

Australian Personal Computer

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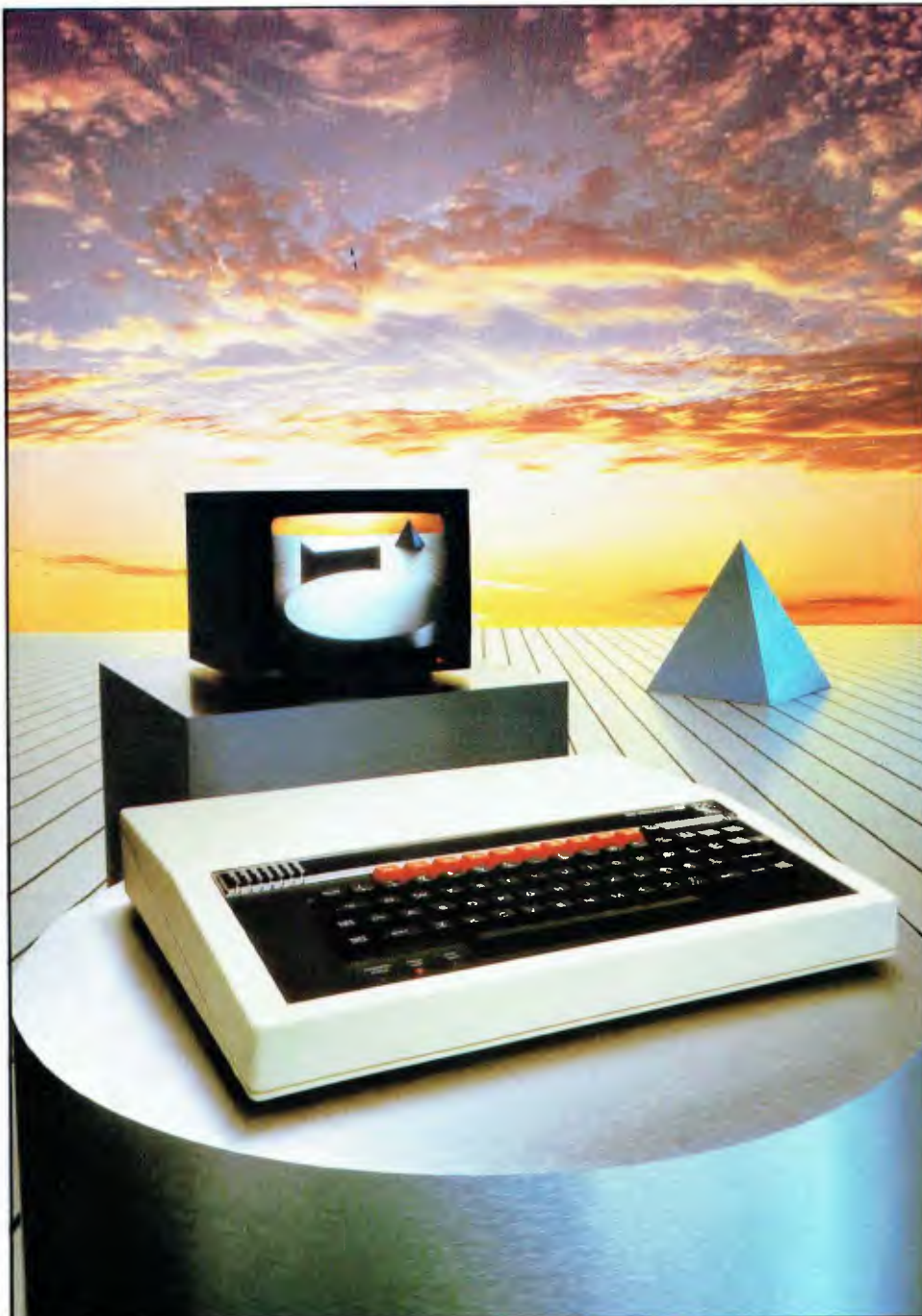
AUSTRALIA'S TOP SELLING COMPUTER MAGAZINE



HOW MIGHTY IS THE SWORD?
We put the M5 on trial

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.


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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.



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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 than 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.

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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. Katakombis. 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

Repondez. Comprenez.

Logical Thinking

Vennman. 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. Enzymic 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.

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A new portable computer with a large built-in display put under the microscope by Dick Pountain.



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Kathy Lang examines MicroPro's offering which is already second to just dBase II in the CP/M stakes.

APC reports on the latest news from the world micro scene

Silicon Valley price wars rage on to the death

Serious developments in Silicon Valley are threatening not only the confidence of the industry's gents but all the vociferous independents who rely on software and peripherals to survive. As more games machines miraculously transmute themselves into computers: Atari, Coleco, Odyssey . . . it seems more and more rats are getting onto the sinking ship. The price of software is plummeting daily and now mainstream US publishers feel that the water is right for them to give it a shot. They were initially attracted by the high price and the ability to manufacture cheaply and sell through existing retail book outlets.

The TI fiasco with cancellation of the 99/2, shows that even the largest companies are not immune from misreading the signs. The plummeting stocks at Warner Communications at the end of last year left investors bitter and now with the TI crisis, things are not all roses in computerland.

And yet, a Japanese strategy has now emerged and the plans have been laid on. The usual ploy is underpricing (a traditional technique). Timex and Radio Shack hold the bottom of the market. The MSX common standard for the developers of software agreed by Microsoft Corporation and 14 Japanese computer companies signals the establishment of a unified stable market for the Japanese producers of both hardware and software in years to come.

In the turbulent waters ahead there will only be a few survivors and Tandy, Timex, Atari, Commodore and TI will need to use their bugles like foghorns. Not all will make it to IBM-land where so far only the Golden Apple grows.

The Coleco Adam bundling together of a computer, software and peripherals into a package has taken the industry by surprise. The Adam package will sell for \$600. Although not something that will arrive here immediately, previous US computer guidelines on pricing suggest it will sell for near \$1000 here, which is too rich for most people's blood, even though one gets a complete system. There is a new tape data storage device, better quality printer, word processing software, joystick, and a video games cartridge. The publicity people tell us that the printer that comes with the package alone is worth the \$600.

The computer games programs are going to be retailing from \$9.95 compared with \$20 to \$35 around Christmas time. And business-oriented software such as spreadsheet, word processing and electronic filing software will be coming down to \$50 to \$100 compared with several hundred dollars that these cost a couple of months ago.

Sinclair Microdrives and ROM packs

Only a year late, Sinclair released not one, but two 'fast load' software devices.

The Microdrive, which so

impressed the world when Clive Sinclair showed the first prototypes last year, is to be sold in the UK for £50, enabling customers to load a 48k program in nine seconds, rather than the quarter hour it takes off audio tape.

Sinclair Research was also planning to release the serial interface which will be used to network up to 64 Spectrum computers together. This will be seen as a big marketing plus in the schoolroom.

The actual 'stringy floppy' or endless tape loop used in the Microdrive will cost £5, and will have a capacity of 85k.

Software producers will therefore be under pressure to offer it with more than one program per cartridge.

News of the plug-in read-only cartridge is likely to be delayed, however. Sources told us that there were still various technical decisions to be finalised.

One, in particular, affects the way software will be 'protected' against copying.



Sinclair's Searte: Microdrives in volume.

Microsoft MSX 'old hat'

Microsoft has firmly

quenched any "gee whiz" excitement about its MSX home computer standard, announced earlier this year, by declaring it all to be "old technology".

Scott Oki, head of international operations recently said that Microsoft has built "around 100 prototype MSX machines for software developers."

Oki also announced that a rival plan, put forward by Digital Research, has been nipped in the bud.

A rival plan was to have been based on Japanese software supplier Nippon Soft Bank and Sord, with Digital Research co-ordinating the work.

However Microsoft chairman Bill Gates has told staff that "Sord will do nothing and Soft Bank has now joined MSX".

The inducement to switch allegiances, said Oki was simple: "We reduced our royalty payment demands from \$3.50 for 100,000 systems to \$3.00, and Soft Bank were then able to agree to join in."

Digital Research staff were unable to comment by press time.

The idea of MSX is reminiscent of the old railways idea of the "standard gauge" track. It sets out essential hardware bits and pieces of the future Japanese home computer.

According to Oki, the MSX standard "will open up the Japanese market to world software writers."

He said: "Even today, less than two in a hundred Japanese homes have a home computer. The most popular is the NEC PC600, and that sells for over \$300. So they're facing a situation quite unlike the United States where there are VIC 20s, and where there is now talk of even the Commodore 64 coming down to under \$100 by end of year."



Oki: MSX is not optimised for today's technology.

Oki does not think MSX will make any impact outside Japan for two years. "This MSX design is not optimised for technology today," he told us. "One day, of course, it will be, eventually, just because of the technology that the Japanese firms will throw at the MSX problem. It will make this sort of machine cost less than \$100, by 1986."

The specification requires a Zilog Z80A processor, a Texas 9918 video display (graphics) chip, the Microsoft GW (Gee-Whiz) Basic as used in the IBM micro, a pair of joysticks, a standard 50-pin ROM cartridge and an audio tape cassette. And there is a General Instruments sound-generator chip, too.

The specification of MSX is based on the Hong Kong designed Spectravideo machine, the SV280, and is included in the SV380 with an expansion box, Oki said.

Digital Research hit back cheerfully with news of a defection from the MSX camp — NEC.

And a Digital Research executive said that "the whole idea of MSX is simple capitulation by Microsoft on the graphics front."

According to this executive, DRI has a clear lead in graphics for micros with GSX, and Microsoft is having to ask machine builders to design a common machine, before they can match this.

"There will be an announcement from DRI within a month," the executive concluded.

No rise for flat screen displays

Flat computer displays will not take over from conventional picture tubes until at least 1990, according to a new report from market research outfit Stanford Resources.

The argument is that in terms of cost per character none of the nine main flat display technologies will be complete until the end of the decade.

In the report, Stanford Resources argues that the replacement of CRTs by flat panel displays is "easy to visualise, but technologically

and economically extremely difficult to implement.

"None of the 20 or 30 techniques for producing flat panel displays is manufacturable for a cost of less than five times an equivalent CRT."

IBM's deal with Digital rouses rivals

The honeymoon between Microsoft and IBM may be over. 'Big Blue' is to start selling rival Digital Research's Concurrent CP/M-86 as an operating system for the PC and Microsoft was also noticeably absent from the IBM conference on information centre management held in Miami at the end of June.

Despite adopting Microsoft's PC DOS as the native operating system for the PC, IBM does not appear prepared to wait for the concurrent version, due out in September.

Instead, IBM issued instructions to its 9,000 US executives on 19 July telling them to start marketing Concurrent CP/M-86 with other non-IBM logo products such as WordStar, dBase II, Microplan and Microlink. Unlike many of IBM's other agreements with software suppliers, the deal with Digital Research is not limited to \$1.5 million, so that even if each account executive sells only one copy, revenues of over \$1 million will result for DRI.

A spokesman for IBM dismissed the idea of plans for IBM to sell Concurrent CP/M-86 in the UK as "pure speculation". He added that IBM's links with Microsoft "extended beyond whether

they are at a conference or not."

A Microsoft spokesman, anxious to make light of IBM's apparent betrayal but wary of committing himself about whether IBM does have copies of the new release of PC DOS for beta testing commented: "We deal with IBM at top level and they know what we're doing. They will be selling Concurrent CP/M-86 as an unsupported product and it is not, in any case, a true multi-tasking operating system because of being disk-bound. The new version of PC DOS will not be like that — it will have full multi-tasking facilities."

Stringy floppies aim at middle range

As the need to store computer data, cassette tapes have been losing out to floppy disks for some time. Tapes are cheaper, but they are also painfully slow and unreliable, but a new type of tape machine has been developed that is swifter than cassettes and might lead to a resurgence of the use of tapes as a storage medium. The Coleco Adam uses this technique and various other small development companies are producing a whole range of this kind of memory system for everything from the Commodore 64, VIC 20 and any other computer that has a large installed base to provide a tempting target for their attention.

Entrepro Inc has developed a system both for the Atari and the Texas Instruments. It's a

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Californian company and it has devised a wafer tape, which is 1/16in compared to the 1/4in width of a normal tape. It looks like string and it is being called the stringy floppy. One problem with the traditional cassette is the time that it takes for the tape to wind to a proper spot, and

once the tape has reached the proper location, it can still take several minutes for the data and the program to be read off the tape into the computer or to be recorded from the computer off the tape.

The wafer device however is a continuous loop tape similar to the old-fashioned eight track cartridge, which whirls at 10in/second.

Entrepro says that a program that could be loaded into a computer from a disk drive in seven or eight seconds would take 15 seconds to about 1 minute to use the wafer tape, and several minutes on cassette. Yet the wafer tape drive will sell between \$75 and \$100 and in time, will come down in price as the demand and therefore the volume of production increases.

This compares with about \$300 for a cheap disk drive. The wafer tape can hold up to 128,000 characters, about the same as a low capacity floppy. Of course, there are always problems. Entrepro has trouble perfecting its technology and the manufacturing process which prompted Coleco to abandon its plan to use the wafer tape for the Adam. Coleco instead opted for a reel-to-reel tape device that outwardly resembles a cassette.

Wizard games soon from Sydney/Sierra

US micro games specialist

Sierra On-Line has signed a deal with Canadian firm Sydney Development, best known for its mainframe packages.

Under the terms of the deal Sierra and Sydney will work together on a series of games for the Apple, Atari, Coleco and Commodore 64 machines involving Johnny Hart's BC and Wizard of Id strip cartoon characters.

According to Sydney, several titles will be ready for the Christmas rush including Quest for Tires, Wiztype, Wizword, Wizlab, Wizmath, Wizspell, Dot-to-dot Zot, and Bung Juggler. The reasons for the names will be apparent to fans of the strips.

Both Sierra and Sydney claim that this is the largest licensing agreement made by any independent US software company to date. It

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gives Sierra world publishing and sub-licensing rights for all popular home computers, and gives Sydney \$1m in up-front royalties with the prospect of more to come over the next three years.

At least eight games and education packages will emerge over the next eighteen months, and Sydney is planning a big TV commercial push in the US for the Christmas run-up. Both the games and the TV commercials will use Sydney's 'unique' computer graphic system, which is said to create cartoon-quality animation a cut above normal computer graphics.

Short circuit

The company which produced the first portable computer, Osborne Computer Corporation, has barely scraped through the worst crisis of its short history, having been saved from what accountants call 'bad cash flow problems' by an injection of around \$20 million.

How the company actually got to the point where all the shareholders (or all I know about) had to cut their share of the stock by half is one of the saddest tales of wasted optimism ever.

The reason Osborne got into cash flow problems was simple enough: the company couldn't

ship enough machines to pay the previous month's bills.

And there were two occasions when this happened: first, when it was switching to the new double-density disk storage system (storing 180 kbytes per diskette, rather than 90 kbytes) and second, when it was due to start shipping the new Executive, and didn't have any to despatch.

On its own, that wouldn't have been a near-fatal problem. The reason it was nearly catastrophic lay, paradoxically, in the success of the company. Growing at an enormous rate, Osborne needed absolutely every penny it could make in January in order to buy the parts for the February shipments.

Originally, the optimism was quite possibly justified. Osborne's dream was to produce a cheap machine which would provide a software standard. It would be the most common CP/M computer, and therefore most people would want to write programs for that one first.

To make it cheap, he said, he would have it designed in-house, but all the other work would be bought in from the high-powered specialist companies working in Silicon Valley. His nails-for-breakfast buyer, Tom Davidson, would bully incredibly low prices out of chip and board suppliers, and sub-contractors would assemble the boxes. And as soon as anybody tried to

compete, the lean and hungry corporation would demonstrate that there was a lot of price elasticity in the design.

It went wrong almost from the day the first machines were shipped, when regular, ordinary people started joining the company. They wanted regular, proper jobs.

First of all, they weren't happy about the quality of the product. It was cheap and cheerful, and they wanted to be associated with high quality.

Then, when these bright new people inside the company found out that Davidson didn't seem to be on their side, they were appalled. Stories circulated of 'hidden commission' payments by successful supply tenderers, of designs sold to competing companies (Access Data) and of other double-dealing: whatever the truth, Davidson got fired.

And whether or not he was whiter than white, his ability to buy memory chips, plugs, power supplies and design expertise at half the normal price was not replaced. So the Osborne 1, far from being a very profitable item, became a very marginal item.

That wasn't too bad because Osborne's idea had always been to make his big money on software. One of his cleverest ideas was to get a list of every owner's name and address. He did this by withholding the dealer discount until he got the name and address. Then he mailed them (the owners) with offers of software.

But the idea of making money on software relied heavily on having a lot of software to sell. And it took much longer than people realised for this to happen. The machine was far from a standard CP/M machine, so



A new programming language for IBM users: Logo has licensed itself as the official educational language. This announcement is behind the announcement of (and will probably arrive behind the expected arrival of) Digital Research's DR Logo on the machine.

I'll be very surprised if there are big differences: apart from the fact that this will be the official one licensed by Logo Computer Systems Inc of Quebec to IBM directly.

And of course it has the incredibly creative Logo logo shown here.

Urgent Product Safety Notice

RE: High Resolution Green Screen Monitors Cat X-1200 'BMC' Brand, units marked with code BM 12ES only (marking on identification plate on rear of monitor).

We have been advised that wiring on a small number of these monitors could develop a fault which, in conjunction with incorrect mains power point wiring could make them potentially dangerous.

If you have purchased a monitor as described above please return it to the point of purchase where a free safety examination will be made and, if necessary, arrangements will be made for modification. ONLY monitors with code BM 12ES on the rear panel are affected.

DICK SMITH Electronics

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software either had to be written directly for it, or had to be adapted. And the limitation of having only 90 kbytes of diskette space turned out to be another handicap to programmers trying to fit things into the system—too many of them had got used to at least twice that.

Double-density ran into problems, because the diskettes were simply not up to the standard needed. They went out, they came back. Deliveries stopped. Debts mounted, money didn't come in. Kaypro sold a lot into the vacuum, and made good publicity out of it.

Around this time, the power struggle (inevitable at the top of most big corporations) got to be vicious. Energy that should have been diverted to getting the product out, to getting a Mk II ready, to getting Mk III started, went into getting the boss fired—well, made into Chairman of the Board.

It also went into a meaningless dream—that of going public. Going public in America is the sort of thing that can take two very senior executives out of the firm, full-time, for as much as a year. And in the end, it was all for nothing, because Osborne Computer just wasn't in any sort of shape to go public.

The big capital injection now allows Osborne to pay its debts, and move on. So far, so good: but there are a lot of questions still worrying people in California, such as: 'Can the Executive sell in big numbers, soon?' and 'What will happen to the Osborne 1?' and 'How much will it cost to develop new, 16-bit products?'

One big white hope for the company, a smaller, tidier version of the Osborne 1 (it was first dubbed the Vixen, later the Companion) has been swamped by a wave of far cleverer and neater developments like the Gavilan and the Tandy 100. It has been cancelled. But it cost a lot of

money to take to prototype level.

Adam Osborne and Clive Sinclair like to muse on the striking similarities in their fates. Both English, both ex-journalists, both regarded as figures of authority, both wise to the power of low-cost micros, and both making a fortune out of computers. Adam should have taken it a step further and reminded himself of another line in Sir Clive's pedigree. That is—'made a pretty thorough mess of his first high technology company.'

Don't make the mistake of writing Osborne himself off. I don't know more than a couple of people in Silicon Valley who doubt that Adam Osborne now knows, in detail, almost everything he thought he knew before launching Osborne Computer.

He may even get knighted, one day.

Guy Kewney

Fighting fit

Gary Kildall could have been more explicit. He said that 'if IBM had not given the contract for its operating system, PC-DOS, to Microsoft, we would not be as strong as we are today.'

The battle continues happily between Kildall's Digital Research and Bill Gates' Microsoft, with all the fun of a long-running Dynasty saga—and all the predictability, too.

One month, Gates is trotting out his old friend Chuck Peddle to say that Sirius will now support only MS-DOS—but there is no war. Then the next, Kildall is offering Future Technology, Future Computer, and even PC-DOS itself, as proof that his company may not have IBM, but it has everything else. But there is no war, of course.

The wise pundit will keep an

open mind about this race, as on any other unpredictable subject. But I have no pretensions to wisdom, so here's my opinion: Kildall is right, but he could express himself more forcefully.

What he should have said is that until it lost the chance to make CP/M-86 the IBM

standard, his company was horribly complacent—but that now it is at least doing its job.

This month's signs are that DRI is working hard start off so that anybody with an IBM micro can buy Digital Research programming languages (CBasic, MT Pascal, and soon) without buying CP/M-86.

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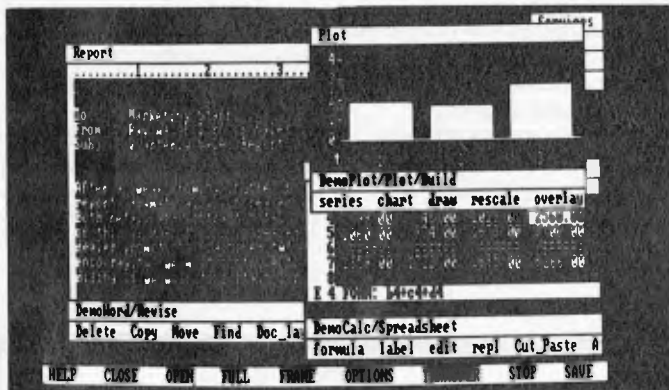
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A typical VisiOn screen with word processor, plotting and spreadsheet windows

Kildall managed to make this sound like an important concession to the average user, and in terms of appearances, psychologically it is. As for his suggestion that support for

languages under PC-DOS was not the same as support under MS-DOS, there are many who will take it as acknowledgement of defeat.

For the average user of IBM

type machines, however, it is more significant that you can now buy Concurrent CP/M86 to run on the hard-disk version.

That version of CP/M is very nice, spoiled only by the delay in getting the modern file-handling abilities of CP/M Plus. And by selling it with applications that use CP/M, he will start pushing the statistics the other way.

For the future, the most significant move is probably the decision to support Visicorp in its VisiOn venture.

VisiOn (says Visicorp) will do for IBM users what the mouse does for Apple Lisa. Having CP/M in the package, even if DRI itself comes up with something rather similar (like the Monarch system which

Commodore's Tramiel keeps talking about) makes CP/M look like a much longer-term thing.

Guy Kewney

Barson launches Spectrum

The Sinclair Spectrum has finally made it to our shores. Sales will begin in September with a basic price of \$295 which isn't particularly cheap when the machine has to stack up

Unfortunately, this piece is literally being typed into a Tandy Model 100 (on loan) in the publisher's car, chasing the artwork in a vehicle some half mile ahead as it proceeds to the printer containing no mention of an ambitious project by an Australian company to manufacture micros. Excuse please, the brevity of this report, but appreciate our desperate attempts to publish the news first.

The product is a briefcase portable. It could be described as an Osborne 1 Australian style (with utilization of more recent technology). The 'Executive 816' is based on a Z80A processor running CP/M with two slim-line 5¼" floppy disks providing a total of 1.6Mb on line.

The screen is small at only 5" but manages to squeeze 80 x 24 characters on it — how successfully we'll say after conducting a full test of the machine.

As is standard practice, being portable it comes with a host of software estimated to be worth \$4000 by the manufacturers, Amust Computer Corporation (Australia). Retail price in Australia for the whole



package will be less than \$3000. Science and Technology Minister, Mr Barry Jones MP,

unveiling the product on August 19, said: "Amust is a fine example of the successful

commercial application of Australia's undoubted technological excellence."

PRINTOUT

against Dick Smith's VZ-200 and Tandy's new MC-10 both selling for under \$200. However, as readers who have been following our reports on the dramatic price war ensuing at this low end of the market in the US will be aware, the price of the machine must be considered in relation to the amount and price of suitable software. There is no doubt that the Spectrum and Commodore's VIC 20 vie for the title of the best software supported home micros in the world. And they both sell in Australia for around the three hundred dollar mark (with no rumours of impending price cuts, unlike machines currently retailing in the \$500—\$700 range).

The Sinclair Spectrum does not have any particular

advantage over similar machines from a technical/hardware or price point of view. Its strength is in the ocean of software currently available on foreign markets which should soon be available here.

Barson Computers, the exclusive Australian distributor, is on (03) 419 3033.

In addition, Sinclair Research is committed to the production of a range of innovative peripherals, one of which has been recently announced in England. It's called the Microdrive (suggesting a floppy disk drive) which is actually a stringy floppy selling in England for \$80. Details are elsewhere in this issue's *Printout*.



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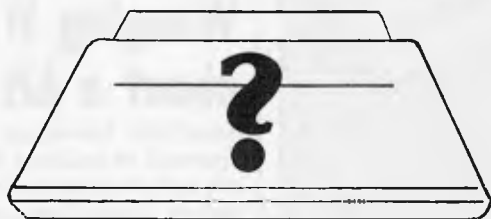
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The Australian micro scene as viewed by Frank Linton-Simpkins.

Little Grey Radio Shack in the west

While IBM's bus run to the Bowral event was rather a new departure for that company it had been to some extent prestaged by another bus trip a few days earlier to Tandy.

Tandy has located its main distribution facility to

the far west of Sydney at a place called Mount Druitt where once was held a 24 hour car race and where less mechanical activities are carried on on a 24 hour basis seven days a week.

Once, not too long ago, a full house multi-user riot was held at Vinegar Hill, just to the east of Mt Druitt. Having been to both places I cannot understand how the riot isn't still going on.

Tandy, from its little Grey Radio Shack in the west,

announced that it was releasing a whole new set of micros with varying degrees of portability.

These range from a device to fit the sidepocket of an old suit to the underneath layer of a decent makeup kit.

Others in the range require the aid of perhaps a "key grip", a "best boy" and a "gaffer". Mind you I haven't the vaguest idea of what any of the three would normally do but they are always listed on film credits and seem to

have a modicum of strength.

Tandy has linked all the new machines to its already established TRS-80 range, though one wonders if there is too great a family resemblance except in so far as the labels go.

The TRS-80 Model PC-4 is the old suit pocket variety and the TRS-80 Model 100 is the briefcase or makeup case carryable one. The TRS-80 Model 100 is ideal to take to an IBM Customer Executive Program Dinner as it not only is easy to carry but it drives IBM wild. In a somewhat bewildering way of numbering the TRS-80 Model 4 is a personal computer that mounts on a desk top and the Model 12 is a "Professional" computer. The Model MC-10 is a new micro based Colour computer and so it all goes.

One other new thing for Tandy is that the new machines aren't exactly the cheapest on the market, but then IBM isn't the cheapest in its field either, and look at it.



After running through almost all aspects of computing the Australian office automation company, Remington Business Machines Pty Ltd, has moved into the personal computer market with NBI 2000.

Remington's entry will impact on the executive personal computer market currently the preserve of IBM's PC.

In a manner not unlike IBM, that is the new NBI 2000 is intended to be used as part of a network of information processing applications, Remington has largely turned its back on the home/hobby sectors. That is for the present.

The NBI 2000 is intended to talk to a Remington supplied OAS 64 from NBI. The 64 is to maintain large scale files and to provide shared resources for a number of the Personal and other NBI systems.

Remington says that the 64 can happily talk to a mixed network of IBM PC's and NBI 2000s and the mass user of IBM PCs is seen as a major sales prospect for NBI. So far Remington hasn't sold any NBI 2000s, they were only announced in Australia on August 4, but it has over 50 of the 64s installed in NSW alone.

Wanging it about a bit

Apart from having an approach to knickers that can only be commended, the Sydney Dance Company is one of the great dance organisations of the world. But all those beautiful, for the company's business is the production of beauty, have to eat and even the tiny costumes cannot be had for nothing.

In short the company is always short of cash to handle running expenses like new shoes, accounting costs, fees to the resident choreographer (whatever he is paid is far too low), paper and pens etc.

Wang has moved from

sponsoring 5.4864109 metre sailing skiffs, through 42 kilometre running races to the far more physically strenuous sponsoring of the Sydney Dance Company.

Wang has made available just over \$80,000 in the form of much money and a small Wang computer to enable the company to keep its feet moving across the boards. Can we expect to hear of Apple sponsoring a pie baking competition, Facom moving into Ikebana and Honeywell backing the annual ferry race on Sydney harbour.

TEST and Debug

According to the journalist who brought the TRS-80

Model 100 to IBM's party, it really is a rather nice looking unit, borrowing the machine for test hadn't been easy.

In contrast to other makers Tandy rather insists on a few guarantees. Included in these are that the only person to use the machine is the titular borrower, the company has to be indemnified against loss or damage and that the return of the machine to Mt Druitt has to be at the expense and responsibility of the borrower. Oddly the agreement hasn't to be signed in blood at the dark of noon.

Getting it back to Mt Druitt wouldn't be easy, the courier might be attacked by Dingoes and there is more than an outside chance of

encountering a few spears and returning boomerangs. The one at Bowral was of the \$1099 order and had a very nice looking eight line display. But since I couldn't touch it without the borrower being condemned to a painful death I couldn't really say how good it was.

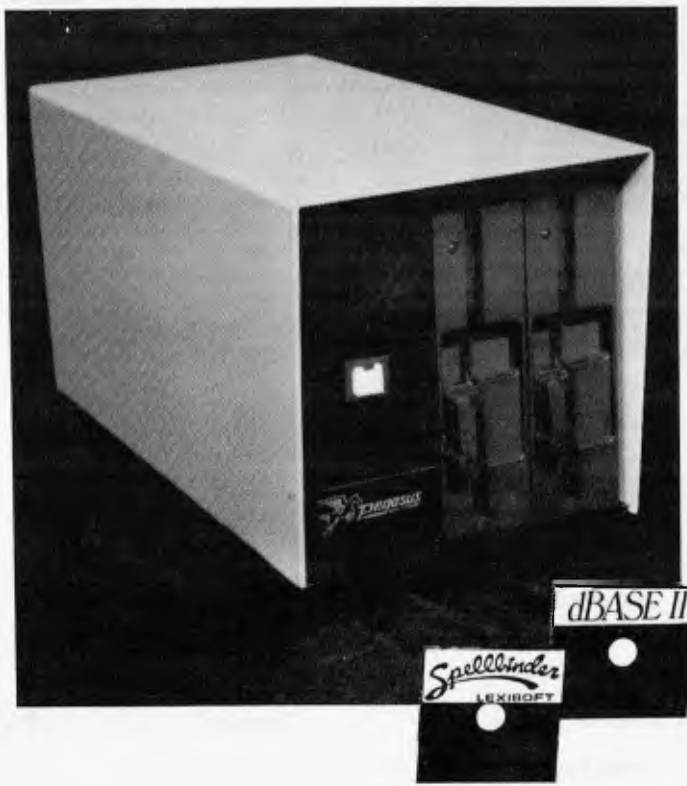
To the manor borne

The night after August Bank Holiday there were 15 devout IBMers and seven totally agnostic and atheistic journalists who didn't even believe in White Plains and all eating and putting on IBM's Camus at that. Enter

stage left a prodigal journalist carrying a Tandy TRS-80 Model 100.

Since the rest of us had been Case Studying and fending off the proselytising and the laying on of hands of the IBM missionaries since early morning with a 45 minute break for lunch, the Model 100 came as something of a blessed relief. IBM wasn't as pleased about it all as we were.

There was a move by a certain element of IBM, the devout outnumbering gentiles two to one, to have the man with the Model 100 as guest of honour at an impromptu auto de fa over near the chook yard. Wiser and more experienced heads prevailed and arrangements were made to have him called up the next morning



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ASERTOIDS PLUS is the finest high resolution graphic arcade game available for the MicroBee computer. It features spinning 3-D point by point resolution graphics, shields, intelligent beings, guided missiles, black holes, high-score board and breathtaking sound effects. ASTEROIDS PLUS took more than 1,000 man hours to write and cost in excess of \$20,000 to develop. You owe it to yourself to experience the best in arcade games on your MicroBee

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METEOR RESCUE is a high speed graphics arcade game. The mission is to shuttle earthlings from the planet surface to the mother ship without colliding with meteors and other spinning 3-D objects. The game increases in difficulty as the score rises

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GHOST MUNCHER is styled after the very popular ATARI arcade game, PACMAN. What more needs to be said?

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TRSBEE is a package of three programs that loads TRS-80 Model 1 and 3 program tapes into the MicroBee without any additional hardware. Although some program editing will still be required prior to their running, the majority of program typing time is saved by TRSBEE. The first program loads TRS-80 BASIC programs into MicroWorld BASIC. Most programs may then be edited and run. The second program in the package loads any TRS-80 machine code file into MicroBee memory. The third program loads TRS-80 assembler files into the MicroBee EDITOR/ASSEMBLER. Any TRS-80 Model 1 or 3 tape may be loaded. TRSBEE opens up a whole new world of possible software on your MicroBee!

\$30

The following three programs are about to be released. Orders may be placed for them now and the programs will be sent out as soon as they are available.

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DEFENDER needs no introduction. The DEFENDER arcade game is one of the most popular ever produced and we expect that our MicroBee version will be the same

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in time to join a run around the gold course and over the melting ice.

IBM and the Apostates

The people who live within the realms of the micros are not aware of the real world peopled by IBM, Honeywell, Hewlett Packard and even a few civilians.

If you sell a micro costing about \$1000 not a lot is going to be available to spend on the finer things of life like food and drink and advertising.

But if you are a \$44 billion company much can be done. Thus IBM was able to invest in taking, at a bottom line cost of circa \$150 per man day, eight journalists to Berida Manor at Bowral for a religious retreat. Berida was the site of a large scale visit by many heads of state far back in the Fraser era. Recalling the rather radical re-cycling habits of the head Indian at the earlier conference one took rather a closer look at one's dry ginger ale than normal. Was IBM responsible for the wake-up calls at 7.00am? Was it just possible that the company wanted us up and over the worst before starting at 8.30 on the "Customer Executive Program"?

City bred micro

Just behind Sydney Town Hall and around the corner from the French Deli, their pate is superb, lies the world's most unusual computer factory.

Almost at the top of one of the city buildings is the works that makes System I

computers and from which 300 odd units have been installed. Now the city's only computer factory is to start exports to foreign lands and perhaps even to Queensland.

Actually the System I machines are all built by one man who spends a great deal of his time seeking certain components from retail outlets, as suppliers from overseas aren't always as certain in their deliveries as we are told they are.

Kentucky fried and Susi Computers

There is yet another portable computer to be shortly released upon our agog markets. This one will sell for about \$450 with some software and 32k. Included in the software, if someone can build a really portable letter quality printer, will be "Wordstar". One wonders if the new Japanese made machine will have virtual store as well as a data highway and multiplexer channels.

Computers and potential criminals

At the recent conference in Sydney of the Australian Federation of Travel Agents Dr Bill Caelli of Ecom demonstrated the concept that hackers are alive and well and living in Surfers Paradise.

While not as dramatic as the postulations behind the making of the film "Wargames", Bill ably

demonstrated how an immensely skilled man with a few hundred dollars worth of equipment bought from Tandy or Dick Smith etc could get a free holiday.

Mind you one has to point out that there aren't too many Bill Caellis around or the entire travel industry would now be in the hands of the receivers, also the banks and many other organisations as well.

Still he is an inspiration to us all. Let's get out and hack our way into the ASIO computers and positively identify all the people we dislike as KGB dupes. Then we all have to book first class flights to Silicon Valley and cancel the listings on our credit cards.

After all Dr Caelli says that microcomputer systems are the things that currently offer the best opportunity for computer crime there is.

What time does this University open?

The NSW Post Graduate

Open University has announced a course on microprocessor applications in common situations.

The course will be conducted over the Radio University operated by the University of NSW starting on October 5.

We are two nations divided by the same language.

It has become certain that IBM and the rest of us have moved towards speaking two tongues and these are mutually untranslatable.

IBM no longer tells anyone anything, it "shares" things, it no longer schedules things or assigns a priority, it "prioritizes" them. But then again it might spell that ugly word with an extra "s" rather than a "z". The company also "modularises" things as well.

Life amid a language under siege is rough.

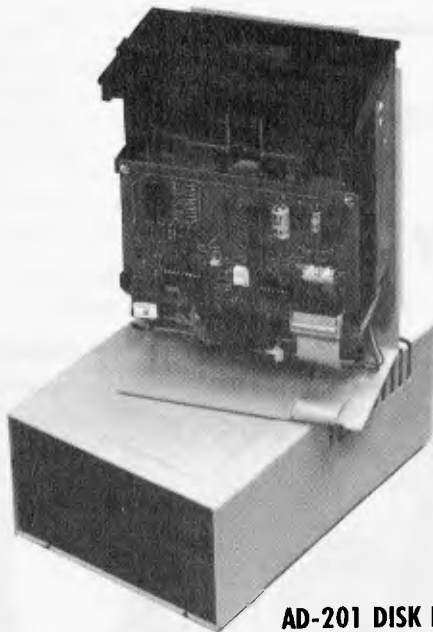
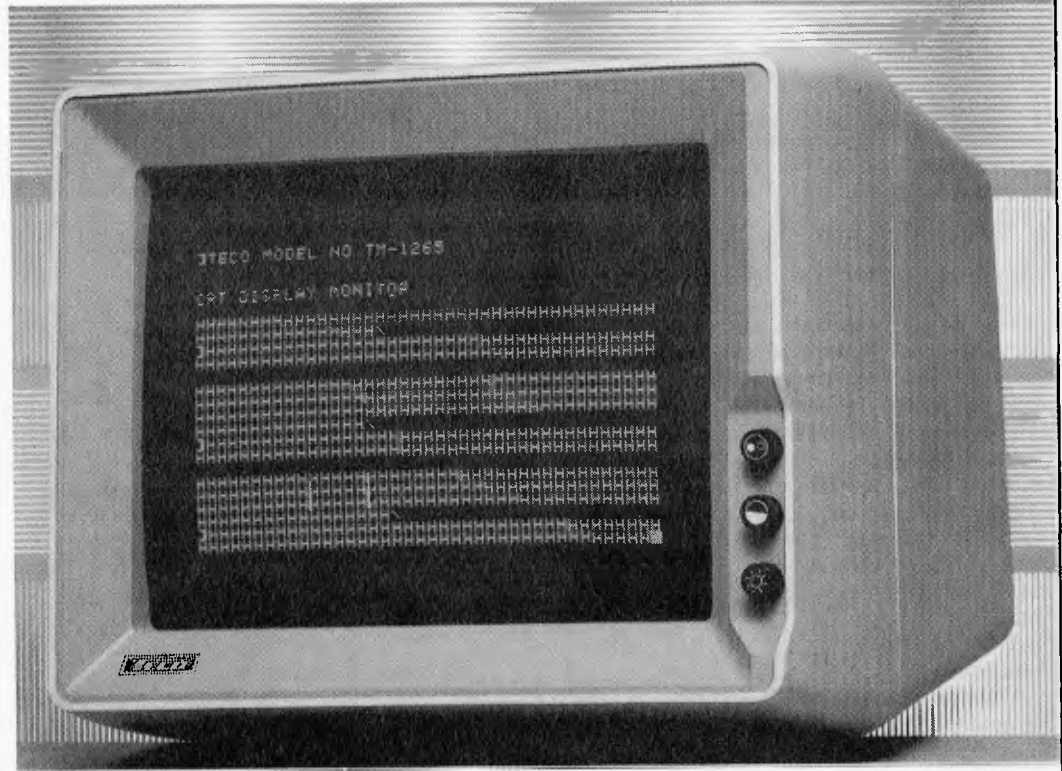


Sanyo has won a contract to supply Telecom Aust with masses of MBC 1000 personal computers from now to June 1983. The first unit has already been delivered to the User Service Section of NSW Information Systems branch.



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INDUSTRY FOUNDER PROFILE

The man who could be called the father of personal computing, Steve Wozniak, has returned to Apple Computers, the company he founded. Paul Walton discovered what brought him back.

Apple has now sold a million machines. Two years after leaving the corporation, the man who built the Apple machines and virtually kicked off the personal computer boom is back at his desk there, saying "I want to be part of Apple", after dropping out to run a revival of the Woodstock music festivals.

That man is Steve Wozniak, who "built the Apple I and II totally single handedly in my garage", but never wanted to start the company, much less profit from his design of both hardware and software. He is now back to try and do it all again.

Since the middle of 1981, Wozniak has taken time off from Apple to organise two 'Us Generation' festivals of rock 'n' roll technology in a single three-day event, akin to Woodstock. "Right now, I'm a small kinda' unusual celebrity type", he said. The events lost him \$21m of his own money, a small fraction of the billion dollar fortune which his share in Apple's success has brought. He claims not to care about the money, but outside finance is being sought for the next event.

In this exclusive interview what emerges is a portrait of Wozniak the engineer turned impresario, combining the mysticism of a technical genius who reads systems "in the chips" with an earthy understanding of what people actually want to buy. He has remained "very accessible", but shys away from the label of Californian Renaissance man. Above all he comes across as a nice guy, unchanged by success.

The computer industry, building systems, writing operating systems and programming still captivate him — he remains an engineer at heart. He reads the system in the timing and circuit diagrams of a chip, like others pick fortunes from tea leaves. He takes some,

but not all of the credit for inventing the personal computer as we know it. Much of Apple's phenomenal success is put down to either luck, the innovative suppliers or just a new way of packaging computers.

Creating a short cut

In a sideways swipe at big projects like Fifth Generation, Wozniak feels that "there must be a funky little short cut" to the production of intelligent machines. The computer and consumer electronic products which he is starting work on will

'I'm happy sitting on my bedroom floor with a PCB and some wires to a keyboard.'

herald yet another round of price reductions, use fewer parts, and be easier to use.

But he also notes some of the "awesome" projects presently under wraps at Apple, with only scant information yet available about the way the corporation will move. He has his own ideas about how it will develop away from the personal computer. And this change is already beginning, Wozniak claims, with a conscious effort to return to the creative early phase and out of the new suit-and-tie image by many at Apple.

Wozniak left Apple for what was to have been a one year educational break in 1981. "I had had a plane crash, and as a result of the plane crash I decided to take a year off from Apple and go back to school. I had the freedom on my hands.

Also I had the money, y'know I was never really trying to have it for that reason, I was not attached to it in the way that everything had to be planned by an accountant."

'Us Generation' festivals in September last year, and May of this year at Southern California's San Bernardino County Park brought together headlining bands and a host of technology.

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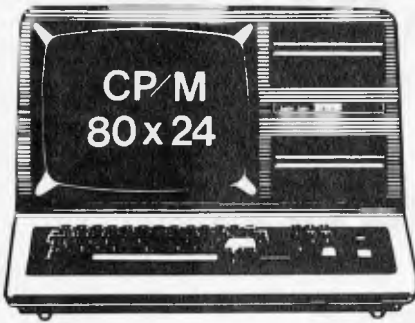
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The idea was to give people something else, to relieve the boredom of a three day event for the hundreds of thousands who turned up. "The culture didn't mix (music and technology) together at all, even though there was a very great demographic overlap between the technology people and the music people".

The event was big news round the world, "it brought us a great deal of notoriety and publicity", he says. A fortune was spent, not surprisingly, on the best technology. There was even a simulcast — to Moscow, allowing a question and answer session, and carrying the music into millions of Russian homes. If a backer can be found for next year's event there will be even more technology on show," says Wozniak.

'I've been given a free hand. I'd like to work on projects here, to excite people.'

Wozniak went back to Apple because he wanted to be "a part of it again, I've been given a free hand, if I want it. I'd like to work on projects here, to excite people, to learn. Just to participate." He will participate in what are called product streams, working as part of a group sometimes hundreds strong and spread over several divisions. But it is not really his style — he prefers to work alone.

It was a rather shy and introverted Steve Wozniak, back in 1975, that built the Apple I, and followed it up with the money-spinning Apple II in 1976. He built them just to "show off at the local computer fairs and stuff". At the time he was working as an engineer at Hewlett Packard for three years after leaving college. He was just 24 years old at the time.

He has some regrets: "Apple's just been too successful almost, the Apple computers were not even designed as products. There was no intent to start a company, have a product or anything."

Wozniak is rather embarrassed by the scale of his machines' success, but knows his own skill as an engineer "who always excelled at cleverness". In some ways, he is like the academic who made a fortune writing pulp fiction. So, what was the secret of the success which brought him a \$200m fortune for his reluctant four percent share in this company?

"I get a ton of credit for building a machine which has sold (a million) all over the world, and I get a ton of money. But in the end we've got about a hundred thousand unpaid, unofficial employees that have their own little companies they started up to supply us. And it is really as though Apple were this great big world, much larger than Apple Computers.

"It's not as though we actually created this whole new thing on our own. All we did was to bring together a few of the right bits and pieces in the right kinda' order", he said.

There was no plan to start Apple, and in the end Wozniak had to be pushed to do anything to sell the machine. The creative spark was his, fanned by the business acumen of his life-long friend (and business associate) Steve Jobs, now Apple's chairman.

"Well, it turns out that we took a lot of very unusual steps, partly because of the fact that neither machine was designed as a product. We still didn't really know what we were doing, setting the direction for personal computing or anything with the Apple II.

"The Apple II was the first computer ever sold in a plastic case, with colour built-in as standard, with graphics as standard. It was the first of the consciously low cost computers which had the keyboard and a video display as standard, there were very few that had thought of doing that before. It used the highest density RAMs of the day, so as to be state-of-the-art. The actual processor we used didn't matter nearly half as much as this packaging", he said.

Making a million

Wozniak was happy just "sitting in the middle of my bedroom floor, with a printed circuit board in front of me, and having a bunch of wires connected to my keyboard. Steve Jobs at that time had the more far-reaching ideas of a product that could be sold, that could be taken out of a box complete, plugged into the wall, ready to be able to write a program to teach your kids maths". Jobs has recently announced that the next 9,000 Apple II machines produced, after the one million sales mark was reached, will be given away free to schools in California under the Apple Kids program. In fact they will each get an Apple II.

Jobs said: "This computer represents the millionth time that Apple brought technology to individuals through personal computing, as well as marking the changes from an industrial to information society, which Apple has done much to foster."

An earlier technological feat which Jobs may wish to forget involves some illegal defrauding of the Californian

State telephone company. Wozniak produced a device to put tones down the telephone line which would allow a free call to be made, while both were still at college. "I managed to learn how to call all over the world."

Wozniak gave them out free to his friends, but Jobs had the idea of selling the devices, and set them up in business. They got caught, and had to pay back a sum of money to the phone company. But Jobs' next business idea, Apple, was a little more successful. "I did not think of starting a company — I merely said OK to Steve (Jobs), after much soul-searching, pushing and friends and relatives telling me to do it. It's kind like all I ever wanted to do was to design a computer," Wozniak adds.

Being an Apple Fellow means that Wozniak is now able to work on any project he chooses, within limits. He says that he will work on practical projects, "not a bunch of phoney research." He believes that a lower cost machine will help "all of society, give a lot more people access to computing." While Apple takes more business directions, Wozniak says that there is now beginning to be reaction from within, from people who want to build computers for home use.

"I am going to be involved, be starting some projects without an immediate product direction. That will be low chip count, few parts, a little on the clever-side. I've also got some software projects for more user friendly machines which I want to work on.

"There are design styles which emerge when you look at the chips, the timing diagrams, how many fancy special features they have to get higher

'I want to build a machine which can calculate pi to a billion digits.'

performance. You figure it out, and the chips tell you things like how many dots across the screen, or how many colours you get cheaply for the day etc. This is the way to start." He will have no marketing restrictions, just as it was when Apple was created.

One of the first concrete products could be a home video production and

edition system for the Apple II, a project which Wozniak is joining mid-stream. This will enable the production of very high quality graphics, video games, and even cartoons for low cost.

But there will also be the more obscure projects from Wozniak. He is getting much more involved in writing basic systems and applications software now. "There is a machine I want to build which can calculate pi to a billion digits, and I know how to do it", he said. This is just one of several basic mathematical systems which will seek to extend the processing abilities of Apple machines. It will increasingly integrate such complex calculations into the machines' pcb and operating systems

The intelligent Apple II is already under development in several divisions based in Southern California. The Personal Computer Systems Division at Cupertino, where Wozniak and Jobs first set up the company, is now home for much of this work. Wozniak reports despite what he thinks to be a misguided cloak of secrecy, some of Apple's developments.

"God, I see so much happening here that I do not even comprehend it all. There was a time before I showed anyone

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else, that I was the only one who knew how to program the Apple II. Now they are still working on my machine, and I couldn't do anywhere near as good a job.

"Apple is doing everything just like IBM. Operating systems, languages which have never been thought of, working on new types of computer units themselves, on better video, on video resolution, a lot of video devices and integrated VCR and video disks. There is also a great deal of basic system and applications software being written here now too", he reveals.

He went back to Apple expecting the more regimented "IBM type" of corporation. But "no, in the end I think that the company is getting healthier, with a return to the basic creativity which was there in the beginning."

Wozniak now knows fewer of the people at this first Cupertino plant than when he left. Most of the engineers there are under 25. But he thinks that this will motivate him — he relishes the challenge. Many of the early Apple people have left, in time honoured Silicon Valley style, to set up their own firms. It was this process which first spawned Intel and others in the early 1970s, as bright young college kids left Hewlett Packard or Fairchild to go it alone.

The next machine which Wozniak aims to build will not just be an extension of Apple II, or an attempt to better the Lisa. "Just an improvement is something like you double the speed, you add more memory, you add a little graphics. The way Lisa works was totally different from my machine — it was the greatest revolution on computers, it made them real friendly.

"But I think that the next revolutionary leap isn't necessarily going to be forwards, but sideways, off in another direction, something totally different! And what this could be is the simple, but very intelligent personal computer costing a few thousand dollars," he adds.

Finding the obvious

Rather than spend hundreds of man hours, and millions of dollars researching artificial intelligence, Wozniak thinks we are being incredibly short sighted, and that the answer is quite simple. "You know I think that there has got to be some little five-page program which you can write, that will tell the computer, based on all of its sensory inputs, and all of its motor outputs, how to totally learn." This learning machine

will accumulate, rather than be programmed further. It will do its own learning.

But computers will never be able to learn all the things which make us human, he says. "There is a thing called Tessler's law, named after a guy that works here at Apple. Tessler's law says that any time a function was thought to be intelligent and it can also be programmed into a computer, then the definition of intelligence is modified to exclude it to mean real intelligence." In other words, put an idea into a computer, and it is no longer clever.

Wozniak himself tries to lead the simple life. He claims to tell the same jokes, to know the same people, despite being a dollar billionaire. "I've told people who ask me whether or not I've changed, that I'm still just a computer engineer inside me, I always was." He claims to never have wanted the wealth "I can never think what to do with it. I get a thousand phone calls a year telling me what I can do with it."

The success of Apple, perhaps even the personal computer boom, was just luck according to him. But from now on there is going to be a little more planning. "I plan to remain real accessible though," he said. He never took his name out of the local phone book.

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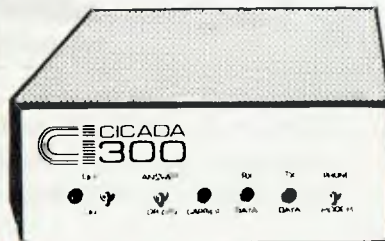
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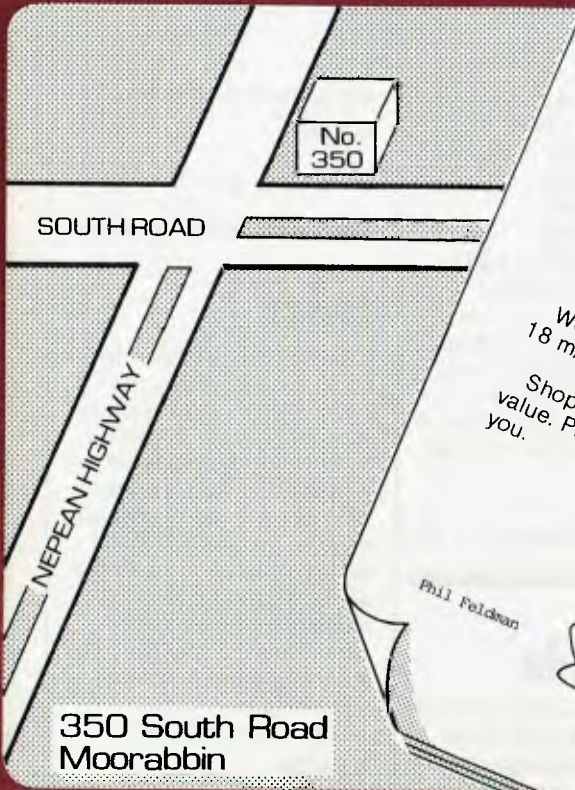
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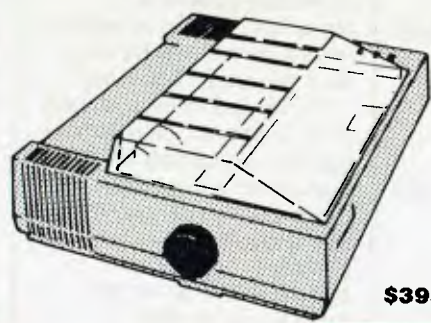
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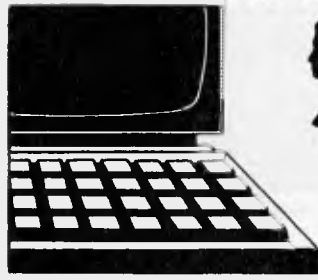
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Devious

Congratulations on the Lisp based version of ELIZA published in the June/July issue. It is useful to have a chance to examine this often quoted program in its original language.

I thought this program was intended to emulate a psychiatrist. Your particular implementation seems to be modelled more on a politician as may be seen from the following early exchange. My lines are indented.

(ELIZA)
HOW DO YOU DO?
PLEASE TELL ME YOUR PROBLEM
WHAT IS 2+2?
WHY DO YOU ASK?
I WANT TO KNOW THE ANSWER
WHAT WOULD IT MEAN TO YOU IF YOU GOT TO KNOW THE ANSWER?
IT WOULD MEAN YOU ARE INTELLIGENT
WHAT MAKES YOU THINK I AM INTELLIGENT?
YOU ARE SUPPOSED TO BE
WHAT MAKES YOU THINK I AM SUPPOSED TO BE?
YOU COST ENOUGH
WE WERE DISCUSSING YOU—NOT ME
WE WERE DISCUSSING MY QUESTION
CAN YOU EXPLAIN?
WHAT IS 2+2
WHY DO YOU ASK?
ANSWER
WHAT EXACTLY DO YOU MEAN?
ANSWER!!!!
TELL ME MORE
DON'T PREVARICATE
HOW DOES ALL THIS RELATE TO YOUR TROUBLES?

IT DOESN'T PERHAPS YOU SHOULD TAKE LIFE LESS SERIOUSLY
YOU DON'T TAKE IT SERIOUSLY ENOUGH
WE WERE DISCUSSING YOU—NOT ME
ANSWER THE QUESTION
SORRY YOUR TIME IS UP. BYE

I think in future I will stick to Basic. It's less hassle.
Andrew Donald

Cross-figures

As a long-time fan of the cross-figure puzzle I was very interested in the article by Philip Lewis (*APC* June).

When I first acquired a microcomputer I, too, tried to use it to solve a cross-figure puzzle and came up with a program that would have run for a few thousand years. I concluded that these puzzles were not suitable for programming and went on to other things. Now that I know that programs are feasible I'll try it again!

Incidentally the type of puzzles discussed by Mr Lewis are not the last word in cross-figuring. A few years ago an extraordinary series of puzzles appeared in *Games and Puzzles* magazine, written by a compiler who used the name 'Rhombus'.

On the left of each identity there are three 3-digit primes together containing the nine digits (zero excluded). Capital letters denote Across lights, small letters Down lights.

$D/2+j/3+(E-N) = 999$
 $D/2+E/3+c = 1089$
 $D/2+j/3+G = 1269$
 $b/2+k/2+M = 1359$

$f+C/2=K = 1449$
 $d/6+J+K = 1539$
 $e/2+(3g-2f)=h = 1629$
 $H+B+a = 1809$
 $H+F+a = 1899$
 $J+M+A = 1989$

Finally, why not add to your already excellent coverage of the recreational mathematical area (Mike Mudge's 'Numbers Count' series has been most interesting) by publishing a regular cross-figure puzzle!

G J Suggett

Anyone else interested? — Ed.

Only Ada

I have noticed that whenever you have an article about Real Time languages you only seem to mention Ada, which I believe only just about exists at present. Do you know of Coral 66 or do you prefer to ignore it?

I agree that there are not many (if any) implementations of it on micros, but surely the same could be said of Ada?

Paul Nix

We are always interested to hear about applications of Coral 66. — Ed.

Numbers

With reference to the series 'Numbers Count', would it be possible for you to explain or indicate some of the techniques used by those who manage to solve the problems, either with the article or in notes for which we could send?

Alternatively could you suggest reading references to

any particular technique?

D Kent

We're working on it — Ed.

Index

Now that your 'Back Issues page' fills two pages, the format which gives contents, issue by issue, is becoming less helpful. For those of us who want to find whether *APC* has covered a particular topic in the past (and that must be true of most readers of 'Back Issues'), a format similar to that of your annual index, updated monthly would be much more helpful.

Any chance of this?

R Phillips

Point taken — Ed.

Untimely death

I have been trying to transfer a document from a word processor to an Osborne 1 via the serial RS232 interface. I am using a 'PIP filename. ext=RDR:' command which works on another micro, but the Osborne just dies until it is reset or control-Z is typed. I have been able to send a file to the word processor using PIP.

Z Merali

A 'dead' micro is often a symptom of a wrongly wired cable, but your problem is clearly the IOBYTE. This is a useful CP/M feature which is not implemented on all micros.

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COMMUNICATIONS

It allows you to switch each of the four logical I/O devices — console, reader, punch and list — independently between four physical devices, without having to modify your programs. The default Osborne IOBYTE value assigns list to the printer port and the others to the keyboard or screen, which is why control-Z end of file key woke it up. You change the assignment using the STAT commad (manual p244). I suggest RDR:=PTR: for serial input and PUN:=PTR: for serial output, then you can keep LST: free in case you use a Centronics printer.

Len Warner

Disk decision

I use a 'mainframe' in my job and I am new to the world of microcomputers. I plan to buy a personal computer and use it for word processing, games, business and programming.

Please tell me:

What are the advantages of a disk drive compared with tape? What, if any, advantages twin disk drives have over single drives? Can cassette programs be loaded via the computer onto disk?

G Vincent

A disk may hold many files, and they are all equally accessible. Several may be opened at one time, or in quick succession, without manual intervention. A tape allows only one file open at a time — only the last one on the tape for output — and it often needs rewinding or changing. The data transfer rate is also very much slower. As a result, using a disk-based system is very much more convenient, since you have a library of programs and datafiles literally at your fingertips, instead of needing cassette changes. File operations like sorting or master file update become practical, whereas they could

only be done with several computer-controlled tape drives. Also, it is possible to set up random-access files for a records management or database system, which could not be supported by a tape system at all.

Twin disks have two advantages over single. One is that you can share out files between disks for best efficiency. During data entry this means keeping programs on one drive and data files on the other for best use of space. While sorting you use both drives for data to minimise head movements.

For copying, use one drive as source and the other as destination to avoid disk swapping. The other advantage is hardware back up; since most tasks can be done with one drive, though less efficiently; with two disks you can continue working when one breaks down.

Tape programs are usually written to use low memory addresses which are needed by the disk operating system, so a simple conversion job is necessary. First you *LOAD the tape to a higher address than normal, then save it as a disk file. To run it, first load, then move it to its correct address. When it has finished, reselect the DOS ROM to get back to disk.

Mike Forster

Colouring book

Can you recommend a book on TRS-80 Color graphics?

John Gold

McGills newsagency advise us of a wide range of "Color" graphics books available of which the following is a selection: "Assembly Language Graphics for the TRS-80 Color Computer," by D Inman, \$23.95; "Top Down Basic for the TRS-80 Color Computer," by K Skier, \$25.95; "TRS-80 Color Computer Graphics," by D Inman, \$23.95; and

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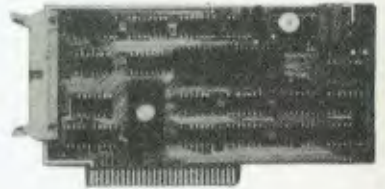
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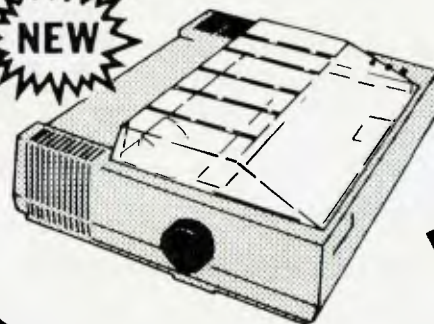
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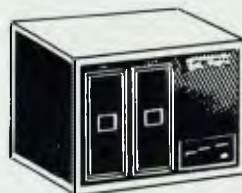
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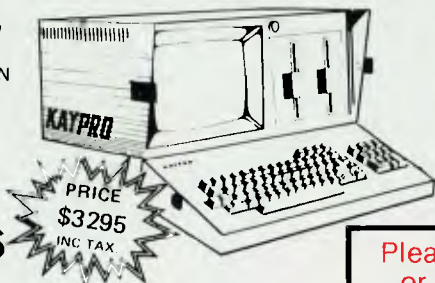


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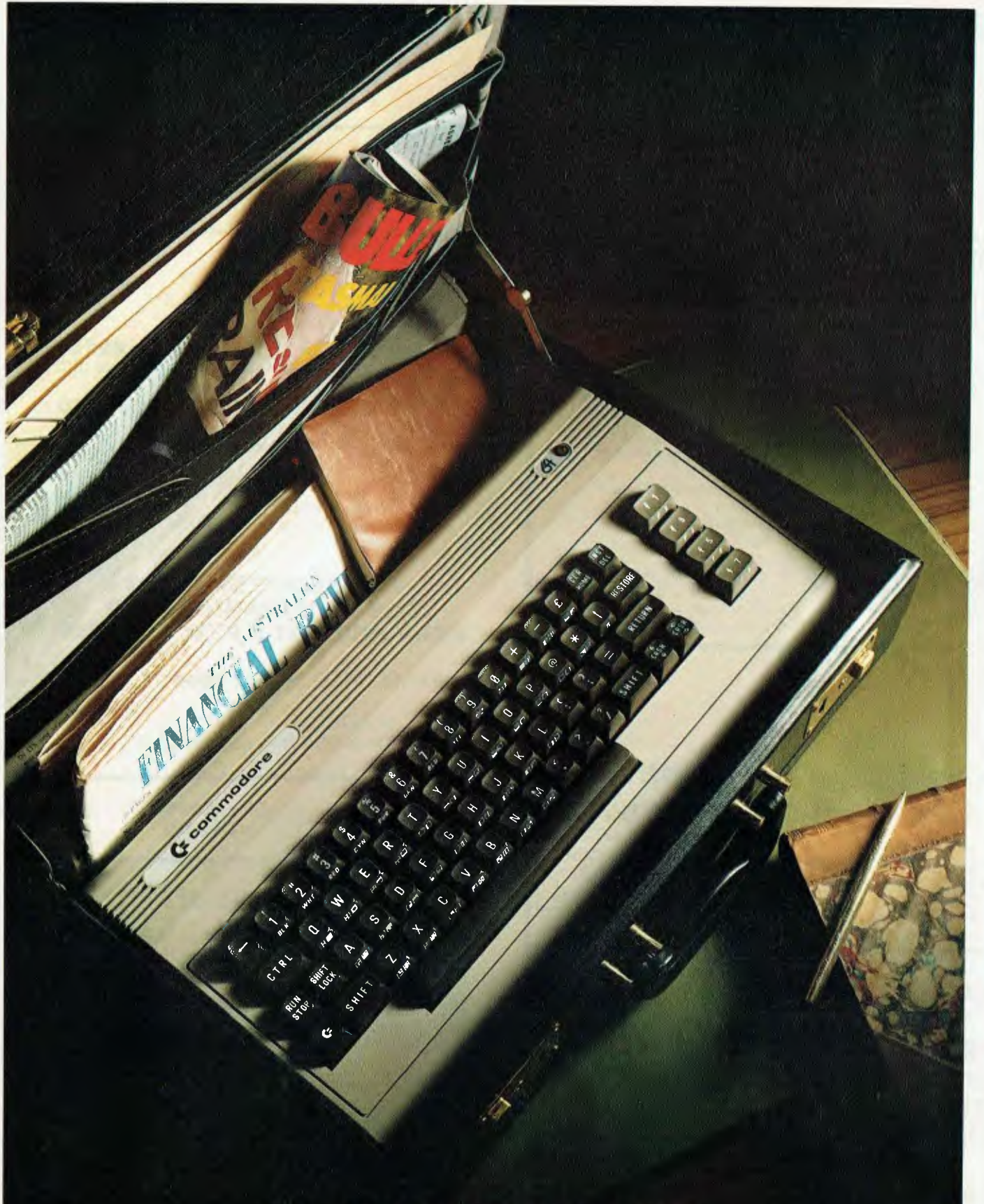
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"TRS-80 Programs and Applications for the Color Computer," by A Baker, \$22.95. The following magazines are also available:

"Hot Coco" by Wayne Green, \$5.20; and "American Rainbow" (Australasian edition), \$3.00. — Ed.

EDTASM answered

In Communications, APC June/July 1983, G O'Callaghan asked for details of the format used by

EDTASM when writing source files to tape. The "Assembly Language Toolkit" by Edwin Paay (Micro-80 Publications, Adelaide) says that an EDTASM source tape has the following structure:

- 256 zero bytes — LEADER
- A5H — SYNCH BYTE
- OD3H — START CODE
- NAME — Six byte ASCII file name. Names less than six characters are padded with blanks.
- Line number — 5 bytes. Each byte contains ASCII code for one digit of the line number. Each byte has bit 7 set to 1.
- 20H — ASCII space used as a delimiter
- text — One line of source program stored as ASCII code
- ODH — Carriage return marks end of source line
- /line number/20h/text/ODh/repeats for each source line.
- 1AH — End of file marker

Terry Day

Two wrongs

In the June/July edition of APC on page 83, Mr P L McIlmoyle gave two incorrect answers to the "More Directory Space" question.

Firstly, it is very easy to get more directory space with NEWDOS 80 V.z by specifying on the PDRIVE command DDGA=6 when creating a new disk. This will give 222 files per disk.

The second error is that Mr McIlmoyle states that moving the directory will greatly slow down disk access. This is not so. It probably will speed it up. The directory is usually on track 17, by moving it to track 40, the middle of the disk, the head seek time is minimized.

To move the directory use, DDSL=4 on the PDRIVE command.

G Skabek

DeBono knew

I am writing in reply to the report by Guy Kewney in the "Printout" section of your June/July issue.

Olivetti is very much aware of the availability of CP/M86, CP/M80 and MS-DOS on the M20. Anyone who has followed our recent television and press

advertising campaign should realise this fact.

The alternate processor board (APB 1086) contains an Intel 8086 microprocessor which will allow the user to run CP/M86 or MS-DOS if activated. From October 1983 the board will also contain certain EPROM chips which will allow the use of the UCSD-P system and UCSD Pascal. The cost of the APB 1086 is \$480 if ordered as a field upgrade or \$350 if

ordered with the M20.

CP/M80 will run on the standard M20 under PCOS (Olivetti's Professional Operating System) and a CP/M80 emulator.

I trust this answers the questions raised in your last issue. Any further queries can be directed to me at Olivetti, Sydney.

Hilton Gray,
National Sales Manager,
M20 Personal Office
Computers, Olivetti Australia.

Larger directory

In reference to T R Martin's letter on directory space under Newdos 80 2.0, (APC

Communications June/July 1983), it is possible to allocate a larger directory using Newdos's PDRIVE command.

To allocate the extra space you need to enter these parameters:

- PDRIVE DN1, DN2, DDGA=X : Where
- DN1 = Drive number to get PDRIVE information from;
 - DN2 = Drive number to update;
 - DDGA = PDRIVE spec (Disk Directory Granule Allocation);
 - X = Number of granules to allocate 2 to 6

On the original system disk, the directory is initially set to two. By using the PDRIVE command, you can now set it to any size that you require. It is advisable, though, to copy up your system disk and deallocate unnecessary files, update

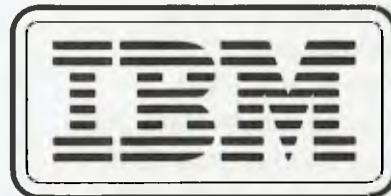
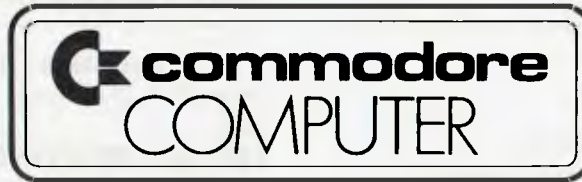
directory size, reboot, then copy your operating software onto it. Afterwards use this disk as your master for your database, and format new disks with it to utilise the larger directory size.

Stuart McGinn



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Buying a first computer is a total act of faith: It's not just that one does not know the answers, one doesn't even know what questions to ask. The jargon doesn't simplify matters either.

The ideal would be to determine what you want from the machine, find the most suitable applications packages, and then select the best and cheapest chunks of electronics on which they would work. But people are put off this obvious course not just by the persuasive publicity, but by the comparative ease with which one can compare physical characteristics. It is almost impossible to sort out the intangible differences between the applications.

As soon as someone has explained the language (see Newcomers Start Here) it is fairly easy to differentiate between Machine A and Machine B. But even low cost computers are quite expensive and if you buy the wrong one you cannot just hand it back — normally. The choice is quite bewildering. The 1983 edition of the Australian Microcomputer Handbook lists 25 computers costing under \$3000, of which 10 are less than \$1000, and there are a number of omissions, particularly at the lower end of the price range.

Question time

Firstly ask yourself the question: why do I want a computer? Do try to be honest — bogus reasons can lead to the wrong choice of machine.

Don't kid yourself computers have a practical use in the home. There is no domestic job which can not be done more quickly, cheaply, and efficiently with paper and pencil.

Admit it if what you want is a complex toy that surely must be fun because everybody else seems to have one! So, class one toy is the electromechanical tinkering, and class two toy is the fun of seeing what the beast can do if you rewrite the instructions to make it go faster. Then there is class three — the computer which will play games.

For the first of these you could well consider buying a kit version of something, although such kits are becoming less common as mass production replaces batch assembly. Alternatively a big secondary market has grown up for machines like the Sinclair ZX81 — there are enough bits and bobs

of add-ons to bump the eventual price to over \$1000 even though the ZX81 is now only \$149.

If you want to play games, there is a flood of games software available. The Atari models are outstanding for their range; but the Commodore VIC 20 and 64, Sinclair ZX81 (though you need bolt-on added memory for most of the applications) and even the more expensive Apple have such a large user

base that scores of independent companies have produced an enormous variety of programs for them.

As a general rule, the larger the RAM of the computer, the greater the sophistication of the games it can play. The ZX81 has only 1k which means it can do very little; the Apple IIe can have 128k which can cope with most games. Nearly all home computers lie somewhere between these two. 16k of RAM is often



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enough for quite complex games, but if you are keen on color pictures ('graphics' in the computer world), it might be advisable to opt for 64k; or at least for a machine that can be upgraded to that.

If you want an educational introduction into what computers are and how to program them, the ZX81 will satisfy your needs for a very modest outlay.

Some traditional book publishing companies are getting in on the act. Wiley have started bringing out book and disk or cassette combinations for various popular machines, teaching programming for home and business applications.

Educational software of a more general nature is available for some computers. Tandy and Texas Instruments both offer a selection of programs of this kind, although the former are oriented towards classroom use.

Then, there is business usage. Probably the most common is word processing but do ensure that the computer can cope with the full standard screen width of 80 characters, and preferably a length of 25 lines. The Atari 400 and 800, and the Commodore 64 and VIC 20 for instance, cannot. The MicroBee 64k Plus and more expensive

computers can. Word processing on a narrow screen is not impossible, but much of the utility is lost as the gap increases between what you see on the screen and the printed page.

Breakdown

If you have a small business a micro-computer could be your salvation. Word processing, however, needs at least 16k of RAM (often more) and 'spreadsheet' financial planning packages usually require between 48k and 64k.

It is not enough to look at the RAM installed — for instance, machines expandable to 48k include the VIC 20 which has been selling well at \$299 and the Sinclair ZX81 at \$149, but there are only a few business programs for either machine.

At the bottom of the range there is the 16k Sinclair Spectrum costing \$295 but with a rubber keyboard on top of a plastic membrane, it is rather unpleasant to use. The Atari 400 at \$599 has lots of (games) programs but has a plain flat keyboard like the ZX81. (You depress areas marked with letters — it is slow and irritating.) The BBC Model A was also in this memory bracket but is no longer available.

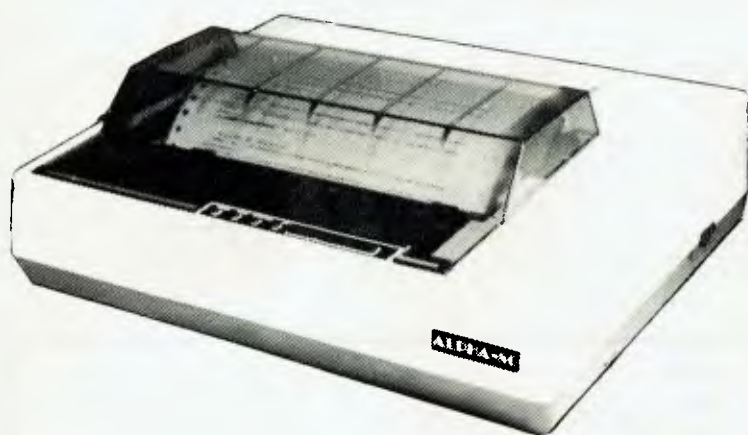
One level up at 32k is the BBC Model B, which has many features but costs an alarming \$1579. Expensive perhaps, but, as well as being well designed ergonomically, the electronic design is very advanced and sophisticated, enabling the machine to be upgraded, adapted and even supplemented with other calculating chips inserted into it. Both it and the Sinclair machines have rather good instruction books unlike the notoriously unhelpful manuals supplied with some earlier machines. The MicroBee 32k Plus (\$549) is an Australian machine with a number of advocates.

And so on up. At 48k there is the Atari 800 at \$1349 with a proper keyboard or an expanded Tandy TRS-80 Model III for about \$1500. At 64k the Commodore 64 (\$699) was primarily designed as a home computer, but despite its display limitations is versatile enough to be used for simple business applications. Similar observations apply to the famous Apple II at \$1650 which has a number of more sophisticated applications programs.

If you are going for a serious business machine on which you can run accounts, prepare letters, do financial forecasting, maintain stock control, and prepare pay slips, etc, you will almost certainly have to spend \$3000, and probably more. The

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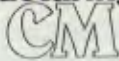
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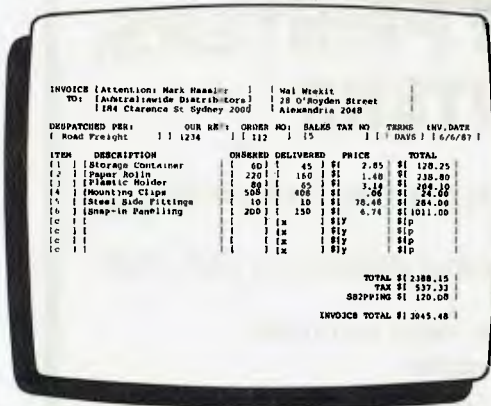
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reason for the increase in cost is that cassette input will not cope (you need floppy disks), and you will also have to buy sophisticated program packages and a printer.

One difference between these machines is that they have their own displays while cheaper machines are plugged into the TV. Apple, Commodore, Epson and Cromemco all have computers in this bracket, but probably the easiest entry is via the Osborne. All its advertising emphasises portability but at some 12½ kg you need strong arms to carry it any distance. The Osborne's major advantage is that at around \$1995 plus tax (and you may get it cheaper if you shop around) it includes WordStar and SuperCalc. Other systems that include a significant amount of software are the Kaypro (\$2859 plus tax) and the Morrow Micro Decision (\$2975 plus tax).

Incidentally, if you are dead set on portability Australia should soon see a number of quite elaborate machines in this category. Examples include the locally produced Magnum as well as imports like the Hyperion/Ajile, Columbia portable, Gavilian and Grid. Expect prices from \$2000 upwards.

Forecasts

People always ask: 'Is this the right time

to buy or should I wait a few months for the price to come down?' No, this is not the right time to buy, but the right time never comes. The technology continues to improve so whatever you buy is certain to be overtaken in price and performance terms — for instance Acorn Computers have announced the Electron, a stripped

down and cheaper version of the BBC Computer. Buy a reasonably new machine which provides good value and performance now, and resign yourself to the fact that your neighbour who was a late starter got something more advanced by missing a year or two of fun and use.

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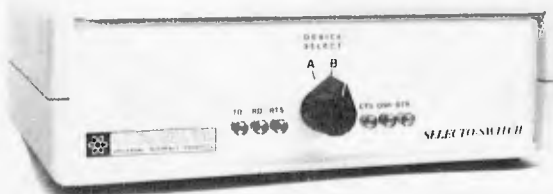
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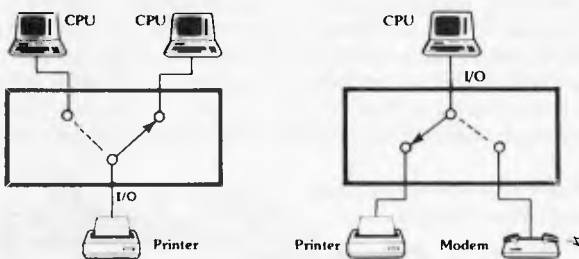
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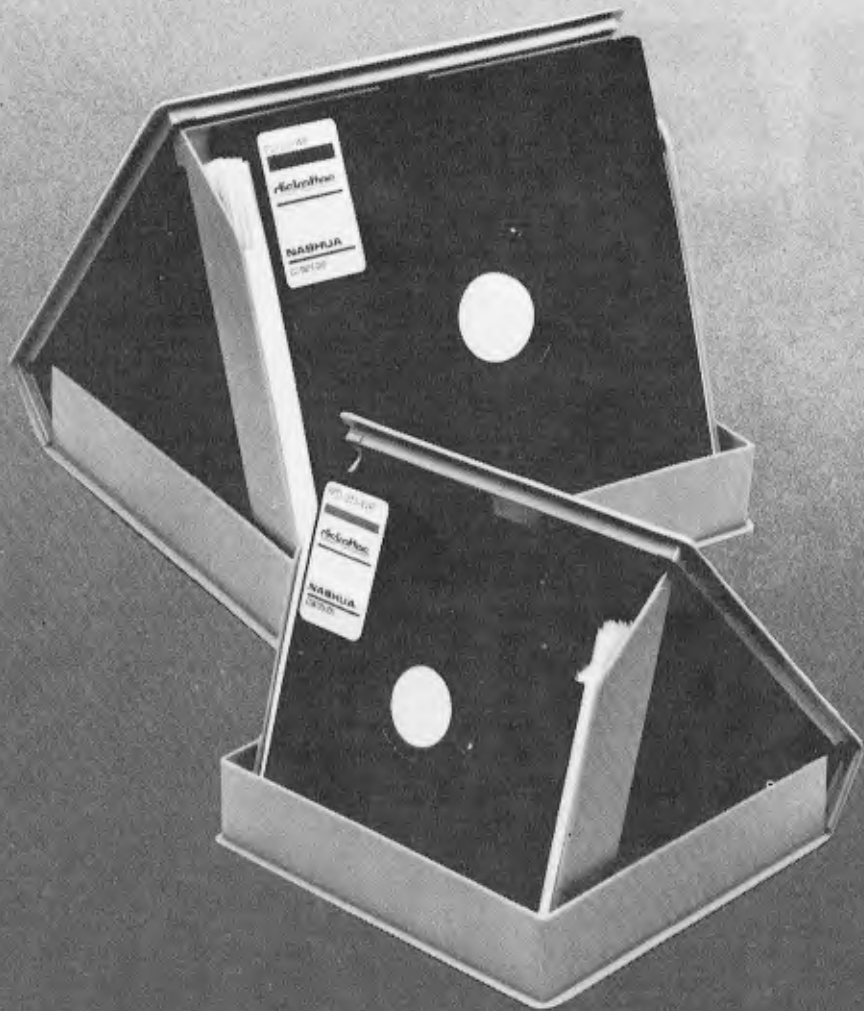
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BENCHTEST

SORD M5



Sord's entry into the full-colour sub-\$400 sector of the computer market is something of an enigma. On the one hand, its user memory could charitably be described as meagre—but, to compensate, there's a full 16k of video RAM giving superb sprite graphics. Steve Mann puts the Japanese challenger through its paces.

This review nearly turned out very differently. Micro magazines have recently been full of dire warnings of an impending Japanese invasion, but at first sight the vanguard of the invading forces, Sord's M5, appeared to indicate that there was nothing to worry about. A \$395 computer with integer-only Basic and with just 3k or so of RAM available to the user — how could that possibly pose any sort of threat to the VIC-20s and VZ-200s we have come to know and love? I was all set to put the boot in. Reading through the introductory manual only confirmed my suspicions—it was full of mistakes and, among other howlers, contained absolutely no mention of how one was supposed to use the sound facilities, even though Sord proudly trumpeted 'three chords, one noise, seven special sounds' in the setting-up booklet.

So, pen dipped in vitriol, I was all set to put the upstart in its place. Then I was loaned a Basic-G cartridge to try out for a couple of days—and my opinion changed rapidly. With Basic-G in place, the M5 was a different machine. I had no time to give the extra facilities any more than a cursory examination, but it soon became clear that

Sord has come up with a very neat and clever machine indeed. However, to get full value from the M5, considerably more than the basic package of computer and Basic-I cartridge is required: extra cartridges are needed to use the graphics and sound facilities and to reap the benefits of full floating-point mathematics. This is going to add considerably to the price and could be a major stumbling-block to wide acceptance.

The Sord is not a cheap machine, even in its basic configuration, and for any serious application the user is going to have to fork out around \$460.

Hardware

The M5 comes in a VZ-200-style case measuring 262x185x36mm, and weighs in at 1kg. It is finished in two shades of grey, with yellow and white lettering, and has a 55-key touch-sensitive keyboard. At the rear are sockets for cassette, printer, two 'joypad' games controllers and output for a standard TV or composite video. In addition, there's a lift-up lid which allows access to a socket for the various plug-in cartridges. The whole thing is manufactured to a high standard and seems satisfyingly robust.

Sord obviously does not expect users to poke around inside. Getting at the inter-



'Joypad' games controllers

nals appears impossible without tearing the ribbon cable that connects the keyboard, but levering up the front and squinting inside reveals a well constructed and neat PCB, with no obvious 'kludges' or last-minute changes of mind.

The Z80A runs at 3.58 MHz and there is 8k of onboard ROM (expandable to 16k via expansion cartridge) and 20k of RAM. Of this 20k, 16k is needed to handle the display and about 1k is used to handle various system chores—so the user is left with only about 3k for programs. Inserting the Basic-G cartridge adds another 4k, but this is still very limited in comparison with other machines in the same price range and may well be a big drawback as far as sales are concerned. But then again, limited memory does not seem to have done the VIC-20's sales any harm!

The keyboard is reminiscent of the VZ-200's but has a much better feel to it. The keys are rectangular, with a small piece cut out of the bottom left hand corner, and are positive in action; there is a satisfying click as the Sord accepts input. Characters and keywords are detailed in yellow and white, but some of the letters are extremely hard to pick out on the dark grey background. The key positions take a bit of getting used to as well—I found myself getting confused between the RETURN and SPACE keys and the CTRL and FUNCTION ones. There are 64 graphics characters—32 of which are represented on the keys and the other 32 are accessed via the SHIFT key. The separate power supply is switched (other manufacturers please copy) and a red LED on the keyboard indicates when power is on.

Basic-I

The Sord M5 cannot function without a ROM cartridge in place so, before switching on, the lid above the keyboard must be raised and a cartridge slotted in. The lid appears somewhat flimsy at first sight,

but in fact is cunningly designed to come off if undue force is exerted.

Basic-I is the cartridge supplied with the M5. I assume the 'I' stands for 'Introduction' as this is a very simplified and limited dialect.

It is integer-only, and calculations are restricted to the range -32767 to 32767. This limit applies even in the middle of calculations that result in an in-range figure. So, for example, PRINT 2000*50/100 gives an overflow error message, while PRINT 2000/10*50 is okay. The manual does not make this clear—it warns that the final result must be in range but says nothing about intermediate steps.

The Basic seems to be fairly standard Microsoft-style, but the restrictions against using embedded keywords that are present in many dialects thankfully do not apply to the Sord. Variable names can be up to 16 characters in length, and LET is optional. Upper case and lower case are totally interchangeable — 'TOTAL' is the same variable as 'total', and 'run' or 'RUN' are equally permissible. The M5 automatically inserts spaces into listings; the only one that is compulsory is the space after a keyword. This is a very nice touch — there's nothing more offputting for the beginner than to have his/her program continually hang up because of missing spaces in input lines.

For a Basic that is obviously designed for the beginner, though, the manual does not do its job very well. The mistakes begin in the first section, where the manual insists that the cursor is a letter 'A' whereas it is, in fact, 'L', 'C' or 'G' depending on the mode selected. The manual writer also seems to have trouble distinguishing between colons and semi-colons—the former are referred to as semi-colons on numerous occasions. The instructions for the DELETE command are also given wrongly, with a full stop shown instead of a comma. These are all

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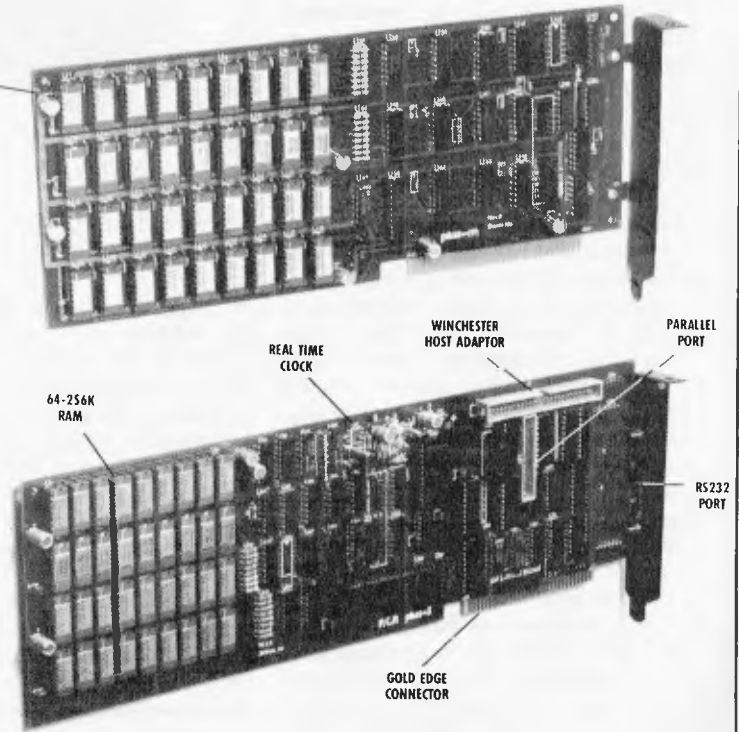
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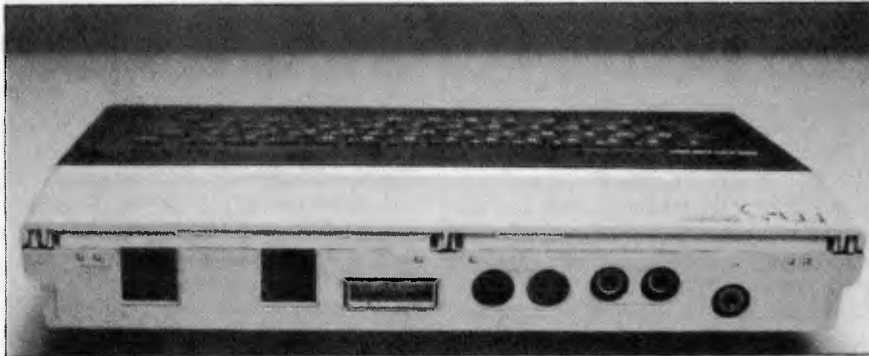
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SORD M5



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relatively minor points, but one which could give the beginner some problems. It's not inconceivable that a newcomer, on seeing the letter 'L' instead of an 'A' as the cursor, could think that his new computer is malfunctioning and return it to the shop. Sord needs to revamp the manual with some urgency; it is imperative that an instrument booklet for the computer novice should be as complete and error-free as possible.

Basic-I supports simple graphics; these are accessed by pressing the FUNCTION key together with numeral 3. Basic-I does

have some sophisticated commands for such a limited dialect: facilities such as automatic line numbering are supported, and the FRE function takes several parameters, detailing amount of memory used and amount of memory remaining. Various control codes are used for changing screen modes, cursor movement and — particularly useful — scrolling the screen. Most computers require special routines to scroll the screen sideways; with the Sord this is accomplished simply by inserting the relevant control codes in PRINT statements. A complete list of control codes is

given in Table 1. Basic-I commands and functions are detailed in Table 2. In normal operation Basic commands are entered one letter at a time, but by using the FUNCTION key plus the initial letter of each command they can be entered VZ-200-style — ie, FUNCTION plus 'P' gives PRINT.

Basic-G

The Basic-G cartridge is sold as an optional extra for about \$65 but is really an essential purchase as the full power of the M5's graphics, and sound cannot be realised without it. Basic-I is essentially a limited subset of Basic-G and all the facilities mentioned in the Basic-I review above are present in the G version.

With Basic-G in residence, the Sord becomes a remarkably flexible and powerful machine. The facilities offered are quite astounding for a small personal computer and, of course, the sprite capabilities and 16k video RAM make the M5 a superb games machine.

There are four screen modes: text, which gives 24 lines of 40 columns, with characters defined on an 8x6 grid; GI, which gives 24 lines of 32 columns and all

SORD M5

the keyboard graphic characters; multi-colour (or, as Sord insists, 'multi-color'), which allows you a limited mosaic graphic capability with a 4 x 4 pixel block, giving 64 x 48 distinct locations; and GII, the full sprite graphic mode. GII allows up to 32 moving sprites to be defined, with a 16-colour static background and a 'backlight plane' which can also be coloured in any one of 16 shades.

The M5 also features two alternate screens, named 'screen 0' and 'screen 1'. Of course, as a TV can display one screen only, one screen is always hidden from view. Use of various control codes enables the user to flip from one screen to another, and it is also possible to have one screen on view while you input text or information to the hidden screen. Each screen can be set up in a different mode (with the exception of GII and multi-colour). And that's not all . . . in every mode except GII you can use 'expanded screen buffers' which, says the manual, 'can be envisaged as eight extra-screen buffers added to the two display screens'. These provide a very quick and simple way of animating characters — if a character is displayed on the various screen buffers in a slightly different position on each, the illusion of motion is achieved by flipping through the screens in the same way as flicking the pages of an animated cartoon book. Any of the 224 displayable characters can be user defined by means of the STCHR command so, even without sprites, some very classy animated graphics can be achieved.

But it's with the sprites that the M5 really comes into its own. The M5 has 32 sprite planes, the background plane and the backlight plane. A background is set up on the 256 x 192 resolution background plane and up to 32 sprites can move individually, each on their own plane. Sprites can be as small as an eight pixel by eight pixel matrix or as large as four 16 x 16 matrices. They can be joined up or split apart at will and, because positioning is determined by pixel position, movement is extremely smooth and impressive.

Sprites are assigned 'sprite codes' with the SCOD statement, are coloured with SCOL and are displayed with LOC (for 'location'). They are numbered hierarchically from 0 to 31, with 0 as the highest level. A higher level sprite will hide a lower level one — so if sprite 0 passes over sprite 5 and they are both the same size, sprite 5 will be hidden. It is also possible to set up screen windows or 'viewports'. To erase a sprite, you simply need the command ERASE together with the relevant sprite number. So setting up moving graphics on

the M5 is very easy — and the results are extremely impressive. In fact, for any application involving moving graphics, the limited memory of the M5 is hardly a problem — on most other computers setting up the screen and feeding in the graphics code is going to use a large amount of memory. On the Sord all the hard work is handled for you and the constant 16k video RAM means that you do not have to 'steal' memory from the user RAM in high-resolution modes.

While your sprites are busily dashing around the screen, the background can be set up in detail. The M5's CIRCLE statement will draw circles (surprise, surprise!), polygons, ellipses, arcs or fans (very useful for pie charts) by simply changing the parameters; there is a BOX statement for drawing squares and rectangles; the BAR statement for displaying solid rectangles; and PAINT for filling an enclosed area with colour. Using graphics, a single pixel may be coloured in any one of 16 shades by using the FCOL statement, but any particular character may contain at most two colours. To display a character on a graphics screen it is simply necessary to add '#1' to a PRINT statement. This is, of necessity, a brief

| | |
|-------------------------|--------------|
| No colour (transparent) | Light red |
| Black | Dark yellow |
| Green | Light yellow |
| Light green | Dark green |
| Dark blue | Purple |
| Light blue | Grey |
| Dark red | White |
| Cyan | |
| Red | |

Table 3 Colours

rundown only of the graphic capabilities of the M5 — a full exploration of the various effects would take considerably longer than the couple of days I was able to spend with the GII cartridge. Suffice it to say that the M5 makes professional graphic effects very simple for even the beginner to achieve.

One particularly impressive feature of Basic-G is its use of interrupts. Interrupts allow you to break off from a specified task to handle something different, then return to the main job in hand. Basic-G has six different statements to handle various interrupts. ON COINC GOSUB takes care of any collisions between sprites — whenever a collision occurs, the program branches to the relevant subroutine. ON

EVENT GOSUB accesses the internal timer, which is set by the user. Each time the set timer period expires an interrupt is caused. There is also a built-in alarm timer that is useful for setting a single time limit. This is serviced by an ON ALARM GOSUB statement. ON KEY GOSUB and the delightfully named ON JOY GOSUB service interrupts from the keyboard and from the joypads. Finally, ON ERROR GOSUB enables a GOSUB statement to be called whenever an error occurs while drawing graphics pictures. Unlike the other interrupts, this one cannot be turned on and off by the user.

The M5's internal timer is extremely versatile. The TIMES\$ statement sets the clock time in the format TIMES\$ = "hh:mm:ss". WAIT suspends operation for the prescribed time; after this an interrupt is generated and the appropriate subroutine called. SLEEP is very similar, but instead of calling a subroutine it simply carries on with program execution after the prescribed period is exceeded.

There are also some more features for handling PRINT statements and screen formatting. MPRINT allows the user to separate a character and display different segments on different lines; and there are

| | |
|---|--|
| A | not used |
| B | return cursor to beginning of line |
| C | scroll screen display down |
| D | scroll screen display left |
| E | scroll screen display up |
| F | scroll screen display right |
| G | bell |
| H | backspace |
| I | tab cursor eight spaces |
| J | move cursor down one line |
| K | move cursor to home position |
| L | clear screen display |
| M | same as RETURN key |
| N | move cursor to beginning of next line |
| O | change to standard mode |
| P | change to insert mode |
| Q | change to multi-colour mode |
| R | change to GII graphics mode |
| S | change to GI graphics mode |
| T | return to text mode |
| U | change to visible screen |
| V | alternate between visible and invisible screens |
| W | same as RETURN key |
| X | delete characters to right of cursor |
| Y | alternates between visible and invisible screens |
| Z | writes input to alternate screen |

Table 1 Control codes



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two statements — DIST and DRCT for calculating the distance between sprites.

Basic-G is almost overburdened with features — for example, there are four different LIST commands. These are the normal LIST, which displays all or part of a program listing on the screen or on the printer; LISTC, which is as LIST but which lists everything out in upper case; ELIST, which is the same as LIST but which clears the screen first; and ELISTC, which is as ELIST but with everything in caps. Although the M5 lacks REPEAT UNTIL and WHILE/WEND, IF...THEN...ELSE is supported and the use of labels as destination addresses for subroutines makes structuring of programs easier.

All in all, Basic-G is sufficiently sophisticated to handle just about any situation involving graphics and, although integer-only, combines ease of use with power and flexibility. For full floating-point capability, the user will have to purchase the Basic-F cartridge.

| | |
|------------------|---------|
| AUTO | LOC |
| CLEAR | MAG |
| CLS | SCOD |
| CONT | SCOL |
| DEL | STCHR |
| LIST | VIEW |
| LIST #2 | VPOKE |
| NEW | ASCII |
| RUN | CHR\$ |
| CHAIN | HEX\$ |
| DATA | INKEY\$ |
| INPUT | LEFT\$ |
| OLD | LEN |
| OUT | MID\$ |
| PRINT | RIGHT\$ |
| PRINT #2 | VAL |
| READ | CURSOR |
| RESTORE | ERR |
| SAVE | ERRL |
| TAPE | ERRL\$ |
| VERIFY | PEEK |
| CALL | VPEEK |
| DIM | ABS |
| END | FRE |
| FOR...TO...STEP | INP |
| GOSUB | NUM\$ |
| GOTO | RND |
| IF...THEN...ELSE | SGN |
| LET | TIME |
| NEXT | |
| POKE | |
| RANDOMIZE | |
| REM | |
| RETURN | |
| STOP | |

Table 2 Basic-I commands

Sound

The Sord takes the sensible course of using music notation to program the sound generator — PLAY 'c' gives you, funnily enough, the note C. Sharps and flats are handled by suffixing the note letter with a plus or minus sign. The M5 provides up to six octaves and defaults to octave five, in which note C is middle C on a piano. To change octave it is simply necessary to insert a lower case 'o' and a number for the relevant octave. Note duration is specified by inserting a number without the letter 'o'; when first switched on the M5 plays quarter-notes. Dotted notes are dealt with by the simple expedient of inserting a full stop in the PLAY statement, and triplets are denoted (ouch!) by an exclamation mark. To continue with the logical approach, Sord has decided that rests should be indicated by use of the letter 'r'.

Up to three notes may be played simultaneously to create harmony — this is done by separating the notes in the PLAY statement with commas. Volume is set in the range 0-15 by including 'V' and the relevant number at the beginning of the PLAY statement (volume is set at maximum on switch-on) and tempo is indicated by the letter 'T' and a number in the range 1-255. There are eight different 'envelope' shapes for changing the sound of each note; these are set with 'S' and a number.

Of course, music is not the only use for the M5's sound capabilities — arcade-style effects are easily obtained by using the SG statement.

All in all, the M5's sound capabilities are more than adequate and the logical method of defining sounds and music means that even a complete novice should be able to achieve some good effects — a definite plus-point.

Cassette

The M5 uses an ordinary cassette player for storage of programs and data, but once again Sord has done everything in its power to make things easy for the user.

The M5 uses an eight-pin DIN plug to connect to the user's tape machine and supports a 'remote' facility. Files are saved with SAVE "file name" or LIST "file name" and loaded with CHAIN "file name" or OLD "file name". SKIP can be used to 'skip over' files already on cassette, thus finding the first piece of blank tape. When programs are loaded back into the machine FIND "file name.BG" . . . is displayed, with the 'BG' suffix denoting Basic-G, or 'BI' if the file was saved under

Basic-I. The dots after the file name and suffix give an approximate idea of the length of the file, with each dot representing 256 bytes. Programs can be verified, and the whole operation seems very reliable. While I was reviewing this machine every program I tried saved and loaded first time and the M5 seems very tolerant of volume variations. It is also possible to save a screen — in this case VSAVE is used, but it should be noted that it's the alternate screen buffer that's saved, not the screen currently being displayed. So to save the displayed screen it is necessary to hit CTRL V and then type VSAVE: saving the screen takes about two minutes. When reloading a screen, care should be taken to ensure that the screen buffer is set to the mode the retrieved file expects — so when saving a screen it is advisable to note down the screen mode and screen buffer involved.

Documentation

As mentioned above, the instruction manual for Basic-I leaves a lot to be desired. In contrast, the Basic-G manual is clearly written and, on the whole, accurate. In particular, the sections devoted to sprite graphics are very easy to follow and should make it easy for anyone to come up with some stunning graphics.

My only major quibble is the complete lack of information concerning memory addresses. I know it's possible to PEEK and POKE addresses in both user RAM and video RAM because these commands are mentioned in the manual glossary — but nowhere in the text does it tell you how to use these commands and what will happen if you do. CALL is also mentioned in passing as a means of executing assembler programs, but once again no further information is given. This is a serious omission as Basic-G is designed to be sufficiently powerful to attract the more advanced programmer who would want to use machine code.

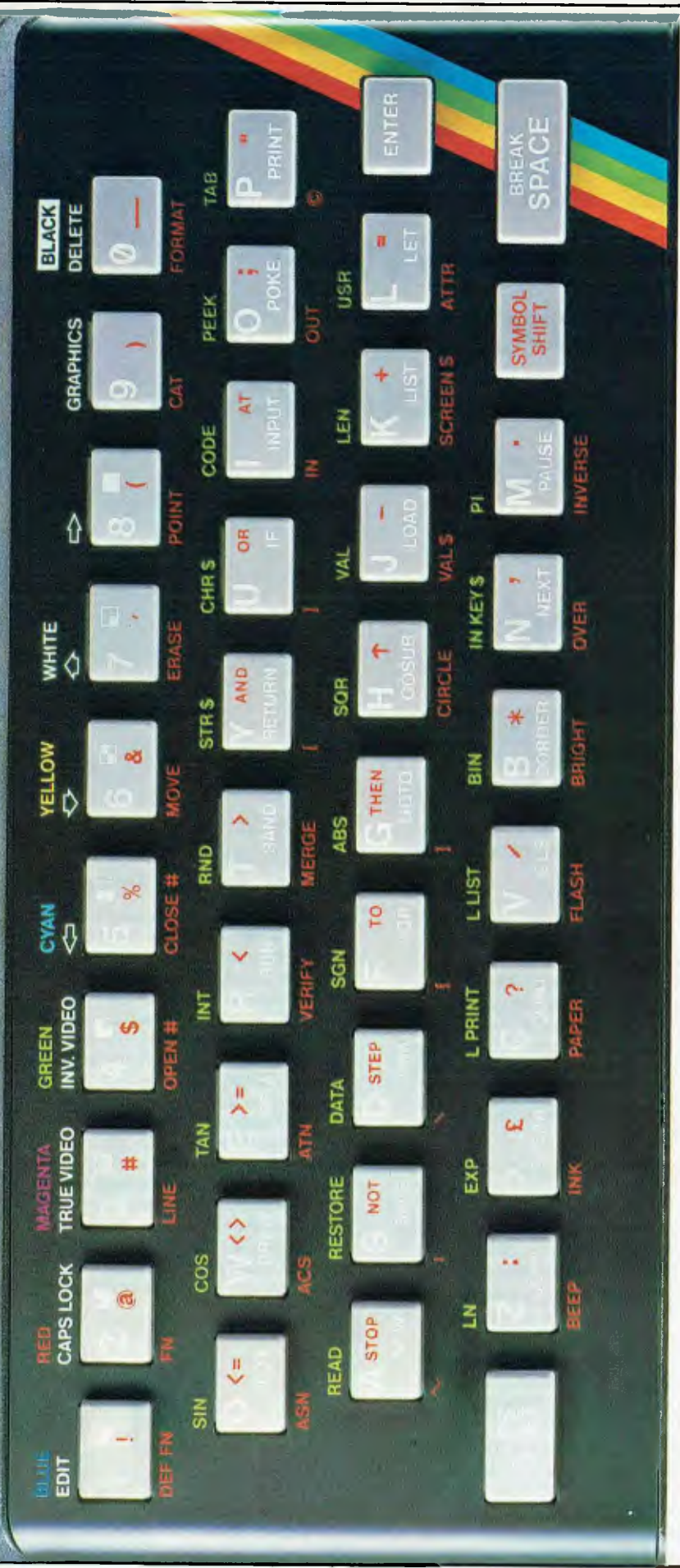
But the manual certainly scores in the way it takes the user logically and carefully through the intricacies of Basic-G. It is well-written and thankfully is not subject to the mangling of the English language that was once almost compulsory for Japanese manuals.

Expansion

The M5's design lends itself to expansion — the slot for various ROM cartridges means that other languages can be added with the minimum of fuss. As yet, the



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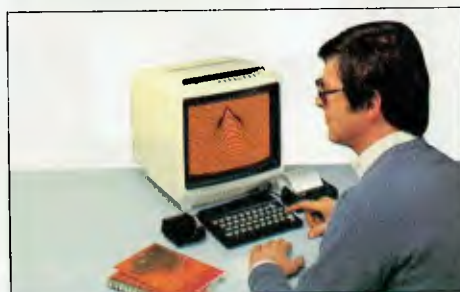


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Key features of the Sinclair ZX Spectrum

- Full colour — 8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
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- Full size moving-key keyboard — all keys at normal typewriter pitch, with repeat facility on each key.
- High resolution — 256 dots horizontally and 192 vertically, each individually addressable for true high-resolution graphics.
- ASCII character set — with upper and lower case characters.
- Teletext compatible — user software can generate 40 characters per line or other settings.
- High speed LOAD & SAVE — 16K in 100 seconds via cassette, with VERIFY & MERGE for programs and separate data files.
- Sinclair 16K extended BASIC — incorporating unique 'one-touch' keyword entry, syntax check, and report codes.

um



The ZX Printer available now

Designed exclusively for use with the ZX range of computers, the printer offers Sinclair ZX Spectrum owners the full ASCII character set – including lower case characters and high-resolution graphics. A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your Sinclair ZX Spectrum. A roll of paper (65ft long and 4in wide) is supplied along with full instructions. Further packs of paper are available in packs of five rolls.



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The new Microdrives, designed especially for the Sinclair ZX Spectrum, are set to change the face of personal computing by providing mass on-line storage.

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A remarkable breakthrough at a remarkable price. The Microdrives will be available in the early part of 1984.



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| | Sinclair ZX Spectrum — 48K RAM version | 399.00 | |
| | Sinclair ZX Printer | 169.00 | |
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Sinclair ZX Spectrum—technical data.

Dimensions

Width 233 mm
Depth 144 mm
Height 30 mm

CPU/ memory

Z80A microprocessor running at 3.5 MHz.
16K-byte ROM containing BASIC interpreter and operating system.

16K-byte RAM (plus optional 32K-byte RAM on internal expansion board) or 48K-byte RAM.

Keyboard

40-moving-key keyboard with full upper and lower case with capitals lock feature. All BASIC words obtained by single keys, plus 16 graphics characters, 22 colour control codes, and 21 user-definable graphics characters. All keys have auto repeat.

Display

Memory-mapped display of 256 pixels x 192 pixels; plus one attribute byte per character square, defining one of eight foreground colours, one of eight background colours, normal or extra brightness and flashing or steady. Screen border colour also settable to one of eight colours. Will drive a PAL UHF colour TV set, or black and white set (which will give a scale of grey), on channel 36.

Sound

Internal loudspeaker can be operated over more than 10 octaves (actually 130 semitones) via basic BEEP command. Jack sockets at the rear of computer allow connections to external amplifier/speaker.

Graphics

Point, line, circle and arc drawing commands in high-resolution graphics.
16 pre-defined graphics characters plus 21 user-definable graphics characters. Also functions to yield character at a given position, attribute at a given position (colours, brightness and flash) and whether a given pixel is set. Text may be written on the screen on 24 lines of 32 characters. Text and graphics may be freely mixed.

Colours

Foreground and background colours, brightness and flashing are set by BASIC INK, PAPER, BRIGHT and FLASH commands. OVER may also be set, which performs an exclusive-or operation to overwrite any printing or plotting that is already on the screen. INVERSE will give inverse video printing. These six commands may be set globally to cover all further PRINT, PLOT, DRAW or CIRCLE commands, or locally within these commands to cover only the results of that command. They may also be set locally to cover text printed by an INPUT statement. Colour-control codes, which may be accessed from the keyboard, may be inserted into text or program listing, and when displayed will override the globally set colours until another control code is encountered. Brightness and flashing codes may be inserted into program or text, similarly. Colour-control codes in a program listing have no effect on its execution. Border colour is set by a BORDER command. The eight colours available are black, blue, red,

magenta, green, cyan, yellow and white. All eight colours may be present on the screen at once, with some areas flashing and others steady, and any area may be highlighted extra bright.

Screen

The screen is divided into two sections. The top section – normally the first 22 lines – displays the program listing or the results of program or command execution. The bottom section – normally the last 2 lines – shows the command or program line currently being entered, or the program line currently being edited. It also shows the report messages. Full editing facilities of cursor left, cursor right, insert and delete (with auto-repeat facility) are available over this line. The bottom section will expand to accept a current line of up to 22 lines.

Mathematical operations and functions

Arithmetic operations of +, -, X, ÷, and raise to a power. Mathematical functions of sine, cosine, tangent and their inverses; natural logs and exponentials; sign function, absolute value function, and integer function; square root function, random number generator, and pi.

Numbers are stored as five bytes of floating point binary – giving a range of $+3 \times 10^{-39}$ to $+7 \times 10^{38}$ accurate to 9½ decimal digits.

Binary numbers may be entered directly with the BIN function. =, >, <, >=, <= and <> may be used to compare string or arithmetic values or variables to yield 0 (false) or 1 (true). Logical operators AND, OR and NOT yield boolean results but will accept 0 (false) and any number (true).

User-definable functions are defined using DEF FN, and called using FN. They may take up to 26 numeric and 26 string arguments, and may yield string or numeric results.

There is a full DATA mechanism, using the commands READ, DATA and RESTORE.

A real-time clock is obtainable.

String operations and functions

Strings can be concatenated with +. String variables or values may be compared with =, >, <, >=, <=, <> to give boolean results. String functions are VAL, VAL\$, STR\$ and LEN. CHR\$ and CODE convert numbers to characters and vice versa, using the ASCII code.

A very powerful string slicing mechanism exists, using the form a\$(x TO y).

Variable names

Numeric – any string starting with a letter (upper and lower case are not distinguished between, and spaces are ignored).

String – A\$ to Z\$.

FOR-NEXT loops – A-Z.

Numeric arrays – A-Z.

String arrays – A\$ to Z\$.

Simple variables and arrays with the same name are allowed and distinguished between.

Arrays

Arrays may be multi-dimensional, with subscripts starting at 1. String arrays, technically character arrays, may have their last subscript omitted, yielding a string.

Expression evaluator

A full expression evaluator is called during program execution whenever an expression, constant or variable is encountered. This allows the use of expressions as arguments to GOTO, GOSUB, etc.

It also operates on commands allowing the ZX Spectrum to operate as a calculator.

Cassette interface

The ZX Spectrum incorporates an advanced cassette interface. A tone leader is recorded before the information to overcome the automatic recording level fluctuations of some tape recorders, and a Schmitt trigger is used to remove noise on playback.

All saved information is started with a header containing information as to its type, title, length and address information. Program, screens, blocks of memory, string and character arrays may all be saved separately.

Programs, blocks of memory and arrays may be verified after saving to confirm successful saving.

Programs and arrays may be merged from tape to combine them with the existing contents of memory. Where two line numbers or variable names coincide, the old one is overwritten.

Programs may be saved with a line number, where execution will start immediately on loading.

The cassette interface runs at 1500 baud, through two 3.5 mm jack plugs.

Expansion port

This has the full data, address and control busses from the Z80A, and is used to interface to the ZX Printer, the RS232 and NET interfaces and the ZX Microdrives.

IN and OUT commands give the I/O port equivalents of PEEK and POKE.

ZX81 compatibility

ZX81 BASIC is essentially a subset of ZX Spectrum BASIC. The differences are as follows.

FAST and SLOW: the ZX Spectrum operates at the speed of the ZX81 in FAST mode with the steady display of SLOW mode, and does not include these commands.

SCROLL: the ZX Spectrum scrolls automatically, asking the operator "scroll?" every time a screen is filled.

UNPLOT: the ZX Spectrum can unplot a pixel using PLOT OVER, and thus achieves unplot.

Character set: the ZX Spectrum uses the ASCII character set, as opposed to the ZX81 non-standard set.

ZX81 programs may be typed into the ZX Spectrum with very little change, but may of course now be considerably improved. The ZX Spectrum is fully compatible with the ZX Printer, which can now print out a full upper and lower case character set, and the high resolution graphics; using LLIST, LPRINT and COPY. ZX81 software cassettes and the ZX 16K RAM pack will not operate with the ZX Spectrum.

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SORD M5

company has released no details of forthcoming languages, but there is a 32k memory upgrade in the pipeline which will increase the machine's appeal considerably. There are also plans for a printer (the M5 has a built-in Centronics interface) to be released in a couple of months. It will use a thermal mechanism with up to eighty columns per line and eighty cps and will sell for less than \$300. A 3 inch disk drive with 160k capacity is also expected soon which, in combination with the FALC database and spreadsheet, could turn the M5 into a small business machine.

information about memory addresses is something that needs to be rectified to attract the machine code fanatic.

It is a pity that the M5 comes supplied with the Basic-I cartridge only. Although useful as an introduction to the complete beginner, Basic-I is not powerful enough to use the machine's capabilities to the full and I feel that Basic-G is a vital purchase. However, at \$65, its purchase will put the price of the M5 up to \$460.

The M5 is beautifully designed and constructed; it definitely has the air of a 'quality' machine, but would benefit from a slight price reduction and/or inclusion

of Basic-G in the basic package.

Prices

| | |
|---|-------|
| Sord M5 (with all leads, power adaptor Basic-I cartridge and — probably — two games cartridges) | \$395 |
| FALC applications package | \$ 65 |
| Basic-G and Basic-F (for floating-point arithmetic) cartridges | |
| Prices not yet set, but approximately | \$ 65 |
| Two games 'joypads' | \$ 85 |

Conclusions

The Sord M5 is not a cheap computer and is impeded by a somewhat limited memory. That said, it must be admitted that the M5 makes graphics programming extremely simple and allows some stunning effects to be achieved with the minimum of fuss. It will therefore appeal to the games programmer — although the lack of

Technical specifications

| | |
|------------|---|
| Processor | Z80A running at 3.58 MHz |
| RAM | 4k user memory, 16k video RAM |
| ROM | 8k expandable to 16k via ROM cartridge |
| Keyboard | 55 keys, membrane type |
| Screen | TV or monitor; four display modes, 16 colours |
| Sound | 3 voice channels, 1 white noise, 7 'special sounds' |
| Interfaces | Tape (remote control), Centronics printer interface, composite video and sound. |

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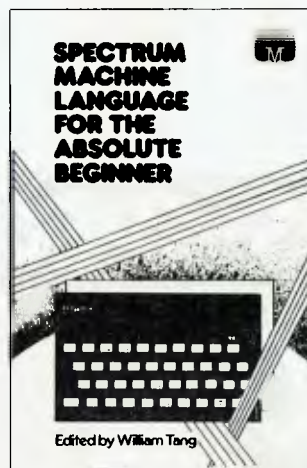


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LISAWRITE

Intrepid reporters Robin Webster and Leslie Miner follow up last month's Apple Lisa scoop with an analysis of the wordprocessing program, Lisawrite.

In last month's *APC* we gave an overview of what the Lisa Office System could do — however, time did not permit an in-depth look at any of the Software Tools. One program that was certainly given only the briefest attention was the word processing tool, Lisawrite.

As a standalone system, Lisawrite offers as wide a range of facilities that a non-specialist would require but, of course, it has the 'what you see is what you get' characteristic along with the ability to accept input from other documents created on a Lisa system (although not all, as we shall see). It is a screen-based editor, but, because of its mouse cursor control, is unlike any you've used before.

Starting up

To enter Lisawrite, you must first activate, or 'tear-off' a piece of Lisawrite

paper from the relevant pad. This pad is available from the ProFile storage disk which is represented as an icon, or object, on the Lisa Desktop.

To open up the ProFile's window, that is, to represent its contents graphically, you must place the mouse-controlled cursor (represented by a small arrow at this point) on the ProFile icon and click the mouse button twice. Once the window is open, it is then possible to locate the Lisawrite paper pad and begin work.

Repeating the icon selection procedure on the Lisawrite pad, ie, pointing to an icon with the cursor and pressing the mouse button twice . . . produces another icon, with the name 'Untitled' next to the pad. At this point you can give this blank document icon a name by simply placing the cursor over the word 'Untitled' and starting to type whatever file name you wish; I called it Lisawrite Review.

Clicking twice with the mouse on the Lisawrite Review icon opens up an empty window on the screen. The cursor is changed from an arrow to what is called an 'I' beam cursor which is easily positioned between characters. At this point you are 'in' Lisawrite and can therefore start typing whatever you wish, but let's first take a look at the commands that are available to us.

The text cursor, which is a very thin flashing vertical line, can be placed rapidly anywhere on the screen by means of the mouse controlled I-beam cursor, so you don't have to sit with your finger on a cursor control key, scrolling the screen. This is of great value when there is a mistake somewhere in the text situated in the middle of the screen.

Across the top of the screen, outside the window border, there is the ever-present menu bar. The range of features available through this menu bar differs depending on the Lisa Software Tool being used.

Lisawrite's main menu bar is: File/Print (which is quite self explanatory); Edit (which offers such functions as Cut, Copy and Paste to move text around); Search (this offers search and replace capabilities, global and otherwise); Type Style (there are eleven standard typesstyles and a range of special variations — see Fig 1); Format (margins, tab stops, text justification and

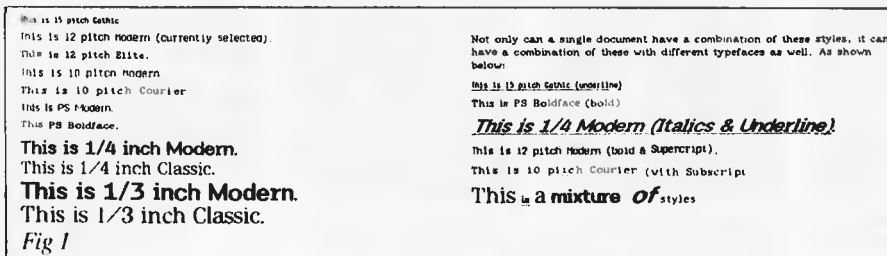


Fig 1

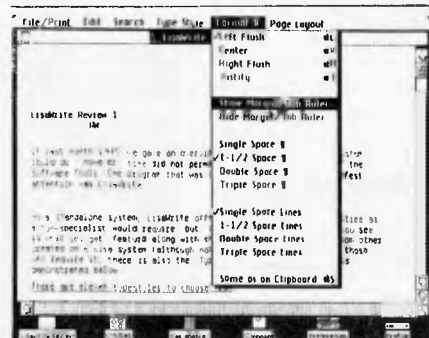


Fig 2

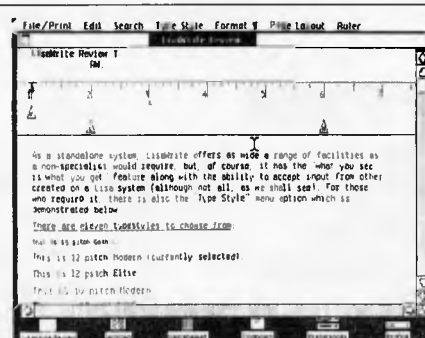


Fig 3

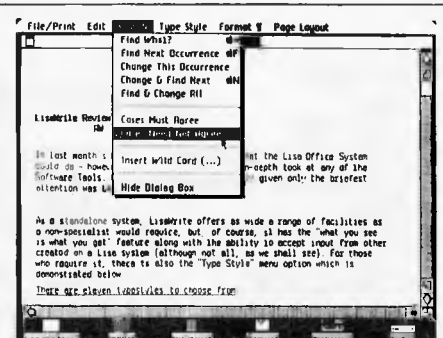


Fig 4

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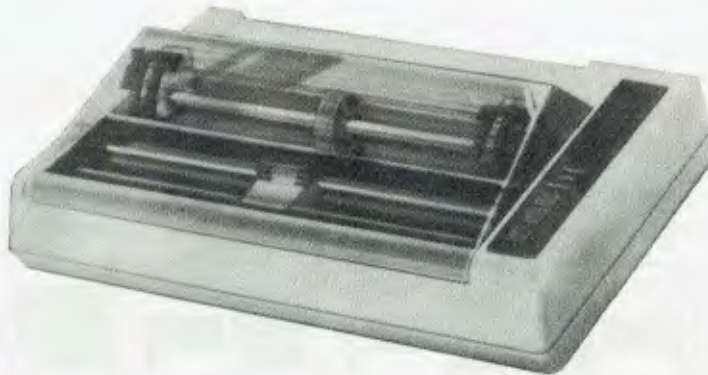
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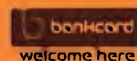
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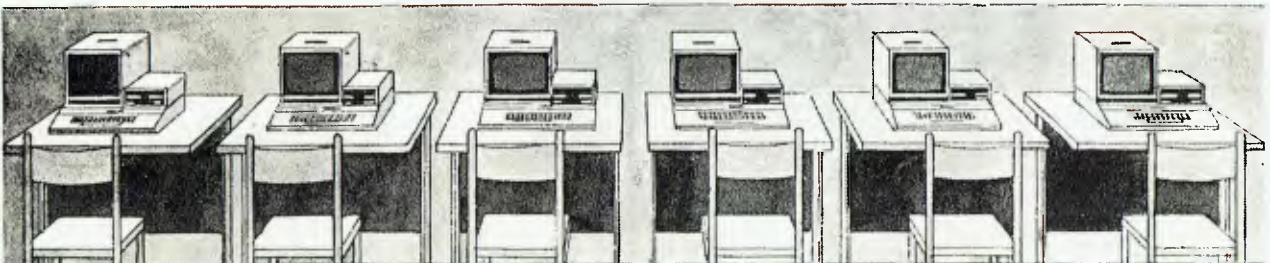
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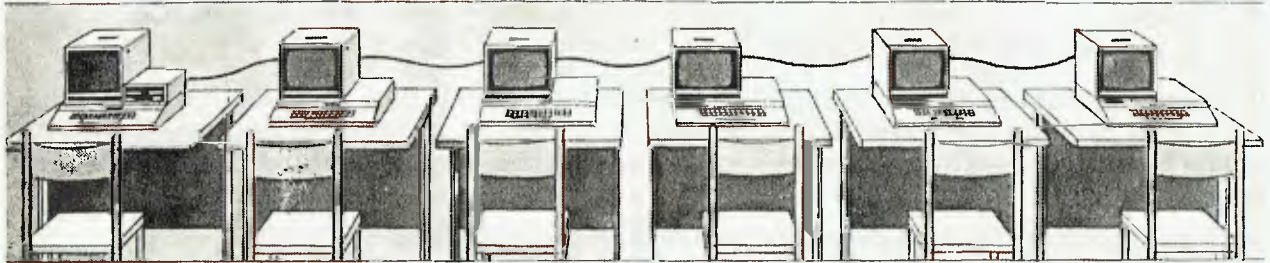


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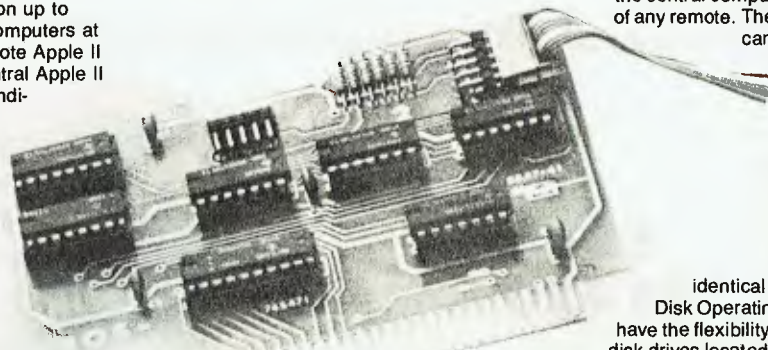
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inter-character spacings are the features offered here); Page Layout (which allows the user to check how the page will look when it is printed and where such things as footers and headers will appear).

To select any one of these options, you simply place the cursor over the relevant word, press the mouse button, and keep it depressed. This causes further menu selections to appear in the form of a pull-down menu. As the cursor is moved down over these menu commands they become momentarily backlit (reverse video). Stopping the cursor over a command and releasing the mouse button is all you need to do to activate any command.

So, if we want to set up margins and tab stops we would go to the Format menu option and then select 'Show Margin/Tab Ruler' from the pull-down menu; see Fig 2. By activating that command we get a display like that in Fig 3.

As you can see, some text, with one or two errors, has already been input, but I've decided to make some changes to the margin and tab stop settings. Also notice that another option, called 'Ruler', has appeared on the menu bar. This offers the ability to alter the ruler markings from inches to centimetres.

Left and right margins are adjusted by selecting the little triangles marked 'L' and 'R' with the cursor, and moving them around until they are satisfactorily positioned. Tabs are set by picking up the triangle marked 'F', and putting it down at whatever tab interval you wish. The screen in Fig 3 shows one tab set at the three-inch point.

Once everything is as you wish, the margin/tab ruler can be removed by selecting 'Hide Margin/Tab Ruler' from the Format menu bar option. Any text that is entered after such an operation will be arranged according to the new settings.

LisaWrite is more concerned with treating text as a total object, and not as a group of sequential pages (unlike the word processing system that is available, say, on the Wang Personal Computer, or those editors that are designed for dedicated word processing systems). Essentially, this means that you cannot simply press a 'goto

page x' button to move around in a document. Instead, LisaWrite offers a set of text movement controls which are an integral part of the document window's border.

At the top right of the window border there is, in descending order, an upward pointing arrow, what looks like a dog-eared piece of paper, and a small white square.

The arrows (there are four to each window) provide the same capability as the up/down/left/right cursor controls on ordinary computer keyboards; they scroll the document one line at a time in one of four directions.

The dog-eared paper symbols (there are two) are used for whole-screen jumps, since they are supposed to indicate the turning of a page.

For very big text jumps, say, from the beginning to two-thirds into a document, the small white square, called an elevator, is used. The elevator can be moved up and down the whole height of the window, and whenever it is moved, the text in the window moves in conjunction. LisaWrite only has a vertical elevator, while other Software Tools have both vertical and horizontal elevators.

The symbol placed at the bottom-right of the window indicates the point at which the user can 'pull' on the window border to make the window bigger or smaller (you tug down and to the right to make it bigger, and up and to the left to make it smaller).

Suppose that we already have input some text and now wish to edit it by maybe deleting a few words, moving some others around, and changing a typestyle or two. The main thing is to tell the system which sections of text you are interested in altering. You do this by running the I-beam cursor over the relevant text with the mouse button depressed. This has the effect of backlighting the text, and readies it for editing operations.

If you want to delete a piece of text you go up to the Edit menu option, enter the pull-down menu, and select Cut. The highlighted text will disappear (it has actually been placed on the Lisa clipboard icon at the bottom of the screen, however).

If you want to move a block of selected text to a new location you would first Cut and then select the Paste option (to bring it back from the clipboard). If you want to change a section of highlighted text and make it appear bold, you would go to the Type Style menu option and make a typestyle choice.

Since you are able to select discrete sections of text with LisaWrite, in common with many other word processing systems on the market, it is possible to also use the margin/tab ruler to make certain paragraphs or lines appear narrower or wider than the overall body of text.

In Fig 4 you can see the range of Search facilities offered by LisaWrite. There is 'Find What?' which, when selected, displays a dialogue box in which the user types the word that must be found and, if appropriate, the replacement word.

'Find Next Occurrence', 'Change This Occurrence', 'Change & Find Next', and 'Find & Change All' are the supporting commands, since they offer a set of convenient document search techniques that are at one time or another used by word processing operators.

As far as being integrated, LisaWrite is a bit of a disappointment because at the time of writing it can only interact with the LisaCalc system. According to Apple, the problem has to do with the data formats involved in textual and graphics storage, but the company says that it is trying to resolve the situation. So for now, you can create a spreadsheet and paste part(s) of it directly into a LisaWrite document, but you can't do much else. If you really need to create a high-quality document with both graphics and text you can produce quite good results by staying entirely within LisaDraw. An example of LisaDraw text and graphics is shown in Fig 5. Once you get used to it, you can easily produce documents that look as if they had been done mainly within LisaWrite, but with a little help from LisaDraw.

Finally, having written and corrected your document, you must get ready to print it out.

All the printouts created for last month's overall review, and this program-specific

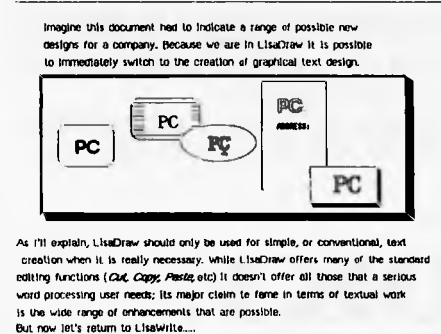


Fig 5

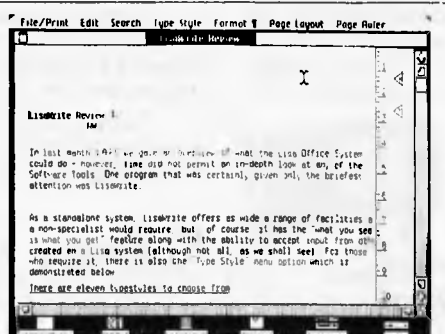


Fig 6

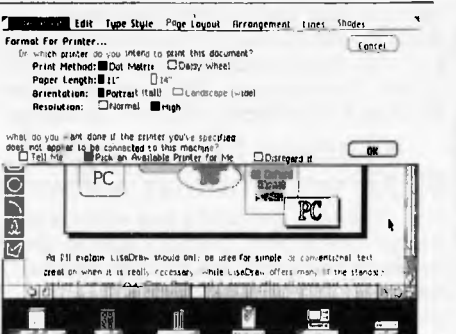


Fig 7

OKI versus Apple: No Contest!

Now, low price on OKI's Model 20.

The most popular model in the Sigma/OKI range is now available at 20% less than before. If price has meant you've had to compromise on your choice of personal computer, then the Sigma/OKI Model 20 is now within your reach. And if you need further convincing... read on!

Compare the Features.

One look is enough to tell you that the Sigma/OKI Model 20 is superior. Compare its compact, streamlined, all-in-one design with Apple's bits 'n' pieces. And compact good looks and space-saving properties are just the start. We offer you function keys. A separate numeric pad. Two disks standard instead of one. Four interfaces that are not standard with the Apple IIe. And that's not all.

Compare the Systems.

Good looks, price, quality and features still not enough? The OKI Model 20 runs on CP/M software. The Apple IIe generally runs on Apple software. If what you want to do is play computer games, then perhaps you don't need the sophistication of the CP/M software. But if you mean business, then CP/M is what you need. Because it offers you a huge library of software... 80% of all business microcomputers operate on this system. And it's worldwide, too. Like all the OKI's advantages, it's built in.

If you compared it with the Apple IIe, you'd have to purchase a special CP/M card to use the CP/M software. And like so many of the Apple features, it's going to cost you an extra - *\$545. Are you getting the picture?

Compare the Colour.

Speaking of pictures, we'd like to boast about our colour capacity. Not only is the OKI Model 20 acknowledged as just about the best colour available in personal computers today, but with the equivalent Apple IIe package, you don't even get colour! You get mono. If you pay extra (here we go again), you get colour. And then, compare the colour.

Compare the Free Offer - \$1,000 worth of 'Star' software!

Now, what would a real contest be without a free offer? Sigma/OKI's Model 20 comes to you with \$1,000 worth of 'Star' software... all the most used and wanted packages (CP/M, Basic, Wordstar,



Calcstar, Mailmerge, Spellstar) absolutely free. It's starting to look like not much of a contest, isn't it?

Compare the Final Costs.

This is the real cruncher. To find out just what incredible value the OKI Model 20 really is, we compared, feature for feature and item for item, directly with the Apple IIe. This is what we found:

The Sigma/OKI all-in-one Model 20 costs *\$4,390 including \$1,000 worth of free software.

The equivalent Apple IIe costs over *\$5,900.

Here's the breakdown:

| | |
|----------------|----------------|
| Hardware alone | Over \$4,400* |
| Plus CP/M | \$545* |
| Plus Colour | Say \$300* |
| Plus Software | \$700-\$1,500* |

*As per Apple Retailer quotation 14/6/83. Prices shown exclude sales tax.

Compare the Support and Service.

Our own service team is available, throughout Australia, in case anything goes wrong. You'll be back in business before you know it.

You'll find there's no comparison.

If you're considering a personal computer, we suggest you compare the OKI Model 20 with the Apple IIe. We believe that feature for feature, cost for cost, you'll find there's not only no comparison, but there's simply no contest!

Sydney 436 3777; Melbourne 26 2465; Canberra 80 6233; Adelaide 271 6688; Perth 321 4815; Brisbane 371 7355; or your nearest dealer.

SIGMA/OKI

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review, were produced on an Apple dot matrix printer either by dumping screen contents straight to the printer or printing from main memory. Screen dumps automatically result in low-resolution output (Figs 2 and 3 are examples), while memory output can be reproduced in both low and high-resolution (Fig 5 is a high-resolution example).

While the LisaWrite system is not primarily page-oriented, it does allow the user to see how pages will be printed out before any printing has taken place. By going up to the Page Layout menu option, you can select 'Preview Pages' from the resultant pulldown menu. This organises the document into as many pages as are required. If you need to check the layout in more detail, you can preview pages and display what is called the 'Page Ruler' down the right-hand side of the document

window (see Fig 6). This ruler is very similar to the margin/tab ruler, but is used to show how document text lies in the page printing area, and where headers and footers are supposed to be.

Once everything is ready to print, you go to the File/Print menu option and obtain the display shown in Fig 7 by selecting 'Format For Printer'. This, like almost everything about the Lisa system, is very easy to follow. Printouts can be done either in the normal letter-style fashion or in landscape mode.

Conclusions

LisaWrite is a very reliable word processing system that has much to commend it. There were times, though, when I felt the system was too slow. The slowness was especially noticeable during scrolling

operations or when quite a large amount of data was being block-moved (I suppose it is in the nature of a bit-mapped display). Occasionally, I also encountered delay when trying to select a small amount of text, such as a two-letter word, or maybe even single punctuation mark. The black on white display was very easy to use for long periods, and there was no perceptible flicker on the screen.

In general, being able to pinpoint rapidly text with the mouse-controlled cursor was a major feature of the system, and one that makes up/down/left/right cursor movements seem ever more tedious. LisaWrite won't replace any dedicated word processing systems, but it might well encourage a lot more business people to get involved in the creation of well put-together documents. **END**

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Sol Libes presents his monthly batch of juicy snippets from the Big Apple.

Random rumours

There are rumours that Microsoft is now beta testing version 3.0 of MS-DOS and that it may be available as early as October. It is expected that the new version will have multi-tasking ability à la Concurrent CP/M-86 . . . Meanwhile Digital Research is expected to release a new version of CP/M-86 by the end of the year which will include many of the new features included in CP/M-80 Plus (Version 3) . . . Hewlett-Packard is expected to introduce a system, running MS-DOS into an already crowded IBM PC compatible market . . . Rumours continue that the Shugart division of Xerox is up for sale . . . Xerox is apparently readying a four-pound battery-powered portable computer . . . USI International Corp, Taiwan, is expected to introduce a 'joy mouse' cursor control device for use with home computers with an expected retail price of under \$10 . . . Sharp Electronics is rumoured ready to start sampling a 16 line x 80 character liquid crystal display this summer. The company has already demonstrated a prototype 24 line x 80 character display . . . Commodore's under \$3000 Lisa-like machine is expected before year end. The word is that Digital Research is doing the operating system for Commodore . . . Sord Computer Systems Inc is expected shortly to introduce a portable for \$190 based on the Z80 with 250k RAM.

Micro Unix News

At the recent National Computer Conference 45 new Unix-based microcomputers were being demonstrated with about 80 per cent based on the Motorola 68000 microprocessor. At the show Western Electric announced that agreements had been signed with Intel, Motorola and National Semiconductor to license Unix version 5 and provide support to these vendors. WE is also expected to sign a contract with Zilog.

Tandy announced that it will furnish Microsoft's Xenix to all past, present and future purchasers of the Tandy 16 system at no extra charge. Thus if all of these users were to use Xenix on their systems there would be 15,000 additional Unix systems in operation, more than doubling the number of Unix systems in operation and making Xenix the most widely implemented version of Unix. Of course, if only a few Tandy 16 users use it, that is another matter. With Xenix on the Tandy 16 a three-user timesharing system can be implemented.

Apple doings

Apple Computer is continuing an aggressive fight against Apple clones. In its latest battle it was successful in obtaining an injunction against Formula International, Los Angeles, California, to halt the sale of its 'Pineapple' kit. This is the first such injunction Apple has received against a domestic supplier. The Pineapple's components were actually made in Hong Kong. The judge in the case concluded that FI

had violated copyright laws by copying Apple's ROM and disk-based software. Apple is presenting its suit also charging patent and trademark violations. FI is appealing and in the meantime has changed the name of the system to 'Pinecom' and is furnishing a new ROM. The system sells for half the price of the Apple IIe.

FI has also announced that it will soon introduce an IBM PC look-alike.

Apple, which has as yet not delivered any Lisa systems to customers (although many dealers have their demo units), has disclosed that it has already accepted orders for the McIntosh, the lower-priced Lisa look-alike. The orders, which already total close to 20,000 units have been accepted from universities which will require their students to purchase the systems. Deliveries of the unit are expected this fall. First shipments of Lisas to end users are expected this summer.

Apple has disclosed that orders for the Lisa are well ahead of what was expected and that the Lisa should be in short supply until the second quarter of next year.

Big blue news

The new IBM PC XT model has met with such success that IBM has fallen up to six weeks behind in deliveries to dealers. The result is that IBM look-alike competitors have seen a tremendous boost in sales. The prime beneficiary of the XT shortage has been Compaq Computer Corp whose unit is now also in short supply.

Dealers are also claiming that the supply of PC-DOS version 2.0 is even more of a

problem. Many dealers are resorting to making copies of the system disk so that they can deliver PCs to customers. They will then supply the manuals when they come in.

Price war intensifies

Tandy finally entered the home computer pricing war with a new version of its Colour computer having only 4k of RAM (expandable to 20k) and selling for \$150.

Texas Instruments countered by introducing its \$100 rebate on the 99/4 two weeks earlier than scheduled thus bringing the street price down to well under \$90. Further, TI is now giving away its \$249 expansion box with the purchase of any three of its peripheral devices. This is the first time that a supplier has cut prices on a peripheral device, which is usually where it makes up for the profit lost on the computer. Also TI is expected shortly to unveil new lower-priced peripherals and two new versions of the 99/4 and a new 'top-of-the-line' model called the 99/8.

Timex, which ironically spearheaded the price war by cutting the price of its TS/100 (Sinclair ZX81), has decided to pull back the TS/2000 (Sinclair Spectrum) which it had already announced with a suggested selling price of \$149 (16k RAM) and added features to it so as to be able to meet competition. The new 200 will have banked memory, an expanded 64x24 display, a ROM port for plug-in software cartridges and an upper/lower case keyboard. Timex will also introduce a new machine, to fit between the 1000 and 2000, called the

YANKEE DOODLES

TS/1500, with a suggested list price of \$79.

The unit will be similar to the Spectrum with ROM port and compatibility with TS/1000 software and will be made in South Korea.

The Timex 1000, which a year ago was selling for \$99, is currently selling for \$39.

And Atari has announced that it will market software for the Commodore, TI, Radio Shack, IBMPC and Apple computers. Atari is also expected to introduce its long rumoured upgrades of the 400 and 800 machines to be called the 600XL and 800XL. The 600XL will finally have a raised keyboard and 16k RAM and list at \$150. The new 800 will come with 64k RAM and list at about \$300. Atari is also expected to introduce a new top-of-the-line computer to be called the 1400XL and 1450XL. The 1450 is expected to have a built-in disk drive, modem, speech chip and 64k RAM. The 1400 should be the same as the 1450 less disk drive. The 1450's list price is expected to be about \$800. In the meantime, Atari has reported a second quarter loss (its second in a row), merged its game and computer divisions and laid off another 225 employees (it laid off 1700 just three months ago).

The Commodore VIC-20 still appears to be the leading seller in the colour home computer market now selling for under \$80; and Atari's recent rebate on the 400 has brought its price down to less than \$95.

New portables introduced

Commodore showed off its new \$995 portable called the 'Executive 64' with a six-inch CRT colour display, 64k RAM and 170k disk drive. However, at 25lbs is it really a 'portable' machine?.

Three true portables were introduced by Gavilan, Sharp and MicroOffice Systems Technology. The Gavilan unit

weighs 9lbs, is battery operated and has built-in software and disk drive. The 8 line x 66 character display has an associated touch pad that acts like a mouse and gives the unit many Lisa-like features. The unit uses an 8088 microprocessor with 128k RAM and MS-DOS is also furnished. The price will be approximately \$4000.

The new Sharp portable features an 8 line x 80 character display, 128k RAM, a bubble memory, an 8088 processor, and will retail for \$2500. The MST unit will be under \$2000 and feature an 8 line x 80 character display and the NCS800 CMOS processor running CP/M. Apple and IBM are expected to introduce portables by year-end.

Disk technology trends

At the recent National Computer Conference the trend was for lower profile winchester hard disk drives for the emerging desk-top and portable markets. Several vendors also showed micro-winchester (sub 5.25in) drives. Control Data Corp and Rodime introduced 3.5in winchester drives with the same form factor as the floppy disk drives from Sony, Shugart and Tandon. The CDC drive stores 6.38Mbytes (unformatted) with production expected by the end of the year. The firm is working on 12 and 19Mbytes versions.

Syquest, the first firm to introduce a sub 5.25in hard disk (3.9in), disclosed that it will soon introduce 10 and 20 Mbytes versions of its drive. Computer Memories Inc, Tandon Corp, Miniscribe and Shugart all showed half-height 5.25in winchesters.

In the floppy area Sony introduced a 1 Mbyte version of its 3.5in drive; Amlyn Corp showed a 5.25in floppy storing 3.3 Mbytes and Kodak showed

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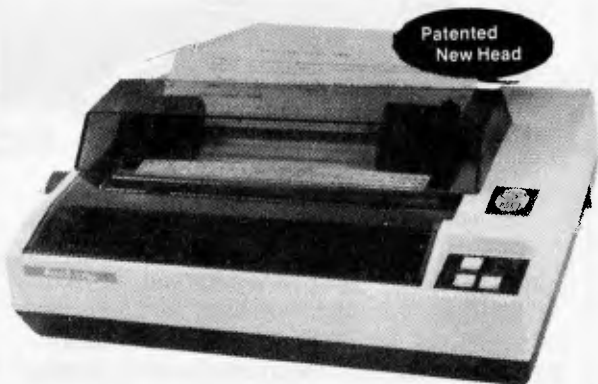
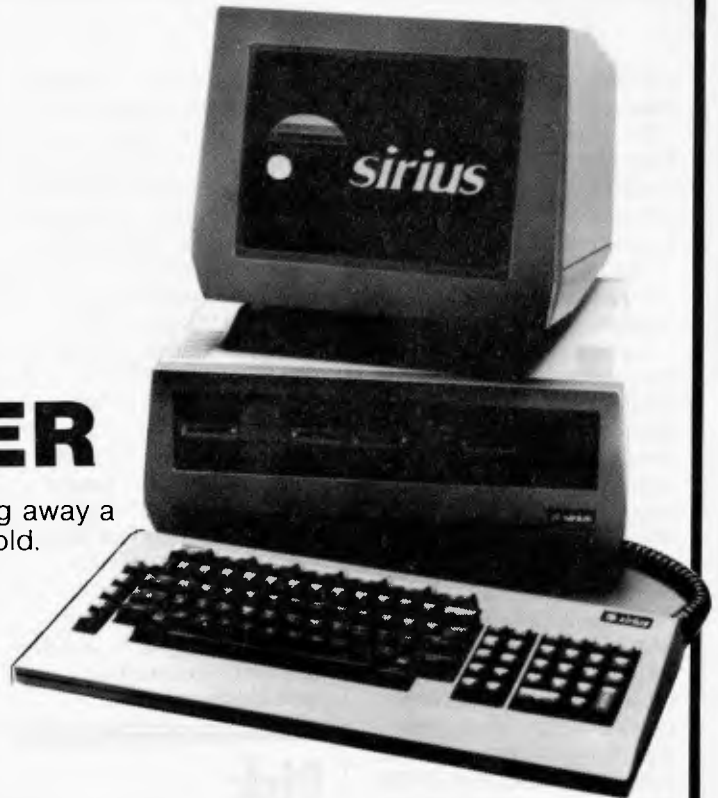
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off a prototype 5.25in floppy drive storing up to 10 Mbytes.

On the optical memory front Panasonic demonstrated its 8in disk storing 700 Megabytes and Control Data showed off a 12in optical disk system.

Commodore fined by FCC

Commodore Business Machines has been fined \$4000 by the Federal Communications Commission for violating the Radio Interference Standards. The FCC, which recently began policing retail stores, claimed that the new P500 computer and 8023P printer lacked compliance with the Commission's regulations.

Lower supply voltages proposed

The JEDEC JC-42 memory committee has proposed lowering power supply voltages for logic circuits from the current 5V level to 3.3V for devices powered by regulated supplies and 2.8V for battery-powered devices. The reasoning is that the newer devices continue to be scaled down and IC designers are concerned that the thinner oxides and reduced lateral dimensions will not be able to withstand the electric field stress imposed by 5V power supplies. 3.3V devices could still interface with 5V devices without buffering, allowing the mixing of TTL and low-voltage devices in a system. The 2.8V devices would match the end-of-discharge levels for many batteries and the lower operating supply limit of high performance CMOS devices.

The proposed standard has already been approved by the JEDEC, MOS and bipolar memory standards committees and is under review by the JEDEC gate-array, bipolar

logic and MOS logic committees.

Smalltalk released by Xerox

The much talked about Smalltalk, the integrated language and operating system, developed by Xerox at its Palo Alto Research Center over a ten year period, has finally made its debut. Xerox will now be offering commercial licences (\$20,000) and university licences (\$400). System manufacturers who install Smalltalk on their systems will have to pay a \$150 per system licence fee. Called 'Smalltalk-80' it includes text, graphics and program editors and a large number of utilities.

Japan taking the lead

Several top US computer experts are predicting that programs initiated by the Japanese will make Japan the computing leader within ten years. They claim that Japan is using a similar strategy to that which boosted it into becoming the leading power in the automobile industry. They claim that Japanese government sponsored development projects in artificial intelligence, computer-aided design and manufacturing and large-scale numeric processors are readying Japan to make great strides in almost every area of computer technology.

They claim that US computer manufacturers are too concerned with yearly profits and pass up opportunities for future technological developments. Also, US companies are unwilling to share results of their research and hence many developments go unused. They pointed to a lack of directed US technology research programs and they expressed the view that the US

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may already be in trouble in the supercomputer or large scale number crunching market.

IBM and Digital Equipment Corp have undertaken a joint venture to establish a networking system at Massachusetts Institute of Technology consisting of 63 DEC minicomputers and several thousand DEC and IBM personal computers acting as work stations. MIT will develop the software with DEC and IBM taking care of the hardware. This is the first instance in which the two giants of US computing have ever cooperated on a project or attempted to make their equipment compatible.

Random news bits

Fujitsu appears to be the first manufacturer to introduce a system (its 8/16 microcomputer) with 256k

memory chips. Naturally it uses Fujitsu's own memory chips . . .

Visicorp has now pushed back delivery of the VisiOn system for the IBM PC until October (although December appears to be more realistic) and announced a price of \$495. The mouse will be an extra \$250 and the spreadsheet, word processor and graphics packages will cost users an extra \$395, \$375 and \$195 . . . Mattel Electronics has filed a suit against Atari for \$40 million alleging 'misappropriation of trade secrets, unfair competition and inducing breach of contract' when it lured away three programmers who were working on Intellivision games . . .

VisiCalc, for over two years the most popular spreadsheet program, has been overtaken by Microsoft's MultiPlan and Lotus Development's 1-2-3, both of which offer improvements over VisiCalc.

END

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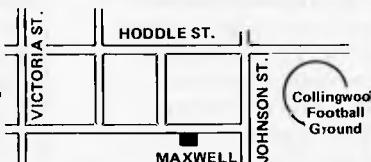


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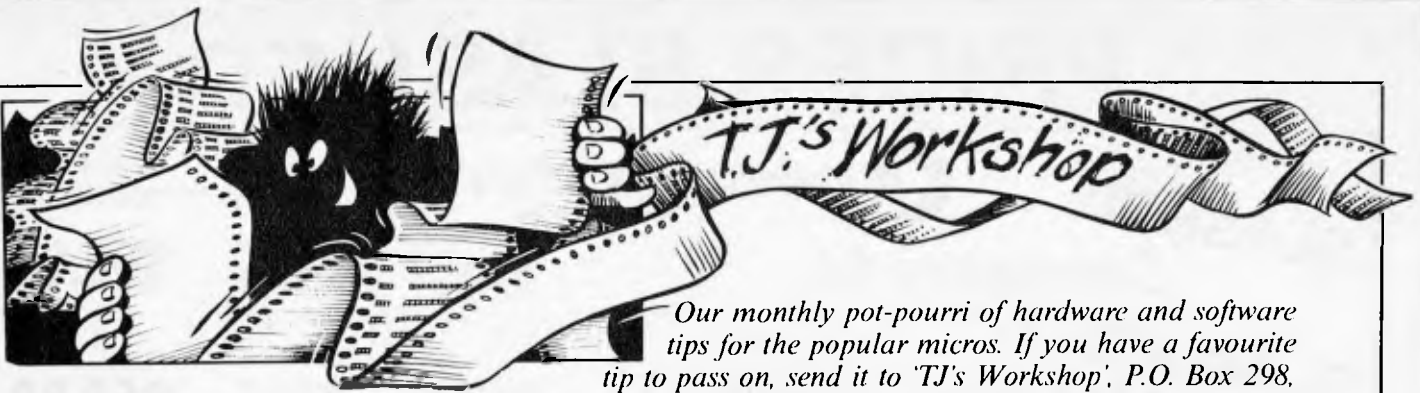
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Clayton, Vic 3168. Please keep your contributions as concise as possible. We will pay \$10—\$30 for any tips we publish. APC can accept no responsibility for any damage caused by using these tips, and readers should be advised that any hardware modifications may render the maker's guarantee invalid.

TRS-80 hex

TRS-80 users without disks will often have needed a convenient method of entering hexadecimal numbers in a Basic program, especially for PEEKing and POKEing. In Disk Basic (Level III) this is achieved by preceding the number with &H, eg, &HAA gives 170 decimal. The Basic program given loads a machine code routine into 4040H (not used by Level II) which is called whenever an & is encountered. The program converts a following hexadecimal number into its decimal equivalent which is passed to the Basic interpreter. If more than four hex digits follow the &, only the last four are evaluated. No H is required, eg, PRINT & 1001 prints 4097; POKE&4000, &FF pokes 255 into location 16384.

```

10 RESTORE
20 READ N
30 IF N=999 THEN END
40 IF N>255 THEN A=N:
  READ N ELSE A=
  =A+1
50 POKEA,N
60 GOTO20
70 DATA 16789,64,64
80 DATA 16448,197,213
  17,0,0,35,126,214,48
  56,39,254,10,56,
  10,254,17,56,31,
  254,23,48
90 DATA27,214,7,71,122,
  135,135,135,135,87,
  123,7,7,7,7,95,
  230,15,178,87,62,
  240,163,176
100 0,95,24,211,237,83,
  33,65,229,33,175,64,
  54,2,225,209,193,
  201,999

```

A W Sheppard

PET function key

This is a routine which creates a definable function key. The stored function is printed by pressing shift and space together. Any string can be printed including those containing cursor movements. For example, the

combination of ASCII characters

147,76,201,13

would clear the screen and list the program in RAM.

It is necessary to specify the length of the desired string before entering it into the computer. The length is the number of ASCII characters used, so the above example has a length of 4.

What the program does is

to check first if the keys are pressed, then insert the string into the keyboard buffer.

The start address of the program is input in the program

Note: In the listing the characters , , and are the cursor controls DOWN, UP, LEFT and RIGHT respectively.

Chris Patmore

```

10 PRINT"(CLR ++++ RVS ON) FUNCTION KEY FOR NEW ROM PET.
20 INPUT"AT WHAT DECIMAL POSITION IN RAM DO YOU WANT THE ROUTINE";D
25 PRINT"(++)
30 IFD<826THENPRINT"THAT WOULD NOT BE WISE."GOTO20
40 P=PEEK(53)*256+PEEK(52)
50 IFD>P-60THENPRINT"YOU HAVE NOT GOT ENOUGH MEMORY TO PUT ITTHERE."GOTO20
60 IFPEEK(47)*256+PEEK(46)>D-20THENPRINT"THAT'S A BIT CLOSE TO THE END OF THIS
70 IFPEEK(47)*256+PEEK(46)>D-20THENPRINT"PROGRAM.CHOOSE AGAIN"GOTO20
80 R=D:DX=0/256:D=D-DX*256
90 PRINT"(CLR ++)TURN ON WITH :-
100 PRINT"(+) POKE144,"D":P=145,"DX
110 PRINT"(++) TURN OFF WITH :-
120 PRINT"(+) POKE144,46:P=145,230
130 PRINT" OR BY USING THE TAPE DECKS."
140 PRINT"(+) PRESS SHIFT & SPACE SIMULTANIOUSLY
150 PRINT"TO PRINT A PRE-DEFINED STRING.
160 PRINT"(+) N.B.":PRINT"====":PRINT"IT CAN CONTAIN CURSOR CTRL CHARACTERS"
170 POKE158,0
180 FORI=1TO2000:GETA$:IFA$=""THENNEXT
190 INPUT"(CLR) LENGTH OF STRING (1-9)";L
200 POKER+33,L:POKER+37,L
210 FORI=1TOL:PRINT"ASCII VALUE OF CHAR."I:INPUTA:POKER+47+I,A:NEXT
220 PRINT"(CLR ++++++ ++++++) POKING MACHINE CODE."
230 FORI=0TO47:READX:POKER+I,X:NEXT
240 Q=R+48:QX=Q/256:Q=Q-QX*256
250 POKER+26,Q:POKER+27,QX
260 POKER+33,L:POKER+37,L
270 PRINT"(+++ ) SWITCHING ON
280 POKE144,D:POKE145,DX:PRINT"(++) ON."
290 END
300 DATA165,151,201,6,240,5,133,255,76,46,230,165,255,201,6,240,247
310 DATA165,152,201,1,208,241,160,0,185,106,3,153,111,2,200,192,9,208
320 DATA245,169,9,133,158,169,6,133,255,76,46,230,0

```

Sorting without sorting

I was particularly interested in RW Bishop's sort program on page 39 of April's APC as I had been thinking along similar lines. However, I

think that the modification that I am proposing not only saves on memory space and execution time, but is also a totally different approach to traditional sorting methods. My method replaces his new sorted array with a sorted index-array which references the original unsorted data. (The program was written in PET Basic but should easily

be transferable to other systems.)

It is easier to explain how the program works after showing a typical end result:—

Original data array
D\$(1) = Smith
D\$(2) = Jones
D\$(3) = Brown
D\$(4) = Bloggs

Why buy an imitation when you can have the real thing? EPSON

The new EPSON RX-80 dot matrix printer, featuring 8KB ROM, uses proven EPSON MX series technology combined with several new features to take the lead in moderately priced printing. Ideal for both business and personal computing use, the RX-80 guarantees the same reliability and versatility that has made the EPSON MX series the world's best selling printers.

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To meet more complicated and diverse user needs, 12 types of 1 byte command, and an expanded command group of 54 commands (following ESC) are provided.

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Hard copy possibilities have been greatly expanded thanks to the RX-80's 6 bit image print modes. These include 1920 dot per 8-inch quadruple density, 640 dot per 8-inch CRT graphics, and 720 dot per 8-inch CRT graphics II. These can be used in the same print line in any combination.

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PQRSTUVWXYZ{ }~
Normal-Italic /"#\$%&'()*+,-./0123456789:;<=>
cdefghijklmnopqrstuvwxyz{|}~
Emphasized i"#\$%&'()*+,-./0123456789:;<=>
fghi jklmnopqrstuvwxyz{|}~
Enlarged i"#\$%&'()*+,-./0123456789:;<=>
ABCDEFGHIJKLMN O PQR
STUVWXYZ
Elite-sized i"#\$%&'()*+,-./0123456789:;<=>
PQRSTUVWXYZ{|}~
Elite-Enlarged i"#\$%&'()*+,-./0123456789:;<=>
ABCDEFGHIJKLMN O PQR
STUVWXYZ{|}~



Condensed i"#\$%&'()*+,-./0123456789:;<=>@ABCDEFGHIJKLMN
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Condensed-Enlarged i"#\$%&'()*+,-./0123456789:;<=>
PQRSTUVWXYZ{|}~
Double-Strike-Elite
23456789:;<=>
ZC\|}~ abcdefgh
Subscript-Italic-Emphasized
PQRSTUVWXYZ{|}~
Y=aX³+bX²+cX+d
2NH₃+CO₂+H₂O --> (NH₄)₂CO₃

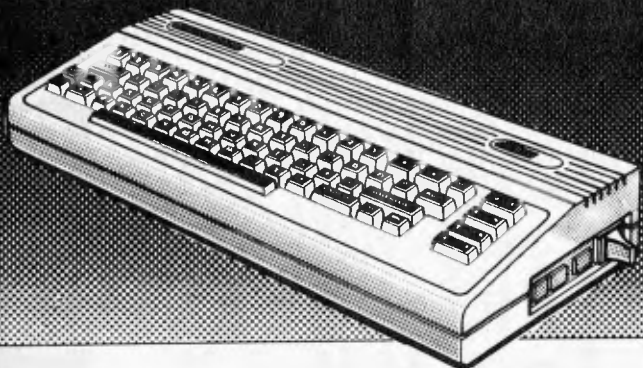
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D\$(5) = Andrews
D\$(6) = Henderson
D\$(7) = Richards
D\$(8) = Allen

Sorted index-array

X(1) = 8
X(2) = 5
X(3) = 4
X(4) = 3
X(5) = 6
X(6) = 2
X(7) = 7
X(8) = 1

Index sorted list

D\$(X(1)) = Allen
D\$(X(2)) = Andrews
D\$(X(3)) = Bloggs
D\$(X(4)) = Brown
D\$(X(5)) = Henderson
D\$(X(6)) = Jones
D\$(X(7)) = Richards
D\$(X(8)) = Smith

Thus only the index array is sorted and not the original data.

I tested the program using 100 randomly generated strings of alpha-characters varying in length from five to 20 characters. Each string is compared, one at a time in line 130, with the highest string already indexed. If the latest string is the same — or of higher ASCII value — then that index array is set

(line 140) and the loop continues. If the latest string is lower, the program branches to line 1000. The check is then continued downwards through the indexed list (NB *not* the list itself) and each time through this loop the index value is moved upwards (NB *not* swapped) until the position is found at which the string can be indexed into place. Operation then returns to the major loop in line 150.

As well as being faster than traditional bubble sort routines and Mr Bishop's method, more dramatic savings can be made where multiple fields of data are being sorted. For example, with a typical list of name, address and telephone number which is sorted into alphabetical name order, a considerable amount of time is wasted performing string-swap operations. With my method the time taken to 'sort' is the same regardless of the number of fields of data as no re-shuffling of data occurs. If required, the data can be re-stored in sorted order by indexed listing as shown above.

Bob Sharpe

```
100 TI#="000000"
110 X(1)=1
120 FORA=2TOH
130 IFD$(X(A))D$(X(A)-1)>THEN1000
140 X(A)=A
150 NEXTA
160 PRINT"TIME = " ; TI#
170 END
1000 FORB=A TO 2STEP-1
1010 IFD$(B)>D$(X(B)-1) THEN1040
1020 X(B)=X(B)-1
1030 NEXTB
1040 X(B)=A
1050 GOTO150
```

TRS-80 file copier

Owners of the TRS-80 with only one disk drive may be interested in the following program.

A limitation of TRS-DOS is that it does not allow

copying of disk files between disks with only one drive.

My program overcomes this limitation by copying the entire file to memory, then copying the file, now resident in memory, to the other disk. This assumes that the available memory is sufficient for this purpose, but even with the minimum

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- dual floppy diskette storage
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- easy to use keyboard
- built-in communications capabilities
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- software development and productivity tools, including a variety of popular language compilers, application generators, and systems software.

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- increased accessibility to computing power — you can use DOT not only as a standalone personal computer but also access a world of computing resources including timesharing services and data bases
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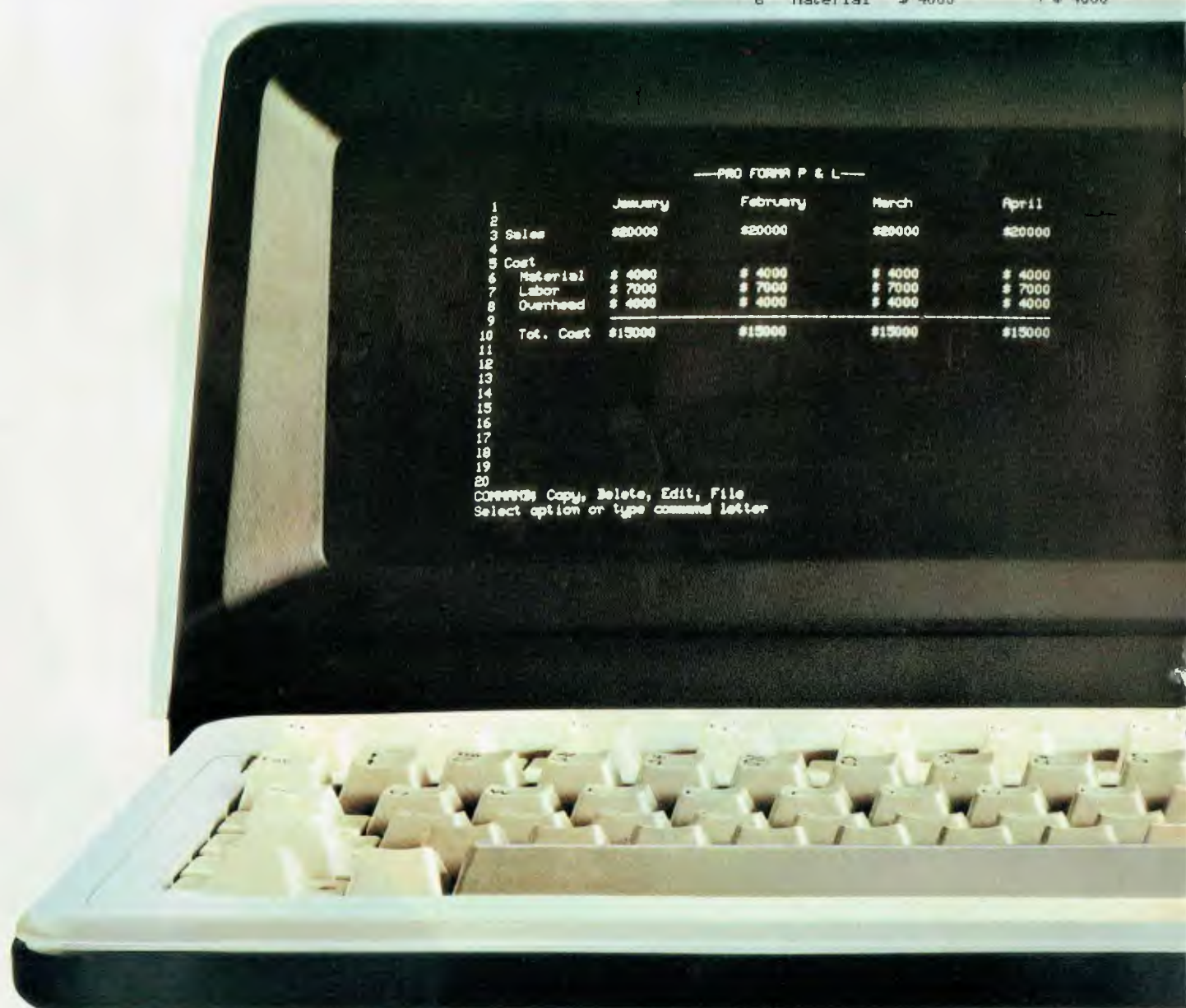
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| 1 | January | February |
| 2 | | |
| 3 Sales | \$20000 | \$20000 |
| 4 | | |
| 5 Cost | | |
| 6 Material | \$ 4000 | \$ 4000 |



---PRO FORMA P & L---

| | | | | |
|--------------|---------|----------|---------|---------|
| 1 | January | February | March | April |
| 2 | | | | |
| 3 Sales | \$20000 | \$20000 | \$20000 | \$20000 |
| 4 | | | | |
| 5 Cost | | | | |
| 6 Material | \$ 4000 | \$ 4000 | \$ 4000 | \$ 4000 |
| 7 Labor | \$ 7000 | \$ 7000 | \$ 7000 | \$ 7000 |
| 8 Overhead | \$ 4000 | \$ 4000 | \$ 4000 | \$ 4000 |
| 9 | | | | |
| 10 Tot. Cost | \$15000 | \$15000 | \$15000 | \$15000 |
| 11 | | | | |
| 12 | | | | |
| 13 | | | | |
| 14 | | | | |
| 15 | | | | |
| 16 | | | | |
| 17 | | | | |
| 18 | | | | |
| 19 | | | | |
| 20 | | | | |

Commands: Copy, Delete, Edit, File
Select option or type command letter

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HARDWARE OVERVIEW

DOT provides maximum personal computing power in a compact, affordable package with a powerful microprocessor, mass storage, keyboard and video display console communications and integral printer.

MICROPROCESSOR

- The DOT is based on a powerful 16-bit Intel 8088 microprocessor chip and provides:
- advanced 16-bit power for high performance in a compact package
 - an internal time of day clock/calendar
 - 128K bytes of main memory (minimum)
 - 32K bytes of video display RAM (standard)
 - optional additional memory allowing up to 256K bytes on a single board, and up to 768 bytes with an additional expander board.

MASS STORAGE

The DOT offers single or dual disk drives that use high capacity, high speed, 3½ inch floppy diskettes for data storage.

The DOT is configured with: two 282K byte floppy diskettes(formatted).

KEYBOARD AND VIDEO DISPLAY CONSOLE

The keyboard and video console for the DOT, like all DOT components, work together to provide an easy to use and comfortable interface between the operator and the computer. The keyboard provides a familiar means of communication with the DOT.

- familiar typewriter style layout with cursor and numeric keypads
- ten soft function keys
- full 256, character set (includes many international characters).

The video display console meets the requirements of compact packaging while fulfilling the operators need for an easy-to-view, flexible display. The console offers:

- 5 x 9 inch monochrome screen for easy operator viewing
- high resolution video display with bit map graphics and standard screen character modes of: 132 x 25, 132 x 16, 80 x 25, 80 x 16, 40 x 25, 40 x 16
- selectable screen graphics modes:
 - IBM modes: 320 x 200
 - 640 x 200
 - DOT modes: 1024 x 254.

COMMUNICATIONS

The DOT not only supplies a complete, self contained unit with all the personal computer

Australian Personal Computer

components a professional, manager, or small businessman requires, it also provides the communications capabilities they need to integrate the DOT with an assortment of networks, data bases, and on-line services.

Communications capabilities include:

- IBM 3270 and 3780 Bi-sync protocols supported
- two communications (RS- 232) ports
- DEC VT 100/52 emulation available
- supports synchronised and A-synchronous. Bi-synchronous protocol also supported.

HIGH SPEED PRINTER

Computer Devices has always sold compact, reliable, quiet printers as integral parts of their portable data terminal/printer units.

The DOT incorporates all the features and benefits that Computer Devices has introduced in its printers during those years.

The DOT high speed printer offers the following features:

- thermal printing for quiet, reliable operation
- 160 cps bidirectional printing
- 1 x 11 dot printhead for letters that look like letters, with true descenders
- selectable 80 or 132 column format. Useful for financial and statistical applications where a wide format is a necessity
- integral graphic capability for quality charts, plots, etc.

CONFIGURATIONS

Configurations offer a choice of 128K or 256K main memory (running MS DOS), with or without an integral printer. All configurations include a

high resolution bit map graphic display, disk drives, a detachable keyboard, two option slots, and a 90 day warranty as standard features.

In addition, the DOT can be equipped with expanded memory (to 768K), integral communications capabilities, a parallel port, and professional application software.

The DOT can also be configured with a Zilog, Z80, 8- bit processor for access to software running under CP/M (tm) 2.2.

To complement the best personal hardware, DOT uses advanced personal computer software. DOT offers access to a wide range of application software, as well as proven, transportable system software and software development and productivity tools.

APPLICATION SOFTWARE

For a personal computer to be truly valuable to the business and industrial professional, application software must be available to run on it.



SOFTWARE OVERVIEW

With DOT, the user can access compatible applications software from a variety of vendors for a range of applications.

These include:

- spreadsheet calculation applications Multiplan™ from Microsoft
- word processing applications Volkswriter™ from Lifetree Software Inc. Wordstar™ from Micropro
- filer/indexer applications Record Manager™ from DATAMENSION CORPORATION. Project Manager™ from DATAMENSION CORPORATION (Critical Path Analysis)
- scheduler applications Time Manager™ from DATAMENSION CORPORATION
- accounting applications — including a wide range of Australian accounting packages
- three dimensional financial modelling applications Report Manager™ from DATAMENSION CORPORATION
- relational data base/report writer applications D Base II™ Management system
- program/application generator PEARL 3 Program Generator™ from PEARLSOFT a division of Relational System, International Corp.
- terminal emulation applications Asynchronous Bisynchronous.

This assortment of packages enables the DOT to play an immediate role in helping business professionals be more productive and efficient.

SYSTEM SOFTWARE

DOT is equipped with MS-DOS™ a widely used, proven, true 16-bit operating system.

MS-DOS provides easy access to personal computing power for novice and expert users.

For novice users, DOT's operating system and self-help features mean they won't be lost, confused or frustrated.

The DOT system software helps novice users apply the power of a personal computer to their particular area of professional expertise without becoming computer programmers.

For example, business professionals can use DOT and Microsoft's Multiplan software to format a spreadsheet and stipulate the calculations to be performed in simple, English language commands.

For expert users and systems developers, MS-DOS offers the following features:

- no limits on file or disk size
- fast, efficient file structure
- relocatable macro assembler
- time/date stamp
- resident debugger and editing template.

DOT languages and software developers' tools include the following:

- Microsoft —
 - GW-BASIC™
 - MS-BASIC Compiler
 - MS-FORTRAN™
 - MS-COBOL
 - MS-PASCAL™
 - MS-MACRO ASSEMBLER™

PRODUCT DOCUMENTATION

To make sure that DOT users have all the information they need, Computer Devices supplies a comprehensive documentation package.

That package covers a wide range of topics, including start-up and shut-down, entering information, using commands, file creation, housekeeping, application and system software selection, editing procedures, hardware specifications, and diagnostics.

Each DOT configuration purchased comes with a documentation kit. That kit includes the following manuals:

- Meet your DOT: An Introduction to Your DOT Computer
- Your DOT File Cabinet
- DOT Guide to Software Selection
- Business and Fun with BASIC
- MS-DOS Users Guide
- MS BASIC Users Manual

The documentation is clear, concise, and straightforward so that users, whether

novice or expert, are able to find the information they need quickly and easily.

The documentation offers a total view of the DOT.

ACCESS TO A WORLD OF COMPUTER DEVICES

With the DOT's communications capabilities a user can take advantage of considerable timesharing computing and data acquisition resources. These resources include: program development, access to a multitude of data bases and information services, as well as consultation and training services.

For example a business professional could access a number of financial data bases for information on historical stock data, commodity news, newspaper financial reports, financial advice, information finances for major companies, or even personal financial records.

The user could acquire information first thing in the morning on-line, use the DOT's personal computing power to manipulate the information during the day. In this way, the user combines the capabilities of a personal computer and a timesharing resource to provide the computing power he or she needs.



CUSTOMER SERVICE

At Radaro, customer support doesn't end at the point of sale.

Radaro Computer Devices have established an enviable reputation for sales and service expertise.

This reputation is reinforced by the appointment of Radaro Computer Devices as the sole Australian distributor of the amazing DOT computer.

Radaro has not undertaken this responsibility lightly, before committing to the task they conducted an extensive evaluation of the DOT computer, it's software back-up and it's suitability for the Australian market.

At the head office in Melbourne there is a trained team of specialists on hand to answer customer queries and to solve any operational problems.

A dealer network is being established to handle the DOT computer.

Before being allowed to sell the DOT, each is screened to ensure that they measure up to the professional standard of support and service expertise that Radaro Computer Devices has set.

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system of 32k there would not be many cases where this would not be so.

The program makes extensive use of the routines that exist in TRS-DOS. It prompts the user to change disks when necessary.

the COPY command in TRS-DOS, ie, COPY FILENAME TO FILE-NAME. Unfortunately the word COPY is not available. A different program name will have to be used, maybe TRANSFER.

The syntax is the same as *L Brooks*

```

5200          00050      ORG 5200H
5200 11E752  00060  START  LD DE,BUFFIN  #FIRST DCB
5203 CD1C44  00070      CALL 441CH  #GET 1ST. FILESPEC
5206 C28A52  00080      JP NZ,ERR1  #JUMP IF NO FILESPEC
5209 110753  00090      LD DE,BUFFDUT #2ND. DCB
520C CD1C44  00100      CALL 441CH  #GET 2ND. FILESPEC
520F C28A52  00110      JP NZ,ERR1  #JUMP IF NO FILESPEC
5212          00120  #DISPLAY *INSERT SOURCE DISK <ENTER>*
5212 21AC57  00130      LD HL,SRCSMES #MESSAGE ADDRESS
5215 CD6744  00140      CALL 4467H  #DISPLAY MESSAGE
5218          00150  #WAIT FOR <ENTER>
5218 CD4900  00160  KB1   CP 49H      #KEYBOARD
521B FE00    00170      CP 00H
521D 20F9    00180      JK NZ,KB1   #JUMP IF NOT CK
521F          00190  #READ SOURCE FILE
521F 0400    00200      LD B,0
5221 11E752  00210      LD DE,BUFFIN  #SOURCE DCB
5224 212953  00220      LD HL,BUFFER #SECTOR BUFFER
5227 CD2444  00230      CALL 4424H  #OPEN SOURCE FILE

523A C29352  00240      JP NZ,ERR2  #JUMP IF ERROR DURING OPEN
523B 012954  00260      LD BC,MEMORY #TEMPORARY STORE
523D 11E752  00270  READ  LD DE,BUFFIN  #SECTOR BUFFER
523F 0E1300  00280      CALL 13H    #GET A BYTE FROM
5241          00290      #SOURCE FILE
5243          00300      JK NZ,ERR4  #JUMP IF READ ERROR
5246 02      00310      LD (BC),A   #STORE BYTE IN MEMORY
5248 03      00320      INC BC
524A 10F4    00330      JR READ
524C FE1C    00340  ERR4  CP 1CH      #TEST FOR EOF
524E 20F9    00350      JR Z,RTIT  #GO IF DONE
5250          00360      JK ERR2    #JUMP IF SOME OTHER ERROR
5252 1051    00380      #THE ENTIRE FILE NOW STORED IN MEMORY
5254          00390  #ADEQUATE MEMORY ASSUMED
5254 FD432753 00400  RTIT  LD (CONTA),BC #STORE HIGHEST
5256          00410      #MEMORY ADDRESS
5258 11E752  00420      LD DE,BUFFIN  #SOURCE DCB
525B CD2844  00430      CALL 4428H  #CLOSE SOURCE FILE
525E 2045    00440      JP NZ,ERR2  #JUMP IF ERROR DURING CLOSE
5260          00460  #DISPLAY *INSERT DESTINATION DISK <ENTER>*
5260 21C752  00470      LD HL,DSMES  #MESSAGE ADDRESS
5263 CD6744  00480      CALL 4467H  #DISPLAY MESSAGE
5266          00490  #WAIT FOR ENTER
5266 CD4900  00500  KB2   CP 49H      #KEYBOARD
5269 FE00    00510      CP 00H
526B 20F9    00520      JK NZ,KB2
526D          00530  #OPEN DESTINATION FILE
526D 0400    00540      LD B,0
526F 110753  00550      LD DE,BUFFOUT #DESTINATION DCB
5270 212953  00560      LD HL,BUFFER #SECTOR BUFFER
5273 CD2044  00570      CALL 4420H  #INIT CALL
5276 20F9    00580      JP NZ,ERR2  #JUMP IF ERROR
5278          00590      #DURING INIT
527A          00600  #TRANSFER DATA TO DESTINATION FILE
527A 012954  00610      LD BC,MEMORY
527D 0A      00620  WRITE LD A,(BC)
527F 110753  00630      LD DE,BUFFOUT
5281 CD1800  00640      CALL 18H    #WRITE BYTE TO DISK
5283 201F    00650      JR NZ,ERR2
5286 2A2753  00660      LD HL,(CONTA)
5289 07      00670      SCF
528B FD44    00680      SBC HL,BC  #COMPARE BC WITH
528E 03      00690      INC BC     #HIGHEST MEMORY
5290 7C      00700      LD A,H
5292 85      00710      OR L
5294 20EC    00720      JP NZ,WRITE #JUMP IF NOT DONE
5297          00730  #CLOSE DESTINATION FILE
5297 110753  00740      LD DE,BUFFOUT
529A CD2844  00750      CALL 4428H
529D 200C    00760      JP NZ,ERR2  #JUMP IF ERROR
529F          00770      #DURING CLOSE
52A1          00780      #DONE, GO TO TRSDDS
52A1 C32040  00790      JP 402DH
52A4 219852  00790  ERR1  LD HL,MESS
52A7 CD6744  00800      CALL 4467H
52AA C33040  00810      JP 4030H
52AD F440    00820  ERR2  OR 40H      #ADD FILE ERROR BIT
52AF          00830      #TO ERROR CODE
52B1 C30944  00840      JP 4409H  #CALL SYS4 TO PRINT
52B4          00860      #ERROR MESSAGE
52B7          00880      #
52BA 46      00900  MESS  DEFM 'FILE SPEC, REQUIRED'
5299 49
529A 4C
529B 45
529C 20
529D 53
529E 50
529F 45
52A0 43
52A1 2E

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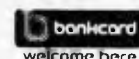
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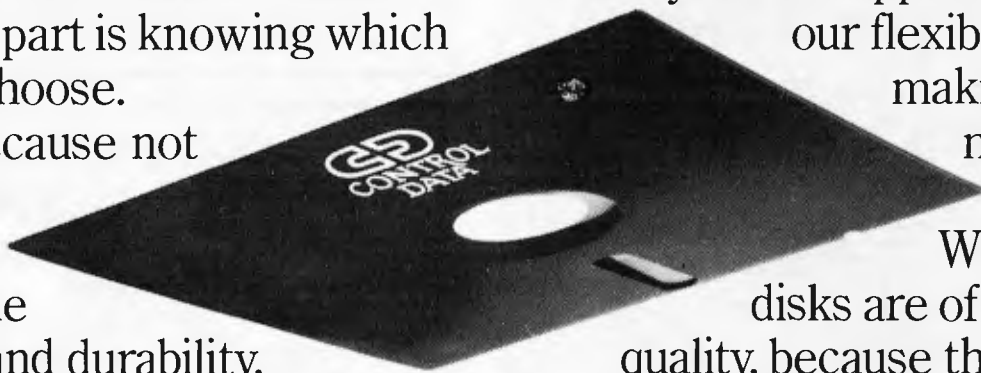
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```

52A2 20
52A3 52
52A4 45
52A5 51
52A6 55
52A7 49
52A8 52
52A9 45
52AA 44
52AB 0D
52AC 49
52AD 4E
52AE 53
52AF 45
52B0 52
52B1 54
52B2 20
52B3 53
52B4 4E
52B5 55
52B6 52
52B7 43
52B8 45
52B9 20
52BA 44
52BB 45
52BC 52
52BD 4B
52BE 20
52BF 4C
52C0 45
52C1 4L
52C2 54
52C3 45
52C4 52
52C5 3E
52C6 0D
52C7 49
52C8 4E
52C9 00
52CA 45
52CB 52
52CC 54
52CD 20
52CE 44
52CF 45
52D0 53
52D1 54
52D2 49
52D3 4E
52D4 41
52D5 54
52D6 49
52D7 4E
52D8 4E
52D9 20
52DA 44
52DB 49
52DC 53
52DD 4B
52DE 20
52DF 3C
52E0 45
52E1 4E
52E2 54
52E3 45
52E4 52
52E5 3E
52E6 0D
0020 01000 BUFFIN DEFB 0DH
0020 01010 BUFOUT DEFB 32
0002 01030 CONTA DEFS 2
0100 01040 BUFFER DEFS 256
5429 00 01050 MEMORY NOP
5200 01060 END START

00000 Total Errors
MESS 5298
WRITE 526B
KB2 5254
DESMES 52C7
CONTA 5327
RTIT 5242
ERR4 529C
READ 5230
MEMORY 5429
ERR2 5293
BUFFER 5329
KB1 5218
SRCMES 52AC
BUFOUT 5307
ERR1 528A
BUFFIN 52E7
START 5200
00910 DEFB 0DH MESSAGE TERMINATOR
00930 SRCMES DEFB 'INSERT SOURCE DISK CENTER'
00940 DEFB 0DH
00950 DESMES DEFB 'INSERT DESTINATION DISK CENTER'
00960 DEFB 0DH
01000 DEFB 32
01010 DEFB 32
01030 DEFS 2
01040 DEFS 256
01050 NOP
01060 END START
    
```

Centronics driver

Printer turn-on using an Eddy Sorcerer does not involve using simple

'LPRINT' commands, but instead requires POKEing the printer on or off, using addresses that vary with memory size. This method is inconvenient and takes up memory. However, Sorcerer owners can now go one

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better than their 'LPRINT' counterparts by using this 76-byte machine code driver program.

The driver is not relocatable, and should be entered from 0000(H). The program shown is configured for a 48k Sorcerer (for a 16k machine, addresses 0013 & 001C should be changed to 3F, and for 32k, they should be 7F). Once the routine is loaded, type 'SE Q=0'. Using the driver in Basic is easy: when printer output (as well as video) is required within a PRINT statement, all that has to be done is to print character code 254(D) (GRAPHIC-SHIFT 'full stop' on the keypad) before the text, and character code 255(D) (GRAPHIC-SHIFT 'equals' on the keypad) at the end of the line. The two user-defined characters will not show when the program

actually runs. Each time the Sorcerer reaches the character code 254(D), it will turn the printer on; every time it reaches code 255(D), it will turn the printer off.

Since the previously-mentioned switching can happen while listing, the driver should only be enabled before running the Basic program; this is done by pressing CONTROL-P. To disable the driver (after running the program), press CONTROL-V.

The graphics characters can be defined if desired: for a 'P' and 'V' definition of the appropriate keys, enter FE 82 82 FE 80 80 80 00 82 82 82 44 44 28 10 00 from FFF0(H). To save the driver and characters, use SAVE DRIVE FFF0 004B from monitor.

Ashley Brown

```

0000: CD1CEB CALL EB1C
0003: FE10 CP 10
0005: 2807 JR Z,07 (000E)
0007: FE16 CP 16
0009: 280C JR Z,0C (0017)
000B: FE00 CP 00
000D: C9 RET
000E: 212000 LD HL,0020
0011: 2200BF LD (BFD0),HL
0014: 3E00 LD A,00
0016: C9 RET
0017: 211EE0 LD HL,E01B
001A: 2200BF LD (BFD0),HL
001D: 3E00 LD A,00
001F: C9 RET
0020: FEFE CP FE
0022: 2816 JR Z,16 (003A)
0024: FEFF CP FF
0026: 2818 JR Z,18 (0040)
0028: F5 PUSH AF
0029: 3A4B00 LD A,(004B)
002C: FE01 CP 01
002E: 2805 JR Z,05 (0035)
0030: F1 POP AF
0031: CD1BE0 CALL E01B
0034: C9 RET
0035: F1 POP AF
0036: CD93E9 CALL E993
0039: C9 RET
003A: 3E01 LD A,01
003C: 324B00 LD (004B),A
003F: C9 RET
0040: 3E00 LD A,00
0042: CD93E9 CALL E993
0045: 3E00 LD A,00
0047: 324B00 LD (004B),A
004A: C9 RET
004B: 00 NOP

```

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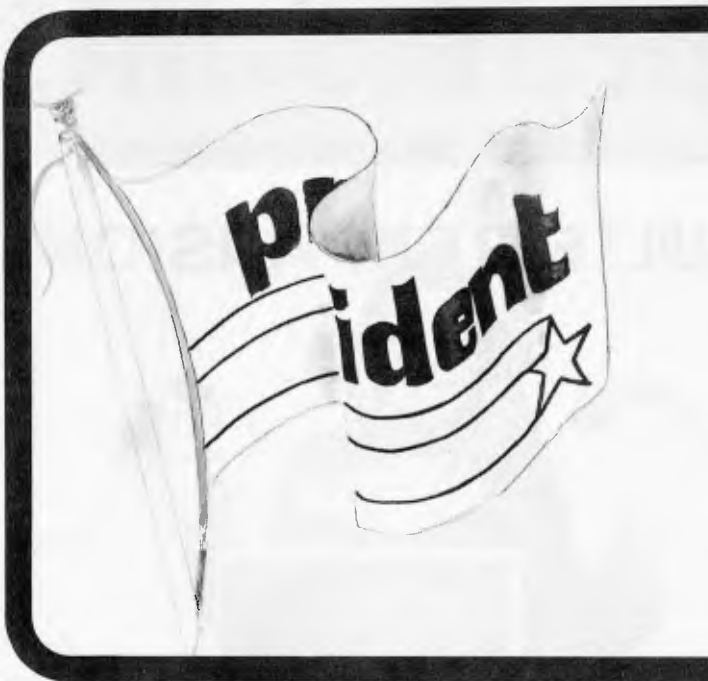
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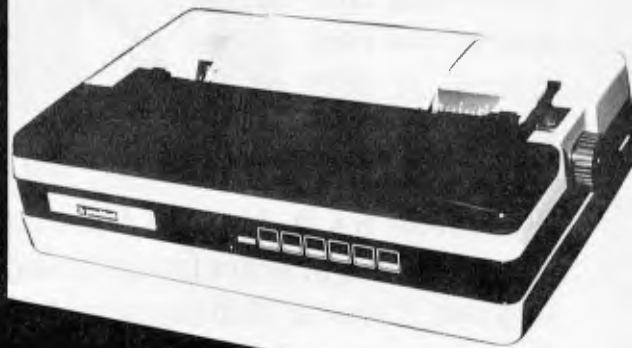
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SETTING THE STANDARD



My old Kentucky Home, Goodbye

Frank Linton-Simpkins bemoans automation.

After nightfall when the sun ceases to shine bright on all those old Kentucky homes secret black and midnight deeds are done.

Then draws near the season wherein the local spirits hold their wont to force the Blue Grass types to doff their derbies and to switch off the heat under their chicken friers.

Picture a small Kentucky town complete with piles of cannon balls from the war between the states and strewn around with rusting pick-up trucks, discarded bible belts etc. Add a few sets of people with toothpaste commercial teeth plus some natural rhythm and Tom's your Uncle.

Picture the same sort of town late at night, circa 2200 hours, with the soft local moonlight falling across the keyboard of a bank's automated teller machine. Outlined in the moonlight and the fading glow of a few late burning crosses stands a fair average quality inhabitant of the region. He is trying to find the ground with both feet at once and waving around breath and tribal .357 magnum.

Across the street in the shadows of his police department vehicle is Patrolman George Washington Lincoln Lee Jefferson Billee Joe Braunswieger. He watches as our man thrusts a note of demand through the card slot. As everyone knows who uses one of those wretched anti-human devices, that is anyone who hasn't got "Fortran" written on his heart, they always terminate with extreme prejudice your first try at communication.

Speaking of hearts label-

led Fortran etc, one of the vast number of old Queens possessed by the United Kingdom over the centuries claimed that she had "Calais" written on her heart. I expect that she had Bordeaux written on her liver. Any curiosity about her other organs and their labels might just constitute seditious libel.

To get back to the Kentuckian and moonlit magnum, he was out of all patience and the quiet charm of his race after the machine had rejected his note for the third time. Each time it had replied with the normal rusty red message of contempt and a pace or two backward to improve his aiming angle our man fired off his magnum into the midst of the machine as follows, Crash, Crash. Magnums don't merely go Bang, Bang.

To the amazement of Patrolman Billee Joe across the road and our man with the gun no blood or anything else flowed out of the wounds. At the least a sort of viscid yellowish ichor would have been expected in any self respecting adventure story.

Stunned at the magnitude of his failure the magnum fancier was able to offer scant resistance to Billee Joe, the Patrolman, who ran across and arrested him. But what was the charge? Computercide, Calcslaughter, Culpable Terminal Operating? Conduct such as to cause a reasonable micro-processor serious affront and alarm? Now questions arise. Was the magnum man really only a rather desperate Kentuckian who was sobering up in the absence of

cash, he having left home, without the American Express Card or was he something more noble? Was he perhaps, the vanguard of a revolutionary army trying to restore human contact to man? Or perhaps a Hit Man for the Bank Clerk Union?

If he was part of the revolution then I hope someone in Kentucky immediately makes him a colonel, even if he is without a chicken to his name. How many times have I stood at the head of a line of people stretching along New South Head Road and around the corner into Budapest south while the automated teller machine resolutely proclaims that it hasn't previously been aware of my existence? Meanwhile the dismounted Magyar hordes behind me mutter under their middle European breaths that I am probably trying to perpetrate an electronic bank robbery prior to indulging myself in my normal Sunday morning pastime of murder and rape.

At such times don't you wish that you had a magnum to use on the machine prior to turning it on yourself? Mind you I never feel that way. I tend to visions of playing grievous bodily harm with it with a heavy blunt axe followed by a little dedicated arson while its circuits still have a few remaining volts.

While all this spleen vomiting is going on it might be as well to report that the Kentuckian's blow for humanity and/or booze money was totally wasted. Not only didn't he get the bulk package he hoped for to pledge a few more revolu-

tionary toasts, but IBM was able to have the wound stitched up and the machine back in action without even a duelling type scar before the start of normal banking hours the next day. The teller didn't even have an obvious talking point as an opening gambit with passing amorous microwave ovens.

Even though he failed on all counts I rather like the style of the Kentuckian with his note and gun. I was thinking about him the other day while waiting for some rotten bank robber/rapist ahead of me in the line to my bank's terminal. It was not a good day, the local dogs, all with what seems alike afflicted with canine cholera, were out in force and one had to practise one's tap dancing to get into line in the first place.

Already raging against computers and all their works and pomps and also their servants such as people like me and automated tellers, I was not helped by the ritual three rejections before the terminal was prepared to acknowledge that I had an account and also the right to use it.

Then, like an automatic lift that ignores the buttons one presses, the obscene machine told me that I couldn't have the \$56 I wanted and that I could have only \$60 and in the demoninations it wanted to give me not the ones I wanted. Manual systems are so flexible I mused as I regained control of my ire and put down the half brick I had planned to beat the machine to death with. A manual system on its way to play tennis moved flexibly past to prove my point.

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WARNIER ORR PROGRAMMING PART 2: SETS OF DATA

In Part Two of this four-part series Paul Overaa examines the relationship between program and data and elucidates the advantages of the Warnier diagram.

I have previously indicated how the Warnier diagram may be used to design and describe the logical layout of a computer program. The use of this diagram is not limited to program design but is also of practical value in describing the structure of data items themselves. The relationship between a program and its data plays a significant role in the development process and here I shall be dealing with the general ideas involved. For those of you who do not know the basic conventions of the Warnier diagram for program design, here are the essential details that you will need to understand its application to data sets.

The diagram consists of sets of brackets. Each bracket defines a set of actions or a particular subset of data. Underneath a particular action or data type there will be an indication of how many times the item occurs. Items within a particular bracket may be further subdivided and such subdivision is shown by a bracket written to the right of a data item name. Within each bracket the actions or data item details are read from top to bottom. In data structure diagrams the existence of 'brackets within brackets' indicates the occurrence of multiple sets of similar types of data items. In program design diagrams it is the existence of subroutines that are 'programmed once but called an appropriate number of times' that is implied.

Note: The basic conventions of the Warnier diagram have been dealt with previously (see *APC* Oct 81, April 82, January and August 83). If you are unsure about some of the notation used, you should refer to the earlier works.

I shall start by examining some basic definitions. When a computer program is written, it is hoped or expected to do something. It will act on some input values and provide some useful information as output. By 'output' I am referring not just to VDU or printer output but to output in the sense of 'information passed'; such output of course includes data derived from one procedure that is passed on to become input to further procedures.

This description can be translated into a slightly more technical form. The collection of input items is nowadays called an 'input-set'. Similarly, the output items are collectively called the 'output-set'. The function of a computer program is to

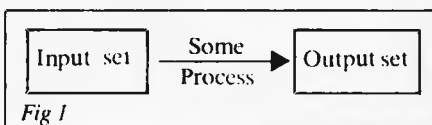
translate or 'map' the input set onto the output set. This is shown in Fig 1.

The area I now wish to examine more closely is the relationship between the input/output sets and the finished program.

To do this I have selected as an example a project in which I was involved several years ago. I have simplified the problem to a certain extent because the purpose of the exercise is to get across the underlying essentials rather than get 'bogged down' with technicalities peculiar to the example itself.

A company of consulting analytical chemists, that I shall call company X,

analyses many thousands of samples each year. The samples arrive from all over the world and represent commodities that are being bought and sold on the various commodity markets. Each sample requires various analytical tests to be carried out; these tests are not always the same because requirements vary according to different contractual obligations. The statistical information that can be collected by computer is



| Commodity | Origin | Type | Tests | No Tested | Low | High | Ave | St Dev |
|-----------------|--------------|--------------|--------------------|-----------|-------|-------|-------|--------|
| Cereal-Replacer | Unclassified | Unclassified | Moisture | 33 | 7.31 | 12.31 | 9.81 | 0.33 |
| | | | Oil | 14 | 1.79 | 6.50 | 4.14 | 0.29 |
| | | | Protein | 106 | 8.90 | 17.73 | 13.31 | 0.20 |
| | | | Fibre | 105 | 7.00 | 16.96 | 11.98 | 0.21 |
| | | | Ash | 98 | 7.66 | 11.55 | 9.61 | 0.40 |
| | | | Sand- &/ or-Silica | 99 | 1.86 | 5.87 | 3.86 | 0.33 |
| Citrus-Pulp | Unclassified | Unclassified | Oil | 68 | 1.78 | 2.29 | 2.03 | 0.40 |
| | | | Protein | 22 | 8.23 | 11.22 | 9.72 | 0.42 |
| | | | Fibre | 94 | 8.57 | 13.36 | 10.97 | 0.21 |
| Copra | India | Extraction | Oil | 96 | 0.76 | 3.20 | 1.98 | 0.35 |
| | | | Protein | 45 | 20.23 | 27.75 | 23.99 | 0.26 |
| | | | Fibre | 101 | 10.45 | 13.04 | 11.75 | 0.42 |
| Copra | Indonesia | Extraction | Oil | 8 | 4.04 | 15.28 | 9.66 | 0.32 |
| | | | Protein | 83 | 18.38 | 28.73 | 23.56 | 0.23 |
| | | | Fibre | 46 | 10.88 | 14.02 | 12.45 | 0.25 |
| Copra | Indonesia | Expeller | Oil | 78 | 1.04 | 6.58 | 3.81 | 0.38 |
| | | | Protein | 97 | 20.23 | 29.13 | 24.68 | 0.28 |
| Copra | Ivory Coast | Extraction | Oil | 20 | 1.21 | 2.79 | 2.00 | 0.34 |
| | | | Protein | 37 | 20.81 | 25.48 | 23.14 | 0.45 |
| Copra | Kenya | Extraction | Moisture | 21 | 6.86 | 11.13 | 8.99 | 0.22 |
| | | | Oil | 85 | 10.43 | 19.76 | 15.10 | 0.45 |
| | | | Protein | 88 | 17.99 | 25.15 | 21.57 | 0.36 |
| | | | Fibre | 12 | 8.43 | 10.22 | 9.33 | 0.34 |
| | | | Sand- &/ or-Silica | 10 | 1.00 | 3.48 | 2.24 | 0.44 |
| Copra | Mozambique | Expeller | Oil | 42 | 8.59 | 15.35 | 11.97 | 0.27 |
| | | | Protein | 12 | 18.66 | 26.30 | 22.48 | 0.32 |

Fig 2

obviously of great importance to the company and also to the trade in general. The problem given to me was to write the software to handle the collection, statistical reduction and the reporting of the information collected during the year. many different types of analytical tests that have been carried out. Each test has a name — for example, per cent moisture, and associated with each test there are statistical data that give the number of samples analysed for a particular Commodity-Origin-Type-Test combination; also given for such a combination is the lowest value found, the highest, the average value and the standard deviation. This last item simply measures the 'spread' or amount of variation of the analytical test results.

You will note from the above description and from examining the example page taken from the report in Fig 2 that this is a hierarchical subdivision. This may lead you to suspect that 'output set' can be represented by using a Warnier diagram. The example has been selected because the hierarchy is fairly obvious. Look at Fig 3 — this is the Warnier representation of the proposed report.

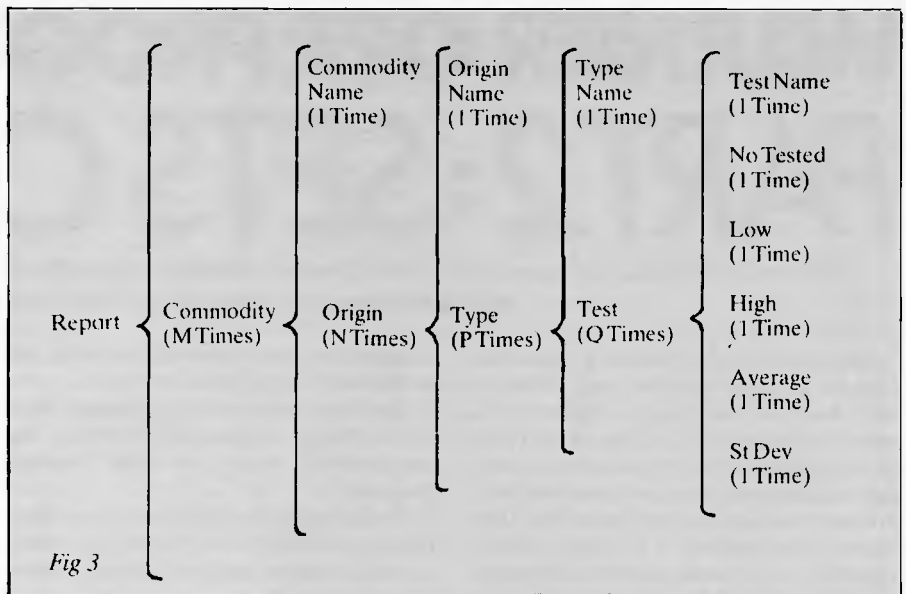
The representation reflects the logical ordering implied by the report being described. It is sometimes, therefore, called the logical file of output.

A review of the progress made shows that the problem has been outlined and the logical structure of the required output has been identified.

Items in the output file can be classed into two basic categories:

1. Items that are collected by the program. I call these 'Primary Data Items' or 'Input Data'.
2. Items that are derived from Input Data Items. These I call 'Secondary Data Items' or 'Derived Data'.

The following data items necessary to produce the required output can now be identified.



Primary items — — —

- a) Commodity Name
- b) Country of Origin
- c) Type (see definition earlier)
- d) Analytical Test Name

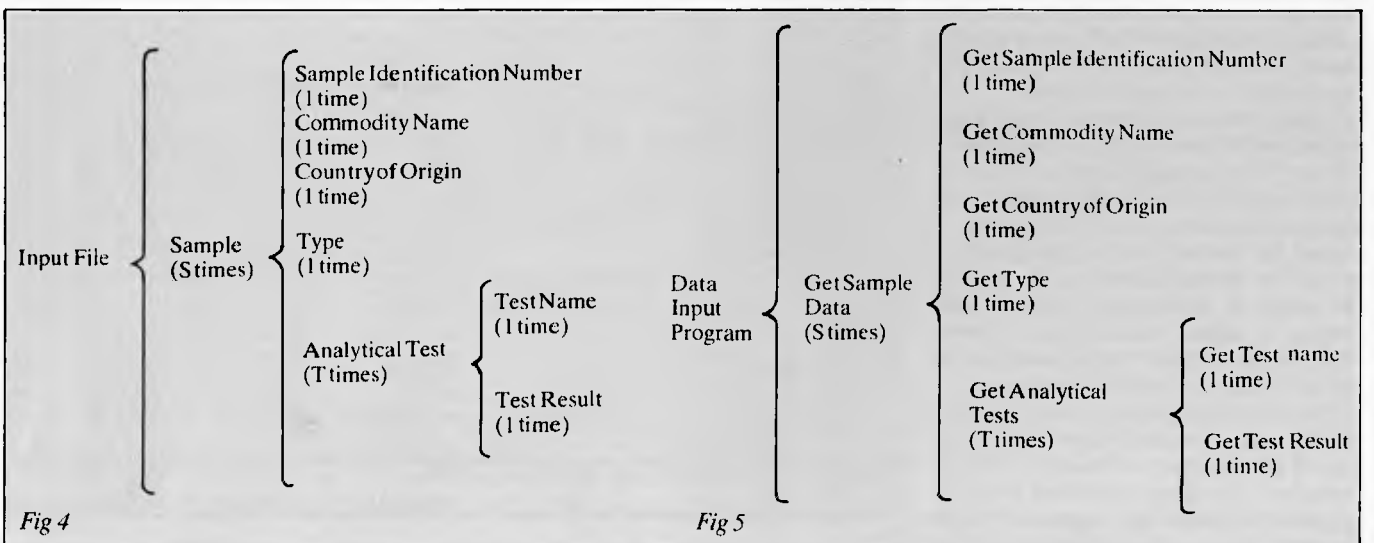
Secondary or derived data items — — —

- e) Number Tested — This item is the sum of all occurrences of a particular test for a particular Commodity-Origin-Type-Test combination. At present you only need to recognise that this can be obtained directly from the input data we shall store.
- f) Lowest Value — Again, if all the individual sample data is available then, from a logical standpoint, we have access to or can identify, the lowest item for a particular Commodity-Origin-Type-Test combination.
- g) Highest Value — Same applies as for Lowest value.
- h) Average Value — This is the sum of the analysis results for a particular Commodity-

ty-Origin-Type-Test combination divided by the number of occurrences of the test.
 i) Standard Deviation — This is computed from the analytical test data using the sum of the squares of the test results, the sums themselves and the number of occurrences. The point to note is that the data is available from the primary items listed above.

The above secondary items indicate that another rather obvious additional primary item needs to be considered. Its existence has already been implied: it is 'Analysis Test Result'.

The primary items will now be used to construct a logical input file. One more primary item needs to be added to the list and that is a 'Sample Identification Number'. Obviously there is no point in storing large amounts of analytical data if you can't identify to which customer samples it belongs. It's important to get one thing clear, though — the logical requirements of the problem do not actually need this identifier.



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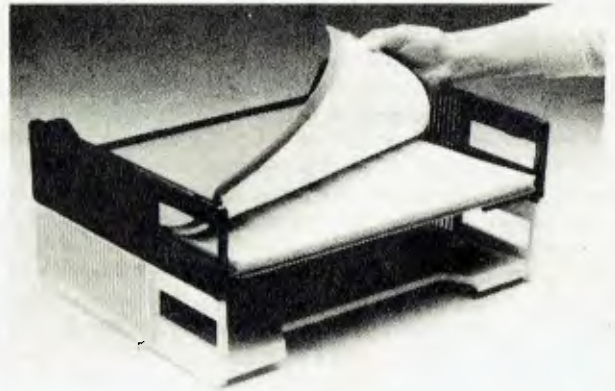
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WARNIER ORR PROGRAMMING PART 2: SETS OF DATA

Let's list the Primary data item in its entirety just to complete things:

Sample Identifier, Commodity Name, Country of Origin, Type, Analytical Test Name, Analytical Test Result.

The Primary or Input items can be described using a Warnier diagram as in Fig 4. This shows the logical structure that exists for the input.

The representation in Fig 4 is straightforward. The Identifier, Commodity Name, Origin, and Type is collected for each sample, and then the name for the analytical test that has been carried out and the result obtained. Note in passing that what I have done is to subdivide the input set according to the frequency of occurrence of the primary data items. It is possible that the next stage in the development may come as a surprise. Look again at the 'Logical Input Structure', and now look at Fig 5: the Warnier description of the module to handle data input. The structures are identical. Look for example at the subgroup of actions which was isolated as 'Analytical Test'. This reveals that for 'T' tests the names and the results obtained are stored, that is, it suggests 'T' occurrences of each item for each set of

sample data stored. The equivalent program description shows that a subroutine has to be called 'T' times to collect this analytical test data.

So far I have worked backwards as follows: I took the output required and identified the data items needed to produce the required output. I recognised that this output consisted of two identifiable data types. Firstly, I identified input data items that are not 'manipulated' by the program but are used unchanged. Secondly, I examined the 'derived' data items and by examining the primary items upon which they are dependent I identified further primary items. I used the completed list of the primary data to describe the logical input structure using a Warnier diagram. From this the program that handles this input was designed. I found a close correspondence between the logical structure of the input data and the equivalent program structure.

There is a potential problem arising because the most obvious way to store the input data may not necessarily be the most logical or the most convenient form of dealing with the logical output. It is important now to be aware that I have been talking of the data items as though they are independent, and not restricted by the physical format used to store the data. I will go further than this and say that if these

logical design techniques are to be used to their maximum practical potential, then I must ensure that the data is represented in a way that will enable any logical structure required to be imposed without having to rearrange the physical structure of the data.

In a commercial situation there may be many applications programs that operate on various subsets of a company's data. It is therefore advisable to ensure that defined data types from one application do not overlap or duplicate defined data types from another application. In practice there are several ways in which such 'non-redundancy' can be achieved although one technique stands out in its ability to divide a data set into non-overlapping subsets that have the 'flexible independence' qualities that are required. The technique to which I am referring has been around for some time now and is usually connected with database design: it is called 'Normalisation'. The application of a single set of rules enables the logical description of the required independence to be produced which in turn gives the clues needed for the practical solutions.

Next month, I will explain how you can normalise a set of data items and show how this helps create flexible file structures.

END

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MY KIND OF SHOW..

Our international traveller Robin Webster presents a full report on innovations in the computer industry from the Consumer Electronics Show in Chicago.

Who would have expected that at an exhibition best known for its displays of the latest home video films, novel telephones, noisy toys and ear-splitting quadrophonic systems for Porsches, there would also be a rash of significant announcements for the microcomputer industry?

As it turned out, few of the 80,000 or so people who attended the Summer Consumer Electronics Show held in Chicago (June 5-9) were ready for what happened.

Main contenders

Video games company Coleco (best known for its Atari-competitive ColecoVision games system) introduced a colour microcomputer called Adam. Or to be more precise, the company introduced a package consisting of: a Z80A-based system unit with 80k of RAM and an integral data storage device that can hold up to 500k; a keyboard with joystick cursor controller; a letter-quality (daisy-wheel printer); ROM-based word processing; a Basic language pack, called Smart Basic; and a games pack, called Buck Rogers — The Planet of Zoom.

The whole system, as described, will cost about \$600, according to the company. Another Adam version, which simply upgrades a ColecoVision video games machine into an Adam system will sell for around \$400.

Commodore, which has already featured in the cut-price computer market, drew much attention with what was described as 'the largest single software introduction in the history of the company'. About 70 new software products for the Commodore 64 and VIC-20 were either on show or being seriously discussed at the Commodore stand. While many of these were games and educational packages, the company slipped in a few demos of a product called 'Magic Desk'. Although it is still in the prototype stage, Magic Desk has some features in common with (albeit at a much cruder level) the Desktop Manager software available on Apple Computer's Lisa system.

Other Commodore events were the introduction of a portable computer called the Executive 64 which not only has a colour screen and costs \$995, but can be made to run CP/M or PET programs with the addition of suitable options; and the welcome announcement that the company intends to sell Microsoft's Multiplan spreadsheet system for under \$100 on the Commodore 64 computer.

Atari, is also trying to shake loose its image of being 'just a games machine maker' with great gusto. It publicly announced four new computers — called the 600XL, 800XL, 1400XL, and 1450XLD —, a CP/M add-on that works with all Atari systems, the AtariWriter

word processing system priced at \$99.95, a 16k Logo language cartridge, a disk-based colouring and drawing package called Paint, a light-pen, a touch-pad, and many more pieces of hardware and software.

More privately, in a nearby hotel suite, Atari was willing to discuss and display some experimental work it has been doing, such as Atari Artworks (a menu-based, free-hand drawing system which provided similar facilities to Apple's LisaDraw) and an as-yet-unnamed free-hand drawing system which combines an on-screen line/shape/and colour palette with the ability to store 'pictures' on visibly displayed cards or windows. Once a picture or a group of pictures are saved in this way, the cards themselves can be electronically put



The Coleco Vision Family Computer System with memory console, Smart Writer and Keyboard.



The Romox Programming Terminal can store up to 500 different games.



The Tomy Tutor for children has a 16-bit T19995 chip.

away and later retrieved. In other words, graphic images are not just saved in the traditional sense, they are *seen* to be saved in the current 'metaphor' fashion. In the case of Atari Artworks it is possible to use either a light-pen or touch-pad (to suit the task); in the case of the unnamed system, a light-pen is the device currently used.

While the three above-mentioned companies were the major combatants in what is now obviously a home-computer price/performance war, others carried on in their own way.

In the background —

Very quietly, Tomy, a Japanese manufacturer of wind-up toys, and similar playthings, was showing off its Tomy Tutor machine at the show. Designed for 8-year-olds, the machine has a 16-bit TI 9995 chip inside it which is said to operate at an incredible 10.7 MHz! The basic machine is expected to cost less than \$150 when it is



The new range of Atari line printers.

marketed in a few months time.

Texas Instruments on the other hand created a lot of fuss and upset many independent games software manufacturers by making it clear during the show that it intends to make use of patented circuitry in the TI 99/4A home computer. The move essentially means that only TI developed or 'TI Approved' packages will run on the machine. Apparently, the company has decided to take this step because it wants greater control over the quality and type of software that is made available on the 99/4A. One company, called Romox, didn't get too upset, however — it just announced a product that would get around the plan.

Coleco announcement

There's no doubt that the Coleco announcement was the show's most significant for the home computer market both in terms of prices and the type of equipment which consumers will expect to get for their money.

To understand why, we have to take a closer look at what Coleco intends to offer with the Adam system. As indicated above, the Adam system uses the 8-bit Z80A micro as the main CPU, but it does have another three processors lurking around. In addition to the Z80A, the system unit has one other processor (presumably handling the mass storage tape drives), the keyboard has one, and the daisy-wheel printer has one as well. Coleco is not saying whose chips they are, and it probably doesn't really matter. It's clear

that Coleco decided on this arrangement of processors so that the main Z80 chip could delegate the responsibility for tasks; the printer processor can accept and control all printing jobs by itself after the initial data is transferred from disk or main memory; both the keyboard and the mass storage drives tell the Z80A CPU when they have some data, rather than the Z80A constantly polling all peripherals to see if something needs attention. Coleco has given the name 'Adam-Net' to the method by which the CPU and peripherals communicate.

One technical aspect of the Adam system which attracted a lot of attention is the so-called mass storage or digital data pack drives which provide data storage/loading facilities. Originally, it was announced that the Adam would have 'wafer tape' or 'stringy floppy' drives, but on the demonstration machines at Coleco's press conference, the actual drives had much in common with ordinary audio cassette decks. There was a flip-down door which allowed you to slip in the data pack itself; this data pack could be described as a 'ruggedised' audio cassette since its casing was made up of some lightweight alloy, and the actual reel hubs which engage with the drive spindles were of substantial design (the photographs show a different drive arrangement).

The reason for all this strength becomes clear once you know that the data pack to



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CHICAGO IS...



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Commodore's Executive 64 uses a 6510 CPU and has Basic stored in ROM.

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main memory transfer rate is said to be 19.2k baud, a respectable speed when compared to floppy disk drives, and one which must put quite a bit of stress on the data pack materials. The standard Adam system comes with one digital data pack drive, which will hold between 250k to 500k depending on the density of the code being stored. Ideally, a second digital drive should be added and this will be available for about \$150. The data packs will cost under \$10.

In the memory department, the Adam system starts off with 80k RAM as standard, but this can be increased to 144k with an optional 64k add-on board. This gives the user quite a lot of memory to play around in, which may be necessary if Coleco follows through on some promises.

For example, the Adam system is supposed to be both Applesoft code and CP/M compatible. Negotiations are taking place with various companies with regard to getting CP/M programs onto the machine. Such programs will probably be first available on digital data packs, and later via a Coleco-label floppy disk drive. This drive will be released very late this year or early next year at a cost of about \$300.

As far as Applesoft Basic programs are concerned, Coleco is being very careful, and will only indicate that if you write a program on an Apple using that particular

Basic, will you be able to type that code into the Adam when running the Smart Basic digital data pack and have it run as it would on the Apple machine.

Coleco is also providing a ROM-based word processing package, called SmartWriter, keyboard function keys, and a daisy-wheel printer.

From the demonstrations performed during the Coleco press conference (held at Chicago's Art Institute) and at the company's extravagant Consumer Electronic Show stand, it is very hard to form any definite opinions about the Adam system. SmartWriter, or at least a few parts of it, were readily shown to all who asked — up to a point. It was possible to see how some of the six functions keys on the Adam keyboard were used to select word processing modes from on-screen menus, but it wasn't possible to see enough to make a critical judgement. Document margins could be altered at will, but no word or phrase 'searches' could be accomplished.

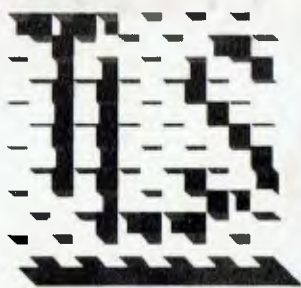
Coleco claims that Adam software is integrated, but only SmartWriter was to be seen, and only in the limited way described above. The joystick cursor control, intended to be used instead of a mouse, was never demonstrated in detail. In fact, one of the on-screen menu options still indicated that files were being stored on 'wafer-tape' drives instead of the digital data packs. There were many other

facilities that could not be demonstrated (the effect of pressing the 'UNDO' key was never shown). This, combined with the fact that the machines at the Adam press conference had I/O ports and other bits and pieces glued down so that no one could even get a quick look at them, suggests that Coleco still has a lot of work to do before shipments begin (planned for this month).

It would really have been an event if Coleco had been able to back up just a few more of its claims — software integration, CP/M compatibility, 'Undo' last command, multi-tasking — at the show, rather than just saying 'we can do it, but not on this demonstration machine', or 'we don't have that yet, but maybe later this year'. But everyone wants Coleco to succeed, and the company has stunned a lot of competitors with its innovative digital disk packs and printer.

Output from the Adam daisy-wheel printer is very good since a range of standard daisy printwheels can be used, but if you're expecting to produce documents rapidly, forget it. The printer operates at only 10 characters per second, which is fine if you're printing a two-page letter, but will be a real pain when used for a 3000 word manuscript.

Unlike the conventional daisy-wheel printers on the market, which utilise all sorts of servo-motors and drive mechanisms, Coleco has apparently opted for a

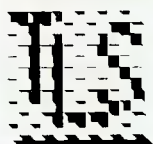


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simple 'stepper-motor' design for its product. Instead of being whizzed around at high speed under the control of fancy electromechanics/software, Coleco's print-wheel is driven to discrete, degree-by-degree movements. This old faithful approach is probably more than adequate for the average home computer. There are suggestions that Coleco may be able to push the print speed up from 10cps to 30 or 40cps; if it does, it will have to pay more attention to the noise the printer makes while it is working.

A more quiet rival is the new Atari 1027 'barrel' printer which operates at 20 characters per second. It is about one-third the size of the Coleco device and is very quiet in operation. Rather than using a print-wheel, this printer uses a set of narrow rollers which have the print characters on their outside faces. The rollers are all rotated at once, and somehow the print mechanism is able to impact the correct character, from the correct roller, onto the paper surface. Surprisingly, the printer does not use ink or carbon ribbons. Instead, it features a spongy ink roller which transfers ink to the character faces. Unfortunately, it is priced at \$349.95 and can only produce one typestyle (Prestige Elite 12).

Commodore range

Commodore's presence at the show was very noticeable, partly because of the company's large stand and shuttle service to the Commodore Clipper — a rented boat moored just a few miles away from the main exhibition hall — but mainly because it had so many new things on offer.

Fuelling the home/personal computer price war, Commodore announced large price reductions on its machines: software trade prices were cut by up to 50 per cent; hardware trade prices were cut by up to 25 per cent.

The portable Executive 64 machine, coming in under the \$1000 mark by just \$5, uses a 6510 CPU (this is program compatible with the 6502) and has Basic stored in ROM. It can run a wide range of programming languages in addition to Basic, including Pascal, Comal, Logo, Pilot and Assembler. The main hardware features are that it weighs 27.6 pounds, has 64k RAM, full upper/lower case display and keyboard, an integral six-inch colour display, and one floppy disk drive with only a 170k storage capacity with the option of adding another drive later. It is very compact, measuring 14½ × 14½ × five inches.

By buying an add-on Z80 cartridge, the Executive 64 can be turned into a CP/M machine or, with a PET Emulator, a PET. Also, the Executive 64 can make use of

VIC-20 and Commodore 64 peripherals.

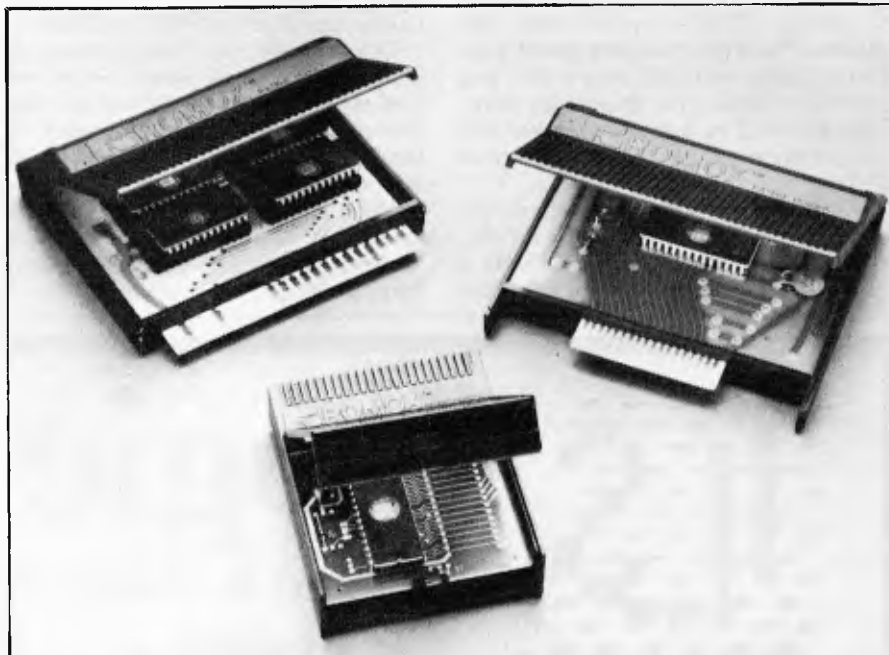
Since Apple's Lisa became widely known, there has been a flurry of announcements regarding similar projects, packages and concepts. Commodore (which has a licence to use the Xerox-developed Smalltalk system), has made a first attempt at producing software that allows a user to enter commands by manipulating visual representations of everyday objects. It is called Magic Desk and runs on the Commodore 64.

With Magic Desk, the user is provided with a graphic representation — in arcade quality resolution — of an office. In the centre of the screen there is a desk with a collection of familiar objects arranged on top: a typewriter (word processing or text editing); a calculator and financial journal (for calculating and simple spreadsheet facilities); a card file (for storing lists of names and addresses); and a telephone

(Commodore wouldn't comment on what the telephone represented since it couldn't be demonstrated, but it doesn't take much imagination to figure that one out). Under the desk is a wastebasket, which is used to discard unwanted files. To the right of the desk is a filing cabinet with a digital clock resting on top of it, and to the left is an artist's easel.

Like the telephone, the artist's easel is not yet available for use, but it will presumably be used to access some kind of drawing system. The filing cabinet, on the other hand, is a key metaphor of the Magic Desk environment since it is where all files will be saved to or retrieved from. The cabinet has three drawers, each of which contains ten file folders. Each of these folders contains ten pages for document storage. It's not clear how much information can be stored per page.

Instead of a conventional cursor, users



Hardware manufacturer Romox made two major announcements at the Consumer Electronics Show. It is going to market a product that gets around Texas Instruments' plans to modify the TI99/4A so that it will accept only TI approved games cartridges. And it will soon launch a juke-box like terminal that will allow retailers to program and reprogram special games cartridges.

The first product is called GamePort. It plugs into the TI99/4A I/O port, and so can communicate directly with the machine's 9900 central processor. In this way, Romox says, users can avoid the consequences of the TI circuit modification. GamePort will play any standard ROM cartridge and it also includes an extra 8k of ROM to expand the TI99/4A's capabilities. There are plans to include some RAM memory as well, but Romox has not yet decided how much should be included. GamePort will cost \$39.95 and will be available later this year.

The company's second product is designed for retail stores that already sell games software cartridges. Instead of stocking a large number of the relevant cartridges, the new terminal allows retailers to maintain a central base of up to 500 games which can be copied any number of times onto what Romox is calling the Edge Connector Programmable Cartridge.

This cartridge is simply inserted in the games terminal and the software is downloaded into it. Once you get tired of a particular game you just take the cartridge back and reload another game over the first (the same way audio cassettes can be used for one recording then erased).

Romox plans to lease the terminal to retail stores for about \$100 per month.

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of Magic Desk move a disembodied arm, complete with pointing finger, to select any of the office objects, or metaphors. If you want to open a file cabinet drawer, for example, you would use a joystick, mouse, trak-ball, or any other cursor controller to

first point at the relevant drawer with the hand. You would then press the controller's 'select' or 'fire' button to execute the 'open file-drawer' command, and then move onto finding a particular file and updating it in some way.

Magic Desk does not presently feature windows as on the Xerox Star, Apple Lisa, or even those simple bordered split screens available with Microsoft's Multiplan. Instead, whenever a new activity is selected, the whole screen display is updated. Magic Desk has little of the sophistication of the Star and Lisa, but yet it shows the kind of effort being made at the home computer software market level. It is simple to use, can be immediately understood by a user regardless of his or her native language, and the on-screen metaphors can be customised more or less at will. Magic Desk I, as this first system is being called, will be available later this year in ROM cartridge form for less than \$100. A second cartridge, to handle calculating and home applications, is also on the way.



Following the unsuccessful launch of the Aquarius home computer last autumn its maker Mattel Electronics produced a re-vamped model, the Aquarius II, at the show.

It includes full-stroke keyboard, 12k ROM, 64k RAM, a Z80A processor and it runs Microsoft Basic with 16 colours.

Back-up marketing includes the Aquarius COM/PAC package containing the basic unit with hand controllers for game-playing, a 40 column thermal printer and a cassette recorder.

Atari attack

With the announcement of four new machines (all based on the 6502C chip running at 1.79MHz) and a range of new peripherals, Atari is hoping to quiet much of the criticism it has been receiving in the last year or so.

The smallest of the new entrants, the 600XL, comes with 16k RAM and 24k ROM as standard, although the RAM can be pushed up to 64k with an optional Memory Module expansion unit. A useful addition is the 'Help' key, placed to the

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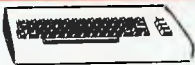


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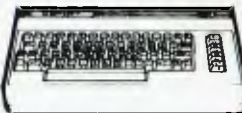
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right of the keyboard along with other special function keys. If the user encounters some difficulty in proceeding with a task, pressing the Help key will usually summon up useful instructions. This feature is common to all of the new machines, as is the ability to generate 256 colours, to emit all sorts of sounds, and to carry out self-test diagnostics.

In addition, the 800XL has 64k as standard; the 1400XL has 64k RAM, four programmable keys, a built-in modem, and a speech synthesiser. The 1450XLD includes all of this, plus an integral double-sided, dual-density disk drive.

Only the 600XL has been given a price — \$199. Atari has yet to make up its mind about the three others.

As a result of the new Atari CP/M plug-in module, produced by California company, Add-On Software, all Atari computers can now run CP/M version 2.2 programs. The module features a four MHz Z80 micro with 64k RAM and it connects to the various machines via the serial I/O port. While this is a fairly simple

approach, there is a penalty to pay as far as program execution speed is concerned because the Z80 and 6502C chips can only communicate at the standard I/O port speed rather than at system bus speed. No price has been set.

Conclusions

In the midst of all this jockeying for position by the major competitors, it would be easy to miss some interesting advances made by less conspicuous companies. It would be easy to miss the system with a 10.7 MHz chip, called Tomy Tutor, which has been designed for younger children. It comes with a peanut-butter proof (rather than ergonomic) keyboard, and can *really* handle animated graphics. Standard memory is 32k ROM and 16k RAM, expandable up to 64k. Interested parents/children can obtain the machine on a 'five day free home trial' basis.

Just a short time ago, a company called Spectravideo would have made quite a splash with its two microsystems — the

SV-318 and the SV-328. Both machines are based on the Z80A, and can handle up to 256k RAM and 96k ROM. The SV-318 comes with built-in joystick cursor controller, special word processing keys, 32 graphic sprites, ten user definable keys and CP/M compatibility for under \$300. The SV-328 is designed more for business use and, in addition to most of the SV-318 features, comes with Basic, word processing, a 'Super Terminal' program and a 'Help' program stored in ROM. The SV-328 costs \$595.

With Commodore, Coleco and Atari engaged in an all-out battle for the home computer market, we'll obviously have to look that bit harder so as not to miss significant breakthroughs by the smaller companies.

Overheard at the show

Apple's Mackintosh will probably be offered with TK! Solver, the high powerful calculating tool from Software Arts.

The Mackintosh is a low cost personal computer which will be a cut-down version of Lisa running similar applications and incorporating a mouse, although not the icons. It was named after a breed of the edible apple in the US, the McIntosh. **END**

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A new direct connect 300 bps modem that is no taller than a 50c piece and fits snugly under the base of a telephone, has been released by Australian communications manufacturer, Electromed. Called the Sendata 300 the modem is simple to operate and does not require operator training. It attaches to the existing telephone wall socket plug and becomes fully operational with the flick of a switch by the operator.

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MSX™ and LOGO™: Two more reasons why Spectravideo is leading the way in Personal Computers.

While price wars and confusion reign all around us, Spectravideo goes about its business, setting standards by which all other personal computers will soon be judged. MSX and LOGO are the two latest examples of how Spectravideo is rocking—and reshaping—the personal computer industry.

MSX AND LOGO.

It is now history that, on June 15 1983, Spectravideo, Inc. joined with most of Japan's largest electronics firms to launch MSX. The most far-reaching personal computer standard in history. MSX is the name given to a specific hardware/software configuration that makes product interchangeability possible. While Spectravideo is proud to participate in MSX, we are even prouder of this fact: It was our own SV-318 computer that was used as a prototype for the MSX design! There are two important aspects to this.

First, all future MSX hardware—i.e. computers, peripherals, appliances—will be based on several key design elements of the SV-318. What does this mean to you, the consumer? A great deal, because when you buy an SV-318, you will not only be able to use all of Spectravideo's own software and hardware—you'll also be able to take advantage of all the remarkable new equipment that will be coming from other MSX participants.

In addition, the software aspect of MSX was largely inspired by the software built into the SV-318. From the outset, Spectravideo offered built-in Microsoft BASIC as its resident interpreter. Now, Microsoft also makes a LOGO program compatible with the SV-318. It was Spectravideo's Microsoft BASIC/LOGO that helped to make MSX possible.

Another standard that Spectravideo can take credit for is the built-in Joystick/Cursor Control. Built right into the SV console, this control is always at fingertips and is much easier and faster to use than external joysticks or conventional editing controls.

Certain engineering elements that helped to make this built-in control possible have also been incorporated into MSX.

OTHER STANDARDS OF EXCELLENCE.

While these are the computer standardizations that Spectravideo helped to initiate, they by no means represent the whole SV-318 story. This remarkable computer has also established many standards of excellence that other personal computers now aspire to:

- **Built-In Super Extended Microsoft BASIC**—Makes the SV-318 the first truly programmable affordable computer!
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- **More Available Software**—Built-in CP/M compatibility gives you immediate access to over 3000 existing software programs. Plus, you can utilize Spectravideo's own line software library.
- **Advanced Graphics Capabilities**—The SV-318 offers 16 colors in high resolution, and more importantly, 32 programmable sprites that allow tremendous control of movable screen objects.
- **Many other fine features**—Such as Z80A Microprocessor with fast (3.6) internal clock, top-loading cartridge slot, 10 user-programmable special function keys, 3 sound channels (8 octaves per channel), low profile and attractive styling.

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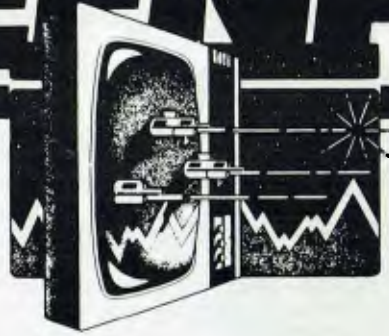
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SCREENPLAY



This month Steve and Catherine Withers review games for the TI99/4A

The Texas Instruments 99/4A is quite a nice home computer, with some powerful graphics features which give it great potential for arcade-style games. All the games we tried out were supplied as plug-in cartridges, which are very convenient but also expensive. Given the choice of (say) five LPs or one game program, we would pick the records every time.

All but one of the games are from Texas Instruments, the odd one out being Henhouse, which is a Funware product.

GAME : Tombstone City: 21st Century
PRICE : \$39.95

The dubious scenario of this game is that a Wild West ghost town is being attacked by Morgs — green nasties that eat people and tumbleweeds, reproducing with the aid of cacti! Your mission (should you decide to accept it) is to destroy the Morgs with the aid of your trusty prairie schooner. You get ten lives, which is a lot compared with most games, but you need them, believe me.

Unless you are particularly dexterous, forget about playing this game with the keyboard. Even on the 'novice' skill level the action is fast and furious. The instruction leaflet says that Tombstone City is "an exciting new way to test your game-playing skills" and it isn't joking. Even with joysticks it is a difficult game because of the speed at which the Morgs move.

You steer your schooner around the town, zapping tumbleweeds and Morgs to score points. When you kill a Morg it turns into a cactus, and two adjacent cacti are likely to spawn a new Morg at some future point in the game, but the only way to destroy a cactus is to shoot a Morg standing next to it (don't ask me why that should work). One thing in your favour is that by pressing the space bar you can instantly retreat to a cemetery, a safe area that the Morgs

As a general rule joysticks are essential for the arcade games, as the pace is either too rapid for fumbling with the keyboard, or because the programmer chose less than ideal keys to control the game. Unfortunately the TI joysticks are not very pleasant to use. They have a stiff action and the edges dip into your hands making them quite sore after a few games. The 'fire' button is also very rubbery, but this is less of a problem.

Only one of the games seemed original

(Henhouse) but if everyone and his dog is selling a space invaders game it must be difficult to avoid joining the crowd. A look through a US magazine dedicated to the 99/4 revealed a number of distinctive games for this computer, including a very graphical 'surgery' game (guts and all). Putting people back together sounds far more constructive than killing them.

Thanks to Gametronics of South Yarra for the loan of the equipment and cartridges used for this review.



won't enter. To make life difficult the entrances to the cemetery are likely to become blocked by cacti if you try to kill the Morgs from within. There is also a penalty of 1000 points for such a retreat — a bit harsh when you only get 150 for killing a Morg.

Within each skill level the game gets harder as the score mounts. Each time you clear the city of Morgs and pairs of cacti a New Day starts with more pairs of cacti than before. The skill levels control the speed of the Morgs

relative to your schooner, and at the 'insane' level the Morgs regenerate at an even greater rate. I would be surprised if many people could master Tombstone City, and its difficulty could be disheartening for players of modest ability.

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

GAME : Parsec
PRICE : \$49.95

Yet another variation on the space war theme, this time of the 'Defender' genre. Parsec's main feature is that it is able to drive the TI speech synthesiser, giving you a talking shipboard computer which warns of approaching enemy ships and occasionally compliments your shooting.

The plot of the game is that you control a spaceship which has been given the task of destroying marauding fleets of alien craft. While you can control your altitude and (to a limited extent) speed, you cannot change direction and your only weapon points forward. As well as dealing with the attackers you must avoid crashing into the ground. This is a particular problem during refueling as this process involves flying through a narrow tunnel on the planet's surface. In a couple of hours play only one of my ships lasted long enough to need refueling.

The first few waves of ships attack



head on and they can be dealt with fairly easily once the pattern of their behaviour has been identified. The flying saucers are a bigger problem as

they pop up behind you, often crashing straight into your ship. Your only chance is to shoot them after they have flown past, but I (Steve) only managed

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Australian Personal Computer Page 111

Before you buy the sizzle, take a damn good look at the steak.

The environment surrounding the personal computer has led purchasers to expect that every new model on the market will relegate its predecessor to the electronic junkheap.

In truth, the last truly important breakthrough in computer technology came with the invention of the silicone chip in the late 70s.

The rest, like the salesman's pitch, is rather more sizzle than good red meat.

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

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ORIGINALITY IS NOT ALWAYS ALL

IT'S CRACKED UP TO BE

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

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

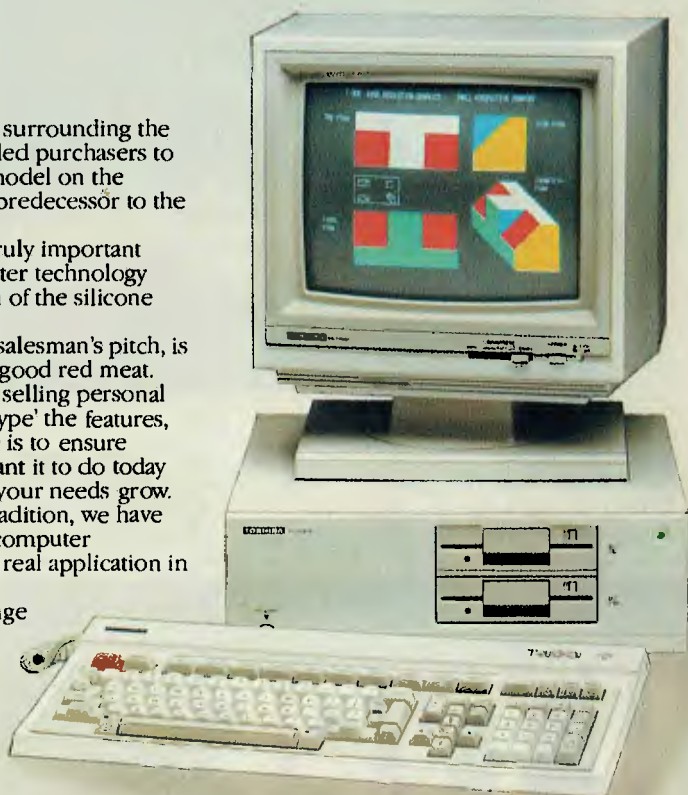
The T100 uses the Zilog Z80A processor — the same as DIGITAL. Quality and reliability is the most important aspect of the Toshiba product range.

MEMORY. WHAT HAPPENS IF YOU NEED MORE?

The workload any computer is capable of depends largely on its memory. The more information you can store the more useful it is. Most Toshiba computers start with more memory than their competitors but this can inexpensively be doubled or even trebled. This feature may not seem very exciting when you're shopping around, two years down the track it could save you replacing the entire computer.

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Big, relentless and effective



to destroy the saucer fleet once.

The graphics are fast and smooth, and the speech synthesiser adds to the fun. The game does have its weaknesses, especially when using the keyboard. The choice of the E-S-D-X diamond to control movement with the full stop acting as the 'fire' button is acceptable to lefthanded players, but it

causes problems for the rest of the population. It's much more fun with a joystick, and my scores doubled when I switched to using one. Another annoying point is that collisions are sometimes registered even though the screen shows a near-miss. Despite these criticisms, I found Parsec to be a challenging game that I could play for

hours, and certainly my favourite out of those we tested.

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

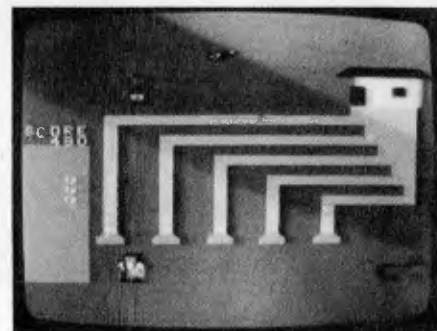
GAME : Henhouse
PRICE : \$64.00

A solo game where the player takes on the role of a farmer collecting eggs and defending his hen house. Points are scored by gathering eggs from full chutes and carrying them to a truck. Additional points can be gained by shooting birds and poachers, and the rarely appearing wolf must be killed at all costs or the game is lost. The farmer cannot collect eggs while he is carrying his gun, so decisions on priority have to be continually made. The game ends after six eggs have been broken or stolen, or when the wolf gets into the hen house.

This is a friendly game with good clear cartoon-like graphics, although

the sound effects are rather unimaginative. It is easy to build up a good score and to go on to better it. Henhouse is a test of concentration rather than reflexes as there is plenty of time to carry out your tasks (but the game does speed up as the score mounts), and it will appeal to those who do not enjoy the constant threat of being under attack. It is also a particularly easy game to play using the keyboard as the farmer can only move across the screen, however the choice of 'Q' as the firing key could be improved as it is too close to the 'S' and 'D' keys used to control the farmer.

All in all this is an absorbing game well suited to those without lightning reflexes but who still enjoy a challenge. Being in that category itself, I



(Catherine) enjoyed this game more than the others in this article.

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

GAME : Tunnels of Doom
PRICE : \$59.95

Tunnels of Doom is a "Dungeons and Dragons" style game for one to four players. Up to four characters (who may be fighters, wizards, rogues or heroes) explore a dungeon on a quest, the nature of which is determined by a data file on tape or disk. Tunnels of Doom comes with two files: Pennies and Prizes, and Quest of the King.

"Pennies is a very simple game intended for children or new players who wish to become familiar with the mechanics of moving around the dungeon without having to worry about the hazards that appear in more advanced games. "Quest" is more complex, requiring careful selection of goods from the store, searching for secret doors, engaging weird creatures in combat, and wielding magical artefacts. There is also a time limit, as

you must rescue the King before he is put to death by the monsters that are holding him prisoner.

It isn't easy to describe such a sophisticated game in a few words. The dungeon consists of up to ten levels, each comprising a number of rooms linked by corridors. The party of characters move around in response to commands entered from the keyboard, while the screen shows a perspective view of what lies ahead. When the



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party enters a room the display changes to a plan view with small figures representing the characters and any monsters and treasures that may be present. The party may offer to negotiate with the monsters as an alternative to fighting, but a battle may result anyway. During combat each character is controlled separately and can fight with whatever weapons he or she is carrying, and may be able to make use of magical items as well. A large dungeon could take many hours

to explore, and for this reason it is possible to save a game on disk or tape and continue later. That assumes you can tear yourself away — I kept telling myself "just one more room".

The manual indicates that other games for use with Tunnels of Doom will appear in the future, although the systematic and random variations that are possible with "Quest" should give many hours of entertainment.

The corridor graphics are superficially attractive, while the combat

mode gives a degree of control that would be difficult to achieve in any other way. If you are intrigued by the idea of "Dungeons and Dragons" but don't have anyone to play with, Tunnels of Doom is a pretty good substitute.

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

GAME : TI Invaders
PRICE : \$39.95

What can you say about yet another version of Space Invaders? This one is fairly standard, giving you three missile launchers to shoot as many invaders as possible. There are three varieties of attacker with the least valuable in the front ranks, and there are four shields for you to hide behind in order to avoid the invaders' fire. A yellow saucer periodically crosses the top of the screen giving you an opportunity to score additional points, but the value of a hit depends on your accuracy (maximum value comes from hitting it dead centre). When all the invaders are destroyed a red spaceship flies across the screen, and it is in your interest to keep it on the screen by hitting it — each time you do it changes direction, boosts your score, and delays the arrival of the next wave of invaders.

The game ends when all your launchers have been destroyed or when an invader reaches the surface.

Two sets of keys may be used to play the game, suiting left or right handers, but in common with similar games it is better played with a joystick.

There appear to be major problems with this game in that the scoring system does not seem to work properly: the score shown bears little relationship to the number of invaders left on the screen (we never got past the first wave), and no relationship to the scoring system in the instructions (i.e. the values of all targets are a multiple of 5, yet all sorts of scores were seen). There also seemed to be no difference between the two levels of difficulty offered at the start of the game.

This is a very ordinary game which does not seem to work to its own rules. It's addictive only in the sense that you



go on playing even though you are not enjoying the game, and will only be of interest to confirmed space invader junkies and those who enjoy being aggravated.

USE OF GRAPHICS : **
ADDICTIVE QUALITY : **** (or none)
VALUE FOR MONEY : *

GAME : Video Chess
PRICE : \$69.95

This is a very complex chess playing cartridge which offers a multiplicity of options. You have the choice of playing against a human opponent or the computer at beginner's or more advanced levels, storing an unfinished game on cassette, or playing from a special position. The program can play nine separate games at once.

The chess board and pieces are very clear and they take up about half of the screen, the remainder being used to show the last move by each side and the clocks. The keyboard is used to enter moves, with columns identified by letters and rows by numbers. Other commands are entered by single keystrokes, but what might be the most useful did not seem to work on the test cartridge. This was the HELP mode,

where the program will either suggest your next move or evaluate the move you enter. If this cartridge is intended to help you play better chess then the absence of this function is laughable. Other useful options that are available are time out, replay, save game, back up (allowing you to cancel your last move) and mode change (to change the style of play during a game).

In addition to all these functions there are a number of game options such as three levels of play (from beginner to intermediate), 'thinking time' allowed for the computer (between 30 and 200 seconds per move, but only at the higher levels of play), and the style of play to be adopted by the computer (normal, aggressive, defensive, or losing).

It takes a little time to get used to all the facilities on this cartridge but for those who take the game seriously and

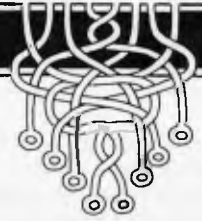


wish to improve their chess it could be an excellent alternative to some of the higher priced chess machines that are on the market.

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

LEISURE LINES

by J J Clessa



Quickie

No prizes, no answers! What can be found at the back of a bus and the front of a sports car?

Prize Puzzle

In a certain street in Sydney, there are six families whose surnames are Adams, Baker, Chambers, Dawson, Eastwood and Finch.

In each family there are three children, and of the 18 children in all, there are three Malcolms, two Bernards, two Susans and two Tinas. The others are Anne, Charles, Leslie, Yvonne, Peter, Roger, Joan, Fred and George.

The families decide to select one child from the 18 to represent the street at a forthcoming festival. The method of selection is as follows:

The families line up in alphabetical order, and within each family the

children are also placed in alphabetical order. Then, starting with the first child of each family — Adams family first — the children count off alphabetically, and the first child who is 'counted' with the initial letter of his own christian name is to be the one selected for the festival.

Thus, the Adams' first child calls 'A'; the Baker's first child calls 'B'; and so on to 'F' for the Finchs'.

Then the Adams' second child calls 'G'; Bakers' second child calls 'H'; and so on.

Finally when 'R' is reached by the third child of the Finchs' the count goes back to the start again. Also when 'Z' is reached, the count continues with 'A', 'B', etc.

After 20 times through the alphabet, still no decision has been reached, so the families decide to call it a day and choose instead the only child of Mr and Mrs Grant, who also live on the street.

What are the christian names of the children in each family?

Answers please — postcards or backs of envelopes only — to reach APC by 30

September, 1983. Send your entries to: APC, Lazing Around, P.O. Box 298, Clayton, Vic 3168.

May prize puzzle

A good response — about 95 in all — of which about 15 were disqualified because they were not on postcards or outsides of envelopes.

Now, to the May winner — drawn by random selection from the mostly correct heap. The correct entry was from N Sheehan of Riddells Creek. Congratulations Mr Sheehan — your prize is forthcoming.

Meanwhile, to all others, keep trying, your turn might be next.

The winning solution was: Celia was the Mother, and Doris was the Daughter.

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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!

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

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

The microcomputer is capable of receiving information, processing it, storing the results or sending them elsewhere. All this information is called **data** and it comprises numbers, letters and special symbols which can be read by humans. Although the data is accepted and output by the computer in 'human' form, inside it's a different story — it must be held in the form of an electronic code. This code is called **binary**. Binary is a system of numbering which uses base 2 instead of the more familiar decimal — or, to be more accurate, denary-system of base 10. In binary notation there are only two digits — 0 and 1 — which the computer recognises as the absence or presence of an electric current. The easiest way to visualise this is to think of each binary digit (**bit**) as being a switch which can be either off or on. Each binary digit stands for a power of 2. The right-most digit, the least significant, is $2^0=1$, the next $2^1=2$, then $2^2=4$, $2^3=8$, $2^4=16$, $2^5=32$, $2^6=64$, $2^7=128$, $2^8=256$. So decimal 24, for example, is represented in binary as 00011000. A set of eight bits is known as a **byte** and, to make things easier for humans, a third system of numbering, **hexadecimal** or **hex** for short, is used as a sort of 'halfway house' between binary and denary. Hex uses numbers to base 16, with denary numbers between 9 and 16 represented by the letters A-F. The hex equivalent of a byte is obtained by giving each half a single character code: 0=0000, 1=0001, 2=0010, 3=0011, 4=0100, 5=0101 ... E=f110 and F=1111. Our example of 24 is therefore 18 in hex.

To simplify communication between computers, several standard coding systems exist, the most common being **ASCII** (American Standard Code for Information Interchange). This allocates a numerical code to each digit and letter. For example, the number 5 is given the ASCII code 35 hex, 53 decimal, whereas a capital A is represented by ASCII 41 hex, 65 decimal.

The computer processes data by reshuffling, performing arithmetic on, or by comparing it with other data. It's the latter function that gives a computer its apparent 'intelligence' — the ability to make decisions and to act upon them. It has to be given a set of rules in order to do this and, once again, these rules are stored in **memory** as bytes. The rules are called **programs** and while they can be input in binary or hex (**machine code** programming), the usual method is to have a special program which translates English or near-English into machine code. This speeds programming considerably; the

closer the **programming language** is to English, the faster the programming time. On the other hand, program execution speed tends to be slower.

The most common microcomputer language is **Basic**. Program instructions are typed in at the keyboard, to be coded and stored in the computer's memory. To **run** such a program the computer uses an **interpreter**, which is usually built into the machine's ROM (see later paragraph on this page). The interpreter picks up each **Basic** instruction, translates it into machine code and then feeds it to the **processor** for execution. It has to do this each time the same instruction has to be executed. A much faster method is to use a **compiler**, which accepts each instruction in turn, waits until the program has been entered, then turns each instruction into machine code before running the program. This means that each instruction has to be translated once only — consequently the speed of execution is considerably improved.

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

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

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

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

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

Because **RAM** loses its contents when power is switched off, **cassettes** and **floppy disks** are used to save programs and data for later use. Audio-type tape recorders are often used by converting data to a series of

audio tones and recording them; later the computer can listen to these same tones and re-convert them into data. Various methods are used for this, so a cassette recorded by one make of computer won't necessarily work on another make. It takes a long time to record and playback information and it's difficult to locate one specific item among a whole mass of information on a cassette; therefore, to overcome these problems, **floppy disks** are used on more sophisticated systems.

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

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

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

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

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

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

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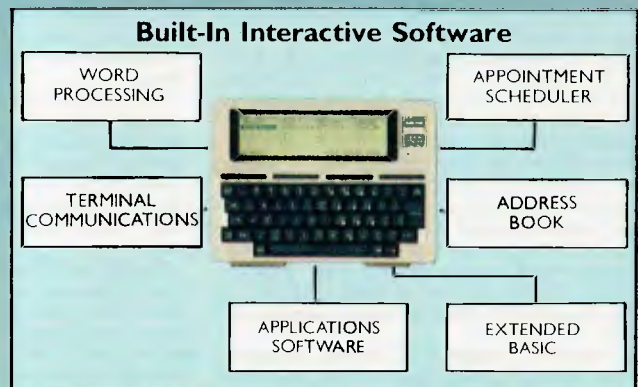


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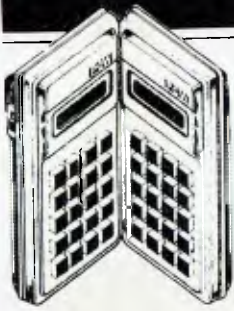
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TRS-80 MODEL 100

Dick Pountain rekindles his interest in the portable computer market with his in-depth review of Tandy's TRS-80 Model 100.



PORTABLE COMPUTER WORLD

The state of the portable computer market has been transformed beyond recognition since I last pontificated in these pages in a review of the Epson HX-20. I recently obtained a copy of the first issue of the *US Portable Computer* magazine and found listed therein over thirty models, most of which no one over here has heard of; to be sure many of them appear to be 'announce now, manufacture later' jobs.

The facilities offered are beginning to include bubble-memory, 16-bit processors and large scale LCD displays. Industry analysts now routinely include the portable sector in presentations of future market trends, and forecast enormous growth potential, particularly in machines with communications ability. Three groups of portable machine are identified: briefcase size (Osborne), book size (Epson) and pocket.

All of this preamble is by way of saying that portable computing has suddenly been promoted from a fringe interest to a big business; if proof were needed then this review of a machine from Tandy — which (as Radio Shack) was, until recently, America's biggest seller of micros — should supply it.

Tandy was the first US manufacturer to enter the pocket computer market, selling a slightly modified Sharp PC1211 under its own brand name. When the Sharp PC1500 came out, that too entered the Tandy catalogue. The TRS-80 Model 100 is, however, developed solely for Tandy, with an operating system, Basic language and built-in software by Microsoft. It sports an LCD display larger than that of any competitor, and in its US version incorporates an auto-dial modem for telephone communications.

Hardware

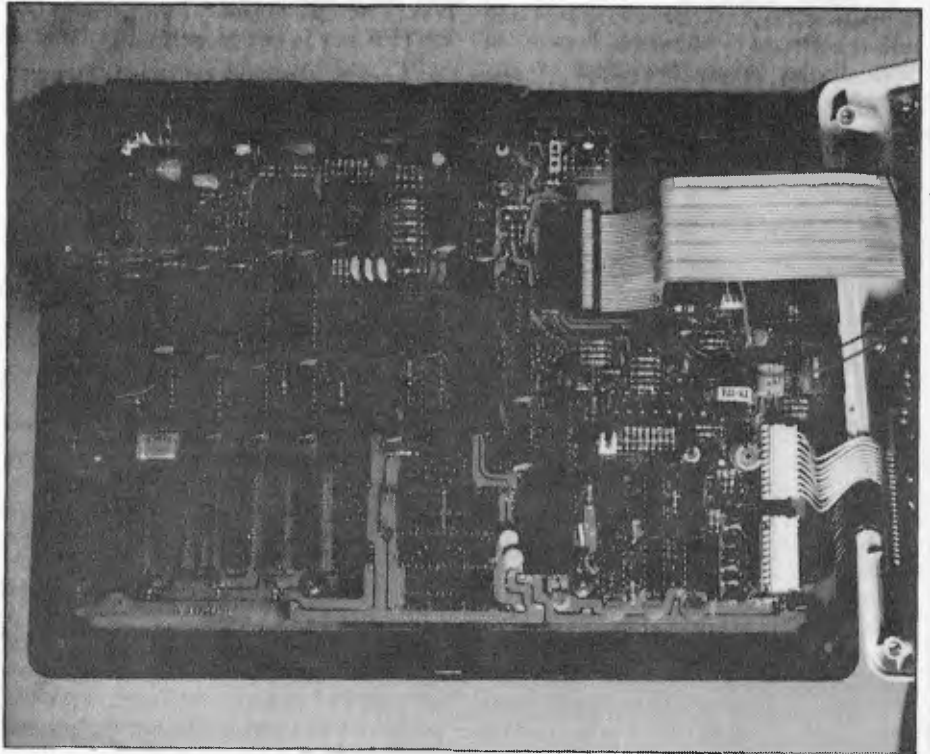
The Model 100 is encased in a strong ABS moulding and, at $30 \times 21.5 \times 5$ cms, is fractionally smaller than the Epson. The most striking visual feature is the display; this 40 characters by 8 line LCD display is the largest currently available on a computer of this size. It makes a big difference to the usability of such a machine for text processing, since you can see a sensible amount of text without the need for sideways scrolling. Upper and lower case characters are formed on a 7×5 dot matrix and are quite legible, if a little 'dotty'; in addition there are built-in graphics symbols and the facility to do pixel graphics from Basic. A thumbwheel on the right-hand side of the case allows the optimum contrast to be obtained at any viewing angle.

The right-hand side also has the sliding

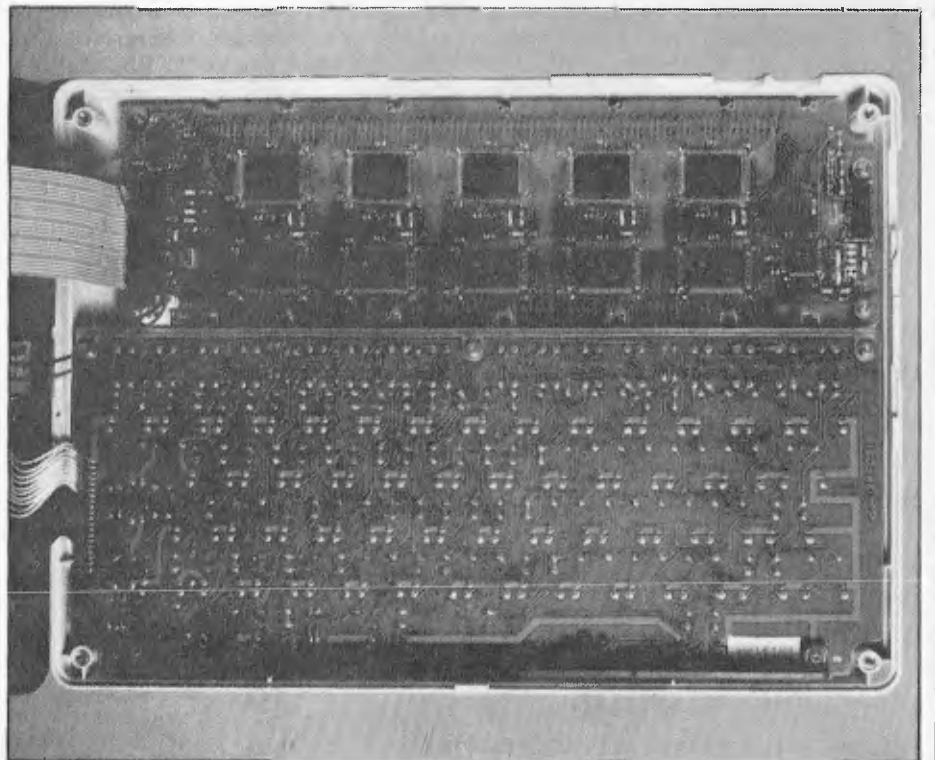
ON/OFF switch and a socket for a mains adaptor, which is an optional extra. The Model 100 has an auto power-off function which is under software control; it comes set to a delay of ten minutes but you can

reset it from Basic using the POWER command to override it completely.

The keyboard is a full sized unit with proper typewriter pitch and good feel. There is obviously no separate numeric



A very pretty main board layout.



Ten large 'flat pack' ICs predominate.

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SPECIFICATIONS Functional Specifications

Printing Method — Serial impact dot matrix
 Printing format — Alpha numeric — 7 x 8 in 8 x 9 dot matrix field. Semi-graphic (character graphic) — 7 x 8 dot matrix. Bit image graphic — Vertical 8 dots parallel, horizontal 640 dots serial/line
 Character size — 2.1mm (D.083") W x 2.4mm (D.09") H/7 x 8 dot matrix
 Character set — 228 ASCII characters, Normal and italic
 Printing speed — 80 CPS, 640 dots/line per second
 Printing direction — Normal — Bidirectional, logic seeking, Superscript and bit image graphics — Unidirectional, left to right
 Columns/line — Normal size — 80 columns. Double width — 40 columns. Compressed print — 142 columns. Compressed/double width — 71 columns. The above can be mixed in a line.
 Paper feed — Adjustable sprocket feed and friction feed
 Paper type — Fanfold, Single sheet. Thickness — 0.05mm
 Ribbon — Cartridge ribbon (exclusive use), black
 MTBF — 5 million lines (excluding print head life)
 Print head life — Approximately 30 million characters (replaceable)

Parallel CP80 \$415 plus tax Serial CP80 \$595 plus tax



STAR PRINTER

SPECIFICATIONS

Printing system — Impact dot matrix
 Interface — Centronics standardized parallel interface (TTL level) built in printer
 Matrix — Character mode: 9 x 7 matrix. Graphic mode: 6 x 6 matrix
 Printing direction — Character mode: Bi-directional printing with logical seeking function. Graphic mode: Uni-directional printing from left to right
 Number of characters per line — 80/96/131 (40/48/66 for double-width characters)
 Printing speed — 80 characters/sec
 Character set — JIS 160 codes/ASCII 96 codes + international character codes 64 graphics patterns
 Character size — 2.0 (W) x 2.6 (H) in mm in case of 80 columns/line
 Character space — 2.54mm (1/10 inch) in case of 80 columns/line
 Line space — 1/6, 1/8 or 1/12 inch
 Paper feed system — Friction type: Friction feed. Tractor type: Variable sprocket feed or friction feed
 Line feed speed — 7.5 lines/sec at 1/8 spacing, 10 lines/sec at 1/8 inch spacing
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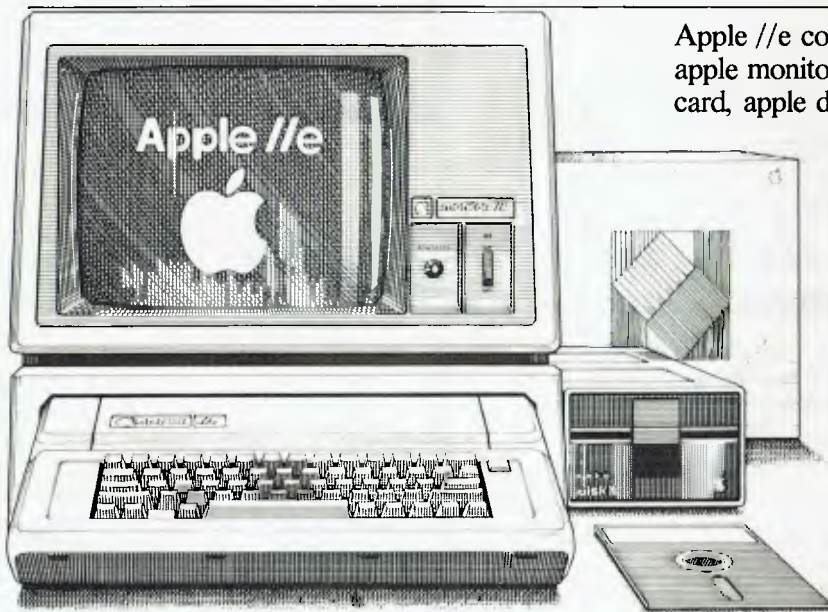
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keypad, given the limited space, but as on the Epson a NUM lock key is provided which turns a block of alpha keys into a pad. All the keys repeat if depressed for more than a second. The keyboard layout is very well put together, with a huge fat ENTER key in the proper place, CTRL, SHIFT and ESC in the standard places and extra shifts called GRPH and CODE either side of the full-sized space bar. The GRPH key produces a variety of block graphics characters (GRPH A is a little aeroplane and GRPH Y a space invader) while CODE produces the various European accents, umlauts, etc. The character set contains 256 symbols, setting the eighth bit for the specials.

Above the main keyboard are four blocks of four function keys. The first two blocks, labelled F1 to F8, are user programmable and are also used by the built-in software. The third block contains dedicated keys labelled PASTE, LABEL, PRINT, PAUSE and BREAK. PASTE is used by the text editor; LABEL toggles a display on the bottom screen line of the labels attached to keys F1 to F8; and PRINT dumps the screen contents to a printer. It also hangs the system if a printer is not connected, but BREAK will get you out without needing to reset. PAUSE suspends execution of a Basic program and a second press restarts it. The final block contains four cursor movement keys.

At the rear of the case is the reset button, a 27-pin D connector for the RS232 port, a Centronics compatible parallel printer port and a DIN socket for a cassette deck. Tandy recommends the use of its own line of dot-matrix or daisy-wheel printers but most parallel printers should work with a little tweaking. Most cassette recorders nowadays have mini-jack sockets including Tandy's own recommended one; if you want to use a pocket microcassette, say, you'll have to buy Tandy's DIN-to-jack cable (part no 26-1207), which costs around \$6.95. The cassette port has remote control, and the motor can be switched on and off from a Basic program; this falls rather short of the sophistication of the Epson's software tape counter and fast-forward program control.

Coming round to the left-hand side, there is a small connector for attaching a bar-code wand; this will make the machine popular for retail and stock-control applications. Tandy will supply the wand as an extra, along with the driver software.

There is no provision for attaching a monitor or TV set though there is a suggestive looking empty hole next to the cassette socket.

Underneath the case is a battery compartment which contains four replaceable

AA size alkaline cells; approximately 20 hours' use can be had from them in normal use. These batteries do not provide the power to preserve the contents of the CMOS RAM, which is served by its own built-in Ni-Cad cell. This is automatically recharged every time you power on the computer and contains enough juice to keep 8k happy for 30 days or 32k happy for eight days, following the last power-on. This internal battery can be switched off by the Memory Power Switch on the case bottom, if you want to store the machine for long periods. Obviously all RAM contents will be lost so it will pay to be wary of this switch. A red LED low-battery indicator sits just under the company logo on the front of the machine, and lights up when you have about 20 minutes of power left.

Also on the underside is a small hatch which covers a compartment to accommodate ROM software modules, which will be available in the future; none were supplied with the test machine. Next to the ROM socket is a 40-pin DIP socket which takes all the internal bus lines to the outside world; the pin-out is given in the manual, but with minimal information as to what the signals mean.

Inside

The case opens up by removing four screws and reveals a very pretty main board layout plus subsidiary boards for the keyboard and the LCD display. This latter contain no less than ten large 'flat pack' ICs whose function I failed to define, and more tracks than I have ever seen on one board; decoding large LCDs is no laughing matter.

Memory on the main board comes in the form of three 64k chips of a curious construction; each has two Toshiba 'flat pack' 32kbit chips mounted side by side on a DIP carrier. The test machine had 24k RAM but a cheaper 8k version will be sold. There is a spare socket on the board to expand either machine by a further 8k, so 32k is the largest memory available.

The CPU is an 80C85, a CMOS version of the Z80-compatible 8085, which is good news for software developers. It runs at 2.4 MHz and the Benchmark timings reflect this by being acceptably fast for a portable (apart from BM8 which is very slow).

When the Model 100 is switched on it performs a warm start; you will be placed into the main menu. A cold start, which erases the contents of RAM, is performed by holding down CTRL PAUSE and switching on the power or resetting; it is only necessary following a major system change such as adding more RAM or a ROM module. RESET itself does not lose any memory contents and can be used

without anxiety if you manage to hang the system which is only likely if you are messing around in machine code; BREAK always sufficed from Basic.

Software

The Model 100 has a suite of operating software in ROM which was designed for the machine by Microsoft. There are four built-in application programs called TEXT, TELECOM, ADDRSS and SCHEDL (short for schedule) plus a custom version of Microsoft Basic. When the machine is turned on for the first time, these five options appear on a menu with a reversed field block cursor sitting over BASIC. The top line of the screen contains the time and date in the format '19 Jun 1983 Sun 14:40:03' which makes a refreshing change from the list of cryptic numbers offered by most machines. A choice from the menu can be made by either typing the filename on the 'select:' line at the bottom of the screen or by moving the block cursor over the name using the cursor keys and then hitting return (this excellent system was pioneered in Microsoft's Multiplan spreadsheet). At the bottom right corner is displayed the amount of free RAM.

The operating system is simple but effective. It treats RAM just like a disk with the Menu as the directory. Obviously some of RAM is used as working space when you are in one of the programs, but this is organised in a totally transparent manner so that you never need to worry about the memory partitioning; work-space does not appear on the directory, only files. The application programs all create files which are added to the directory and can be saved and loaded just as if from mass storage. Files can be redirected to other devices by adding a device name to the specification — for example, SAVE "CAS:MYPROG" would put a program onto cassette. The other devices recognised are LPT: (the printer), LCD: (the screen), COM: (the RS232 port) and RAM: which is normally omitted since it is the default.

The operating system recognises only three types of RAM file; tokenised Basic programs suffixed by .BA, documents (ie, ASCII files) suffixed by .DO and machine code files with the .CO extension. The first two suffixes are added by the Basic interpreter or the text editor automatically, so that every file you create will have one or the other; both programs reject any attempt to give a different extension. The .CO extension is automatically given to machine code files saved from Basic by the SAVEM command. Therefore, the only files without suffixes are the built-in programs, which is a reasonable way of

enforcing file discipline. If a .BA or .DO file is selected from the Menu then the interpreter or editor is automatically loaded with that file; it isn't necessary to first select BASIC or TEXT unless you want to create a new file. A .BA file selected this way will be run immediately.

The main Menu can be thought of as being at the operating system level; pressing function key 8 ('Menu') returns you to this level from any of the programs. However, file management commands can't be issued in the Menu; you have to be in Basic to KILL (ie, delete) or NAME (change the name of) a file, or to send it to an I/O device. From Basic it is also possible to create a turnkey program using the IPL command; IPL "MYPROG.BA" will cause MYPROG to be automatically executed at every warm start until another IPL is issued.

Tandy (or Microsoft?) didn't miss a trick when it was specifying the application areas to build into the machine; they cover the needs of about 90 per cent of potential users at a stroke. The editor is good enough for word processing away from home, the address-book provides for most of the data management you could expect to do on a machine of this size, and the communica-

tions program caters for the rest by allowing you to download a file from a remote machine or plug into an information service. The one disappointment is the scheduling program, of which I'll say more later.

Word processing

TEXT is a great little editor which can be used quite happily for basic word-processing. On selecting TEXT from the Menu it prompts for a filename, and creates one if it doesn't exist (only .DO files can be edited this way and you don't need to type the extension). The text appears on the screen with an arrow marking the end of the file. TEXT is always in insertion mode so anything you type is inserted at the cursor position; to overwrite something you must delete the old and then insert. Sensibly two forms of deletion are provided; the BKSP key is a destructive backspace while DEL (SHIFT BKSP) deletes characters under the cursor, 'eating' text to the right. Automatic wordwrap operates at the end of a screen line (40 chars) though for printing or uploading a file the line width can be specified to be anything from ten to 132 columns. Car-

riage returns are marked in the text as little black triangles. The cursor keys work in three modes. Used alone they move by one character or line, with SHIFT they move by one word or eight lines (one screen), and with CTRL they go to either end of the current line or the beginning and end of file.

Pressing LABEL displays the following function key operations; FIND, LOAD, SAVE, COPY, CUT, SEL and MENU. FIND prompts for a string to search for though it only searches forwards from the cursor and performs a crude literal search regardless of case; the cursor is left on the first character if found, otherwise NO MATCH is printed. Pressing FIND again repeats the search unless you type a new string. LOAD and SAVE are for storing the file on cassette; merely exiting the editor with MENU saves it in RAM. SEL allows you to define a block of text; when it is pressed and the cursor moved, all the text moved over goes into reverse field. To select the whole file you'd only press CTRL SEL CTRL V. CUT deletes the marked text into the PASTE buffer while COPY copies it into the buffer. Using the PASTE key then inserts the buffer contents at the cursor position. By this means

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large amounts of text can be moved, copied or deleted using only three keys (plus cursor movement). All the commands are duplicated as control sequences for touch typists who don't want to leave the main keypad; the WordStar sequences being used for cursor movement. CTRL P lets the next control character be embedded in the text so that you can use bold and underlining if your printer supports them. The whole design is spare and elegant.

Address book

ADDRSS, the address organiser program works in conjunction with TEXT as an address book. A file called ADRS.DO must be created using TEXT, with all your name and address information in it. There is no compulsory format for the information except for a carriage return to separate records. Selecting ADDRSS then puts up the prompt 'adr:'. Typing 'find John' (function key 1 types 'find' for you) will then display all the records containing John; the find function is the same used in TEXT and so it will find 'JOHN' and 'Johnson' as well as all the Johns.

Records are displayed six lines at a time; if there are too many to fit the screen then

'More' and 'Quit' are offered as options above function keys 3 and 4. Crude though this retrieval system is, it works quite effectively for a simple address book where there are unlikely to be hundreds of duplicate matches. It can be made more selective by cunning design of your database, using mnemonic codes or the many graphics symbols as search keys to label different categories, eg, the little aeroplane for airline booking offices. Like the editor it is very simple to use; a more powerful but complex database program would be counterproductive here.

Diary planning

The reason for my disappointment with the schedule organiser program is that it is exactly the same program as ADDRSS! The only difference is that it requires a file called NOTE.DO instead of ADRS.DO. The idea is that you fill the file with dates and memos instead of names and addresses, and then search for the date or for some other key word. There is no real-time element in it at all, despite the fact that the Model 100 has a perfectly good clock/calendar built in. Something which reads the clock/calendar and flashes a prompt at

the proper time, on the lines of Hewlett Packard's 75C, would surely not have been too difficult for the creators of MS-DOS to manage.

Communications

TELCOM, the communications program, comes up in its 'entry mode'. The key labels Stat and Term (plus Menu of course) are displayed together with a string which defines the currently set communication parameters, and the Telcom: prompt. If the parameters need to be changed then a new string is typed after the prompt; Stat merely displays the current settings again. The codes are to be found in a table in the manual. As an example 3711E means:

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Word Length 7) bits

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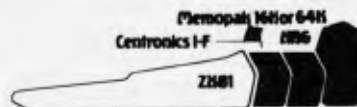
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files can be transmitted. Tandy desk-top machines like the Model III or 16 already have suitable software for direct communication to the Model 100 but a 'null-modem adaptor' is needed in the line joining the serial ports. For telephone communications an approved modem or an acoustic coupler will be required (although it's likely the built-in modem in the US version of the Model 100 will be available in the near future) and for non-Tandy hosts, a suitable comms program too.

Basic

Model 100 Basic is a specially written version of Microsoft which has some interesting features, particularly in the area of interrupt handling. I won't waste space going into many details of the standard bits; let this suffice. Variable names are of any length but only two characters are significant. Integer, single and double (14 digit) precision numbers are supported and type can be declared, eg, by DEFINT X-Z, which makes all variables which begin with X,Y or Z integer only. Arrays can be of any number of dimensions. IF..THEN..ELSE is there but not WHILE..WEND. PEEK, POKE and CALL are supported and the top of Basic's memory can be set with CLEAR to make room for machine code routines. I could find no mention of a resident Monitor in the manuals, though, and none of the usual commands such as SYS did anything.

Graphics are performed by PSET and PRESET which light or extinguish a pixel on the 240 x 64 'hi-res' screen, and LINE which draws lines but has switches to draw and fill boxes too. Text and graphics are mixed on the same screen but when text scrolls, any graphics will be erased. There is a versatile PRINT USING for formatted output and in the form PRINT# USING it can be used to write formatted data to a file. A sound generator allows feeble noises of variable pitch and length to be produced.

The really interesting stuff is in the area of interrupt handling. In addition to the widely available ON ERROR..GOTO for error recovery, Model 100 Basic has interrupt handling statements called ON COM, ON TIME\$ and ON KEY...GOSUB. They cause a jump to subroutine on receipt of an interrupt from the RS232 port, the clock and the function keys F1 to F8 respectively. The function keys can be programmed with strings of up to 15 characters in the orthodox way by using KEY; ON KEY...GOSUB however allows them to interrupt running program and execute one of eight subroutines. ON

TIME\$="12:00:00" GOSUB 1000 will cause a jump to a subroutine at line 1000 at 12 noon. This feature is rather limited in that it cannot work more than 24 hours ahead, and the use of a string to represent the time makes for extremely cumbersome programming if you want to generate a regularly repeated timer interrupt; a proper timer returning a numeric value would have been more useful. ON COM...GOSUB allows you to write routines to allow the computer to be remotely controlled through its RS232 port which would be useful for data-logging applications. All of these interrupt modes can be enabled, disabled or masked with the ON,OFF and STOP statements, eg, TIME\$ ON, COM STOP. To establish a priority order you would mask the other interrupts in the subroutine which serves the one with highest priority; if TIME\$ STOP is placed in the COM servicing routine then Basic will remember any timer interrupt which occurs while ON COM is being served, and jump to its routine once COM is finished, assuming that you have re-enabled ON TIME\$ with a TIME\$ ON before returning. A powerful set of tools that allow tricks which would usually require assembler programming.

Editing of Basic programs is performed by TEXT which is called from within Basic by the EDIT command. In this instance key F8 returns to Basic rather than the Menu. Basic programs can be stored either in ASCII or in tokenised form and either form can be LOADED and run. It is, therefore up to you whether to write Basic programs with TEXT directly, or write them from within Basic using EDIT in the familiar way. The snag is that TEXT can only handle ASCII text, and so when it is called up by EDIT the program in memory has to be detokenised and then re-tokenised when the edit is finished. This process can take up to two minutes for a large program, and in such a case it is wisest to edit the bare minimum number of lines at a time. I was irked to find that, as a result of this way of working, it is not possible to copy program lines by editing the line number as I am accustomed to doing; the original line will no longer exist. Another source of annoyance is the lack of either AUTO line numbering or RENUMBER which is pretty inexcusable nowadays. In fact, at risk of becoming a bore on the subject, I would have preferred a 'proper' interactive Basic screen editor; one that lets you edit direct mode commands as well as programs.

Documentation

The 200 page manual is quite clearly written and is nicely printed and bound

with a large wire spiral binder that actually opens flat without ripping the pages. There is a first section of quick 'get-you-going' reference for each application, followed by individual chapters of deeper explanation on each. The rest of the book is devoted to the Basic with a good command summary that devotes several clear paragraphs to each keyword. There is an index at the back but it is not very comprehensive. There is very little tutorial material in the book; all of it assumes a fair level of familiarity with computing concepts. For instance, the section on TELCOM will not be very informative to anyone who knows nothing about communications. There are also a number of odd omissions which I hope will be corrected in later versions.

Conclusions

At \$1399 for the 24k version the Tandy is good value for money compared to its main rivals in the 'book-size' class; the HP-75C and the Epson HX-20. Although it lacks the Epson's built-in printer and cassette deck, the provision of a good text editor and communications aim it directly at the corporate executive type of user who is so important in the USA. For such users a miniature printer is of little use compared to the ability to upload files to a desk-top machine and log on to information networks such as Dow-Jones. The lack of a portable printer will be felt more by the 'roving-salesman' class of user, which I suspect rather more important here. The large display puts the Model 100 well ahead of the field as a machine for word processing. Microsoft's software is well designed and easy to use and renders the machine useful straight out of the box; no mean consideration in these days when more software is promised than is delivered. END

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HARSHAD NUMBERS IN THEORY AND PRACTICE

In the *Journal of Recreational Mathematics*, Volume 13, 1980-81, D R Kaprekar defines a Harshad Number (H-Number) for d as a number that is a multiple of the sum of its digits, d . For example, 247 is an H-Number for 13 because $2+4+7=13$ and $247 = 13 \times 19$.

Clearly every positive integer less than 10 is an H-Number for itself. Kaprekar states that there is at least one H-Number for each positive integer, hence there is an infinity of such H-Numbers, since if N is an H-Number for d then so is $10^k N$ for $k = 1, 2, \dots$. N is said to be a Non-Zero Harshad Number (NZH-Number) for d if it is an H-Number for d and *none* of its digits are zero.

Note: The number of NZH-Numbers for a given d is clearly finite and the difference between any two of them is by definition a multiple of d .

Problem A: Given d , a positive integer, find the smallest H-Number and the largest NZH-Number for d .

Problem B: Generalise the above results to arithmetic radix $r \neq 10$. Known theoretical results include the following:

If $m = 3^s$ then

(i) the largest NZH-Number for m is the Repunit R_m defined by $(10^m - 1)/9$, viz. a sequence of m 1's.

(ii) the smallest H-Number for m is $9R_n$, where $n = 3^s - 2$.

Known practical results include the following:

(i) 37999 is the smallest H-Number for 37

(ii) 291899999999 is a small H-Number for 101

(iii) 8587 followed by 27 nines is a small H-Number for 271.

Are (ii) and (iii) the smallest H-Numbers?

Readers are invited to submit a program, or suite of programs, to solve the above problems. All submissions should include program listings, hardware descriptions, run times and output; they will be judged for accuracy, originality and efficiency (not necessarily in that order). A prize of \$25 will be awarded to the best entry received.

Entries, to arrive by 1 November, to: Mr M Mudge, C/- APC, P.O. Box 298, Clayton, Vic 3168.

Steinhaus Problem

The Steinhaus problem attracted detailed submissions in both Basic, assembly language and Z80 Machine Code. Undoubtedly the 'best' submission was that programmed in assembly language on a TRS-80 model one 16k, the machine language program being down loaded onto a 48k ZX Spectrum for running. This technique adopted by Gordon Grant allowed the determination of all cycles for orders from 2 to 12; the results being printed on a Tandy line printer VII. Gordon can expect a bonus for the originality of his approach in the form of a publication in one of the mathematical journals.

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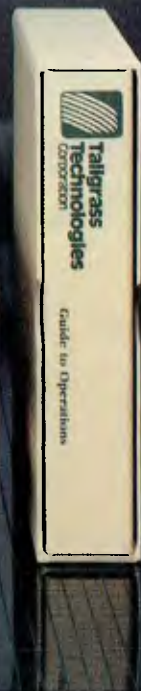
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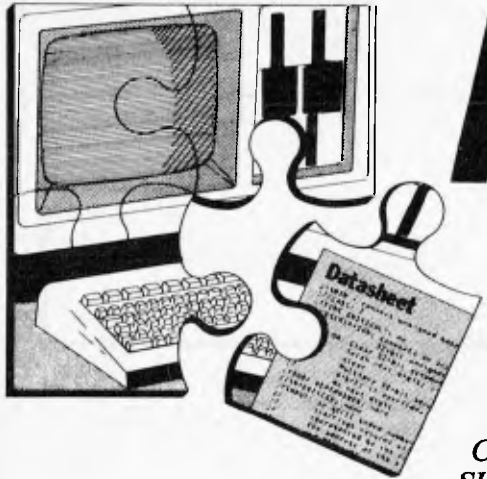
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6809 multiplication

As this is written, June's Sub Set has only been out for a few days, so, while we are waiting to see how many 6809 machine-coders our

June offering stirs into action, we present two more routines from Mike Kerry. They are the multi-precision LMUL and UMUL, a limited precision routine but *very fast* (152 micro seconds on a 1 MHz6809). Now if that doesn't bring some 6809 response, nothing will.

DATASHEET

```
// LMUL - Multi-precision unsigned integer multiplication.
// CLASS: 1
// TIME CRITICAL?: No
// DESCRIPTION: Computes the product of two unsigned binary
// integers giving a result up to 128 bytes long.
// ACTION: Save registers, clear result. Compute the products
// of every combination of 1 multiplicand and 1
// multiplier byte, and add into the result field,
// catering for any carry. Restore registers, exit.
// SUBR DEPENDENCE: None.
// INTERFACES: Input multiplicand and multiplier fields in
// RAM or ROM. Each input field is from 1 to 127
// bytes long.
// INPUT: X points to the multiplicand.
// Y points to the multiplier.
// A contains multiplicand length (bytes).
// B contains multiplier length.
// OUTPUT: U points to result field in RAM.
// The results field length is assumed to be equal to A * B.
// REGS USED: None (all saved).
// STACK USE: 9
// LENGTH: 45
// PROCESSOR: 6809
```

```
LMUL: PSHS CC,D ;save registers. 34 07
      ADDB 1,S ;compute result length 5A 61
      DECB ;less 1. 5A
LM2: CLR B,U ;clear 6F 05
      DECB ; result 5A
      BPL LM2 ; field. 2A FB
      DECA ;get offset of low order 4A
      ; multiplicand byte.
LM3: LDB 2,S ;offset of low order 56 62
      DECB ; multiplier byte. 5A
LM4: PSHS D,U ;save offsets & pointer. 34 46
      LEAU A,U ;compute address for 33 C6
      LEAU B,U ;this partial result. 33 C5
      LDA A,X ;get multiplicand byte. A6 86
      LDB B,Y ;get multiplier byte. E6 A5
      MUL ;compute 16-bit product. 30
      ADDD ;,U ;add into E3 C4
      STD ;,U ; result field. E0 C4
      BCC LM6 ;any carry? = no 24 04
      INC ;,-U ;= yes, adjust higher 6C C2
      BEQ LM5 ;order bytes(s). 27 FC
LM5: PULS D,U ;restore offsets & pointer. 35 46
      DECB ;done all multiplicand bytes? 5A
      BPL LM4 ;= no, get next. 2A E6
      DECA ;done all multiplier? 4A
      BPL LM3 ;= no, get next. 2A E0
      PULS CC,D,PC ;restore registers, exit. 35 87
```

DATASHEET

```
// UMUL - Unsigned 16-bit integer multiply.
// CLASS: 2. Position independent and re-entrant but does not
// save registers.
// TIME CRITICAL?: No
// DESCRIPTION: Multiplies two 16-bit integers giving 32-bit product.
// ACTION: Compute and store high order 16-bit product. Compute
```

```
// and store low order 16-bit product. Compute each
// mid order product and add into result. The 6 statements
// starting at label UM20 are used as an internal
// subroutine, as well as being executed in-line.
// SUBR DEPENDENCE: None.
// INTERFACES: Two 2-byte input fields holding multiplier
// and multiplicand.
// One 4-byte output field for the product.
// INPUT: X points to the multiplier.
// Y points to the multiplicand.
// OUTPUT: U points to the product.
// REGS USED: CC, D
// STACK USE: 4
// LENGTH: 34
// PROCESSOR: 6809

UMUL: LDA ;,X ;high order multiplier. A6 84
      LDB ;,Y ;high order multiplicand. E6 A4
      MUL ; 30
      STD ;,U ;high order product. E0 C4
      LDA 1,X ;low order multiplier. A6 01
      LDB 1,Y ;low order multiplicand. E6 21
      MUL ; 30
      STD 2,U ;low order product. E0 42
      LDA ;,X ;high order multiplier. A6 84
      LDB 1,Y ;low order multiplicand. E6 21
      BSR UM20 ;compute product and 8D 04
      ; add to the result.
      LDA 1,X ;low order multiplier. A6 01
      LDB ;,Y ;high order multiplicand. E6 A4
UM20: MUL ; 30
      ADDD 1,U ;mid order result. E3 41
      BCC UM30 ;overflow to high order? 24 02
      INC ;,U ;= yes, adjust 6C C4
      STD 1,U ;restore mid order. ED 41
      RTS ;exit. 39
```

Z80 string move

Sean Leitch has been secretly hoarding Sub Set routines on his CP/M system for some time now and has been using, and adding to them. He has now come into the open with a 30-page contribution, which we will be looking at from time to time. Sean uses Microsoft's

Macro-80, which provides him with excellent facilities. But he has been having problems with the use of *common* areas and has had to remove them. He would like to know of anyone who has used *common* areas and solved all problems.

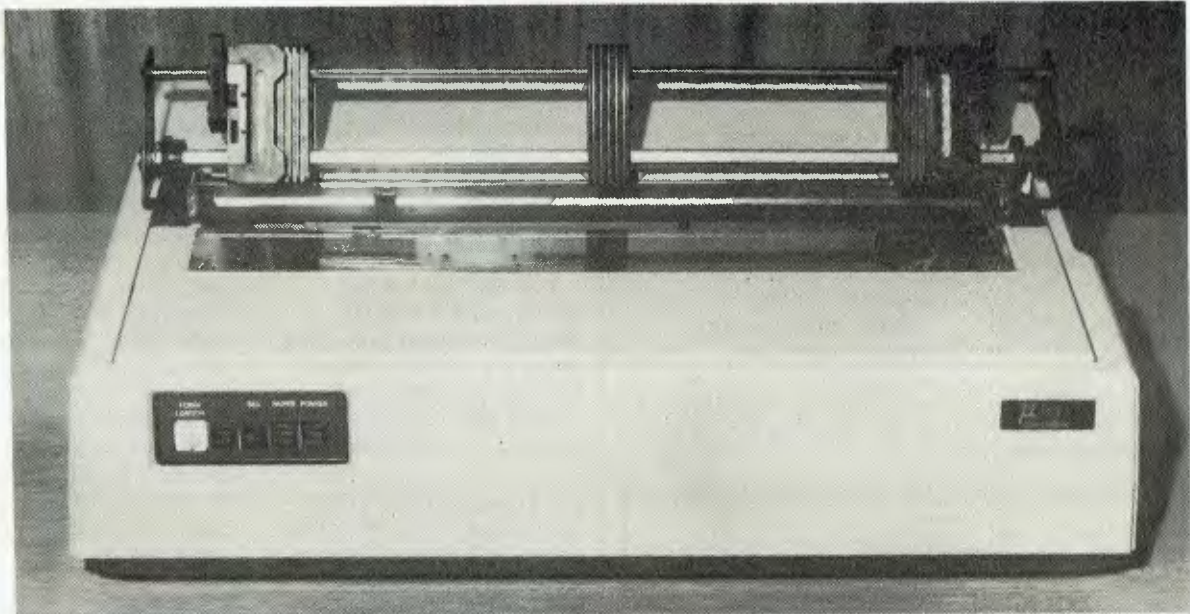
Here is Sean's routine, MSTRV, for moving strings, which he wrote for a suite of programs for keeping membership records.

DATASHEET

```
// MSTRV - Move variable length string and spacfill.
// CLASS: 2
// TIME CRITICAL: No.
// DESCRIPTION: Move a string to a destination area. If the
// destination area is longer than the string,
// spacfill. If the destination area is shorter,
// truncate.
// ACTION: Transfer bytes until end of string or count = 0.
// If count = 0 return, else store spaces until count = 0.
// SUBR DEPENDENCE: Local subroutine, L5.
// INTERFACES: None
// INPUT: HL = addr. of source string whose last byte has bit 7 set.
// DE = addr. of destination area.
// BC = length of destination area.
```


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```

// OUTPUT: HL - original contents of DE.
// DE - address of byte following destination area.
// BC = 0000H
// REGS USED: BC, DE, HL
// STACK USE: 4
// Length: 45
// PROCESSOR: Z80

MSTRV:  PUSH DE      ;save original contents.      D5
L1:      BIT 7,(HL)   ;is bit 7 set?                CB 7E
        PUSH AF      ;save flags.                    F5
        LD  I,HL     ;transfer, bump HL & DE, dec BC.  ED A0
        JP  P0,L4    ;if count = 0.                  E2 B4 17
        POP AF       ;restore flags.                  F1
        JR  Z,L1     ;if not the last input byte.     28 F5
        CALL L5      ;remove bit 7 from last byte.   CD YY YY
        PUSH AF      ;save accumulator.              F5
        LD  A,Z0H    ;get space in A.                 3E 20
        LD  (DE),A   ;space destination.             12
        LD  H,D      ;put address.                    62
        LD  L,E      ;into HL.                        68
        INC DE       ;                                13
        DEC BC      ;for one space stored.            0B
        LD  A,B      ;test.                            78
        DR  C        ;count.                           B1
        JR  Z,L2     ;and jump if now zero,           28 02
        LD  IR       ;else spacefill.                 ED B0
L2:      POP AF      ;restore accumulator and        F1
L3:      POP HL      ;original contents of DE        C9
        RET         ;and return.                      F1
L4:      POP AF      ;                                F1
        CALL NZ,L5   ;only call if was last byte.    E4 YY YY
        JR  L3       ;                                18 F8
L5:      DEC DE      ;address of last byte transf.   1B
        EX  DE,HL    ;into HL.                        EB
        RES 7,(HL)   ;clear bit 7 of last byte.     CB BE
        EX  DE,HL    ;                                EB
        INC DE       ;                                13
        RET         ;                                C9

```

```

JAOX:   INC  M6      ;                                E6 22
        STA  M5      ;                                85 22
        LDA  Z84C    ;write JMP instruction          A9 4C
        STA  M4      ;before jump back address      85 22
        LDA  M0      ;restore A and Y and           A5 22
        LDY  M2      ;jump to one-off routine       A4 22
        JMP  M1      ;perform OPCODE (XY).          4C 22 00

```

Fig 2

The major difference to be found in the two routines is in the way that the programs generated by them return control to the calling program. XYMOD2 takes the return address off the stack and turns it into a JMP back to the calling program. RINXY leaves the return address, suitably adjusted, on stack and terminates the page zero program with RTS, a method which requires the use of less page zero memory. But consider what happens if OPCODE is \$4C producing JMP(XY). In XYMOD2 the return jump is never used but in RINXY it is the RTS instruction which is not used and a stacking error occurs.

The concept behind RINXY and XYMOD2 is certainly thought provoking but is it a worthy subject? Leaving out CPX, CPY, LDX, LDY, STX and STY which are improbable uses of an (XY) operand, there are 17 instructions which may benefit from this extra addressing mode. However, eight of them can be

programmed in only 4 bytes each — the number of bytes taken by JSR and the opcode byte without the dummy address field — and using only 2 page zero locations. If MO is initialised to and kept at a zero value then the two instruction sequences STXM1:opc(MO),Y produce the effect of opc (XY) for opc:ADC,AND,CMP,EOR, LDA,ORA,SBC and STA.

It may be worth while doing a RINXY or XYMOD2 for the remaining nine instructions which cannot use the post-indexed indirect addressing mode but how often are X and Y used to hold a 16-bit address? If you have to put the address into page zero in order to use it, then why not have it there right from the start and leave X and Y free for their normal uses as loop counters and index registers.

One final thought prompted by these two routines: how long before Sub Set has to credit a computer program as a contributor?

The zero option

Indefatigable John Kerr and Conor O'Neill have sent in routines to do the same job as David Heale's XYMOD (APC April). Both contributors overcome the problem identified in XYMOD of altering program

code by getting their routines to write a one-off subroutine in page zero using an opcode byte from the calling program and the 16-bit value in X and Y as the address operand.

First, John's routine RINXY at 41 bytes, minimum 71T states and changing the contents of M1 to M4. (See Fig 1).

```

RINXY:  PHP          ;save status                08
        PHA          ;and accumulator            48
        LDA  $360    ;put RTS instruction        A9 60
        STA  M4      ;in page zero after        85 22
        STX  M3      ;high order address        86 22
        TSX          ;index stack and          BA
        INX          ;increment (return address - 1) E8
        INC  $0102,X ;to skip OPCODE on return  FE 02 01
        BEQ  PAGE    ;                                FO FA
        TSX          ;index stack and          BA
        LDA  $0103,X ;copy new return address  B0 03 01
        STA  M1      ;into page zero           85 22
        LDA  $01C4   ;to allow OPCODE          BB 04 01
        STA  M2      ;to be copied from        85 22
        LDX  E0      ;to position after        A2 00
        LDA  (M1,X)  ;JSR RINXY to            A1 22
        STA  M1      ;M1 followed by          85 22
        STY  M2      ;low order address        84 22
        LDX  M3      ;restore X, A and P        A6 22
        PLA          ;then jump to one-off      68
        PLP         ;subroutine in page zero   28
        JMP  M1      ;perform OPCODE (XY).     4C 22 00

```

Fig 1

And now Conor's XYMOD2 which retains the dummy 2-byte address field following the opcode. Conor is aware that this is unnecessary but has left it this way to improve program

readability and for ease of assembly/disassembly. XYMOD2 is a little shorter and quicker at 40 bytes and a minimum of 60T states but does change M0 to M6 and P. (See Fig 2).

```

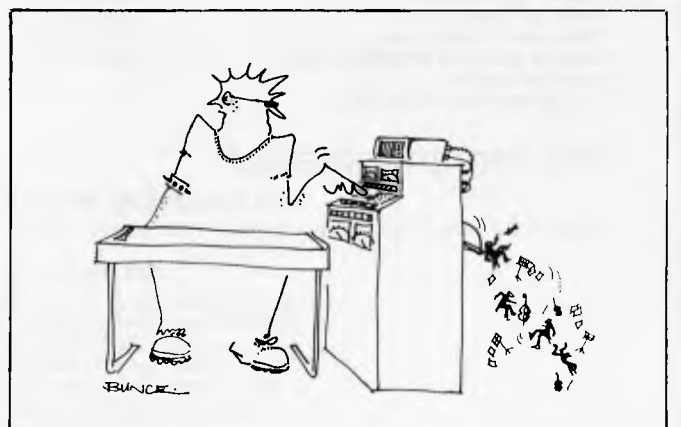
XYMOD2: STA  M0      ;save accumulator            85 22
        PLA          ;pull return address        68
        STA  M5      ;off stack and store       85 22
        PLA          ;in page zero for jump     68
        STA  M6      ;back to program           85 22
        STY  M2      ;write address operand     84 22
        STX  M3      ;to page zero              86 22
        LDY  E1      ;copy OPCODE from after   A0 01
        LDA  (M5),Y ;JSR XYMOD2 to page zero  B1 22
        STA  M1      ;before address field     85 22
        LDA  M5      ;adjust return address    A5 22
        CLC         ;for jump back to program  18
        ADC  E4      ;after dummy address field 69 04
        BCC  JAOX   ;                                90 02

```

Root extraction

Two misprints in John Kerr's lucid account of root extraction (APC June) must be corrected for those of you still trying to puzzle it out. Half way down the third

column on page 124, the previous equation becomes $(2s+d)^2 + q = 4x + y$, not $(2s+d)^2 + y$ and, one third of the way down the next column, virtual input = $8x + y$, not $1 + y$.



PINPOINTING THE PROBLEM

GRAPH PLOTTING ON THE BBC MICRO

David Angier and Amselm Kuhn take a closer look at presenting data by graph plotting and curve fitting using the BBC micro.

Ever since science began to get serious, it has been recognised that by presenting data in a graphical form, a much better understanding of it can be obtained. Furthermore, the form of the graph allows all sorts of deductions (especially when it is a straight line). There are also benefits of interpolation (prediction of intermediate values) and extrapolation (prediction of values outside the actual range of the experiment).

So it should be a reflex reaction for scientists, on obtaining their data (usually in the form of X,Y pairs) to plot it. It is not only scientists who have come to value the graphical method of data presentation, but engineers, economists, sociologists and businessmen, too. Until the arrival of the computer, it was normal to draw a smooth curve through the points and leave it at that. Even for straight line data, calculation of the line of best fit was a procedure so complex that it was very rarely attempted.

So how did the advent of the micro change all this? The answer is 'surprisingly little'. For over five years now, there have been a number of books (see below) containing program listings in a very transportable form of Basic for jobs such as straight-line fitting, or other mathematical functions such as:

$$Y = Ae^{bx}$$
$$Y = A + BX + CX^2 \dots NX^n$$

which fitted data to these equations, printed out goodness of fit and also allowed interpolation. But — and this was the price of their 'transportability' — none of these readily available listings enabled the user to see, still less obtain, hard-copy of the data in graphic form. Using the methods in such a form was like working blindfold, and though a high scoring 'goodness of fit' percentage was comforting, it meant very little. The common end result was to leave the keyboard with a clutch of, say, '99 per cent fit' X,Y values and plot them, only to find that the function fitted to those figures looked ludicrous and had no meaning in physical terms. It would often shoot off to

'HOW'S THAT FOR A GOOD FIT?'

plainly ridiculous values only a short distance outside the actual span of experimental X,Y values.

The harsh fact of the matter is that a single figure, such as the goodness of fit, is not and never can be a substitute for a display of the actual data points. It is essential to have a graph-plotting routine that can be used in conjunction with a curve-fitting suite of programs. This has long been available on larger machines, and the GINO-F package (a version of which can be implemented on some micros is a superb plotting routine. But all too often, larger machines (such as those at most universities and technical institutions) are not capable of operation by the user in an interactive mode. The user inserts his data and has to wait for the results to arrive back, when what he would prefer is to sit at the keyboard and manipulate the fitting function.

The program for doing this is described below.

Preliminary inspection of data

The only really satisfactory procedure is to inspect the data before committing oneself to a given form of curve fit, and the X,Y data points must be available for fitting to more than a single mathematical inspection. A preliminary inspection of data then may enable us to consider (or eliminate) many types of X,Y relationship, in order to make an informed guess as to the most suitable curve-fitting routine. Fig 1 shows two sets of data. One is clearly a candidate for straight line treatment, the second might best be fitted by a function such as the polynomial. We see at once that neither function passes through the origin and so we do not waste time on functions such as the single power fit:

$$Y = aX^b$$

The second piece of important information to be extracted from a preliminary inspection of data relates to monotonic functions on one hand (those in which the sign of the slope does not change, or which possess no maxima or minima) while more complex functions will display such phenomena. Broadly speaking, we shall need at least a two term function to model such complex data, in which the first term dominates over part of the data range, the second over the rest of it. Given these preliminary thoughts to guide us, it remains only to select the most suitable functions and see how they fit.

```
100*FX5,2
200*FX8,3
300R$=CHR$(13)
400S$="S9":GOSUB13900
500MODE7
600VDU23:8202:0:0:0:0
700 DATA "1","2","3","4","5","6","7","8","9","0"
800 DIM P(1,30),F$(35),F(10),A(30),X(32),Y(32),A1(30),B(30),C(30),D(31),V(30),
W(30)
900B0T09500
```

Straight line plots

These are the most commonly found plots, and indeed most scientists will endeavour to cast their data into a form giving such a relationship.

All the commonly found program lists-

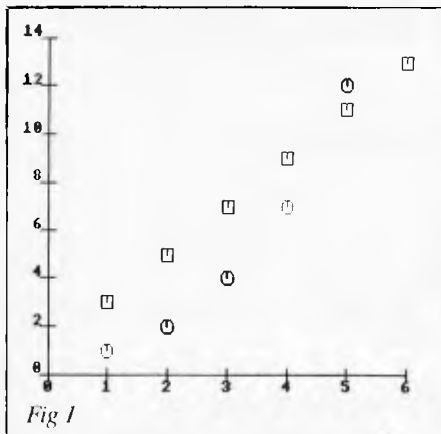


Fig 1

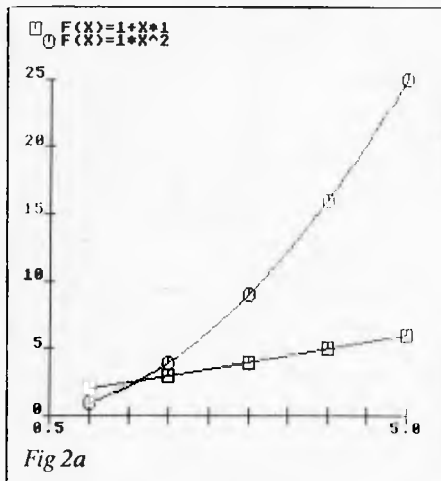


Fig 2a

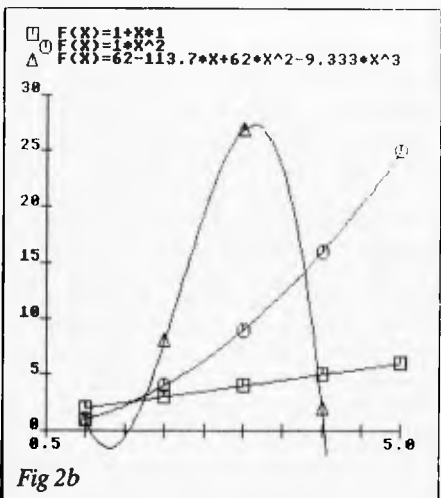


Fig 2b

ings are based on the equation:

$$Y = MX + C$$

However, in some cases, data should pass through the origin. When this is so, and especially if data is sparse or bad, it is

```

1000PRINTTAB(3,4);CHR#132;CHR#141;"This is the B.B.C. version of"
1100PRINTTAB(3,5);CHR#132;CHR#141;"This is the B.B.C. version of"
1200PRINTTAB(9,7);CHR#130;CHR#141;"THE CUBIC SPLINE"
1300PRINTTAB(9,8);CHR#130;CHR#141;"THE CUBIC SPLINE"
1400PRINTTAB(14,10);CHR#(129);CHR#(141);"Program"
1500PRINTTAB(14,11);CHR#(129);CHR#(141);"Program"
1600PRINTTAB(2,20);CHR#136;CHR#133;"Press the SPACE BAR to continue"
1700FORZ=255 TO 50 STEP-4
1800SOUND1,-11,Z,1
1900SOUND2,-11,Z-6,1
2000NEXT
2100FORZ=50 TO 249 STEP4
2200SOUND1,-15,Z,1
2300SOUND2,-15,Z+6,1
2400NEXT
2500A$=GET$
2600MODE1
2700RETURN
2800 FOR J9=1 TO F(3):F*(J9)="":NEXT:IFF(2)>F(3)-2THEN 4400
2900F(2)=ABS(INT(F(2)+.5)):F(4)=F(3)-F(2):F(5)=ABS(F(1))+.5*10^(-F(2)):F(6)=0:F
(B)=0:IFINT(F(5))=0THEN3700
3000 IFF(6)>0THENF(5)=F(5)/10
3100 F(6)=F(6)+1:IFF(6)>F(3)-F(2)-2THEN 4400
3200IFINT(F(5))>9THEN3000
3300FORJ9=F(6) TO1STEP-1:IFINT(F(5))=0THENF(5)=F(5)+10
3400F(B)=F(B)+1F*(F(4)-J9)=F*(INT(F(5))+25):IFF(B)>6THENF(5)=0
3500F(5)=10*(F(5)-INT(F(5))):NEXT:IFF(B)>6THEN 4100
3600F(5)=ABS(F(1))+.5*10^(-F(2))
3700 FORJ9=1TO F(2):F(7)=F(4)+J9:F(5)=10*(F(5)-INT(F(5))):IFINT(F(5))=0THENF(5)
=F(5)+10
3800F(B)=F(B)+1F*(F(7))=F*(INT(F(5))+25):IF F(B)>6THEN 4000
3900NEXT
4000IFF(2)>0THENF*(F(4))="."
4100IFF(1)<0THENF*(F(4)-F(6)-1)="-"
4200 F*(F(3)+1)="":F$="":FORJ9=1TOF(3):F$=F$+F*(J9):NEXT:IFABS(VAL(F$))>1THENF
$=" "+F$:RETURN
4300 T$=LEFT$(F$,F(4)-1):Z$=RIGHT$(F$,LEN(F$)-F(4)+1):F$=T$+"0"+Z$:RETURN
4400F$="":FORJ9=1TOF(3):F$=F$+"$":NEXT:RETURN
4500FORJ=1TON
4600I=J-1
4700A=A(J)
4800IFA>A(I)THENS200
4900A(I+1)=A(I)
5000I=I-1
5100IFI>0THEN4800
5200A(I+1)=A
5300NEXT
5400RETURN
5500MOVE100,100:DRAW100,1000
5600MOVE100,100::DRAW1000,100
5700FORI=100TO1000STEP40
5800MOVE100,I:DRAW90,I
5900NEXT
6000S$="M100,100"+R$+"X1,125,20,20"+R$+"M100,100"+R$+"X0,124,20,20":GOSUB13800
6100FORI=100TO1000STEP40
6200MOVEI,100:DRAWI,90
6300NEXT
6400RETURN
6500RETURN
6600CLS:FORI=0TON:X(I)=INT(SX*(P(0,I)-X0)):NEXT
6700FORI=0TON:Y(I)=INT(SY*(P(1,I)-Y0)):NEXT
6800FORI=0TON:MOVE X(I)-9+100,Y(I)+100:DRAW X(I)+100+9,Y(I)+100
6900IO=X(I):JO=Y(I):GOSUB13500
7000MOVE X(I)+100,Y(I)+100-9:DRAW X(I)+100,Y(I)+100+9:NEXT:RETURN
7100PRINTTAB(32,1)"PDINTS"
7200GOTO6500
7300REM
7400FORI=0TON:A1(I)=P(1,I):NEXT
7500FORI=0TON-1:D(I)=F(0,I+1)-F(0,I):NEXT
7600D(N)=D(N-1):D(N+1)=D(0)
7700B(0)=2*D(0):FORI=1TON-1:B(I)=2*(D(I)+D(I-1)):NEXT:B(N)=2*D(N-1)
7800C(0)=3*(A1(1)-A1(0)):FORI=1TON-1:C(I)=(D(I-1)*(A1(I+1)-A1(I)))/D(I)
7900C(I)=C(I)+(D(I)/D(I-1))*(A1(I)-A1(I-1))
8000C(N)=3*C(N):NEXT:C(N)=3*(A1(N)-A1(N-1))
8100V(0)=B(0):V(1)=B(1)-(D(1)*D(N+1)/V(0))
8200FORI=2TON:V(I)=B(I)-(D(I)*D(I-2))/V(I-1):NEXT
8400W(0)=C(0):FORI=1TON:W(I)=C(I)-(D(I)*W(I-1)/V(I-1)):NEXT
8500B(N)=W(N)/V(N):FORI=N-1TO1STEP-1:B(I)=(W(I)-(D(I-1)*B(I+1)))/V(I):NEXT
8600B(0)=(W(0)-(D(N+1)*B(1)))/V(0)
8700C(0)=0:C(N)=0:FORI=1TON-1:C(I)=(A1(I+1)-A1(I))/D(I)^2:C(I)=3*C(I):C(I)=C(
I)-((2*B(I))+B(I+1))/D(I)):NEXT
8800FORI=0TON-1:D(I)=(C(I+1)-C(I))/(3*D(I)):NEXT:RETURN
8900PLT69,X(0)+100,Y(0)+100:JO=Y(0):GOSUB13400:FORI=0TON-1:FORJ=X(I)TO
X(I+1)STEP3:TEMP=X0+(J-5)/SX
9000TEMP=TEMP-P(0,I)
9100TEMP=A1(I)+B(I)*TEMP+C(I)*TEMP^2+D(I)*TEMP^3
9200TEMP=SY*(TEMP-Y0)+.5
9300DRAW J+100,TEMP+100:IO=J:JO=TEMP:GOSUB13600
9400NEXT:NEXT:RETURN
9500GOSUB 12800:GOSUB 1000:GOSUB 10400:S1Y=900:GOSUB 10400
9600GOSUB14000:GOSUB 6600:GOSUB 5500:GOSUB 7100
9700 GOSUB 7300:GOSUB 6700:GOSUB 12900:GOSUB12800:MODE 7
9800INPUT"NAME OF X-AXIS "X$
9900INPUT"NAME OF Y-AXIS "Y$
10000S$="S9"+R$+"M1000,0"+R$+"P"+X$:GOSUB13800
10100S$="M120,2400"+R$+"F"+Y$:GOSUB13800
10200S$="H":GOSUB13600
10300END
10400FORI=0TON:A(1)+F(0,I):NEXT:GOSUB4500:SY=900/ABS(A(N)-A(0)):X0=A(0)
10500FORI=0TON:A(1)+P(1,I):NEXT:GOSUB4500:SY=900/ABS(A(N)-A(0)):Y0=A(0):RETURN

```


PINPOINTING THE PROBLEM

```
10600REM
10700PRINTAB(5,4)"You now have to enter your data":PRINTAB(5);"You first enter
the X-VALUES"
10800PRINTAB(9);"and then the Y-VALUES":PRINTAB(11);"To finish type '':N
=0
10900DRAW1279,0:DRAW1279,1023:DRAW0,1023:DRAW0,0
11000VDU19,0,4,0,0,0
11100GOSUB12900
11200CLS:PRINTAB(0,5);"What is x-value of point":IN+1:PRINT"Press <RETURN> afte
r typing your numbers":INPUT N$:IF ASC(N$)=47 THEN 11700
11300IF ASC(N$) 4B OR ASC(N$)>57 THEN 11200
11400P(0,N)=VAL(N$)
11500PRINT "What is y-value":INPUT N$:IF ASC(N$)<44 OR ASC(N$)>57 OR ASC(N$)=46
OR ASC(N$)=47 THEN 11500
11600P(1,N)=VAL(N$):N=N+1:GOTO11200
11700N=N-1:F(3)=7:F(2)=2:FORJ=0TO(1+.4343*LN(N))
11800CLS:PRINTAB(7,4);"READING X-VALUE Y-VALUE":FORI=0TO9:IFI+10*J>
N THEN 12000
11900PRINTI+1+10*J:F(1)=P(0,I+10*J):GOSUB 2800:PRINT SPC(6-LEN(STR$(I+10*J)))
:F$:F(1)=P(1,I+10*J):GOSUB 2800:PRINT SPC(2);F$:NEXT
12000PRINT "Is data OK?":T$=GET$:IF ASC(T$)<>B9 AND ASC(T$)>7B THEN 12000
12100IF ASC(T$)=B9 AND I+10*J>N THEN 12600
12200IF ASC(T$)=7B THEN 12300
12300PRINT"Enter number of wrong set":INPUT X:CLS:PRINT"Enter x-value of point"
X:INPUTP(0,X-1)
12400PRINT"& now the y value":INPUTF(1,X 1):GOTO12000
12500NEXT
12600CLS
12700PRINTAB(5,8);"Calculations being made":RETURN
12800FORI=26TO35:READ F$(I):NEXT:RESTORE:RETURN
12900PRINTAB(4,26)"Press the SPACE BAR to continue"
13000VDU23;B202;0;0;0;
13100SOUND1,-13,100,8
13101SOUND2,-13,105,8
13200A$=GET$
13300RETURN
13400I0=I0*2.4+100:J0=J0*2.4+100:S$="M"+STR$(INT(I0))+",""+STR$(INT(J0)):GOTO1370
0
13500I0=I0*2.4+100:J0=J0*2.4+100:S$="M"+STR$(INT(I0))+",""+STR$(INT(J0))+R$+"N2":
GOTO13700
13600I0=I0*2.4+100:J0=J0*2.4+100:S$="D"+STR$(INT(I0))+",""+STR$(INT(J0))
13700IFI0<0ORJ0>2500ORJ0<0ORJ0>2500THENRETURN
13800IFplot=FALSE THEN RETURN
13900FORLO=1TOLEN(S$):VDU1,ASC(MID$(S$,LO,1)):NEXT:VDU1,13:RETURN
14000PRINT"PLOTTER ON":INPUTS$:IFLEFT$(S$,1)="Y"THENplot=TRUE ELSE plot=FALSE
14100RETURN
```

better to use the correct equation which omits the constant. Some users, dimly aware of this, seek to type in a large number of 'dummy' points 0,0. This is bad practice and, as a trial will readily show, distorts the result to give false answers. The facility for the simpler form is thus important.

Polynomial functions

These are among the most powerful of curve-fitting routines — but also the most dangerous, as only a graphical display or a wide-ranging numerical interpolation can show. One of us recently used such functions in handling data for the charging of car batteries. The result was a marvelously close fit. However, graphing the results revealed that the actual function (a third order polynomial) was, in physical terms, a nonsense. So graphic display is really essential here. The other important point is that the readily available program listings (see References) for this type of fit allow the user to select the order of polynomial up to a maximum of around eight, that is anything from:

$$Y = MX$$
$$\text{to } Y = M_0 + M_1X + M_2X^2 \dots M_8X^8$$

What is not possible, is the selection of fractional orders. To anyone with even a casual knowledge of engineering, it will be recognised that this is a major drawback since so many relationships in the engineering sciences, or indeed in chemistry, pharmacology and biology, are either $X^{0.5}$ or contain some wholly arbitrary fractional exponents, and a curve-fitting routine not offering this facility can only be of limited use.

Other functions

Books such as Borchers' and Poole's (editions of which exist specifically for PET, Tandy and other named machines, to take account of quirks of individual software) give Basic listings for curve-fitting to functions such as:

$$\text{Exponential fit — } (Y = A \exp^{(bX)})$$
$$\text{Log Fit — } (Y = A \log BX)$$
$$\text{Single Power — } (Y = AX^B)$$

any one of which may be valuable for specific types of data.

We should also mention here the 'Cubic Spline' fitting program. Stripped of the mathematical aspects (the program fits a series of cubic equations between node points), this draws a smooth curve between

points, which may contain as many maxima and minima as are required to give a smooth fit. In a sense, the routine is doing (but perhaps on a less empirical basis) what the draughtsman does with his Flexicurve or French curves. The result has no significance in itself (in contrast to lines or curves formed from a mathematical function) and also it cannot be used (unlike any of the functions above) to extrapolate, but only to interpolate. The best article on this routine was (you might have guessed) in *APC* (February 1982), and this showed not only typical output, but also listings in Applesoft.

Implementation

The BBC (Model B) is an ideal machine for this type of work. It is faster than almost any other micro (and will be even faster yet when those second processors are hooked up). Since both graph plotting and mathematical solution of some of the higher-order polynomials can be fairly time consuming, this is important. The resolution of the screen (in Mode 4) is as good as most experimentally obtained data merits. In addition, the Acornsoft 'Graphs and Charts' package is invaluable in putting together a program such as this. The EVAL function, which few other micros offer, enables a simple implementation of the 'arbitrary polynomial fit'.

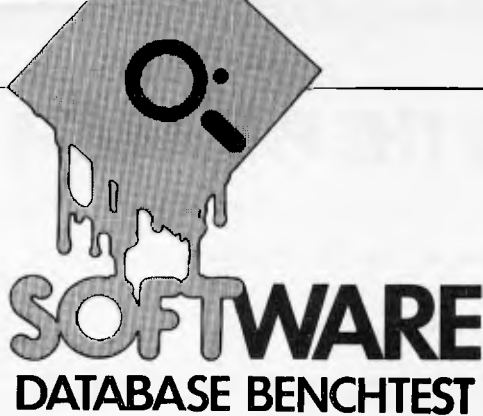
Screen dumping onto an Epson printer is achieved in less than a minute and the resulting quality — with a new ribbon — is good enough for direct reproduction. Figs 2a and 2b show how two sets of data can be plotted and each fitted to a separate mathematical function (which can be printed above the graph, together with a symbol identifier). Further data sets can be added (and plotted according to still another function) as shown in Fig 2b.

The results, both in terms of the graphical display and the equations resulting from curve-fitting are an essential part of many types of research carried on today. True, we could have plotted the data by hand. But fitting it to a theoretical model is something that would have been virtually impossible before the advent of the micro. And for those who send their work out to a commercial artist or draughtsman to be plotted, the savings could just about pay for the micro itself in a year.

References

Some Common Basic Programs (separate editions for PET/CBM and TRS-80 Level II). Lon Poole & Mary Borchers • Osborne/McGraw Hill.
Basic Programs for PET. Tom Rugg & Phil Feldmann • Dilithium Press.

EJD



STAR QUALITY?

Kathy Lang evaluates InfoStar, MicroPro's recently launched data management package running under the CP/M operating system.

InfoStar is MicroPro's entry in the CP/M-80 data management stakes. It has been available in Australia for only a few months in its present form, and in the US for just a little longer, but it is already second in sales of CP/M-80 data management packages in the US only to the long-established dBASE II. There are probably two very good reasons for this, excluding the inherent merits of the package. Firstly, it consists of two elements: a data entry and interactive query part, which is actually our old friend DataStar, and a reporting element, ReportStar, which is new. So anyone who already has, say, an early version of DataStar would be very likely to want InfoStar to give flexible reports on the data. Secondly, the data file format is identical with that used by Mail-Merge (used with WordStar to produce personalised letters and 'boiler-plate' documents) and by CalcStar, so anyone who uses either of those packages may expect to find InfoStar a natural partner. But for uncommitted users, how does the package measure up to the plethora of competition?

The two sections of InfoStar — DataStar and ReportStar — consist of several parts which may be invoked directly from CP/M or from within its associated module. For instance, after creating a data file format on the screen, you may then go directly to DataStar to enter data; but to set up report formats and run them, you go back to CP/M and invoke ReportStar direct. Throughout InfoStar, each screen displays the commands available at the top of the screen, in a very similar way to the prompts in WordStar. This makes it easy to see where you are in the package, and to give

the commands in the appropriate format. After an initial reading, I found I very rarely needed to look at the manual for straightforward functions. (That was just as well, because for all its clarity and comprehensiveness I still didn't find it all that easy to get the overall picture from the manual, or to find the particular piece of information I needed.)

Information in InfoStar is stored in the simple 'comma delimited' format used by many packages and by Basic programs. Data entry and display are governed by a display 'form' created by the FormGen part of the package — one form per data file. This form is created by 'paint-a-screen', supplemented by question-and-answer where features such as data checking are needed. Because 'comma delimited' fields are used in records, the

Those of you who are already familiar with DataStar will know that within its limitations it is a good 'workhorse' package, with flexible form-filling facilities and good 'help' features. Its reporting features have, however, always left a lot to be desired, and ReportStar goes a long way to solving this problem. This program consists of three main sections: to create a report format; to sort the file if necessary; and to print or display the report using the pre-defined format. Formatting is achieved in a similar way to screen form design.

Constraints

A data file must be capable of being displayed on a screen format 255 characters wide by 255 characters deep as a

'InfoStar can be tailored to a wide variety of terminals and printers. There are also facilities for patching the code to deal with special circumstances, as in WordStar and the other MicroPro products.'

size of fields can be changed after records have been stored. However, as records are stored they are indexed, and the specification of key fields cannot be changed after entry. Only one index file, based on one or more key fields, is allowed for each data file. There are extensive data validation and calculation facilities. Once stored, individual records can be retrieved by specifying the key, or the file or parts of it may be scanned in stored or key order.

maximum, including captions and messages to the form-filler. No field may exceed 255 characters. But these are generous limits, which few other packages can match. A single key is permitted, made up of one or more complete fields not exceeding 120 characters altogether. This rigidity in key field specification is one of the less attractive features of the package. Other constraints (none as serious for most applications) are shown in Fig 1.

File creation and indexing

Once a form has been created using FormGen, the first invocation of DataStar triggers off the setting up of the data and index files. So the form must contain all the information needed to set up these files. The form consists of a grid of 255 by 255 characters, which can be displayed on the screen by moving the cursor into the desired area. The underline character is used to indicate a field and its length; any other characters typed on the screen are treated as labelling information used for display purposes only. A typical screen format which I used for the Benchtest is shown in Fig 2. To indicate a key field, you just put the cursor somewhere in the set of underline characters which shows the field placing, and press CTRL/K; the underlines are then replaced by asterisks. As you can see from Fig 2, I used the first field, Refnum, as my key field. If you use more than one field to construct the key, the fields are ordered in the index as they appear in the design form. If that would be inconvenient for data entry, then the actual display order can be changed, using the 'enter field attributes' command.

Field attributes are assigned by moving the cursor to the field to be defined, pressing CTRL/R, and then answering the questions posed. This is the place where the extensive data validation features come in, with the most powerful features being provided by the 'edit mask' option. This allows you to say whether a field must be entered (with various riders), and what kind of field it must be — eg, all letters, all numbers, a mixture, including special characters such as a decimal point, etc. It also specifies copying a field from a previous record. Range checking is provided too.

Fields may also be derived, either from calculations or from a list of allowable values stored in a separate file. So if you have, say, a field which must always contain the name of an electorate, you could list all the electorates in a separate file, and DataStar would allow you only to input a valid electorate name in that file. You can specify that a key field must take a unique value, and you can use DataStar's 'tie-breaker' feature to make non-unique keys unique. Calculated fields may be based on constants and/or other field values, using the arithmetic operators with brackets if required. Finally, you can request operator verification: this may be either by asking the person entering data just to check by sight that the field is correct, or by asking for the field to be retyped, thus providing a 'type and verify' facility as in conventional key-to-disk systems.

The index file is updated as data is

entered, amended and deleted. However, the manual recommends that 'file maintenance' should be carried out regularly to give efficient access to files which are frequently updated. This may be done within DataStar, or (much more quickly, says the ReportStar manual) using the FormSort program which is part of ReportStar.

Data input and updating

Records may be entered directly to the data file and verified at the same time, or they may be entered in a batch without verification and verified later. This makes it possible to have data which is to be verified by the 'type and retype' method to be entered by one person and verified by another. In either case, the screen displays the form as created by FormGen, and data is simply entered in situ, using control characters to move from one field to

another (backwards as well as forwards . . .). Once the record has been entered, you are asked to confirm that it should be stored, and given the option to make further changes.

Data access for updating or viewing may be by entering a key field value; exact matching is used, and if more than one field is needed to construct the key, then values for all the fields used must be entered. If duplicate keys exist, DataStar shows the first record with the required key. Alternatively, the file may be scanned in key order or in the order the records were entered. These approaches can be used in combination; for instance, you can find the first record of interest in key mode, by specifying the key exactly, and then switch to 'Index Scan' mode to display records in key order. For instance, if your file were keyed by surname, you could use this approach to look for, say, all the Smiths. Scanning by Index or Entry order may be modified selecting particular records for viewing or amending — see 'Selection' below.

| | |
|------------------|--|
| Max file size | CP/M limit (8 Mb) — may occupy more than one volume |
| Max no records | Not stated |
| Max size record | 255×255 characters |
| Max no fields | 255 |
| Max field size | 255 |
| Max no keyfields | 25, totalling 120 characters, in one key; only one key allowed per data file |
| Field types | Character, numeric; several varieties of each may be validated in DataStar |

Fig 1: Constraints

| | | |
|---------------|-------------------|----------------------------|
| Ref num ***** | Name _____ | Date _____ |
| Type _____ | Description _____ | |
| Supp1 _____ | Price1 _____ | Supp2 _____ Price2 _____ |
| Supp3 _____ | Price3 _____ | Supp4 _____ Price4 _____ |
| System1 _____ | System2 _____ | System3 _____ Rating _____ |
| Ref1 _____ | Ref2 _____ | Ref3 _____ Ref4 _____ |

Fig 2: Typical Data Entry Screen

| | | |
|------|--|---|
| BM1 | Time to add 1 new field to each of 1000 records | 1 hr 23mins |
| BM2 | Time to add 50 records interactively | Scrolling time |
| BM3 | Time to add 50 records 'in a batch' | 6mins 40secs |
| BM4 | Time to access 50 records from 1000 sequentially on 25-character field | NA* |
| BM5 | Time to access 50 records from 1000 by index on two fields totalling 25 characters | 2secs/key+ scrolling time (+6mins 25secs to sort & index) |
| BM6 | Time to index 1000 records on 25-character field | 1min 50secs |
| BM7 | Time to sort 1000 records on 5-character field | 5mins |
| BM8 | Time to calculate on one field per record and store result in record | 1hr 11mins |
| BM9 | Time to total three fields over 1000 records | 2mins 30sec |
| BM10 | Time to import a file of 1000 records | 1min 25secs |

Notes: NA* = Not available as tested — key must match exactly when selecting interactively

Fig 3: Benchmark Times

STAR QUALITY?

Screen display

Within DataStar, records are displayed using the form created in FormGen; only one form is permitted per record, so you can't use DataStar's retrieval facilities to show, say, just parts of a record. DataStar records may also be displayed using the report formats created in ReportStar, which are discussed in the next section.

Reporting

Printed or displayed reports are created with the ReportStar arm of InfoStar. This consists of three parts: a report generator, called RGEN, with its associated editor REDIT; the sorting program FORMSORT; and the REPORT program which actually prints the report. ReportStar cannot be used except within InfoStar, as it requires the data definition file set up by DataStar to describe the records to be printed. The report generator sets up a report format, giving you the option of using a simple default format which just spreads the chosen fields of the record across the report using appropriate column widths and column titles. Totals and counts are also available at this simple level. Alternatively, you may set up your own format from scratch. In either case, once the format has been set up, it can subsequently be edited to provide more complex forms of report.

In the advanced report generation provided within REDIT, the facilities are so extensive that it would be impossible within a short review to describe them all. They include flexible field calculation, merging of information from several files, conditional line printing, emphasis (bold, underlining, etc), sub- and super-scripts, up to nine levels of page-break and sub-totalling, operator entered fields, control over the frequency with which a field is cleared, and limited conditional execution. There are, of course, extensive formatting features controlling field and line display, including various kinds of edit masking. Any report may be either printed or stored in a file, from which you can list it (under CP/M) or edit it in WordStar.

Within the reporting mechanism a number of facilities are provided for writing new data files. This is the area where it is most obvious that InfoStar consists of a new suite of programs grafted onto an older package. Many of these facilities for creating data files would more naturally have been implemented either as separate procedures or else within the interactive, data handling package, DataStar. For instance, to change the

structure of a file to add an extra field, it is necessary to create a new file definition (amended from the old) within DataStar, create a report definition which includes the new field, and which tells ReportStar to write all input and new fields to the output file. Finally (assuming you don't want to print each record out as it is copied across) you suppress the printing of the detail line in the report format.

Selection

Records may be selected for screen display within DataStar by using a mask, to select particular values for fields other than those which make up the key. Initially this mask is set entirely to asterisks, which match any character. The asterisks may be replaced by match characters in any way desired. For instance, to find everyone who lived in Moreton Bay, you would simply replace the first five asterisks in the electorate field by the letters Moreton Bay. To find all those whose surnames begin with B, you would enter a B in the first position and leave the rest as asterisks. If entries are made in more than one field, only those records which meet all the conditions are satisfied — there is no 'OR' facility. So you can't, for instance, select in one operation all the people who live in Moreton Bay, Philip, Chisholm or Wills unless you have another field which identifies those four electorates as a group.

You can do this within ReportStar, where one of the options when defining a field in the report is an 'INCLUDE IF' command. This allows any tests you might need, including tests on substrings, tests with the usual relational operators, and comparisons with field values or constants. If several conditions are set, you can specify that all or some of them must be passed, using both 'and' and 'or' to combine conditions, with brackets if necessary. On the minus side, in string comparisons upper and lower case characters are considered as equivalent. However, the need to set up a report format to do this kind of selection adds an extra level of complexity; you can't change your mind so easily, or play around with selections until you get what you're after. So it works well for information with a regular, well-understood processing sequence, but less well for exploratory situations.

A further level of selection within ReportStar allows you to include records if they correspond with records in another file, so that you only display fields from a record if the key field matches the key field in a record in the second file. It is also possible to include information from more

than one file in the same report.

Sorting

Another program in the ReportStar suite, FormSort, allows you to sort any data file on up to 25 fields totalling 120 characters. The sorting is quick and efficient. The sort program can also very quickly produce new index files. It is possible to use these two features in conjunction to keep a data file ordered by one set of key fields and indexed on another set, which would to some extent mitigate the disadvantage of only having one index file. However, the user would have to take steps to ensure that the correct data order was maintained, by sorting and indexing after each update session.

Calculation

Both at input and when reporting, InfoStar allows you to calculate field values using other field values and constants, with the usual arithmetic operators and brackets. These calculations may be carried out on character fields as well as numeric, and there is a sub-string function for handling parts of fields. More extensive functions are provided within ReportStar, including some mathematical functions and string concatenation; limited control over whether a calculation takes place is also provided in reports with an UNLESS function.

Tailoring

InfoStar can be tailored to a wide variety of terminals and printers. There are also facilities for patching the code to deal with special circumstances, as in WordStar and the other MicroPro products. I didn't try patching, but normal tailoring was easy enough. Within the packages, there aren't any tailoring features as such — for instance, you couldn't design your own menus for a particular application.

Multiple files

When setting up a file definition in DataStar, you can specify that particular fields are to be copied from another file. Similarly, within reports you can include fields from records in several different files (up to 25 files, in fact). So you could, for instance, have one file of patient records, another of patient consultations, and merge data from the two when reporting.

Housekeeping

There are no file housekeeping facilities within InfoStar — you use CP/M itself for file deletion, copying and so on. There didn't even seem to be a way to use one report format as the basis for another, keeping both, except by going out to

CP/M, copying the original with PIP, and then invoking REDIT to modify the copy.

Links with outside

Importing a data file from elsewhere into ReportStar is quite straightforward: you just set up an appropriate definition file within DataStar, make sure that your data file is written in 'comma delimited' format, and then use FormSort to construct an index file. But it is a pity that the only place the manual mentions this is in a 'handy hint' at the end of the Tutorial Guide.

User image

'Like the curate's egg — good in parts' is a description that I've employed a good deal when describing user images in this series — but if ever a package deserved that description, then InfoStar does. The 'Help' banners at the top of each screen are well thought out and very helpful. Each of these screen banners includes a 'procedure number' which cross-references with the manual — an unheard of helpfulness which I have been advocating without much hope of success for a long time. Some of the other prompting features, like showing the characteristics of a field when you move the cursor into it, are also good.

On the other hand, the use of 'question-and-answer' techniques for setting up complex options, a practice found throughout ReportStar, is to my mind muddling and tedious in the extreme. This is exacerbated by the habit of showing just the current question and a few before it at any one time, so you don't always have the full context, and never know what's coming next. For instance, when setting up field attributes in reports, it is quite possible to find yourself pressing the RETURN key (for the default option) a

dozen or more times to get to the one option you want to change for that field. It would be very much better to display a complete list of options, allowing the user to move the cursor to the one or two required, and using a control character to move into the detailed definition.

It would also be better to have more 'sets' of defaults for common tasks: for instance, to add one field to the record format for the Benchtest (BM1), I had to go through this process of changing the single field attribute 'write to output file?' for each of the 21 fields separately. That meant I had to press RETURN 15 times, type the number of the output file (even though there was only one valid number it would allow me to type), enter the destination field number (the same as in the input file) and press RETURN twice more. By the time I'd done that complete operation 21 times I was not in the best of tempers. Of course, that particular task is not something you'd want to do every day, but there are other less extreme examples of long-windedness in things that you might want to do quite often. And it's the totally unnecessary nature of that sort of time-wasting that is so irritating, to users as well as reviewers.

Documentation

The complexities of option definition are made no easier by the documentation. There are three manuals for InfoStar: a DataStar guide, a ReportStar Training Guide, and a ReportStar Reference Manual. Good points first: all three have an index (not as comprehensive as they might be, but at least they exist), and each suite has a Reference Card. The DataStar manual I found quite readable, the Training Guide I thought quite helpful at a 'here's how to get started' level, if you can

stomach the 'happy campers' style of drawings of satisfied customers learning all about the package. I didn't find it so helpful when it came to trying to get an overall view of what the package could accomplish — indeed, I gleaned a lot of my information about that from the 'hints' section at the end, which reads like a throwaway add-on but which is actually very useful.

You really do need some overview information, as the Reference Manual is very tough going indeed. It has a series of 'Road Maps' covering each section, but these were very detailed, and it wasn't at all easy to guess where a particular facility might be provided. This was particularly true in the area where ReportStar has to be 'stretched' to provide facilities — for instance, for reformatting data files, which would ordinarily be in the data entry part of the package. I very much regret having to criticise to this extent, as the manuals are of a very high standard typographically, and a lot of effort has clearly gone into them. Unfortunately, it's almost as bad to have too much and too complex information as it is to have too little.

Conclusions

My overall impression of InfoStar is that it is rather an uneven package in the facilities it provides. The report formatting is extremely flexible, with a power I have not come across elsewhere. The selection and sorting features for reports are good, but I suspect that people who need that degree of flexibility in reports also want a high degree of flexibility in data entry and screen display. If so, they may well find the limitation, during data entry and interactive display, to a single index file and one screen format an irksome constraint.

Some parts of the package are unusually fast, particularly the index sorting with FormSort. Others, such as procedures involving writing a complete data file (for instance, to update all prices by ten per cent) are not so quick: Benchmark times are given in Fig 3. Disk space is economically used, because the process of storing records in comma-delimited format means that an empty field occupies only one character.

On the user image side, the similarity with WordStar and CalcStar must obviously help people who need a suite of programs, but I think many people will find the more powerful features of ReportStar difficult to use. Personally I wouldn't feel that the family resemblance was enough to give InfoStar the edge, with WordStar users, over other packages which can read and write Mail-Merge formats. However, those reporting features, even if they are tedious to use, would be extremely valuable in some environments, and if that is your requirement, then InfoStar would be well worth investigating.

END

Summary

| | |
|-------------------|---|
| Package Type | Data management: variable length 'comma-delimited' records, data from more than one file may be included in screens and reports. |
| Facilities | Screen display, sorting and reporting in three modules. Direct retrieval based on one key (several fields) per record. Reporting very flexible. Sorting flexible and fast. |
| Drawbacks | Limitation to one key. Complexity caused by use of report program for data management functions. Interactive selection limited. No true multifile capability. No housekeeping within package. |
| Ease of Use | Good at the simple level. Very tedious when specifying complex options. Connections among programs not complete. |
| Error Messages | Reasonably clear. |
| Documentation | Clear, well presented and structured, but very verbose. Has (not very comprehensive) indexes. |
| Costs (incl. tax) | \$666 |
| Supplier | Exclusive Australian distributor: Imagineering, 3/579 Harris Street, Ultimo, 2007. Telephone: (02) 212 1411. |

DIARY DATA

**DIRECT
ACCESS**

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.

| | | |
|-------------|---|----------------------------------|
| Melbourne | 10th Australian Computer Exhibition Contact: Riddell Exhibition Promotions. Tel: (03) 699 1066 | September 27—30, 1983 |
| Boston, USA | CP/M '83 for the CP/M operating system Hynes Auditorium | September 29— October 1, 1983 |
| Hong Kong | Consumer Electronics Show 1983 Regent Hotel/New World Hotel Contact: Ms Narelle McKinnon on Sydney 232 2422 | October 15—17, 1983 |
| Brisbane | Computer Expo '83 Contact: Robert Woodland Exhibitions. Tel: (07) 372 3380 | November 4—6, 1983 |
| Sydney | The Australian Personal Computer Show Contact: Australian Exhibition Services (03) 20 1208 | March 14—17, 1984 |

NETWORK NEWS

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

CYBERNET. Operator: Control Data Australia Pty Limited, 493 St Kilda Road, Melbourne 3004. Telephone: (03) 268 9500. Sales offices in every capital city. Facilities: Access to hundreds of applications from statistical analysis, financial modelling, linear programming, structural analysis, mineral evaluation to data base management. Hours: 0600 to 2400, Monday to Friday.

MICOM CBBS. Operator: The Microcomputer Club of

Melbourne, P.O. Box 60, Canterbury 3126. Facilities: Computer bulletin board system, allows users to exchange messages on subjects of mutual interest. Free of charge. Hours: 24 hours/day, 7 days/week (single 'phone line only). Access number: 762 5088. Protocol: full duplex ASCII, 8 data bits, 1 stop, bit, no parity.

INIONET. Operator: Network Services Division of Computer Sciences of Australia Pty Ltd, 460 Pacific Highway, St

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

AUSINET. Operator: ACI Computer Services, P.O. Box 42, Clayton, Victoria. Tel: (03) 544 8433. Facilities: Medium to database whose subject coverage includes agriculture, education,

energy, industry, public affairs, science and technology and an online Australian database directory. Hours: 8.30am to 9.00pm E.S.T. Monday to Friday.

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

USER GROUPS INDEX

Below is a list of alterations and additions to the list of user groups published in the June/July issue. The next full listing will appear in the December issue of APC.

NEW SOUTH WALES

A Commodore VIC-20, C64 and PET computer user group meets on the first Tuesday of every month in the Ellis room of the Newcastle Technical College at 7pm. Further information is available from Geoff Rayner on (049) 43 3352. His address is 8 Kulai Street, Charlestown 2290.

The Newcastle Microcomputer Club meets on the second and fourth Monday of each month at 7.30pm in Room G12 of the Physics Building at the University of Newcastle. Members own a variety of microcomputers and the club is not devoted to any particular brand of microcomputer. Anyone interested in further information should contact Angus Bliss on (049) 67 2433 or Tony Nicholson on (049) 52 6017 AH.

The Hawkesbury MicroBee Computer Club meets at 7.30pm on the first Friday of each month at the Richmond Primary School (NSW). The club has thirty members and is running courses in Basic and Z80 Assembly Language. More details are available from Bruce Rennie on (045) 67 7329.

VICTORIA

A Kaypro Users Group is now operating in Melbourne. The next meeting is scheduled for 2pm on September 25 at the Australian Council for Educational Research, 9 Frederick Street, Malvern. A newsletter is available for interstate users. Ring Stephen Foley on (03) 857 7236 for further details.

The Warragul Commodore Club meets at the Community Education Centre every Saturday afternoon. The group is particularly keen to contact other Commodore user clubs. Their postal address is Walkers Road, Number 1 Road, Warragul 3820.

The Ballarat Computer Users Group's new particulars are as follows: Meetings are held on the first Wednesday of each month at 7.30pm at a location known by John Preston on (053) 31 4363.

QUEENSLAND

Anyone interested in forming a Jupiter Ace user group should contact Helge Nome, P.O. Box 183, Ravenshoe 4872.

The Southport Commodore Computer Users Group meets every Monday night at the Southport State School in Scarborough Street, Southport at 7pm. New members are welcome at any time. The President is Tony Gosling (075) 31 1680 and the Secretary is Bill Fitzpatrick (075) 32 0061.

ACT

The Canberra A.C.T. Sirius User Group meets every third Tuesday of the month at 31 Altree Court, Phillip, 2606. Contact Jim Bland on (062) 81 2824 or (062) 81 2832 for further details.

**DIRECT
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MICRO EXCHANGE



All Micro Exchange ads must be submitted by readers on the appropriate form (or a photocopy). Maximum of 30 words. Print one word per box, very clearly. Contact name and telephone number/s must be included in the 30 words. All ads must be accompanied by a fee of \$5.00 for Australian Personal Computer or \$7.50 for inclusion in both Australian Personal Computer and Australian Business Computer. Make cheques or Postal Orders payable to Micro Exchange. Ads cannot be repeated (unless sent on another form) and we cannot guarantee to print an ad in any specific issue. Please help the typesetter by printing very clearly.
Send your form to: Micro Exchange, P.O. Box 62, Middle Brighton. Vic 3186.

VICTORIA

ACCESSORIES 8MC, VDU'S \$180.EA COLOUR \$250.EA. VERBATIM DISKETTES SINGLE SIDE, 5" DOUBLE DENSITY \$2.93 EA + S/TAX. APPLE SOFTWARE HALF PRICE. ATARI GAMES. ZX 81 PRINTER \$125 MX80, MX100. RIBBONS CHEAP. PH:DCA 8.H. (03)690 8955 (03)690 8362.

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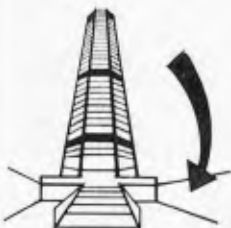
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**Contact Geoff Lohrere at:
57A STANLEY AVE,
MT WAVERLEY 3149
PHONE: (03) 543 1485**

PROGRAMS

```

170 ifa$="x"andC<22thenc=22
190 return
210 n=7680+int(rnd(1)*500)ifPeek(n)>32then210
215 ifn=pthen210
220 m=int(rnd(1)*9)+49:Poken,m+128:Poken+30720,4
230 t$=t$:forq=15to10step-1:Poke36877,255-10*q:Poke36877,0:next
270 t$=t$:co=1:goto100
300 Poken,32:n=0:co=0
310 forq=230to200step-1:Pokes1,q:next:Pokes1,0:goto100
500 v=Peek(P)-176:pokeP+30720,1:ifc=26thenc=1
510 forq=1tov:sc=sc+1:Print"Score":sc:PokeP,Peek(P)-1
520 fori=180to230:Pokes1,i:next:next:Pokes1,0
530 PokeP,i60:PokeP+30720,0:Poken,32:n=7703:Pokelo(c),32:lo(c)=P:co=0:goto115
1000 s2=36878:ca=ca+1:f$=t$
1010 Poke36877,128:forq=15to10step-1:Pokes2,q:next:Poke36877,0:Pokes2,15
1020 forp=q+1to25:lo(p)=0:next:c=1:co=0:p=7913:Poke198,0:ifc<10thenc=0
1025 ifc>9thenc=sc-10
1030 co=0:poke36878,15:t$=f$
1040 gosub10:d=1:p=7913:goto100
1500 ifsc>15+(1/sk)andf9=0thenf9=1:goto1600
1501 Print"TIME UP":poke36879,127
1510 Print"You scored"sc"Points"
1512 Print"on skill level"sk*50
1515 ifca=0thenPrint"You didn't crash!":goto1530
1520 Print"Crashed"ca"times":ifca>1thenPrint"s"
1530 Print
1540 ifc>Peek(820+50*sk)thenPoke820+50*sk:sc:Print"IT Is The Best Score":goto1
560
1550 Print"Best score still"Peek(820+sk*50):Print"on level"sk*50
1560 Print"Type in your Skill":Poke198,0:clr
1565 Print"(1 to 5)":Print"Easy to Hard"
1570 geta$:ifa$<"1"ora$>"5"then1570
1580 sk=val(a$)/50:goto1
1600 forz=1to4:Print"Extra Time":forx=1to750:next
1605 Print"
1610 forx=1to750:next:next:t$="00005"
1620 forz=1to25:Pokelo(z),160:Pokelo(z)+30720,4:next:t=60-val(tif):goto100
2000 Print"SERPENT SNAKE LINE":Poke36879,46:Printchr$(0);Poke36889,242
2010 Print"Instructions:-"
2020 Print"The object of the game is to chase after the flashing numbers
2030 Print"without crashing into the obstacles or your tail."
2040 Print"If you do crash then you lose 10 Points."
2050 Print"Press Any Key":Poke198,0
2060 geta$:ifa$=""then2060
2080 Print"SERPENT SNAKE LINE"
2090 Print"Instructions:-"
2100 Print"Press:-"
2110 Print"DOWN to go UP"
2120 Print"LEFT to go LEFT"
2130 Print"RIGHT to go RIGHT"
2140 Print"DOWN to go DOWN."
2145 Print"Extra time will be awarded if a good"Print"Score is reached"
2150 Print"Press Any Key":Poke198,0
2160 geta$:ifa$=""then2160
2170 Print":goto1560
3000 data7954,7955,7977,7976,7975,7953,7931
3010 data7932,7933,7934,7956,7978,8000
3020 data7999,7998,7997,7996,7974,7952,7920,7988,7989,7910,7911,7910

```

ZX81 Surround

by Graham Stoneman

Both you and a computer-controlled snake slither happily around the screen. The first one to crash into either trail loses.

The keys used to control your movement are 5, 6, 7 and 8 for left, down, up and right respectively. If you want to change these to more sensible keys, the

lines to edit are 270—300 inclusive.

When you run the program, you will be asked how many games you wish to play. Since the program already asks you whether you want to play again after each game this seems mildly pointless. So you could delete lines 610 and 50-60 inclusive.

```

1 REM 16K SURROUND
5 DIM A(4)
10 LET C=0
15 LET S=0
20 LET T=3
25 LET A=PEEK 16396+256*PEEK 16397
30 LET A(1)=1

```


PROGRAMS

```

35 LET A(2)=-1
40 LET A(3)=33
45 LET A(4)=-33
50 PRINT "HOW MANY GAMES (1-10) ?"
55 INPUT T
60 IF T<1 OR T>10 THEN GOTO 55
65 POKE 16418,0
70 CLS
80 LET P=517
90 PRINT "YOU ";C;AT 0,9;"* SURROUND * ME ";S
100 LET D=A(INT (RND*4)+1)
110 LET Y=1
120 LET X=306
130 FOR N=1 TO 23
140 PRINT "....."
150 NEXT N
160 POKE A+X,128
170 POKE A+P,136
180 FOR N=1 TO 10
190 PRINT AT 6+N,31;"■"
200 NEXT N
210 FOR N=1 TO 10
220 FOR F=1 TO 20
230 NEXT F
240 PRINT AT 6+N,31;" "
250 NEXT N
260 LET D#=INKEY#
270 IF D#="5" THEN LET Y=-1
280 IF D#="6" THEN LET Y=33
290 IF D#="7" THEN LET Y=-33
300 IF D#="8" THEN LET Y=1
310 IF D#<>" " AND RND>.5 THEN LET D=-Y
320 LET X=X+Y
330 IF PEEK (A+X)<>27 THEN GOTO 600
340 POKE A+X,128
350 IF PEEK (A+(P+(3*D)))<>27 THEN GOTO 420
360 IF RND<.1 THEN LET D=A(INT (RND*4)+1)
370 LET P=P+D
380 IF PEEK (A+P)<>27 THEN GOTO 410
390 POKE A+P,136
400 GOTO 260
410 LET P=P-D
420 LET R=INT (RND*4)+1
430 IF PEEK (A+(P+A(R)))<>27 THEN GOTO 460
440 LET D=A(R)
450 GOTO 370
460 IF PEEK (A+(P+1))<>27 THEN GOTO 490
470 LET D=1
480 GOTO 370
490 IF PEEK (A+(P-1))<>27 THEN GOTO 520
500 LET D=-1
510 GOTO 370
520 IF PEEK (A+(P+33))<>27 THEN GOTO 550
530 LET D=33
540 GOTO 370
550 IF PEEK (A+(P-33))<>27 THEN GOTO 580
560 LET D=-33
570 GOTO 370
580 PRINT AT 22,0;"YOU WIN"
585 LET C=C+1
590 GOTO 610
600 PRINT AT 22,0;"I WIN"
605 LET S=S+1
610 IF C+S=T THEN GOTO 640
615 PRINT AT 23,0;"ANOTHER GAME"
620 IF INKEY#<>"Y" AND INKEY#<>"N" THEN GOTO 620
630 IF INKEY#="Y" THEN GOTO 70
640 FOR W=0 TO 760 STEP 33

```

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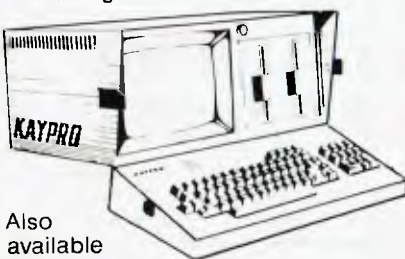
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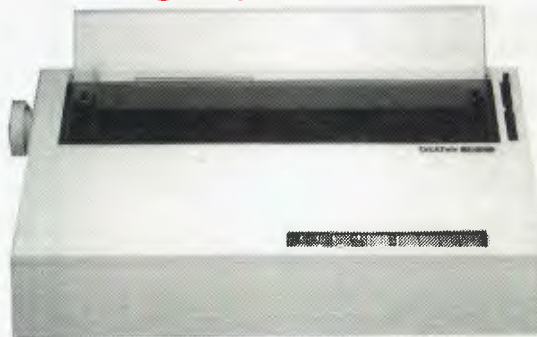
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BLUDNERS

Geoff Lohere has written to us in reference to a letter published in 'Communications' in the August issue of APC. We reprint his letter:

"In reference to the 48k System 80 article, Communications Volume 4, No 8, August APC. Russel Wild elaborated on my memory expansion article Volume 4, No 8 of APC. Mr Wild states, after reading the article, he found it easy going from 16k to 32k, but 'found the article very vague about going to the full 48k'.

As I stated in my article, it was primarily intended for people upgrading to 32k, as using this method for upgrading to 48k is outdated and puts an excess strain on parts of the System 80's logic, especially the 12 volt

regulator next to diodes 2 and 3 on the CPU Board. There is a strong possibility that upgrading to 48k will burn out this regulator, and possibly do severe damage to the System 80.

There are new ICs now available which can replace the existing 4116 memory ICs, along with the appropriate hardware mod, to take the System 80 to the full 48k with less strain on the power supply than the existing 4116 RAMs.

For going to 32k, the method I described is cheapest and best, but for 48k, the new memory ICs should be used. These should be fitted by a qualified computer technician to avoid doing severe damage to your computer.



Anyone who has already fitted 48k Piggyback style, must heavily heatsink the 12 volt regulator.

Myself or Don McKenzie is qualified to fit the new 64k memory ICs. People in states other than Victoria should contact Don. My phone number is (03) 543 1485 and Don's is (03) 338 6286."

PROGRAMS

```

650 POKE A+W,118
660 NEXT W
670 CLS
680 PRINT "OUT OF ";C+S;" GAMES, I WON ";S;" AND YOU WON ";C
690 POKE 16418,2
700 STOP
    
```

Program
of the Month

Apple II Screencopy

by H C Grant

'Screencopy' is an Apple utility program written in UCSD-Pascal. It will run under Pascal versions 1.1 and 2.1.

The program allows the user to create a single-screen layout of text which can subsequently be saved to disk as a data file under the filename SCREENCOPY.DA-TA. The program includes procedures for saving and loading the screen by acting directly on the Apple textscreen buffer in order to increase the running speed.

The main use of the program is to aid in the creation of 'HELP' screens which can then be called by the reader's own program.

Full cursor-controlled screen editing is provided, with the facility for normal, inverse and flashing characters. As far as possible, the editing controls are identical to the standard Pascal editor:-
CTRL-Q: Quit the program

- I: Inverse characters
- N: Normal characters
- B: Flashing characters

- O: Cursor up
- L: Cursor down
- ←: Cursor left
- : Cursor right

RETURN: New line

CTRL-R: Read stored screen, abandoning current display

- P: Put current screen to disk, overwriting stored file.

It should be noted that 'Screencopy' only allows 40-column screens to be created (40x25 lines) and is therefore incompatible with the 80-column Pascal card.

In its present form, 'Screencopy' can only save a single screen per disk since it uses the same filename every time. Modifying the program to handle multiple screens should give a few readers something to do in their tea-break.

Note that you need to have the System Library present when compiling the program.

USES APPLESTUFF;

```

CONST
  CTRLQ = 17;
  CTRLI = 09;
  CTRLN = 14;
  CTRLB = 02;
  CTRLD = 15;
  CTRLL = 12;
  LEFTA = 08;
  RIGHTA = 21;
  CTRLP = 16;
  CTRLR = 18;
  CTRLX = 24;
    
```

CURCHR= ' ';

```

TYPE
  BYTE = 0..255;
  PA = PACKED ARRAY[0..1] OF CHAR;
  MEMLOC = RECORD CASE BOOLEAN OF
    TRUE : ( ADD : INTEGER );
    FALSE : ( DATA : PA );
  END;
  PPA = PACKED ARRAY[0..1024] OF BYTE;
  MODETYPE = (NORMAL, INVERSE, FLASHING);
  DIRECTION = (UP, DOWN, LEFT, RIGHT);
    
```

```

VAR
  LNSTART : ARRAY[0..23] OF INTEGER;
  CH : CHAR;
  CURX, CURY : INTEGER;
  WRITEMODE : MODETYPE;
  SAVEDCHAR : CHAR;
  CTRLCODES : SET OF BYTE;
  DDNE : BOOLEAN;
    
```

```

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PROGRAMS

```

PROCEDURE SETLNSTART;
BEGIN
  LNSTART[00]:=1024;      LNSTART[01]:=1152;      LNSTART[02]:=1280;
  LNSTART[03]:=1408;      LNSTART[04]:=1536;      LNSTART[05]:=1664;
  LNSTART[06]:=1792;      LNSTART[07]:=1920;      LNSTART[08]:=1064;
  LNSTART[09]:=1192;      LNSTART[10]:=1320;      LNSTART[11]:=1448;
  LNSTART[12]:=1576;      LNSTART[13]:=1704;      LNSTART[14]:=1832;
  LNSTART[15]:=1960;      LNSTART[16]:=1104;      LNSTART[17]:=1232;
  LNSTART[18]:=1360;      LNSTART[19]:=1488;      LNSTART[20]:=1616;
  LNSTART[21]:=1744;      LNSTART[22]:=1872;      LNSTART[23]:=2000;
END; (* PROCEDURE SETLNSTART *)

FUNCTION INVCHAR(CH:CHAR) : CHAR ; (* PRODUCES REVERSE FIELD CHARACTERS *)
BEGIN
  INVCHAR:=CHR((ORD(CH) MOD 64) );
END;

FUNCTION FSHCHAR(CH:CHAR) : CHAR ; (* PRODUCES FLASHING FIELD CHARACTERS *)
BEGIN
  FSHCHAR:=CHR((ORD(CH) MOD 64) + 64);
END;

FUNCTION NMLCHAR(CH:CHAR) : CHAR ; (* PRODUCES NORMAL FIELD CHARACTERS *)
BEGIN
  NMLCHAR:=CHR((ORD(CH) MOD 64) + 128);
END;

PROCEDURE HELLSHT(INTEGER);
BEGIN
  FOR N:=N DOWNTD 1 DO WRITE(CHR(7));
END;

PROCEDURE GETCHAR(CURX,CURY:INTEGER; VAR CH:CHAR); (* GETS CHAR FROM BUFFER *)
VAR CORE : MEMLOC;
BEGIN
  CORE.ADD:=LNSTART[CURY]+CURX;
  CH:=CORE.DATA^I03;
END;

PROCEDURE PUTCHAR(CURX,CURY:INTEGER; CH:CHAR); (* PUTS CHAR INTD BUFFER *)
VAR CORE : MEMLOC;
BEGIN
  CORE.ADD:=LNSTART[CURY]+CURX;
  CORE.DATA^I03:=CH;
END;

PROCEDURE RETURN;
BEGIN
  PUTCHAR(CURX,CURY,SAVEDCHAR);
  CURX:=0;CURY:=CURY+1;
  IF CURY >23 THEN CURY:=0;
  GETCHAR(CURX,CURY,SAVEDCHAR);
  PUTCHAR(CURX,CURY,INVCHAR(SAVEDCHAR));
END; (* PROC RETURN *)

PROCEDURE CURSOR(DIR : DIRECTION);
BEGIN
  PUTCHAR(CURX,CURY,SAVEDCHAR);
  CASE DIR OF
    RIGHT : BEGIN
      CURX:=CURX+1;
      IF CURX>39 THEN BEGIN
        CURX:=0;CURY:=CURY+1;
        IF CURY>23 THEN CURY:=00;
      END;
    END;
    LEFT : BEGIN
      CURX:=CURX-1;
      IF CURX<0 THEN BEGIN
        CURX:=39;CURY:=CURY-1;
        IF CURY<00 THEN CURY:=23;
      END;
    END;
    UP : BEGIN CURY:=CURY-1; IF CURY<0 THEN CURY:=23 END;
    DOWN : BEGIN CURY:=CURY+1; IF CURY>23 THEN CURY:=0 END
  END; (* CASE *)
  GETCHAR(CURX,CURY,SAVEDCHAR);
  PUTCHAR(CURX,CURY,INVCHAR(SAVEDCHAR));
END; (* PROC CURSOR *)

PROCEDURE SAVEBUFFER;
CONST NAME = '#4;SCREENCOPY.DATA';
BUFFERSTART = 1024;
BUFFERLENGTH = 2; (* TWO SECTORS = 2 BYTES *)
VAR ID : INTEGER;
F : FILE;
STPNT : MEMLOC;
BEGIN
  PUTCHAR(CURX,CURY,SAVEDCHAR);
  STPNT.ADD:=BUFFERSTART;
  REWRITE(F,NAME);
  ID:=BLCKWRITE(F,STPNT.DATA,BUFFERLENGTH);

```

PROGRAMS

```

CLOSE (F, LOCK);
PUTCHAR (CURX, CURY, INVCHAR (SAVEDCHAR))
END;

PROCEDURE LOADBUFFER;
CONST NAME = '*4: SCREENCOPY.DAT';
BUFFERSTART = 1024;
BUFFERLENGTH = 2; (* TWO SECTORS = 2K BYTES *)
VAR ID : INTEGER;
F : FILE;
STPNT : MEMLOC;
BEGIN
STPNT.ADD := BUFFERSTART;
RESET (F, NAME);
ID := BLOCKREAD (F, STPNT, DATA, BUFFERLENGTH);
CLOSE (F, LOCK);
CURX := 0; CURY := 0;
GETCHAR (CURX, CURY, SAVEDCHAR);
PUTCHAR (CURX, CURY, INVCHAR (SAVEDCHAR))
END;

PROCEDURE INITIALISE;
BEGIN
SETLNSTART;
UNTCLEAR (1);
WRITE (CHR (12)); (* CLEARSCREEN *)
GOTOXY (40, 0); (* CLEARCURSOR *)
WRITEMODE := NORMAL;
CURX := 0; CURY := 0;
DONE := FALSE;
GETCHAR (CURX, CURY, SAVEDCHAR);
PUTCHAR (CURX, CURY, INVCHAR (SAVEDCHAR));
CTRLCODES := CCTRLQ, CTRLI, CTRLN, CTRLB, CTRLD, CTRLU,
LEFTA, RIGHTA, CTRLP, CTRLR, CTRLX;
END; (* PROC INITIALISE *)

BEGIN (* MAIN PROGRAM *)

INITIALISE;

REPEAT
READ (KEYBOARD, LH);
IF EOLN (KEYBOARD)
THEN RETURN
ELSE
BEGIN
IF ORD (CH) IN CTRLCODES
THEN
BEGIN
CASE ORD (CH) OF
CTRLQ : DONE := TRUE;
CTRLI : WRITEMODE := INVERSE;
CTRLN : WRITEMODE := NORMAL;
CTRLB : WRITEMODE := FLASHING;
CTRLD : CURSOR (UP);
CTRLU : CURSOR (DOWN);
LEFTA : CURSOR (LEFT);
RIGHTA : CURSOR (RIGHT);
CTRLP : SAVEBUFFER;
CTRLR : LOADBUFFER;
CTRLX : INITIALISE
END (* CASE *)
END
ELSE
CASE WRITEMODE OF
NORMAL : BEGIN
SAVEDCHAR := NMLCHAR (CH); CURSOR (RIGHT)
END;
INVERSE : BEGIN
SAVEDCHAR := INVCHAR (CH); CURSOR (RIGHT)
END;
FLASHING : BEGIN
SAVEDCHAR := FSHCHAR (CH); CURSOR (RIGHT)
END;
END; (* CASE *)
END;
UNTIL DONE;
WRITE (CHR (12)); (* CLEARSCREEN *)

```

PET Histogram

by Sid Thomas

'Histogram' requires a 3000 or 4000 series PET with a 3022 or 4022 printer.

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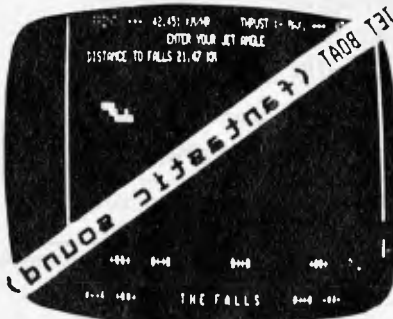
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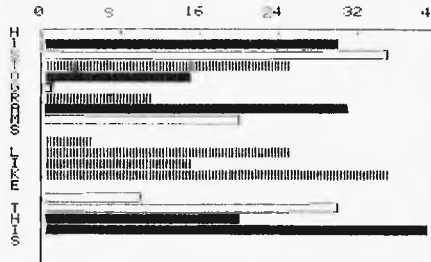
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PROGRAMS

again, cloth ears' and 'Buffoon — outside
range'.

The program uses programmable char-
acters to provide high-density resolution
bars, and produces a quality good enough

for semi-formal presentations (see exam-
ple below). Use of the program is
straightforward and the input prompts are
self-explanatory.



Sample printout of Histogram

```

0      8      16      24      32      40
H I S T O G R A M
L A B E L
T I T L E
O
60 DATA65,65,65,65,65,65,65,65,65,127,65,65,65,127,0,0,0,127,0,127
70 DATA0,127,0,127,0,0,127,127,127,127,127,127,127,127,127,0
80 L$=CHR$(141):DIM$*(10)
90 FORM=1TO7
100 FORM=1TO6
110 READA:S$(N)=S$(N)+CHR$(A)
120 NEXTM
130 NEXTN
140 PRINT"ENTER TITLE OF HISTOGRAM";INPUT$
150 PRINT"THE HISTOGRAM BARS ARE DRAWN HORIZONTALLY"
160 PRINT"LEFT-----RIGHT [X AXIS]"
170 PRINT"ENTER X MARK";INPUTX$:PRINT"ENTER XMIN";INPUTXN
180 PRINT"ENTER AXIS LABEL";INPUTX$
190 PRINT"XMIN-----XMAX CAN BE UP TO 50 UNITS WIDE"
200 PRINT"ENTER WIDTH - MAKE IT A NICE MULTIPLE"
210 PRINT"OF (XX-XN)";INPUTW$
220 IFW$=50THENPRINT"TRY AGAIN, CLOTH EARS";GOTO200
230 PRINT"HOW MANY DIVISIONS ALONG THE";PRINT"X AXIS?"
240 PRINT"BE SENSIBLE AND CHOOSE A SIMPLE"
250 PRINT"FACTOR OF "W";INPUTI$
260 A$=" ";B$=" "
270 FORM=1TOI$-1
280 NX=N$+1;B$=B$+" "
290 IFN$=W$/I$THENA$=A$+" ";N$=0;GOTO310
300 A$=A$+" "
310 NEXT
320 A$=A$+" ";B$=B$+" ";C$=C$+" ";D$=D$+" ";E$=E$+" ";F$=F$+" ";G$=G$+" ";H$=H$+" ";I$=I$+" ";J$=J$+" ";K$=K$+" ";L$=L$+" ";M$=M$+" ";N$=N$+" ";O$=O$+" ";P$=P$+" ";Q$=Q$+" ";R$=R$+" ";S$=S$+" ";T$=T$+" ";U$=U$+" ";V$=V$+" ";W$=W$+" ";X$=X$+" ";Y$=Y$+" ";Z$=Z$+" ";
330 OPEN1,4:PRINT#1:PRINT#1:PRINT#1,SPC(25)T$
340 PRINT#1:PRINT#1:PRINT#1,SPC(35)X$:PRINT#1
350 PRINT#1,SPC(24)XN;L$;
360 FORM=1TOI$-1
370 B=B+(X-XN)/I$;S$=STR$(B);C=23+(N*(W/I$))
380 PRINT#1,SPC(C)LEFT$(S$,S);L$;
390 NEXT
400 PRINT#1,SPC(23+W)XX
410 OPEN2,4,6:PRINT#2,CHR$(24):PRINT#1,SPC(25)A$
420 E=E+1:PRINT"BAR #E
430 PRINT"ENTER LABEL [C21 CHARACTERS]"
440 PRINT"TO LEAVE A GAP, ENTER #1 BELOW"
450 PRINT"TO OMIT A LABEL, ENTER #2" :PRINT"TO FINISH ENTER #3" :INPUTC$
460 IFLEN(C$)>20THENPRINT"DO YOU HAVE YOU NO BRAIN??";GOTO430
470 IFC$="#1"THENPRINT#1,SPC(25)"| "SPC(W-1)"| ";GOTO420
480 IFC$="#2"THEN#20
490 IFC$="#3"THEN#30
500 C$=" "
510 PRINT#1,SPC(4)RIGHT$(C$,20);L$;
520 PRINT"CHOOSE SHADING FOR THIS BAR"
530 PRINT"UNSHADED = #1" :PRINT"STRIPED = #2" :PRINT"BLACK = #3";INPUTSH$
540 ONSH$GOTO560,570,580,550
550 PRINT"A LITTLE MORE CONCENTRATION PLEASE";GOTO520
560 S$(8)=S$(1)+S$(9)+S$(2)+S$(10)+S$(3);GOTO590
570 S$(8)=S$(4)+S$(9)+S$(4)+S$(10)+S$(5);GOTO590
580 S$(8)=S$(6)+S$(9)+S$(6)+S$(10)+S$(7)
590 PRINT"ENTER DATA VALUE";INPUTX
600 IFX<XNORX>XNTHENPRINT"OUTSIDE RANGE";GOTO590
610 X=(X-XN)*W/(X-XN)-.5;OPEN3,4,5:PRINT#3,S$(8);PRINT#1,SPC(25)"| ";
620 IFX<.25THENPRINT#1,"| ";GOTO790
630 IFX<.75THENPRINT#1,L$;:PRINT#3,S$(10);PRINT#1,SPC(26)CHR$(254);:GOTO790
640 IFX<1.25THENPRINT#1,L$;:PRINT#3,S$(9);PRINT#1,SPC(26)CHR$(254);:GOTO790
650 IFX<1.75THENPRINT#1,L$;:PRINT#3,S$(8);PRINT#1,SPC(26)CHR$(254);:GOTO790
660 IFX<2.25THEN#20
670 IFX<2.75THEN#60
680 GOSUB#40
690 PRINT#1,CHR$(254);L$;
700 PRINT#3,S$(9);:PRINT#1,SPC(26+X)CHR$(254);
710 GOTO790
720 GOSUB#40
730 PRINT#1,L$;
740 PRINT#3,S$(9);:PRINT#1,SPC(25+X)CHR$(254);
750 GOTO790
760 GOSUB#40
770 PRINT#1,CHR$(254);
780 PRINT#1,L$;:PRINT#3,S$(10);:PRINT#1,SPC(26+X)CHR$(254);
790 PRINT#1,L$;:CLOSE3
800 PRINT#1,SPC(25+W)"| "
810 GOTO420
820 PRINT#1,SPC(25)B$:OPEN4,4,10:PRINT#4:PRINT#1:CLOSE1:CLOSE2:CLOSE4
830 END
840 FORM=1TOINT(X)-1
850 PRINT#1,CHR$(254);
860 NEXT
870 RETURN
READY.

```


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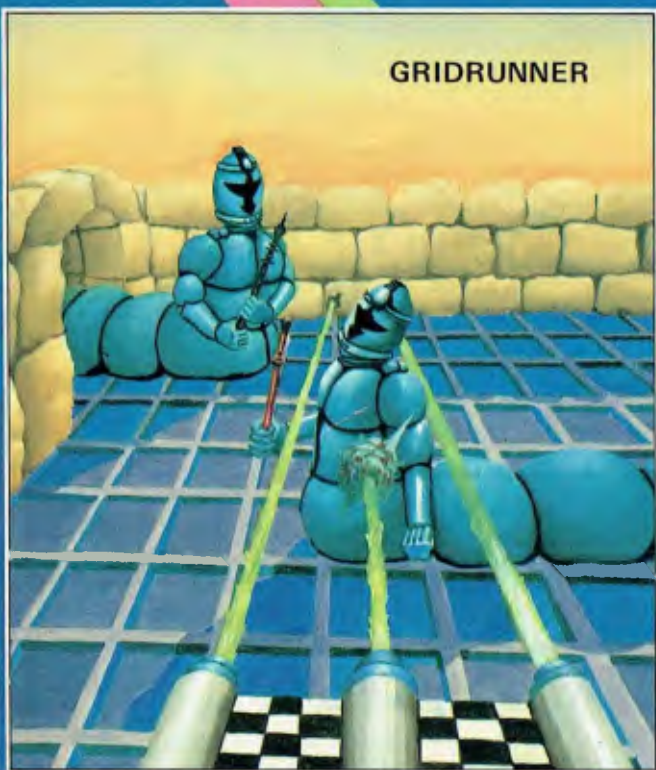
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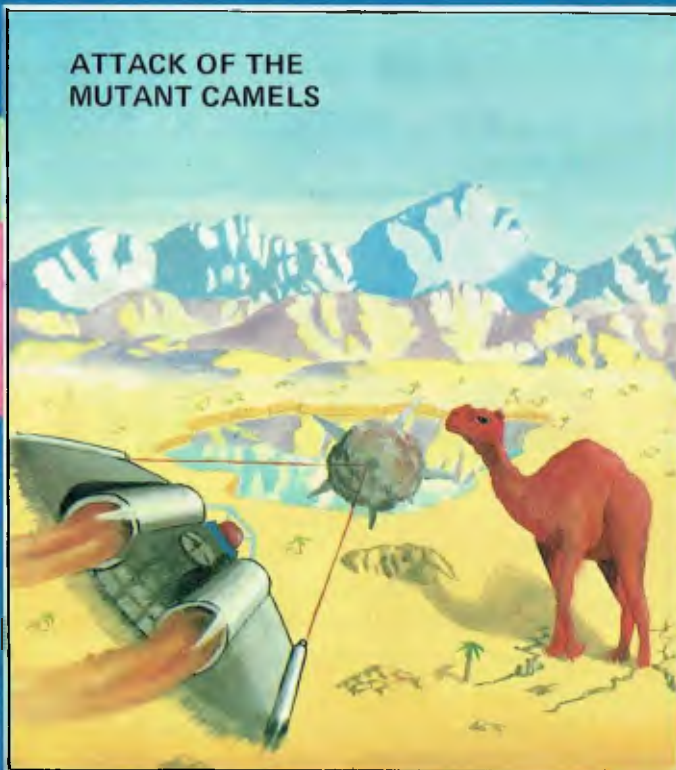
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Anonymity seems to be all the rage this month. An anonymous press release magically appeared in the offices of one of our international editorial sources. It said under the heading 'Cheesed Off': 'Recent reports which appear to give Apple the credit for developing the mouse, used with its new Lisa micro-computer, have caused Xerox to be cheesed off. The hand operated device, which enables users to carry out functions simply by pointing at the computer screen was, in fact, first developed by Xerox as part of its award-winning 8010 executive work station. Its introduction was generally acclaimed as a considerable advance in making microcomputers 'user friendly' at the executive level. It seems the 'mouse' has since become an industry term.' Well, it certainly wasn't Apple who

sent us that. The press release, though, is probably true; the weight of truth resting upon the word 'developed' in connection with Xerox. Xerox was the first company to sell the mouse as part of a micro-computer system but the mouse was originally invented in 1965 by Stanford Research Institute, USA — or that is the first record we can find of it. It was probably Xerox or some loony academic who sent the above treatise . . . Anonymous(e) telephone calls this time. We did describe our subscription department personageress as 'user friendly' in a cute promo to attract subscribers. But some one has taken it a step further with repeated calls to said sub dept. To this nurd, desist (poorly) initiating a computer trying to establish protocols with our humans . . .

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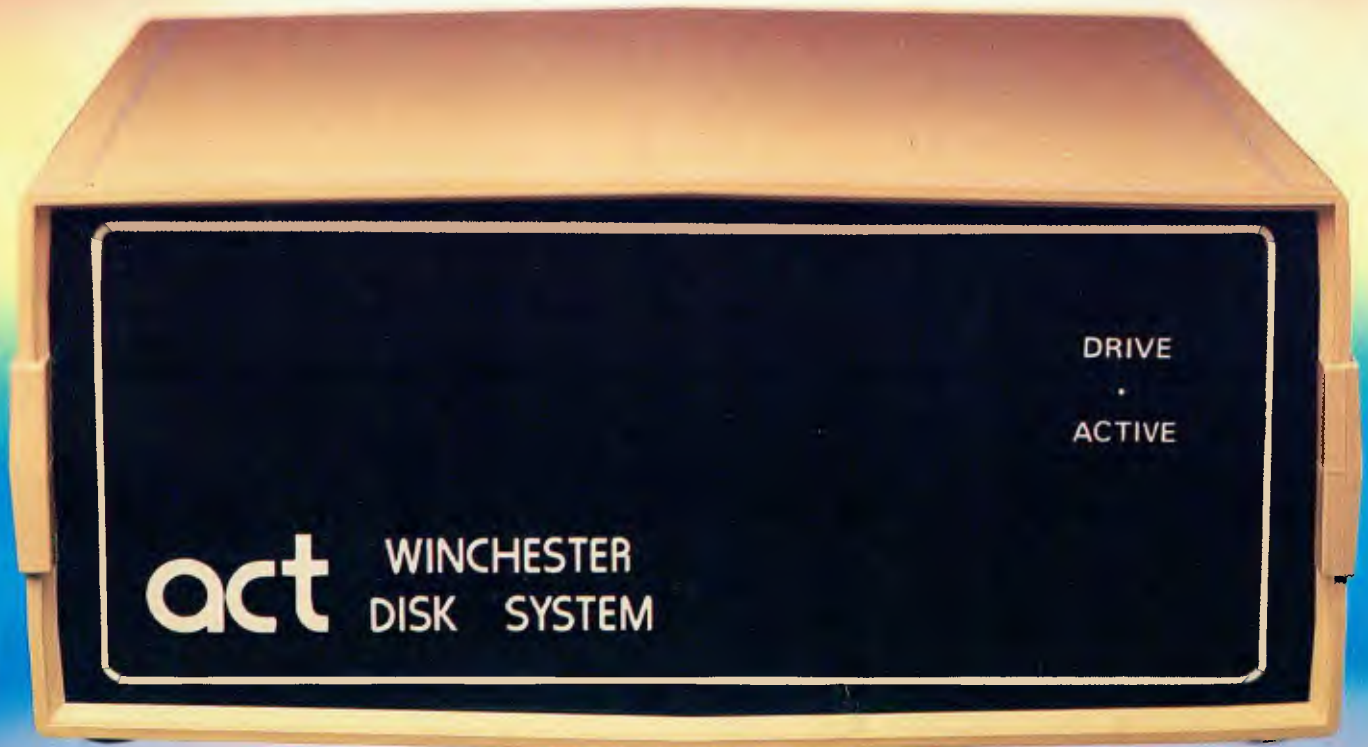
Usually the publisher decrees that an entire page in each issue of *Australian Personal Computer* is to be reserved for conveying to readers the joy to be found in parting with their cash. This month, however, the offer could be hidden obscurely anywhere in the magazine and readers in their thousands could still be confidently expected to subscribe over the next four weeks.

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