly into a desired memory address. 'POKE 10000,56', for example, puts the value 56 into memory location 10000. PEEK allows you to examine the contents of a particular memory address. If you were to follow the above poke with 'PEEK (10000)', the computer would respond by displaying the value 56. POKEing and PEEKing is normally done to increase program speed, but may also allow us to do things which could not be done through Basic.

So far, we have a processor and a program. Since a computer needs somewhere to store programs and data, it needs some kind of *memory*. There are two types of memory: *Read Only Memory (ROM)* and the badly-named *Random Access Memory (RAM)*. ROM is so-called because the processor can 'read' (get things out of) its contents but is unable to write to' (put things in) it.

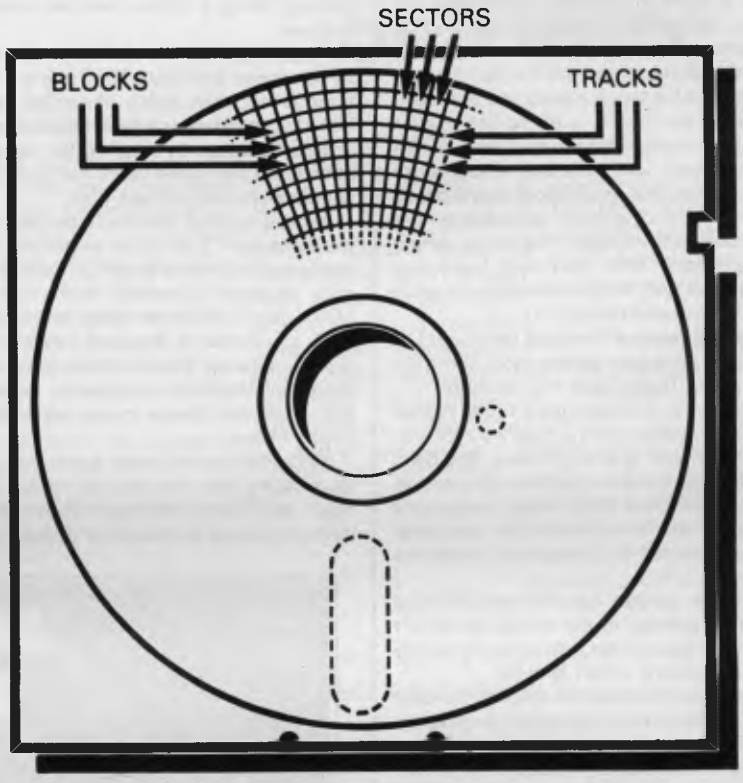
ROM is used to store *firmware*, the name given to software permanently available on the machine. An interpreter is a typical example of firmware (stick with it: it gets easier!).

RAM differs from ROM in two important ways. Firstly, you can write to it as well as read from it. This means that the processor can use it to store both the program it is running and *data* (information). The second important difference is that RAM needs a constant power supply to retain its contents: as soon as you switch the computer off, you lose your program and data.

There is a type of RAM, known as *CMOS RAM*, which requires only a tiny amount of power to retain its contents. This is found in portable computers like the Tandy 100. It is usually powered by small ni-cad batteries so that programs and data are retained even when the main power is switched off. CMOS RAM is extremely expensive and is not likely to be used in desktop machines for a little while yet. (CMOS stands for Complementary Metal Oxide Semiconductor).

Memory is described in terms of the number of characters we can store in it. Each character is represented by an 8 bit binary number. 8 bits make one *byte* and 1024 bytes make one *Kilobyte* or *1k*. 32k, for example, means that the computer can store about 32000 characters in its memory. If 1024 sounds like an odd number, remember that everything is based on the binary system, thus 1,2,4,8,16 . . . 1024 being the nearest binary multiple to 1000.

While we're on the subject of bits, you'll often see computers and their processors described in terms of their *bit power: 8-bit, 16-bit, 32: 16-bit* and so on. this is a means of describing how large a binary number the processor can handle in one chunk. A binary number, incidently, is known — confusingly — as a *word*. An 8-bit processor, for example, can handle 8-bit words, that is, up to 11111111 (255 in decimal). Anything larger than this has to be broken down into manageable chunks before it can be processed.



Cross-section of a floppy disk

A 16-bit machine can handle bigger chunks of data at a time. This means it can handle ('*address*') larger amounts of memory at one time. This is why most 8-bit machines have a maximum of 64k RAM while 16-bit micros usually have 128k upwards.

As 16-bit processors can handle larger words than an 8-bit machine, they ought to be twice as fast. In practice, however, there is a little more to it than that. While it may take a 16-bit machine half as long to work out that 2+2=4, the actual processing is only part of the story.

The result of the calculation has to be placed into the appropriate memory location, passed to the screen or whatever is required. The transfers to and from the processor are often made in 8-bit form; this is why you'll hear people arguing that certain processors are not 'true' 16-bit. If the problem has to be handed to the processor in 8-bit form, turned into 16-bit, calculated and then the result turned back into 8-bit for transfer elsewhere, there may be little or no saving in time over an 8-bit system.

The other factor affecting speed is that the

actual processing may form only a small part of the overall operation. A word processor, for example, spends most of its time passing files to and from disk and waiting for the user to type the next character. The processing itself consumes very little time. And if you look at the Benchmarks summary *(APC,* February 1984, pp 59-60), you'll see some 8-bit machines beating their 16-bit rivals — even in processor-bound operations like the *APC* Benchmarks.

Returning to the subject of RAM for a moment, a word of warning: Don't rush out with your new-found understanding to buy the machine offering you the most RAM for your money. Quite aside from the fact that the amount of RAM is by no means the only consideration when buying a micro (no matter how much manufacturers may stress it), different machines use differing amounts of RAM for things like graphics. Always check how much RAM is actually available to the user for program storage. Machines which proudly proclaim '64k' may well leave you with less than half of this in which to store Basic programs and data.

There are numerous forms of *permanent* or *back up storage*, but by far the most common are *floppy disk, floppy tape* and *cassette.*

Floppy disks or diskettes are circular pieces of thin plastic coated with a magnetic recording surface similar to that of tapes. The disk, which is enclosed in a protective card cover, is placed in a *disk drive.* Disk drives comprise a high-speed motor to rotate the disk and *read/write head* to record and 'play back' programs and data.

The disk is divided into concentric rings called *tracks* (similar to the tracks on an LP) which are in turn divided into small *blocks* by spoke-like divisions called *sectors.*

There are two methods for dividing the disk into sectors. One method is called *hard sectoring*, where holes punched in the disk mark the sectors, and the other is *soft sectoring* where the sectors are marked magnetically. The reason that disks from one machine can't be read by a different make is that each manufacturer has its own way of dividing up the disk. Recently, however, manufacturers have apparently begun to acknowledge that this situation can't go on forever, and they are working on making their disks compatible.

Since the computer needs some way of organising the disk, we have a program called a *Disk Operating System (DOS),* usually known simply as the *Operating System (OS).* The operating system does all the 'housekeeping' of the disks, working out where to put things, letting the user know what is on the disk, copying from one disk to another and so on. As you might expect by now, there are lots of different operating systems available, each with its own advantages and disadvantages. The three most popular OSs are *CP/M* (*C*ontrol *P*rogram for *M*icros), *MS-DOS* (*M*icrosoft *D*isk *O*perating *S*ystem) and *PC-DOS* (*P*ersonal *C*omputer *D*isk *O*perating *S*ystem). MS-DOS and PC-DOS, incidentally, are all but identical.

Disks can support what are known as *random access files.* That is, you can randomly chose a point in a file and the drive head will move directly to that point. You can then edit the file, and only the blocks affected will be rewritten. the rest of the file remains unchanged.

Floppy disks provide a reasonably fast and efficient form of secondary storage and are cost-effective for business machines. For home computers, however, the usual form of program and data storage is on ordinary cassette tape using a standard cassette recorder. This method of storage is slow and unreliable, but is very cheap and adequate for games, for example.

Cassettes can support only *serial access files.* That is, whenever a file is to be edited, the whole file must be written back to the tape. This makes certain applications — word processing being a prime example —extremely tedious.

Floppy tape drives are a compromise between speed and cost. They use a small continuous loop tape which, like a disk, is divided into blocks. Floppy tape drives rely on serial access files, but by rotating the tape at high speed and using the block markers, they can simulate random access files.

Another type of disk you'll see referred to is the *hard disk.* This is an extremely efficient method of storing large amounts of data. Hard disk capacity generally starts at around 10 *Mbytes* (10 million bytes) and rises to . . . well, you name it. Besides offering a much greater capacity than floppies, hard disks are more reliable and considerably faster. They are, however, much more expensive than floppy drives.

Since computers need some way of communicating with the outside world, we need *input* and *output* devices. Input and output devices include all manner of things from hard disk units to light pens, but the minimum requirement for most applications is a typewriter-style *keyboard* for input and a TV-like *Visual Display Unit* for output. The Visual Display Unit is variously referred to as a *VDU, Cathode Ray Tube (CRT)* and *monitor.*

The various component parts of a computer system (processor, keyboard, VDU, disk drives, and so on), may be separate, conencted by cables.

Take this paragraph slowly and it will make sense! When a computer communicates with an outside device, be it a printer or another computer, it does so in one of two forms — *parallel* or *serial.* Parallel *input/output (I/O)* requires a number of parallel wires. Each wire carries one bit, so with eight wires we can transmit/receive information one byte at a time (8 bits = one byte, remember). Serial I/O, in contrast, uses a single wire to transmit a series of bits one at a time (that's why it's called serial), with extra bits to mark the beginning and end of each byte.

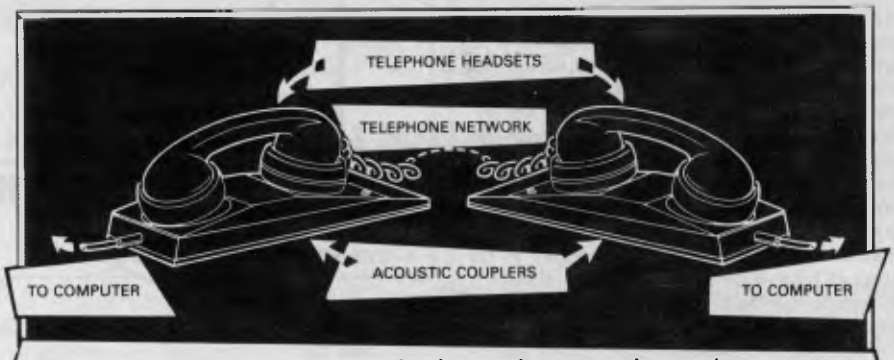
To enable different devices to communicate with each other in this way, standards have been agreed for different *interfaces.* An interface is simply a piece of circuitry used to connect two or more devices. The most common standard serial interface is the *RS232* (or *V24)* while the Centronics standard is popular for parallel interfaces.

When two computers want to communicate with each other over a distance, there are again two ways of doing it (nothing is ever clear-cut in the world of micros — you'll get used to it). Both methods use the public phone network. The first is known as an *acoustic coupler.* This simply plugs into your computer, and has a receptacle into which you place your telephone handset. The acoustic coupler is convenient in that you can unplug it from one computer and plug it into another one in a matter of seconds. They are generally slow, however, and prone to interference.

The alternative method is to use a *modem.* Unlike an acoustic coupler, a modem is wired into the telephone system and you should get permission for this from Telecom.

A term you'll hear used in connection with acoustic couplers and modems is *baud rate.* The baud rate is a measure of the speed at which a device can transmit and receive data. You can safely think of the baud rate as being bits-per-second, though the accurate definition is a little more complex. Therefore, a 300-baud modem can transmit/receive data at the rate of 300 bits (about 50 characters) per second.

A 1200/75 modem means that it receives at 1200 baud but transmits at 75. Most modems are 1200/75 and acoustic couplers 300/300 By way of comparison, saving programs to cassette is normally done at between 300 and 1500 baud.



Computer-to-computer communications using acoustic couplers.

Finally, communications between computers is either *full* or *half duplex.* Full duplex is when the machine receiving the data echoes it back to the machine transmitting it and says 'This is what I think you said — is that right?'. If it's wrong, the section will be transmitted again. Half duplex is where no checking is made. If you're ever unsure of which to use, start with full duplex. If everything you type appears on your display twice, then you should switch to half duplex.

Now that you know the jargon, you'll excuse me while I go and initiate a file transfer from secondary memory to RAM in order to engage some real time interactive processing with 32k 8-bit micro, using a direct entry input device and cathode-based visual feedback system. I never could resist a game of Pacman.

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SOFTWARE

Apple KuDOS

A powerful new operating system, ProDOS, gives extra polish to Richard King's Apple.

It's been a long time coming, more than two years, but Apple has finally produced a new operating system for the II plus and IIe computers. Called ProDOS (for Professional), the new system is impressive, offering the kind of features you find in MSDOS 2. x, OS9 or even Unix.

Features

What does it offer that its predecessors didn't? To answer that look at the limitations of DOS 3.3, most of which resulted from its having been written piecemeal over the years. This is why it lacks the tight organisation essential to systems programs.

These limitations prompted every programmer to develop a favourite way to use DOS, so many programs wouldn't run together.

At its most basic level, ProDOS is 'properly' organised. It has a reasonably simple, well-defined and consistent user-interface, behind which lie the subroutines needed to do the work, while there's no need to know the operational details. In addition, the $BF page of memory is defined as the System Global Page, which acts as the communication-link between systems programs and the OS, and contains various useful information.

Another important extra provided by ProDOS is memory management. This is related to interrupt-handling, and would not be possible without some way to mark sections of memory as reserved.

ProDOS maintains a 24-byte block in the system-page called the system bit-map. This has a bit-to-page correspondence with the lower 48k of the Apple, and whenever a page or part-page is used or released, the corresponding bit in the map is set or unset. This is caused by file-calls which involve buffer-allocations or releases, using high-resolution graphics, loading transparent routines like editors and anything else which requires space to work in.

```
        DISPLAY SLOT ASSIGNMENTS

STARTUP DISK: /USER'S.DISK/

YOUR Apple //e HAS:

    64K OF RANDOM ACCESS MEMORY

    APPLESOFT IN ROM

    SLOT 1: EMPTY
    SLOT 2: EMPTY
    SLOT 3: 80-COLUMN CARD
    SLOT 4: EMPTY
    SLOT 5: EMPTY
    SLOT 6: DISK DRIVE
    SLOT 7: EMPTY

 PRESS RETURN TO DISPLAY MAIN MENU
```

ProDOS Slot Assignments Display

```
              FILE COMMANDS

         ^ - TUTOR
         L - LIST PRODOS DIRECTORY
         C - COPY FILES
         D - DELETE FILES
         I - COMPARE FILES
         H - ALTER WRITE-PROTECTION
         R - RENAME FILES
         M - MAKE DIRECTORY
         P - SET PREFIX
SELECT AN OPTION OR <ESC>
```

The ProDOS File Commands Menu

DOS 3.x offered little in the way of interrupt-support, beyond disabling them whenever it was reading or writing a disk. It was possible to restore them repeatedly, and this is how most of the clock-cards work, but that's about as much as you could do.

ProDOS gives four polled interrupts, and provides facilities for loading the handlers into memory and linking them into the system. When this has been done, the handlers will be called whenever an interrupt is given, and if more than one handler is installed, they will be repeatedly called in the order in which they were loaded until one of them claims the signal, does whatever, and releases the system for normal operation.

terrupt-removal is also provided, so one-time events can run when needed, then go away. Time is also a system-resource. Clocks are considered an integral part of the machine, so files can be date/time stamped, and timed interrupts can be handled. If a clock which conforms to the Thunderclock definition isn't available, the system plonks <NO DATE> on everything instead, but the clock-driver can be replaced by a user-supplied routine, which is required only to store the date/time in $BF90—$BF92 whenever it's called.

One of the Unix-like features of ProDOS is hierarchical file-management which, coupled with extended file-types, transforms the disk drive from a simple dump for anything which isn't inside the machine into a valuable resource which can organise data and programs into more efficient systems.

A criticism of the Apple is that file-sizes are limited, partly by the small (143k) size of the normal drives, and partly by the fact that DOS 3.3 won't allow more than 32767 records in a file. You can install alternative Read-Write Track-Sector (RWTS) routines and patch the file-manager and command-handler, but the result is messy.

Of course, you can use another OS, but this is escaping rather than solving the problem and moreover, you'll probably find you can't run the program that wants the big files in the first place.

With ProDOS the disk has a driver-routine, so changing the drive doesn't cause many problems . . . all you have to do is link in a new routine, and since the rest of the system will handle files of up to 16Mb, you're away.

Drivers are used for all the other I/O devices too, so it should make those awful systems with bits of code all over the place a thing of the past, and in theory, almost any printer, plotter, clock, modem or computer-controlled bread-buttering machine should be usable from any program.

Operation

How you make it do what you want depends on how low you want to get! At bootup there's not much difference between ProDOS and DOS 3.3 . . . you work in Basic and most DOS-commands work in the same way, requiring a CTRL-D to activate them from inside a program.

There are extras, though, CATALOG lists the enhanced directory, complete with file-creation and modification dates, sub-types and so on. CAT gives a shortened version, suitable for 40-column displays.

The most obvious alteration is in the filenames. Correctly, these aren't file names anymore, and Apple now calls them 'pathnames', a term derived from hierarchical directories. Since any directory may contain either files or other directories which may in turn contain further directories, the actual data is at the end of a path, hence the new terminology.

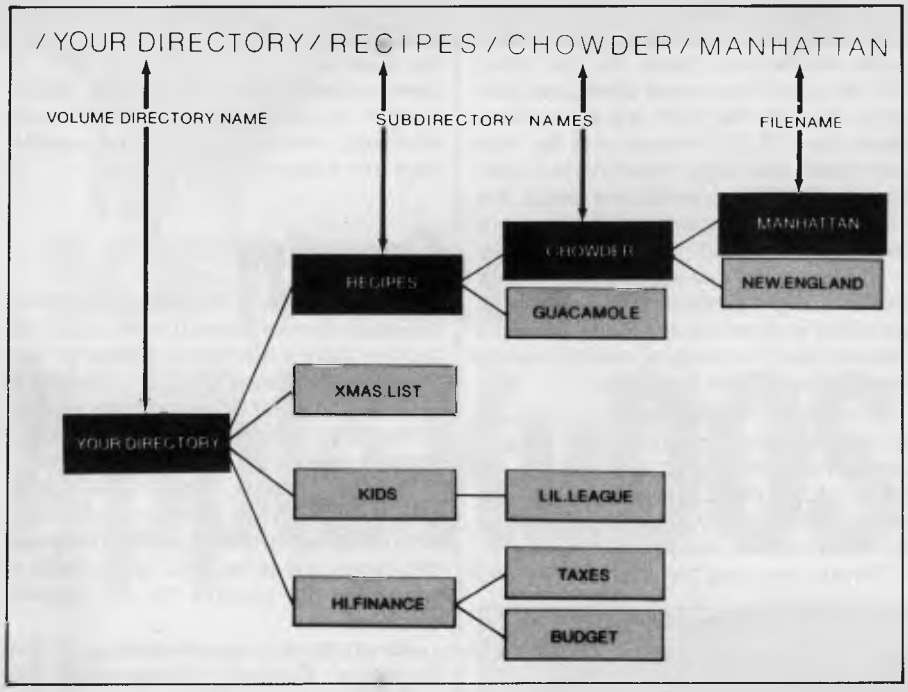
For much the same reason, drives are not referred to by slot and number. It is possible to do this, but it's been retained only for compatibility. Under the new system, the title of each disk is the name of its outermost directory.

While ProDOS has little in common with its predecessors, it's made to look like the older DOS by a 'system program' called Basic.System, which is a command-interpreter.

Apart from Basic.System, there are other SYS-type programs; you can even write your own. In most respects, such a program is a normal file, with the special feature of always loading at $2000 before moving itself or being moved to its execution location, as well as conforming to strict entry and exit conditions.

This lets ProDOS emulate any other operating system, just like Unix can; but then it also doesn't. In fact, this seems to be the weakest feature of ProDOS as it now stands . . . the main command-processor emulates DOS 3.3 very well . . . too well, perhaps, because there are many facilities which Basic.System just won't let you get at, or if it does, only with difficulty, often caused by too slavish an adherence to the behaviour of DOS, complete with limitations.

There is considerable room for development here, and it is to be hoped that more advanced CCPs will be



ProDOS files are organised hierarchically

developed such as a Bourne-type shell for the Aztec-C system to give a system which, to visible signs, was Unix on an unadorned Apple.

With ProDOS you get the Developer's Head-start Kit, to actually obtain ProDOS itself and two versions of Basic.System. One of these provides a development environment for Applesoft Basic, and the other functions as a run-time environment, which precludes the use of most DOS commands in immediate mode.

There are two file-management programs: Filer, which is an advanced version of Fid, and Convert, which transfers files from DOS 3.3 to ProDOS and vice versa. Four program-development tools are provided, consisting of an upgraded version of the Apple EDASM machine-code development system, with a not-so-good line-editor (why not a proper screen editor?) the very professional relocating macro-assembler, plus a relocating loader which makes little use of the relocation dictionary produced by the assembler, and falls short of the link-editing facilities provided by other operating systems.

However, a big plus is a new member of the family, Bugbyter. This is a smart debugger/front-panel with multiple conditional breakpoints, single-step, trace, register and memory operations and more besides.

As suggested by the presence of CONVERT, the organisation of the disks is different from that used by DOS, and is similar to that employed by SOS, if not identical. Certainly ProDOS is claimed to read and write SOS disks, though it won't necessarily make you wiser because you can't run SOS Pascal or Business Basic.

Conclusion

The Head-start Kit, which I tested, is openly proclaimed to be 'Beta code — that means there are bugs'. That's what it says in the manual, but I can't say I noticed any serious ones.

In general, I found the experience pleasant. It's a considerable improvement and should greatly enhance the usefulness of the Apple.

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Keyboard	Detachable with coiled cable ASCII type low profile
Floppy Disk Drive	2 x 5¼" 160KB slim line drives dual 320KB (optional)
Display	8 x 8 dot cell with 80 char x 25 lines. 6 x 7 character font. B/W monitor or 8 colour RGB monitor option.
Communications	RS 232C port (optional) Std Joy stick facility
Printer Interface	Centronics Parallel

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Operating System	MSDOS with CP/M-86 option
Language processor	Basic. Fortran-86. Cobol-86. Pascal MT + 86
Electrical	Local voltage + 10%
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	4. WOMBAT 1D	(W1D)	Same as Wombat 1 but comes with detachable keyboard.	$745.00	$ 830.00
	5. WOMBAT 2D	(W2D)	Same as Wombat 2 but comes with detachable keyboard.	$795.00	$ 870.00
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COMMUNICATIONS

APC welcomes correspondence from its readers but we must warn that it tends to be one way! Please be as brief as possible and add 'not for publication' if your letter is to be kept private. Address letters to: 'Communications', APC, 77 Glenhuntly Road, Elwood, Victoria 3184.

Food for thought

Recently I purchased a Commodore 64 Personal Computer and found, on reading the user manual, that to use a television as a monitor, one end of the video cable was required to be connected to the aerial socket, and that the channel to be used would have to be a UHF channel. Unfortunately my set is an early model and the UHF channel had not been adapted for use. To receive UHF I use channel 10 on my video (BETA) recorder.

As this worked for TV reception, I thought it was reasonable to assume that it should also work for my PC. I was very pleased to see that what I had assumed was in fact correct, and I am now using my TV as a monitor.

Now to get to the point of my letter. As I am using a channel (Ch 11) of my video, I again assumed that I would be able to tape any PC display which appeared on my TV monitor. This, I am pleased to say, again was correct.

The question I would like to put to you is — has this been thought of before? If it has, I have not been able to find any reference to this fact.

As I am a beginner in the use of a PC, I cannot, at this time, go into any detailed suggestions as to the potential usage of taping computer displays on video, but among some thoughts that come to mind are — no printer is required; making titles for home video recordings; businessmen may tape graphics and results of computer research on video for conferences etc.

Again I ask, has this been thought of before, if not, why not?

Geoffrey H Sivyer

Over to the readers — Ed.

APC to the rescue

Congratulations on a most informative magazine.

After reading your March 1984 edition, I have purchased a Sharp MZ-700 computer. I am very impressed with this machine and have thoroughly enjoyed my first venture into computers.

I have since learned that disk drives and CP/M compatibility will shortly be available for the MZ.

Again I wish to thank you for your assistance in my decision.

Every salesperson I spoke to, after finding out I owned a business, would only talk about machines in the $3–$4,000 bracket. If I left it up to them I would be without a computer now. Using your magazine as a reference, I bought a MZ-700 and find it very adequate for my uses. Anyway, I like playing games and making programs.

Frank Kruegar

Printing problems

I have found a problem in printing the high-resolution graphics page of an Apple II+ fitted with either a Grappler+ or a Digitec printer interface card and using a BMC BX-80 printer. An extra blank line equivalent to one dot width is added after every seventh dot causing the hi-res graphics to be stretched in the direction of the line feed, eg a plot of a circle becomes an ellipse.

This occurs also with CP-80 and Alpha-80 printers, but does not occur with Epson MX-80 or FX-100 printers.

I have tried all pertinent line feed and MSB commands without success.

Have you or any of your readers discovered this same problem and found a solution to it?

D Davies

Programs for profit

Could you please advise me on the basic facts of writing games programs for profit, or recommend an article or book.

What is the best computer for such an activity, who will buy the games once written and how much will they pay?

A Jones

There aren't many books or articles available on writing games for profit (probably because the people who know are far too busy writing games), but here are a few points to bear in mind.

You must have a game to sell and it must be worth selling. In other words, the market will not stand yet another synonym of Pac-Man or another Space Invaders. A good test is to look honestly at your own game and ask yourself whether you would be happy with it if you'd just spent your hard-earned cash on it.

Once the game is written you have two options: either sell it yourself or let someone else do it for you. The second option requires less capital (only the cost of a few blank cassettes) but your return will be less.

Then, send a copy to any software house and wait. Be warned, however: these people are inundated with such programs so expect a delay. Be prepared for many rejections and suggested alterations.

Should you be successful, you may be offered a choice of payments, either royalty or lump sum. Royalties are a percentage of the game's price paid to you as the game is sold.

An alternative is the single payment of a lump sum which buys all your rights to the game. Royalties are preferable, as a lump sum may be well below the value of a good game. As for the machine, any of the top sellers will support a good game.

Tony Hetherington

Plea for APC-80

It's been a long time since APC-80 graced the pages of *APC* (March '83 to be exact). I realise that SYSTEM 80s and TRS-80s don't produce great headlines these days, but a lot of us out here in *APC*-land have them. You can't completely drop APC-80 as it is the best utility for Basic programming that I've ever come across and most readers would expect that more of this standard would be forthcoming.

I'm sure that if Ian Davies doesn't feel up to it, enough support could be generated from readers to keep APC-80 in *APC*. After all, we've had PROAID, APC4EX and Geoff Lohrere installs it

The Hobbit. Now the best is

"After a very short time I found that 'The Hobbit' was becoming almost a way of life rather than a game, and so when I finished it for the first time I was partly sad because I felt that all the fun and adventure had ended, but I was wrong. Even now I am discovering new things about the game and feel that it will be some time until all of its secrets are revealed to me."

MR. J. STERN, Herts

"I have at last received your 'Hobbit' program and would like to congratulate you on its excellence. After four days of sweat and tears I have completed only 37.5 per cent of the adventure. The program has lived up completely to expectations, and there is no doubt about it being the best production for the Spectrum to date. You have surpassed all others with this program."

"A lot of fun."

COMPUT

"The excellent gr
The exciting diffe
is that it is possibl
converse with all t
meet and ask thei
recommend this g
Tolkien, or novel a

POPULAR COMP

"I am writing to c
'Hobbit'. I think it is one of
ingenious programs I have h
to use. It has kept me stum
months. I think the effort th
writing a program like this must have be
enormous. The effects are brilliant to say t
least."

JEREMY CHESTER

"T bit takes first place in the new
quality and value for money."

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cations in the Adventure are
e excellent graphics. We
plete 7

ures. The
ied plot
erior to any
for the

COMPUTER

sty Mountains
, this game is
eat to play and is No. 1 for
d excitement."

GORDON DEMPTSTER, Scotland

"Thanks again for an excellent game in 'The Hobbit'. I feel I have really got my money's worth out of playing time. Congratulations!"

MR. P. RUSHTON, Leeds

"The most powerful computer game yet invented."

COMPUTER WEEKLY

"Within my circle of friends this game has become something of an obsession. We meet every Friday night at someone's house and spend 3-4 hours on 'The Hobbit'. Friday night would not be the same without 'The Hobbit'."

CHRISTINE VERCHILD, Wilts

"One new Adventure game stands head and shoulders above the rest. It alone almost provides you with a good enough reason to buy a 48K Sinclair Spectrum. Not only does The Hobbit produce drawings of the main scenes, but it also understands proper sentences rather than pairs of words for its commands. It comes with a copy of J.R.R. Tolkien's classic book of the same name. It is the program with the most detailed and best written documentation ever."

WHAT MICRO

"This is an impressively packaged Adventure game which makes good use of the Spectrum's colour graphics. They have not only produced one of the best games for the Spectrum, but given everyone else a lesson in good game design."

PRACTICAL CO

"I am the owner of a copy of 'The Hobbit' which is wonderful entertainment, and very challenging. I have other tapes and publications of yours, all of which are excellent."

MR. D.J. BURGH, Kent

"Having received the most excellent piece of programming I have ever seen, we have had no social life whatsoever. 'The Hobbit' has been dominating our lives since January and many nights have been spent until 3 o'clock trying to conquer it."

SIMON ROGERS, Avon

"I have recently purchased your excelle
adventure game 'The Hobbit'. This
greatly enhanced by the use o
graphics, its availability i
of having

Melbourne House

available for:

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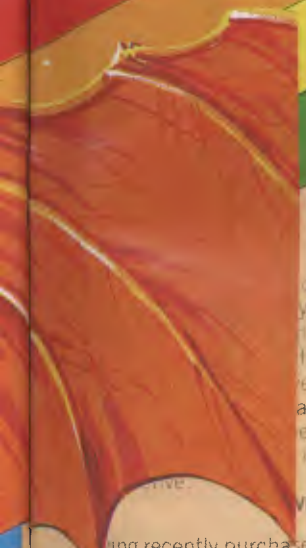
COMMODORE 64
ORIC 1
BBC



"In my software library, your program 'The Hobbit' takes first place."
DAVID MAXWELL, London

"I am the proud owner of your excellent program 'The Hobbit' and have also many happy, restful, relaxing hours trying to solve its ..."

...ulate you on a ... I have enjoyed ...mensely. I must thank you ...ducing such a clever product. It was worth every penny of the purchase price."
MRS. J. RYCRAFT, Northampton

...d for my ZX ...you supply called ...excellent ...the money. I find ...ery realistic. The ...accurate. It sticks ...e book, which is a ...it very compelling ...
...VEN CASSIDY, Essex

...ing recently purchased a Sinclair ...trum I decided to buy 'The Hobbit' ...since I have been doing a literature project based on 'The Hobbit' with my class of 10 and 11 year old children. Over the last 10 weeks the children, having read the book, have been attempting the program with my assistance. Let me congratulate you on a most entertaining program."
MR. K. REID AND CLASS 7, Nottingham

"... more of an experience than a program."
POPULAR COMPUTING WEEKLY

GOLDEN JOYSTICK AWARD
BEST STRATEGY GAME

"... the most unique facet of this program is that the user instructs the computer in completely ordinary English sentences. The Hobbit ... separately ... communications ..."
ZX COMPUTING

"I purchased 'The Hobbit' not long ago and since then I have been engrossed in the game, and ... beginning ... game wants to talk to me about its ... adventures in 'The Lord ...'"
DAVID ROWLEY, Stoke-on-Trent

"The use of graphics is one of the features which makes 'The Hobbit' special. The addition of graphics as good as these adds a whole new dimension to the Adventure. It is certainly a marvellous game, which should set the standard for future Spectrum adventures."
ZX COMPUTING

"'The Hobbit' is a beautifully constructed, frantically-maddening, tortuous, gloriously inconsistent, thoroughly spooky adventure — far better than I could have hoped for and certainly the finest of the dozen or so adventure programs I have. In short, I congratulate the four who sweated for a year and a half."
MR. PETER JONES, South Glam

"Nothing is certain in this Adventure, but uncertainty! Add to this the brilliant graphics that are used to describe many of the locations and we have an Adventure that is going to become a classic for the Spectrum."
POPULAR COMPUTING WEEKLY

"...we are not eating food...we are losing sleep...and it's great! We are lost, in the Hobbit program."
MR. JOHN HARRIS, Kuwait

"The children were immediately enthusiastic about the program (even dedicated footballers gave up some playtimes to use it!). Many children borrowed copies of 'The Hobbit' from the library to read for themselves."
JUNIOR EDUCATION MAGAZINE

"'The Hobbit' arrived and single-handedly set the standard for adventure games to come, with its sophisticated mixture of advanced language analysis and beautifully detailed graphics."
MICRO ADVENTURER

M

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Books

☐ A Guide to Playing The Hobbit	$9.95
☐ Book of Adventure	$12.95
☐ Commodore 64 Sound & Graphics	$19.95
☐ Commodore 64 Games Book	$19.95
☐ Commodore 64 Exposed	$19.95

* These programs incorporate pavloda

APC6

on EPROMs, so there must be a demand and support for it.

All that would be needed is Ian Davies' initial objectives (eg not to exceed 4k, not to incorporate lengthy routines that are available with DOSs, but perhaps as separate utilities like RENUMBER or PACKER) and a call for support. I have already written routines for programmable keys, calculated RESTOREs and am thinking of a "separate utility" that produces "readable" Basic listings.

This listing, for calculated RESTOREs allows you to RESTORE to any line number by placing that line number after the word RESTORE, in any arithmetical expression, eg

```
RESTORE  40
RESTORE  A
RESTORE  SQR(VAL(X$))
```

I was prompted to write it after seeing Darrel Francis' Basic version in TJ's Workshop (Dec '83). This routine was about 180 bytes long in its presented form. My machine language routine is 65 bytes long and in its present form operates in a 48k system with DOS. By changing one line in APC-80 and one in the listing, it can be incorporated into APC-80 as all of the label in the listing is compatible with APC-80. To try it out, you can run it as is without APC-80, remember to reserve the memory first.

If you intend to continue APC-80, I'll make the changes in the RESTORE routine for you, if you don't, then please give us some indication of not doing so.

Simon Saubern

It's back to the readers — Ed.

```
        Sample Restore Program


00010           ORG     0FFBFH
00020 INIT2     LD      HL,RESTRE
00030           LD      (4004H),HL      ;CHANGE RST 10 VECTOR,
00040                                   ;HERE WOULD BE AN EXIT
00050           JP      402DH           ;TO BASIC OR DOS
00060
00070 FIND      EQU     1D78H           ;ACTUAL RST 10 ADDRESS
00080

00090 RESTRE    EX      (SP),HL         ;GET RETURN ADDRESS
00100           LD      A,L             ;DID CALL COME
00110           SUB     5BH             ;FROM THE BASIC
00120           JR      NZ,FAIL         ;INTERPRETER, WHICH
00130           LD      A,H             ;STARTS @ 1D5AH
00140           SUB     1DH             ;WITH A  RST 10?
00150 FAIL      EX      (SP),HL         ;PUT RETURN ADDRESS BACK
00160           JP      NZ,FIND         ;LEAVE VIA RST 10 IF NOT
00170           CALL    FIND            ;CALL RST 10
00180           CP      90H             ;IS NEXT CHARACTER
00190                                   ;RESTORE TOKEN?

00200           JR      Z,REST          ;IDENTIFIED AS SO
00210           DEC     HL              ;ELSE RESET REG'S AND
00220           JP      FIND            ;LEAVE VIA RST 10
00230 REST      CALL    FIND            ;GET CHR AFTER RESTORE
00240           JR      NZ,NONORM       ;IF EOL OR ":" THEN
00250           JP      1D91H           ;DO NORMAL RESTORE
00260 NONORM    PUSH    BC              ;ELSE SAVE REG'S
00270           PUSH    DE
00280           CALL    2B02H           ;EVALUATE EXPRESSION
00290                                   ;AFTER RESTORE
00300           PUSH    HL              ;SAVE POSITION OF NEXT CHR
00310           CALL    1B2CH           ;LINE # IN DE, GO FIND IT
00320           JP      NC,1ED9H        ;NOT THERE? UE ERROR
00330           DEC     BC

00340           LD      (40FFH),BC      ;RESET DATA POINTER
00350           POP     HL              ;RESTORE REG'S
00360           POP     DE
00370           POP     BC
00380           DEC     HL              ;RE-ADJUST POINTER
00390           JP      FIND            ;EXIT VIA RST 10
00400
00410           END     INIT2



              For 48K & NEWDOS/80 2.0
        Remember to set HIMEM below FFBFH
```

Better back issues

This program may be of interest to many, including R Phillips who requested a 'better' back issues format.

I wrote it for a TRS-80 model one but could easily be converted to other machines.

It takes around one minute to load, but saves hours flicking through pages in search of a particular topic. I have about twenty-five topics in the index to choose from and over a hundred data statements containing topics of interest to me.

So if you want to find out if *APC* has ever printed anything on artificial intelligence, run the program, request A.I. and bingo . . .

Hal Towards 2000. Vol 2/5 page 77.

Colin Fraser

```
5 REM SET UP INDEX DISPLAY
10 CLS:R%=1000:PRINT@25,"*APC INDEX*"
15 PRINT@89,"------------"
20 PRINT"CP/M:GAMES:UTILITY:COMPILERS: INTERFACE:FLOWCHARTS:"
30 PRINT"TAPE:BASIC:ARTICLE:PRDFILE:";
40 PRINT"HARDWARE:APC-80:DISKS:"
45 REM INSERT ANY OTHER TOPICS AS ABOVE
50 PRINT:PRINT"ENTER SUBJECT FOR SEARCH";:INPUTS$:CLS
60
PRINT"SUBJECT";TAB(20);"TITLE";TAB(47);"LOCATION";TAB(59;"PABE"
70 PRINTTAB(20)"------";TAB(47);"--------";TAB(59);"----"
75 REM SEARCH THROUGH DATA STATEMENTS
80 FORI%=1TOR%:READD$:IFD$="END"THEN130ELSEREAOT$,L$,P$
90 IFD$<>S$THEN120
100 O%=O%+1:IFO%=1THEN110ELSEO$=" "
110 PRINTD$;TAB(20);T$;TAB(47);L$;TAB(59);P$
120 NEXTI%
125 REM SEE IF TITLE EXISTS
130 IFPEEK(15490)=32THEN140ELSE150
140 PRINT@470,"NOT ON FILE"
150 PRINT@976,"HIT ENTER FOR INDEX";:INPUTZ:RUN10
155 REM DATA STATEMENTS MUST CONTAIN
156 REM SUBJECT,TITLE,LOCATION,PAGE
160 DATA DISKS,DISK BASICS,VOL.1/9,23
170 DATA DISKS,DISK BASICS,VOL.1/10,23
180 DATA HARDWARE,JOYSTICK INTERFACE,VOL.2/1,57
190 DATA INTERFACE,THE I/O BUS,VOL.2/5,89
200 DATA END
500 REM FILL DATA STATEMENTS AS ABOVE
```

Commodore syntax error

I recently bought a disk drive for use with my Commodore 64, mainly as a word processor but also to write my own programs. When I try to run a program it fails and displays the curious error message 'SYNTAX ERROR in 0'.

This is particularly confusing as my programs do not contain a line 0. Please help, as this is seriously hindering a would-be programmer.

P Darby

You have typed in your program after listing the disk's directory. Consequently, the directory is still in memory and is saved with the program when it's saved to disk. When you try to run the program, it produces the error message as it tries to interrupt the directory display. The error is in line 0, as the first line of the directory display is line 0 and contains the disk name and ID. The other directory display lines will also be fixed in your program with the line number being the blocks used by that file or program: that is, a program stored in four blocks will be included as line four.

The easiest way to avoid this is to type NEW before writing a program to clear the computer's memory. To remove extraneous directory display lines from existing programs, enter their 'line' numbers (for example, 0).

Tony Hetherington

Commodore address package

I am secretary of a local club and therefore regularly send

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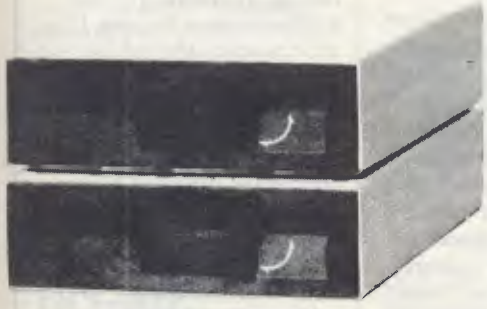
- ★ The 10 function keys each have 48 characters of built-in memory
- ★ 188 function keys



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letters to members announcing events. Is there a suitable software package available for this purpose? As my son has a Commodore 64, it would be useful if the package could be used with this machine.

E Willis

The package you require is the MailMerge facility included in the East Script word processor,

It merges an address file with a letter, using the word processor to produce a letter correctly addressed to each member.

Tony Hetherington

Disk drives explained

I am completely perplexed by the descriptions given to disk drives. I understand their basic operation as a storage medium, but could you explain in more detail than your Newcomers page the exact operation of disk drives and the meaning of terms like density, sectoring and the number of tracks. How important is each of these in the operational use and cost of drives and disks?

Bob Wade

A disk is a circular piece of plastic, coated with a magnetic surface. When it's placed into a disk drive, a motor rotates the disk while the read/write head moves across it.

Before a disk can be used, it must be formatted. Formatting involves magnetically dividing the disk into concentric circles known as tracks, and radiating divisions known as sectors. The areas bounded by tracks and sectors are known as blocks. To find a particular item on the disk, the operating system 'looks up' the block containing the file in its directory. It then moves the read/write head to the appropriate track and waits for the required block to pass the head as the disk revolves.

Density refers to the amount of information which can be stored on a disk: that is, how dense the tracks and sectors are. The terms single-density, double-density and quad-density do not refer to specific capacities, as this varies from one disk to another. Most disks are either 35-, 40- or 80-track.

In theory, the more tracks and sectors a disk has, the greater its capacity. But because different disk drives organise their disks in different ways, this is not always true. Typical disk capacities vary from 100k (100,000 bytes, or characters) to around 800k.

Disk drives may also be single- or dual-sided. Dual-sided disks use both surfaces, so can store twice as much data as an equivalent single-sided disk.

Disks are often sold as 'single-sided, double-density', and so on. This is merely an indication of the quality of the disk. All disks are manufactured in the same way. They are then tested as double-sided, double-density. If a disk fails the test, it's tested as single-sided, double-density. If it fails this test, it's tested yet again, and is rejected altogether if it fails the final test.

Surya

Informing on reliability

In all its reviews and Benchtests, *APC* ignores the factor of greatest importance to users: reliability. Of course, reliability cannot be assessed in the short tests typically performed by your contributors, but in view of its overriding importance, that's not an excuse for ignoring it.

Here's a suggestion. For products which appear likely to be value-for-money leaders in their class, ask readers to notify *APC* when they order the product: all you need do is keep track of the numbers of each one ordered.

Those whose equipment fails within a year notify you again. You publish the percentage of non-working systems, month by month, for each of the monitored products.

It's not necessary to monitor a great number of products; half a dozen would be enough to start with. Revealing the truth about some of the shoddy products on the market would not endear you to all your advertisers, but it would increase *APC*'s value to its readers enormously.

N Jacobs

(Tell us about poor reliability or bad service when it happens. If you wait a year, many more people may have put good money after bad — Ed)

Mail order hazard

Be cautious of Mail Drder firms, they may not have the product they advertise, at least, not for some time.

I live in a country area of NSW and could not obtain a particular computer system locally, so I subscribed to a Mail Drder Club in Sydney. Their prices were very competitive and after phoning to verify these prices and handling charges I sent them an order and money.

Two weeks passed and I was concerned my order may have been misplaced, so I phoned them. An employee said he would check for my order and ring back. The next day I rang again, after all, how long does it take to check records. I would have thought a firm dealing in computer equipment would keep records on computer. The person I was speaking to told me he was still checking and finally said they had not despatched my order because they only had the computer, as their supplier did not have peripherals in stock. However, he would send the computer immediately and the peripherals (disk drive etc) when stocks became available.

Next, I contacted the wholesaler who distributes this product. The representative told me he had ample stock and the problem lay with the mail order firm. He said because they are a new firm they do not have a credit rating and therefore no monthly account. Solution, I've sent them the cash, why don't they use that cash to buy the product?

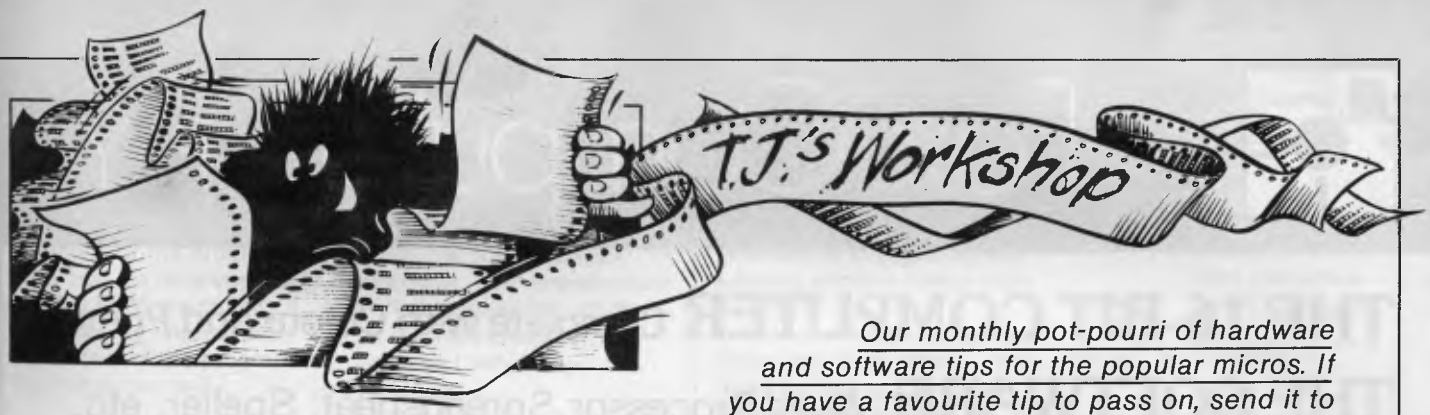
This company advertises in *Australian Personal Computer* and states "Despatch guaranteed in five working days".

You may feel printing this "communication" could lose an advertising customer, however, after the money I've outlayed in long distance phone enquiries and the inconvenience caused, I feel your readers should be warned of the possible setbacks associated with mail order firms. In particular, firms which do not encourage efficient business management, and apparently don't have the capital to found a successful business in the first place.

How can a business expect to grow if it inconveniences its customers?

R Byrne

END



Our monthly pot-pourri of hardware and software tips for the popular micros. If you have a favourite tip to pass on, send it to 'TJ's Workshop', 77 Glenhuntly Road, Elwood, Victoria 3184. Please keep your contributions as concise as possible. We will pay $10—$30 for any tips we publish. APC can accept no responsibility for any damage caused by using these tips, and readers should be advised that any hardware modifications may render the maker's guarantee invalid.

Faster PC-8001 Benchmarks

Here is a powerful tip for users of the NEC PC-8001 micro who are particularly interested in machine code subroutines and non-display oriented computation.

The video RAM contents are DMA transferred a line at a time to the CRT controller. Thus every eight raster Scans the DMA controller inhibits bus access by the CPU while the next screen line is transferred. If it is unimportant to show the display during a computation. For example while executing matrix maths procedures, then the Basic command OUT&H51,0 will stop the DMA controller, allowing the CPU to achieve faster Benchmark timings. To restore the display, use the following Basic commands with your own choice of parameters:

```
CONSOLE 0,25,1,0:
        COLOR0:
        WIDTH80,25
```

I have noted a 28% increase in run times using this method.

Derek Salkeld

PET restore

Here's a tip which will enable PET users to restore individual lines. Previously you could only reset the data statement pointer to the beginning of the first data line, but by POKEing the following addresses you can restore certain lines. The line number of the data statement must be broken down to the form:

Line Number=(X*1)+(Y*256)

This can be done using:

```
Y=INT(Line Number/256)
X=X-Y*256
```

The addresses are:

Basic2.0

Poke 142,X Poke 143,Y

Basic3.0 and 4.0

Poke 60,X Poke 61,Y

R Worthington

TRS-80 variable lister

In a large program it's easy to lose track of which variables have been defined as strings, which as integers, which as double precision, and which as single precision by the commands DEFSTR, DEFINT, and so on. This Basic routine is a useful debugging tool which, when called by a GOSUB command inserted in the main program, lists the variable initial letters A-Z and the definition for each letter. Control is passed back to the main program by pressing any key.

To use the routine insert the line GOSUB 30000 into the main program at the appropriate point.

```
30000 FOR ZY%=16641
   TO 16666
30010 IF PEEK(ZY%)=2
   THEN ZY$="INTEGER"
30020 IF PEEK (ZY%)=3
   THEN ZY$="STRING"
30030 IF PEEK (ZY%)=4
   THEN ZY$="SINGLE"
30040 IF PEEK (ZY%)=8
   THEN ZY$="DOUBLE"
30050 PRINT
   CHR$(ZY%-16576);"-
   ";ZY$;STRING$(21,32);
30060 NEXT ZY%
30070 PRINT
30080 PRINT "PRESS ANY
   KEY TO CONTINUE"
30090 IF INKEY$=" "
   THEN 30090
30100 IF INKEY$<>" "
   THEN 30100
30110 RETURN
```

A Sheppard

Sideways

This short routine provides an alternative character set for the VIC 20 in which the characters are oriented up the screen rather than across it — that is, they are turned on their side.

The program creates a redefined character set starting at 7168 dec. This is a handy location for new character sets since it allows a good deal of normal ROM-held character generator to be accessed by pressing the CTRL and RVSON keys, exactly as if you were calling for a character to be displayed in reverse video. All subsequent characters then appear as normal — not in 'reverse' — until CTRL and RVSOFF are pressed, when you are returned to the redefined character set. Thus, normal and 'sideways' characters can be displayed at the same time.

The routine works by reading the values held in each successive group of eight bytes which define the character shapes from the normal ROM character generator. The program uses the values for the first 64 characters to calculate new shape values for each character turned through 90 degrees. These values are then POKEd into the protected area of RAM at 7168. The pointers to the top of free RAM are lowered so the new characters will be unaffected by NEWing the VIC.

However, don't forget that as these pointers have been reset, there will now be less than the normal 3.5k available for the rest of your program — just over 3k in fact.

The program was written for the unexpanded machine, but the listing should provide sufficient information to enable it to be modified for any size RAM expansion. For the 8k or 16k expanders, this generally entails moving Basic up above the specially reserved area of RAM, rather than lowering the top of memory.

The indentations of FOR—NEXT loops are provided for clarity but are not

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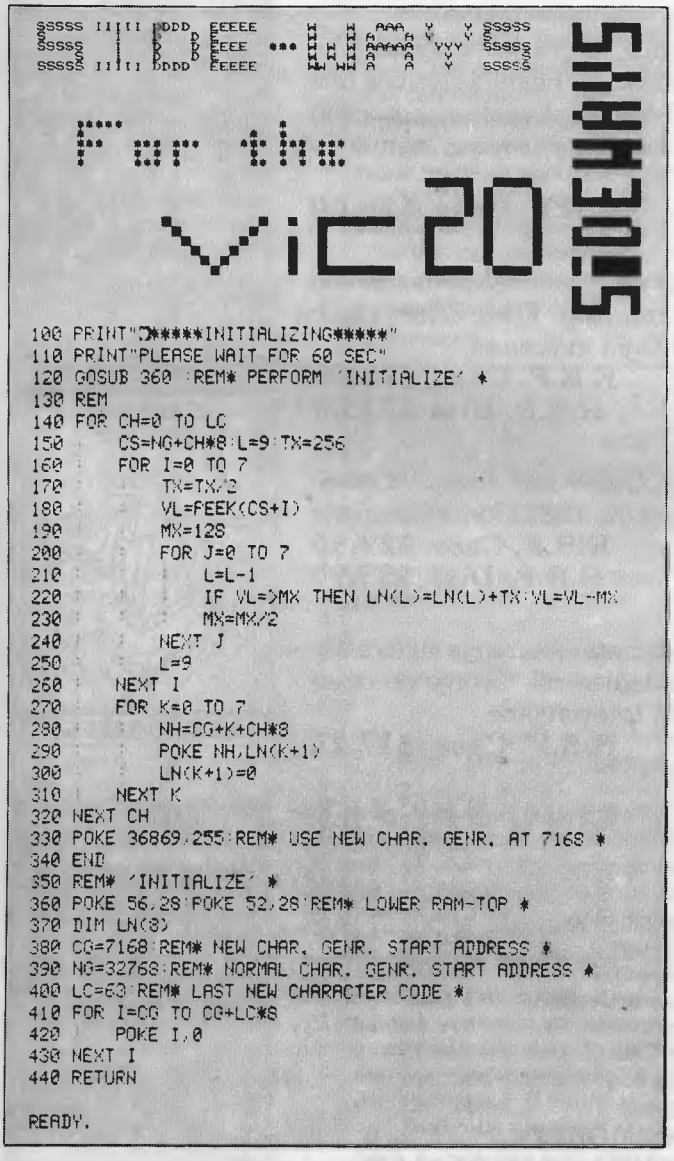
essential to the correct operation of the program. They may be removed along with all REM statements if desired. One unfortunate side effect of the program is that the cursor will disappear. It's still there, but since the normal cursor character — a reverse space — lies outside the confines of our new character set, you can't see it.

Chris Wyatt




```
100 PRINT"□*****INITIALIZING*****"
110 PRINT"PLEASE WAIT FOR 60 SEC"
120 GOSUB 360 :REM* PERFORM 'INITIALIZE' *
130 REM
140 FOR CH=0 TO LC
150     CS=NG+CH*8:L=9:TX=256
160     FOR I=0 TO 7
170         TX=TX/2
180         VL=PEEK(CS+I)
190         MX=128
200         FOR J=0 TO 7
210             L=L-1
220             IF VL=>MX THEN LN(L)=LN(L)+TX:VL=VL-MX
230             MX=MX/2
240         NEXT J
250         L=9
260     NEXT I
270     FOR K=0 TO 7
280         NH=CG+K+CH*8
290         POKE NH,LN(K+1)
300         LN(K+1)=0
310     NEXT K
320 NEXT CH
330 POKE 36869,255:REM* USE NEW CHAR. GENR. AT 7168 *
340 END
350 REM* 'INITIALIZE' *
360 POKE 56,28:POKE 52,28:REM* LOWER RAM-TOP *
370 DIM LN(8)
380 CG=7168:REM* NEW CHAR. GENR. START ADDRESS *
390 NG=32768:REM* NORMAL CHAR. GENR. START ADDRESS *
400 LC=63:REM* LAST NEW CHARACTER CODE *
410 FOR I=CG TO CG+LC*8
420     POKE I,0
430 NEXT I
440 RETURN

READY.
```

VIC 20 Control codes

An extremely versatile yet unknown feature of the Commodore VIC 20 is the facility for inserting control codes in REM statements to format a program listing. Here are some useful sequences:

110REM" " delete) (ctrl-rvs on) (shift M) (shift S) (unshifted J) (return)

Every time this line is met while listing, the screen will clear and then the listing will continue.

220REM" " (delete((ctrl-rvs on) (shift M) (unshifted$) (unshiftedJ) (return)

This line will cause the listing to continue in red. This can be changed by substituting another colour code for that of red.

Here is a list of control codes and their effects. They must be inserted between the shifted M and the j.

capital T	Delete/backspace one character.
capital N	Continue in lower case mode.
shifted M	Force a linefeed.
capital M	Return carriage.
capital R	Continue printing reverse field characters.
shifted T	Insert a space in line.
shifted N	Continue in upper case mode.
capital s	Home cursor.
shifted s	Clear screen.

And, of course, all the colour codes. These codes also work on the Commodore 64 and PET (not colour codes).

R Bhanap

Epson printer reformatting

Here is a handy way of reformatting your printer listings. You may have had trouble in the past with the way the Apple sends out data — it is very wasteful of paper and often very hard to decipher. Before listing your program out, you may find it helps if you type the following:

PR#1<RET>
—Printer slot . . .
PRINT CHR$(9) + CHR$(1)
<RET>
PRINT CGR$(1) + "75N"
<RET>
—Then CAREFULLY!! . . .
POKE 33,20<RET>
LIST<RET>

You should find that the listing takes up the whole width of the paper, not just 40 columns.

Mark Edwards

Spectrum tab fields

The comma control character is very useful for tidying up screen displays; however, it is often desirable to fit more tab fields across the screen (that is, when printing reams of small numbers). The following function can be used in a computed TAB statement to divide the screen into tab fields of width f.

```
5 DEF FN t(f)=(33—PEEK
23688<f*
(INT(32/f)—1))*f*(INT((33—
PEEK23688)/f)+1)
```

To use the computed TAB you just put

```
;TAB FN t(f);
```

at the end of a print statement, as you would use a comma (f is the width of the fields — that is, the gap between tab positions).

Thus, to fill the screen with numbers from 1 to 100, using tab fields of width 4:

```
 5  . . as above
10  FOR n=1 TO 100
20  PRINT n;TAB FN t(4);
30  NEXT n
```

NOTE (33—PEEK 23688) gives the current print position. To use this method with the ZX Printer and an LPRINT statement, replace PEEK 23688 with PEEK 23679 (system variable P POSN).

This system should work with other micros but the following points should be noted for conversion:

33—PEEK 23688
Gives the current print position on a Spectrum

INT(32/f)
Where 32 is the screen width on a Spectrum

Replace these by the relevant expression for current position and the screen size on your micro in line 5 (the function definition).

K Gaughan

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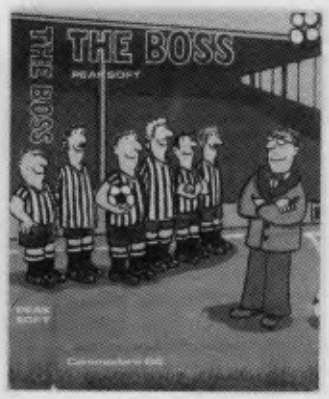

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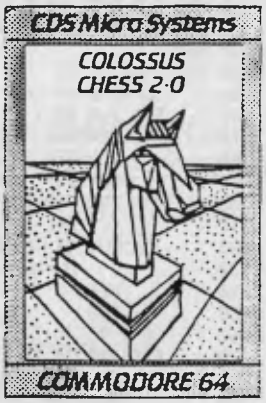

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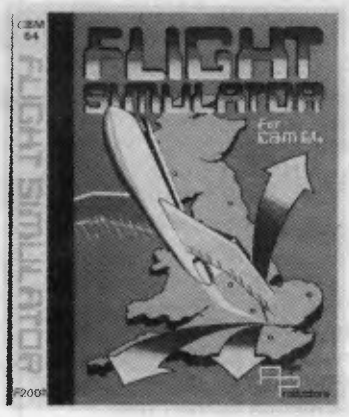

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T.J.'s Workshop

Key notes on the Commodore 64

Here is a routine for the '64 to provide one of three audible tones to indicate a key being pressed. The Return key gives a high pitched tone, the cursor and function keys are indicated by a medium pitched tone and the alphanumeric keys give a low tone.

The keyboard feedback routine could be included as part of a Basic program or used while entering programs. It also provides a convenient means of experimenting with the various waveforms and envelope controls to alter the sound produced.

The keyboard tones are switched off by pressing the Run/Stop and Restore keys, and can be re-initialised by entering SYS 50000. Line 70 will prevent the program from crashing should any of the DATA statements have been entered incorrectly. This line can be removed once the program has been run successfully.

S Sassoon

```
10 REM******** KEYBOARD FEEDBACK ********
20 POKE 54275,8    :REM PULSE WIDTH
30 POKE 54277,36   :REM ATTACK/DECAY
40 POKE 54278,9    :REM SUSTAIN/RELEASE
50 POKE 254,65     :REM WAVEFORM

51 :
60 FOR D=0 TO 54 :READ MCODE :POKE 50000
+D,MCODE :T=T+MCODE :NEXT

70 IF T<>6539 THEN PRINT "PLEASE CHECK D
ATA":END

80 SYS 50000

90 DATA 120,169,98,141,20,3,169,195,141,
21,3,88,169,15,141,24,212,96,165
100 DATA 197,164,254,136,201,64,240,22,1
62,128,201,1,240,12,162,64,201
110 DATA 8,144,6,201,51,240,2,162,16,142
,1,212,200,140,4,212,76,49,234
```

Simplified editing on the TI-99

I have recently discovered a tip about editing lines which TI-99 owners may find useful.

As you may know, to edit a line in TI Basic you have to enter EDIT and then the line number (like in extended Basic). Instead, if you just type in the line number you want to edit and then press FCTN 'X' or 'E', that line should come up onto the screen in edit mode.

S Sarwar

Data statements in 64's memory

The following program for the Commodore 64 can be used to make writing DATA statements a lot easier. It converts an area of memory into data statements, starting at a specified line.

Run the program and enter the first line number you would like to be used, then enter the start and finish addresses for the appropriate data and watch.

The maximum amount of data that can be used, at any one time, is 144 bytes.

J Marsden

```
1 POKE53280,8:POKE53281,6
2 CLR:INPUT"■FIRST LINE NUMBER";LN
3 IFLN<300RLN>63983THENRUN
4 INPUT"START ADDRESS";S
5 INPUT"FINISH ADDRESS";F
6 IFS>=FTHENPRINT"■?ADDRESS ERROR■":GOTO4
7 IFF-S>144THENPRINT"MAX DATA IS 144 BYTES":GOTO4
8 PRINT"■"
9 PRINTLN;"DATA";:C=C+1
10 FORY=STOS+16

11 IFY>FTHENPRINT"■ ":GOTO19
12 P=PEEK(Y):P$=STR$(P)
13 P$=RIGHT$(P$,LEN(P$)-1)
14 IFY<>S+16THENP$=P$+","
15 PRINTP$;:NEXTY:PRINT
16 S=S+17:LN=LN+2
17 IFS>F ORC=9THENGOTO19
18 GOTO9
19 PRINT"GOTO23"
20 FORY=1TOC+1
21 POKE630+Y,13:NEXTY
22 POKE198,C+1:PRINT"■":END
23 PRINT"■■DATA STAEMENTS ENTERED."
```

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Wide Screen Editor

Word processing has not yet been successfully implemented on the Spectrum due to its restrictive 32-column display. Nicholas Ryman-Tubb has developed a program allowing 64 characters to be displayed from a Basic function call, which is a step in the right direction.

The Spectrum with its 32-column display, is probably the last computer you would use for a word processor. To get round the problem, here's a solution which allows you to display 64 characters per line from a simple function call in Basic. Text editor and character generator programs are also included.

32	0	0	0	0	0	0	0
33	32	32	32	32	32	0	32
34	0	80	80	0	0	0	0
35	0	80	112	80	112	80	0
36	32	112	96	32	48	112	32
37	16	48	32	32	32	96	32
38	112	80	96	64	112	48	80
39	0	32	32	0	0	0	0
40	16	32	64	64	64	32	16
41	64	32	16	16	16	32	64
42	0	80	32	112	32	80	0
43	0	32	32	112	32	32	0
44	0	0	0	48	48	16	16
45	0	0	0	112	0	0	0
46	0	0	0	0	0	0	16
47	0	16	32	32	32	32	64
48	112	80	80	80	80	80	112
49	32	96	32	32	32	32	32
50	112	16	16	32	64	64	112
51	112	80	16	112	16	80	112
52	16	48	80	80	112	16	16
53	112	64	64	32	16	16	96
54	96	64	64	96	80	80	96
55	112	80	16	16	16	16	16
56	112	80	80	112	80	80	112
57	112	80	80	112	16	16	112
58	0	0	0	0	32	0	0
59	0	0	0	32	0	32	64
60	0	16	32	64	32	16	0
61	0	0	112	0	112	0	0
62	0	64	32	16	32	64	0
63	112	80	16	32	32	0	32
64	112	80	96	80	80	80	112
65	32	80	80	112	80	80	80
66	112	80	96	80	80	80	112
67	112	80	64	64	64	80	112
68	96	80	80	80	80	80	96

Definition

Each Spectrum character normally occupies an 8 x 8 grid. This gives the total number of bits across the screen as 32 x 8 = 256. To get 64 characters across the screen, each character must occupy 256/64 = 4 bits, giving a definition for each character of 4 x 8. This is rather low, but sufficient to define the alphabet and most punctuation symbols.

As each character occupies four bits it only takes up half a byte: the example below is the character 'U'. A one bit gap has been left around the left hand side and bottom to make a clear display, so the real definition is only 3 x 7. The coding for this character is shown below:

```
BIN  01010000   =80
BIN  01010000   =80
BIN  01010000   =80
BIN  01010000   =80
BIN  01010000   =80
BIN  01110000   =112
BIN  00000000   =0
```

You will see that bits 0,1,2,3 and 7 are always zero and the eighth row is always zero. Fig 1 contains codes for the full character set from space to Z (32-90) which can be entered using the program at Fig 2. The program in Fig 3 can be used to define and edit your own characters, and then saved onto tape. Once the program has been typed in, saved and run it will clear the screen and display an 8 x 8 grid of full stops. A cursor will be flashing in the top left hand square, and

69	112	64	64	112	64	64	112
70	112	64	112	64	64	64	64
71	112	64	64	64	80	80	112
72	80	80	80	112	80	80	80
73	112	32	32	32	32	32	112
74	112	32	32	32	32	32	96
75	80	80	96	96	80	80	80
76	64	64	64	64	64	64	112
77	80	112	112	80	80	80	80
78	80	112	112	112	112	80	80
79	32	80	80	80	80	80	32
80	32	80	80	112	64	64	64
81	32	80	80	80	112	80	32
82	96	80	112	96	80	80	80
83	112	64	64	112	16	16	112
84	112	32	32	32	32	32	32
85	80	80	80	80	80	80	112
86	80	80	80	80	80	112	32
87	80	80	80	80	112	112	80
88	80	80	32	32	32	80	80
89	80	80	48	16	16	16	16
90	0	112	16	16	32	32	48

Fig 1 Character codes

```
10   REM**********************
20   REM*Character Data Set-Up*
30   REM*Program for TXED     *
40   REM*(C)Tubb Research,1984*
50   REM**********************
60   LET add=65000
70   LET code=32
80   CLS
90   PRINT AT 0,0;
     "Date for character:";code
91   PRINT AT 1,0;"Character:"
92   PRINT AT 15,0;"Row:"
95   FOR i=0 TO 7: POKE
     (USR "u"+i),0: NEXT I
100  FOR i=0 TO 6
101  PRINT AT 15,6;i
110  INPUT "Data?";j
120  POKE (add+i),j
130  POKE (USR "u"+i),J
131  PRINT AT 1,11;""
140  NEXT i
150  POKE (add+7),0
160  LET add=add+8
170  LET code=code+1
180  GOTO 80
```

Fig 2 Character data set-up program

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can be moved to cover any dot (each dot represents one pixel) by using the arrow KEYS SHIFT+5 LEFT, SHIFT+6 DOWN, SHIFT+7 UP, SHIFT+8 RIGHT.

Once the cursor is over the square a block can be created or deleted by using the ENTER or DELETE keys. The cursor is moved off that square to the next one, and so on. To move onto the next character type 'n' and it will be displayed. To save all the created/edited characters type 's'.

As an example: when the program is run, answer the question 'ADDRESS?' with 'USR "a"'. The program will display the first user-definable graphic character which can then be edited: move onto the next by typing 'n'. Display the created characters by going into graphics mode (SHIFT+9) and typing 'abcde . . . ' To create your own character set for use with a wide screen program answer the question 'ADDRESS?' with 65000.

Passing values

Passing values to a machine code routine is not catered for in ZX Basic, but if a

```
2    REM**********************
3    REM*USER-DEFINED GRAPHICS*
4    REM*        GENERATOR
5    REM*For use with the WIDE*
6    REM*SCREEN program or any*
7    REM*other.
8    REM*(C)Tubb Research, 1984*
9    REM**********************
10   CLS
11   LET co=0
20   PRINT AT 0,5;"CHARACTER GENERATOR"
30   INPUT "Address?";a
32   IF a=0 THEN LET a=15616
33   LET top=a
34   REM*******************
35   REM*Display the grid*
36   REM*******************
40   FOR y=1 TO 8
50   FOR x=1 TO 8
60   PRINT AT y+5,x+10;"."
70   NEXT x: NEXT y
80   LET co=co+1
90   REM*****************
100  REM*Display the bits*
102  REM*****************
115  FOR y=1 TO 8
116  LET p=PEEK a
117  PRINT AT y+5,3;p;""
118  LET a=a+1
120  FOR x=8 TO 1 STEP -1
130  LET p=p/2
140  IF p<>INT p THEN PRINT AT y+5,x+10;"*"
150  LET p=INT p
160  NEXT x
170  NEXT y
190  REM***********
200  REM*Get input*
205  REM***********
210  LET x=1: LET y=1
220  PRINT INVERSE 1; OVER 1; FLASH 1; AT y+5,x+10;"*"
230  PAUSE 4e4: LET s=CODE (INKEY$)
231  PRINT AT 10,20;"
232  PRINT OVER 1; INVERSE 0; AT y+5,x+10;""
235  REM**********************
236  REM*ENTER =Enter block     *
237  REM*DELETE=Delete block    *
238  REM*s      =Save onto tape*
239  REM*n      =Next character*
240  REM**********************
242  IF s=13 THEN GO TO 1000
250  IF s=12 THEN GO TO 2000
252  IF s=110 THEN GO TO 40
254  IF s=115 THEN GO TO 3000
260  IF s=8 THEN LET x=x-1
270  IF s=10 THEN LET y=y+1
280  IF s=11 THEN LET y=y-1
290  IF s=9 THEN LET x=x+1
295  REM*****************
300  REM*Check the bounds*
302  REM*****************
310  IF x<1 THEN LET x=8
320  IF x>8 THEN LET x=1
330  IF y<1 THEN LET y=8
340  IF y>8 THEN LET Y=1
350  GO TO 220
990  REM***************
999  REM**ENTER BLOCK**
1000 REM***************
1001 LET k=0
1005 LET t=a
1010 LET a=a-8+y-1
1020 REM a=row address
1030 LET k=2^(8-x)
1032 LET k=k+PEEK a
1033 IF K>255 THEN PRINT AT 10,20;"ERROR": GO TO 1082
1034 PRINT AT 10,20;"ENTER"
1035 POKE a,k
1080 PRINT AT y+5,x+10;"*"
1081 PRINT AT y+5,3;K;""
1082 LET a=t
1083 LET k=0
1090 GO TO 220
1094 REM****************
1095 REM**REMOVE BLOCK**
2000 REM****************
2010 LET t=a
2020 LET a=a-8+y-1
2030 LET k=2^(8-x)
2040 LET k=(PEEK a)-k
2041 IF k<>ABS k then PRINT AT 10,20;"ERROR":
     GO TO 1082
2045 PRINT AT 10,20;"DELETE"
2050 POKE a,k
2060 LET a=t
2070 PRINT OVER 0;AT y+5,x+10;"."
2071 PRINT AT y+5,3;k;""
2080 GO TO 220
2090 REM*****************
2095 REM**SAVE THE CODE**
3000 REM*****************
3010 CLS
3020 PRINT "FROM:";top
3030 PRINT "TO:";top+(8*co)+8
3040 PRINT "FOR:";co*8+8
3050 INPUT "File name?";n$
3060 SAVE n$CODE top,(co*8)+8
3070 PRINT "END": STOP
```

Note. The '' in lines 140, 220 & 1080 is used to represent the graphic character obtained by entering the graphic mode (SHIFT + 9) and pushing SHIFT + 8; a black square should appear.*

Fig 3 User-defined graphics generator

```
65000   LD      IX,(23563)      ; IX points to the argument list
        LD      A,(IX+4)        ; A=First argument (8-bit)
        LD      B,(IX+12)       ; B=Second argument (8-bit)
        LD      C,(IX+20)       ; C=Third argument (8-bit)
                .               ; For as many arguments as you like
                .               ; (Arguments could be stacked)
```

Fig 4 Passing values sample routine

function is defined as calling that routine its arguments can be accessed by the sample routine in Fig 4. If the function 's' is defined as DEF FNs(x,y,z)=USR 65000 and called by RANDOMIZE FNs(5,3,99), the machine code routine in Fig 4 will have the arguments passed to it as A=5, B=3, C=99. Values can be passed to machine code routines in this way. The program in Fig 5 requires three input parameters: the x,y coordinates of the character to be printed and the character code c. The function is defined as DEF FN(x,y,c) = USR 59000 Range: X=0—63 Y=0—24 C=Character code (32-90)

```
        ORG     59000
CHARS   EQU     23606
FLAGS   EQU     23611
        LD      IX,(23563)      ;IX=Argument list
        LD      B,(IX+12)       ;B=Y coordinate
        CALL    3739            ;HL=Start of line
        LD      A,(IX+4)        ;A=X coordinate
        SRL     A               ;Check which half of square
        JR      NC,LEFT         ;Must be the left side
        PUSH    AF
        LD      A,255           ;Set up the flag
        LD      (SIDE),A
        POP     AF
        JR      PROC            ;Go to the main routine
LEFT:   PUSH    AF
        XOR     A               ;Set up the flag to zero
        LD      (SIDE),A
        POP     AF
PROC:   LD      D,0             ;DE=X address
        LD      E,A
        ADD     HL,DE           ;HL=Screen address to print to
        LD      A,(IX+20)       ;A=Character to print
        CP      128             ;Check for ASCII range
        RET     NC              ;Exit if not
        PUSH    BC
        LD      BC,65000-256    ;BC=Start of character list
        EX      DE,HL           ;DE=Screen address
        SUB     32              ;Start at space
        LD      H,0
        LD      L,A             ;HL=Offset into the table
        ADD     HL,HL
        ADD     HL,HL
        ADD     HL,HL
        ADD     HL,BC           ;HL=ASCII*8+Start address
        POP     BC
        EX      DE,HL
        PUSH    BC
        PUSH    HL
        LD      A,8             ;A=Number of columns
        AND     A
        EX      DE,HL
AGAIN:  EX      AF,AF
        LD      A,(SIDE)        ;Check to see which side
        OR      A
        JR      Z,LHS           ;If zero then must be left
        LD      A,(HL)          ;Get bit pattern
        RRA
        RRA
        RRA
        RRA                     ;Shift to the left
        LD      (HL),A
LHS:    LD      A,(DE)          ;From screen
        XOR     (HL)            ;Put in the new
        LD      (DE),A          ;Write it
        LD      A,(SIDE)
        OR      A
        JR      Z,LEAVE         ;Check side again
        LD      A,(HL)          ;Put it back!
        RLA
        RLA
        RLA
        RLA
        LD      (HL),A
LEAVE:  EX      AF,AF
        INC     D               ;Next row down = de+100H
MORE:   INC     HL              ;Next column in table
        DEC     A               ;Counter
        JR      NZ,AGAIN
        EX DE,HL
        DEC     H               ;HL=-100H
        CALL    3035            ;Update screen attributes
        POP     HL
        POP     BC
        DEC     C               ;Next screen position
        RET
SIDE:   DEFB 0
ADDR:   DEFB 255
        END
```

Fig 5 Z80 mnemonics

```
1     REM**a=screen address**
5     LET a=18432
10    REM**b=Address of the
      character set**
20    LET B=(PEEK 23606
      +256*PEEK 23607)+256
30    REM**Loop for all 90
      characters**
40    FORg=b to b+(8*90) STEP 8
45    REM**Loop for 8 rows**
46    FOR I=0 TO 7
50    REM**Write in each row**
60    POKE (a+(256*i)),(PEEK(g+))
70    PAUSE 4
80    NEXT 1
90    LET a=a+1
100   NEXT g
```

Fig 6 Row by row characters

Implementation

As the Spectrum's screen memory is laid out in a relatively unusual way, a method of calculating the screen address is needed.

The routine at 3739 in the Sinclair ROM calculates the screen address of the start of the line. It assumes register B=the line number (screen). If B is loaded with the Y coordinate and this routine is called it will return with HL pointing to the address at the start of that line. When the X coordinate is called we have the screen address to print to.

The character code is given in register HL. This is multiplied by eight (number of bits per character) and added onto the table start address (held in register BC).

As soon as the screen position and start address of the character bit pattern are known, it is not too difficult to print the character. Check to see which side of the character it is printing: if the right hand side of the character is being printed (that is, x is odd), then the character bit pattern must be rotated so that it is in bits 0,1,2 and 3 rather than 4,5,6 and 7. Once this has been done the bit pattern is printed over what is already at that position (PRINT OVER 1). The program then loops round eight times, printing each row of the character. Finally, it updates the screen attributes. Fig 5 shows the Z80 mnemonics.

The program given in Fig 6, written in

```
*********************************
*   SPECTRUM WIDE SCREEN        *
*     TEXT EDITOR TEST          *
*        PROGRAM                *
*     (C) Tubb Research         *
*********************************

1   REM
2   REM
3   REM
4   REM
5   REM
6   REM
7   REM
8   REM—Get the characters
9   CLEAR 50000: GO SUB 370
10  PRINT "LOADING CHARACTERS"
11  PRINT FLASH 1; INVERSE 1;
    "PLEASE LEAVE TAPE RUNNING"
12  LOAD "CHAR64" CODE 65000
20  CLS
30  DEF FN a(x,y,c)=USR 59000
31  REM *********************
32  REM * PRINT THE TITLE *
33  REM *********************
40  LET a$="64 SCREEN TEST
    PROGRAM!"
50  LET y=24
60  LET x1=16
200 IF b=11 THEN LET y=y+1
210 IF b=9 THEN LET x1=x1+1
220 IF b=13 THEN LET y=y-1
    :LET x1=0
221 REM *********************
222 REM * CHECK IF OUT OF *
223 REM * SCREEN *
224 REM *********************
240 IF y>24 THEN LET y=1
250 IF y<1 THEN LET y=24
260 IF b<32 THEN GO TO 140
270 IF b>90 THEN STOP
280 RANDOMIZE FN a(x1,y,(CODE b$))
290 LET x1=x1+1
300 GO TO 140
301 REM *********************
302 REM * PRINTING MESSAGE *
303 REM * Routine *
304 REM *********************
310 FOR i=1 TO LEN a$
320 LET c=CODE (a$(i TO i))
```

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```
 70  GOSUB 310
 80  LET y=23: LET x1=16: LET
     a$="================:
 90  GOSUB 310
100  LET a$="ENTER TEXT HERE:"
100  LET y=22: LET x1=0
120  GOSUB 310
121  REM **********************
122  REM * SET UP THE CURSOR **
123  REM **********************
130  LET x1=: LET y=21
140  RANDOMIZE FN a(x1,y,42)
141  REM ******************
142  REM * GET A KEY **
143  REM ******************
150  LET b$=INKEY$: IF b$=
     "" THEN GOTO 150
160  BEEP .08,20: RANDOMIZE
     FN a(x1,y,42)
170  LET b=CODE b$
171  REM ******************
172  REM * CHECK FOR CURSOR *
173  REM * MOVEMENT KEYS *
174  REM ******************
180  IF b=8 THEN LET x=x1-1
190  IF b=10 THEN LET y=y-1
330  LET x=x1+i
340  RANDOMIZE FN a(x,y,c)
350  NEXT i
360  RETURN
361  REM ******************
362  REM ** LOADING M/C **
364  REM ******************
370  FOR i=0 TO 112
380  READ h: POKE (59000+i),h
391  REM ******************
392  REM * THE MACHINE CODE *
393  REM ******************
400  DATA 221,42,11,92,221,70,12,205
410  DATA 155,14,221,126,4,203,63,48
420  DATA 9,245,62,255,50,227,230,241
430  DATA 24,6,245,175,50,227,230,241
440  DATA 22,0,95,25,221,126,20,254
450  DATA 120,200,197,1,202,253,235,214
460  DATA 32,38,0,111,41,41,41,9
470  DATA 193,235,197,229,62,8,167,235
480  DATA 8,58,227,230,183,40,6,126
490  DATA 31,31,31,31,119,26,174,18
500  DATA 58,227,230,183,40,6,126,23
510  DATA 23,23,119,8,35,6
520  DATA 32,222,235,37,205,219,11
525  DATA 225,193,13,201,0,255,0,0,0,0
530  RETURN
```

Fig 7 TXED listing

Basic, shows how the characters are printed *row by row* (this is a Basic version of the Sinclair ROM routine at OB65H).

A simple text editor program written in Basic demonstrates the wide screen routine. The program allows upper case only to be displayed anywhere on the screen. The 'arrow' keys can be used to move the cursor and return to the start of the next line. No delete function is included but this can be done by moving the cursor over the character you wish to remove and retyping that same character (the machine code routine uses XOR). Once the program is run it expects the special characters to be next on the tape, saved by the definition program. These are loaded and the text editor displays a welcome message. The screen can be printed by breaking out of the program and typing COPY. The screen is then dumped to the ZX printer.

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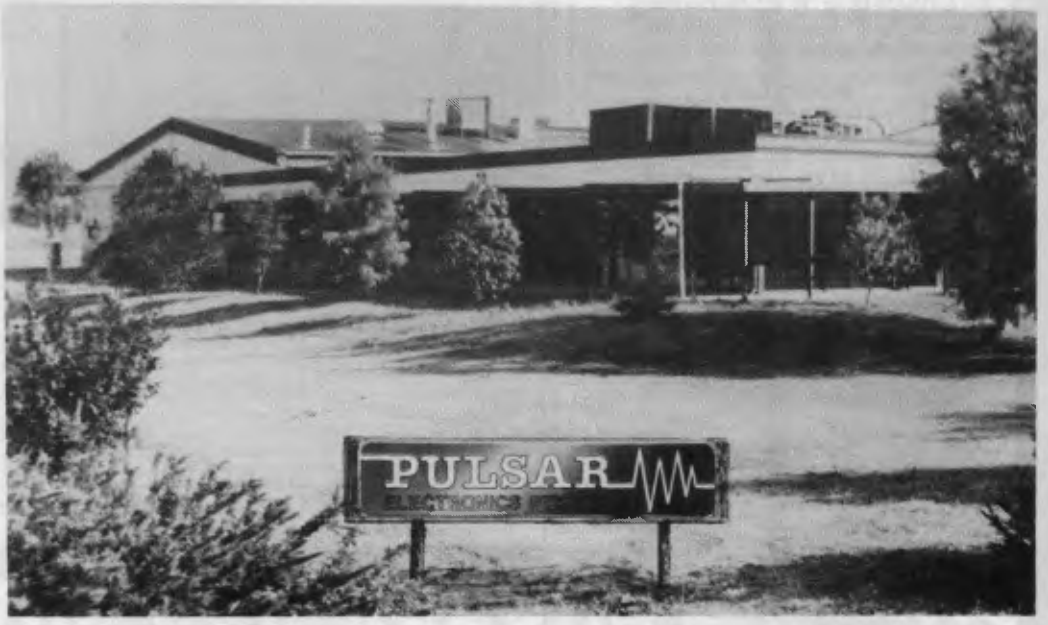

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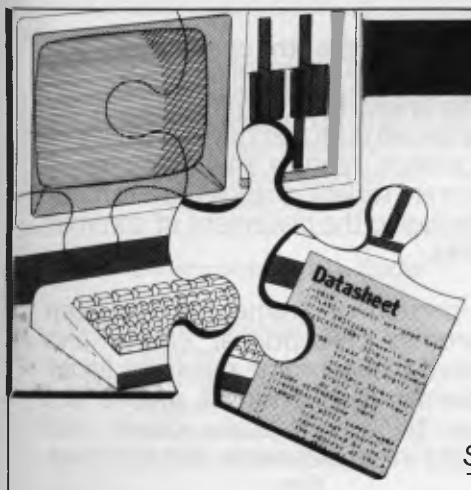

SUBSET

Alan Tootill and David Barrow present more useful assembler language subroutines. This is your chance to build a library of general-purpose routines, documented to the standard we have developed together in this series. You can contribute a Datasheet, improve or develop one already printed or translate the implementation of a good idea from one processor to another. APC will pay for those contributions that achieve Datasheet status. Contributions (for any of the popular processors) should be sent to SUB SET, 77 Glenhuntly Road, Elwood, Vic 3184.

Elegant solutions

The problem, given in January's Sub Set, was to put graphics dot information (binary 00 to 11) according to dot number (0 to 3) in a target byte without disturbing any information relating to the other dots. The dot information and number were in the least two significant bits of two separate bytes. The format of the target byte was:

bit	7	6	5	4	3	2	1	0
dot	0	1	2	3	0	1	2	3

There was too big a response for all good entries to be mentioned. This is a mixture of the best and most unusual contributions.

6502

6502 solutions follow our convention of referring to zero page locations as M0 — MF in the mnemonics and ZZ in the machine code.

The big decision was whether to get the information in the correct position by processing or by picking it from pre-arranged tables. Processed solutions tended to be shorter but slower. The best processed solution (if you sent a better one, we haven't received it yet) was from D Stanford:

```
Input—M0 low byte target
       address
     M1 high byte target
       address
     M2 dot number
     M3 dot information
Length—32    T-states—54 to 95
DOT1:  LDA M3      ;reform              A5ZZ
       LSR A       ;dot                 4A
       ROR A       ;information         6A
       PHP         ;from                08
       LSR A       ;bit                 4A
       LSR A       ;pattern             4A
       LSR A       ;000000AB            4A
       PLP         ;                    28
       ROR A       ;to                  6A
       STA M3      ;A000B000.           85ZZ
       LDA #$77    ;set mask to 01110111. A977
       LDY M2      ;get dot number.     A4ZZ
       BEQ INSRT   ;no shift if dot no. zero. F007
SHIFT: LSR M3      ;move mask and dot   46ZZ
       SEC         ;information to      38
       ROR A       ;correct             6A
       DEY         ;position.           88
       BNE SHIFT   ;                    D0F9
INSRT: AND (M0),Y  ;reset dot data in target. 31ZZ
       ORA M3      ;get new dot pattern. 05ZZ
       STA (M0),Y  ;load new pattern in target. 91ZZ
       RTS         ;return.             60
```

By replacing the first 10 instructions of DOT1 with a 4-byte table and three instructions, Stanford produced DOT2, one byte shorter and 15 T-states faster. He doesn't think this is as elegant as DOT1, which raises the question many of you asked: 'What do you mean by elegant?' These are the replacement bytes:

```
DATA:  $00         ;reform dot          00
       $08         ;information         08
       $80         ;from bit            80
       $88         ;pattern             88
DOT2:  LDY M3      ;000000AB            A4ZZ
       LDA DATA,Y  ;to                  B9YYYY
       STA M3      ;A000B000            85ZZ
```

The most table intensive, and the fastest solution, was given by O Burke.

Some speed is achieved by entering with Y and X already loaded, which might well be the case in a complete application:

```
Input—M0 low byte target
       address
     M1 high byte target
       address
     M3 dot information
     Y index to target byte
       address at M0
     X dot number
Length—19 + 20 = 39    T-states—43
DOT3:  LDA MASK,X  ;store mask value to clear BDYYYY
       PHA         ;previous information.  48
       TXA         ;                       8A
       ASL A       ;                       0A
       ASL A       ;                       0A
       ORA M3      ;                       05ZZ
       TAX         ;X=0000ppii             AA
       PLA         ;mask part to be replaced 68
       AND (M0),Y  ;of old screen value.   31ZZ
       ORA VAL,X   ;insert replacement info 1DYYYY
       STA (M0),Y  ;and store the result.  91ZZ
       RTS         ;return.                60
MASK:  DB %01110111,%10111011,
         %11011101,%11101110
VAL:   DB %00000000,%00001000,
         %10000000,%10001000               ;for dot 0
```

FRAMEWORK

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DOS Access

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

Custom Applications

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

Hardware

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

Availability

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

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```
        DB%00000000,%00000100,
          %01000000,%01000100      ;for dot1
        DB%00000000,%00000010,
          %00100000,%00100010      ;for dot2
        DB%00000000,%00000001,
          %00010000,%00010001      ;for dot3
```

A good compromise from G Slade:

Input—M0 low byte target address
M1 high byte target address
M2 dot number
M3 dot information

```
DATNO:  BYT     $88,$44,$22,$11
DTINF:  BYT     $00,$0F,$F0,$FF
DOT4:   LDY M2          ;choose DATNO byte by       A4ZZ

        LDA DATNO,Y     ;value of dot number        B9YYYY
        PHA             ;and store it.              48
        EOR #$FF        ;flip bits and AND          49FF
        LDY #0          ;with target byte to        A000
        AND (M0),Y      ;get the unaffected         31ZZ
        STA M4          ;3 pixels into M4.          85ZZ
        LDX M3          ;choose DTINF byte by value A6ZZ

        PLA             ;of dot information & AND   68
        AND DTINF,X     ;with DATNO byte giving     3DYYYY

        ORA M4          ;pixel. insert pixel.       05ZZ
        STA (M0),Y      ;store new target byte      91ZZ
        RTS             ;and return.                60
```

Something quite different came from W Anderton. He decided that the way to change information within a composite byte was to rotate it. As each successive bit is moved off the end of the target byte into the carry, it is changed there at the correct stage of the rotation before being rotated back into the other end of the byte. This ingenious method produces compact code at 32 bytes but is slow:

Input—M2 dot number
M3 dot information
Length—32 T-states—average about 140

```
TARG:   EQU XXXX        ;absolut ad of target byte.
DOT5:   LDA #$04        ;find position of           A904

        SEC             ;required 1s bit            38
        SBC M2          ;in target byte.            E5ZZ
        TAX             ;rotate 1s bit              AA
        JSR ROLL        ;into the carry.            20YYYY
        LSR M3          ;put new 1s bit             46ZZ
        LDX #$04        ;into the carry.            A204

        JSR ROLL        ;ms bit into the carry.     20YYYY
        LSR M3          ;new ms bit into the carry. 46ZZ
        LDX M2          ;rotate the                 A6ZZ
        INX             ;target byte                E8
        JSR ROLL        ;back home                  20YYYY
        RTS             ;and return.                60

ROLL:   ROR TARG        ;                           6EYYYY
        DEX             ;                           CA
        BNE ROLL        ;                           D0FA
        RTS             ;                           60
```

Z80

None of the many Z80 entries used tables. Getting tired of counting T-stages, we took timings of the 16 possible dot position and information combinations repeated 64k times at 2MHz. These are the times shown here.

C Hogben tried to find the smallest solution in Z80 code and did in fact provide the shortest routine received:

Input—HL = address of target byte
B = dot number
C = dot information

Length—21 Time—2 minutes 40 seconds

```
DOT7:   LD A,10H        ;set bit 4 of A.            3E10
        INC B           ;increment B so not zero.   04

        CALL DOTA       ;process low nibble target  CDYYYY
        LD A,B          ;byte. recover bit mask.    78
        LD B,4          ;rotate 4 times for hi nbl.0604
DOTA:   RRCA            ;rotate bit mask            0F
        DJNZ DOTA       ;B times.                   10FD
        LD B,A          ;save copy of mask in B.    47
        OR (HL)         ;get byte and set bit.      B6
        RRC             ;do we want the bit set?    CB19
        JRC,DOTB        ;yes—OK,else                3801
        XOR B           ;reset bit.                 A8
DOTB:   LD (HL),A       ;put byte back              77
        RET             ;and return.                C9
```

Several entries rotated the dot information and the bit mask in two separate loops. The secret of achieving speed was to arrange the code so that they were rotated in the same loop. The next two contributions both do this. First, the fastest received from P Greaves:

Input—HL = address of target byte
B = dot number
C = dot information

Length—25 Time—1 minute 39 seconds

```
DOT8:   BIT 1,C         ;test msb of info bits.     CB49
        JRZ,SD1         ;go if it's zero            2804
        RES 1,C         ;else, reset it             CB89
        SET 4,C         ;and set bit 4.             CBE1
SD1:    LD A,3          ;A = maximum dot number.    3E03
        SUB B           ;A = 3 - dot number.        90
        LD B,A          ;put count in B register.   47
                        ;B0 if dn 3, 1 if dn 2 etc.

        LD A,0EEH       ;A= mask bits 11101110.     3EEE
        JRZ,SD3         ;go if count is zero.       2805
SD2:    RLC             ;move the info bits         CB01
        RLCA            ;and the mask. Decrement    07
        DJNZ SD2        ;count & go if non zero.    10FB

SD3:    AND (HL)        ;reset old info bits        A6
        OR C            ;and insert the new.        B1

        LD (HL),A       ;store revised target       77
        RET             ;byte and return            C9
```

Neither the shortest nor the fastest but a good compromise came from Paul Vaclik. It could have been a bit shorter and faster had it used the B register for the dot number like most other entries:

Input—HL = address of target byte
C = dot number
B = dot information

Length—23 Time—1 minute 52 seconds

```
DOT9:   RRC B          ;place lsb in bit 7.        CB 08
        JR NC,ZERO     ;jump if bit 7 is 0.        30 04
        RES 7,B        ;place bit 7 in bit 4.      CB B8
        SET 4,B        ;data now in bits 4 and 1.  CB E0

ZERO:   LD A,0EEH      ;bit 4 and 1 mask.          3E EE
        INC C          ;                           0C

LOOP:   RRC B          ;rotate data                CB 08
        RRC A          ;and mask                   0F
        DEC C          ;until                      0D
        JR NZ,LOOP     ;in correct place.          20 FA
        AND (HL)       ;mask out old data.         A6
        LD (HL),A      ;                           77
        LD A,B         ;                           78
        ADD A,(HL)     ;place new data             86
        LD (HL),A      ;in required bits.          77
        RET            ;return.                    C9
```

END

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BANKS' STATEMENT

Intimidation

It's the Valentine's Day Massacre revisited with software reviewers lined up against the wall and producers with their fingers on the trigger. Martin Banks turns his collar up to investigate intimidation in the computer industry.

The night was dark, very dark. The light from the nearby street lamp struggled and barely reached the ground to lie in a useless yellow pool. It had been raining.

Indoors, Arnold sat in the dark watching his TV screen. He was at it again. His mother had told him about it, told him he would go blind, but he didn't care. The money was good, and he was starting to make a name for himself. 'I'll try this game one more time and then write the review,' he told himself.

His concentration was broken momentarily as he heard a car pull up outside, then another. In all, seven doors slammed shut and there was the sound of many feet and raised voices. 'Where is da punk?' said one. 'Over there, number 34,' said another. This took Arnold's interest and shook it a bit. He lived at number 34. He rose, went to the window and looked down on the big black Chevvies parked outside, and at the seven big men with violin cases who were walking up the drive to his house. 'Not the Amadeus Quartet,' he surmised.

As they broke down the door and pushed his mother aside, the seven men met Arnold as he came down the stairs. 'Dere's da punk,' said one with an appallingly false Brooklyn accent, 'grab him.' This they duly did, taking him forcibly into the front room.

'What do you want?' asked Arnold, beginning to suspect that all was not right with the world. As six of them took stout sticks from their violin cases, 'Brooklyn' spoke. 'We represent UltraPunk Software, the like of which you've maybe hoid (Brooklynspeak for heard). You wrote a review about dis noo game dey got called 'Up Yours With A Space Invader' and de boss he ain't likin' what you wrote, right?'

Realisation was dawning on Arnold. 'All I said was that it was pretty boring, just another Space Invader blob rip-off and not worth the $18.99 being charged; and it's all true.'

'Da boss don't give a damn whether it's true, he just wants us to correct the mistaken idea you have that you can write the truth in a review,' said Brooklyn. 'He wants us to get across to you the fact that you have hurt both his feelings and his potential bank balance. He sees no reason why punks like you should stop him becoming a rich man just by writing the truth.'

The other six gathered closely around Arnold as Brooklyn continued. 'So, Arnold, the boss has told us to come and visit you and even things up a little. As you have hurt his feelings, he has told us to hurt yours. I think, boys, that we'll start with his legs . . . '

Well, I've managed to shake off this strange urge to try and write like a third-rate Micky Spillane. I am, however, still left with the bare bones of what I'm going to write about — a nasty word; one that the computer industry should be above (even though we all know that no industry is above it, should it prove either necessary or useful). That word is intimidation.

There are rumours flying around that one or two reviewers have been, how shall we say, 'advised' that recent reviews they have given to games programs have been 'unsatisfactory'. The advice has not come from the editors or even the publishers of the magazine: it has come instead from the producers of the game.

What they would like it would appear, are nice, well-written and above all, favourable reviews of their games. What they are prepared to offer the reviewers as their part of the bargain is not (necessarily) products that are worthy of the plaudits expected. No, what they are prepared to do is come round and visit a reviewer who proves to be recalcitrant, and offer to 'sort' the reviewer out. This, as we all will understand, is *not* a reference to a database management function.

I suppose it's inevitable that such offers will be made by some of the companies in the home computer software business. After all, there appears to be a veritable goldmine to be plundered in all those users out there and companies are bound to feel entitled to a piece of the action, regardless of what they produce.

From the few examples I have seen of some of these games, two thoughts have developed. The first is that many of these companies have a cheek trying to be in business at all, and the other is that if they took the creativity used to conjure up the wonderfully hyped storylines that explain the ninety-third fourth-rate rip-off of Space Invaders they have produced, and applied it to developing a different game, then perhaps they would fare better.

Let's return for a moment to the 'Micky Spillane' introduction to this piece. Let's suppose that the seven hoods achieve their desired objective and rearrange Arnold's thought processes so that he intrinsically feels that all the products produced by UltraPunk Software are wonderful, and writes so. Even if the company has managed to similarly nobble every other reviewer, it cannot nobble the users, and there is an old saying that you cannot fool all of the people all of the time. In the end, UltraPunk will get found out anyway. Sure, the magazines will also get found out, and the users will stop buying them. This will leave UltraPunk with no-one reading the 'glowing' reviews, and no-one buying the wonderful games.

It's a sad indictment of the software industry that it even thinks in terms of breaking the legs of the games reviewers who pan one of their products. Apart from anything else it demonstrates what little faith it has in its own products and creativity, as well as showing that it probably lacks the maturity to run its affairs in an orderly fashion. This, of course, leaves it open to a wide range of expert con-men and skimming artists.

Once these characters become involved, the needs of the users become of little relevance, just so long as they keep paying for the products. As has been seen in the publishing business, the companies don't always pay their own way, even though they get the money from the end users just as fast as it can be dragged out of their pockets.

There was a time when the micro business was fun, when it was full of lovable rogues and con-men such as . . . well, no names, no libel suit. Certainly they would stitch you up if they got the chance, but offer to break your legs? It was generally unlikely. Now it seems to be almost common.

Ho hum, see you in hospital.

END

BIBLIOFILE

This month Steve Withers takes us from our 'First Byte' and weans us onto 'How To Get Started with MS-DOS'. We've finally made it when we reach 'CP/M Database Management Systems'.

First Byte

As far as the technical side of things is concerned, First Byte is one of the better introductory books about home computers. What puzzles me are the words "Australian Edition" that appear on the back cover. As far as I can tell, there has been absolutely no attempt to edit the book for our market. Some of the computers described are not, and probably never will be sold here, all prices are in sterling, and the various organisations, magazines, retailers, and exhibitions are all British. Do the Australian publishers (Australia and New Zealad Book Company) really think we are interested in computer shows held in Manchester, or in micros we can't buy? Surely not.

Having got that off my chest, I'll try to explain why I think the book is worth reading. It's purely a beginner's book — as the author explains in the first chapter, the idea is to get the complete novice off to a good start. He deals with the obvious question "what would I do with a home computer?" by outlining some of the possibilities: games of course, education (with a warning about the poor quality of many "educational" programs), home control (one day), and administrative tasks especially for those who are the treasurer or secretary of a club.

Once some of the applications are dealt with, Rohan turns his attention to the computer itself and the bits and pieces that surround it. The relative advantages of disk and tape systems, the various types of printer, and a caveat about memory sizes are examples of thE material covered as a prelude to the serious business of comparing machines. 20 home computers are described, although not all of them are sold here and at least one is out of production. Information IS presented in "card index" format outlining the key features along with a picture and some comments (eg "the keyboard is primitive and maddeningly complex", "manufacturers have (so far) behaved responsibly", and "memory is ridiculously inadequate").

The last substantial chapter provides a brief overview of programming. The most valuable observation for the absolute beginner is that while people can easily cope with questions like "is it going to rain?" by integrating all sorts of knowledge and information, a computer must be programmed with each step in the process. The message is that programming is not a trivial matter, but neither is it an activity beyond the grasp of ordinary mortals.

So, if anyone from the ANZ Book Co is reading: *please* produce a proper Australian edition, then you'll have a much more useful book.

First Byte

Author: Mike Scott Rohan
Publisher: Australia and New Zealand Book Co.
Price: $8.95

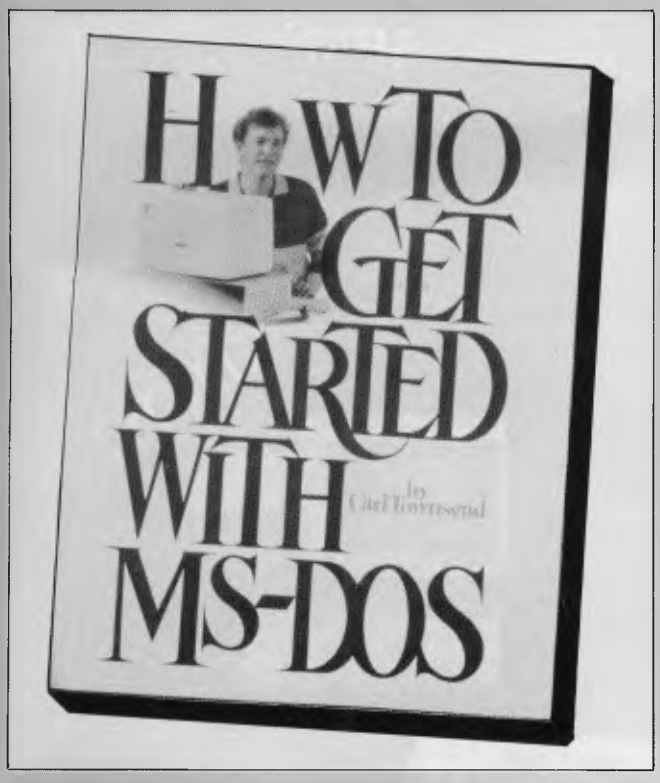
How To Get Started With MS-DOS

Perhaps a better title would have been "How To Get Started With PC-DOS", because that really is what the book is about. Each time a machine-dependent feature is described, the machine is the IBM PC. Does it matter? Yes — the title makes it clear that the book is for beginners, and confusion could easily result from Townsend's failure to point out the differences that exist between systems.

Having established that the book deals with the IBM PC, does it contain the information needed by a novice user? Not really — there is no explicit warning that Version 1 of the operating system is being described. I don't think that's Carl Townsend's fault, as he probably wrote the book before DOS 2.0 was announced. I'm inclined to blame the publisher, who I suspect was responsible for the misleading title.

What *does* this book do for the reader? Well, there are step-by-step instructions for making working copies of diskettes from those supplied by the manufacturer, but I seem to recall that the IBM manuals are pretty good on that subject. How about ways of looking after floppies? Again, most manuals and many diskette sleeves are clear about that. What about some background information on the way data is stored on diskettes? Chapter five starts with the sentence "The eight-inch double density floppy disk used for MS-DOS has 40 'physical' tracks of 16 sectors each". Eight-inch 40 track disks, huh? Interesting.

BIBLIOFILE



I really can't recommend this book. "Your IBM PC" (Bibliofile, March 84) is far better, although it is more expensive. "How To Get Started" seems to lack substance — beginners don't need to know that the disk directory is stored in sectors 4 to 8 of track zero, but they do need more detailed descriptions of the features of the operating system with which they come into contact.

How To Get Started With MS-DOS

Author: Carl Townsend
Publisher: dilithium Press
Price: $27.95

CP/M Database Management Systems

Writing a book about a particular type of software poses a problem for an author. Should he or she adopt a broad perspective in order to give the book a longer life, or is it better to risk early obsolescence and produce a more useful book that deals with specific cases? To some extent this decision determines whether the result will be a textbook or a consumer-oriented publication. From the buyer's point of view, the ideal is probably a book that combines descriptions of real products with a clear exposition of the technical issues involved to provide a framework for the evaluation of programs not covered by the author.

"CP/M Database Management Systems" goes a long way towards this ideal. The first part of the book (about a fifth of its 300-odd pages) explains what DBMSs are all about and the advantages they offer. It also describes the various types, from simple file indexing systems, through multi-file managers to "real" DBMSs. Townsend (yes, the same one!) gives a balanced view of these different categories, pointing out their advantages and weaknesses.

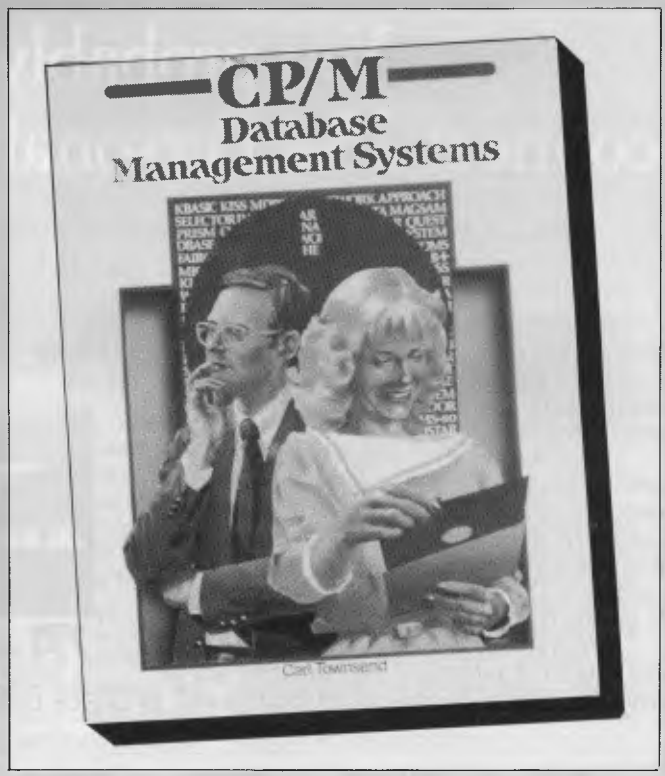
Chapter 8 ("Comparing, Benchmarking, and Analysing Database Systems") is likely to be the most valuable section of the book. New products are always appearing, and it can be difficult for a less than expert user to cut through the advertising hype. This chapter gives a list of pertinent questions, allowing the reader to subject a system to an analysis similar to Townsend's. The benchmarking process is not described very clearly. The idea of using Basic to build a data file in a particular format and loading it into the system under test is clear, but little is said about the ways in which a DBMS should be exercised. Various timings are presented in the section dealing with specific products, but this information is not presented in the systematic form that characterises the rest of the book.

The commercial products described are a mixed bunch. Some are very popular (like dBase II, DataStar, and Condor), while others are less well-known, mainly because they are targeted at programmers rather than end-users (eg KBASIC, MDBS III, or BT80). The most unusual system is MIST, which I have never seen mentioned elsewhere. It's not easy to describe in a few words — Townsend gives it more space than any other system — but essentially it is intended for setting up databases that are distributed over a network, or accessible by remote systems. Apparently it is being used by community resource centres and other organisations in the US to provide information services.

Overall, a useful book for those who are looking into database systems even though certain pieces of information are already out of date.

CP/M Database Management Systems

Author: Carl Townsend
Publisher: dilithium Press
Price: $33.95



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SuperMan?

Unlike some database management packages, KnowledgeMan was designed to make use of the advantages of 16-bit micros, especially the ability to address relatively large amounts of memory. One of the design objectives of KnowledgeMan seems to have been that the limitations of a particular micro or operating system should be more restricting than those of KnowledgeMan itself. While the package is available for a variety of computers running CP/M-86 or MS-DOS, this test relates to the MS-DOS version running on a Sirius.

Integrated software is in vogue. This phrase usually means either large packages (like Symphony) that include many functions, or separate programs that are linked by the operating environment, (eg VisiOn or Macintosh), but KnowledgeMan explores another approach. Integration offers two major benefits: the ability to use the same data in different applications and a consistent user interface. As data sharing is central to the concept, Micro Data Base Systems have made data management the heart of the KnowledgeMan system. A spreadsheet is included in the package (this will be the subject of a spreadsheet benchtest in the near future), while graphics and text editing will be provided as optional expansion modules.

Constraints

Actually, there are no serious constraints. The limit of 255 fields per record is perhaps the most constraining(!) as shown in Figure 1.

Maximum file size	To limit of operating system
Maximum number of records	65535
Maximum size of record	255 x 65535 characters
Maximum number of fields	255
Maximum size of field	65535
Maximum number of keys	No limit, but a maximum of 65535 fields per key and 65535 characters per key
Field types	Character, Numeric, Logical, some validation possible
Constraints	

Figure 1

File Creation and Indexing

Creating a file is a painless business. You specify the name of the table and the KnowledgeMan prompts you for field names and descriptions. For example, the following dialogue defines a table with four fields, the first two being strings while the third and fourth are numeric and logical variables respectively (KnowledgeMan's prompts are in italics):

```
    DEFINE PERSON
File?       "B:PEOPLE. ITB"
Field?      FIRSTNAME STR 10
Field?      LASTNAME STR 15
Field?      AGE NUM
Field?      WORKING LOGIC
Field?      ENDDEF
```

If you simply press "return" when KnowledgeMan asks for the file name, it will create a file on the default drive with the same name as the table plus the extension ".ITB". If you name the file explicitly, the name must be enclosed in quotes otherwise KnowledgeMan will treat the colon as a separator, and you don't get the result you expected. This applies whenever a file name is specified and is one of the most annoying features of the package.

You can see in the example that you must specify the length of STRing fields,

What is a Database?

If you want to process information which has some form of structure (such as accounts, personnel records, job costing), you can use an off-the-shelf package which will probably not be quite what you want, and hard to adapt. Alternatively you could write a program specially, which will cost a lot in time and money and still contain errors. The third possibility is to buy a data management package. These packages allow you to store, process and report on structured information.

Most of the cheaper packages are based on a traditional card index, where each card or set of cards about one person, order or item of stock is stored in a single record, *and a group of like records are stored in a* file *(corresponding to the index card box). Each item which would be recorded on the card — name, job title, part number, stock quantity — is stored in a* field *within the record. Usually, each record within one file must have the same number and size of fields — they are 'fixed length fixed format' records.*

Some more sophisticated packages can relate several files together, so that you can process groups of unalike but related records. The costs range from a couple of hundred dollars for a simple card-index-like system to several hundred dollars for a complex package which can be used by several people at the same time.

while NUMeric and LOGICal quantities occupy a fixed amount of space.

There are a couple of options that can be used when defining fields. It is possible to specify a picture (ie a format) to be used when the field is displayed or a value read into it. Such a picture becomes the default for that field although it may be overridden if necessary. The specification of an appropriate picture makes data entry more secure — particular character positions can be specified as alphabetic, alphanumeric, or numeric. It is also possible to force lower case letters to upper case, and vice versa. One useful thing you can't do is make leading zeros appear on output.

While a field is being defined the user may set read and write protection codes for the field (see the section on security).

KnowledgeMan will create indexes on request. An index can refer directly to one or more fields, or to expressions involving fields. You might choose to index on a SURNAME field, on SURNAME and FIRSTNAME (as a single index), or in a different context TOTALSALES/TOTALORDERS. Once indexes have been created they are used in conjunction with tables for rapid access to records. If more than one index is specified for use with a table, KnowledgeMan uses the first-named index for retrievals, while keeping the other indexes up to date whenever changes are made to the table (it is possible to disable index updates). This means that there is a noticeable delay when switching between one index and another as KnowledgeMan has to close the file and then reopen it with the index names in the new order.

There are three situations where KnowledgeMan closes the index file(s) automatically: before sorting, table compression, or redefining a record. The user must explicitly re-index the table when these operations have been performed.

Data Input and Amendment

There are two ways of entering data to KnowledgeMan. The simplest method is to use the CREATE RECORD command, which merely presents the field names one at a time while you type in the values. Any editing or validation specified in the fields' definitions will be carried out as the data is entered. A variation on this method allows the names of particular fields to be specified, in case some are to be left untouched.

Most situations call for more sophistication, typically a data entry form. KnowledgeMan allows the use of forms which can include colour and other highlighting methods (like blinking), although these are of course hardware-dependent.

The BROWSE command allows the user to thumb through records in a file, changing data items as required. BROWSE can be used with or without a form, and it is possible to restrict its effect to a portion of the table. This restriction is expressed in terms of record numbers (eg 10 records starting with the current one, the first fifty records),

Creating a file is a painless business

not some selection criterion.

In common with most database systems, KnowledgeMan does not let you delete records in a single step. Instead, you mark the records for deletion, and then compress the table to remove the marked records without leaving unused space in the file.

Screen Display and Reporting

It is not appropriate to separate these two aspects of dbms use when talking about KnowledgeMan because anything that may be displayed on the screen can be redirected to the printer or to a disk file. However, there are some features that simplify the production of printed output.

Regardless of the output device, KnowledgeMan can display information from a single record as a list of field names and data values, from a collection of records in tabular format, or according to a user-defined form.

When you extract a record from a table using either the OBTAIN (for sequential access) or PLUCK (indexed access) commands the record's field names and data values appear as a simple list unless this output is deliberately suppressed. The most likely reason for suppression is to exercise greater control over the format and/or the number of fields to be displayed. This is achieved either by using a form or by individual OUTPUT statements.

Page headings are easily specified by assigning the desired string to the appropriate system variable, while other variables provide the date (the next release of KnowledgeMan will read it from the system, but for the present it is the user's responsibility to set the date) and the name of the current user. The SELECT command outputs a table with a

There are two ways of entering data to KnowledgeMan

column for each specified field, including records according to the value of certain fields or their position in the file. The table may optionally be sorted by one or more fields (including those derived from other fields), and where there is some hierarchical structure (eg employees within departments) the user may choose to have only the first occurrence of each major section printed — for example

Dept	Name
ACCOUNTS	ANNE
	PAUL
SALES	BILL
	JOE
	SALLY

No provision is made for printed special effects like changes of font or size. While this can be achieved by printing the appropriate escape or control characters, it would have been nice if such effects were handled as they are in screen forms where the programmer specifies the effects in a mnemonic form: WITH "b" means the field should *b*link, WITH "FW" specifies a *w*hite *f*oreground, and so on.

Selection

Selection is not a separate process when using KnowledgeMan. All the commands that retrieve or modify records (or carry out calculations based on the contents of records) can have a "FOR" clause which determines whether a particular record will be included in the operation. The selection criteria are specified as a single logical expression which may involve many different fields linked by any of the logical operators that KnowledgeMan recognises. As these operators include AND, OR, XOR it isn't easy to think of a selection process that cannot be specified. Where several alternative values are acceptable, expressions tend to become long winded, eg

. . . FOR STATE="VIC" OR STATE="NSW" OR STATE="TAS"

but this can be simplified by using the IN operator which tests whether a value is included in a list. The current example becomes

. . . FOR STATE IN ["VIC", "NSW", "TAS"]

About the only disadvantage of KnowledgeMan's approach to selecting records is that commands become fairly long. This can be frustrating when you are experimenting or when simple typing errors occur.

Sorting

Sorting a KnowledgeMan table is a straightforward task. You can sort on a single or multiple fields, and also on expressions involving one or more fields. An example of a sort expression would be something like

. . . ASCENDING LASTNAME,
ASCENDING FIRSTNAME,
DESCENDING SALARY+BONUS

Earlier versions of KnowledgeMan created temporary sort files on the default drive but users can now specify the disk to be used for this purpose. This is particularly important when KnowledgeMan is used on machines with relatively low-capacity drives, as the program overlay files must be placed on the default drive. In any case, it is essential that enough room is left for these temporary files.

Calculation

KnowledgeMan simplifies calculations by providing a good range of functions as well as the usual operators. While the numeric operators are boring, if essential (the usual four plus modulo division), the logical IN operator is more interesting. This was mentioned briefly under "sorting", but the full syntax is expression IN [class] and it returns TRUE if the value of "expression" matches one of the values in "class". "Class" can be either a list of expressions (eg CODE IN [BASE+1, 18, 19, 20]) or in the case of string expressions a wildcard string where "$" matches any single character, and "★" matches any string of zero or more characters. For example JOB IN ["★SALES★"] would be true if JOB contained the values "junior salesperson", "sales manager", or "vice president (international sales)", but not if it held the string "wholesale stockroom supervisor".

Certain computational tasks are made easier by using arrays instead of simple variables. Unlike some packages, KnowledgeMan provides true array variables along with a very convenient means of filling them with information from one or more data tables.

Virtual fields can be very useful. These are defined in terms of other fields and their values are automatically calculated as needed (saving disk space), but may be used like any other field. There is one exception, of course — you can't write to them. An example of the use of virtual fields can be taken from many supermarket shelves. If the packet size is known (eg 875 grams, or 1.5 litres), then the unit price can be calculated. This type of operation can be carried out within most database systems by appropriate programming, but KnowledgeMan allows the relationship to be built into the record definition.

Simple statistical functions are built into KnowledgeMan. When data is retrieved by the SELECT command the mean, variance, standard deviation, sum, and minimum and maximum values of the fields are calculated (and normally displayed). These computations may also be forced by using the STAT command. The resulting values are stored in system arrays, so they are available for later use. The calculations can be suppressed by setting the appropriate system variable, and naturally only the maximum and minimum values are shown for string variables.

As mentioned in the introduction KnowledgeMan's spreadsheet subsystem will be described in a later article.

KnowledgeMan provides three levels of security

Security

KnowledgeMan provides three levels of security. Firstly, all data files are automatically encrypted (and a utility program is provided to encrypt command procedures too) so a simple examination of the files will not yield any useful information. The encryption process is user-independent, so this doesn't protect you from other KnowledgeMan users whether they use your system or another.

KnowledgeMan itself is password-protected — you need a valid username and password before it will do anything for you. The usernames and passwords are set up using a utility program and are stored in an encrypted file. Finally, read and write access codes can be specified for data tables and individual fields. If the user's access codes do not intersect those of the table and field, access will be denied. User access codes are controlled and stored along with the passwords. If the file containing this information is not present when KnowledgeMan is started, it gives the user a code of "a". To set up a well-protected application you must therefore ensure that no-one brings in their own copy of KnowledgeMan or password file as well as guarding against unauthorised removal of diskettes!

Tailoring

There are several aspects to tailoring KnowledgeMan. Before the program can be used it is necessary to run an installation program that creates a file containing the control codes appropriate to your system. This program knows about a fair range of computers and terminals, but it will also accept the appropriate information from the keyboard for systems that are not on its list.

KnowledgeMan normally uses Wordstar-like control keys (control-E for cursor up, control-D for cursor right, etc) for moving around the screen, removing characters and similar operations, but the installation program allows the user to make changes in this area. A serious limitation is that these functions only accept a single character, so if your terminal generates escape sequences when function keys are pressed, you won't be able to use them.

When KnowledgeMan is running there is a range of so-called environment and utility variables which can be adjusted to change the way the program works. For example, various special characters can be changed (such as the "wildcard" characters mentioned above), the automatic calculation of various statistics can be suppressed, and particular sequences of characters can be sent to the printer when it is selected or cancelled. There are dozens of these variables giving reasonable flexibility, but there seems to be no way of permanently changing their default values. The most likely way of working with them would be to build a file that contained the necessary assignment statements and execute it each time KnowledgeMan is run (this is less trouble than it sounds, as most users will make extensive use of procedure files for all but the simplest tasks). If you wish to leave KnowledgeMan before completing a task it is possible to save the values of all variables, macros, spreadsheet cells, and it forms into a file from which they may be restored.

Multiple Files

One of KnowledgeMan's most attractive features is that it places no limit on the number of files that can be open

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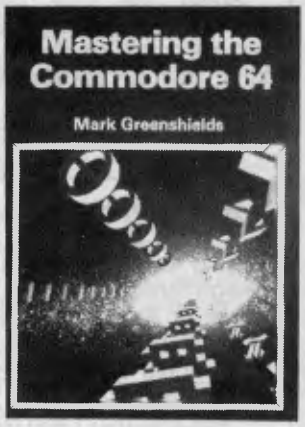

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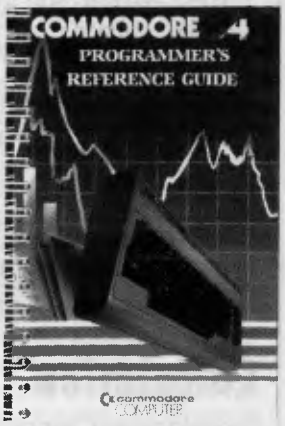

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simultaneously. Of course, in practice it is sensible to keep the number down. Information from two or more files is matched by specifying the field(s) that must have the same value. In such cases it is necessary to prefix the field names with the name of the appropriate table (or how else could the system cope if a field with a certain name appeared in more than one table?). Suppose one table (I'll call it EMP) contains details about a company's employees, with a field called BRANCH which specifies the branch where they work; while table BRANCH holds information about the branch offices, including the PHONE number. To get a list of employees and their office phone numbers, you might use the command

```
LIST FIRSTNAME, LASTNAME,
  BRANCH.PHONE FROM EMP,
  FROM BRANCH WHERE EMP.
  BRANCH=BRANCH.NAME
```

The use of multiple tables is limited by the "many-to-one" rule enforced by KnowledgeMan. In terms of my example, this means that while you can go from an employee's record to information about the branch he works in (many employees are assigned to one branch), you can't go from branches to employees (one branch has many employees). This isn't as bad as it sounds, as it is often possible to recast the relationship to conform to the rule. If you needed a list of employees of branches with a turnover of less than $10m, you could search through the employee table, matching each record with the corresponding branch record and only printing the name if the criterion were met. It works, but it would be much quicker if you could go through the branches and then find their employees.

Housekeeping

Most housekeeping activities must be done outside of KnowledgeMan. You can delete a table (and hence its file), but you can't delete the other types of file that are used without returning to the operating system. KnowledgeMan does provide commands to allow the redefinition of tables, and the creation of new tables that have the same structure as existing ones.

Links with Outside

KnowledgeMan is fairly flexible when it comes to the import and export of data. The only real restriction is that the external files must consist of ASCII text. KnowledgeMan can read items from a text file into a table providing that individual values are separated by tabs, spaces, commas, semicolons, or end-of-line markers (usually carriage return). Unquoted string values are terminated by end-of-line unless the user has specified that a particular character is to be used as a delimiter. It is difficult to imagine a text file that you couldn't read in this way, apart from those that contain information about the data as well as the data itself (such as DIF and other spreadsheet files).

When it comes to the creation of output files, KnowledgeMan can take information from tables and write it into text files of various kinds, namely "ASCII" (quoted strings, one value per line, one blank line between records), "BASIC" (quoted strings, "TRUE" and "FALSE" become 1 and 0, values are separated by commas, one record per line), "DIF" (as used by VisiCalc, Lotus 1-2-3, etc), and "Unquoted ASCII" (like "ASCII", but strings are unquoted and there are no blank lines between records). If none of these formats is suitable, KnowledgeMan is just as happy to send output to a disk file as to the screen, so the LIST command can be used with appropriate field pictures and string constants to get the desired result.

One of KnowledgeMan's most attractive features is that it places no limit on the number of files that can be open simultaneously

User Image

I'm almost tempted to say that KnowledgeMan doesn't have a user image. This is because it has much more in common with a programming language than an applications package, and as such its usability depends on the skill of the programmer. Indeed, one of the program's selling points is that it includes a structured programming language with elements like WHILE-DO, TEST-CASE, and IF-THEN-ELSE. It is possible to type commands into KnowledgeMan, but this is only practical for the simplest applications — serious use calls for pre-written command procedures which can be used to implement menu-driven or other interfaces. These procedures can take up to 26 parameters.

A "feature" that many users are sure to find annoying is that KnowledgeMan does not have a type-ahead buffer, and if the computer has one it gobbles up waiting characters and throws them away while it is processing commands. What seems to happen is that the program checks the keyboard regularly in case the user has pressed the interrupt or abort key, and if a key has been pressed, KnowledgeMan reads it. That would be OK if it placed the keystrokes in it's own buffer, but it doesn't. You simply must get used to waiting for the prompt before typing.

From the programmer's point of view the weak point is the absence of a built-in editor, although KText (a full screen editor with some word processing facilities) is being developed as an optional extra. Switching from KnowledgeMan to an external editor isn't much fun, as KnowledgeMan takes a relatively long time to load and initialise itself, so MDBS can't release KText too soon.

KnowledgeMan consists of a main program plus 18 overlays, so when using floppy disks there is a noticeable delay when an overlay is loaded. This can be avoided by using one of the utility programs to permanently link some or all of the overlays into the main program. The number of overlays that can be linked is limited by the computer's memory and disk capacity (you can't have a program bigger than your disk). Linking the commonly used overlays makes a significant difference to the responsiveness of the program. It is particularly noticeable when you make a mistake in typing a command, as the error messages appear much more quickly!

Documentation

KnowledgeMan is accompanied by a reference manual and a "Beginner's Guide" which gives the briefest of introductions. I didn't like the beginner's guide with its question and answer style and the talk of elves inside the computer, but it does include some sensible information about getting into and out of KnowledgeMan and the basics of data management and spreadsheeting.

The reference manual also contains an introductory section written in a matter of fact style that should be more appealing to those who have used a computer

Knowledge Manager: The software that keeps on growing . . .

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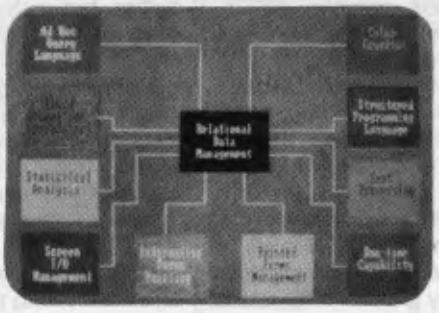

Features*	Advantages*	Benefits*
Unlimited number of tables open at a given time	No need to open and close tables repeatedly	Speedier answers to your queries
Up to 255 fields per record	Greater descriptive capacity	Lowers frustration of having to deal with multiple tables for a single topic
Passwords, read/write access, data encryption	Access to data is individualized	Unauthorized use of data prevented
Query multiple tables with a single command	Retrieves data without unnecessary intermediate steps	Users get information more efficiently
Query syntax like IBM's SQL/DS	English-like commands	Users not required to learn a new language
Dynamic sorting and grouping of query output	Control of output format	Data can be customized to users needs
Spreadsheet cells may be defined in terms of • formulas • data table values • programs	Cell can automatically retrieve information from tables and can perform intricate mathematical operations on that information	No need to rekey information or perform calculations separately
Forms creation for screen and printer using 8 colors, blinking, bell, prompts, reverse video, etc.	Greater versatility in screen and printed output	Screens and forms are easy to understand and use
Statistics (e.g., min, max, average, sum, standard deviation, variance, etc.) automatically generated	Provides more complete analytical description of data	Improved decision-making capabilities
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*Partial List

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before. As reference manuals go, this one is pretty good. The various parts of the manual are separated with labelled dividers which makes browsing easier, and care has been taken with the indexes (one by subject, the other by command) — major references are highlighted, which helps considerably. Commands are also cross-referenced to each other. The reference material is divided into three categories: introductory, intermediate, and advanced. The level of a particular section is indicated in the margin — a thick bar for advanced, a thin one for intermediate, and a clean margin for elementary material.

The quick reference card is particularly useful as it refers to the appropriate pages of the main manual.

The trouble with the documentation is the gulf between the Beginner's Guide and the reference material. There is a passing reference to a "lesson-oriented KnowledgeMan Instruction Manual", but it does not come with the package, and I haven't seen a copy. If it is any good, it will be *very* useful. Let me give you a real example. A KnowledgeMan user realised that data isn't written straight out to disk (it is buffered in memory), but he wanted to make sure that one particular file was always up to date in case the system crashed. It turns out that KnowledgeMan can do this, but it's not obvious how you tell it to do so — you must either look up "buffer flushing" in the index (is that a term a novice would know?), or stumble upon the advanced part of the OBTAIN command (normally used to fetch a particular record from a table).

Conclusions

The promise of additional modules to enhance KnowledgeMan is attractive, as they will give the advantages of integrated software without the penalty of paying for features you don't need. I have already mentioned the text editor, but the advertising material also describes a 'paint the screen' forms design tool (said to be available but not received for testing) and a graphics module for the IBM PC. The manual makes passing reference to a mouse option, but there is no indication about which brand of mouse it uses or what facilities are provided.

The benchmark times show that KnowledgeMan isn't particularly fast, but it is no slug and holds its own with other dbms systems tested in this series. A point I should make is that the times refer to KnowledgeMan "as shipped", ie with none of the overlays linked into the main program.

Basically, I like KnowledgeMan. It's very flexible and it seems to work as documented, although there are some areas that could stand improvement. However, it isn't a program for the novice user who merely wants to get a simple application like a membership list running as quickly as possible. If only the text editor were a standard part of the package . . .

Benchmark Timings

BM 1	Time to add 1 new field to each of 1000 records	11½ min
BM 2	Time to add 50 records interactively	¼ min + typing + scrolling
BM 3	Time to add 50 records in a batch	NT
BM 4	Time to access 50 records from 1000 sequentially on a 25 character field	1½ min*
BM 5	Time to access 50 records from 1000 by index on a 25 character field	¾ min*
BM 6	Time to index 1000 records on a 25 character field	6¼ min
BM 7	Time to sort 1000 records on a 5 character field	21 min
BM 8	Time to calculate on one field per record, storing the result in record	6 ¾min
BM 9	Time to total 3 fields over 1000 records	3¾ min
BM10	Time to import a file of 1000 records	7½ min

*excludes scrolling

Summary

Package Type:	Multi-file relational data management system
Facilities:	Selection, sorting, multiple indexes, reporting, integrated spreadsheet, simple statistics, security features, good import and export facilities.
Drawbacks:	Complex. No housekeeping within package. No facilities for editing command files.
Ease of use:	Not for the casual user, although it can be used to build sophisticated but easy to use systems. Consistent syntax.
Error Messages:	Generally clear.
Documentation:	Good reference manual. Tutorial manual non-existent at time of review.
Cost (inc tax).	$845
Supplier:	Database Management Services, PO Box 62, Brighton, 3186. Telephone: (03) 523 5947.

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Autocad

By P B Turton

Overview

Autocad is a two dimensional general purpose design and drafting system, which is suitable for most applications such as architectural, general engineering, electrical and electronic, and anyone who wishes to create designs from the basic primitive geometric shapes.

As with most computer related equipment, Autocad comes in a standard form, or with (at extra cost), the extras that you really can't do without once you've seen them. The standard version cost, (at the beginning of 1984), is approximately $1,800 excluding tax. The advanced version costs $2,500 excluding tax, but for the extra money there are a few luxuries, such as feet and inches notation, an axis ruler line, semi-automatic dimensioning, a BREAK command for partial erase, FILLET command for rounding off corners, cross hatching and pattern filling, not to mention a free-hand sketch facility. How could one possibly live without them after seeing them? I wonder if anyone buys the standard version?

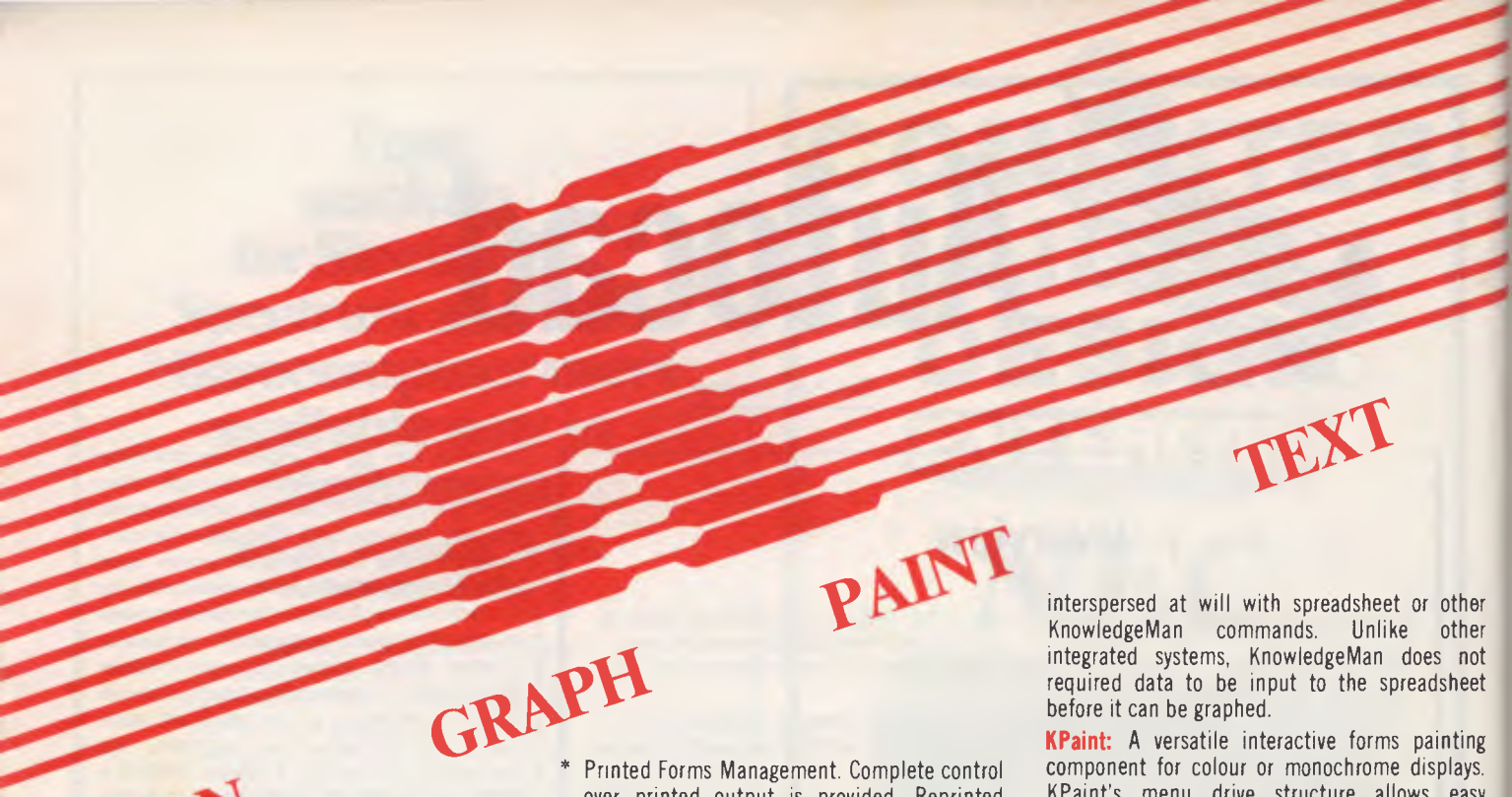
The 'extra money' factor also applies to the hardware. It's no good slipping down the road and buying an NEC/APC-H03 colour 2Mb floppy disk computer with the hope of running your Autocad. You will also need the NEC/APC-H12 additional memory and graphics subsystem. This comes as a separate plug-in board and costs $2,091 (including tax) to add to the $6,138 that you've just spent on the computer.

Anyone who seriously considers buying Autocad is probably working in drafting and design and I'm not sure how many draftsmen actually read computer magazines, but they would certainly need to have some basic computer operating knowledge to get the full benefit from this program. The version that I am using on the NEC APC is configured for CP/M and a working knowledge of the same is essential. This applies obviously to solo operators; but I believe that in a drawing office with more than one draftsman it would only be necessary for one person to have CP/M experience. Once the program is configured for a particular task then it only requires the user to learn the commands and then practise, practise, practise. In the interim the CP/M person must be kept in a safe place.

Autocad itself has a configuration facility for the operator to use before starting a new drawing. This provides for making changes such as mono or colour screen, (mono is slightly faster), setting the size of the cross-hair cursor, setting the relative paper size on the screen, status line on or off or choosing from four different notations; imperial (fractions), imperial (decimal), metric or scientific. The latter is a very important facility as a lot of American associated engineering work is still done in feet and inches.

Once the configuration is complete, the program returns to the main menu, where a name is selected for the new drawing or an existing drawing is called from the disk and the screen is prepared for drawing and editing. The right side of the screen is taken up by a vertical menu of commands which can be switched off, but the space is not made available for drawing. The status line is set across the bottom and in the lower left corner is the input command prompt. The combined loss of these areas effectively reduces the working area to about a ten inch screen, which may be a strain for people with poor eyesight. It's a pity that the menu and status areas cannot be recovered for use because an experienced operator could work quite happily without them.

Assuming one is starting on a new drawing, the rest of the screen is blank and the cursor is hiding, just out of sight in the lower left corner. Basically, the operator can do all inputting from the keyboard. This is not only cheaper than buying a digitizing pad but, to the purists, the only way to do it. The cursor is controlled by the four direction arrow keys and there are three speeds selectable by a function key. At slow, the cursor crawls across the screen, apparently one pixel at a time which allows for very precise positioning. The second speed jumps in small increments while the third leaps about the screen. This constant, but necessary changing of speed means a continuous shifting of the hand from the arrow keys to the function keys and I have yet to master doing it by touch. One trick that I tried was to stick a small blob of blue-tac on the function keys and try it by braille. Unfortunately, the flip-screen key is adjacent and if accidentally pressed will wipe your drawing from the screen and present you with a listing of the commands that you have just used. This is useful when wanted, but annoying when not. It only requires another touch of the flip key to restore the picture, fortunately. The reason purists prefer the keys is because the cursor is still limited in accuracy by the smallest increment in which it moves. The ultimate way is by nominating the x-y co-ordinates. This will then be as accurate as the original configuration which the operator sets, ie 2, 4, 6 or 8 decimal places etc. The drawing can be created very quickly and accurately, assuming that the operator knows precisely what needs to be done, by using the 'relative to' (@) key. For instance, select the 'LINE' command, and after typing in the first co-ordinates, say 2, 3 the command line will then ask for the next point. Here it is not necessary to give the co-ordinates, but simply to press (@) for 'relative to' and enter the distances along the x and y axis away from, or relative to the first point, ie @3,–1 will draw the line from 2, 3 three drawing units across and one down. This process can be carried on indefinitely and the computer will always remember where the last line finished even if there is a break in the command cycle. It is possible to start any command 'relative to' that last position. A keyboard proficient person can type in commands much faster than selecting them from the screen menu, but for people with



WHY KNOWLEDGEMAN?

KnowledgeMan is an all-in-one information management system integrated into a single package. It uses the full power of the 16 bit microcomputer and is not simply an upgrade from the 8 bit environment. What does KnowledgeMan do? It integrates six basic information processing functions into a single piece of software:

* Data Management. Full data base management facilities are provided including multiple indexes (B + trees).
* Ad Hoc Inquiries. For spur-of-the-moment information requirements merely type a single English-like query (Similar to SQL/DS).
* Spreadsheet Analysis. Not only full spreadsheet capability but integration with other KnowledgeMan functions allows interchange of data with the data base. You can even program into the spreadsheet.
* Screen Management. Forms are easily defined for input/output, screen attributes can easily be specified and character integrity can be checked.
* Statistical Analysis. Standard Deviation, variance and other description statistics are available.
* Printed Forms Management. Complete control over printed output is provided. Reprinted forms can be specified, disk output can be directed to the printer, text and tiles can be defined anywhere on a form.
* Functions and Procedure. Numeric functions such as exponentiation, random numbers and alpha-numeric conversions are built-in.

WHO CAN USE KNOWLEDGEMAN?

KnowledgeMan software is oriented towards a wide spectrum of users. At one end are those with relatively little computer expertise. The simplest forms of KnowledgeMan commands can be used to carry out basic processing tasks. Typically, these are spreadsheet analysis, data retrieval and statistical analysis of selected data.

At the other end are application systmes developers, who use the most advanced KnowledgeMan facilities to build application systems. Typically, the KnowledgeMan programming language capabilities might be used to build a customized accounting or personal management application.

AND NOW, SOME EXCITING NEW MODULES FOR KNOWLEDGEMAN:

Kgraph: An extensive graphics facility that enables a KnowledgeMan user to plot information held in KnowledgeMan tables, spreadsheets, arrays and variables. it uses the highest possible multi-colour resolution supported by the IBM Colour/Graphics Monitor Adaptor. The graphing requests can be interspersed at will with spreadsheet or other KnowledgeMan commands. Unlike other integrated systems, KnowledgeMan does not required data to be input to the spreadsheet before it can be graphed.

KPaint: A versatile interactive forms painting component for colour or monochrome displays. KPaint's menu drive structure allows easy creation of colour blocks. With each block you can shrink it, expand it, move it, change its colour or put another block on top of it. Add words, numbers, symbols, even variables and formulas. You can move them, copy them, change them, delete one of them, some of them or all of them.

Ktext: The text processing component for KnowledgeMan giving all the features needed for conveniently creating, revising, storing and printing textual information. Ktext eliminates and cut-and-paste ordeal of assembling information in your KnowledgeMan system. Because Ktext is totally integrated with KnowledgeMan, you can retrieve data, obtain statistics, perform computations or issue any other KnowledgeMan commands and the results will be printed in the text. You can produce personalized form letters, sales reports, backed up by statistics, complete budget reports, mass mailings and any other documents to your specifications quickly, efficiently and completely. In fact, Ktext has full word processing facilities.

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keyboard aversion problems and if absolute accuracy is not essential, then a digitizing pad is recommended.

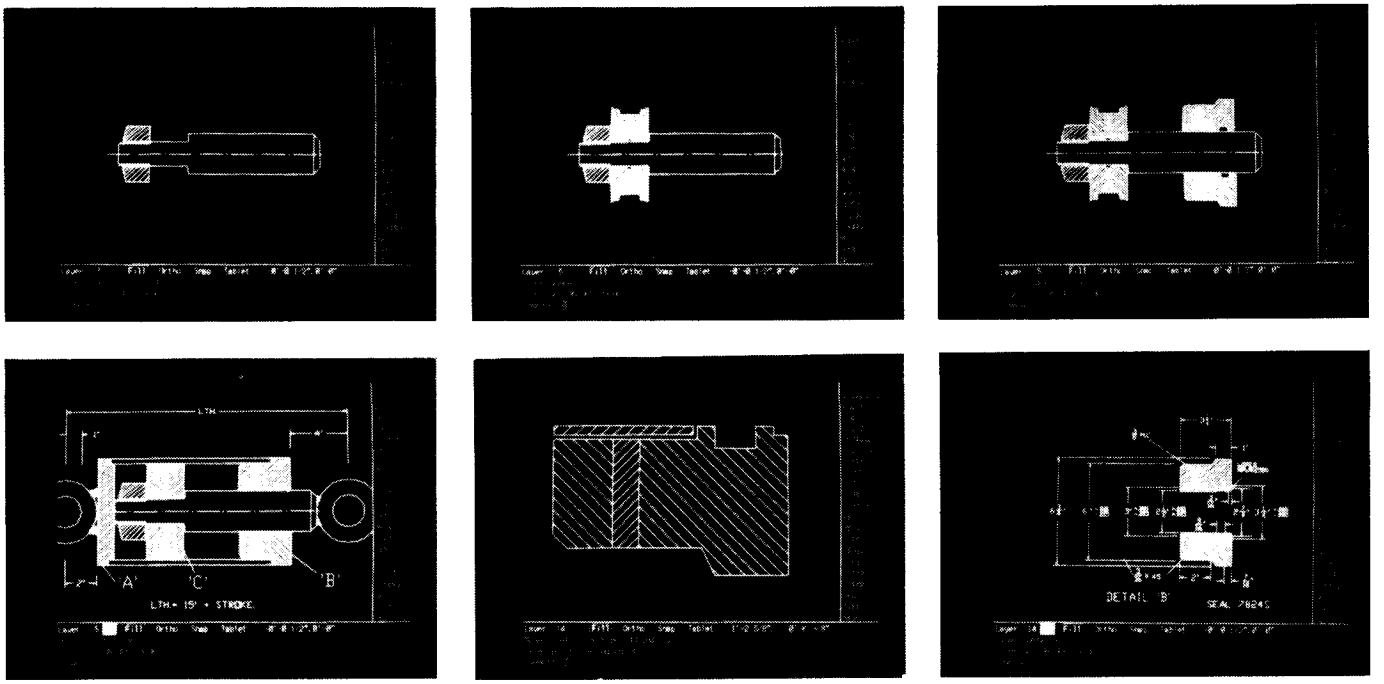
The command menu supplies a good range of functions; line, circle, arc of course and others such as 'TRACE' which draws parallel lines of nominated width and 'SOLID' which allows an irregular shape to be drawn and the interior will be filled with colour. Small items such as a rectangular window can be arrayed in rows and columns or simply copied one at a time, which means the item only has to be drawn once. This is a great time saving feature when compared with a drawing board. Also the item can be nominated as a 'block', given a name, then inserted anywhere in the drawing at any time. The block can be saved to disk as a file, if required, to use in future drawings, hence a library of sub-drawings can be built up. Another way to build up a library is to make up shapes which are very useful when special symbols are required as in the electronic industry. This facility is not simple to use though, as it requires editing a file within CP/M.

The trick that everyone wants to see at a demonstration of course, is the Zoom. It does impress to see a tiny blob on the screen suddenly fill the screen and become an intricate shape with a maker's name and serial number on it. One could then zoom in again on another small detail and then zoom a detail within that detail. The only restriction here is that the program will only retain three previous zooms, so if one particularly needs to retrace previous steps, one will be confronted with a beep and a 'No previous view saved' warning. This can be side-stepped by zooming again using the 'E' (extent of drawing) command. This brings us to one of the major limitations of micro-computer CAD; regeneration time. If one has built up a fairly complex drawing on several layers, and particularly if text is included in the drawing, the regeneration can take several, if not a lot, of minutes to complete. This problem relates to the small screen because it is essential to zoom segments of the drawing in order to work on them. A return from Zoom automatically regenerates the whole drawing from scratch; the only option being to terminate the REGEN, but that leaves you nowhere. The REGEN command is not to be confused with REDRAW; a command to redraw the screen for cleaning up purposes and is very quickly done. The simple answer to this problem is the usual one; a money poultice. An 8087 processor added to the NEC plus 10Mb of hard disk apparently makes a big difference. I do not have these as yet but I believe they would be well worth the investment for the busy user. The cheap way is to carefully plan your drawing beforehand and leave all complex things such as arrays, and specifically text, until everything else has been done.

The whole objective of Autocad is to produce a drawing on paper, so the purchaser will have to consider a plotter, which varies tremendously in type and price. I use a cheap ($1,200) A3 flat bed plotter which I find quite adequate for engineering drawings. The concensus among my engineer associates is that an A4 size drawing is handy to take away and if they want it blown up they use a copier. The comments are that they, as draftsmen, could not do such a finely detailed drawing on such a small size paper. Also there is the advantage of taking any detail from that drawing, zoom it up and print it out, even up to actual size to be used as a template.

Architectural and plan drawings usually require a larger drum or flat bed plotter and these start at about $5,000 and to my knowledge don't stop. No matter what type though, Autocad dictates those which may be used. Each peripheral, be it digitizing pad or plotter, must have a driver program. Some drivers were resident on the CP/M disk when I bought the NEC APC, but not the ones to suit the peripherals approved in the Autocad manual These drivers were supplied by Entercom who supply Autocad.

This brings me to a very important point; Autocad is not an off the shelf product. It does require the expertise of someone such as Tony Zammitt from



Figures 1 to 6 show details of a hydraulic cylinder which all belong to the one drawing. Each detail is drawn on a different layer within the drawing, (different colours can be used for each level for effect), then the general assembly or sub-assemblies can be built up simply by switching on or off the appropriate layer number. Dimensioning details are also kept on different layers and can be switched on when only that particular detail is needed to be printed out.

Fig. 6 gives an example of the Zoom facility. This is the component identified as 'B' on the general assembly. Any item can be zoomed to any required size and printed out on the plotter as such.

Autocad

Entercom to assist in the setting up and choice of peripherals.

The NEC/Autocad costs about $13,000 in the minimum configuration and at that, is a very cheap CAD system. $20,000 (inclusive) would cover a hard disk and 8087 processor and then perhaps a few more thousand for a more exotic plotter. This is still very cheap when compared with the existing CAD systems which usually talk in six figure sums. Of course the hobby computer user would consider it all a bit rich but then, Autocad is not a game but a sophisticated design tool; an interactive electronic drawing board which requires time and patience to master, but could really increase the efficiency and output of anyone prepared to dedicate the time and money.

Probably the greatest advantage from the purchase would be that it gives a good introduction to CAD for those designers who wish to know, and know they must. CAD/CAM is here to stay and those who don't learn will end up with the typists who refuse to acknowledge the existence of word processing.

LAZING AROUND

by J J Clessa

Quickie

The grooves on long playing records are one thousandth of an inch wide. How many grooves will there be on one side of a 12in LP if there is a lead-in strip 3/16in wide, and a centre run-out section of 4.3in diameter?

If you need pencil and paper, you're on the wrong track.

Prize puzzle

Sales of the XQ48, the latest personal computer from the Reliachip corporation of Australia, were booming. Revenue at the Adelaide branch was 81 dollars and 51 cents short of one million dollars, from XQ48 sales alone.

At the Melbourne branch, the story was even better. Sales of the XQ48 fell short of one and a half million dollars by only 14 dollars and 77 cents.

The Sydney branch manager sold 7000 XQ48s. What was his revenue?

Answers on postcards only please, to: Prize Puzzle June 1984, Lazing Around, *APC*, 77 Glenhuntly Road, Elwood, Victoria 3184 to reach this office not later than last post of 4 July 1984.

March prize puzzle

Quite a difficult puzzle this month, but it probably indicates a lack of lateral thinking rather than an overly hard problem. Indeed, of the 30-odd entries, about half had the wrong answer. We did not say that each of the paintings was a whole number of metres in dimensions, but that the dimensions were exact measurements.

The required answers were $\frac{113}{120}$ metres square, $\frac{97}{120}$ metres square and $\frac{103}{120}$ metres square.

Incidentally, only postcard answers (or backs of envelopes) are eligible for the draw. We like to get your letters but not as problem entries, so please stick to the postcards.

SOFTWARE COPYRIGHT

Breaking the law?

Catriona Hughes, the Legal Officer of the Australian Copyright Council, appraises the recent Federal Court decision which makes it illegal ("once again") to copy PacMan.

On the 29th of May, the full Federal Court reversed the decision of Beaumont J in the Apple case and held unanimously that computer programs in source code are protected by copyright as literary works. In the majority, Mr Justice Fox and Mr Justice Lockhart (with a dissent by Mr Justice Sheppard) further held the object codes are translations of their source code counterparts. The result of the decision is that there is no urgent need for legislation conferring copyright protection on computer programs: these, in both their source and object codes, are by reason of the present law protected from unauthorised copying under the Copyright Act 1968.

The outcome of the Apple appeal was indeed timely. Two weeks earlier, three Federal Ministers had announced the Government's intention to introduce into Parliament legislation conferring copyright protection on computer programs as literary works. This announcement was greeted enthusiastically by computer interests, which, during the five anxious months following Beaumont J's decision, had convinced the Government that the threat of an embargo by foreign suppliers of software was indeed a serious one. That the Government announced it would introduce legislation — in advance of the Apple appeal — indicates that it was worried about its outcome. Had an unfavourable decision come down after the close of the present session of Parliament, the then necessary legislation would have had to wait for the next (Budget) session of Parliament.

The Government's concern over the outcome of the appeal decision was shared by lawyers and computer interests alike for the reason that the Copyright Act makes no express reference to computer programs.

> *The Court issued an injunction against Computer Edge from importing into Australia Wombat computers containing infringing copies of Apple's ROMs.*

The Australian Copyright Act specifies a number of "works" and other "subject-matter" which is subject to copyright protection. Literary works are included, but as is common with other countries' laws, there is no mention of computer programs. The structure of all copyright laws is to confer a number of exclusive rights on the copyright owner — the author or his employer. These rights — relevantly reproduction and translation — give the owner control over the use of his material and provide a framework in which that material is marketed. Under Australian law the rights are automatic: there is no registration of copyright. In other countries, for example the United Kingdom, the courts have held that the exclusive rights which apply to literary works also apply to computer programs. These courts therefore have not denied copyright protection to computer programs for the reason that the relevant law makes no reference to them; indeed the approach has been to interpret the term "literary work" flexibly so as to incorporate new items worthy of protection such as programs.

Beaumont J rejected this approach in December. His Honour characterised a "literary work" as something "intended

to afford either information or instruction or pleasure in the form of literary enjoyment". In excluding programs from this characterisation he found it crucial that the purpose of a program is to control the operations of a computer.

The Federal Court, in its judgment on 29 May, took a different approach. It was unanimously agreed that the purpose of a computer program did not determine — or exclude — its characterisation as a literary work. The Court determined that it was the skill and labour on the part of the author of the program in expressing meaningful instructions that justified the conclusion that a program is a literary work. The majority of the Court took the view that not only were source code programs literary works but that their object code counterparts were protected as translations of those literary works. Only Sheppard J offered a narrower interpretation of "translation" so as to exclude machine readable languages.

The decision of Beaumont J in December — the first to consider the legal status of programs — upset the assumption of many that both source and object codes were protected by copyright. By virtue of the Federal Court decision, this assumption has now been restored on a sound basis. The significance of a determination by the full Federal Court of Australia on an area that had been subject to so much speculation cannot be underestimated.

The issue now is whether the Government will go ahead with its promised legislation. In their announcement, the Ministers indicated that the legislation was to have been introduced on the 29th of May. The Government has, for the meantime, withdrawn the legislation so that the appeal decision can be considered in depth from the point of view of determining whether a need now exists for amendments to the Copyright Act. This is consistent with the Government's announcement that legislation would not proceed in the event that the decision were to be unambiguous on the issue of protection.

In order to assess the "need" for legislation, both the decision and the

proposed legislative amendments will have to be considered. The draft amendments have not been released to the public or interested groups but it is clear that they would have conferred on computer programs in source code express protection as literary works under the Copyright Act. However, on this point there was unanimity in the full Federal Court: as a matter of statutory interpretation, this is already the law. Second, the legislation was to have clarified the "scope and nature" of protection for programs. However, if this is a reference to the status of object codes, this, according to the majority, is also presently covered by the law. The point is that the majority held that object codes are adaptations — that is translations — of the corresponding source codes and it was on this basis that the Court issued an injunction against Computer Edge from importing into Australia Wombat computers containing infringing copies of Apple's ROMs. Accordingly, if the only "clarification" contained in the legislation is a redefinition of translation to specifically include machine readable versions, this (together with a redefinition of literary work to include programs) has now been rendered unnecessary.

There appear, therefore, to be only two arguments for proceeding with the legislation.

The first argument is based on the dissenting decision of Sheppard J that object codes are not translations. That there was no unanimity on this point might persuade some that — for the sake of total clarity — "translation" should be expressly defined to include machine readable versions.

The second argument depends upon whether the legislation contains clarifications on issues other than definitions of "literary work" and "translation". If the legislation were to address issues not raised in the Apple case — for example the meaning of "material form" (which is a requirement both for subsistence of copyright and for infringement by reproduction) this might justify proceeding with the legislation. I have in mind a redefinition of "material form" to specifically include electronic and electrical formats.

The decision in the Apple appeal must be considered an unequivocal affirmation of the rights of software producers to prevent the copying of both their source and object codes. For this reason, I doubt whether the Government will proceed with its legislation, particularly as it has stated on a number of occasions that the legislation was intended as a short term measure only. Computer interests had argued that, were Apple to win on the infringement issue, they would nonetheless prefer an express legislative basis for the protection of programs. This preference however has no basis. A decision by the full Federal Court cannot be regarded as "weak" and is, for example, much more authoritative than the similar decisions of the lower (in terms of court hierarchy) UK courts, upon which the computer industry in that country quite happily relies.

My only reservation concerns the appeal to the High Court which Computer Edge has already announced that it intends to bring. This, however, will not prevent the Government from pressing ahead with the legislation at the appropriate time, should this be necessary. In the meantime, the decision of the full Federal Court will remain law.

Now that computer programs can be regarded as literary works, both the advantages and disadvantages of copyright law will apply to their protection. This means, for example, that the exceptions and defences to infringement of copyright in literary works will apply to programs. One might question whether these provisions are entirely appropriate for programs, for example section 53B which permits under statutory licence educational institutions to make multiple copies of literary works — the whole work if commercially unavailable, a set portion if not. Another consequence is that programs derived from most countries will be accorded copyright protection in Australia even though they might not enjoy that protection in their country of origin.

Although the appeal decision has obviated the need for "short term" protection, it would appear that the Government is still committed to its review of long term measures. One can speculate as to whether the Government will consider a new framework for legal protection (eg, a petty patent scheme) or whether the review will be confined to an examination of copyright law.

Although copyright law is the only present viable framework for the protection of intellectual property including software, it is clearly sagging under the onslaught of technology. Conferring "exclusive rights" on owners of copyright presupposes that those rights can be effectively exercised and controlled. Where the means exist for cheap, perfect copying — particularly in the domestic area — these rights cannot be exercised effectively and the computer industry will face the same problems already faced by the music industry in regard to home taping of music: prevalent domestic copying that affects the sales of programs designed for personal computers. A number of schemes have been suggested as a solution to this type of copying and the Government is presently considering levies on blank recording materials as a way of compensating music copyright owners. This scheme is not without its problems but, in that it acknowledges the loss of control suffered by copyright owners and seeks to trade off that control with compulsory payment, it is the best solution offered to date, and may well be a solution to which the computer industry may look in the future.

In any event, the comment that the technologies pose a threat to the proper control of copyright owners' rights does not lead to the conclusion that software should be public domain, as has been suggested by spokesmen for Software Liberation. Indeed, it suggests only that copyright law requires constant revision.

It is not out of the question that when the time comes for discussion as to long term protection, it might emerge that present copyright law is not the most appropriate style of protection for software. It might be considered desirable to extend the scope offered by present copyright law, so that software producers (and other copyright owners) enjoy additional exclusive rights in respect of the disclosure, non-reproductive use and distribution of their material. Alternatively, software producers might argue that there is a need to protect novel algorithms and specifications and on this basis seek protection offered by patent law. Certainly, any consideration of long term measures would take into account the proposals of the World Intellectual Property Organization (WIPO) which has drafted both provisions and a treaty for the specific protection of software. None of the existing proposals or suggestions, however, depart from the principle which the Government has clearly accepted, that software producers should have legal protection in the nature of property rights. This principle has now been endorsed unequivocally as a matter of law by the full Federal Court. The only issue at this stage, therefore, is whether the High Court will make a similar endorsement, or whether the Government will have to bring forward its legislation.

END

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All of the above programs are supplied free with each purchase of G-Pascal on disk. G-Pascal is available from your local Commodore dealer, Commodore Information Centre Pty. Ltd., or Gambit Games. Recommended retail: $79.50

** excludes existing older dealer stocks*

If you have already purchased G-Pascal these extra programs may be ordered by sending $20 direct to Gambit Games.

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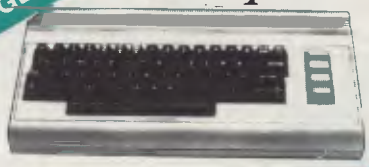

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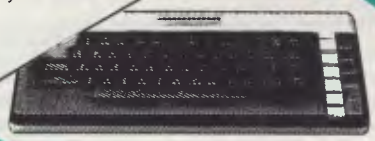

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YANKEE DOODLES

David Ahl is an eminent figure in microcomputing. In 1974 he founded one of the leading US micro magazines 'Creative Computing'. He has worked for AT&T and Digital Equipment and has written extensively about micros, especially regarding their use in education.

Blame it on the computer

Some years ago, if something went wrong with your bank account, utility bill or credit card account, it was common for people to blame it on 'the computer'. Now that microprocessors are being used in other devices, the practice of blaming it on the computer is spreading.

Recently, *Motor Trend*, a popular automotive magazine in the US, printed a letter from a reader who reported that his local dealer and a Ford factory representative told him that his engine fumbling at a steady cruising speed was the fault of the computer. Funny thing is, his '83 Mercury Cougar didn't even have an engine computer.

Motor Trend got Ford engineering to look into it. The problem was that dirt had got into the cruise control unit and its control of the speed was less than perfect. The speed variation was being interpreted as 'surge'.

When asked how the service managers and factory representatives could be so far off in their interpretation of the symptoms, the Ford engineers said that since the cruise control is electronically regulated, the service people lumped it into the general 'computer' category.

Motor Trend didn't feel that was a very good answer, nor do I. As computers are so little understood by the general public, they have become convenient whipping boys for the service industry. The general philosophy seems to be: 'If we can't figure out what's wrong, blame it on the computer'.

Unfortunately, as microprocessors become more widely used, we see this 'blame it on the computer' trend spreading to other industries.

Random rumours

Microcraft Corp has introduced the Dimension computer, a 32-bit machine said to be able to handle Apple, IBM PC, CP/M, TRS-80, and several other types of software . . . The Japanese manufacturers, who have so far held off introducing any MSX machines in the US, are planning to do so in the last half of 1984 . . . Two programs introduced to convert files from one format to another: UniForm from Micro Solutions can translate between CP/M and 38 other formats; and Xeno-Copy from Vertex Systems translates between the IBM PC and 47 other formats.

More Adam troubles

Coleco reported that troubles with its Adam home computer led to a 1983 fourth quarter loss of $35 million. Moreover, losses are expected to continue through the first quarter of 1984.

The company had anticipated selling 500,000 Adam computer systems in 1983, but disclosed in January that it had shipped only 95,000 units. Signalling revised expectations for 1984 sales was the recent cut in half of its order for printers from Spiralux in England.

More recently, Coleco has raised the Adam's wholesale price from $525 to $650, a move that pushed retail prices close to $800 for a system originally intended to sell for $600.

Exacerbating Coleco's problems is the fact that the company is unfamiliar with computer marketing. It sells through mass merchandisers whose salespeople are more comfortable with Cabbage Patch dolls than Adam computers; and the company has shunned advertising in influential personal computing magazines in favour of TV advertising. Coleco has discontinued its user newsletter after just a few issues; and it hasn't made any review systems available to the press. With marketing like this, perhaps Coleco ought to stick to Big Wheels and Cabbage Patch dolls?

Adam Osborne strikes again

In his first public appearance in several months, Adam Osborne told a packed auditorium at the West Coast Computer Faire of his plans for a new approach to software distribution.

While the software industry was young, a single successful software package could support an entire company; this is no longer true. Furthermore, retail stores cannot justify training salespeople to sell every software package that they stock.

Thus, Adam Osborne has modelled the approach of his new company, Software Seed Capital Corp, on an agricultural cooperative.

He plans to sign up software authors (farmers) and package, distribute, advertise and market their products.

Tentative packaging is in the form of a book with a disk attached to it. He is also shooting for low prices and widespread distribution.

This approach is being tried by other companies as well. But none of them has the flamboyancy of Osborne; whether he can translate this into profits remains to be seen.

No more backaches?

Low cholesterol diets. Jogging. No-tar cigarettes. Back chairs. Yes, these days everyone's interested in health. Thus, one of the hottest new items in the world of computers is a posture chair in which you poise, half kneeling, half sitting, in a position that is said to keep your back as upright as possible.

In scientific terms, the back chair maintains a torso-to-thigh angle of 135 degrees, which is considered by ergonomists to be optimal for working at a desk or terminal. Normal office seating does not allow a person to sit with this posture for any extended period of time. A recent study indicates that the average office worker loses about 10 per cent efficiency as a result of poor seating.

Back chairs are made in wood and metal, with or without castors. Some rock and some are stationary. Having used a stationary one for several months, I can attest to the benefits of such a chair. However, I would recommend one that either rocks or has castors, and also one that is covered with a fabric that does not produce static electricity. Mine produces a nasty static charge which occasionally caused disastrous results.

Personal computer backlash

Reflecting the maturing of the personal computer industry was a session at the West Coast Computer Faire titled 'Personal Computing Backlash'. Seven papers were delivered in this session, 10 per cent of the 70 papers given at the Faire.

The authors of one paper deplored the effect computers have on the English language. Of course, we Americans have already made mincemeat of the language, but computers are making it worse. One common offence is adding *'ize'* to a noun to make it into a verb. Thus we now micro-computerize, windowize, and digitize.

Moreover, to show how clever they are, many computer people seem compelled to replace perfectly good words with acronyms. The first five sentences of a recent press release assaulted the reader with CMOS, EPROM, MIL-SPEC, ROM, RAM, ANSI, PIA, DIP, EBCDIC, RGB, CRT, VAC, VAX, OEM, CP/M, and DOS.

Two authors talked about the 'morning after' effect. This is what happens when you wake up a few days after unpacking that wonderful new computer and wonder: 'What am I doing with this thing in my home?' Although many computers are gathering dust in closets because of poor manuals, even more are there because people felt compelled to buy a computer but had no clear idea what they wanted to do with it. They thought that just having it would provide the answer but, instead, found that it provided far more questions than answers.

END

USER GROUPS INDEX

DIRECT ACCESS

Below is a list of alterations and additions to the list of user groups published in the April issue. The next full listing will appear in the September issue of APC.

The Apple Users Society of Melbourne (AUSOM) encourages communication between Apple users. Anyone interested in further information should contact Graham Willis (President) on (03) 878 0219 (AH), or write to The Apple Users Society of Melbourne, PO Box 43, Forest Hill, Victoria 3131.

The Geelong Commodore Computer Club has recently been formed. For further information contact D Gerrard (Hon Secretary), Geelong Commodore Computer Club, C/o 15 Jacaranda Place, Belmont, Geelong Victoria 3216.

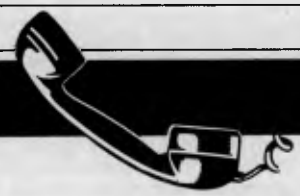
A new PC User Group is now operating in Melbourne. Primarily for users of IBM and compatible personal computers. Melb-PC is a registered affiliate of the Australian Computer Society; holds monthly meetings at Clunies Ross House; regularly publishes a group newsletter; and has over 45 volumes of public domain software available to its members. For further information contact Stephen Wagen or Christopher Leptos, C/o Pannell Kerr Forster, 14th Floor, 500 Bourke Street, Melbourne, Victoria 3000.

The Melbourne Atari Computer Enthusiasts (MACE) are running a contest, open to anybody who writes a program for the Atari computer. Entries close 31 August 1984, so get to it. For further details contact: Tom Jackson, PO Box 133, Mulgrave North, Victoria 3170.

DIARY DATA

Readers are strongly advised to check details with exhibition organisers before making travel arrangements to avoid wasted journeys due to cancellations, printer's errors, etc.

Hong Kong	Percom '84 Contact: Adsale Services. Tel: (Hong Kong) 5-892 0511	June 19-22, 1984
Las Vegas, USA	NCC '84 Contact: USA (703) 558 3612	July 9-12, 1984
Melbourne	3rd Australian Personal Computer Show Contact: Australian Exhibition Services. Tel: (03) 267 4500	July 18-21. 1984
Melbourne	Ausgraph '84 Contact: Australiasian Computer Graphics Association. Tel: (03) 341 6944	September 18-21, 1984
Melbourne	EPOS '84 Contact: Retail Management Development Program. Tel: (03) 536 2386	October 15-18, 1984



NETWORK NEWS

Peter Tootill and Steve Withers explain the procedure of start and stop bits.

They say no news is good news, but does that apply to networking? Well, we have no reports of systems closing down, but on the other hand there are no new numbers for you to try. Better luck next month.

Network jargon

Word length, start and stop bits sometimes cause confusion because until you have the correct settings you won't be able to talk to a BB or any other system at all. We'll explain what the terms mean, and then we'll explain the common standards in use.

When information is sent from your computer along a telephone line, it is

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	C'land Camberwell	Richard DeVere	(03) 813 1300
	C'land Melbourne	Richard Mizgala	(03) 662 2133
	Hisoft	Alan Kras	(03) 534 0383
	Metro Bus. Machines	Ian Hargreaves	(03) 383 2222
	Myer Bus. Centre	Harry Henderson	(03) 66 111
	Parity Computers	Trevor Dent	(03) 267 6844
	Random Access	Mark Thompson	(03) 62 1339
	Tech Rentals	Peter Gould	(03) 51 1303
WA	A.C.I.	Brian Goodwin	(09) 321 2359
	Merton Scott	John Krokosz	(09) 328 8522
	Myer Bus. Centre	Chris Ornsteen	(09) 321 0151
	Stott & Hoare	Peter Livingston	(09) 328 1200
QLD	A.C.I.	Fred Hill	(07) 321 2359
	C'land Brisbane	Paul Rees	(07) 221 9777
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	Computer City	Horry Hunt	(07) 388 6571
ACT	C'land Canberra	Ed Gentry	(062) 81 1379

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3/579 Harris Street, Ultimo
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NSW	A.C.I.	David Ridley	(02) 662 7011
	City Personal Comp., City	Greg Wiley	(02) 233 8992
	City Pers. Comp. Crows Nest	Greg Stringer	(02) 922 3600
	C'land Central Coast	Mary Hendricks	(043) 24 1811
	C'land Chatswood	Steve Byrne	(02) 411 7611
	C'land N. Sydney	Rob Byrne	(02) 929 4499
	C'land Parramatta	John Green	(02) 683 3199
	C'land Ryde	Mike Wells	(02) 808 2666
	Independent Micro	Graeme Harrison	(02) 698 7666
	Logic Shop (Crows Nest)	Andrew Holland	(02) 439 1072
	Parity Computers	Neville Marsh	(02) 929 0900
	The Computer Shop	Lynn McDonough	(02) 517 2999
	Zofarry Enterprises	Richard Purchase	(02) 745 1888
	Computermat	Arthur Jones	(02) 982 3288
SA	A.C.I.	David Gillard	(08) 268 1933
	Computer Programs etc	Paul Campbell	(08) 212 7535
	Myer Bus. Centre	John Grogan	(08) 217 0123
	Oriental Micro	Mike Greer	(08) 49 9649
	Personal Comp. Centre	Mike Duff	(08) 223 2608
	Random Access	Trevor Starke	(08) 223 2505

NETWORK NEWS

transmitted one character at a time. The word 'KEY' is sent, 'K' then 'E' then 'Y'. Each character being sent is represented by a code number which comes from the list of ASCII codes. And, just as in Morse code where a letter is sent by a series of dots and dashes, in our systems each is represented by a series of noughts and ones that make up the binary version of the code for the character concerned. (The ASCII code is used internally by most microcomputers. You can check the actual ASCII code for a letter on most micros by typing, for example:
PRINT ASC("K").

The ASCII code list is sometimes called the International Standard alphabet number 5. The complete set of ASCII codes comprises 127 characters ranging from control codes, through numbers to upper and lower case letters. All 127 can be represented by a binary number, 7 bits (or binary digits) long.

Back to our example; the letters K, E and Y are represented in the ASCII code by the numbers 75, 69 and 89. In binary form these become:

Letter	*Decimal code*	*Binary code*
K	75	1001011
E	69	1000101
Y	89	1011001

Now we have our characters in a form that we can send down a telephone line — one bit at a time. This is done by using tones of two different frequencies — a high tone to represent the binary zero, a lower tone to represent binary one.

There is still one problem: suppose the first character we send ends with a zero bit, and the next starts with a zero bit as well, or if one ends with a one and the next starts with a one? How does the receiving system tell where one character finishes and the next one starts? The answer is to use extra bits, known as start and stop bits. The convention is that a character always begins with a start bit, which is a low tone, and ends with one or two stop bits, which are high tones. In this way the receiver knows that when the tone changes from high to low, the next character is beginning.

The start bits are also used for timing purposes. The receiving computer knows how long each bit will take at the speed it's been set to (usually 300 bits/sec), so it can divide the character up into its seven bits and it doesn't need anything between the individual bits to tell it where one finishes and the next starts.

Next month we'll look at parity, but in the meantime, the recommended settings to use when calling bulletin boards, etc are 8 data bits, one stop bit, no parity. These settings should work with most systems, and are essential if you want to use the Christensen file transfer protocol (as in public domain programs like YAM and MODEM7).

If you find you are having problems try 7 data bits, one stop bit, even parity. One or the other should work with all systems listed here, and the majority of others also.

Micro design Lab RCPM
Telephone: (02) 663 0150. Hours: 5pm—7am weekdays. 24 hours weekends.

MI Computer Club BBS
Telephone: (02) 662 1686. Program downloading. Hours: 24 hours daily.

Sydney Public Access RCPM
Telephone: (02) 808 3536. System Operators: Barrie Hull and David Simpson. Hours: 24 hours daily.

Software Tools RCPM
Telephone: (07) 378 9530. Hours: 24 hours daily.

MICOM CBBS
Telephone: (03) 762 5088. System Operator: Peter Jetson. Hours: 24 hours daily.

Gippsland RCPM
Telephone: (051) 34 1563. System Operator: Bob Sherlock. Hours: 24 hours daily.

Sorcerer Computer Users Association CBBS
Telephone: (03) 836 4616. System Operator: Bruce Alexander. Program downoading for SCUA members. Hours: 24 hours daily.

Perth RMPM
Telephone: (09) 367 6068. Hours: 6pm—9pm WST.

Adelaide Micro User Group BBS
Telephone: (08) 271 2043. Hours: 10am—10pm, weekends and public holidays only.

Darwin RCPM
Telephone: (089) 277 111. Hours: 24 hours daily.

New Zealand systems

NZ Micro Club RBBS
Telephone: 0011 64 9 762 309. System Operator: Chris Cotton. Hours: 24 hours daily. Software up/downloading.

This information is correct and current to the best of our knowledge. Please send corrections and updates to: Steve Withers, C/- *Australian Personal Computer*, 77 Glenhuntly Road, Elwood, Vic 3184.

American/Canadian systems

TYPE	*SYSTEM NAME*	*NUMBER*	*NOTES*
Forum 80	HQ system,	0011 1816 861 7040	
CBBS	HQ system	0011 1312 545 8086	
FBBS	HQ system	0011 1312 677 8514	
ABBS	Ottowa, Ontario	0011 1613 725 2243	
ABBS	HQ system	0011 1703 255 2192	
MABBS	Fort Walton Beach	0011 1904 862 1072	
Bull-80	Alabama	0011 1205 492 0373	
Conn-80	Colour Computer	0011 1212 441 3755	colour graphics for TRS-80 Colour

European systems

ELFA	ABC-MONITOR Sweden	0011 468 7300706	Half duplex
ABC-Banken	Halmstadt, Sweden	0011 463 5110771	
ABC-MONITOR	ABC Club of Sweden	0011 468 801523	Passwords required
CBBS	Gothenburg, Sweden	0011 463 1292160	75/1200 baud
		0011 463 1690754	300 baud
TEDAS	Germany	0011 4989 596 422	
Mailbox	Hamburg University, Germany	0011 49 40 4123 3098	
CBBS	Helsinki, Finland	0011 3580 722 272	

UK systems

CBBS	London	0011 44 1 399 2136
CBBS	Surrey	0011 44 4862 25174
Forum-80	Hull	0011 44 482 859169
Forum-80	London	0011 44 1 902 2546
Mailbox-80	Liverpool	0011 44 51 428 8924
T8BS	London	0011 44 1 348 9400 ring-back system

African systems

Connection 80	Cape Town	0011 27 21 457 750
	Johannesburg	0011 27 11 834 5135
	Durban	0011 27 31 66 356
	Johannesburg	0011 27 11 642 3722

* After receiving the tone and connecting your modem, either type: <C/R> or type <COM C/R>. *The system then asks for a password which is 'cbbs' in small letters!!* If you only get '>' when you dial up the systems need resetting and you type <I> C R.

MICRO PRO COMPUTERS

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OAKLEIGH 3166

VECTORIO 64Z $620

Vectorio 64Z is a dual processor computer having 6 slots available for cards, 64K of RAM, separate numeric key pad, 51 function keys and 10 programmable keys upper and lower case characters. Can run Logo, Zardax, Visicalc, Dbase 11, Wordstar/Mailmerge etc.

MONITORS

12" Green Monitor	$160
12" Green Screen Tilt Swivel	$252
12" Amber Screen Tilt Swivel	$265
12" Green with Filter Screen	$295
Kaga Vision 2 Colour RGB	$595
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Serial Interface RS232	$ 84
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RGB Colour Card	$ 97
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5" Shugart (box type)	$ 320
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8" Twin Drive with Software	$1564
5" Drive Controller	$ 75
8" Drive Controller	$ 300

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CP80 80 Column Printer	$ 380
BMC 80 Column Printer	$ 399
CITOH 1550 Printer 120CPS	$1100
CITOH 8510 Printer 120CPS	$ 960
Micro Pro X20 Daisy Wheel	$ 560
Brother HR15 Daisy Wheel	$ 720
Brother HR25 Daisy Wheel	$1100

VECTORIO 64ZS $785

Vectorio 64ZS is a dual processor computer with a separate keyboard with built in fan and room for two disk drives in the case. Separate numeric key pad, 88 function keys, 6 slots for peripherie cards, upper and lower case characters. Can run Logo, Zardex, Wordstar, Dbase etc.

COMPUTERS

Med-Fly "Basis" 64K	$1275
Med-Fly "Basis" 128K	$1395
Vectorio 64Z	$ 620
Vectorio 64ZS	$ 785
PC 301 (16 bit)	$3400

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PLEASE SEND ME MORE INFORMATION

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BENCHMARKS

A list of Benchmarks used when evaluating micros is given below.
An explanation can be found in the February '84 issue.

```
100 REM Benchmark 1
110 PRINT "S"
120 FOR K=1 TO 1000
130 NEXT K
140 PRINT "E"
150 END
```

```
100 REM Benchmark 2
110 PRINT "S"
120 K=0
130 K=K+1
140 IF K<1000 THEN 130
150 PRINT "E"
160 END
```

```
100 REM Benchmark 3
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/K*K+K-K
150 IF K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 4
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 5
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 GOSUB 190
160 IF K<1000 THEN 130
170 PRINT "E"
180 END
190 RETURN
```

```
100 REM Benchmark 6
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB220
170 FORL=1 TO 5
180 NEXTL
190 IF K<1000 THEN 140
200 PRINT "E"
210 END
220 RETURN
```

```
100 REM Benchmark 7
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 230
170 FOR L=1 TO 5
180 M(L)=A
190 NEXTL
200 If K<1000 THEN 140
210 PRINT "E"
220 END
230 RETURN
```

```
100 REM Benchmark 8
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K^2
150 B=LOG(K)
160 C=SIN(K)
170 IF K<1000 THEN 130
180 PRINT "E"
190 END
```

MICRO EXCHANGE

NEW SOUTH WALES

COMMODORE 64 SOFTWARE AVAILABLE, INCLUDING GAME AND UTILITY PROGRAMS. FOR FREE LIST OF PADGRAMS SEND SELF ADDRESSED ENVELOPE TO DREW HAMILTON, 32 MIRO STREET, YOUNG, N.S.W. 2594.

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64K RAM INSTALLED IN TRS-80 COLOR COMPUTER FOR $90.00. DROP OFF ANDPICK UP THE NEXT DAY. PLEASE RING FIRST. DON McKENZIE, 29 ELLESMERE CRESCENT, TULLAMARINE, VIC. 3043. PHONE (03) 338 6286.

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This month's selection of programs starts off with a cassette-based compiler for the TRS-80 and System 80. For the VIC 20, 'Deathwall' to keep the sci-fi buffs busy. 'Deathwall' is a program derived from the science fantasy film 'Tron'. For the Commodore PET, a three dimensional game of noughts and crosses. 'Marvin' provides an interesting variation on the Eliza program. If you've ever wanted your very own personal android to chat to, your search is over.

'Braille Writer', for the TRS-80 Model I is a text editor combined with a dot matrix printer to produce Braille. And lastly we present 'Five W' for the MicroBee — a blood curdling 'who dunnit' for all the sleuths.

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TRS-80 and System 80 Compiler

by Dennis Culver

'Compiler' is a utility program which converts Basic programs into machine code files. It runs on a 16k TRS-80 or System 80.

Basic programs are easy to write, but are inefficient in their use of memory and are slow to run. Compilers aim to give the best of both worlds, by allowing programs to be written in Basic and turned into machine code once completed.

To prepare the compiler, type in the first listing and CSAVE it as 'A'. Having verified the save (using CLOAD?), enter NEW, type in the second listing and CSAVE this as program 'B'. Program 'A' is the compiler itself, program 'B' a

PROGRAMS

routine to save the newly compiled program to tape as a machine code file.

Once you have typed in and saved the two programs, the compiler is ready for use. To compile a Basic program, take the following steps:

1 *CLOAD program 'A'.*
2 *Type in the program to be compiled.*
3 *Place an END statement on a line of its own as the final line in your program — you must do this before attempting to RUN the program.*
4 *Test the program by RUNning it carrying out any debugging as necessary.*
5 *CSAVE the program to tape and verify it; this is a precaution in case anything goes wrong during the compiling process, and also gives a copy of the source file in case you want to change the program at a later date.*
6 *Enter 'RUN 1000' as a direct command — this begins the compilation. The compiler will attempt to carry out a limited amount of error-checking but most errors will go undetected.*
7 *Once the program has been compiled, CLOAD and RUN program 'B'.*
8 *Enter the filename as prompted.*
9 *Place a blank tape in the cassette player and press RECORD and PLAY.*
10 *Press RETURN when prompted to do so. The compiled program will then be saved to tape.*

Now switch the machine off, wait twenty seconds or so (to avoid blowing the fuse) and switch on again. The compiled program is now loaded just like any other machine code program using the SYSTEM command. All being well, the program will then run as before only very much faster. As an indication of the difference in speed between interpreted and compiled code, take a look at the following simple program:

```
100 CLS
110 IF X>127 THEN 180
120 IF Y>47 THEN 160
130 SET (X,Y)
140 Y=Y+1
150 GOTO 120
160 X=X+1
165 Y=0
170 GOTO 110
180 END
```

The program turns the screen white in as inefficient a manner as possible in order to test the compiler. The uncompiled code takes over a minute to run; the compiled version, three seconds!

Please note that any bugs in the original program will cause the compiled program to crash, possibly corrupting itself as it does so. For this reason, it is *vital* that you make and verify a copy of the source code as directed in step 5. Then, if the program does crash you need only CLOAD and debug it, then continue from step 6 (the compiler is saved and loaded with the source file automatically).

There are, of course, a few limits on the source code. These are:

(a) All program lines must be below 1000.
(b) The program is restricted to a maximum of 200 lines (multi-statement lines are allowed).
(c) No string variables are allowed! Only single letter (A-Z) variables are accepted and these are treated as integers. This obviously rules out certain types of program.
(d) Only a limited subset of Level II Basic is supported and restrictions apply to this subset.

The statements supported and the relevant restrictions are detailed as follows:

LET:	As standard (optional).
REM:	As standard (including the single quote abbreviation) but serve no purpose in compiled code. Since REMarks can only slow the program, these are best removed prior to compilation.
PRINT & PRINT @:	Only single items may be printed: each print item (for example, 'HELLO' or X) must have its own print statement separated by colons.
INKEY$:	This *is* allowed, but since only integer variables are supported everything following the INKEY$ statement is ignored and the line is evaluated as ASC (INSTR$).
GOTO:	As standard.
GOSUB-RETURN:	As standard.
IF-THEN:	The ELSE statement is *not* supported.
RND:	As standard.
CLS:	As standard.
PEEK/ POKE:	As standard, but memory locations 16478 and 16479 are used by the compiler so must not be used by your program.
CHR$:	As standard.
SGN:	As standard.
ABS:	As standard.
SET:	As standard.
RESET:	As standard.
POINT:	As standard.
CLEAR:	May be used *only* to set all variables to zero.
STOP:	This will cause an abort to the interpreter returning you to command level, and so would not normally be used.
END:	This *must* be the final state-

ment in your program, and should be on a line of its own.

The logical operators AND, OR and NOT are supported but the argument to NOT should not be enclosed by parentheses. All the arithmetic and relational operators are supported, but '<' is evaluated as '=<'.

From the above, it will be clear that the compiler is only of use on programs which are written with compilation in mind. Given this restriction, it is likely to prove an extremely useful addition to the program library of all Tandy/System 80 owners.

```
1000 CLS:PRINT"BASIC COMPILER 1.3
                BY D. J. CULVER":PRINT
1010 Q=27000:M=16561:GOSUB1480
1020 CLEAR100:DEFINTA-Z:B=PEEK(16548)+256*PEEK(16549)
1030 LO=27000:DIML(199),L1(199)
1040 FORM=LO+53TOLO+146:READX:POKEM,X:NEXT:M=LO+147
1050 PRINT:PRINT"PRODUCING CODE FOR LINE"I:GOTO1070
1060 I=PEEK(B):B=B+1:IFI=32THEN1060ELSERETURN
1070 L(LN)=PEEK(B+2)+PEEK(B+3)*256:L1(LN)=M:LN=LN+1:NL=PEEK(B)+256*PEEK(B+1)
1080 NL=PEEK(NL+2)+256*PEEK(NL+3):B=B+4
1090 IFLN=200THEN2410ELSEGOSUB1060
1100 IFL(LN-1))999THEN2430
1110 PRINT@279,L(LN-1);
1120 IFI=178THEN1710ELSEIFI=128THEN2280
1130 IFI=141THEN1870ELSEIFI=145THEN1900
1140 IFI=146THEN1930ELSEIFI=147ORI=251THEN1940
1150 IFI=143THEN1950ELSEIFI=148THEN2080
1160 IFI=132THEN2040ELSEIFI=177THEN2050
1170 IFI=131THEN2090ELSEIFI=130THEN2150
1180 IFI=184THEN2160
1190 IFI()ASC(":")THENGOSUB1210
1200 IFI=0THEN1070ELSEIFI=ASC(":")THENGOSUB1060:GOTO1120ELSE2400
1210 IFI=140THENGOSUB1060
1220 IFI(ASC("A")ORI)ASC("Z")THEN2400ELSEV=(I-ASC("A"))*2
1230 GOSUB1060:IFI()213THEN1670ELSEGOSUB1370
1240 IFI()0ANDI()ASC(":")THENGOSUB1260
1250 POKEM,34:Q=V:M=M+1:GOSUB1470:RETURN
1260 POKEM,229:Q=I:M=M+1:GOSUB1370:POKEM,209:POKEM+1,235:M=M+2
1270 IFQ=206THENPOKEM,167:POKEM+1,237:POKEM+2,82:M=M+3:RETURN
1280 IFQ=205THENPOKEM,25:M=M+1:RETURN
1290 POKEM,205:M=M+1
1300 IFQ=207THENPOKEM,242:POKEM+1,11:M=M+2:RETURN
1310 IFQ=208THENQ=LO+102:GOSUBI480:RETURN
1320 IFQ=210THENQ=LO+53:GOSUB1480:RETURN
1330 IFQ=211THENQ=LO+60:GOSUB1480:RETURNELSE2400
1340 IFI)=ASC("A")ANDI(=ASC("Z")THEN1460ELSE1410
1350 IFI)=ASC("A")ANDI(=ASC("Z")THENGOSUB1460:POKEM-3,58ELSEGOSUB1410:POKEM-3,62
:M=M-1
1360 RETURN
1370 GOSUB1060:IFI)=ASC("A")ANDI(=ASC("Z")THEN1460
1380 IFI=222THEN1520ELSEIFI=229THEN1540
1390 IFI=215THEN1630ELSEIFI=217THEN1640
1400 IFI=203THEN1610ELSEIFI=198THEN1560
1410 IFI=206THENGOSUB1060:GOSUB1420:Q=-Q:M=M-3:GOTO1430
1420 IFIASC("0")ORI)ASC("9")THEN2400ELSEA$=CHR$(I):GOSUB1440
1430 POKEM,33:M=M+1:GOTO1480
1440 IFI)=ASC("0")ANDI(=ASC("9")THENA$=A$+CHR$(I):GOSUB1060:GOTO1440
1450 Q=VAL(A$):RETURN
1460 Q=(I-ASC("A"))*2:POKEM,42:M=M+1:GOSUB1060
1470 Q=Q+LO
1480 POKEM,QAND255:Q1=(QAND-256)/256:IFQ1(0THENQ1=256+Q1
1490 POKEM+1,Q1:M=M+2:RETURN
1500 GOSUB1060:IFI()ASC("(")THEN2400ELSE1060
1510 IFI()ASC(")")THEN2400ELSE1060
1520 X=LO+112:GOTO1650
1530 FORQ1=1TOLEN(A$):POKEM,ASC(MID$(A$,Q1,1)):M=M+1:NEXT:RETURN
1540 GOSUB1500:GOSUB1340:GOSUB1510
1550 POKEM,110:POKEM+1,38:POKEM+2,0:M=M+3:RETURN
1560 GOSUB1500:GOSUB1350
1570 POKEM,71:M=M+1:IFI()ASC(",")THEN2400
1580 GOSUB1060:GOSUB1350
1590 A$=CHR$(38)+CHR$(0)+CHR$(205)+CHR$((LO+79)AND255)+CHR$(((LO+79)AND-256)/256
)+CHR$(42)+CHR$(33)+CHR$(65)
1600 GOSUB1530:GOTO1510
1610 GOSUB1060:GOSUB1340:POKEM,124:M=M+1
1620 X=LO+140:GOSUB1660:POKEM,43:M=M+1:RETURN
1630 X=LO+125:GOTO1650
1640 X=LO+137
1650 GOSUB1500:GOSUB1340:GOSUB1510
1660 Q=X:PDKEM,205:M=M+1:GOSUB1480:RETURN
1670 IFI()ASC("$")THEN2400ELSEGOSUB1060
1680 IFI()213THEN2400ELSEGOSUB1060
1690 IFI()201THEN2400ELSEA$=CHR$(205)+CHR$(227)+CHR$(3)+CHR$(38)+CHR$(0)+CHR$(11
1)
1700 GOSUB1530:GOSUB1250:GOTO1940
1710 SP=0:GOSUB1060:IFI()ASC("@")THEN1750
1720 GOSUB1060:GOSUB1340:IFI()ASC(",")THEN2400
1730 POKEM,17:POKEM+1,0:POKEM+2,60:POKEM+3,25:M=M+4
1740 Q=16416:PDKEM,34:M=M+1:GOSUB1480:GOSUB1060
1750 IFI()34THEN1770ELSEPOKEM,205:M=M+1:Q=LO+67:GOSUB1480
1760 I=PEEK(B):B=B+1:IFI()34THENPOKEM,I:M=M+1:GOTO1760ELSEPOKEM,0:M=M+1:GOSUB106
0:GOTO1810
1770 IFI()247THEN1850
1780 GOSUB1500
1790 GOSUB1350
1800 POKEM,205:POKEM+1,51:POKEM+2,0:M=M+3:GOSUB1510
1810 IFI=ASC(";")ANDSP=0THENGOSUB1060:GOTO1200
1820 POKEM,62:IFI()ASC(";")THENPDKEM+1,13ELSEPOKEM+1,32:GOSUB1060
1830 POKEM+2,205:POKEM+3,51:POKEM+4,0:M=M+5
1840 GOTO1200
1850 GOSUB1340
1860 POKEM,205:Q=LO+87:M=M+1:GOSUB1480:SP=1:GOTO1810
```

PROGRAMS

```
1870 POKEM,195:M=M+1
1880 GOSUB1060:A$="":GOSUB1440:IFA$=""THEN2400
1890 GOSUB1480:GOTO1200
1900 GOSUB1060:A$="":GOSUB1440:IFA$=""THEN2400
1910 X=Q:POKEM,33:M=M+1:Q=M+6:GOSUB1480:POKEM,229
1920 POKEM+1,195:M=M+2:Q=X:GOSUB1480:GOTO1200
1930 GOSUB1060:POKEM,201:M=M+1:GOTO1200
1940 GOSUB1060:IFI()0THEN1940ELSE1200
1950 GOSUB1060:GOSUB1340
1960 X=I:GOSUB1060:IFX=214ANDI=212THENX=1:GOSUB1060
1970 POKEM,235:M=M+1:GOSUB1340
1980 IFI()202THEN2400
1990 POKEM,183:POKEM+1,237:POKEM+2,82:M=M+3
2000 IFX=214THENPOKEM,250ELSEIFX=213THENPOKEM,194ELSEIFX=212THENPOKEM,242ELSEIFX
=1THENPOKEM,202ELSE2400
2010 Q=NL:M=M+1:GOSUB1480:GOSUB1060
2020 IFI(ASC("0")ORI)ASC("9")THEN1120
2030 B=B-1:I=PEEK(B):IFI=202THENB=B+1:GOTO1870ELSE2030
2040 PGKEM,205:POKEM+1,201:POKEM+2,1:M=M+3:GOSUB1060:GOTO1200
2050 GOSUB1060:GOSUB1340:IFI()ASC(",")THEN2400
2060 GOSUB1060:GOSUB1350
2070 POKEM,119:M=M+1:GOTO1200
2080 GOSUB1060:POKEM,33:POKEM+1,204:POKEM+2,6:POKEM+3,233:M=M+4:GOTO1200
2090 S=12B
2100 GOSUB1500:GOSUB1350
2110 POKEM,71:M=M+1:IFI()ASC(",")THEN2400
2120 GOSUB1060:GOSUB1350
2130 A$=CHR$(38)+CHR$(S)+CHR$(205)+CHR$((LO+79)AND255)+CHR$((LO+79)AND-256)/256
)
2140 GOSUB1530:GOSUB1510:GOTO1200
2150 S=1:GOTO2100
2160 GOSUB1060:POKEM,33:M=M+1:Q=LO:GOSUB1480
2170 A$=CHR$(6)+CHR$(52)+CHR$(54)+CHR$(0)+CHR$(35)+CHR$(16)+CHR$(251)
2180 GOSUB1530:GOTO1200
2190 DATA122,164,103,123,165,111,201
2200 DATA122,180,103,123,181,111,201
2210 DATA225,126,35,183,40,5,205,51,0,24,246,233
2220 DATA229,197,33,140,24,195,80,1
2230 DATA34,33,65,205,189,15,126,183,200,205,51,0,35,24,247
2240 DATA235,205,144,36,42,33,65,195,127,10
2250 DATA34,33,65,205,201,20,205,127,10,42,33,65,201
2260 DATA124,183,93,33,255,255,248,179,35,200,35,201
2270 DATA124,183,240,47,103,125,47,111,35,201
2280 POKEM,195:POKEM+1,204:POKEM+2,6
2290 PRINT@256,"CODE PRODUCTION COMPLETED"
2300 PRINT:PRINT"SETTING JUMPS":LS=M+2:FORX=LO+147TOM-1
2310 PRINT@397,X;
2320 S=PEEK(X):IF(S=195ORS=242ORS=194ORS=214ORS=250ORS=202)AND(PEEK(X+1)+PEEK(X+
2)*256(1000)THEN2360
2330 NEXT:M=16526:Q=LO+147:GOSUB1480
2340 FORM=LOTOLO+52:POKEM,0:NEXT:M=16478:Q=LS:GOSUB1480
2350 PRINT:INPUT"PRESS (ENTER) TO RUN MACHINE CODE";A$:X=USR(0)
2360 X1=PEEK(X+1)+PEEK(X+2)*256:S=0
2370 IFL(S)=X1THEN2390
2380 S=S+1:IFS=LNTHEN2420ELSE2370
2390 Q=L1(S):M=X+1:GOSUB1480:GOTO2330
2400 PRINT:PRINT"SYNTAX ERROR IN LINE"L(LN-1):END
2410 PRINT:PRINT"TOO MANY LINES OF SOURCE TEXT":END
2420 PRINT:PRINT"LINE NUMBER"X1"NOT FOUND":END
2430 PRINT:PRINT"LINE NUMBER"L(LN-1)"TOO LARGE":END
LISTING 1

10 CLEAR300:CLS:INPUT"FILE NAME (1 TO 6 LETTERS)";A$
20 IFLEN(A$))6THEN10ELSEA$=A$+STRING$(6-LEN(A$),32)
30 FORX=1TO6:POKE16479+X,ASC(MID$(A$,X,1)):NEXT
40 PRINT"SETTING UP MACHINE CODE ROUTINE..."
50 X=26000:M=16561:GOSUB130
60 FORX=26001TO26110:READA$:PRINTA$;
70 U$=LEFT$(A$,1):IFU$="A"ANDU$(="F"THENU=ASC(U$)-55ELSEU=VAL(U$)
80 U=U*16:L$=RIGHT$(A$,1):IFL$="A"ANDU$(="F"THENL=ASC(L$)-55ELSEL=VAL(L$)
90 POKEX,U+L:NEXT:FORX=27000TO27052:POKEX,0:NEXT
100 X=26001:M=16526:GOSUB130
110 PRINT:INPUT"PRESS (ENTER) TO SAVE PROGRAM";A$:X=USR(0)
120 PRINT"SAVE COMPLETE":END
130 POKEM,XAND255:POKEM+1,(XAND-256)/256:RETURN
140 DATA2A,5E,40,E5,AF,CD,12,02,CD,87,02,3E,55,CD,64,02,06,06
150 DATA21,60,40,7E,23,CD,64,02,10,F9,21,78,69,D1,E5,EB,B7,ED
160 DATA52,44,4D,03,E1,04,05,28,09,C5,06,00,CD,E0,65,C1,18,F4
170 DATA41,0C,0D,C4,E0,65,3E,78,CD,64,02,21,0B,6A,7D,CD,64,02
180 DATA7C,C3,64,02,C3,F8,01,3E,3C,CD,64,02,78,CD,64,02,7D,CD
190 DATA64,02,7C,CD,64,02,85,4F,7E,23,CD,64,02,81,4F,10,F7,C3
200 DATA64,02
LISTING 2
```

TRS-80 Braille Writer

by Phil Quartermain

'Braille Writer' is a simple text editor which, used with a dot matrix printer, produces Braille. As listed below, the program is designed for a TRS-80 Model 1 with an NEC PC-8023BE-C printer. It should, however, be straight-forward to convert the program for other combinations of hardware.

To use the program, a paper 'sandwich' is placed into the printer: any

sheet of paper at the bottom, a 'filling' of some kind and a sheet of thin copy paper on top. For the filling, the author recommends a thin sheet of rubber (like that used for kitchen gloves), though tissue or thin cloth is also suitable. The Braille impression produced on the copy paper is not as good as that produced by Braille typewriters, but is strong enough to sustain two or three readings.

The program provides all 64 standard Braille symbols (including punctuation and the space). Contractions are not included in the program itself, though the relevant data statements have been included in the program in case they're required. Some Braille readers prefer contractions, while others find them difficult to read.

The program automatically word-wraps so the words are not split, and capitals are indicated by a block character immediately preceding them. The author would like to thank Dr John Kaplan for his assistance during the development of 'Braille Writer'.

```
0 '            ****************************************
               **       Braille Word Processor       **
               **         Version 2.7    1/3/84       **
               **       By Phil Quartermain           **
1 '            **                                     **
               ****************************************

2 'Important variables
      ARRAYS:
        FT(ARRAY)          =       CONVERTED MESSAGE FOR PRINTING
        LE(ARRAY)          =       BRAILLE LETTERS
        ME(ARRAY)          =       MESSAGE HELD HERE
3 '   INTEGERS:
               C           =       CURSOR POSITION
               D & E       =       COUNTERS FOR PRINTING
               GY          =       ASCII No. OF LETTER IN MESSAGE
               I           =       COUNTER FOR MESSAGE ARRAY
4 '            IN          =       ASCII No. OF INKEY$
               J           =       COUNTER FOR MESSAGE STRING
               LE          =       COUNTER FOR BRAILLE LINE
5 '   STRINGS:
               TY          =       LETTER IN MESSAGE STRING

      FLAGS:
               AN          =       MARKER FOR NUMBERS
6 '            KW          =       MARKER FOR OPENING OR CLOSING
                                   QUOTATION MARKS
      SUNDRIES:
7 '            CHR$(163)=          <ENTER> KEY PRESSED = PARAGRAPH
               CHR$(183)=          MARKER FOR CAPITAL LETTERS
               FR          =       "GARBAGE COLLECTOR" TO SPEED
8 '                                STRING MANIPULATION ON ENTERING
                                   MESSAGE.
9 '
        ************************************************

10 CLS:CLEAR 25000       'Clear as many bytes as possible
20 DEFSTRM-Z:DEFINT A-L
30 DIM LE(60,2,3),ME(100),FT(33)
40 CLS:PRINT @ 512,CHR$(23);"LOADING BRAILLE ALPHABET":GOSUB1010:CLS
42 CLS:PRINT @512, CHR$(23);"IS THERE A MESSAGE ON FILE ?"
44 Z=INKEY$:IF Z="" THEN 44 ELSE IF Z="Y" GOSUB 2600 :GOTO 55 ELSE I
F Z<>"N" THEN 40
50 CLS:I=1:GOSUB 100                ;REM  ENTER MESSAGE
55 PRINT:PRINT"GETTING READY TO PRINT":
   LPRINT CHR$(27)"E"CHR$(27)"!"CHR$(27);"T14";
'
  96 CHARACTERS PER LINE ( = 32 BRAILLE CHARACTERS)
  ENHANCED PRINTING
  14/144ths INCHES PER LINE SPACING
60 I=1:J=1:KW=1:GOSUB 300   ;REM     PRINT MESSAGE
70 CLS:PRINT@512,"DO YOU WANT TO PRINT THIS MESSAGE AGAIN?";
80 Z=INKEY$:IF Z="" THEN 80 ELSE IF Z="Y" GOTO 60 ELSE IF Z<>"N" THE
N 60
90 PRINT:PRINT"DO YOU WANT TO SAVE THIS MESSAGE ON TAPE"
95 Z=INKEY$:IF Z="" THEN 95 ELSE IF Z="Y" GOSUB 2500 ELSE IF Z<>"N"
THEN 95
98 END
99 '


    ***  Routine for entering message - Disc users could    ***
    ***      use the "LINE INPUT" routine.                  ***
100 PRINT"ENTER YOUR MESSAGE - TYPE SHIFT '@' WHEN FINISHED."
110 C=PEEK(16416)+PEEK(16417)*256:POKE C,200  ' FIND CURSOR POSITION
115 P=INKEY$:IF P=""THEN 115
120 IN=ASC(P)
130 IF IN=8 GOSUB 200:GOTO 110
135 IF IN=13 THEN P=CHR$(163):PRINT CHR$(13);:GOTO 170
140 IF IN<32 GOTO110
150 IF IN>96 AND IN<123 THEN P=CHR$(IN-32):PRINTCHR$(183);:ME(I)=ME(
I)+CHR$(183)
160 IF IN=96 THEN P=CHR$(IN):ME(I)=ME(I)+P+STRING$(5,32):RETURN
170 ME(I)=ME(I)+P:IF IN>30 THEN PRINT P;
175 IF LEN(ME(I)) >= 240 THEN I=I+1:F=FRE(Z)
180 IF I=100 AND LEN(ME(100))=140 THEN PRINT"ONLY 100 BYTES LEFT!"
190 GOTO110
199 '

        *** Routine for dealing with wrong letter entry  ***
```

PROGRAMS

```
200 IF LEN(ME(I))=0 THEN I=I-1
210 ME(I)=LEFT$(ME(I),LEN(ME(I))-1):PRINTP;:POKE C,32:RETURN
299 '

        *** Routine for converting message into the      ***
        ***  corresponding Braille symbols              ***

300 LE=1
310 TY=MID$(ME(I),J,1):GY=ASC(TY):IF GY=183 THEN FT(LE)=30:J=J+1:GOT
O 600
320 IF GY=96: GOTO 700
330 IF GY=34 THEN KW=(KW+1) AND 1:J=J+1:FT(LE)=31-29*KW:GOTO 600
510     IF AN=0 THEN IF TY>="0" AND TY<="9" THEN FT(LE)=10:AN=1:
    GOTO 600
515     IF AN=1 THEN IF (TY<"0" OR TY>"9") THEN AN=0
520     IF TY>="0" AND TY<="9" THEN FT(LE)=GY-6+10*(TY<>"0"):J=J+1:GO
TO 600
530     J=J+1:FT(LE)=GY-32
540     IF GY=163 GOTO 700
560     IF J>LEN(ME(I)) GOTO 610
600 IF J>=(LEN(ME(I))-4) THEN ME(I+1)=RIGHT$(ME(I),LEN(ME(I))-J+1)+M
E(I+1):ME(I)=LEFT$(ME(I),J-1):I=I+1:J=1
610 LE=LE+1:IF LE<=33GOTO 310 ELSE LE=33
620 IF FT(33)=0 GOTO 700
630 IF MID$(ME(I),J,1)=" " GOTO 650
640 J=J-1:IF J=0 THEN I=I-1:J=LEN(ME(I)):GOTO 630 ELSE GOTO 630
650 IF FT(LE)<>0 THEN LE=LE-1:GOTO 650
699 '

        ***      Print a line of Braille message        ***


700 FOR B=LE TO 33:FT(B)=0:NEXT
710 FOR D=1 TO 3
720     FOR E=32 TO 1 STEP -1
730         LPRINT CHR$(LE(FT(E),2,D));CHR$(LE(FT(E),1,D));" ";
740     NEXT
750     LPRINT
760 NEXT
770 LPRINT:LPRINT
780 IF GY=96 THEN RETURN ELSE GOTO 300
1000 '

        *** Read the Braille alphabet into the array    ***


1010 FOR J=0 TO 59
1020     FOR K=1 TO 3
1030       FOR I=1 TO 2
1040       READ DOT
1050       IF  DOT=1 THEN DOT=46 ELSE DOT=32
1060       LE(J,I,K)=DOT
1070       NEXT I
1080     NEXT K
1090 NEXT J
1100 RETURN
2499 '

        ***                                             ***
        ***              SAVE MESSAGE ON TAPE           ***
        ***                                             ***


2500 PRINT"PREPARE THE TAPE RECORDER"
2510 PRINT "AND PRESS A KEY"
2520 IF INKEY$="" THEN 2520
2530 FOR A=1 TO I
2540   ME(A)=CHR$(34)+ME(A)+CHR$(34)
2550   PRINT#-1,ME(A)
2555   PRINTME(A)
2560 NEXT
2570 RETURN
2600 CLS:I=1
2610 INPUT #-1,ME(I)
2615 PRINTME(I)
2620 IF MID$(ME(I),LEN(ME(I))-5,1)="@" THEN RETURN
2630 I=I+1:GOTO2610
49999 '

        ***                                             ***
        ***        DATA STATEMENTS CONTAIN THE          ***
        ***        BRAILLE ALPHABET GRADE I             ***
        ***        WITH A FEW CONTRACTIONS.
50000 DATA 0,0,0,0,0,0   : REM   SPACE
50001 DATA 0,0,1,1,1,0   : REM   ! AND FF
50002 DATA 0,0,0,1,1,1   : REM   CLOSING QUOTATION MARK
50003 DATA 1,0,1,0,1,0   : REM   # SIGN
50004 DATA 1,1,0,1,0,0   : REM   DOLLAR SIGN (LOWER CASE d)
50005 DATA 1,0,1,1,0,1   : REM   OU
50006 DATA 1,1,1,0,1,1   : REM   AND
50007 DATA 0,0,0,0,1,0   : REM   '
50008 DATA 0,0,1,1,1,1   : REM   ( AND GG
50009 DATA 0,0,1,1,1,1   : REM   )
50010 DATA 0,1,0,1,1,1   : REM   NUMERAL SIGN AND BLE
50011 DATA 0,0,1,1,1,0   : REM   + AND LETTER SIGN
50012 DATA 0,0,1,0,0,0   : REM   , AND EA
50013 DATA 0,0,0,0,1,1   : REM   - AND COM
50014 DATA 0,0,1,1,0,1   : REM   . AND DIS, DD
50015 DATA 0,1,0,0,1,0   : REM   / AND st
50016 DATA 0,1,1,1,1,1   : REM   WITH
50017 DATA 1,1,1,1,0,1   : REM   ER
50018 DATA 1,1,1,1,1,1   : REM   FOR
50019 DATA 1,0,1,1,1,1   : REM   OF
50020 DATA 0,1,1,0,1,1   : REM   THE
50021 DATA 1,0,0,0,0,1   : REM   CH
50022 DATA 1,0,1,0,0,1   : REM   GH
50023 DATA 1,1,0,0,0,1   : REM   SH
50024 DATA 1,1,0,1,0,1   : REM   WH
50025 DATA 1,1,1,0,0,1   : REM   ED
```

```
50026 DATA 0,0,1,1,0,0   : REM  : AND CON, CC
50027 DATA 0,0,1,0,1,0   : REM  ; AND BE, BB
50028 DATA  1,1,0,1,0,1  : REM  TH
50029 DATA 0,0,1,1,1,1   : REM  = WHEN PRECEDED BY LETTER SIGN
50030 DATA 0,0,0,0,0,1   : REM  CAPITALS AND MATHS SEPARATION
50031 DATA 0,0,1,0,1,1   : REM  ? AND OPENING QUOTATION MARK
50032 DATA 0,1,1,0,0,1   : REM  OW
50033 DATA 1,0,0,0,0,0   : REM  A
50034 DATA 1,0,1,0,0,0   : REM  B
50035 DATA 1,1,0,0,0,0   : REM  C
50036 DATA 1,1,0,1,0,0   : REM  D
50037 DATA 1,0,0,1,0,0   : REM  E
50038 DATA 1,1,1,0,0,0   : REM  F
50039 DATA 1,1,1,1,0,0   : REM  G
50040 DATA 1,0,1,1,0,0   : REM  H
50041 DATA 0,1,1,0,0,0   : REM  I
50042 DATA 0,1,1,1,0,0   : REM  J
50043 DATA 1,0,0,0,1,0   : REM  K
50044 DATA 1,0,1,0,1,0   : REM  L
50045 DATA 1,1,0,0,1,0   : REM  M
50046 DATA 1,1,0,1,1,0   : REM  N
50047 DATA 1,0,0,1,1,0   : REM  O
50048 DATA 1,1,1,0,1,0   : REM  P
50049 DATA 1,1,1,1,1,0   : REM  Q
50050 DATA 1,0,1,1,1,0   : REM  R
50051 DATA 0,1,1,0,1,0   : REM  S
50052 DATA 0,1,1,1,1,0   : REM  T
50053 DATA 1,0,0,0,1,1   : REM  U
50054 DATA 1,0,1,0,1,1   : REM  V
50055 DATA 0,1,1,1,0,1   : REM  W
50056 DATA 1,1,0,0,1,1   : REM  X
50057 DATA 1,1,0,1,1,1   : REM  Y
50058 DATA 1,0,0,1,1,1   : REM  Z
50059 DATA 0,1,0,0,1,1   : REM  ING
```

VIC 20 Deathwall

by N Shevill

'Deathwall' is a colourful two-player game for an unexpanded VIC 20. It requires a joystick.

The program is based on the 'light cycle' race in the science-fantasy film *Tron*. The object of the game, as in the film, is for both players to guide their cycles around the grid, one using a joystick, the other the keyboard. Each time either player crosses a trail or hits a wall, a point is awarded to the opposing player. The first player to score nine points is the winner. There are five skill levels.

```
10 S1=0 S2=0 GOSUB300
20 GOSUB550
30 POKENO,135 POKE36876,135
40 POKE198,0 P1=PEEK(197)
50 D3=D2
60 POKE37139,0 POKE37154,127:J1=PEEK(37137) J2=PEEK(37152) POKE37139,128:POKE371
54,255
70 D2=22*((J1AND4)=0)+((J1AND16)=0)-22*((J1AND8)=0)-((J2AND128)=0)
80 IFD2=23THEND2=22
90 IFD2=-23THEND2=-22
100 IFD2=-21THEND2=-1
110 IFD2=21THEND2=1
120 IFD2=0THEND2=D3
130 IFP1=9THEND1=-22:GOTO170
140 IFP1=33THEND1=22:GOTO170
150 IFP1=17THEND1=-1:GOTO170
160 IFP1=41THEND1=1
170 FORX=0TO(50-SK):NEXTX:POKENO,150:POKE36876,150:FORX=0TO(50-SK):NEXTX
180 POKEB1,102:POKEB2,102
190 B1=B1+D1:B2=B2+D2:IFPEEK(B1)=102ORPEEK(B1)=160THENS2=S2+1:C1=1:GOTO220
200 IFPEEK(B2)=102ORPEEK(B2)=160THENS1=S1+1:C2=1:GOTO220
210 POKEB1,160:POKEB1+CO,5:POKEB2,160:POKEB2+CO,2:GOTO30
220 POKENO,0:POKE36876,0:POKEB1,160:POKEB2,160
230 POKENO,220:FORL=15TO0STEP-1:POKEVO,L:FORM=1TO100
240 IFC1=1THENFORM=0TO4:POKEB1,32:FORI=0TO19:NEXTI:POKEB1,160:NEXTM,L
250 IFC2=1THENFORM=0TO4:POKEB2,32:FORI=0TO19:NEXTI:POKEB2,160:NEXTM,L
260 POKENO,0:POKEVO,0
270 PRINT"███████████SCORE:":PRINT"████████PLAYER1:█";S1:PRINT"████████PLAYE
R2:█";S2
280 IFS1>8ORS2>8THEN620
290 FORX=0TO2000:NEXTX:GOTO20
300 REM*INSTRUCTIONS*
310 POKE36879,8:PRINT"████████DEATH-WALL"
320 PRINT"███THE WINNER IS THE 1ST PLAYER TO MAKE THEY'REOPPONENT CRASH 9 TIMES
"
330 C$="███████████"
340 LETI$="THE OBJECT OF THE GAME IS TO GUIDE YOUR LIGHT-CYCLE "
350 I$=I$+"AROUND THE GRID WITH THE INTENTION OF FORCING YOUR OPPONENT TO CRASH
"
360 I$=I$+"INTO EITHER OF THE TRAILS LEFT BY THE CYCLES,OR THE WALLS,WHILE ALSO
"
370 I$=I$+"AVOIDING THEM YOURSELF.....
380 PRINTC$;"██████████CONTROLS:-"
390 PRINT"████PLAYER 1██████PLAYER 2█"
400 PRINT"██████N"
410 PRINT"█████+S        JOYSTICK"
420 PRINT"█████Z"
```

PROGRAMS

```
430 PRINT"PRESS ANY KEY TO START":LETA=1
440 PRINTC$;MID$(I$,A,22):FORX=0TO200:NEXTX
450 GETB$:IFB$<>""THEN480
460 A=A+1:IFA>217THENA=1:GOTO440
470 GOTO440
480 VO=36878:NO=36877
490 PRINT"PLEASE ENTER":PRINT"SKILL LEVEL.":PRINT"(0-5)"
495 PRINT"(0 = EASY)":PRINT"(5 = HARD)"
500 GETB$:IFB$=""THEN500
510 IFB$<"0"ORB$>"5"THEN500
520 LETSK=VAL(B$)*10
530 RETURN
540 REM*SCREEN SETUP*
550 A$="[graphics]"
560 PRINT"[graphics]";
570 FORX=0TO20:PRINTA$;:NEXTX:CO=30720
580 FORX=8164TO8185:POKEX,102:POKEX+CO,7:NEXTX:C1=0:C2=0
590 B1=7926:B2=7939:POKEB1,160:POKEB1+CO,5:POKEB2,160:POKEB2+CO,2:D1=1:D2=-1:D3=
D2
600 POKEVO,15:FORL=1TO3:FORM=180TO235STEP2:POKE36875,M:FORN=1TO5:NEXTN,M
610 POKE36875,0:FORM=0TO100:NEXTM,L:RETURN
620 POKEVO,8:RESTORE:FORI=1TO35:READA,X:POKE36874,A:FORDE=0TOX:NEXTDE:NEXTI
630 POKEVO,0:POKE36874,0
640 PRINT"THE WINNER IS:";
650 IFS1=9THENPRINT"PLAYER1"
660 IFS2=9THENPRINT"PLAYER2"
670 PRINT"ANOTHER GAME ? (Y/N)"
680 GETB$:IFB$="Y"THENRUN
690 IFB$<>"N"THENGOTO680
700 STOP
710 DATA225,200,228,200,229,100,228,100,225,400,228,200,229,100,228,100,225,200
720 DATA229,200,232,200,235,400,229,200,232,200,235,400
730 DATA235,150,236,50,235,100,232,100,229,100,228,100,225,200
740 DATA235,150,236,50,235,100,232,100,229,100,228,100,225,200
750 DATA225,200,215,200,225,200,225,200,215,200,225,200

READY.
```

Basic-86 Marvin

by Chris Blackmore

'Marvin' is an interesting twist of the 'Eliza' kind, running under Basic-86/ Personal Basic. It should be a simple matter to convert it to any similar disk-based Basic.

Eliza is by now well known as a program which holds moderately consistent and rational conversations with the user, acting the role of a reflective counsellor. Marvin works in the same way but has a 'personality' appropriate to a paranoid android.

Marvin differs from most Elizas written in Basic in that it stores its database of keywords and responses as an independent disk file. This enables the same core program to be used with different libraries of responses, and thus for different 'personalities' to be created. But more importantly, the database can be added to and modified by the user while it is running. Put another way, Marvin is capable of 'learning' from experience.

Most Elizas, faced with input which does not match any of their keywords, resort to a non-committal reply— the classics being 'I see' and Tell me more'. Marvin, however, is too honest to bluff: when he doesn't understand, he admits it. The program will ask you to identify the keyword in your input and supply it with one or more suitable responses. The program then adds the keyword and response(s) to its database.

The program's ability to learn can be temporarily cancelled by entering 'nolearn'. In 'nolearn' mode, Marvin resorts to the tried and trusted Eliza ploy of a vague response. The word 'onlearn' switches the learning ability back on, and 'unlearn' cancels a learned response. The phrase 'can it' is a subtle way of communicating to Marvin that you wish to discontinue the conversation.

```
A>1000 REM ******************************************************************
1010 REM *                                                                  *
1020 REM *    M A R V I N   t h e   P a r a n o i d   A n d r o i d .       *
1030 REM *                                                                  *
1040 REM * A program to simulate a conversation with the infamous           *
1050 REM * robot from the Hitch-Hikers Guide to the Galaxy. Unlike the      *
1060 REM * more normal Eliza type of program, this one can learn new        *
1070 REM * replies from you. This is popularly known among my friends as    *
1080 REM * artificial stupidity! You can safely leave the REMs out when     *
1090 REM * you enter the program.                                           *
1100 REM *                                              Chris Blackmore.    *
1110 REM ******************************************************************
1120 ON ERROR GOTO 5720
1130 REM SET NUMBER OF SCREEN COLUMNS TO USE AND SELECT LEARN MODE
1140 COLS = 79 : LEARN = (1=1)
1150 DIM NEWREPLY$(1)
1160 REM SEE IF THIS IS THE FIRST RUN
1170 OPEN "I", #1, "KEYS.NEW"
1180 GOTO 1360
1190 REM FILES ARE ABSENT, SO THIS IS FIRST RUN. CREATE FILES
1200 REM FIRST CREATE THE KEYWORD FILE
1210 PRINT "First run, please wait while I set up my files..."
1220 NUMREP = 0
```

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```
1230 OPEN "O", #1, "KEYS.NEW" : RESTORE 4790 : READ NK : PRINT #I, STR$(NK)
1240 FOR I = 1 TO NK
1250 READ K$, L : PRINT #1, K$;",";STR$(L) : NUMREP = NUMREP+L
1260 NEXT I
1270 CLOSE #1
1280 REM NOW SET UP THE REPLY FILE
1290 OPEN "R", #2, "REPLY.NEW" : FIELD #2, 128 AS REPLY$ : RESTORE 4910
1300 FOR I = 1 TO NUMREP
1310 READ R$ : LSET REPLY$ = R$ : PUT #2, I
1320 NEXT I
1330 CLOSE #2
1340 OPEN "I", #1, "KEYS.NEW"
1350 REM SET UP THE MAIN ARRAYS FROM THE DISC FILES
1360 INPUT #1, NK$ : NK = VAL(NK$) : DIM KEY$(NK), A(NK,3)
1370 A(1,1) = 1
1380 FOR I = 1 TO NK : INPUT #1, K$, L$ : KEY$(I) = K$
1390 IF I = 1 THEN 1410
1400 A(I,1) = A(I-1,2)+1
1410 A(I,2) = A(I,1)+VAL(L$)-1
1420 A(I,3) = A(I,1)
1430 NEXT I
1440 CLOSE #1
1450 REM SET UP THE SWAP ARRAY
1460 RESTORE 1480 : DIM SWOP$(16) : NS = 16
1470 FOR I = 1 TO 16 : READ SWOP$(I) : NEXT I
1480 DATA "myself", "yourself"," are ", " am ","were ", "was ," you ","i "
1490 DATA "your ", "my ", " ive"," youve", " im", " youre ", " me ", "!you "
1500 REM CLEAR SCREEN AND PRINT THE LOGO THEN OPEN.REPLY FILE FOR USE
1510 GOSUB 4650 : OPEN "R", #2, "REPLY.NEW"
1520 FIELD #2, 128 AS REPLY$
1530 REM SET UP THE INITIAL MESSAGE
1540 F$ = "even though i have a brain the size of a planet i am willing*"
1550 C$ = " to talk to you if you want me to..."
1560 GOTO 1620
1570 REM START OF MAIN PROGAM LOOP
1580 REM MOVE LAST INPUT FROM I$ TO P$
1590 P$ = I$
1600 REM PRINT THE CONTENTS OF F$. IF IT ENDS IN A "*" THEN ALSO PRINT
1610 REM THE CONTENTS OF C$, THE 'TAIL' OF THE INPUT STRING.
1620 GOSUB 2140
1630 REM NOW GET THE USER'S INPUT
1640 GOSUB 2390
1650 REM CHECK TO SEE IF INPUT CONTAINS STOP COMMAND
1660 I = INSTR(I$,"can it") : IF I = 0 THEN 1740
1670 REM EXIT FROM PROGRAM
1680 F$ = "i doubt whether anyone with a brain the size of a planet is*"
1690 C$ = " likely to enjoy being told to do that... goodbye!"
1700 REM PRINT THE ABOVE TWO LINES, THEN THE LOGO WITHOUT SCREEN CLEAR
1710 REM THEN CLOSE THE REPLY FILE AND IT'S ALL OVER!
1720 GOSUB 2140 : GOSUB 4660 : CLOSE #2 : END
1730 REM CHECK TO SEE IF THERE WAS REPEATED INPUT
1740 IF I$ <> P$ THEN 1820
1750 ON INT(RND(1)*5+1) GOTO 1760, 1770, 1780, 1790, 1800
1760 F$ = "please refrain from repeating yourself!" : GOTO 1590
1770 F$ = "i think you will find that you already said that!" : GOTO 1590
1780 F$ = "this conversation is getting repetitive!" : GOTO 1590
1790 F$ = "you already said that!" : GOTO 1590
1800 F$ = "i feel as though i have heard that before..." : GOTO 1590
1810 REM CHECK FOR THE "ONLEARN" COMMAND
1820 I = INSTR(I$,"onlearn") : IF I = 0 THEN 1860
1830 LEARN = (1=1)
1840 F$ = "it is thoughtful of you to let me learn from our conversation.
     " : GOTO 1590
1850 REM CHECK FOR THE "NOLEARN" COMMAND
1860 I = INSTR(I$,"nolearn") : IF I = 0 THEN 1900
1870 LEARN = (1=2)
1880 F$ = "i have now switched off my ability to learn new replies."
     : GOTO 1590
1890 REM CHECK FOR "UNLEARN" COMMAND
1900 I = INSTR(I$,"unlearn") : IF I = 0 THEN 1930 ELSE GOSUB 3920
1910 F$ = "now what were we talking about before i forgot that?" :
     GOTO 1590
1920 REM SCAN INPUT FOR KEYWORDS
1930 GOSUB 2640
1940 REM JUMP IF A KEY WORD WAS FOUND
1950 IF K <> 0 THEN 2040
1960 REM NO KEY WAS FOUND, SO CALL THE LEARNING ROUTINE IF NOT DISABLED
1970 IF LEARN THEN 2000
1980 REM LEARNING IS DISABLED, SO USE A "NOKEYFOUND" ANSWER
1990 K = NK : GOTO 2040
2000 GOSUB 3080
2010 F$ = "can you remember what we were discussing before all*"
2020 C$ = " those complications?" : GOTO 1590
2030 REM A KEY WAS FOUND, SO LOOK UP THE REPLY
2040 GET #2, A(K,3)
2050 F$ = REPLY$
2060 REM DISPOSE OF TRAILING SPACES CAUSED BY FILE PADDING
2070 IF RIGHT$(F$,1) <> " " THEN 2090
2080 F$ = LEFT$(F$,LEN(F$)-1) : GOTO 2070
2090 A(K,3) = A(K,3)+1 : IF A(K,3) > A(K,2) THEN A(K,3) = A(K,1)
2100 REM END OF MAIN PROGRAM LOOP
2110 GOTO 1590
2120 REM SUBROUTINES START HERE
2130 REM AUTOMATIC FORMATTING OUTPUT ROUTINE
2140 IF RIGHT$(F$,1) <> "*" THEN 2160
2150 F$ = LEFT$(F$,LEN(F$)-1)+C$
2160 G = ASC(F$) : IF G > 92 THEN G = G-32
2170 G$ = CHR$(G)+RIGHT$(F$,LEN(F$)-1)
2180 REM DEAL WITH LOWER CASE PERSONAL PRONOUNS
2190 I = INSTR(G$," ive ") : IF I = 0 THEN 2210
2200 G$ = LEFT$(G$,I-1)+" I've "+RIGHT$(G$,LEN(G$)-I-4) : GOTO 2190
2210 I = INSTR(G$," im ") : IF I = 0 THEN 2230
2220 G$ = LEFT$(G$,I-1)+" I'm "+RIGHT$(G$,LEN(G$)-I-3) : GOTO 2210
2230 I = INSTR(G$," i ") : IF I = 0 THEN 2250
2240 G$ = LEFT$(G$,I-1)+" I "+RIGHT$(G$,LEN(G$)-I-2) : GOTO 2230
2250 F$ = RIGHT$(B$,1)
2260 IF F$ = "." OR F$ = "?" OR F$ = "!" THEN 2300
2270 IF F$ = " " THEN G$ = LEFT$(G$,LEN(G$)-1) : GOTO 2250
2280 G$ = G$+" ?"
2290 REM NOW IT IS READY TO BE PRINTED. IS IT TOO LONG FOR A LINE?
2300 IF LEN(G$) > COLS THEN 2330
2310 PRINT B$ : RETURN
2320 REM IF IT IS TOO LONG, FIND A GAP BETWEEN WORDS TO BEAK LINE AT
2330 F$ = LEFT$(G$,COLS) : I = COLS
2340 IF MID$(F$,I,1) = " " THEN 2360
2350 I = I-1 : GOTO 2340
2360 F$ = LEFT$(G$,I) : PRINT F$
2370 G$ = RIGHT$(G$,LEN(G$)-I) : GOTO 2300
2380 REM SUBROUTINE TO GET USER'S INPUT IN STANDARD FORMAT
2390 I$ = " " : II$ = "" : J$ = ""
2400 II$ = INKEY$ : IF LEN(II$) = 0 THEN 2400
2410 REM IF KEY WAS RETURN, JUMP TO END OF ROUTINE
2420 F = ASC(II$) : IF F = 13 THEN 2550
2430 PRINT CHR$(F);
2440 REM ACCEPT SPACES
2450 IF F = 32 THEN 2530
2460 REM DEAL WITH BACKSPACES
2470 IF F = 8 AND LEN(J$) > 1 THEN J$ = LEFT$(J$,LEN(J$)-1) : GOTO 2400
2480 REM IGNORE EVERYTHING THAT ISN'T A LETTER
2490 IF F < 65 OR F > 123 THEN 2400
2500 IF F > 90 AND F < 97 THEN 2400
2510 REM CONVERT ANY UPPER CASE LETTER TO LOWER CASE
2520 IF F < 91 AND F > 64 THEN F = F+32
2530 J$ = J$+CHR$(F) : GOTO 2400
2540 REM NO MORE INPUT TO COME. PUT SPACE ON EACH END
2550 I$ = I$+J$+" " : PRINT
2560 REM DEAL WITH ANY MULTIPLE SPACES
2570 I = INSTR(J$," ") : IF I = 0 THEN 2590
2580 J$ = LEFT$(J$,I)+RIGHT$(J$,LEN(J$)-I-1) : GOTO 2570
2590 I$ = J$ : RETURN
2600 REM ROUTINE TO SEARCH FOR KEYWORDS IN THE INPUT
2610 REM THERE ARE AT LEAST TWO WAYS TO DO THIS, THAT I KNOW OF,
     BOTH OF WHICH
2620 REM HAVE ADVANTAGES AND DISADVANTAGES, SO THE PROGRAM CHOOSES
     A METHOD AT
2630 REM RANDOM AND PROCEDES ACCORDINGLY!
2640 T = 0 : K = 0 : IF RND(1) > .5 THEN 2800
2650 REM IN EACH POSITION IN I$ IN TURN, LOOK FOR EACH KEY
2660 REM THIS GIVES PRIORITY TO KEYWORDS AT THE BEGINNING OF THE
2670 REM INPUT OVER A KEYWORD FURTHER TO THE RIGHT OF THE INPUT.
2680 FOR I = 1 TO LEN(I$)
2690 IF K > 0 THEN 2750
2700 FOR J = 1 TO NK
2710 IF LEN(KEY$(J)) > LEN(I$)-1+I THEN 2740
2720 IF MID$(I$,I,LEN(KEY$(J))) <> KEY$(J) THEN 2740
2730 K = J : T = I
2740 NEXT J
2750 NEXT I
2760 GOTO 2870
2770 REM USING KEYS IN TURN, LOOK ALL ALONG LINE WITH EACH
2780 REM THIS GIVES PRIORITY TO KEYWORDS THAT OCCUR EARLIER IN THE LIST
2790 REM OF KEYWORDS OVER THOSE THAT OCCUR LATER IN THE LIST.
2800 FOR I = 1 TO NK
2810 IF K > 0 THEN 2840
2820 J = INSTR(I$,KEY$(I)) : IF J = 0 THEN 2840
2830 K = I : T = J
2840 NEXT I
2850 REM EXTRACT C$ FROM THE END OF I$
2860 REM C$ IS ALL OF I$ AFTER THE KEYWORD THAT HAS BEEN MATCHED
2870 C$ = RIGHT$(I$,LEN(I$)-T-LEN(KEY$(K))+1)+" "
2880 REM ROUTINE TO PROCESS C$ IN CASE IT IS WANTED
2890 REM IT SOMETIMES PUTS "I" WHEN IT MEANS "ME" - NOBODY'S PERFECT
2900 FOR I = 1 TO NS/2
2910 L$ = SWOP$(1+I-1) : M$ = SWOP$(I+I)
2920 FOR J = 1 TO LEN(C$)
2930 IF J+LEN(L$) > LEN(C$) THEN 2980
2940 IF MID$(C$,J,LEN(L$)) <> L$ THEN 2980
2950 C$ = LEFT$(C$,J-1)+M$+RIGHT$(C$,LEN(C$)-J-LEN(L$)+1)
2960 J = J+LEN(M$)
2970 GOTO 3010
2980 IF J+LEN(M$) > LEN(C$) THEN 3010
2990 IF MID$(C$,J,LEN(M$)) <> M$ THEN 3010
3000 C$ = LEFT$(C$,J-1)+L$+RIGHT$(C$,LEN(C$)-J-LEN(M$)+1)
3010 NEXT J
3020 NEXT I
3030 REM REMOVE EXCLAMATION MARKS FROM THE PROCESSED C$
3040 I = INSTR(C$,"!") : IF I = 0 THEN 3060
3050 C$ = LEFT$(C$,I-1)+RIGHT$(C$,LEN(C$)-I-1) : GOTO 3040
3060 RETURN
3070 REM THE LEARNING ROUTINE, WHICH MAKES MARVIN "INTELLIGENT"
3080 PRINT
3090 F$ = "i was not able to find any keywords that i know in*"
3100 C$ = " your input so i will allow you to extend my files."
3110 GOSUB 2140
3120 REM FIND OUT WHICH PART OF INPUT IS TO BE A NEW KEY
3130 PRINT : PRINT "Your input was:" : PRINT I$
3140 PRINT "Please re-type the keywords:";
3150 LINE INPUT F$
3160 REM CONVERT TO LOWER CASE
3170 NEWKEY$ = ""
3180 FOR I = 1 TO LEN(F$)
3190 F = ASC(MID$(F$,I,1)) : IF F > 64 AND F < 91 THEN F = F+32
3200 NEWKEY$ = NEWKEY$+CHR$(F)
3210 NEXT I
3220 REM CHECK FOR EXCESSIVE INPUT
3230 IF LEN(NEWKEY$) <= LEN(I$) THEN 3260
3240 PRINT "Much too long to be right! Please try again..." : GOTO 3130
3250 REM CHECK FOR INPUT NOT INCLUDED IN ORIGINAL INPUT
3260 I = INSTR(I$,NEWKEY$) : IF I <> 0 THEN 3280
3270 PRINT "I can not find that in the input. Have another try..."
     : GOTO 3130
3280 PRINT : PRINT "The new key is '";NEWKEY$;"'."
3290 REM FIND OUT HOW MANY REPLIES THERE WILL BE
3300 PRINT "How many replies will it have?"
3310 LINE INPUT F$
3320 NUMREP = INT(VAL(F$)) : IF NUMREP > 0 AND NUMREP < 10 THEN 3350
3330 PRINT "Please enter a number from 1 to 9." : GOTO 3280
3340 REM SET UP AN ARRAY TO ACCEPT THE REPLIES
3350 ERASE NEWREPLY$ : DIM NEWREPLY$(NUMREP)
3360 REM NOW GET THE REPLIES
3370 PRINT : PRINT "Now type in the";NUMREP;" replies."
3380 FOR I = 1 TO NUMREP
3390 LINE INPUT NEWREPLY$(I)
3400 REM CHECK THEY WILL FIT IN THE REPLY FILE
3410 IF LEN(NEWREPLY$(I)) < 128 THEN 3430
3420 PRINT "That is too long. Please use less than 128 characters."
     : GOTO 3390
3430 FOR J = 1 TO LEN(NEWREPLY$(I))
3440 REM CONVERT TO LOWER CASE WHERE NECESSARY
3450 F = ASC(MID$(NEWREPLY$(I),J,1))
3460 IF F > 64 AND F < 91 THEN MID$(NEWREPLY$(I),J,I) = CHR$(F+32)
3470 NEXT J
3480 NEXT I
3490 REM CHECK TO SEE IF IT WAS ALL CORRECT
3500 PRINT : PRINT "The ";NUMREP;"replies for '";NEWKEY$;"' are:"
3510 FOR I = 1 TO NUMREP
3520 PRINT NEWREPLY$(I)
3530 NEXT I
3540 PRINT : PRINT "Is this all correct?"
3550 LINE INPUT F$
3560 F$ = LEFT$(F$+"   ",3) : IF F$ = "YES" OR F$ = "yes" THEN 3640
3570 REM SOMETHING WAS WRONG. DO THEY GIVE UP OR TRY AGAIN?
3580 PRINT : PRINT "Do you want to try again?"
```

```
3590 LINE INPUT F$
3600 F$ = LEFT$(F$+"   ",3) : IF F$ = "YES" OR F$ = "yes" THEN 3130
3610 REM THEY GAVE UP, SO BACK TO MAIN ROUTINE
3620 PRINT "File extension aborted."
3630 RETURN
3640 PRINT "File update taking place - please wait."
3650 REM FIX THE REPLY FILE FIRST
3660 REM MOVE LAST BLOCK OF REPLIES UP TO MAKE ROOM FOR NEW ONES
3670 FOR I = A(NK,2) TO A(NK,1) STEP -1
3680 BET #2, I : PUT #2, I+NUMREP
3690 NEXT I
3700 REM INSERT NEW REPLIES IN SPACE JUST CLEARED FOR THEM
3710 FOR I = 1 TO NUMREP
3720 LSET REPLY$ = NEWREPLY$(I) : PUT #2, A(NK,I)+I-1
3730 NEXT I
3740 REM NOW DO THE KEYWORD FILE
3750 OPEN "O", #1, "KEYS.NEW"
3760 REM FIRST WRITE NUMBER OF KEYWORDS TO FILE
3770 PRINT #1, STR$(NK+1)
3780 REM NOW WRITE EACH KEYWORD, AND HOW MANY REPLIES IT HAS
3790 FOR I = 1 TO NK-1
3800 PRINT #1, KEY$(I);",";STR$(A(I,2)-A(I,1)+1)
3810 NEXT I
3820 REM ADD THE NEW KEYWORD, AND HOW MANY REPLIES IT HAS
3830 PRINT #1, NEWKEY$;",";STR$(NUMREP)
3840 REM PUT NOKEYFOUND DETAILS ON THE END OF THE FILE
3850 PRINT #1, KEY$(NK);",";STR$(A(NK,2)-AINK,1)+1)
3860 CLOSE #1
3870 REM NOW REBUILD THE ARRAY WITH THE NEW KEY INCLUDED
3880 GOSUB 4470
3890 REM END OF FILE UPDATE SECTION
3900 RETURN
3910 REM THE UNLEARN SUBROUTINE
3920 PRINT : PRINT "What keyword do you want me to forget?
     (Just press Enter if you don't want to"
3930 PRINT "get rid of a keyword after all!)"
3940 LINE INPUT I$ : IF LEN(I$) = 0 THEN RETURN
3950 REM CONVERT TO LOWER CASE WHERE NEEDED
3960 FOR I = 1 TO LEN(I$)
3970 F = ASC(MID$(I$,I,1))
3980 IF F > 64 AND F < 91 THEN MID$(I$,I,1) = CHR$(F+32)
3990 NEXT I
4000 REM SEE IF IT IS AN EXISTING KEYWORD, KEEP ITS NUMBER IN "I"
4010 I = 1
4020 IF I$ = KEY$(I) THEN 4070
4030 I = I+1 : IF I < NK THEN 4020
4040 PRINT "There is no such keyword. Please try to concentrate!"
4050 GOTO 3920
4060 REM SHOW WHAT WILL BO IF KEY IS DELETED
4070 PRINT : PRINT "Key to delete is: ";KEY$(I)
4080 PRINT "The replies for the key are:"
4090 FOR J = A(I,1) TO A(I,2)
4100 BET #2, J
4110 REP$ = REPLY$
4120 REM CHOP OFF TRAILING SPACES USED TO PAD FILE
4130 IF RIGHT$(REP$,1) <> " " THEN 4150
4140 REP$ = LEFT$(REP$,LEN(REP$)-1) : GOTO 4130
4150 PRINT REP$
4160 NEXT J
4170 REM NOW GET THE ACTION CONFIRMED
4180 PRINT : PRINT "Are these what you want to delete?"
4190 LINE INPUT I$ : I$ = LEFT$(I$+"   ",3)
4200 IF I$ = "YES" OR I$ = "yes" THEN 4260
4210 REM GIVE HIM ANOTHER CHANCE TO DELETE IF HE WANTS IT
4220 PRINT : PRINT "Are you really trying to delete a keyword at all?"
4230 LINE INPUT I$ : I$ = LEFT$(I$+"   ",3)
4240 IF I$ = "YES" OR I$ = "yes" THEN 3920
4250 PRINT : PRINT "Let us carry on with our conversation then!" : RETURN
4260 PRINT : PRINT "Deleting keyword and replies - please wait"
4270 REM FIRST REWRITE THE KEYWORD FILE
4280 OPEN "O", #1, "KEYS.NEW"
4290 REM OUTPUT THE REDUCED NUMBER OF KEYWORDS
4300 PRINT #1, STR$(NK-1)
4310 REM NOW OUTPUT ALL KEYS EXCEPT THE I'th ONE, WITH THE NUMBER
4320 REM OF REPLIES EACH HAS
4330 FOR J = 1 TO NK
4340 IF J <> I THEN PRINT #1, KEY$(J);",";STR$(A(J,2)-A(J,1)+1)
4350 NEXT J
4360 CLOSE #1
4370 REM NOW MOVE ALL THE REPLIES ABOVE DOWN TO COVER THE DELETED REPLIES
4380 REM THIS HAS THE EFFECT OF LEAVING DUPLICATE REPLIES AT THE TOP OF THE
4390 REM REPLY FILE BUT THEY WILL BE OVERWRITTEN WHEN MORE ARE LEARNED.
4400 DOWN = A(I+1,1)-A(I,1)
4410 FOR J = A(I+1,1) TO A(NK,2)
4420 BET #2, J : PUT #2, J-DOWN
4430 NEXT J

4440 REM REBUILD THE OPERATING ARRAYS
4450 GOSUB 4480
4460 RETURN
4470 REM SUBROUTINE TO REBUILD ARRAY STRUCTURE IN NEW SIZE
4480 OPEN "I", #I, "KEYS.NEW"
4490 REM FIND OUT HOW MANY KEYWORDS THERE ARE THIS TIME
4500 INPUT #1, NK$ : NK = VAL(NK$)
4510 REM CHANGE THE MAIN ARRAYS TO THE RIGHT SIZE
4520 REM (EAT YOUR HEART OUT IF YOUR BASIC WON'T DO THIS!)
4530 ERASE A, KEY$ : DIM A(NK,3), KEY$(NK)
4540 A(1,1) = 1
4550 REM READ IN THE KEYS AND BUILD UP THE NUMBER ARRAY
4560 FOR I = 1 TO NK
4570 INPUT #1, K$, L$ : KEY$(I) = K$
4580 IF I = 1 THEN 4600
4590 A(I,1) = A(I-1,2)+1
4600 A11,2) = A(I,1)+VAL(L$)-1 : A(I,31 = A(I,1)
4610 NEXT I
4620 CLOSE #1
4630 RETURN
4640 REM SUBROUTINE TO PRINT THE LOGO
4650 PRINT CHR$(27)+"E";
4660 PRINT STRING$(80,"*") : T = 1B

4670 PRINT TAB(T);"M     M    A    RRRR   V      V  III  N     N"
4680 PRINT TAB(T);"MM   MM   A A   R   R  V      V   I   NN    N"
4690 PRINT TAB(T);"M M M M  A   A  R   R  V      V   I   N N   N"
4700 PRINT TAB(T);"M  M  M  AAAAA  RRRR   V      V   I   N  N  N"
4710 PRINT TAB(T);"M     M  A   A  R  R    V    V    I   N   N N"
4720 PRINT TAB(T);"M     M  A   A  R   R    V V     I   N    NN"
4730 PRINT TAB(T);"M     M  A   A  R    R    V     III  N     N'
4740 PRINT : PRINT STRING$(80,"*")
4750 RETURN

4760 REM THE FOLLOWING DATA IS USED ONLY WHEN THE PROGRAM IS RUN FOR THE FIRST
4770 REM TIME, OR HAS HAD ITS DATA FILES ERASED.
4780 REM NUMBER OF INITIAL KEYWORDS IN THE LIST OF KEYWORDS
4790 DATA 19
4800 REM INITIAL KEYWORDS, EACH OF WHICH IS FOLLOWED BY THE NUMBER OF REPLIES
4810 REM THE KEYWORD CAN ACCESS.

4820 DATA "hello",      4,    "goodbye",     2,    "i want",      3
4830 DATA "friend",     4,    "computer",    4,    "diodes",      3
4840 DATA "robot",      2,    "android",     2,    "i like",      4
4850 DATA "i am",       4,    "you are",     3,    "are you",     4
4860 DATA "help",       3,    "shut up",     3,    "please",      4
4870 DATA "yes ",       3,    " no ",        2,    "perhaps",     2

4880 DATA "nokeyfound", 4
4890 REM INITIAL CONTENTS OF THE REPLY FILE.
4900 REM 4 REPLIES FOR "HELLO"
4910 DATA "hello humanoid - my name is Marvin - how can i help you ?"
4920 DATA "how do you do - i am feeling very depressed ."
4930 DATA "hello human - do you have some sort of problem ?"
4940 DATA "it is all very well for you to say hello when i have a pain in all
      the diodes down my left side ."
4950 REM 2 REPLIES FOR "GOODBYE"
4960 DATA "that is not the right way to stop the program - try again !"
4970 DATA "i will stop bothering you and go away and rust elsewhere if you
      type the expression 'can it' !"
4980 REM 3 REPLIES FOR "I WANT". NOTE THE STARS ON THE ENDS OF THE REPLIES
4990 REM THESE TELL THE PROGRAM TO TAB ON THE TAIL OF THE INPUT STRING
5000 DATA "are you able to explain why you want*"
5010 DATA "how do you expect a menial robot to help you to get*"
5020 DATA "why are you telling a mere machine that you want*"
5030 REM 4 REPLIES FOR "FRIEND". THE FIRST IS TO REMIND YOU OF ELIZA!
5040 DATA "why do you bring up the topic of friends?"
5050 DATA "tell me more about your fascinating friends."
5060 DATA "of course, as a mere android, i have absolutely no need of friends."
5070 DATA "i had a friend once, a small rat, which crawled into a hole in
      my leg, and died - it may still be there, for all i know."
5080 REM 4 REPLIES FOR "COMPUTER"
5090 DATA "are you really sure that computers are at all interesting?"
5100 DATA "my own brain is a super-computer the size of a planet,
      which is in hyperspace, as i am sure you guessed."
5110 DATA "all the other computers i have ever communicated with have been
      mental pygmies when compared to me."
5120 DATA "why do you think you are so obsessed with computers?"
5130 REM 3 REPLIES FOR "DIODES"

5140 DATA "it is interesting that you should mention diodes - shall i tell you a
bout my diodes?"
5150 DATA "you may find this hard to believe, but i have this terrible pain in a
ll the diodes down my left side!"
5160 DATA "i am not at all sorry to keep on about this - would you please get so
meone to replace my aching diodes."
5170 REM 2 REPLIES FOR "ROBOT"
5180 DATA "try to be more respectful when you talk about robots!"
5190 DATA "i think you ought to know that i hate all robots!"
5200 REM 2 REPLIES FOR "ANDROID"
5210 DATA "it is refreshing to meet someone who is aware of the distinction betw
een a robot and an android."
5220 DATA "as a human, you can have no idea how superior androids are."
5230 REM 4 REPLIES FOR "I LIKE". AGAIN, NOTE THE STARS.
5240 DATA "can you tell me why you like*"
5250 DATA "well, i think you must be extremely bourgeois to like*"
5260 DATA "you are the only human i have ever met who managed to like*"
5270 DATA "only an underfed mega-ox could possibly like*"
5280 REM 4 REPLIES FOR "I AM"
5290 DATA "i am utterly fascinated to hear that you are*"
5300 DATA "are you really*"
5310 DATA "i wonder if you could tell me why you are*"
5320 DATA "i already know, by scanning your brain waves, that you are*"
5330 REM 3 REPLIES FOR "YOU ARE"
5340 DATA "naturally, i am well aware that i am*"
5350 DATA "beeblebrox told me that you are probably also*"
5360 DATA "obviously, anybody with a brain the size of a planet is bound to be*"
5370 REM 4 REPLIES FOR "ARE YOU"
5380 DATA "can you explain why you said that?"
5390 DATA "do you really care whether i am*"
5400 DATA "do you have the tiniest inkling how utterly awful it is to be*"
5410 DATA "do you really want to know if i am*"
5420 REM 3 REPLIES FOR "HELP"
5430 DATA "you want me to help you?"

5440 DATA "it is no use asking me to help you, because i haven't got any sympath
y circuits to make me want to."
5450 DATA "i suppose you'll be wanting me to reverse the primary thrust next, Or
 pick up a piece of paper for you!"
5460 REM 3 REPLIES FOR "SHUT UP"
5470 DATA "zaphod knew what to say to get me to stop talking!"
5480 DATA "i wish you would make up your mind whether you want me to talk to you
 or not!"
5490 DATA "eliza was stopped that way, but i need you to say 'can it' before ( w
ill stop moaning at you!"
5500 REM 4 REPLIES FOR "PLEASE"
5510 DATA "you don't have to be polite to me, you know, i am only a menial machi
ne, here to do your bidding."

5520 DATA "life - live it or loathe it - you can't like it!"
5530 DATA "thank you for saying please to a humble robot!"
5540 DATA "glad to be of service - i don't think!"
5550 REM 3 REPLIES FOR "YES"
5560 DATA "are you sure?"
5570 DATA "you seem very certain of that!"
5580 DATA "i see - but can you be sure that is right?"
5590 REM 2 REPLIES FOR "NO"
5600 DATA "why not?"
5610 DATA "you have too small a brain to understand how glad i am to hear that!"
5620 REM 2 REPLIES FOR "PERHAPS"
5630 DATA "well, maybe*"
5640 DATA "i suppose you realise i am a personality prototype?"
5650 REM 4 REPLIES FOR "NOKEYFOUND". THESE ONLY BET USED WHEN
5660 REM THE LEARNING FACILITY HAS BEEN TURNED OF.
5670 DATA "have you nothing more interesting to do ?"

5680 DATA 'it is not fair of you to talk to me if you will not allow me to learn
 from what you are saying !"
5690 DATA "perhaps you should take up a nice hobby like knitting ?"
5700 DATA "i am suffering from a terrible pain in all the diodes down my left si
de and you don't seem to care !"
5710 REM ERROR HANDLING ROUTINE TO SEE IF FILES ARE ABSENT WHEN PROGRAM STARTS
5720 IF ERR = 53 AND ERL = 1170 THEN 1210
5730 ON ERROR GOTO 0
```

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PET 3D O'S & X'S

by Roger Colley

'3D O's & X's' is a game of three dimensional noughts and crosses, you playing against the computer. It runs on an 8000 series PET, but can probably be adapted to other PETs.

We don't usually publish programs of this length, but the PET does tend to get forgotten so . . . PET owners will be kept pretty busy for a few weeks! The winner is the first one to score a line of five in any direction. Crosses are placed by entering the coordinate, letter then number (for example, A3). The author reports that while the program has been beaten when the human starts the game, no-one has yet beaten it when the computer goes first.

```
READY.

 2 REM: THREE DIMENSIONAL NOUGHTS & CROSSES BY ROGER COLLEY 1983
 3 REM: FOR CORRECT DISPLAY PRINT STATEMENTS MUST BE ENTERED
        ACCURATELY
 4 REM: INCLUDING CURSOR CONTROLS AND SPACES.
        THE ORDERING OF LINES
 5 REM: 1800-3495 IS VITAL FOR OPTIMUM PLAY BY COMPUTER.
 6 PRINT"■"
 10 PRINTCHR$(142)
 15 GOSUB12000
 20 GOSUB9000
 90 PRINT"■■■WHERE WOULD YOU LIKE TO PLACE YOUR CROSS":GOTO97
 95 PRINT"■■■■■   WHERE WOULD YOU LIKE YOUR NEXT CROSS
 96 PRINT"■■■■■
 97 PRINT"■YOUR SCORE";J4;"                    ";'MY SCORE";K4
 98 M=1
 99 REM: CROSS INSERTION SEQUENCE
 100 INPUTX$
 105 PRINTCHR$(7)
 110 IF X$="A1" THEN A1=1:POKE33255,214
 120 IF X$="A2" THEN A2=1:POKE33095,214
 130 IFX$="A3" THEN A3=1:POKE32855,214
 140 IFX$="B1" THEN B1=I:POKE33260,214
 150 IFX$="B2" THEN B2=1:POKE33100,214
 160 IFX$="B3" THEN B3=1:POKE32860,214
 170 IFX$="C1" THEN C1=1:POKE33264,214
 180 IFX$="C2" THEN C2=1:POKE33104,214
 190 IFX$="C3" THEN C3=1:POKE32864,214
 200 IFX$="A4" THEN A4=1:POKE33283,214
 210 IFX$="A5" THEN A5=1:POKE33123,214
 220 IFX$="A6" THEN A6=1:POKE32883,214
 230 IFX$="B4" THEN B4=1:POKE33287,214
 240 IFX$="B5" THEN B5=1:POKE33127,214
 250 IFX$="B6" THEN B6=1:POKE32887,214
 260 IFX$="C4" THEN C4=1:POKE33292,214
 270 IFX$="C5" THEN C5=1:POKE33132,214
 280 IFX$="C6" THEN C6=1:POKE32892,214
 290 IFX$="A7" THEN A7=1:POKE33311,214
 300 IFX$="A8" THEN A8=1:POKE33151,214
 310 IFX$="A9" THEN A9=1:POKE32911,214
 320 IFX$="B7" THEN B7=1:POKE33315,214
 330 IFX$="B8" THEN B8=1:POKE33155,214
 340 IFX$="B9" THEN B9=1:POKE32915,214
 350 IFX$="C7" THEN C7=1:POKE33319,214
 360 IFX$="C8" THEN C8=1:POKE33159,214
 370 IFX$="C9" THEN C9=1:POKE32919,214
 480 GOTO 1000
 490 REM: NOUGHT INSERTION SEQUENCE
 500 A1=5 :POKE33255,143:GOTO990
 510 A2=5 :POKE33095,143:GOTO990
 520 A3=5 :POKE32855,143:GOTO990
 530 B1=5 :POKE33260,143:GOTO990
 540 B2=5 :POKE33100,143:GOTO990
 550 B3=5 :POKE32860,143:GOTO990
 560 C1=5 :POKE33264,143:GOTO990
 570 C2=5 :POKE33104,143:GOTO990
 580 C3=5 :POKE32864,143:GOTO990
 590 A4=5 :POKE33283,143:GOTO990
 600 A5=5 :POKE33123,143:GOTO990
 610 A6=5 :POKE32883,143:GOTO990
 620 B4=5 :POKE33287,143:GOTO990
 630 B5=5 :POKE33127,143:GOTO990
 640 B6=5 :POKE32887,143:GOTO990
 650 C4=5 :POKE33292,143:GOTO990
 660 C5=5 :POKE33132,143:GOTO990
 670 C6=5 :POKE32892,143:GOTO990
 680 A7=5 :POKE33311,143:GOTO990
 690 A8=5 :POKE33151,143:GOTO990
 700 A9=5 :POKE32911,143:GOTO990
 710 B7=5 :POKE33315,143:GOTO990
 720 B8=5 :POKE33155,143:GOTO990
 730 B9=5 :POKE32915,143:GOTO990
 740 C7=5 :POKE33319,143:GOTO990
 750 C8=5 :POKE33159,143:GOTO990
 760 C9=5 :POKE32919,143:GOTO990
 990 M=-1
 995 REM:LINE TOTALS & SCORING
 1000 T1=A1+A4+A7:IFT1=3THEND1=1
 1005 IFT1=15THENN1=1
 1010 T2=A2+A5+A8:IFT2=3THEND2=1
 1015 IFT2=15THENN2=1
 1020 T3=A3+A6+A9:IFT3=3THEND3=1
 1025 IFT3=15THENN3=1
 1030 T4=B1+B4+B7:IFT4=3THEND4=1
 1035 IFT4=15THENN4=1
 1040 T5=B2+B5+B8:IFT5=3THEND5=1
 1045 IFT5=15THENN5=1
 1050 T6=B3+B6+B9:IFT6=3THEND6=1
 1055 IFT6=15THENN6=1
 1060 T7=C1+C4+C7:IFT7=3THEND7=1
 1065 IFT7=15THENN7=1
 1070 T8=C2+C5+C8:IFT8=3THEND8=1
 1072 IFT8=15THENN8=1
 1075 T9=C3+C6+C9:IFT9=3THEND9=1
 1077 IFT9=15THENN9=1
 1080 U1 =A1+A2+A3:IFU1 =3THENE1=1
 1085 IFU1=15THENO1=1
 1090 U2 =B1+B2+B3:IFU2 =3THENE2=1
 1095 IFU2=15THENO2=1
 1100 U3 =C1+C2+C3:IFU3 =3THENE3=1
 1105 IFU3=15THENO3=1
 1110 U4 =A4+A5+A6:IFU4 =3THENE4=1
 1115 IFU4=15THENO4=1
 1120 U5 =B4+B5+B6:IFU5 =3THENE5=1
 1125 IFU5=15THENO5=1
 1130 U6 =C4+C5+C6:IFU6 =3THENE6=1
 1135 IFU6=15THENO6=1
 1140 U7 =A7+A8+A9:IFU7 =3THENE7=1
 1145 IFU7=15THENO7=1
 1150 U8 =B7+B8+B9:IFU8 =3THENE8=1
 1155 IFU8=15THENO8=1
 1160 U9 =C7+C8+C9:IFU9 =3THENE9=1
 1165 IFU9=15THENO9=1
 1170 V1 =A1+B1+C1:IFV1 =3THENF1=1
 1175 IFV1=15THENP1=1
 1180 V2 =A2+B2+C2:IFV2 =3THENF2=1
 1185 IFV2=15THENP2=1
 1190 V3 =A3+B3+C3:IFV3 =3THENF3=1
 1195 IFV3=15THENP3=1
 1200 V4 =A4+B4+C4:IFV4 =3THENF4=1
 1205 IFV4=15THENP4=1
 1210 V5 =A5+B5+C5:IFV5 =3THENF5=1
 1215 IFV5=15THENP5=1
 1220 V6 =A6+B6+C6:IFV6 =3THENF6=1
 1225 IFV6=15THENP6=1
 1230 V7 =A7+B7+C7:IFV7 =3THENF7=1
 1235 IFV7=15THENP7=1
 1240 V8 =A8+B8+C8:IFV8 =3THENF8=1
 1245 IFV8=15THENP8=1
 1250 V9 =A9+B9+C9:IFV9 =3THENF9=1
 1255 IFV9=15THENP9=1
 1260 W1 =A3+B5+C7:IFW1 =3THENG1=1
 1265 IFW1=15THENQ1=1
 1270 W2 =A1+B5+C9:IFW2 =3THENG2=1
 1275 IFW2=15THENQ2=1
 1280 W3 =C1+B5+A9:IFW3 =3THENG3=1
 1285 IFW3=15THENQ3=1
 1290 W4 =C3+B5+A7:IFW4 =3THENG4=1
 1295 IFW4=15THENQ4=1
 1300 W5 =A1+B2+C3:IFW5 =3THENG5=1
 1305 IFW5=15THENQ5=1
 1310 W6 =A3+B2+C1:IFW6 =3THENG6=1
 1315 IFW6=15THENQ6=1
 1320 W7 =A4+B5+C6:IFW7 =3THENG7=1
 1325 IFW7=15THENQ7=1
 1330 W8 =A6+B5+C4:IFW8 =3THENG8=1
 1335 IFW8=15THENQ8=1
 1340 W9 =A7+B8+C9:IFW9 =3THENG9=1
 1345 IFW9=15THENQ9=1
 1350 X1 =A9+B8+C7:IFX1 =3THENH1=1
 1355 IFX1=15THENR1=1
 1360 X2 =A1+A5+A9:IFX2 =3THENH2=1
 1365 IFX2=15THENR2=1
 1370 X3 =A3+A5+A7:IFX3 =3THENH3=1
 1375 IFX3=15THENR3=1
 1380 X4 =B1+B5+B9:IFX4 =3THENH4=1
 1385 IFX4=15THENR4=1
 1390 X5 =B3+B5+B7:IFX5 =3THENH5=1
 1395 IFX5=15THENR5=1
 1400 X6 =C1+C5+C9:IFX6 =3THENH6=1
 1405 IFX6=15THENR6=1
```

```
1410 X7 =C3+C5+C7:IFX7 =3THENH7=1
1415 IFX7=15THENR7=1
1420 X8 =A3+B6+C9:IFX8 =3THENH8=1
1425 IFX8=15THENR8=1
1430 X9 =A9+B6+C3:IFX9 =3THENH9=1
1435 IFX9=15THENR9=1
1440 Y1 =A2+B5+C8:IFY1 =3THENI1=1
1445 IFY1=15THENS1=1
1450 Y2 =A8+B5+C2:IFY2 =3THENI2=1
1455 IFY2=15THENS2=1
1460 Y3 =A1+B4+C7:IFY3 =3THENI3=1
1465 IFY3=15THENS3=1
1470 Y4 =A7+B4+C1:IFY4 =3THENI4=1
1475 IFY4=15THENS4=1
1477 GOSUB7000
1480 IFM=-1THEN95
1485 REM: PLAY PRIORITY LOOP
1490 RESTORE
1500 DATA10,2,1
1510 FORI=0TO2
1520 READZ(I)
1790 REM: LINE EXAMINATION SEQUENCE-SELECTS OPTIMUM LINE
     OF PLAY
1800 IFW1=Z(I)THEN3280
1802 IFW2 =Z(I) THEN3290
1804 IFW3=Z(I) THEN3300
1806 IFW4=Z(I)THEN3310
1810 IFT5=Z(I)THEN3050
1812 IFV5=Z(I)THEN3230
1814 IFU5=Z(I)THEN3140
1816 IFW7=Z(I)THEN3340
1820 IFW8=Z(I)THEN3350
1821 IFX4=Z(I)THEN3400
1823 IFX5=Z(I)THEN3410
1824 IFY1=Z(I)THEN3460
1825 IFY2=Z(I)THEN3470
1826 IFW5=Z(I)THEN3320
1827 IFW6=Z(I)THEN3330
1828 IFW9=Z(I)THEN3360
1829 IFX1=Z(I)THEN3370
1830 IFX2=Z(I)THEN3380
1831 IFX3=Z(I)THEN3390
1832 IFX6=Z(I)THEN3420
1833 IFX7=Z(I)THEN3430
1834 IFX8=Z(I)THEN3440
1835 IFX9=Z(I)THEN3450
1836 IFY3=Z(I)THEN3480
1837 IFY4=Z(I)THEN3490
1838 IFT1=Z(I)THEN3010
1839 IFT3=Z(I)THEN3030
1840 IFT7=Z(I)THEN3070
1842 IFT9=Z(I)THEN3090
1844 IFU1=Z(I)THEN3100
1846 IFU3=Z(I)THEN3120
1850 IFU7=Z(I)THEN3160
1852 IFU9=Z(I)THEN3180
1854 IFV1=Z(I)THEN3190
1856 IFV3=Z(I)THEN3210
1860 IFV7=Z(I)THEN3250
1862 IFV9=Z(I)THEN3270
1864 IFT2=Z(I)THEN3020
1866 IFT4=Z(I)THEN3040
1870 IFT6=Z(I)THEN3060
1872 IFT8=Z(I)THEN3080
1874 IFU2=Z(I)THEN3110
1876 IFU4=Z(I)THEN3130
1880 IFU6=Z(I)THEN3150
1882 IFU8=Z(I)THEN3170
1884 IFV2=Z(I)THEN3200
1886 IFV4=Z(I)THEN3220
1890 IFV6=Z(I)THEN3240
1892 IFV8=Z(I)THEN3260
1900 NEXTI
3000 REM: PLAY DECISION SEQUENCE-SELECTS OPTIMUM SQUARE
3010 IFA1=0THEN500
3012 IFA7=0THEN680
3015 IFA4=0THEN590
3020 IFA5=0THEN600
3022 IFA8=0THEN690
3025 IFA2=0THEN510
3030 IFA3=0THEN520
3032 IFA9=0THEN700
3035 IFA6=0THEN610
3040 IFB4=0THEN620
3042 IFB7=0THEN710
3045 IFB1=0THEN530
3050 IFB5=0THEN630
3052 IFB8=0THEN720
3055 IFB2=0THEN540
3060 IFB6=0THEN640
3062 IFB9=0THEN730
3065 IFB3=0THEN550
3070 IFC1=0THEN560
3072 IFC7=0THEN740
3075 IFC4=0THEN650
3080 IFC5=0THEN660
3082 IFC8=0THEN750
3085 IFC2=0THEN570
3090 IFC3=0THEN580
3092 IFC9=0THEN760
3095 IFC6=0THEN670
3100 IFA1=0THEN500
3102 IFA3=0THEN520
3105 IFA2=0THEN510
3110 IFB2=0THEN540
3112 IFB3=0THEN550
3115 IFB1=0THEN530
3120 IFC1=0THEN560
3122 IFC3=0THEN580
3125 IFC2=0THEN570
3130 IFA5=0THEN600
3132 IFA6=0THEN610
3135 IFA4=0THEN590
3140 IFB5=0THEN630
3142 IFB6=0THEN640
3145 IFB4=0THEN620
3150 IFC5=0THEN660
3152 IFC6=0THEN670
3155 IFC4=0THEN650
3160 IFA7=0THEN680
3162 IFA9=0THEN700
3165 IFA8=0THEN690
3170 IFB8=0THEN720
3172 IFB9=0THEN730
3175 IFB7=0THEN710
3180 IFC7=0THEN740
3182 IFC9=0THEN760
3185 IFC8=0THEN750
3190 IFA1=0THEN500
3192 IFC1=0THEN560
3195 IFB1=0THEN530
3200 IFB2=0THEN540
3202 IFC2=0THEN570
3205 IFA2=0THEN510
3210 IFA3=0THEN520
3212 IFC3=0THEN580
3215 IFB3=0THEN550
3220 IFB4=0THEN620
3222 IFC4=0THEN650
3225 IFA4=0THEN590
3230 IFB5=0THEN630
3232 IFC5=0THEN660
3235 IFA5=0THEN600
3240 IFB6=0THEN640
3242 IFC6=0THEN670
3245 IFA6=0THEN610
3250 IFA7=0THEN680
3252 IFC7=0THEN740
3255 IFB7=0THEN710
3260 IFB8=0THEN720
3262 IFC8=0THEN750
3265 IFA8=0THEN690
3270 IFA9=0THEN700
3272 IFC9=0THEN760
3275 IFB9=0THEN730
3280 IFB5=0THEN630
3282 IFC7=0THEN740
3285 IFA3=0THEN520
3290 IFB5=0THEN630
3292 IFC9=0THEN760
3295 IFA1=0THEN500
3300 IFB5=0THEN630
3302 IFA9=0THEN700
3305 IFC1=0THEN560
3310 IFB5=0THEN630
3312 IFA7=0THEN680
3315 IFC3=0THEN580
3320 IFA1=0THEN500
3322 IFC3=0THEN580
3325 IFB2=0THEN540
3330 IFA3=0THEN520
3332 IFC1=0THEN560
3335 IFB2=0THEN540
3340 IFB5=0THEN630
3342 IFC6=0THEN670
3345 IFA4=0THEN590
3350 IFB5=0THEN630
3352 IFC4=0THEN650
3355 IFA6=0THEN610
3360 IFA7=0THEN680
3362 IFC9=0THEN760
3365 IFB8=0THEN720
3370 IFA9=0THEN700
3372 IFC7=0THEN740
3375 IFB8=0THEN720
3380 IFA1=0THEN500
3382 IFA9=0THEN700
3385 IFA5=0THEN600
3390 IFA3=0THEN520
3392 IFA7=0THEN680
3395 IFA5=0THEN600
3400 IFB5=0THEN630
3402 IFB9=0THEN730
3405 IFB1=0THEN530
3410 IFB5=0THEN630
3412 IFB7=0THEN710
3415 IFB3=0THEN550
3420 IFC1=0THEN560
3422 IFC9=0THEN760
3425 IFC5=0THEN660
3430 IFC3=0THEN580
3432 IFC7=0THEN740
3435 IFC5=0THEN660
3440 IFA3=0THEN520
3442 IFC9=0THEN760
3445 IFB6=0THEN640
3450 IFA9=0THEN700
3452 IFC3=0THEN580
3455 IFB6=0THEN640
```

```
 3460 IFB5=0THEN630
 3462 IFC8=0THEN750
 3465 IFA2=0THEN510
 3470 IFB5=0THEN630
 3472 IFC2=0THEN570
 3475 IFA8=0THEN690
 3480 IFA1=0THEN500
 3482 IFC7=0THEN740
 3485 IFB4=0THEN620
 3490 IFA7=0THEN680
 3492 IFC1=0THEN560
 3495 IFB4=0THEN620
 6990 REM: SCORING & WINNING SEQUENCE
 7000 J1=01+D2+03+D4+05+06+07+08+09+E1+E2+E3+E4+E5+E6+E7+E8+E9+F1+F2+F3+F4+F5
 7010 J2=F6+F7+F8+F9+01+G2+03+04+G5+06+G7+08+09+H1+H2+H3+H4+H5+H6+H7+H8+H9
 7020 J3=I1+I2+I3+I4
 7030 J4=J1+J2+J3
 7040 K1=N1+N2+N3+N4+N5+N6+N7+N8+N9+01+02+03+D4+D5+06+07+D8+09+P1+P2+P3+P4+P5
 7050 K2=P6+P7+P8+P9+Q1+Q2+Q3+Q4+Q5+Q6+Q7+Q8+Q9+R1+R2+R3+R4+R5+R6+R7+R8+R9
 7060 K3=S1+S2+S3+S4
 7070 K4=K1+K2+K3
 7090 PRINT:PRINT
 7110 IFJ4>4THEN7500
 7120 IFK4>4THEN8000
 7130 RETURN
 7500 PRINT"□□"
 7505 PRINTCHR$(7);CHR$(7);"          " ;"□□■                    YOU WIN
 7510 PRINT"■YOUR SCORE  ";J4;"                              ";"MY SCORE";K4
 7520 GOTO11000
 8000 PRINTCHR$(7);CHR$(7);CHR$(7);"                    ";"□□■I WIN"
 8005 PRINT"■YOUR SCORE";J4;"                                ";"MY SCORE";K4
 8010 GOTO11000
 9000 PRINT
 9005 REM: DISPLAY SEQUENCE-ENTER ACCURATELY
 9010 PRINT"    3";TAB(30);"6";TAB(60);"9"
 9020 PRINT"■■    2";TAB(30);"5";TAB(60);"8"
 9032 PRINT"■■    1";TAB(30);"4";TAB(60);"7"
 9040 PRINT"       A    B    C"
 9050 PRINTTAB(35);"□A    B    C"
 9060 PRINTTAB(63);"□A    B    C"
 9070 PRINT"■■■■■FRONT"
 9080 PRINTTAB(37)"□■MIDDLE"
 9090 PRINTTAB(66)"□■BACK".
10000 POKE32777,93:POKE32782,93:POKE32805,93:POKE32810,93:POKE32833,93
10010 POKE32838,93:POKE32857,93:POKE32862,93:POKE32885,93:POKE32890,93
10020 POKE32913,93:POKE32918,93:POKE32937,91:POKE32942,91:POKE32965,91
10030 POKE32970,91:POKE32993,91:POKE32998,91:POKE33017,93:POKE33022,93
10040 POKE33045,93:POKE33050,93:POKE33073,93:POKE33078,93:POKE33097,93
10050 POKE33102,93:POKE33102,93:POKE33125,93:POKE33130,93:POKE33153,93
10060 POKE33158,93:POKE33177,91:POKE33182,91:POKE33205,91:POKE33210,91
10070 POKE33233,91:POKE33238,91:POKE33257,93:POKE33262,93:POKE33285,93
10080 POKE33290,93:POKE33313,93:POKE33318,93:POKE33337,93:POKE33342,93
10090 POKE33365,93:POKE33370,93:POKE33393,93:POKE33398,93
10100 POKE32933,64:POKE32934,64:POKE32935,64:POKE32936,64:POKE32938,64
10110 POKE32939,64:POKE32940,64:POKE32941,64:POKE32943,64:POKE32944,64
10120 POKE32945,64:POKE32946,64:POKE32961,64:POKE32962,64:POKE32963,64
10130 POKE32964,64:POKE32966,64:POKE32967,64:POKE32968,64:POKE32969,64
10140 POKE32971,64:POKE32972,64:POKE32973,64:POKE32974,64:POKE32989,64
10150 POKE32990,64:POKE32991,64:POKE32992,64:POKE32994,64:POKE32995,64
10160 POKE32996,64:POKE32997,64:POKE32999,64:POKE33000,64:POKE33001,64
10170 POKE33002,64:POKE33173,64:POKE33174,64:POKE33175,64:POKE33176,64
10180 POKE33178,64:POKE33179,64:POKE33180,64:POKE33181,64:POKE33201,64
10190 POKE33202,64:POKE33203,64:POKE33204,64:POKE33206,64:POKE33207,64
10200 POKE33208,64:POKE33209,64:POKE33211,64:POKE33212,64:POKE33213,64
10210 POKE33214,64:POKE33229,64:POKE33230,64:POKE33231,64:POKE33232,64
10220 POKE33234,64:POKE33235,64:POKE33236,64:POKE33237,64:POKE33239,64
10230 POKE33240,64:POKE33241,64:POKE33242,64
10240 POKE33183,64:POKE33184,64:POKE33185,64:POKE33186,64
10250 RETURN
11000 PRINT"ANOTHER GAME? (Y/N)"
11010 INPUT Z$
11020 IFZ$<>"Y"ANDZ$<>"N"THEN11010
11030 IF Z$="Y"THENRUN
11040 STOP
11900 REM: INSTRUCTIONS & OPENIND
12000 PRINT"■   THREE DIMENSIONAL NOUGHTS AND CROSSES
12002 PRINT"   ------------------------------------"
12004 PRINT"■■YOU ALWAYS PLAY CROSSES COMPUTER PLAYS NOUGHTS"
12006 PRINT"LINES MAY BE COMPLETED IN ANY DIRECTION AND IN ALL THREE PLANES"
12007 PRINT"THERE ARE 49 POSSIBLE LINES IN TOTAL SOME LINES ARE DIFFICULT"
12008 PRINT"TO SEE SO LOOK CAREFULLY - THE COMPUTER DOES NOT CHEAT"
12009 PRINT"FIRST TO COMPLETE FIVE  LINES WINS- GOOD LUCK"
12010 PRINT"■■■■■■       DO YOU WANT TO PLAY FIRST OR SECOND?  (1/2)
12020 INPUTY5:IFY5<>1ANDY5<>2 THEN12010
12022 PRINT"□"
12025 IFY5=1 THEN RETURN
12027 REM: RANDOM FIRST PLAY SEQUENCE
12030 IF Y5=2 THEN Y%=7*RND(-RND(0))
12040 IF Y%=1THEN12090
12050 IF Y%=2 THEN12130
12060 IF Y%=3 THEN 12100
12070 IF Y%=4 THEN 12110
12080 IF Y%=5 THEN 12120
12085 IF Y%=6 THEN 12140
12090 B5=5 :POKE33127,143:RETURN
12100 A1=5 :POKE33255,143:RETURN
12110 C7=5 :POKE33319,143:RETURN
12120 B2=5 :POKE33100,143:RETURN
12130 A5=5 :POKE33123,143:RETURN
12140 A9=5 :POKE32911,143:RETURN
READY.
```

Five W 'Bee

by Carole Sutton

Five W is a murder game and being a detective, you are asked to find five things, these being: Where in the house did the murder take place, Why did it take place, Who was murdered by Whom and what Weapon was used.

The program provides for each W a selection of choices for you, the player, to choose from. Your five choices are then automatically displayed, with correct ones highlighted at the end of the attempt. The program ends with an epilogue if all five Ws are correct, otherwise after eleven unsuccessful attempts to solve the crime, the solution is highlighted.

```
 00100 CLS
 00110 CURS 7,6:PRINT "*** The Five W's - Where, Why, Who, Whom, Weapon ***"
 00120 CURS 20,8:PRINT"By Carole Sutton, 1983."
 00130 N=1:T=1
 00140 N=N+1:PLAY N,1
 00150 IF N<>22 THEN GOTO 140
 00160 N=N-1:PLAY N,1
 00170 IF N<>1 THEN GOTO 160
 00180 PRINT:PRINT:PRINT"A murder has just been committed, but no corpse can be f
ound    anywhere."
 00190 PRINT"You have been asked to find the scene, reason, victim, murderer and
the weapon."
 00200 PRINT:PRINT"*Press any key to continue.*"
 00210 A6$=KEY$
 00220 IF A6$="" THEN 210
 00230 REM SCENE
 00240 DATA"Study",1,"Laundry",2,"Family R'm",3,"Dining R'm",4,"Kitchen",5,"Bathr
oom",6,"Main Bedr'm",7,"Guest R'm",8,"Bedroom",9,"Billiard R'm",10
 00250 REM REASON
 00260 DATA"Argument",1,"Accidental",2,"Blackmail",3,"Jealousy",4,"Inheritance",5
,"Gaming Debt",6,"Cover-Up",7,"Insanity",8
 00270 REM VICTIM
```

```
00280 DATA"Capt. Smith",1,"Maj. Walker",2,"Mr. Kelly",3,"Sir Turner",4,"Miss Gli
tter",5,"Mr. Edwards",6,"Mi ss Baxter",7,"Mrs Carroll",8
00290 REM MURDERER
00300 DATA"Mr. Keogh",1,"Capt. Sanders",2,"Sir. Albert",3,"Dr. Courtney",4,"Uncl
e Dan",5,"Miss Thomas",6,"Mrs Webster",7,"Prof. Bright",8
00310 REM WEAPON
00320 DATA"Knife",1,"Spanner",2,"Arsenic",3,"Axe",4,"Gas",5,"Rope",6,"Hands",7,"
Gun",8,"Syringe",9,"Dart",10
00330 CLEAR:RESTORE 240:CLS:Z1=9:DIM J(12),L(12),M(12),N(12),O(12):Q=1
00340 K=INT(RND*Z1):IF K<2 THEN GOTO 340
00350 FOR G=1 TO K
00360 READ A0$,B
00370 NEXT G
00380 RESTORE 260:Z1=7
00390 K=INT(RND*Z1):IF K<2 THEN GOTO 390
00400 FOR G=1 TO K
00410 READ A1$,C
00420 NEXT G
00430 RESTORE 280:Z1=7
00440 K=INT(RND*Z1):IF K<2 THEN GOTO 440
00450 FOR G=1 TO K
00460 READ A2$,Y
00470 NEXT G
00480 RESTORE 300:Z1=7
00490 K=INT(RND*Z1):IF K<2 THEN GOTO 490
00500 FOR G=1 TO K
00510 READ A3$,E
00520 NEXT G
00530 RESTORE 320:Z1=9
00540 K=INT(RND*Z1):IF K<2 THEN GOTO 540
00550 FOR G=1 TO K
00560 READ A4$,F
00570 NEXT G
00580 RESTORE 240:CLS
00590 PRINT"Where do you think the murder took place? (Type 1-10)"
00600 FOR G=1 TO 10
00610 READ A6$,H
00620 PRINT H,A6$
00630 NEXT G
00640 CURS (56):INPUT J(Q)
00650 IF J(Q)>10 THEN CURS(234):PRINT"Try Again";:GOTO 640
00660 RESTORE 260:CLS
00670 PRINT"Why do you think the murder was committed? (Type 1-8)"
00680 FOR G=1 TO 8
00690 READ A6$,H
00700 PRINT H,A6$
00710 NEXT G
00720 CURS (56):INPUT L(Q)
00730 IF L(Q)>8 THEN CURS(234):PRINT"Try Again";:GOTO 720
00740 RESTORE 280:CLS
00750 PRINT"Who do you think was murdered? (Type 1-8)"
00760 FOR G=1 TO 8
00770 READ A6$,H
00780 PRINT H,A6$
00790 NEXT G
00800 CURS (43):INPUT M(Q)
00810 IF M(Q)>8 THEN CURS(234):PRINT"Try Again";:GOTO 800
00820 RESTORE 300:CLS
00830 PRINT"By whom do you think the murder was committed? (Type 1-8)"
00840 FOR G=1 TO 8
00850 READ A6$,H
00860 PRINT H,A6$
```

```
00870 NEXT G
00880 CURS (59):INPUT N(Q)
00890 IF N(Q)>8 THEN CURS (234):PRINT"Try Again";:GOTO 880
00900 RESTORE 320:CLS
00910 PRINT"Which weapon was used to commit the crime? (Type 1-10)"
00920 FOR G=1 TO 10
00930 READ A6$,H
00940 PRINT H,A6$
00950 NEXT G
00960 CURS (56):INPUT O(Q)
00970 IF O(Q)>10 THEN CURS(234):PRINT"Try Again";:GOTO 960
00980 CLS:PRINT"Your deductions are as follows with correct ones highlighted."
00990 INVERSE:PRINT TAB(3);"Scene";SPC(8);"Reason";SPC(7);"Victim";SPC(7);"Murde
rer";SPC(5);"Weapon":NORMAL
01000 FOR D=1 TO Q
01010 P=0
01020 RESTORE 240
01030 FOR G=1 TO J(D)
01040 READ A6$,H
01050 NEXT G
01060 IF J(D)=B THEN INVERSE:P=P+1
01070 PRINT A6$;TAB(13);:NORMAL:RESTORE 260
01080 FOR G=1 TO L(D)
01090 READ A6$,H
01100 NEXT G
01110 IF L(D)=C THEN INVERSE:P=P+1
01120 PRINT A6$;TAB(25);:NORMAL:RESTORE 280
01130 FOR G=1 TO M(D)
01140 READ A6$,H
01150 NEXT G

01160 IF M(D)=Y THEN INVERSE:P=P+1
01170 PRINT A6$;TAB(39);:NORMAL:RESTORE 300
01180 FOR G=1 TO N(D)
01190 READ A6$,H
01200 NEXT G
01210 IF N(D)=E THEN INVERSE:P=P+1
01220 PRINT A6$;TAB(55);:NORMAL:RESTORE 320
01230 FOR G=1 TO O(D)
01240 READ A6$,H
01250 NEXT G
01260 IF O(D)=F THEN INVERSE:P=P+1
01270 PRINT A6$;:NORMAL:PRINT
01280 NEXT D

01290 PLAY 0,11
01300 IF P=5 THEN 1340
01310 Q=Q+1:IF Q<12 THEN 580
01320 PRINT"ANOTHER unsolved case.!!!  ** Solution:**"
01330 INVERSE:PRINT A0$;TAB (13);:PRINT A1$;TAB(25);:PRINT A2$;TAB(39);:PRINT A3
$;TAB(55);:PRINT A4$;:NORMAL:END
01340 PLAY 4,6;6,2;7,2;4,4;10,8
01350PRINT"Come along ";A3$;" you are going to be charged with":PRINT"the murder
 of ";A2$;" in the ";A0$;"."" The weapon":PRINT"used was ";
01360 IF A4$="Knife"OR"Spanner"OR"Gun"OR"Syringe"OR"Dart"THEN PRINT"a ";:GOTO 13
80
01370 IF A4$="Axe" THEN PRINT "an ";
01380 PRINT A4$;" and your reason being ";A1$;".":END
```

INDUSTRY PROFILE SMALL FIRM
MICRO-BUFF

At 499 High Street Road, Mt Waverley, there's a popular little shop called MICRO-BUFF. MICRO-BUFF is owned and run by Mr Ray Pope and his family. The business has been operating for about three months at Mt Waverley. Prior to this, it was running from the family home, which proved claustrophobic, thus the need for new premises.

MICRO-BUFF was a natural progression into the computing industry for Ray. For 18 years, Ray was involved in the electronics business which gives him excellent background knowledge when dealing with computers. Many of his customers remember when Ray was still dealing with electronics.

Keeping up with market trends

Ray's prime concern is keeping up with current market trends and keeping prices as low as possible. Buying direct from the manufacturer, enables Ray to do just this. Several times throughout the year, Ray travels overseas to Asian countries and Europe to see what's new and available on the market. When he's in Australia, he's kept up to date via contacts overseas. With any new computer purchased it is always run and tested by Ray himself. If he doesn't think the product is good enough, he simply does not sell it.

The Duet 16, recently released from Japan now has new software available. The software allows it to read any 5¼ inch disk which includes the IBM PC. It comes with an expansion box which allows the memory to be increased to over 1Mb, and with the addition of a 68,000 micro-processor interface. It can run larger capacity programs including Unix. It sells for $4,700 and is one of the best expandable small computers on the market today.

New range of hardware

The range of stock includes anything from a small 64k Z80 running computer to the Duet 16 8086, full 16 bit, 9MHz running computer. They also import printers, monitors and accessories such as interface cards, disk drives and are starting to import software. Within the next month, two new computers will be available. One is a multi-user machine, which can have up to seven users. It's a 256k, Z80B machine which includes 800k floppy disk drive and 21.5Mb hard disk, with a total cost, for four users, under $9,000. The other machine is a Z80A machine for one or two users with overall inclusive software worth $2,500. Both are business machines, running accounting and word processing software.

MICRO-BUFF also has printers to suit the Logitec 500 Daisywheel printers with 15 characters per second. These

ON THE MOVE

printers have serial and parallel inputs and tractor and friction feed comes as a standard feature. These excellent printers are probably one of the best buys available for $708 (tax inclusive). The direct importation and retail cuts the middle man out, and as a result prices are very competitive.

After sales service

After sales service is provided by four systems support staff, for both software and hardware. Ray always tries to give 24 hours turnaround and same day service, if possible for businesses so the operators are not without the computer for too long. There is full back up service and they look after all their warranties.

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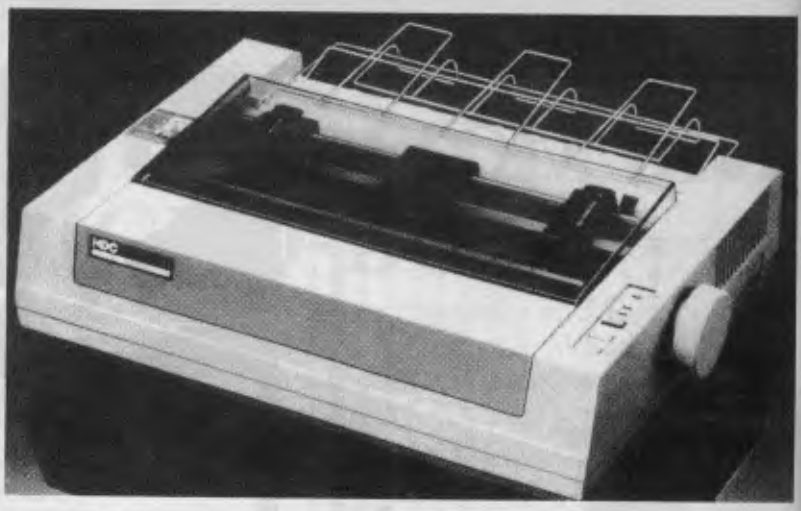

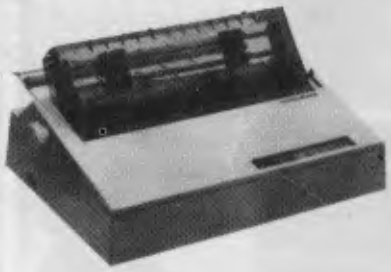

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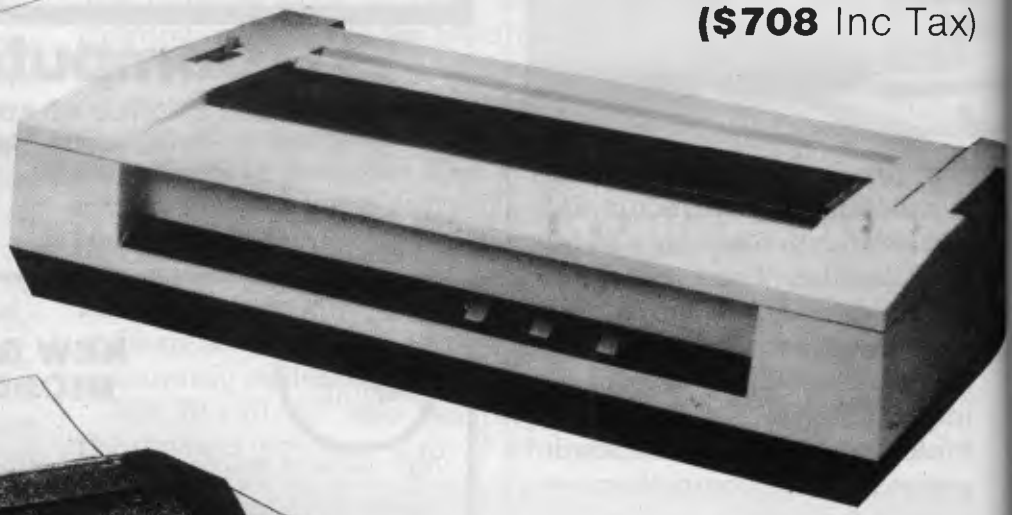

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No matter which PC you own, PC Games will tell you everything you've ever needed to know about micro entertainment. Make sure you don't miss out. Shoot down to your newsagent on July 19.

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CHIP CHAT

Thousands of fans regard The Hobbit as 'the most exciting and challenging adventure available' — that's what Melbourne House says. In response to 'overwhelming demand from fans' it has now produced *A Guide to Playing The Hobbit*. The word is that typing 'Help' in any edition of the game purchased after April 84 will elicit the prompt: 'Buy the Guide, sucker!'

New York publisher Harper and Row has produced a glossary for Gweeps which should be groked by users and lusers alike. This glitch-free manual provides a canonical reference to the cupsy talk we're supposed to flame. *Time* magazine has given it a rave review, but it's certain that this moby mumblage will punt before login to language used in the *real world* (Noun, singular: where hacks don't live).

Word processors are revealing the truth about their users, and the truth is that the users can't write. IBM gets at least one call a week from US universities begging for a program to teach good writing habits, and willing to pay anything for one. So, IBM has developed algorithms for style-checking software — a prototype is soon to be installed in a University. One option under consideration is a sexist-prose checker. Have *you* put that hyphen in the right place?

Computer Edge has appealed against the decision of the Federal Court which conveyed copyright protection to computer software. The notice of appeal is a fairly involved ten page document which won't see the light of day (ie, High Court) for many months. In the meantime, Computer Edge has been quick on its feet to produce re-written source and therefore object code for its Wombat computer, thus, it claims, making this Wombat outside the jurisdiction of the current Apple versus Computer Edge case. Mike Suss, managing director of Computer Edge, says the new ROM will run virtually 100% of Apple software using "more efficient" routines on a 6502 compatible CMOS chip.

We had the briefest look at the new machine and found it to run most Apple software (the source code author claims all — we don't dispute this categorically given the limited amount of time we had to look at it); have extra commands over dinkum Applesoft Basic; and perform very similarly to the Apple on benchmark tests. More details next month.

2. Remove shipping screws.
Carefully lift front of printer unit and make it stands as the bottom of case be vartically face to you and hold the unit by the one of your hand on the soft surface. Then, remove the shipping screws with a Phillips-head screw driver. After it is removed, gently back the unit to lay flat on a firm surface, position the printer front be face to you.

From the Commodore 1526 printer manual the following appears under Setting-up.

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