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ISSN 0725—4115 NZ $3.50
REGISTERED BY AUSTRALIA POST PUBLICATIONS VBP 3691

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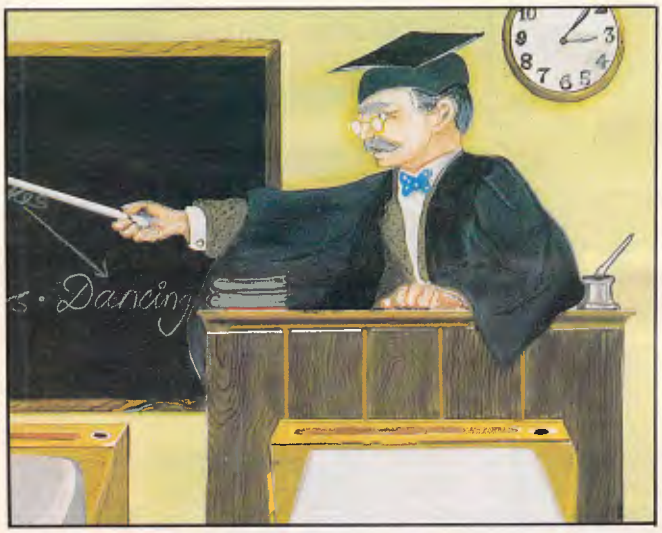


Lateral thinking — see page 60

Volume 5, Number 12, December 1984

APC

FEATURES AND SERIES

BENCHTESTS & REVIEWS

IBM PC AT — see page 18

NEWSPRINT

APC's latest micro news. This month there's talk of a portable computer in NASA's Space Shuttle, Telecom's controversial personal computer, an updated version of the 6502 processor, problems with the Symphony/Lotus 1-2-3 exchange programme and what the inventors of VisiCalc are doing now.

Fair exchange?

The number of people sending in for copies of Lotus Symphony, and asking for part-exchange on their old 1-2-3 disks is not (says Mitch Kapor) significant.

The original idea at Lotus was that the old (1-2-3) program could be upgraded to the new (Symphony) for only US$200, for anyone who sent in a disk with 1-2-3 on it.

It appears to have worked pretty well, with Lotus turnover now bigger than MSA, which was previously accepted as the world's biggest software company. And MSA has shot itself in the foot with too-clever marketing by Peachtree, leaving Lotus home and dry on the top of the software heap.

But Kapor does acknowledge some trivial, miniscule percentage of Symphony users have asked for their old 1-2-3 back.

Critics suggest that the problem is bigger than Kapor would like to believe. 'They have thousands of requests,' suggested one American industry observer, 'and they have a problem in that they don't have the old disks to give back. And we are literally seeing some people who say "never mind the $200 refund, just give me 1-2-3, because Symphony is too much." '

Lotus does have two answers to the problem.

For those who simply find Symphony too complex (a minority, surprisingly, of complainers) Kapor reckons time and practice will solve most snags.

For the more significant number of people who find that Symphony won't accept their very biggest 1-2-3 spreadsheet templates, Kapor is launching a new software tool which will give Symphony users more memory inside the IBM PC.

And, coming soon, will be add-in applications'.

These will be new sections of the orchestra (to coin a phrase). "It's as if we didn't provide a word processor with Symphony, and decided to offer one as an add-in application, part of the Symphony', Kapor told me shortly before the launch.

The biggest Lotus announcement of the next few months, however, will be the Macintosh version.

This isn't the same as Symphony, nor the same as 1-2-3.

Symphony on the IBM family of machines has only one database, with the various application bits and pieces interpreting it in different ways — the graphics section sees it as pictures, the text processor as words, the database as data, and so on. In Macintosh, there will be separate data structures, more along the lines of 1-2-3.

But unlike 1-2-3, the basic structure of the Macintosh product is not a spreadsheet. Instead it is a series of matched files, with automatic cut-and-paste always available from one to the other.

The plan is to make this very nice feature (simply not available with ordinary word processors) actually fast enough to be useful.

I was expecting to see convincing demo versions of the new product at Comdex on the Apple stand, but that doesn't mean you should get excited about it yet. It won't be appearing in dealers' stock lists until March/April, which is a much bigger gap between announcement and release than Kapor likes.

'It's just a question of not being able to keep the secret any longer,' he told me. 'I like a 90-day gap, ideally.'

I'm not altogether astonished the secret is out. Kapor was, after all, demonstrating it in public at the Softcom show in New Orleans, as long ago as last March, and announced it even before Macintosh was officially launched, as part of the Apple launch promotions.

Guy Kewney

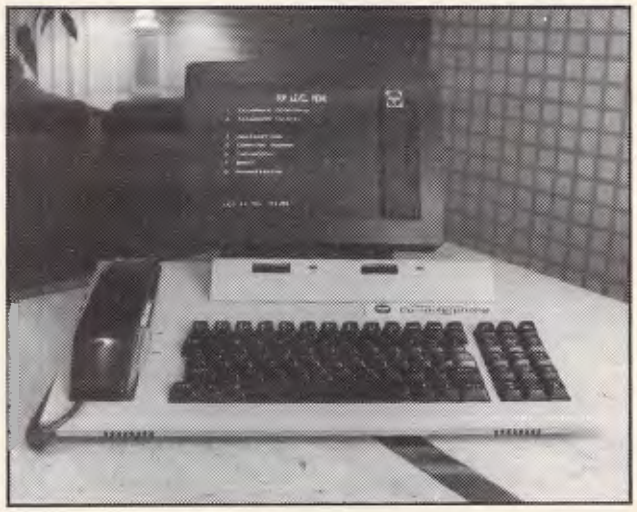
Good and the bad

Things could change for users of the 6502 processor chip — that is, people on Commodore, Apple II and others — with Apple's announcement of an Apple IIX with a 16-bit chip in it.

The original designer of the 6502 was Chuck Peddle, whose chip company, MOS Technology was taken over by Commodore before the PET came to Australia five years ago.

But Peddle left to start up Sirius, and so nobody ever designed the equivalent of a 68000, and Commodore's founder Jack Tramiel fired the people who were trying to.

Now a company called Com Log, together with Western Digital Design, both in Phoenix, Arizona, has come up with a chip it calls the 65816. Like the original



On November 26, Telecom announced its communications-oriented PC, the ComputerPhone, to suggestions of "unfair" and "monopolisation" from the media. It's a product of the British firm ICL with some input from Sinclair Research, is based on the 68008 CPU and has 128k of RAM, 208k of ROM and two 95k Sinclair Microdrives. The machine connects directly to a telephone socket to enable access to the usual analogue (voice) network but it also can be used to connect to videotext services, mainframe computers and Austpac and other public networks.

Other features are a concurrent operating system and Basic interpreter, a voice synthesiser (for automatic answering of incoming calls), simultaneous voice and data calls and auto-dial auto-answer modem.

Applications software comes with the ComputerPhone in the form of the Xchange suite of programs in ROM (spreadsheet, business graphics, word processor and database). Telecom reckons the ComputerPhone "will revolutionise the way managers go about their business".

Prices start at $2,950 for a mono screen machine. Naturally you'll read the first hands-on full test in APC — in next month's Benchtest.

Microsoft gets the

We're called Microsoft. In 1981, Apple asked us to assist in the birth of it's new baby, the revolutionary Apple Macintosh. The software we created has given Macintosh Microsoft's best features: incredible brilliance, power and versatility.

Microsoft's Macintosh programs are born to perform. They are all designed to think like you, even work like you. And they all share the same plain English commands.

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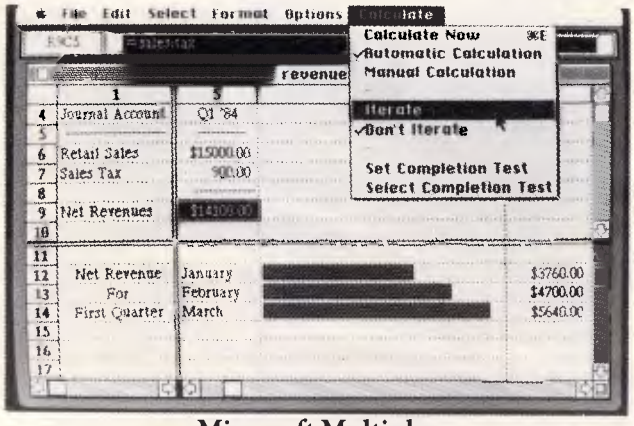

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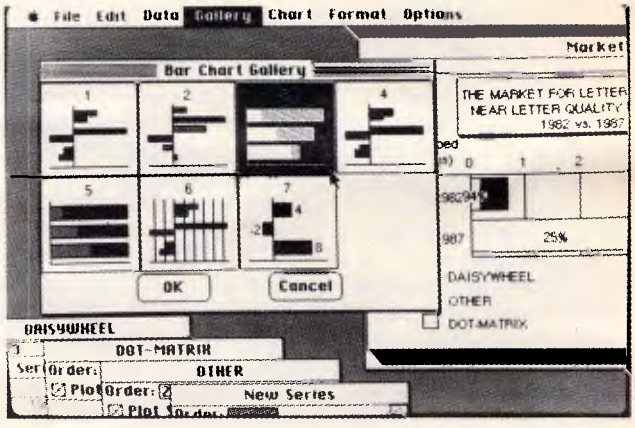
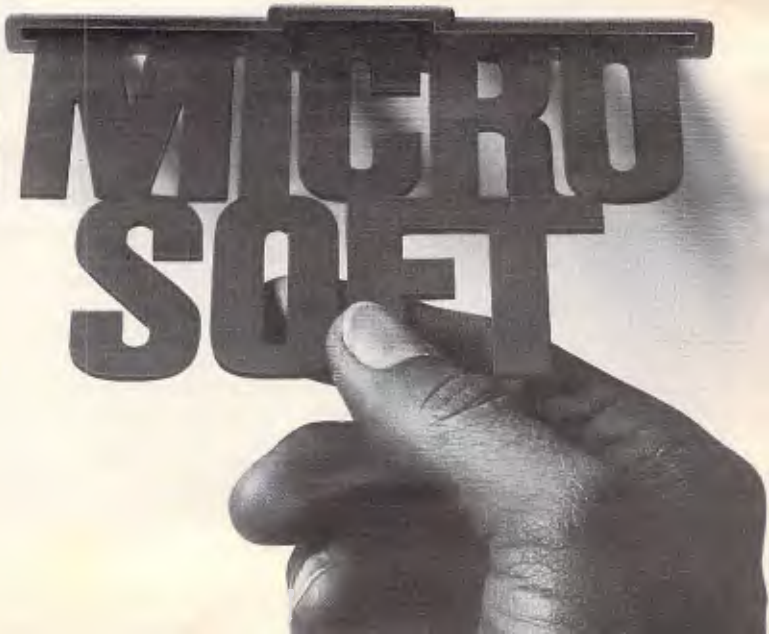


Microsoft Chart



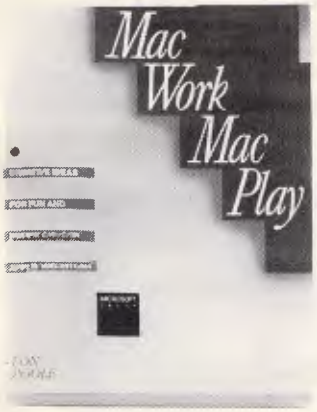
Max out of Mac.

Here's the Macdeal – Grab it while it lasts!

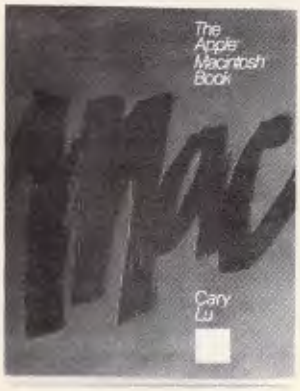
Buy any of these three Microsoft Mac packages – Basic, Chart or Multiplan – between December 1 and December 31 and receive, at no extra charge, one copy of any one of these three Macintosh books from Microsoft Press (individual retail value $27.95) for each purchase:

Mac Work Mac Play

Lon Poole's (author of the best-selling Apple II User's Guide) inspired assortment of applications for MacWrite, MacPaint and Microsoft Multiplan.



The Apple Macintosh Book



Cary Lu's (microcomputer editor of High Technology Magazine) unique insider's view of an historic advance in computer technology that will enhance your Macintosh pleasure and productivity.

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Steve Lambert shows you how to combine Microsoft's innovative Chart software and Apple's breakthrough technology to create dazzling high-quality presentation graphics.

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Intel 8088 inside the Sirius and IBM, this is a 16-bit chip with only an 8-bit data bus.

But what matters is the fact that the new chip can use more than 16 bits in its addressing — where the 6502 could use 64k, the new one can handle 312k.

All this doesn't make the 6502 a rival to the Intel family, which starts with the 8088 and rises to the soon-available 80386. But it does mean that the Apple II can be upgraded, giving it an extra couple of years of life when Apple releases a system based on the new chip.

So much for the good news. The bad news: the machine isn't likely to appear for another 18 months at least.

Guy Kewney

Concurrent releases

Fascinating, isn't it, how Microsoft, author of MS-DOS and PC-DOS, always manages to make some kind of announcement whenever Digital Research, author of Concurrent DOS, comes up with something new.

This time, just to prove they aren't rivals, Microsoft announced MS Net the same week as DR released details of GEM, its Graphics Environment Manager.

Anybody who starts at the back of *APC* and reads forward will know what GEM is — there's a preview elsewhere in this issue. For those who don't, it is designed to make an IBM look like a Macintosh as the picture on this page shows.

The big question about this product is: does it slow things down for the user?

Normally 'ease of use' features like this are applications programs. They occupy space in the machine, take time to load, and time to re-load after the application is finished. In the case of machines like the Hewlett-Packard 150, these friendly interfaces can drive you crazy with frustration as data cranks slowly in and out of the system, on and off disks, like a fast bowler strolling right back to the pavilion before starting to bowl.

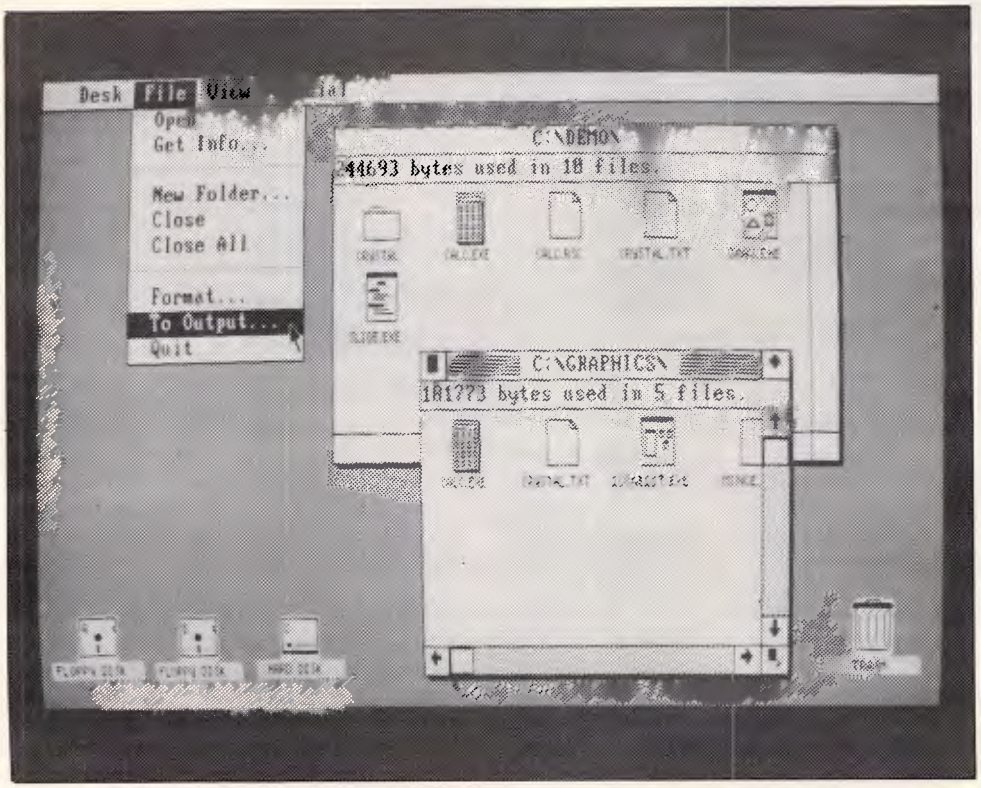
Microsoft, which (as Digital Research will remind you at any opportunity) is not primarily an operating system company, chose a few days later as the date for announcing a system of linking MS-DOS machines.

The announcement was impressive say those who managed to attend, because it was the first time Microsoft had announced something before IBM.

Those less impressed remembered last year's announcement of MS Windows, due out last March. It is now expected this June, and was clearly announced purely to steal the wind from DR's sails over the announcement of windowing on Concurrent. That, too, by the way, was not announced as an IBM product at the time.

With regard to both these launches, I really feel like the old warning 'wait till you see it in the shops' applies as much as on any of the other unlikely sounding products mentioned in these pages with enthusiasm and pleasure.

Guy Kewney



DR GEM showing its windows and pull down menus on an IBM PC.

Apple news

The (unofficial) word from Apple comes in the form of knowing winks, nudges and subtle hints indicating that something really special is to be unveiled next month.

My sources tell me that, candidly, Apple had better have a good rabbit to pull out of the hat, because it is in need of a boost. It's short of cash.

Frankly, if Apple came to me with a request to borrow money, and an offer to pay me interest on it next year, I'd lend whatever I had.

Well, exactly what are we looking forward to next month?

There will be a network, a file server, and a laser printer costing US$7000 — but not the drastic price cut which the rest of us are hoping for.

Worse, there is no sign of the go-faster things that Macintosh needs.

The machine is dreadfully slow. Even the new, 512k machine doesn't quite make up for its wonderful user interface by the relaxed way it uses its disks. You could make a cup of coffee between deciding to stop MacPaint and starting MacWrite.

At the time of writing my Macintosh test drive is being enhanced by a hard disk unit. There is $8,000 worth of hardware strapped onto the Applebus port of my Mac,and it still took me 20 seconds to close one text file, find another, and open it.

There are reasons for this. The machine keeps an awful lot more data about a file than most micros, because of the pretty typefaces, and the detailed graphics, and so on. Also, each time it stores a permanent copy of a file onto disk, it goes to a lot of trouble to make sure that it knows how far it has gone.

Give yourself a break ...

How many activities are you doing at the moment? Reading, listening, thinking. Why shouldn't your Personal Computer be as versatile? Think of the time it could save you. No need to wait while your PC runs payroll or quit your spreadsheet to answer questions about stock. ■ You need the timesaver — the remarkable Concurrent PC DOS from Digital Research. This lets you run up to four separate jobs simultaneously. You start a single program just as you do now. But when you want to, just touch a key and you get a fresh screen to work with... while your original program continues to run. ■ A two-user facility is ideal for people who communicate regularly to remote staff or offices. ■ Remember, each of your four programs is only a keystroke away. ■ And with the built-in window facility, you can keep track of all of your work on screen simply and easily. ■ **Get a personal demonstration of Concurrent PC DOS at your local micro dealer, or complete the coupon below for more information.**

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This is the GRiD Compass, a machine with the unique distinction of being used on the US space shuttle, where it was code-named SPOC (the Shuttle Portable Onboard Computer).

It has three noteworthy features: its 80 column by 25 line display, its bubble memory and its price. The front portion of the top cover of the GRID tilts up to reveal a restful amber coloured flat screen. Unlike the LCD route taken by the latest lap-helds with 80 column by 25 line screens, the GRID uses an electroluminescant display.

The machine runs an 8086 CPU, can have up to 512k of RAM, comes with 384k of non-volatile bubble memory and, in the recently released Compass II, ROM sockets which allow up to 512k of read only memory to be installed.

Also you can opt for a built-in modem, and several types of interfaces (including RS232).

On the software side you can go for a range of software from GRiD itself or run MS-DOS which will give you access to a very wide range of applications software, including Lotus 1-2-3, WordStar, dBase II and the full range of Microsoft languages.

The second noteworthy feature is the bubble memory. It retains its contents when the power is switched off but it is slow by RAM standards, and expensive — which would contribute significantly no doubt to the GRiD's third feature: price.

A basic GRiD Compass (without the extra ROM, with only 256k of memory and no modem) will cost $5,313 plus $188 for GRiD's operating system or MS-DOS on disk, and in each case you'll have to buy a disk drive for $1500. Or you could purchase an operating system in ROM for $469 (GRiD's OS) or $625 (MS-DOS).

Details are available from Vicom on (03) 62 6931.

If the power goes off, it can usually pick up the very complex threads left hanging, and weave them back together into your document or database, or whatever.

Nice, but not good enough — something just has to be done to speed things up.

A really fast disk would be one way of doing it. Even better, would be a lump of semiconductor memory, plugged into the second disk socket, pretending to be a disk — but running at memory speeds (several hundred times faster than a floppy).

Hints and nods suggest that such things are on the way —*but*, I gather, not for some months.

The hard disk, by the way, is rather better value than its enormous price makes it sound, because it includes the beginnings of a working local network.

On my pre-production test sample it was possible to hook up two Macs (all I could get hold of!) and an Apricot simultaneously. Passing files from one machine to another, however, wasn't easy, and was only possible between the Apple models. I could have plugged an Apple IIe in, too.

But for the hard disk to work well requires the software writers for Macintosh to wake up to the fact that people need bigger disks than Mac gives. If you want to put your programs on the hard disk, you'll find that a great many idiots have copy-protected their stuff in a way that prevents this.

Officially, Apple's rules about copy protection are: you must have the original disk in the machine, but can run from a copy. PFS File and Report won't work like that (a new version is promised) and neither will Macintosh Pascal.

Guy Kewney

Rebirth

The original Personal Software company has finally managed to bury itself, and is now struggling to turn the tragedy into a sort of tree-planting exercise.

It was called Visicorp after the success of its best-known product, VisiCalc, the rights to which it has now lost. And having failed so far to sell its next-generation product to the world under the name VisiOn, Visicorp has now decided to swallow itself up in the young, dynamic and thrusting Paladin software corporation of Santa Clara.

This is known as a 'reverse takeover' where the small company swallows its larger victim.

The news to come is interesting.

What we can expect is that the money Visicorp raised (it got finance from investors, and also sold off the development rights to VisiOn to Control Data) will go into new products from both Visi and Paladin stables.

In particular, there will be an IBM version of the Flashcalc product which sells quite well to Apple users, and applications to run under the VisiOn 'environment' — in particular, graphics.

A product called PC Paint is due for release very shortly, aiming to offer the sort of enjoyable drafting tools you get on a Macintosh with MacPaint, together with a 'frame grabber' for getting outside pictures into the machine.

Also prices on VisiOn will come down sharply.

Guy Kewney

Taking centre stage

Fresh from the triumphant burial of Visicorp, Software Arts (inventor of VisiCalc) has come up with a successor — called Spotlight.

It's the sort of program that I've been praying for, for some time now. It includes

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an appointment book, a disk file system manager, an onscreen calculator, phone book, index card file, and a note pad.

If all that works, it takes it quite a few steps further down the friendliness road than Macintosh's utilities, because the one thing Mac doesn't let you do while running a program, is look at the disks.

Spotlight runs in the background, or all by itself, 'with nearly every program available for the IBM PC, XT or Compaq computers,' says Software Arts, which means that any of its functions can be used at any moment.

It sounds a lot more convincing than TK!Solver (pronounced TKShriekSolver) (or pling) which Software Arts raved about earlier, but which no one I know would understand.

Until we have full dealer details, contact the company itself in New York, on (212) 206 9090.

Guy Kewney

What went wrong

It looked like such a good idea at the time, it's still hard to believe that Peachtree's strategy of selling to people like IBM rather than the end-user, has failed so drastically.

No doubt somebody else will try the same idea sooner or later, so it's interesting to try to analyse why Peachtree made such a mess of the micro software market.

The idea was sweet and simple. 'If we sell direct to IBM, they will label all our software with the IBM label, and people will buy twice as much,' they argued. 'And if we do similar deals with other suppliers, business users of a wide range of micros will share the same software product.'

Software is one of those things which it's very hard to judge objectively, and I really don't have any personal opinions about whether Peachtree software was any better or any worse than the average. Common sense tells me that *some* was probably very good, and *most* was probably average or below, since that seems to be the rule in the software market — there are a few very good, and a lot less than ordinary.

What I can report is that the bad was, in the opinion of some people who worked on it, very bad indeed.

Now, it actually isn't important whether their opinion was correct or mistaken. The point is that the way Peachtree sold its software, the company was less likely than most to find out when users had grumbles.

Manufacturers like IBM and Digital Equipment were more concerned to be able to show a wide range of software in the catalogue than they were to actually sell the stuff. They made their profits on hardware, after all, and the purpose of a long catalogue was just to encourage people to buy the software.

Today, Peachtree is up for sale. New products and new marketing strategies will (one hopes) make all the above comments out of date shortly. But the memory of the $1.8 million third quarter losses suffered by parent company MSA will take some time to fade.

Guy Kewney

This Commodore Datassette alignment device is used for adjusting the azimuth alignment of the play/record head of computer cassette recorders. It consists of a small metal case with a level meter, on/off switch, volume control and an input cable. The user must solder three wires into the Datassette and also drill a hole to mount the output jack.

Once this is done, it's just a matter of plugging the 'Datalign' into the jack and adjusting the tape heads with the small screwdriver supplied until the signal 'peaks'. The Datassette is then aligned to the reference cassette.

After instalment the operation of this device is extremely simple for any person that can use a screwdriver. It would appear to be a solution for most if not all Datassette alignment problems.

Call (05) 87 3487 for more details.

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...other computers cringe

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PortaPak has 800K of formatted space on each disk drive. The expensive machines which boast about having 360K suddenly look rather silly. With PortaPak you'll be able to handle much bigger data files and have far more programs on hand without having to fiddle around changing disks.

Reliability is often thought of in terms of machine breakdowns. Nowadays, the big problem isn't with breakdowns it's with hangups – when your machine turns out to be incompatible with your software. This is an enormous, widespread problem.

It's why we teamed up with Australia's software geniuses – Software Source Pty Ltd, the top suppliers of business and professional programs in the country. First, they specially customized PortaPak's operating system so it works with exceptional speed and simplicity.

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As for electrical and mechanical reliability, look inside a PortaPak. There's a striking difference. The PortaPak is completely modular. We didn't scrimp by putting all the circuits on one board. We use *three*. Servicing is simpler, quicker and cheaper. It's why the leading national computer service company, TCG Pty Ltd, is pleased to offer a 12 month service contract on PortaPak in all capital cities.

Take an extra close look at the Canon disk drives. If Rolls-Royce built computers, they'd use Canon drives. See the massive head protection shield? Hear the way the heads lock away every time they deselect? The designers had an unusual attitude to reliability – fanatical.

Now carry out some speed tests. On a standard benchmark test using BASIC routines*, the timings are: PortaPak 12.9 seconds, IBM PC 16.4 seconds, NEC APC 19.7 seconds and Sirius 16.4 seconds. Using a standard dBASE II routine**, the timings are: PortaPak 8 minutes 11 seconds, IBM PC 11m 52s, Sirius 17m 9s and NEC APC 19m 16s.

The expensive imports really cringe at this because they make so much of being "16-bit" machines. PortaPak is an 8-bit machine and proud of it. Not only is an 8-bit machine inherently better suited to jobs like word processing, accounting, spreadsheets, etc, but the 6MHz clock rate ensures it can run rings around the others even in complicated mathematical tasks.

Now to really rub it in, look at PortaPak's stunning additional features:

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*See Australian Personal Computer, Feb., 1984.
**See Australian Micro Computerworld, Nov., 1983.

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1982: Universe releases locally developed concurrency capability with MPS (Multiple program Selection) and SUPERAED enhancements to CP/M operating systems.

1983: Universe introduces dual 8/16 bit processing. Development work on high speed Multiuser operating systems culminates in release of MP/M 8-16, catering for simultaneous use of 8 and 16 bit software by multiple users.

1984: Development work at AED on 80286 processor results in sub-mini performance from Universe. AED wins government grants for earlier MPS work and further grants for work on I/O/File processor. UNIX is currently being implemented on Universe.

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UNIVERSE SUPERCOMPUTER

Glover & Associates 5046

YANKEE DOODLES

David Ahl has some good news for isolated business micro users in the form of companionship and price cuts.

Let's join together

The increasing number of small computers in offices means that users who are unable to share common data often find themselves in isolated, single-user islands. But all that is changing.

Today there's a major move towards local area networks. Ethernet, the first industry-standard local area network, was announced in 1980 by Xerox, DEC and Intel; and there are now more than 5000 Ethernet systems in operation supported by more than 200 vendors. Initially, Ethernet was hampered by a relatively high cost per node, but today the cost is down to about $600 per hook-up and experts expect this to decline even further.

Since 1980, many other local area networks have been announced and it's estimated that there are about 16,000 currently in operation.

These include offerings from Wang, Apple, Corvus, Datapoint and IBM. Consultant Architecture Technology Corp estimates that network sales will grow from about $300 million this year to $1.5 billion by 1988.

IBM is expected to be an important player. Its first offering is the recently announced PC Network which links up IBM Personal Computers.

Expected soon is an announcement of a factory floor 'industrial network' designed to tie together factory automation systems.

And two or three years away is the 'token ring' network, which will allow IBM computers of all sizes (and perhaps those of other manufacturers) to communicate with one another.

Eat your words

In 1950, a study by Univac indicated that five computers would meet the total worldwide demand for the foreseeable future.

In 1976, Ken Olsen, president of Digital Equipment Corp, told a World Future Society meeting in Boston that he couldn't see any reason for an individual ever to need his own computer.

In 1982, Future Computing, a market research firm, predicted that Commodore, Texas Instruments and Atari would be the leading three vendors of home computers for the following three years.

Soft in the head

The new software packages being issued by third-party vendors for three leading computers, the Commodore 64, Apple II, and IBM PC tell an interesting story. In the last six months, more business packages have been issued than anything else, followed by educational and games packages. However, the proportions vary widely for the different machines: IBM leads in business, Apple in education, and Commodore in games.

But, of course, not all the new packages will be successful. Furthermore, business packages tend to be priced considerably higher than games and educational ones, thus vendors of business software need fewer unit sales to break even.

If the price is right . . .

Typical of companies in the personal computer market, Tandy assumed that prices of home computers might fall as fast as 30 per cent per year, but the prices of business systems would fall more slowly, say, 15 per cent a year. However, in recent months Tandy, along with many other manufacturers, has had to face the realities of price declines of mid-and upper-end systems by as much as 40 per cent. In response, Tandy has cut the price of its bread-and-butter Model 4 by 40 per cent to $1299 (with two drives).

Also fuelling the price competition is a new PC compatible from Tandy itself, the Model 1000, priced well below $2000.

Seemingly a competitor for the sluggish PCJr, in reality the 1000 is more of a competitor for the IBM PC. It has a 16-bit 8088 CPU, 128k (expandable to 640k), monochrome and colour graphics adaptors (640 × 240 pixel resolution), single or dual floppy disk drives (360k each), a full-stroke detached keyboard, three-voice sound circuit, a parallel printer interface, two joystick interfaces, and a light pen interface. The CPU operates at the same clock rate as the IBM PC (4.77MHz) and almost twice as fast as the PCJr.

The expansion bus is completely compatible and has three expansion slots, so third-party peripherals can be used directly on the Model 1000. Software compatibility with the IBM PC is very high: the two 'test' programs, Lotus 1-2-3 and Microsoft Flight Simulator, run without a glitch.

According to Tandy, the machine is being aimed at home and small business users, so the initial 40 software releases include such packages as Lotus 1-2-3, Multiplan, MS-Word, DR Graph, Friday!, the PFS: series, Knoware, Micro Illustrator, and a nifty group of games.

Best of all, the pricing on the Model 1000 is 35 per cent to 40 per cent under that of the IBM PC. The base price of the Model 1000 is $1199; an entire system with 256k, a colour monitor, and two disk drives costs $2348 compared with $3578 for the corresponding IBM PC configuration.

Random bits

As well as announcing the 512k Macintosh ($3195) about four months earlier than expected, Apple lowered the price of the 128k Mac by 12 per cent and lowered the prices of the IIc and IIe by $100 each. Is this an indication that Apple is in trouble, or is the company just trying to get a bigger piece of the holiday season business while other mid- and low-end manufacturers are in disarray? . . . Jobs at Japanese computer companies in the US continue to be revolving doors: Sanyo, Sharp, and Panasonic have all had recent shake-ups . . . The shakeout of computer magazines continues to increase with well-established titles such as *Microcomputing, Softalk, Microsystems,* and *Commander* biting the dust along with newer entries such as *Compute's Gazette, Personal Software, Color Computer, PCJr,* and *Jr.* Experts expect the failure rate to rise to four or five a month leaving perhaps 20 healthy titles . . . A study by Communispond, a New York management consulting firm, found that most business executives preferred pencils to computers for composing their correspondence: 89 per cent chose pad and pencil, 10 per cent opted for dictation, and only one per cent used computers . . . Most software companies are reluctant to commit themselves to developing packages for the Coleco Adam, citing doubts about Coleco's long-term intention to stay in the market. Sierra On-Line had cartridges ready to burn in and decided to hold up and eat the costs itself. Other vendors are also taking a wait and see attitude . . . Future Computing projects that 67 per cent of all US households will have a computer by 1990 (presently 10 per cent). END

The PC AT follows its immensely successful and much-copied little brother into the market, but does it represent good value to the single user or is it designed for bigger things? Peter Bright tests the latest product from the seemingly infallible IBM.

IBM PC AT

You're on a 'hiding-to-nothing' reviewing a new IBM micro — the people who don't know any better will buy it anyway, and the people who do, can work out how good it is for themselves.

It was with these thoughts in mind that I set out to review IBM's second offering on the micro scene, the PC AT. 'AT' apparently stands for 'Advanced Technology', and I must admit that on the face of it the AT does boast one or two interesting features: multi-user, the new Intel 80286 processor, and an optional 1.2Mbyte floppy disk. It looks like IBM might have come up with something new for a change.

Hardware

IBM won the prize for the lowest specification in the biggest box with the original PC, but I'm glad to say it has managed to do rather better with the AT. The main box is only slightly larger than the PC box, even though it has much more inside it. That said, putting an AT on your desk is as good a way as I have found of hiding yourself from the rest of the office — it's still a big beast.

For this reason, IBM can supply a floor mounting stand which allows you to stand the system unit on its side next to your desk.

The AT is a three-box design in the same mould as the PC and the vast majority of other desktop micros. The monitor is exactly the same as that used on the PC, but the system unit and the keyboard have been completely redesigned.

The system unit is finished in a mixture of grey and cream. Most of the unit is the same grey as the PC, but the front panel is finished in cream to match the monitor and the keyboard.

On the front of the system unit at the far right-hand side is space for two half-height 5¼in floppy disk drives. On the left-hand side are two LEDs, a key and the IBM badge.

The LEDs are used to indicate power on and when the hard disk is reading or writing. The key is used to disable keyboard input from the main unit; it does not disable input from remote terminals. The idea is that the system manager can prevent access to his terminal without throwing off authorised users.

When the machine arrived, I spent a happy 10 minutes trying to bypass the lock. I thought I had found a way by removing the main cover and wedging the micro switch on the lock closed with the aid of a pen top. Then I found that you can't take the cover off if the lock has been activated. Back to the drawing board.

I wouldn't usually class the maker's badge as one of the most innovative features of a micro (I don't know though . . .); however, IBM seems to employ someone to design useless appendages for the AT. On the front panel that person has been hard at work designing a spring-loaded swivelling IBM badge. The idea is that if you have the unit standing on its side on the floor, at least you can make sure that the IBM logo is the right way up. Isn't that wonderful!.

The rear of the main unit is very unremarkable. From left to right there are sockets for power in and out, the fan, a DIN plug for the keyboard and the exit holes for no less than eight expansion slots. There are also four strips of velcro which look like the work of the useless appendage person.

The velcro is used to hold an optional plastic blanking plate in place. This fits onto the back plate and doesn't seem to serve any useful purpose other than to cover various type approval badges and a few screws. It looks pretty but I'm sure it wouldn't last long before it got lost in an office.

Getting inside is just the same as for the PC: remove five screws and slide the cover off (remembering, of course, to turn the key to the locked position).

The inside is also reminiscent of the PC. The power supply dominates the rear right-hand corner. In front of that are the twin disk drives and the hard disk (which can't be seen from the outside). To their left are the eight full-length expansion slots. The main processor board lies along the bottom of the unit. However, while the layout remains the same, the

The PC AT keyboard is a great improvement on the PC — the typing areas are well spaced and the RETURN and shift keys are larger.

individual components are very different from the original PC.

The PSU is a multi-voltage unit with external switching (although you'd have to be Superman to lug this lot around the world in your hand luggage). The PSU box also incorporates the system cooling fan. This has a built-in thermistor which regulates the speed of the fan according to how hot the unit is. This apparently helps cut down unnecessary noise. It doesn't work — it's still noisy.

The AT is available with a bewildering range of disk drives. The review machine had one 360k floppy drive, one 1.2Mbyte floppy drive and a 20Mbytes full-height 5¼in hard disk. A 40Mbytes hard disk is also available. The floppy drives aren't marked 'A' or 'B', although the 360k PC compatible drives are marked with a '*' embossed onto the casing. All the new floppy drives are half-height as opposed to the old full-height units on the PC.

The most interesting aspect of the new drives is the 1.2Mbyte high capacity unit. The only other mass micro I can recall which offers 1.2Mbyte on one 5¼in floppy is the Sirius. This did it by varying the speed of rotation of the disk to allow it to pack in more data.

The AT drive doesn't do this, but it's still non-standard. The drive can actually work in two modes — IBM compatible and high capacity.

If you put a standard 360k PC format disk in the drive, it will happily read the data. It will also write data back in 360k format, but this is more dodgy. The manual stresses that IBM doesn't guarantee that data written to a 360k disk in a high capacity drive can be read by a standard drive. In practice I didn't have any problems, but don't say you haven't been warned.

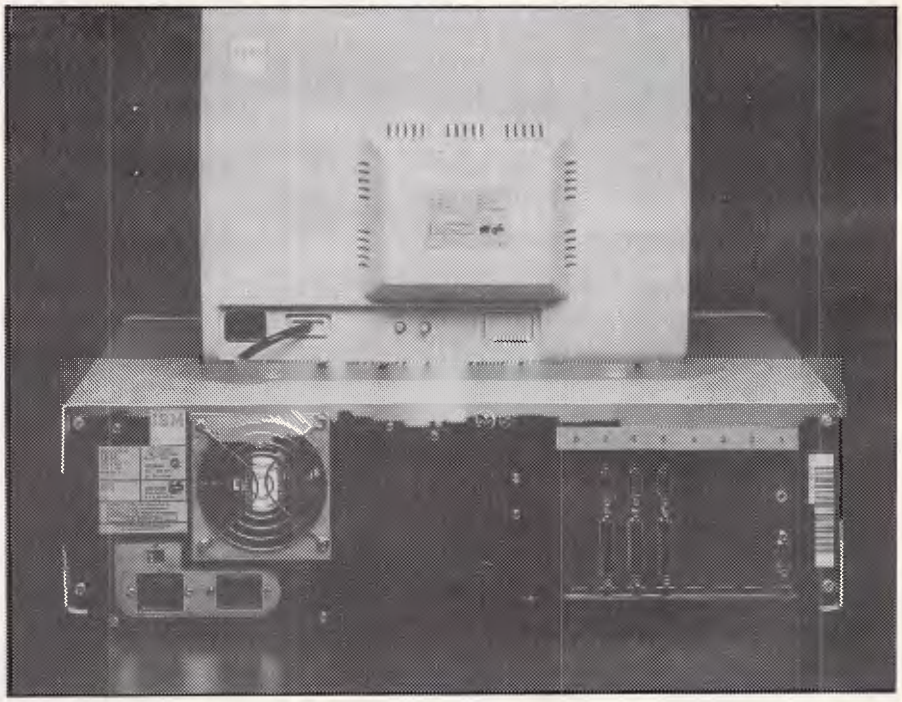
The drive will only work in high capacity mode if you use it with special disks supplied by IBM. At first I thought it might just be a marketing ploy, so I shoved one of my "all-singing-all-dancing" disks into the drive and tried to format it. The AT would have none of it and spat the disk out with a message to the effect of 'You can't fool me like that, sonny.'

It transpires that the disks have a special surface which can handle the high density needed to achieve 1.2Mbytes. The only doubt I have is about the supply of these new disks. No-one I talked to at IBM was sure whether they were available from anyone other than IBM. If they aren't it means you are dependent on IBM's whim until a third party tools up to produce the things. Not recommended.

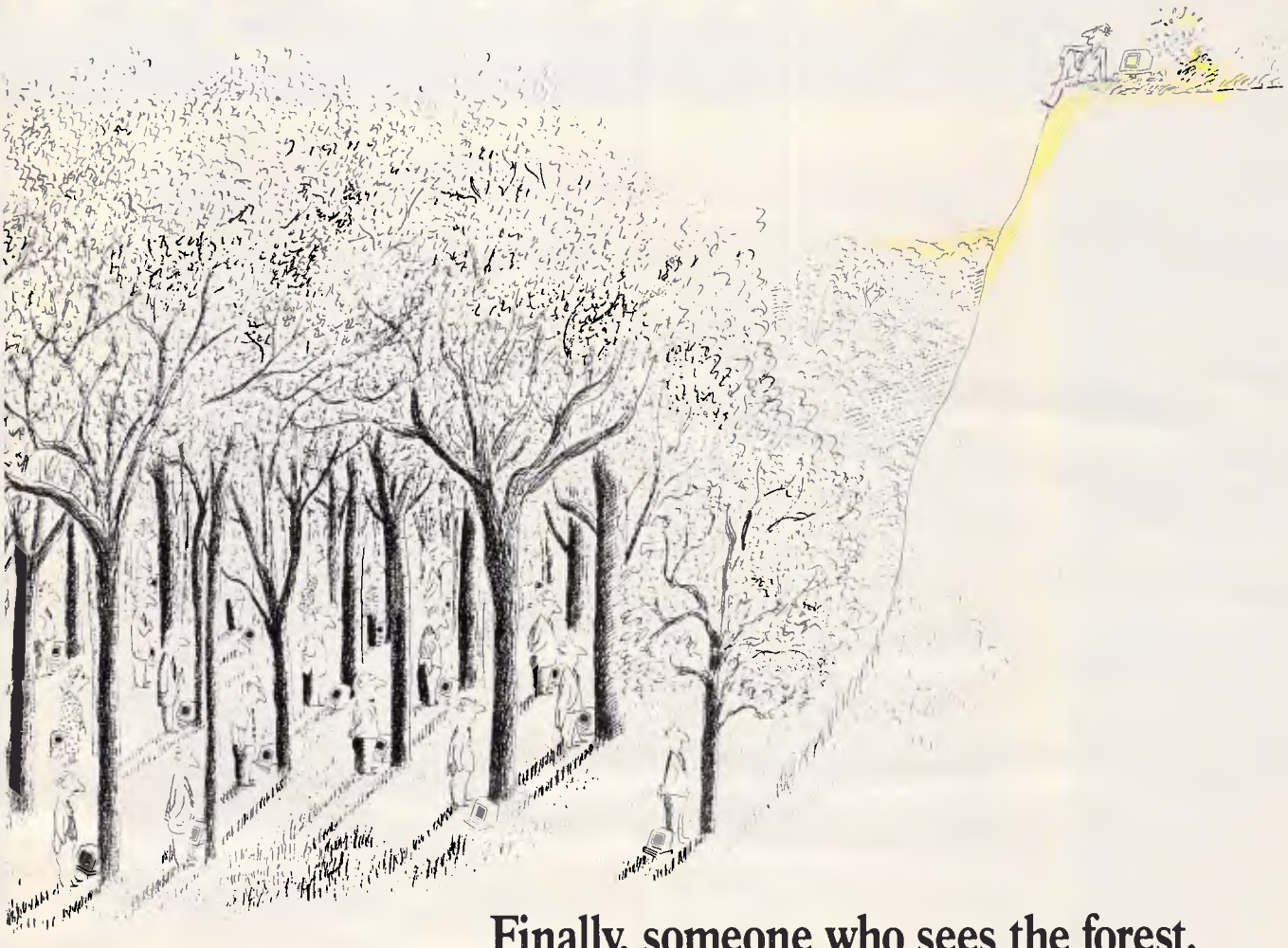
The main PCB takes up two thirds of the floor space in the system unit. It is dominated by the processor, memory and the expansion ports.

The Intel 80286 main processor is very easy to spot because it's square rather than the conventional oblong DIL package. Many modern VLSI chips are adopting this shape because they can run pins out of each side of the square rather than just two sides on DIL packages.

The 80286 and its smaller brother,



Nothing out of the ordinary here — exit holes for up to eight expansion slots



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DISPLAY SCREENS High Definition monochrome display. High resolution color display. IBM compatible graphics.	USER MEMORY Standard 128K bytes, expandable to 840K
COMMUNICA-TIONS Built-in Asynchronous	DIAGNOSTICS Power-on self test
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IK50

the 80186, have been on the stocks for quite a while, but production difficulties and problems with the mask have put the chip in short supply. The mask problem also means that, although the chip has a design clock speed of 8MHz, the production versions can only safely run at 6MHz.

In hardware terms, the 80286 can be looked on as a CPU and advanced memory management unit combined into one chip. It has a full 16-bit external data bus and a 24-bit address bus which would theoretically give access to a maximum 16Mbytes of RAM. I say theoretical because the amount of RAM that the processor can access is dependent upon the mode in which it's running. In compatibility mode the maximum is 1Mbyte.

Although it's loosely based on the older 8086/8088, the design of the processor unit is very different resulting in much higher throughput.

The instruction set of the 80286 is also based on the older chips, but in protected mode programmers have access to an extra 28 instructions. Most of these are designed for use with the memory management unit.

The review machine also came with an 80287 maths co-processor fitted. ATs are usually shipped without the chip but with a socket if your software needs it. The 80287 performs the same function for the 80286 processor as the 8087 does for the 8086: that is, it relieves the processor of mathematical calculations and lets it get on with less time-consuming work.

The base model AT is supplied with 256k of RAM. However, the review machine arrived carrying the full 512k, which the main board can take without having to resort to using expansion slots. Maximum RAM using the expansion slots is 3Mbytes. The RAM was provided by 36 of the new(ish) Texas Instruments 128k x 1 giving 512k with parity. The main board also holds 64k of ROM-based operating system routines and diagnostics.

Like the PC before it, the AT makes heavy use of expansion slots to provide basic functions such as video generation, disk control and printer connection. The AT does rather better than the PC by having eight full-length slots. The main difference between the two machines is that where the PC has an 8-bit data bus and limited memory addressing, the AT has a 16-bit data bus and a 24-bit address bus. This means that if you want to take full advantage of the AT's architecture, you need extra lines for the expansion cards.

IBM gets around this problem by giving each slot a PC-compatible socket and a 36-way socket to take the extra data and address lines. This means that the AT will work both with custom-designed cards and most PC cards.

The expansion cage in the review machine was occupied by four cards: a disk controller, two serial/printer cards and a colour graphics card.

The disk controller card is the only one of the three to make use of the extra socket. This is a new custom-designed unit which controls the high capacity floppy, PC-compatible floppy and the hard disk. The card fitted to the review machine was obviously an early version and had a couple of patches fitted.

The two serial/printer cards are used to connect remote terminals to the main unit. Each card houses a standard (for IBM) 25-way D plug for connecting a parallel printer and a 9-way D plug for the RS232 line. The 9-way RS232 line is a bad idea. It seems that whenever IBM comes across something that everyone else uses as a standard, it changes it. It happened on the PC with the parallel printer port and now IBM has done it to the RS232 connection. Everyone else uses a 25-way D plug, so why use a 9-way version?

Interestingly, according to IBM, the maximum number of remote terminals that can be connected is two. At the launch it was said that this was due to a hardware limitation. I have a feeling it has more to do with IBM not wanting to compete with products higher up its range.

The PC keyboard certainly evoked strong reactions when it was released. You either loved it or you hated it. I rated it as the best keyboard I had ever used until I tried the keyboard on the AT.

The AT keyboard is similar to the PC unit. It's connected to the main unit by an extra long cable, which allows it to be used a fair distance away from the main unit if necessary. Like the PC unit, it has two legs which can be flipped down to alter the typing angle.

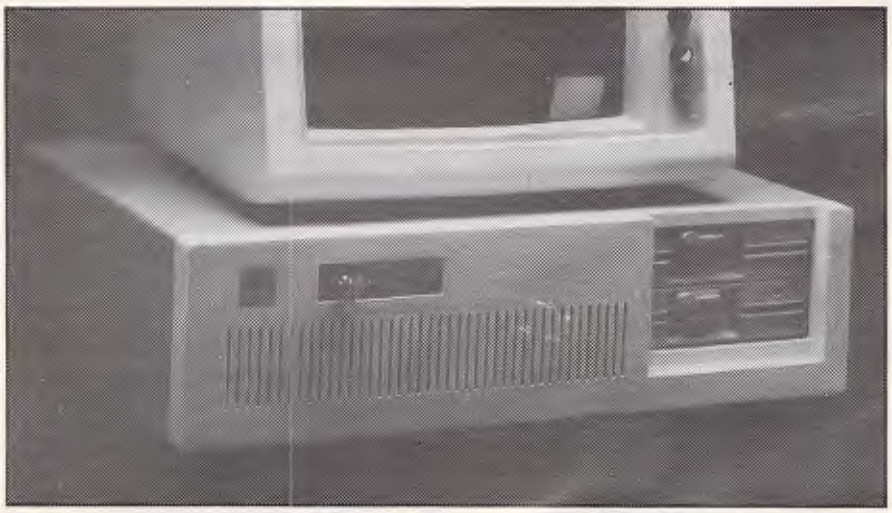
A total of 84 keys is divided into three main areas. The main qwerty typing section is in the middle, with 10 function keys set down the left-hand side and numeric pad/editing keys to the right. The feel of the keys is just the same as on the PC — firm, sharp and beautifully positive.

A great deal of criticism was levelled at the layout of the PC keyboard. IBM seems to have taken note of this and rectified it on the AT.

One of the major criticisms was that the RETURN key was too small and difficult to find. The AT has a RETURN key so large that anyone could find it. The shift keys get similar treatment. Another criticism was that there was no gap between the function keys and the typing area, and between the typing area and the numeric keypad. The gaps are there now. Finally, there was no indication on the PC keyboard that CAPS LOCK or NUM LOCK had been selected. Now there is a bank of three LEDs in the keyboard to indicate CAPS LOCK, NUM LOCK and SCROLL LOCK.

It is not all good news though. A major criticism of the PC keyboard was that the cursor control keys doubled up with the numeric keys and invariably the wrong mode was selected. Unfortunately this is still the case with the AT.

Worse than that is what IBM has done with the ESCAPE key, which usually lives somewhere in the top left of the keyboard. IBM has put it in the numeric keypad on the right-hand side of the keyboard. This makes life difficult for anyone used to running Lotus 1-2-3 *et al* which make heavy use of ESCAPE. Having said that, the AT keyboard is still a vast improvement on the PC keyboard and now rates as my favourite keyboard on any micro.



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Amstrad's new CPC464 comes with plenty of free plugs.

CPC464 green screen VDU (GT64)

You may have noticed that the press has got very excited about our new computer system.

And rightly so.

Because the new CPC464 comes complete with its own green screen VDU or colour monitor, built-in cassette data recorder, 64K of RAM, 32K of ROM, typewriter style keyboard and a very fast extended BASIC.

When you consider that the complete computer system including green screen VDU and cassette data recorder hardly costs a fortune, that's plenty to get excited about.

You can use the green screen version of the CPC464 with a colour TV by connecting the optional power supply and modulator (MP-1).

"I think the Amstrad will give a lot of sleepless nights to Sinclair, Acorn and Commodore..."

POPULAR COMPUTING WEEKLY

Other micros can't get anywhere near the CPC464's memory for the price. Over 42K is available to users, thanks to the implementation of ROM overlay techniques.

Sophisticated and complex programs are easily accommodated.

And the CPC464 offers you high resolution graphics, 80 column text display, up to 8 text windows, a graphics window and a palette of 27 colours.

"The CPC464... in two boxes and one lead includes a list of features that would shame a hybrid of the major machines."

PERSONAL COMPUTER WORLD

One of the most obvious is the quality of the on-screen graphics. Quite simply, the CPC464 beats the micro/domestic TV combination out of sight.

That's because our monitor drives each colour on the screen directly from the computer. Nothing gets in the way of the best possible picture. And you won't have tuning problems, either.

There's plenty of interest for music lovers when the 3-voice, 7-octave stereo output is fed through a hi-fi amplifier and speakers.

"The Amstrad is a powerful, fast machine, with plenty of memory, easy to program..."

PERSONAL COMPUTER WORLD

A fast growing range of Amsoft programs is already available.

The high quality software takes full

advantage of the CPC464's high specification and speedloading capability. Which means even complex programs can be loaded quickly.

Arcade games, educational programs and business applications are all designed to utilise the CPC464's impressive graphics, sound and processing abilities.

Amstrad. User Information Service.

Whether you're interested in serious commercial applications or you're a games fanatic you'll want to receive the latest information about your AMSTRAD Computer. Upon request you will be advised about the latest software and its application, special information concerning your CPC464, available peripherals and software reviews. There will also be programs and exercises to try.

User Clubs.

In addition to the User Information Service you will be given details of where you may contact your nearest independent user club.

"The Amstrad machine provides a lot of other features for a very low price."

GUARDIAN

At Amstrad, we're constantly looking to the future. That's why the CPC464 has a built-in parallel printer interface. A low cost optional disk drive system including CP/M* (with the option to access 3000 programs) and LOGO. A joystick port. And the virtually unlimited potential of the Z80 data bus with sideways ROM support.

With so many free plugs from the press, it's little wonder the CPC464 only needs one.

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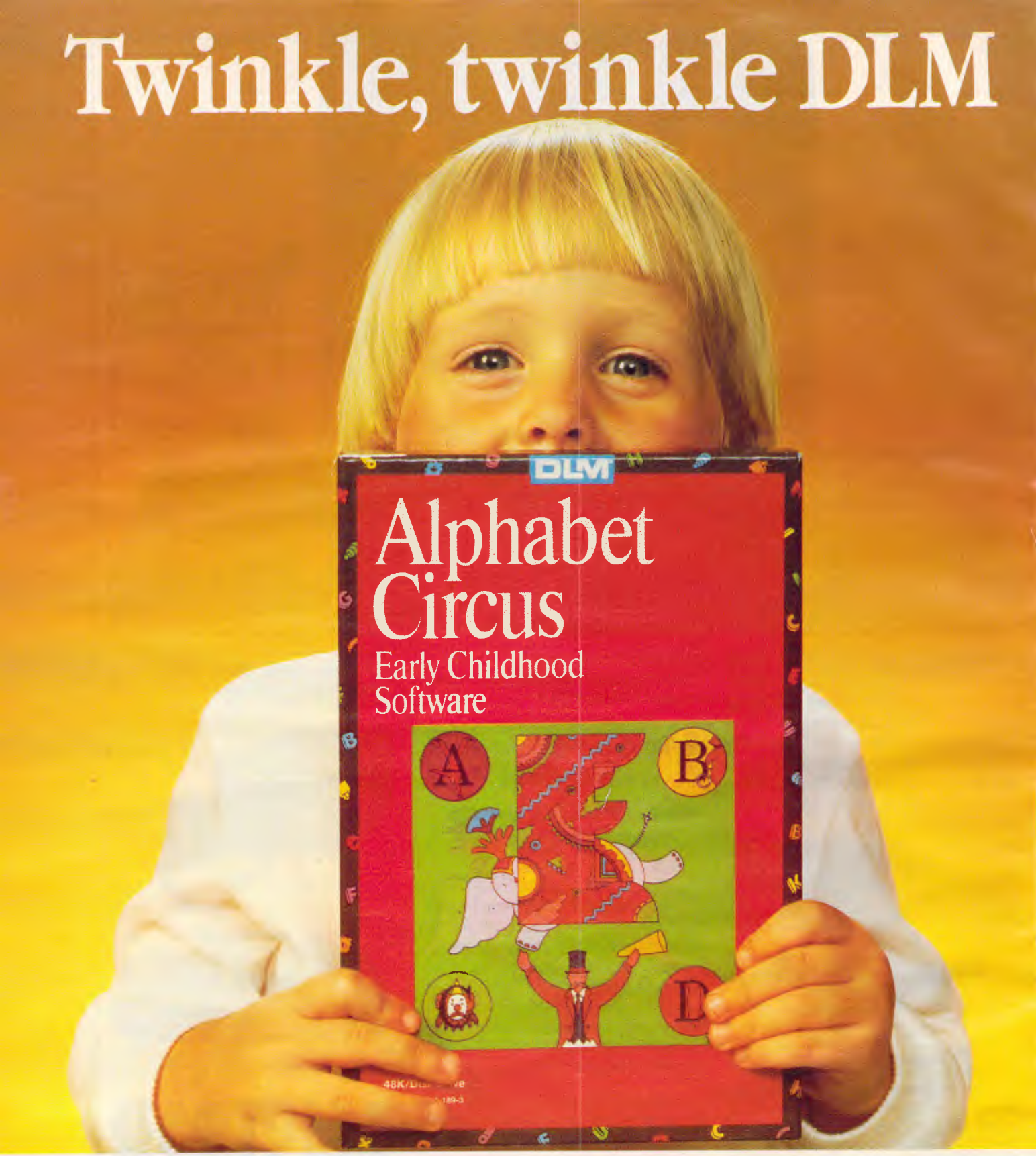

Bring the shine of knowledge and excitement into your child's eyes! With over twenty software titles like Spelling Wiz, Alphabet Circus, Number Farm, Verb Viper and Freddy's Puzzling Adventures, DLM software will give hours of fun and pleasure to your child, while at the same time teaching important educational skills.

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The display on the AT is standard IBM, just the same as the PC. That means that you get an acceptable monochrome display and a downright horrible colour display unless you want to pay for a third party display card that may or may not work in the AT.

The review machine was supplied with the same IBM colour monitor as supplied with the PC. The trouble with this monitor is that it doesn't tilt and only swivels if you pick it up and put it down facing in a different direction.

System software

With the introduction of the AT, the IBM system software scene is starting to look rather muddled. The AT will be offered with a choice of two operating systems, PC-DOS Version 3 and Xenix.

PC-DOS Version 3 is the latest updated version of the PC-DOS single-user operating system which was originally on the PC. Xenix is Microsoft's adaption of AT&T's Unix multi-user operating system. In addition, a special single-user version of Xenix called PC/IX will be made available for the PC. However, PC-DOS Version 3 won't run on the PC, so it stays with PC-DOS Version 2.11.

Xenix won't be available for the AT until next year, so the review machine was tested in single-user mode running PC-DOS Version 3.

When you switch on the AT it goes through its self-test routine in much the same way as the PC; the only difference being that it's thankfully much quicker. It then goes on to boot DOS and ask for the date and time in the same way as the PC — only this time you take the defaults because the AT has a battery-backed clock/calendar built-in.

The 80286 processor in the AT is capable of operating in two modes: either compatibility or protected mode. In compatibility it emulates an 8088 processor so that programs written for the 8088 will run. In protected mode, the processor offers an extended instruction set along with some very comprehensive memory management features designed for use in multi-user/concurrent processing applications.

DOS 3 works in compatibility mode and limits user memory to 640k. This means that even though you can physically expand your AT to 3Mbytes, your program can only access 640k. The rest will have to be used as RAMDisk.

To all intents and purposes DOS 3 is just the same as DOS 2.11 with a few bits rewritten to take advantage of the new architecture on the AT. The user image is exactly the same as DOS 2.11. It looks very much as if IBM and Microsoft have done as little as possible to get PC-DOS up on the AT, which may not have been such a good move. Digital Research is about to release its 80286 version of Concurrent CP/M, and the signs are that it will make full use of the processor as well as offer PC-DOS emulation and a multi-user option. If I were a prospective AT owner I'd give Concurrent CP/M a very close look.

The only interesting features I found with DOS 3 on the AT were a couple of utilities which I've seen elsewhere — but not on IBMs. They are a RAMDisk manager and a prompt utility.

The RAMDisk utility is called VDISK.SYS and is used to set aside an area of RAM as a virtual disk; the advantage being that you can treat the virtual disk in the same way as you would a normal disk, except that the access time is extremely fast.

To set aside a RAMDisk you add an entry calling VDISK.SYS in the CONFIG.SYS configuration file. For example, an entry in CONFIG.SYS such as 'device = vdisk.sys 256 512 64' would mean that every time the system was booted up, a 256k RAMDisk would be set aside with a phantom 512 sectors and up to 64 directory entries.

The other *new* utility is called 'Prompt'. This is very like a similar utility found in Unix which allows you to alter the system prompt. For example, if you were fed up with the system showing 'A>', you could type 'PROMPT GET LOST' and the system would use 'Get Lost' instead of the default prompt. It's fun for five minutes but wears thin after that. Just out of interest I tried booting my PC system disk with PC-DOS Version 2 on the AT. It booted with no problem and even ran applications, but it couldn't recognise the hard disk.

Applications software

Applications software — there's the rub. The obvious use for the AT is as a small multi-user machine. In this role IBM's favoured operating system is Xenix. The problem is that there's not yet a great deal of good multi-user applications software on the market, but no doubt this will change. Such is the pulling power of IBM that software houses will be falling over themselves backwards to convert their software to multi-user. This will take time, but IBM is giving them some lead time by not releasing Xenix officially until 1985.

There are no such problems with PC-DOS, thousands of programs are available for the PC. The only question is: will they run on the AT? The answer is that you can never be totally sure, but it seems that the majority of popular programs will run out of the box. IBM is giving technical assistance to software houses who have to re-write.

I had a go with Flight Simulator on the AT and it wouldn't run. The reason for this isn't clear as it got very close to running and only failed when it tried to load in the scenery from the disk.

IBM has been very thorough in trying to assist with getting applications software over from the PC. Two of the user manuals supplied with the machine were devoted to giving instructions on how to install specific programs on the AT.

A look at the Benchmark timings shows that the AT is fast, but perhaps not quite as fast as one would have expected. Remember that the AT has the brand new 80286 super processor and that the review machine was also equipped with the 80287 maths co-processor. Even with all this it only came out fractionally faster than the Olivetti M24 with a humble 8086 and no

In perspective

The AT sits comfortably above IBM's current range of PCs. Although it can be used as a single user machine, its main role will be as a small multi-user unit with a couple of remote terminals added on to the base unit. The only possible conflict would have been the base model AT competing with the PC XT; IBM got over this potential problem by cutting the price of PC XTs.

The base model AT has 256k of RAM and a 1.2 Mbyte floppy drive. However, I think it's likely that most AT users will go for the 512k RAM, 20Mbytes disk version. This is the minimum configuration with which you can do any serious multi-user work.

The fact that the AT was going to be based on the Intel 80286 chip wasn't a particularly well-kept secret. Consequently the flow of AT 'think-alikes' has already started and is likely to continue in much the same way as the PC look-alike market. Most of these products will either give superior performance or be priced lower than the AT.

As with the PC, the people who know what they are doing will probably be able to get better price-performance elsewhere, but other users are likely to buy it regardless.

maths chip.

The reasons for this are varied. Firstly, Basica makes no use of the 80287, so it might as well have not been fitted; and secondly, Basica is an 8-bit Basic and is not optimised for this processor. Even so, it's an interesting comparison because the Olivetti's GWBasic is an 8-bit Basic . . .

Documentation

What is the world coming to when IBM documentation sprouts yellow cartoon birds saying how nice DOS 3 is?

Luckily the bird has so far only managed to penetrate the guide to DOS supplied with the machine. Let's hope it gets no further! As a rule IBM manuals are well laid out and easy to understand, and don't need the 'Gee-Whizz' style.

The AT was supplied with three other manuals: the *Set Up Guide*, *Guide to Operations* and the *Applications Installation Guide*. The DOS reference manual wasn't available, so I can't comment on it. However, the others were of standard IBM quality: good use of two-colour printing, plenty of diagrams and easy to follow.

Prices

Until IBM actually announces the AT in Australia, it replies to questions about price with the infamous "No comment". Our estimate for the basic AT with 256k of RAM and one 1.2Mbyte floppy disk is $6,500 (including sales tax). However, it's more likely that most people will go for the expanded version with 512k of RAM, a 20Mbytes hard disk and a 1.2Mbyte floppy drive which, by our estimates, will sell for around $10,000.

Conclusion

I found nothing to dislike about the AT and quite a lot to like. The 1.2Mbyte disk drive is interesting, but I'm not sure how useful it is in a machine which already has a hard disk. It makes backups easier but not *that* much easier — I'd still go for a high capacity tape streamer. It would be of much more use in the PC, but the disk controller card won't work there.

DOS 3 is a disappointment. I was hoping IBM would take the opportunity to improve the operating system, but it hasn't made full use of the main processor's facilities.

As far as Xenix goes, it will be a while before it's launched and even longer before decent software is available. I think a long look should be given to the 286 version of Concurrent CP/M. Assuming Digital Research doesn't make any major *faux pas*, it could have a great deal to commend it to the AT user.

The AT doesn't look like good value as a general purpose single user machine, nor was it so designed. But as a small multi-user system or as part of IBM's new micro LAN it begins to look much better. Perhaps even good value.

The IBM PC AT is a good solid product, just as you would expect from IBM. It leans towards innovation by using a new chip and a high capacity disk drive, but on the whole sticks with what IBM stands for — good solid conservative technology that sells by the bucketful.

Benchmarks

BM1	0.8
BM2	2.2
BM3	4.9
BM4	5.1
BM5	5.6
BM6	9.4
BM7	15.0
BM8	13.9
Average	7.1

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

Technical specifications

Processor:	Intel 80286 running at 6MHz
ROM:	64k
RAM:	256k expandable to 3Mbytes
Mass storage:	20 or 40Mbytes hard disk, 360k or 1.2Mbytes floppy disks
Keyboard:	84 keys
Size:	6.5 x 21.25 x 17ins
Weight:	19kg
I/O:	Eight extended PC compatible slots
DOS:	PC-DOS Version 3, AT Xenix

Good students can learn anything. As long as they know their BBC.

Obviously, every student lucky enough to have access to a BBC computer is going to learn about computers.

But that is not the only subject they will have at their fingertips.

For the BBC school computer can enhance virtually any subject on the school curriculum.

Hundreds of educational programmes have been written for the BBC by educators in the U.K.

This material, which is of a singularly high standard, was prepared to achieve a major British Government policy objective of computer literacy in schools.

In addition, a number of State Education Departments in Australia have written a range of curriculum specific software to plug any cultural gaps.

To simplify the learning process (not to mention the teaching process) the BBC system allows each student in the class to progress at his or her own pace.

Unlike the traditional classroom, no one is held back by the other students or, conversely, left behind.

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In short, the BBC is the computer for learning.

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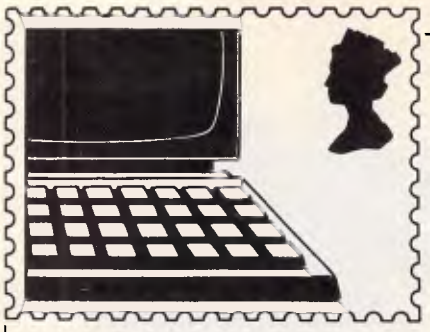


COMMUNICATIONS

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

Calculating the prize

I have written a program which calculates the prime numbers by additions and occasional multiplication, that is, without dividing. It's much faster than the method of testing by division and saves unnecessary testing of non primes.

Furthermore, the formulae used in this program prove that prime numbers, and particularly prime pairs, are not random. It proves many other things besides, and I forwarded some of this work to two masters of science in mathematics. They have agreed it's very interesting and certainly accept the proof of some of the formulae, while they are checking the others. These formulae, when combined, indicate that there are an infinite number of twin primes.

As you state in 'Brun's Constant' on page 97 of the August issue, there is a $25,000 prize for this part of my work. I would be grateful for information so that I can claim same.

G Wright

(Kenneth Carter is just one reader now coding up the best way to spend his $25,000. To qualify for the prize, the winning proof must be published in either Proceedings of the American Mathematical Society *or* Transactions of the American Mathematical Society. *A copy of the article in published form, identified as the twin prime proof or disproof, must be delivered by certified mail to Twin Primes, Worldwide Computer Services Inc, 7 Doig Road, Wayne NJ07470, USA. The proof must stand unrefuted for one year following the date of delivery of the publication to WCS. The prize offer expires on 31 March 1987 — Ed)*

Computer evolution: a battle against time?

If one examines the progress of biological evolution, it can be seen that the overall level of organisation and complexity in living organisms has increased as the degree of specialisation of, and division of labour between, the subunits (for example, cells) of the organisms has increased. For example, the single cell which is known as an amoeba is far more complex than, say a cell from the human mouth, but the latter is found in an infinitely more complex organism.

It seems possible that computer evolution will follow a similar path. Will the super-powerful computers of tomorrow be derived from today's mainframes, or will processor array machines make the traditional mainframe an extinct species? What sort of power will a computer that has advanced as far past a Cray-1 as a human has passed the amoeba possess? More importantly, perhaps, what will it think of us?

D Roberts

(The exponential curve that maps computer evolution suggests that before such a computer has had time to think at all, it will be obsolete — Ed)

Learning a new language

In the hope of increasing computer awareness among my employees I run a number of computer classes for my company. I have successfully taught Basic and am now looking at other computer languages and their application.

Can you help?

R Bright

There are a number of alternative languages available for the more popular micros. Having worked with a Basic interpreter, it would probably be interesting to look at a compiler in order to appreciate the increase in speed of programs and the extra stages a compiled program must go through before it can be run.

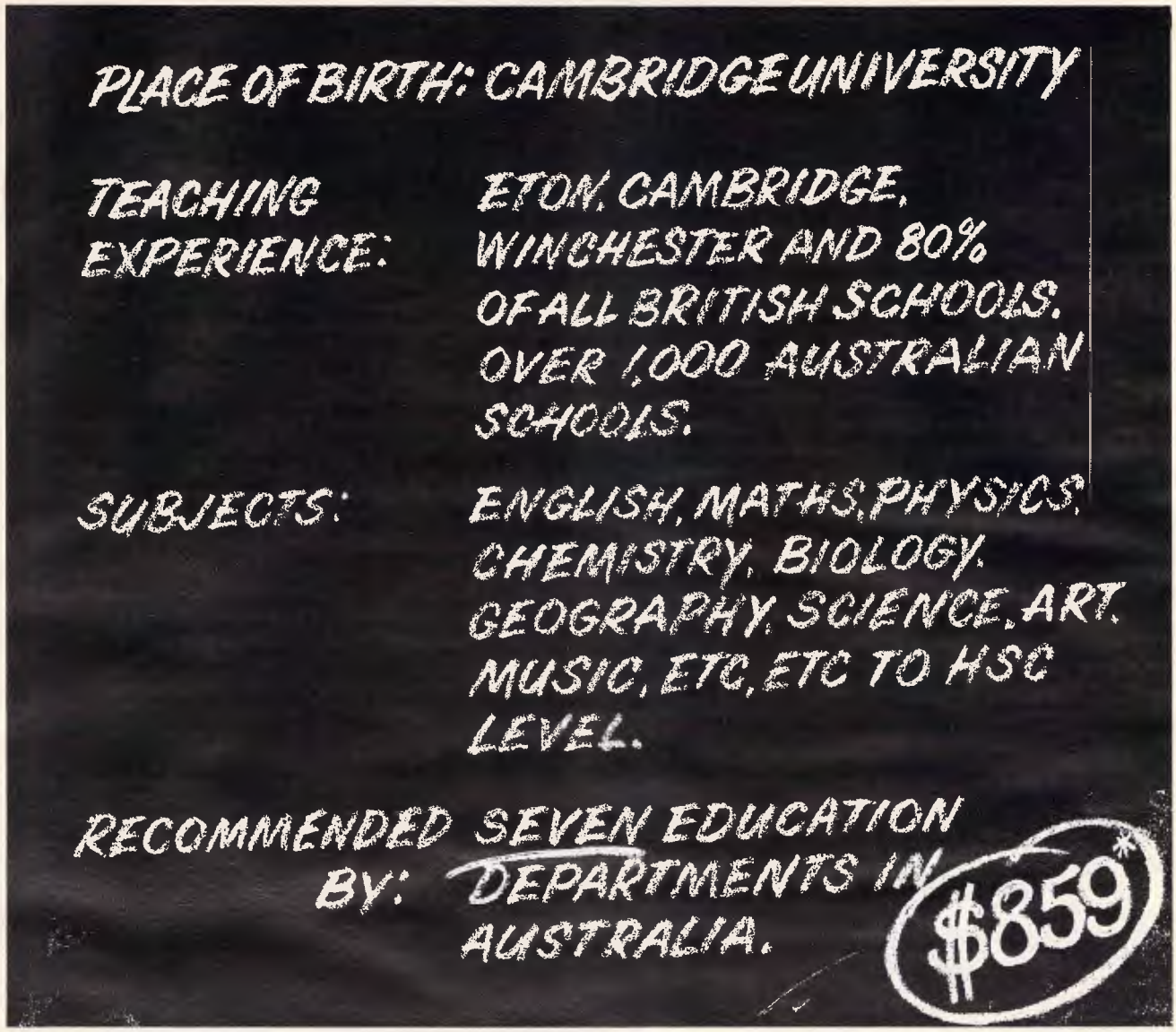
I will try to cover the most common languages available on micros and the type of application to which they are suited, leaving you to choose the ones you wish to cover.

First up is Logo, an increasingly popular micro language. The greatest attraction of this language for most people is its graphic capability. Logo graphics are generated by an imaginary turtle crawling across the screen with a paint-brush attached to its tail. Simple commands are used to move the turtle, such as FORWARD 100 and RIGHT 45. People who find generating graphic screens difficult in Basic usually find Logo a joy to use because of these 'turtle graphics' commands. Logo's biggest success has been in educational environments with children from the ages of six upwards being taught a structured approach to problem solving.

It is important to realise that Logo is not just turtle graphics but a complete computer language with the ability to define your own commands, list processing and all other computer language features. Logo is, however, an interpreted language and not particularly fast. Of the Logos I've seen on micros, Apple Logo and Terrapin Logo for the Apple, Atari Logo and Sinclair Logo are good implementations. Watch out for so-called Logos that are only turtle graphics programs.

For a complete contrast from Basic programming try the Lisp language. Lisp stands for LISt Processing. In Lisp everything is represented in list form and all operations are operations upon these lists. Although specifically designed for this purpose it has been adopted by the Artificial Intelligence fraternity and forms a good basis for experimentation in this area.

Lisp is one of the oldest computer languages, being designed to run on an IBM mainframe in the early 1960s. I feel that the transition from Basic to Lisp could be difficult as Lisp contains some idiosyncrasies from that old IBM mainframe. This



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Without doubt, there is no finer educational tool you can give to the teachers at your school.

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is especially true for inexperienced Basic programmers. Lisp is available for very many micros including the Spectrum, IBM PC and others. For a detailed description of the language and a tutorial, look at APC's back issues from August '84 onwards for Dick Pountain's 'Teach yourself Lisp' series.

On to Pascal, which was designed for use in teaching students computer programming. The idea behind Pascal was to produce very reliable programs which could be easily understood, modified and reflect the algorithm used to implement your program. Pascal also has a high reputation in terms of portability and transferring a program from one machine to another. It is probably a good choice for a second language as it is compiled.

Pascal is also available for a number of micros. The most popular version is one known as UCSD Pascal — general micro Pascal compiled into a special internal code known as P-code which is then interpreted, but the difference in speed can still be appreciated.

Another language, Forth, has a great following among the 'hacker' type of computer enthusiast. Forth systems give you a very small group of central commands from which you generate your own commands. It has been used to design the software within arcade machines, giving you some idea of its power. Although it is possible to generate readable programs in Forth, a lot of Forth users seem to delight in writing their programs as cryptically as possible.

Other languages you might consider are C, which is like Pascal but gives you a lot more power to deal directly with the machine you're programming; Action, a 'C' and Pascal clone available for Atari micros; and Cobol, a business language that will run on CP/M and other business-like operating systems.

TH

Immortality taped

According to a leading tape manufacturer all tapes, even C15s, should last indefinitely as long as the tape is rewound at least every six months to eliminate print-through problems.

Although software houses cannot be unaware of this fact, I find that no information on this subject has been given in advertisements or with any program I have purchased on cassette. The implication is, therefore, that the program will last forever.

If a program on a tape deteriorates to such an extent that it's no longer loadable, a reliable software house will replace it upon its return. However, the possibility of the software house ceasing to trade cannot be eliminated, which leaves the tape owner with no absolute guarantee of the program's immortality.

I suggest that all programs sold on tapes which have no free listing supplied, or which have an anti-copying device, may have been sold under false pretences (that is, no warning given that the tape will not last forever unless rewound regularly), and that the owners of such tapes could be legally entitled to a listing of their program.

N Davidson.

Viva Espana!

My problem is finding a word processor suitable for our Spanish Department. It must be complete (inc monitor and printer) and cost less than $6,000 inclusive of a year's supply of any necessary software (floppy disks, printing ribbons, and so on).

The prospective machine needs to perform two tasks: firstly, store the kind of information that is currently held on cyclostyped sheets in the secretarial office (booklists, and so on) allowing easy and quick revisions to be made; and secondly, enable members of staff to put drafts of articles and books onto disk for subsequent (and usually repeated) text-editing (including re-paragraphing and re-pagination).

To date I have run up against two problems. We need a keyboard that has all the necessary Spanish as well as English characters, that is, ¿ ¡ ñ ´ (and if the accent is on a dead key so much the better). We need a printer with italic font as well as roman if we are to achieve neat, camera-ready copy. The problem here seems to be the mixing of two typefaces on the same page: if you leave a gap for the later insertion of italic words and titles you can easily foul the line when re-adjusting the paper in the printer.

Is there an answer?

Dr A Longhurst

There's no need to buy an expensive dedicated WP system nowadays unless it's got to take an eight-hour-a-day pounding in a typing pool. The main difference between dedicated systemn and microcomputers used as word processors is that the former are tank-like in construction.

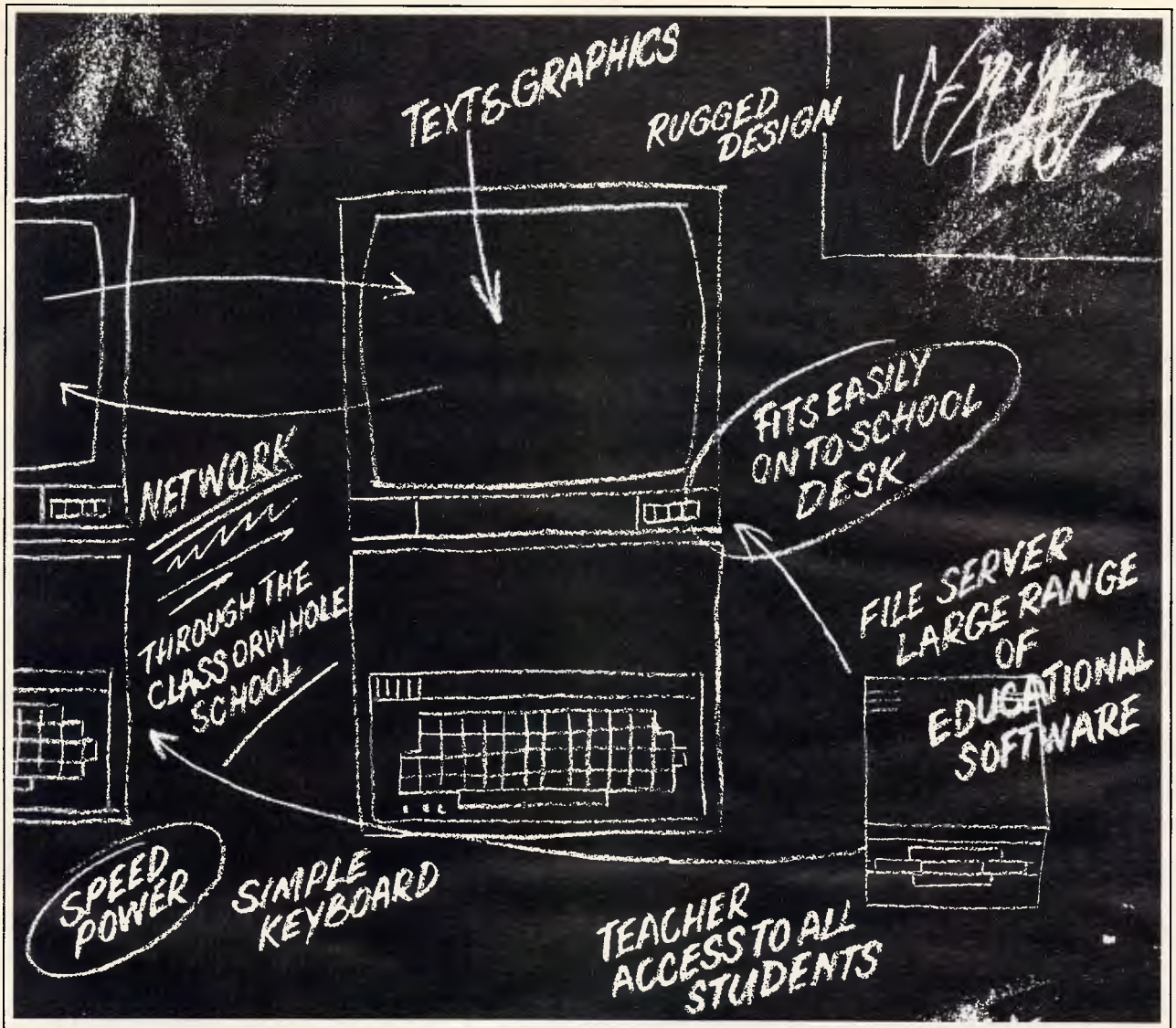
Your problem wouldn't be a problem if you lived in Spain because you could buy an off-the-shelf system (for example, an IBM PC, WordStar and an Epson FX-80 printer) all ready to run in Spanish and English.

Here it's not so easy. There are two main problems: the computer keyboard has to be reconfigured to give foreign character entry and screen display; and the printer has to be able to print the desired characters.

Regarding keyboard and screen, the IBM PC and lookalikes win hands down, since PC-DOS (the IBM PC operating system) includes routines known generally as KEYB command files. Simply type, for example, KEYBSP at the keyboard and it becomes a Spanish one, with a dead key for accenting vowels, and so on.

You don't indicate whether you want daisy-wheel or matrix output. With today's matrix printers you can often achieve Near Letter Quality (NLQ) printout which should be good enough for your requirements. Furthermore, a matrix printer can swap between fonts itself, whereas unless you spend many thousands of dollars on a two-wheel daisy machine, you have to stand over a single wheel one waiting for the computer to tell you to 'change print wheel now'. That's how it copes with different language character sets — you put a wheel for the language required into the printer every time the text changes language.

So we're down to an IBM PC, a matrix printer (either the IBM graphics printer, which is an Epson MX-80 customised to include extended graphics and font capability) or an Epson FX-80. The last part of the equation is the software. Although you can get word processing packages such as WordStar in foreign language versions, you'll only get one language pair for your money. That's because the package allows you to write



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BARSON COMPUTERS

English anyway because (as you know) there are no funny 'squiggles' over or under English letters.

Since you'll have to order a foreign language version anyway, I suggest the best package for you is the Western European version of a word processor called Multilingual, from a company called Economic Insights, 416 Centre Street, 365, Washington Grove, Silver Springs, Maryland 20880, tel: (301) 258 5235. For $450 you get a WP package for the IBM PC which can display and print character sets for all West European languages of the Indo-European family.

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C Anderson

We'd be interested to hear from an expert adventurer too who can spend time chairing a forthcoming adventure feature. Write to 'Expert Adventurer', The Editor, APC, 77 Glenhuntly Road, Elwood, Victoria 3184.

Add-ons for VZ-200

In reply to Nigel Pope's letter in the October issue of *APC*: an RS232 interface for the VZ-200 is available from Mr Ronald Rohde, 13/12 Walsh Street, South Yarra, Vic, 3141. It is sold for $49.95 by mail order only.

Mr Rohde also manufactures and sells various add-ons for the VZ-200, and offers an extensive range of software on cassettes.

I am a primary school teacher at a Perth primary school using the VZ-200 as an educational tool in classes.

R Bleckendorf

When in doubt — cheat!

```
RUN
110  Dear Ed, GOTO 130
120  BRAINDUMP, return
125  September issue of
     APC, return
130  With regard to the,
     GOSUB 120, article in
     the, GOSUB 125,
     which, GOSUB 150,
     was a very valid argu-
     ment, GOTO 230
135  'RETURN without
     GOSUB in line 15',
     see the GOSUB 125,
     GOTO 220
140  It's an, GOSUB 170,
     that, GOSUB 150,
     often interrupts the
     smooth running of a
     program when using,
     GOSUB 190, this,
     GOSUB 170, is,
     GOTO 135
150  In my opinion, GOSUB
     200, return
160  'RUN' return
170  'ERROR!', return
180  If you are reading this
     line you have crashed
     this program
190  'GOSUB', return
200  For what it's worth,
     return
210  But I have found an,
     GOSUB 170. This,
     GOSUB 170, occurs
     when the program is,
     GOSUB 160, GOTO
     140
220  END
230  A time & a place for
     everything, GOTO
     210
```

John Brown

(1000 If you read this you're cheating — Ed)

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Specify Operating System, Disk Size and Format:

_____

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ADDRESS: _____

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THE ADVERTISING AGENCY MS 238

Sony MSX

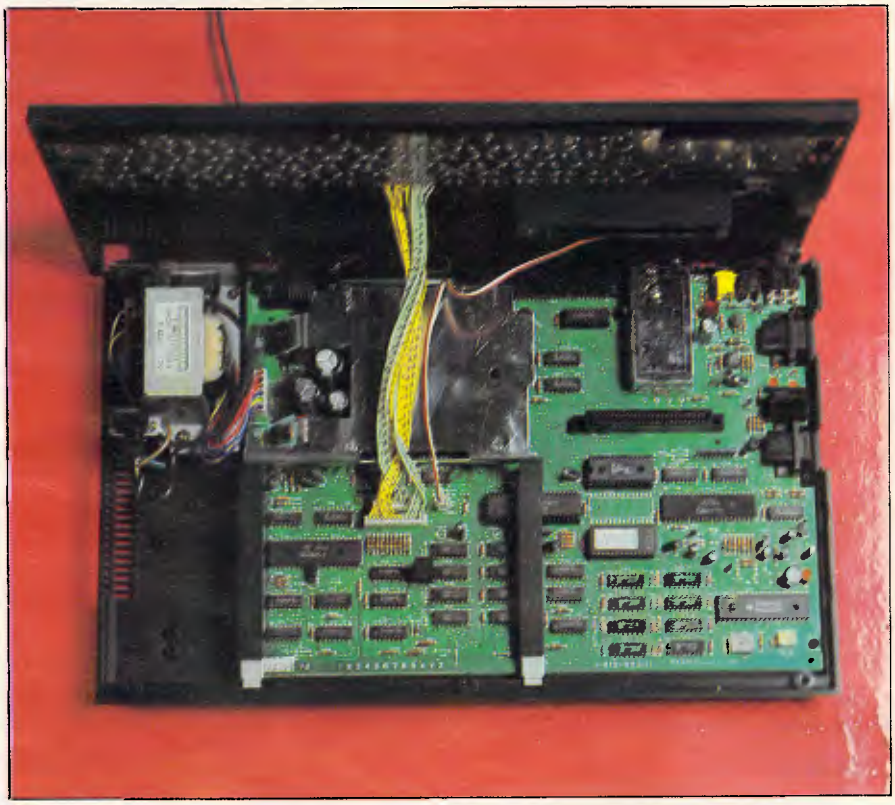
Australia is about to receive the long awaited wave of Japanese home computers. Most will conform to a standard known as MSX, designed to allow software produced for one machine to run on any other MSX micro (with some exceptions). Tony Hetherington looks at Sony's offering due to be released here in the first half of '85. Toshiba intends to precede Sony's launch date with its machine, set to be in the shops in March. The similarity of the machines means that many comments related to the Sony can be applied equally to the Toshiba and other MSX machines to follow.

The built-in programs are selected using the cursor and return keys

Pages of data can be searched for or sorted with this powerful utility

Information held on the Data Cartridge can be saved and loaded from tape

***Execu**tive image — the standard MSX keys are housed in a beautifully styled unit*



Inside: the main circuit board is dominated by four chips

MSX and the principle of software compatibility between machines have dominated the pages of computer magazines ever since the idea was first conceived a year ago.

Few people doubt the reputations or the financial resources of the companies involved — they read like an index of the major Japanese electrical manufacturers. Yet MSX has already had many critics. These critics, however, have based their arguments on the minimum specification of an MSX machine and have therefore missed the vital point: that MSX is only a central core around which computers may be built.

As the first wave of these computers is about to reach our shores, it is becoming clear that they go beyond that central core and contain some interesting built-in features.

The Sony HB-75 is not only one of the first MSX machines, it is also one of the better models. For around $400-$500 it offers 64k RAM, MSX Basic, an impressive choice of video output, including RGB, and 16k of built-in software.

Hardware

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to the MSX requirements but goes further. It is supplied in functional packaging complete with a carrying handle. Opening the box reveals the micro itself, three manuals and the TV and cassette leads.

The review machine was in fact an English translation of the Japanese version and not the PAL version that will be available in the shops. Obviously there are some differences between the two versions but I'll try to rectify these in the appropriate sections.

The MSX standard states that the keyboard will contain 73 keys including the standard qwerty layout, five function keys and a cluster of cursor control keys. However, it is left to the individual manufacturer to decide what to make the keys from and how to organise them on the keyboard. Sony seems to have spared no expense on your behalf, and has gone for the executive image by housing the keys on a beautifully styled unit.

The keys themselves are set into the front part of the unit which slopes towards the user. They are typewriter style with a good positive feel. Surrounding them are the grey 'support keys' which include a CAPS SHIFT with a built-in LED (showing when it is engaged), a graphics key to obtain the graphics characters from the qwerty keys and a suitably large RETURN key.

The five function keys are found above the qwerty keys and are rectangular rather than the usual square shape. They also require a firmer press to register in order to avoid accidental pressing. Another set of such keys are to the right of the function keys and include an INSERT and DELETE key which are used with the full screen editor. Also in the group is a STOP key to pause or stop a program, and a HOME key to position the cursor to the top of the screen. Further cursor movement is performed by the four cursor keys arranged in a cluster to the right of the other keys These are a bonus to anyone using the screen editor and can be used in games if you haven't got a joystick.

To complete the top of the keyboard there are keys for RESET and POWER. These are suitably guarded by plastic ridges to stop you from accidentally wiping out your programs.

Finally, the rear-raised section of the keyboard houses an MSX-compatible cartridge slot. A second cartridge slot can be found on the back of the unit in the PAL version which replaces the Japanese version's I/O port. This is quite a sensible change since all peripherals can be connected to the Sony via a cartridge slot or the built-in Centronics interface. Also along the back is an impressive array of video outputs and a cassette interface which, via the lead supplied, allow programs and data to be stored on an ordinary cassette recorder. The video outputs include the MSX standard RF (UHF channel 36) and composite audio and video, as well as the RGB output. This isn't particularly surprising considering Sony's interests in this field but is a welcome addition to any machine.

The external features of the Sony are completed by two joystick ports on the right-hand side of the machine.

Undoing just three screws allows access to the inside of the Sony HB-75. This contains an internal power supply and the main circuit board which is dominated by four chips.

The Z80A processor is partly obstructed from view by a supporting strut that protects the circuitry from over-zealous keyboard pressing. It runs at just over 3.5 MHz and has access to 64k of RAM.

The processor is ably supported by a remarkable chip, the TMS9918A, which is made by Texas Instruments and is a sprite-based display chip. It is fully interfaced with the CPU and controls the screen resolution, sprites, colours and monitors, updates the additional 16k of video RAM and provides the various video outputs.

Another chip, the PSG AY 3-8910, complements the graphics chip and is responsible for the 3-channel, 8-octave sound that is a feature of the MSX machines.

Finally, there is a 32k ROM chip. This holds the MSX Basic and completes the recognised MSX standard. Although the original MSX specification only called for 8k of RAM, all the MSX machines that I know of have 64k, although there are reports of some 16k versions.

One further chip of interest, which is unique to the Sony micro, is the 16k ROM chip. This contains a collection of programs and utilities held in firmware that gives the Sony the luxury of built-in software.

An additional piece of hardware called the Data Cartridge should be mentioned here. This should be considered by Sony owners as a *compulsory* optional extra as it fits into the cartridge slot and provides instantaneous storage and retrieval of data: compulsory because its presence brings out the full potential of built-in software. The Data Cartridge doesn't involve any new technology but illustrates the Japanese flair for innovation. Quite simply the one I had consisted of 4k of low voltage CMOS RAM continually backed up by a small battery with a five-year life — all packed into a cartridge. The theoretical limit would be a 64k cartridge but the cost of CMOS RAM imposes a realistic limit of 16k.

Although this facility is available to the other MSX machines, so far only Sony has given it any prominence. This is a shame as I feel when the cost of CMOS RAM falls this will become an important storage medium.

System software

Unlike the other MSX micros which go directly into Basic, the HB-75 displays a menu of options when the machine is switched on. These options are selected using the cursor keys and the RETURN button and include an address book, memo pad and diary-like schedule reminder.

Such applications have always been mentioned as uses for a home computer but have never been realised, as the time to load from tape has been too long, However, Sony seems to have found the answer through the Data Cartridge.

Each of these programs is identical in structure and provides the user with screens of nine lines of 15 characters in which to store an address, memo or schedule. These screens of information are given a heading through which they can be located and sorted.

Selecting the address option takes you into another menu of options which stretch along the top of the screen. The first of these is 'files' which, when selected, displays a list of all the address headings that are stored in the machine (or on the cartridge). Moving the cursor down to the one required and pressing the RETURN key is all you have to do to select the screen for that address. A nice little trick with the address headings is to arrange them so that they contain the person's name and phone number. This creates an additional phone directory.

New entries can be made via the NEW option by simply typing in the entry. When you've finished, pressing ESC not only returns you to the previous menu but also saves it to the DATA Cartridge if one's present in a cartridge slot.

Similarly, entries can be altered with the UPDATE option and, as with NEW, characters can be entered, altered or

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deleted anywhere on the screen. Again pressing ESC ends this process, but this time you are given the choice between keeping the updated version or losing it in favour of the original. While updating, you can clear the whole entry by selecting the delete option at the top of the screen.

The final option on the address menu takes you to the search/sort screen. Here you can search for a particular address by either typing in the whole title or a keyword. This keyword can be any number of characters and in either case only the appropriate files are listed. For example, if you had stored the addresses of all known computer magazines then the keyword 'Personal' would produce several entries whereas 'Computer' would result in a longer list.

As you create new entries these appear on the top of the 'files' list but there is a sort facility which will instantaneously rearrange into descending order, giving preference to either numbers, capitals or small letters.

There doesn't seem to be a limit to the number of file entries that you can have unless you are using the Data Cartridge which would impose a 4k limit — about 22 full screens. The entries can be either kept on the Cartridge or saved to tape using the transfer utility. If the Cartridge is present then an additional tape to cartridge utility is also available. Any tape-saving process also includes an automatic verify, so you should ensure that you note the tape position from which the data is saved.

The whole process is very user-friendly and simple to use. So simple that I managed to discover all its facilities without having to delve into the accompanying Japanese manual. Thank goodness!

The software on the review machine still contained some Japanese characters which won't be present in the PAL version. According to Sony the opportunity is also being taken to improve the machine. This will be a difficult task as the HB-75 already performs well. Yes, the screen size is limiting but 150 characters should be enough for anyone's address, memo or schedule reminder.

As mentioned above the memo and schedule reminder have identical structures but you should use the former as a notepad and the latter as a diary. Sony included various entries already saved onto the cartridge as examples for me to find, including a reminder of when to return the machine. Obviously the software is only at its best with the Data Cartridge which is why I referred to it as a compulsory extra.

You can also use the Cartridge to store a program using the SAVE "CAT:" command. This can then be recalled at any time by the opposite LOAD "CAT:". Unfortunately only one program can be stored at any one time. However, with careful planning you could have several routines as part of a single program. This ability to write to a Data Cartridge is just one of the Basic command sequences that sets MSX Basic above run of the mill dialects.

MSX Basic is the final option on the main menu and when selected takes the user into the standard programming screen found on all MSX micros. The screen colours are set to white letters on a dark blue background, although any of the 16 colours can be used.

The current setting of the function keys is displayed at the bottom of the screen. (F1-F5 are displayed, pressing shift reveals F5-F10.) The keys are preset to include commands which are useful to programmers and include AUTO to generate line numbers, LIST and of course RUN. These keys can be easily redefined and can be used effectively in programs via the ON KEY GOSUB command. This command is followed by a series of line numbers which the program jumps to depending on which function key is pressed. This matches the ON GOTO and ON GOSUB commands found on other machines for jumping to a line number depending on the value of a variable. However MSX also includes the useful ON STRIG which is dependent on the direction of a joystick.

These commands should not be confused with the more powerful interrupt-driven commands which have a similar syntax; for example, ON INTERVAL. These are driven independently of the Basic program by interrupts that are generated by the display chip sixty times a second.

The ON INTERVAL command is used to define time intervals at which subroutines will be called. The time interval is written in sixtieths of a second, so 10 seconds would be coded as ON INTERVAL=600 GOSUB 1000. This command would be at the beginning of the program and would

be started by INTERVAL ON. Thereafter, every 10 seconds, the program would jump to the subroutine at line 1000. Later in the program it could be halted by INTERVAL OFF.

Other interrupt commands include ON SPRITE which is activated by a sprite collision, ON ERROR by a program error and ON STOP by an attempt to stop the program. The ON SPRITE command is particularly powerful since, without it, it would be almost impossible to check for collisions between the 32 sprites supported in MSX Basic.

These sprites are just one of the advanced graphics facilities which earn MSX the X for extended in its name. The others include the self-explanatory CIRCLE and PAINT and the powerful LINE command. This, in its simplest form, draws a line between two points but adding a 'b' in its syntax draws a box with two of the corners at the defined points. Finally, add an 'f' after the 'b' and the box is filled in.

More complex line drawings can be quickly created using the graphics macro language via the DRAW command. This is a logo-style language which follows simple drawing instructions. For example, U10 draws a line 10 pixels long up the screen. There are similar commands for left, right and down as well as the diagonals. The instructions are placed in a string which is then drawn. DRAW "U10L10D10R10" draws a box. A similar macro language controls the sound which is then PLAYed.

The pixels referred to above are part of the 256 x 192 graphics screen — just one of three screen modes which can be selected with the screen command. However, I would imagine that the 30 x 24 text mode would be dropped in the PAL version, leaving the 40 x 24 mode, as Australian users will have little use for Japanese character sets.

These advanced Basic commands will be ample compensation to MSX users for the relative slowness of the Basic (see Benchmarks) and only having 28k of the original 64k for program use. They will allow even the beginner to produce remarkably sophisticated games and programs and the more advanced machine code programmers will relish the 60k of memory available.

Applications software

The amount of software available for a machine is of critical importance to its performance in the market. A number of technically sound machines have failed because of the comparative lack of software. MSX machines should have no problem in this area because the principal theory behind MSX is software compatibility.

This is the quite simple idea that software written for one machine should work on another. The video market is a good example of this in practice where any VHS machine can use all VHS cassettes (although even in video there's the rival Betamax standard).

The software houses obviously agree with the principle as at the time of writing over 45 of them are preparing catalogues of up to 15 titles each. This list of 45 companies contains the majority of the market leaders, planning MSX versions of their chart-topping titles.

On top of those already committed there is probably an equal number waiting in the wings to see how well MSX-based micros sell. Should MSX take off, then I would imagine that the number of titles available will be immense, possibly even rivalling the Commodore 64's range.

It is obvious that such a large range will include the inevitable fruit machine and space invaders programs which seem to plague most micros; but then I feel the machine's facilities will generate more advanced software. For example, machine code programmers have 60k to play with which is unrivalled in the home market. Similarly the Data Cartridge combined with a cartridge in the second slot provides the opportunity for immediate software.

Sony 3½in disks will be a third medium available to software houses and will no doubt be used to provide MSX owners with a range of home and small business packages including a comprehensive CP/M library.

Another reason for the availability of software is the help that the MSX group is giving to software houses — including a full list of useful ROM calls. This should be taken as a lesson to other companies who try to keep such information to themselves; which attitude is somewhat self-defeating as without such information programmers cannot best use a machine's capabilities. Consequently, the standard of software suffers and therefore so does the machine itself.

Documentation

Documentation is especially important in a machine aimed at the first-time user and therefore should contain a Basic language tutorial as well as machine instructions. The task of evaluating the Sony manuals was almost impossible as they were all in Japanese. However, by virtue of the

'The Sony HB-75 will be a very tempting buy to a first-time buyer. . .As an MSX machine it carries the benefits of an easy to use and powerful Basic with a promised glut of software.'

Technical specifications

CPU:	Z80A processor running at 3.58 MHz
ROM:	32k MSX Basic; 16k firmware
RAM:	64k RAM; 16k video RAM
Keyboard:	73-key MSX standard incorporating five function keys and a cluster of cursor keys.
Display:	Text mode 40 x 24, graphics 256 x 192. 32 definable sprites, 16 colours.
Sound:	Three channels, eight octaves.
Interfaces:	Centronics (printer), two MSX cartridge slots, standard cassette (1200/2400 baud).
Video output:	RF (UHF ch 36), composite audio and video and RGB.
Dimensions:	407 x 67 x 245mm (width, height and depth respectively)
Weight:	2.8kg

Benchmarks

BM1	2.1
BM2	6.0
BM3	16.8
BM4	18.3
BM5	19.3
BM6	31.2
BM7	44.8
BM8	216.3

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

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fact that Basic keywords are recognisable, an educated guess can be made.

The three manuals supplied were: the introductory guide to the HB-75; an explanation of the built-in software; and a Basic tutorial guide.

The introductory guide takes you through setting up the computer and on to an explanation of the keyboard, particularly the function keys and CTRL key permutations. It closes with a full technical specification and even a vague memory map.

The second manual provides relatively clear instructions about the use of the firmware. This manual couldn't go wrong as the programs are well-structured and easy to follow. However, the manual presents it comprehensively and includes a diagram of the tree structure of the software marked with the key presses necessary to move around it.

The Basic tutorial manual will no doubt be renamed the 'Fido' manual as it likens the computer to a dog called Fido who is very good at following commands. This is quite a nice analogy which sets the tone for a manual blatantly aimed at children. (I was supplied with a direct English translation of this book which turned out to be a competent beginners' guide to MSX Basic).

The main failing in the three manuals is the apparent lack of any explanation of the more advanced and useful facilities of MSX Basic. For example, there is no mention of the machine's 32 sprites, nor of the useful graphics commands or of the more involved interrupt-driven commands. This is a shame since it is these facilities that set MSX Basic ahead of other dialects.

However, according to Sony a fourth manual is being prepared which should answer these criticisms. This manual is said to include an explanation of each of the Basic keywords, with discussions and examples of the more advanced features.

Prices

At the time of writing exact details of the prices of the MSX machines are still somewhat vague. An early indication suggests that they will vary between $400 and $500.

This price compares well with other $400+ micros; for example, the Commodore 64 and the Plus/4. The 4k Data Cartridge is likely to cost about an additional $50.

Conclusion

The Sony HB-75 will be a very tempting buy to a first-time buyer, particularly if they already own a Sony product. As an MSX machine it carries the benefits of an easy to use and powerful Basic along with a promised glut of software.

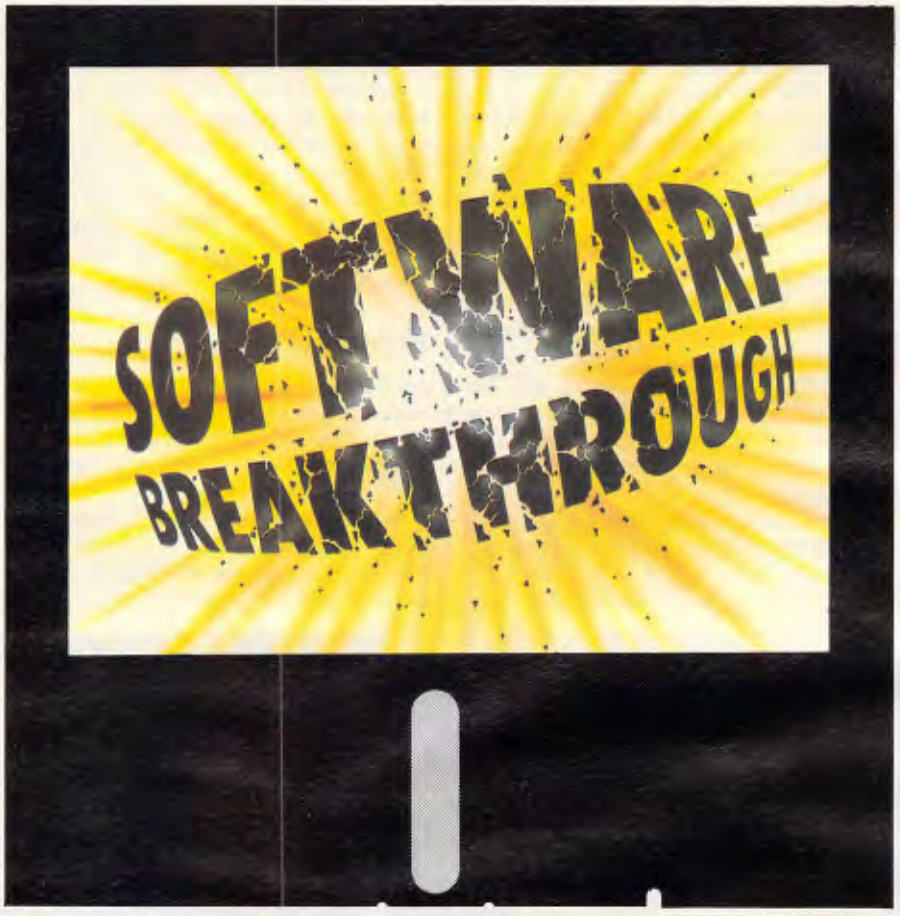
It also expands on the MSX core with the inclusion of RGB and three useful firmware packages which illustrate the potential of the Data Cartridge. The 3½in disk drive will be only one of the many peripherals available as hardware manufacturers will no doubt jump on the MSX bandwagon.

However, it is unlikely that the computer industry will stop developing at its current rate. It may slow down a little, but development will continue. Consequently, there will always be room for really innovative designers as they take home machines into the next generation.

It is debatable whether the MSX machines will be able to cope with these developments. Even if they don't, they will still form a much needed base line.

Deskto

In this exclusive hands-on review, Peter Worlock takes the wraps off a major new desktop system from Digital Research. Running on any 16-bit machine, with all the features you've come to love, it's a real gem, he says.



Things have been fairly quiet at Digital Research recently. Certainly, the company has released some useful products — DR Logo and DR Graph among them — but nothing to compare with the industry-shaping CP/M on which the company was founded.

However, a product announced last month should change that. At a secret location we were allowed an exclusive hands-on preview of a product that will shake a few people. Not least the people at Apple Computer.

DR's latest release is a full, Lisa-like desktop system that will run on any 16-bit machine. To call it a welcome development is a gross understatement — it should be met with open arms by users, programmers, software publishers and manufacturers. Everyone except those at Apple, in fact.

Consider the predicament of many computer buyers: everyone has found the desktop interface introduced by Apple's Lisa an attractive proposition, but Lisa is expensive. The Macintosh promised a cheaper way to get your hands on the system but with drawbacks; the single drive on the Mac has attracted criticism, and the tardy arrival of its software has not helped.

Now enter Digital Research with its Graphics Environment Manager — GEM. Suddenly here's the prospect of the desktop environment running on IBM PCs, Olivettis, Sperrys and the like. And GEM is compatible with the massive range of existing software.

Features

So, what is GEM offering? All of the features you've come to know and love from Lisa and Mac — icons, pull-down menus and so on. However, in many respects the GEM is closer to Lisa than to the Mac, especially running under Concurrent DOS.

The basic GEM software sits between the operating system and the applications and on boot-up presents icons representing the disk drives. Open the relevant icon and you get an open folder containing all files on disk, again represented by different icons according to file type. Perverse users can select text mode and the icons vanish to be replaced by a more normal-looking directory complete with file types and length. Directories can be sorted alphabetically, by size or type.

Your existing software — WordStar, 1-2-3, Supercalc or whatever, will also appear in icon form. Position the cursor over the icon, select, and you go to the usual program environment and things work as normal. Exit the program and you find yourself back on the desktop.

The compatibility is achieved by using a GEM core which provides only the simple disk icons. Further into the system you're using more of GEM, but when you select another program the core flips out most of GEM and hands control to your application, loading GEM back in when you're finished.

DR will also be offering a number of utilities using the full GEM system. They include GEM Draw — a sort of Lisadraw — and a program for creating presentation slides. Both offer facilities familiar to Mac and Lisa users — boxes, fills, a range of text sizes and fonts.

For the programmer, GEM offers a similar range of benefits. Not least of these is the fact that it's portable across a range of machines and offers a standard interface. So software authors can program the environment, not the target system.

DR will offer a programmer's toolkit containing development tools and this should run with a range of languages including Pascal, Cobol and C. The programmer also gets complete redistribution rights.

In use

GEM is difficult to fault, even in the pre-

os get riendly

release version we saw. Running on a standard 5MHz IBM PC it was very fast and smooth, and embodied the extreme friendliness of Lisa and Mac.

Once further programs appear using its facilities the software should be exciting. In the meantime, it scores heavily by allowing you to run the industry's best-selling applications on the most popular machines.

GEM will also support a variety of input devices: the mouse, of course, as well as standard keyboard cursor controls, joysticks, digital graphics pads — even a touch screen (with an eye to Hewlett-Packard?) and voice input.

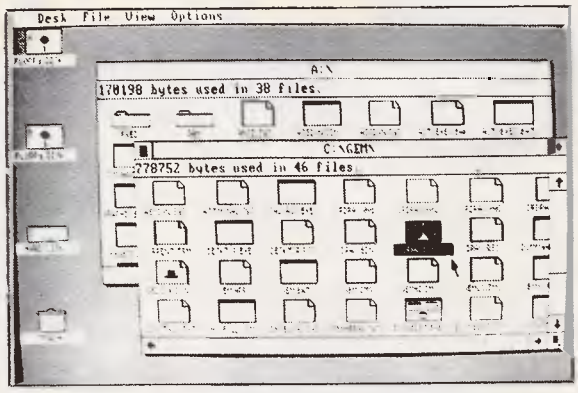
DR is talking about a minimum system of 256k and single disk drive — the memory requirement allows for operating system, GEM and a larger utility like 1-2-3.

The origins of GEM are not hard to discern given DR's success with its GSX graphics system, now under license to more than 75 OEMs, and the company seems set to repeat that success on the same route.

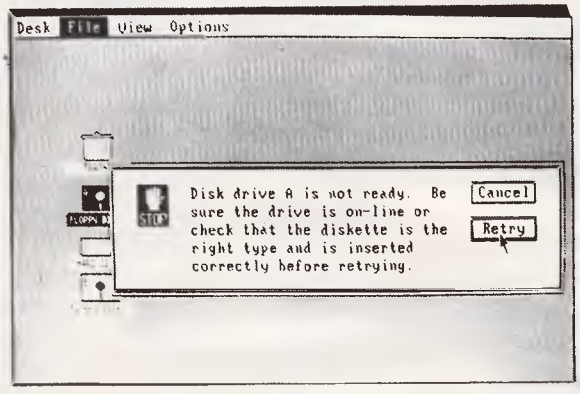
Conclusion

It's hard to see how GEM will fail. It is rumoured that some computer dealers use the Mac's supremely friendly face to lure buyers into the shop, and then sell them PCs and compatibles. DR may have heard similar stories; the company says: 'We think what the computer people find attractive should be the computer they buy.'

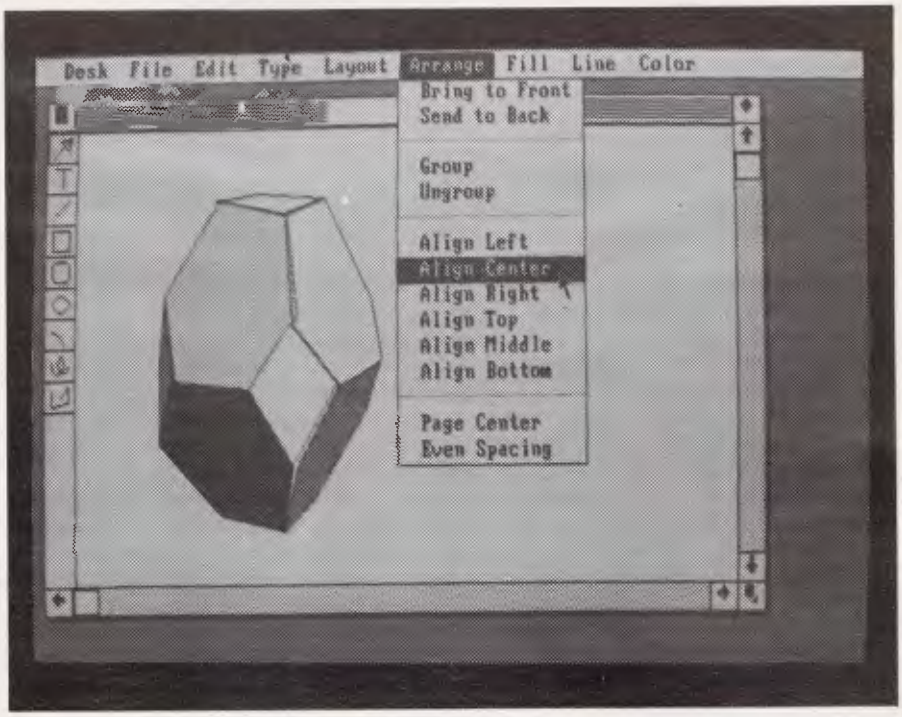
With Apple counting on the Mac to fend off IBM, GEM will be as welcome there as a worm in your Granny Smith. But for other manufacturers it offers a spring-board to that 'new age of user-friendliness' they're all talking about.



The GEM desktop in action showing directories of drives A and C (a hard disk). The 'C:/GEM/ designation shows that the directory is one level — ie a directory of the folder GEM on drive C.



GEM features full error messages and demands a response before allowing you to continue operations.



The GEM Draw application lets users create and edit charts and diagrams

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TI Speech Command System

Will speech recognition/systhesis become the accepted way of communicating with your micro, or will it remain an expensive plaything for the jaded executive? Martin Banks confers with the Speech Command System from Texas Instruments, and has a lot to shout about.

We take speech for granted. It has been for many millennia the best method of communication between individuals. It makes sense to assume, therefore, that at some stage it will also form the best way of communicating between those two other individuals — the human being and the computer system.

We have all become so used to the idea that competent speech recognition and synthesis systems are the stuff of science fiction — that they will happen sometime in the future — that it comes as something of a surprise to discover just how much they belong to the here and now. While computer companies and software houses try to promote mice and touch-screens as sensible alternative input devices to the keyboard, the natural alternative — speech — has been creeping up on us unawares.

Several companies now offer speech-based systems for personal computers, not least of which is Texas Instruments (TI). This company can arguably claim to have played the most significant role of all in developing speech systems, having long ago introduced such wonders as the educational toy, Speak'n'Spell. This utilised a speech synthesis technique called Linear Predictive Coding, which allowed the company to make systems with tolerably 'human-like' speech in a simple and inexpensive form.

Real speech was recorded as discreet words and phrases in a digitised form. The predictive coding technique meant that each second of speech could be stored in a much reduced capacity — 12k rather than the 30k normally required at the time. Each word or phrase was stored at a specific address in memory, and speech could be simply constructed by calling out the addresses in the right sequence.

At the same time, the company was working on speech recognition systems with vocabularies of up to 50 words or phrases, which could be used to control simple functions where one-word commands were sufficient or where numeric data input was required.

TI has now taken these two capabilities and combined them in a hardware/software add-on product for its Professional range of desk-top personal computers.

Called the Speech Command System, the product has been available for several months. TI did not shout about it from the roof-tops: the company's conservatism, a natural state of mind for Texans, precluded making too much ballyhoo about the speech system, even though there's a great deal to be said in its favour.

Hardware

For $3000 the user gets the add-on circuit board containing the speech synthesis and recognition systems, a microphone, a headset (giving the option of machine responses that can only be heard by the user — useful in open-plan offices), and system software.

On the test machine, these items came pre-installed by TI on a hard disk Professional system. The company had also performed some pre-installation of voice commands for Lotus 1-2-3 which had been created at a previous demonstration. These allowed me to control the operation of the package, as well as enter data — and meant that I could use the machine immediately.

Software

Setting up a vocabulary for any applications package is a relatively simple, if time-consuming, one-off task. The beauty of this facility, once installed and working, is that it allows the user to operate in a largely hands-off mode: TI calls it the 'Transparent Keyboard'.

For many applications it won't be relevant: it's not the Orwellian 'Speakwrite' machine that all frustrated keyboard drivers pray for. With others, however, and Lotus 1-2-3 is a good example, it works well.

Imagine the harassed executive telling the computer to enter data, speaking numbers to it and getting printed results, all while scribbling something else by hand.

When the software has been installed on the hard disk, setting up the system is quite simple. The Speech Command System is called from the Professional's MS-DOS operating system by keying in SCS. This offers the user the choice of four applications — Telephone Manager, Calendar/Tickler Manager, Dictation File Utility and Transparent Keyboard — plus an exit back to the OS. Each application is called by function keys, and three have distinct capabilities based on the system's speech synthesis and-or recognition facilities.

The Telephone Manager offers a variety of telephone answering and control capabilities. The Calendar/Tickler Manager is a non-speech application, being just a nice, if standard diary and calendar facility; the Tickler part is a facility enabling specific events to be brought to the user's attention at a stated time. In other words, you can get the machine to flash a reminder message onscreen.

The Dictation facility and the Transparent Keyboard are of most interest. The latter is called by function key F4. Once loaded, it asks you for a vocabulary file name which can be any descriptor you like; for example, the pre-

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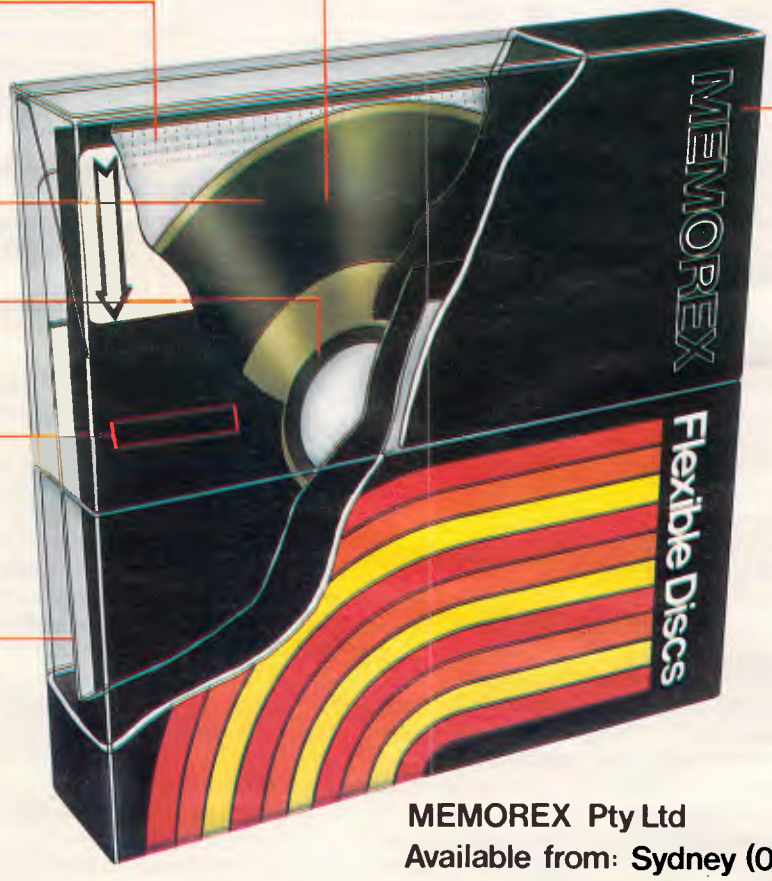

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The TI Speech Command System is an easy to use but expensive add-on for the TI Professional range of computers

installed Lotus filename was E:123.VOC, E: defining the drive location and .VOC defining it as a vocabulary file (it isn't necessary for the user to key in the .VOC extension). The system will also ask for a description of the file for easy clarification by the user. Each vocabulary is stored as two separate files: one being the words used in the vocabulary together with their equivalent keystrokes; the other the digitised recording of the spoken words.

The system requests the phrases to be used, together with the equivalent keystrokes. The phrases obviously depend on the application, but will be predominantly of the 'right', 'left', 'mark block', and create a graph' type. They can also be numbers or letters of the alphabet. Each vocabulary, of which there can be nine, holds fifty words or phrases, and can be used for different applications of the same voice, different voices for the same application, or continuations of single application vocabulary. When each phrase has been keyed in, the system asks for the equivalent keystrokes. In some cases (for example 1, 2, 3, 4, and so on) the keystroke is obvious; for others, it requires checking the applications program manual to see which control keys are used (for example, 'centre text' in WordStar is CTRL OC), and then checking the Speech Control System documentation appendix for the equivalent codes. (Although this may sound rather tortuous, it is quite straightforward.)

Once the phrases have been entered into their file, the next stage is to enrol the voiceprint for each one for which the system provides easy, explicit, onscreen instructions on what to do and how to do it.

When the enrolling process is selected, you are asked to speak each word or phrase as it's highlighted on the screen. You start the recording process by pressing the relevant function keys; as each phrase is highlighted you say it. Should the system not register it, it stays on that word and you repeat it; otherwise it highlights the next phrase, and so on, through the vocabulary.

You are then asked to update the voiceprints, which gives a better chance of recognition by the system. TI recommends a minimum of three updates per word, although the maximum allowed is nine. The system cycles through the vocabulary in blocks of five words at a time, which you repeat the stated number of times.

The recognition capabilities can be tested by displaying the full vocabulary onscreen and saying any of the phrases. The system will display the phrase in red (poor recognition), yellow (reasonable) or green (good), and gives a rating out of 10 for each one. Users are advised to give the red phrases further updates.

To run an application program with this newly created Transparent Keyboard vocabulary requires one further stage. By going back to MS-DOS, you have to call up the keyboard interrupt program TPKSETUP: this allows the voice control to enter the commands or data for which it has been configured. This program contains the one quirk in the system. It is essentially a menu-based configuration program that cycles endlessly through the same menu until you realise you have to QUIT to get out of it.

With all these stages complete, it's now possible to load the application program in the normal prescribed manner and talk it through its paces.

In use

Although speech synthesis is still a new technology and not without its teething problems, this system shows what will be possible in the future. The problems mainly revolve around the recognition rate, which can be patchy, but this is not so much a fault of the system as of the human operator.

By its very nature of operation (comparing an input with a stored record), there has to be a high degree of consistency in the voice before actions occur. Human speech and inflection is not, however, always as constant as it might be. Sometimes, the system does not recognise a command or phrase that it received a few minutes earlier, revealing the need for a certain circumspection in pronunciation. One way round this is to update the stored phrases periodically. The keyboard interrupt program does not block out the use of the keyboard, so all normal command keys are fully functional if required.

One notable improvement in the system over early speech recognition equipment is that its speed of recognition is vastly increased. The spoken words and phrases can be picked up quickly by the machine, so the user does not have to converse in the boring monotone normally associated with such systems.

It is indeed fast enough to pick up commands and data in the middle of normal conversation: a user can 'talk' to his computer in the 'Will you Create A Graph of the Block made up of Rows A4 and A5' mode, and it will select the relevant instructions.

The Linear Predictive Coding technique used by TI to digitise speech has one particular advantage over other approaches which makes it one of the fastest systems available. It's not necessary to speak so slowly as to forget what you want to say. Indeed, the machine can record the spoken word as fast as you can say it, and then play it straight back at you with a quality approaching that of audio cassette recorders.

Also, there's no limit, excepting disk capacity, on the amount of speech that can be recorded. On a 10Mb hard disk, some four hours of continuous speech can be stored, and stored as one large disk file if necessary. The value of this capability might seem minimal, but it does offer considerable promise for the future.

TI has introduced a networking system for the Professional, so it's theoretically possible to append a number of supplementary disk files to a document being sent via electronic mail to another user. There is no reason, in theory, why one of these should not be a file of recorded speech that offers the recipient help, comfort or advice of a verbal nature. At present, TI does not have the specific software tools available to do this, and company executives smile sweetly and 'refuse to speculate on future products' when asked about it.

Having called the Dictation File Utility up from the speech command system menu, the system asks for a filename and description. The means of identifying up to 50 different dictation items appears, with each one requiring a different entry name and description. By using the function keys to select the input device (microphone or headset) and the Record function, you are ready to start: you can record all 50 entries in sequence, or select a specific entry. It also allows you to modify existing entries and add new ones easily. Then, press the appropriate function key and start recording. Playback is either by pressing P to play the last file, or function key 5 to play all files.

To test the system's quality, I recorded a portion of Test Match radio commentary via the microphone and a small portable radio. Tony Greig sounded remarkably like himself at playback until, of course, I speeded things up. A feature of the TI speech system is that recordings can be played back faster, slower, louder or quieter without the pitch of the voice changing. Spoken phrases are still being made by a recognisable voice, but you never knew you could talk that fast!

A more important feature of this facility is that, once the exact entry filename is known, it's possible to get straight into a dictation file from MS-DOS: messages can be left on the machine to be played back later.

Documentation

The documentation is well-written and well-presented, with simple built-in demonstration routines to show how to set up the system. The program obeys the same rules when applications other than the demos are tried.

Prices

The Speech Command System is an add-on product aimed at the top-of-the-range TI Professional (although it will run on smaller models). It adds $3,000 to the price of the machine.

Conclusion

One of the most interesting aspects of the Speech Command System is that, despite being a product well out at the forefront of technological development, it's surprisingly easy to use.

It would be easy to dismiss the Speech Command System as an expensive executive's plaything, primarily suitable as the ultimate status symbol within the corporate pecking order. In its early stages of availability and use, this is likely to be its main market-place. It does, however, offer facilities that are of considerable value beyond the gimmick of driving a spreadsheet by voice. The Dictation File Utility, for example, especially when coupled to electronic mail and networking, has boundless possibilities in extending the power of voice communications.

The speech recognition system, which can be made to work with some 450 different words or phrases, could, for example, be turned into a simple word processing system for the disabled. It would not be able to decipher every word spoken to it, but if the word or phrase were one of a limited vocabulary, then it could be brought together in a word processing system for those who cannot use their hands.

This is a product that is fun to get to know, interesting to use, yet has real purpose and value, too. It's also an indication of what the future holds.

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Shinichiro Kakizawa is a computer technology and applications consultant, and a freelance journalist. He has worked in the computer industry for twenty years, originally on mainframes, and for the last five years on micros. Fujitsu and NEC are among the companies he has worked for and he has been involved in policy setting for the Japanese fifth generation project.

Multi O/S software

Megasoft is selling a package which allows CP/M-80 and CP/M-86 software to run under MS-DOS. This interesting approach comes in the form of interface software which will run immediately below MS-DOS (versions 1.25 and 2.0). Data can be shared between MS-DOS and CP/M, exchanged, and stored on the same disk. The package is called the EM/3 O/S Integration Adaptor and costs around $350. Manuals unfortunately are only available in Japanese at the moment.

1Mb, 1.6Mb in one floppy drive

There is good news for micro users who have difficulty knowing what to do with ever-increasing piles of diskettes in different capacities and densities for a variety of systems.

The majority of the machines on display in shops in the electronics bazaar, Akihabara, Tokyo are now equipped with a standard 1.6Mb floppy disk drive. Only a year ago, the standard was more like 1Mb. As elsewhere in the world, micro users in Japan are facing difficulties with stacks of incompatible floppy disks.

Matsushita (also known as Panasonic) has come up with a decent solution for this problem. Its new drive, called 'Super mini FDD JU591', can read/write two different capacity disks with a single drive by automatically changing the rotation speed of 5¼in disks between 300rpm (1Mb) and 360rpm (1.6Mb). Diskette type can be identified automatically within one second of insertion. Matsushita's plan is to produce 200,000 units this year at its Hananomaki factory in Northern Japan, and it has been talking to a number of micro assembly makers around the world. You may see new micros with this drive before Christmas. The price (note that it's only for OEM sale) is $300.

From black/white to colour in the classroom

Panaboard is a little expensive but a very useful tool for classroom training. What you have written on a black/white board can be hardcopied in colour, transferred to VDU or large video projector, or stored on disks.

Panaboard is from Matsushita, manufacturer of the IBM 5550; price is a little over $15,000. Last year Oki developed a black and white hard board copier, and this new machine is certainly a welcome addition to the micro classroom.

Let your watch do the walking

A watch capable of memorising telephone numbers for 10 people is being sold in Japan by Casio. The watch has a one-chip CMOS CPU, stores 10 sets of four alphabetic characters and 10 numeric digits, and provides a calculator function as well. The idea is similar to the Seiko wrist computer, but unlike the Seiko, this watch does not require a separate keyboard for input. How it will sell is yet to be seen, but my feeling is that watch computers have now established themselves firmly in the market.

Many more with a wide variety of features will soon follow, including offerings from Sanyo, Citizen, Ricoh and Seiko.

Calculating the premium

Sharp and Unix Ltd (a Tokyo system house) have developed a special purpose pocket computer for helping car insurance policy salesmen to calculate the premium quickly. The machine is based on the popular CE-1253H with 24k RAM. It has special function keys needed for car insurance, and cannot be used for any other purpose. This trend of developing more dedicated pocket computers suitable for only one task is a forerunner of future pocket expert systems. Sharp expects to sell a lot — over 20,000 — this year.

Industry overview

In the business microcomputer market, the biggest difference between Japan and the rest of the world is probably the non-existence of the IBM PC (I daresay you can buy it somewhere in Tokyo if you really want it). Instead, IBM Japan sells the 5550, something similar to the PC/XT in terms of horse power. The machine has been reasonably successful and large mainframe users are buying it, but unlike the PC, you can't buy the 5550 in micro shops in Japan.

The major supplier of microcomputers in Japan is, of course, NEC. It has sold over half a million systems, including the ever-popular 8-bit PC8000, PC6000 series, and 16-bit PC9000 machines. NEC has now firmly established itself as the leader in Japanese micros, mainly because it had the right machine at the right time when the micro took off in Japan four years ago.

NEC enjoys the same privileged position that the IBM PC has in other markets. Every software house writes packages primarily for NEC.

MSX arrival

There is no clear distinction between machines to be used by home users and business users, unlike Australia where the Commodore 64 etc are clearly for home and educational use.

In Japan, everyone has been using NEC, Sharp, Fujitsu, Hitachi, OKI, Mitsubishi, and Toshiba machines whether it's for home or business.

The only difference is the money spent on peripherals. Home and hobby users spend less, but the CPUs are usually the same. However, this situation is rapidly changing as more and more MSX machines are joining the force. MSX machines are cheap — current offerings are around $220 for an 8-bit 64k average machine. It will be interesting to see if the MSX standard is accepted worldwide.

Among the major suppliers, Sord is one of the first and has a lot of enthusiastic followers mainly among large business users. Sord's PIPS spreadsheet package has been as popular as VisiCalc.

It's rather sad that we don't see many world popular brands like Apple, Tandy, and Commodore. You can get hold of them if you wish but, except at the beginning of the micro fever, they haven't sold well.

Wrong pricing, inadequate advertising budgets and lack of decent support networks were the reasons.

It's very sad indeed that major companies of this stature let themselves down in this way.

Lateral thinking

A structured approach to programming the English language can lead to some interesting results. Andrew Couch gets to grips with natural language processing.

Providing artificial intelligence on a computer is undeniably difficult. But it's not too hard to make a computer a *little* more intelligent, even if not quite up to the standard of an expert system. As one example, this article explains how to program a computer to form an intelligent reply to a question it has never been asked before.

Structured language

Putting it simply, this can be done by identifying structures in the way words are used. The clever part comes when you have already structured this information and you ask the computer to interpret a pattern of words in a combination that it may not have seen before. The computer then has to consult its structures to see if the new combination of words conveys a meaning or asks a question which is consistent with the structures it possesses.

To manage this the computer must have a vocabulary, an understanding of tense and a set of structure rules. The computer will operate in one of two modes: *Learn*, in which it learns the relationship between words and obtains a symbolic representation of what the word means; and *Question*, where you ask questions which can involve new patterns of words to which an answer must be formed. Mixing these modes, such as asking a question like 'Did you know that . . .?', is not allowed. If it were, and a conflict arose between what was said and what the computer contained in its structures, how would the computer know who was correct?

Word classification

But before the programming problems are solved, we first have to identify the word structures. As we know (but do not often recognise), the English language is very complex, with an average adult having a vocabulary of over 100,000 words. Because of this, writing a program to deal with every possible question is very difficult, so some simplification is required. Consider the following: we have informed the computer that people can own cars but cars cannot own people. We then ask two questions concerning John and his Ford Telstar.

'Can John own a Ford Telstar?'

'Can a Ford Telstar own John?'

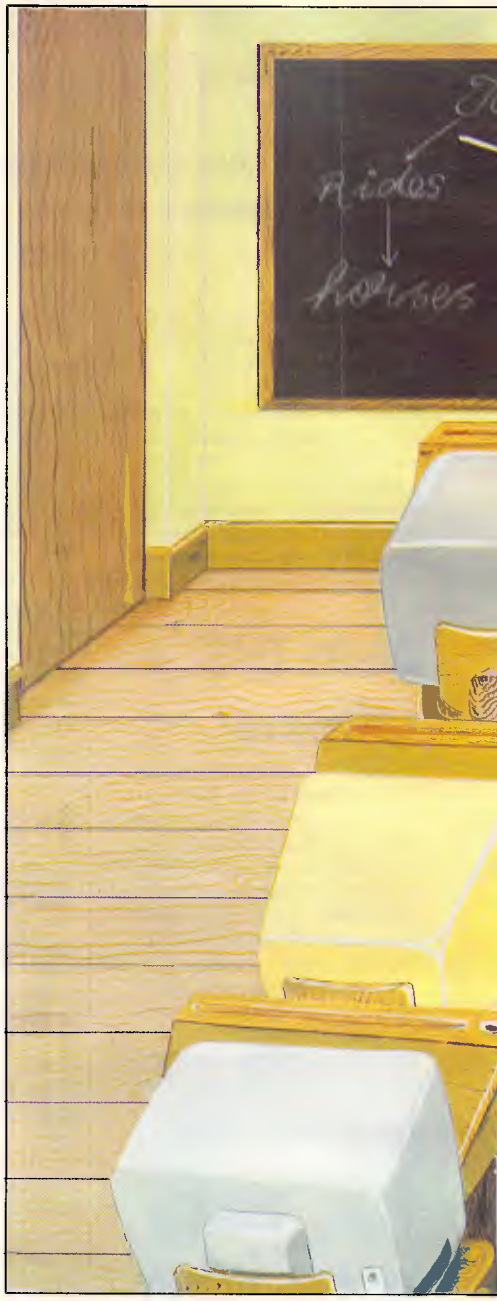
Before the computer can answer either of these questions it requires more information. It needs to know that John is a person and that a Ford Telstar is a car. The generalisation of the above example leads to the rule that people can own objects but objects cannot own people. Problems arise in statements such as 'He was a company man' which implies ownership of a person by a company, but these can be solved by specifying that a company is a name for a group of people, and as such is a grouping word for people and not an object.

Therefore, there is a need for some broad classification of words, so that the computer can establish general rules such as the validity of ownership between items. We shall consider four classifications of words which provide the basis for a good system: material objects, actions, values, and properties.

Material objects are all the things which make the world what it is. They are people, possessions, objects, and can be divided into three sub-classes.

(1) names of people; for example, John;

(2) objects which people can see, own, touch; for example, car; and



(3) parts of the objects in class (2); for example, wheel.

This type of sub-classification is relative. We could equally have defined our classes as:

(1) names of cities;

(2) famous buildings in cities; and

(3) objects found in the famous buildings.

The actual choice of what is to be classified is to some extent arbitrary. Only the relative importance, that class (1) is more important than class (2) which is more important than class (3), must be maintained.

The sub-classification of material objects sets up a type of hierarchy among the objects.

Actions are words which reflect that

something is being carried out, such as running, dancing and swimming; for example, 'The tree was *falling* over.' Values are of a purely personal nature. They express feelings, such as hatred and love. Properties are physical attributes of objects, such as colour, shape and size. They also reflect the current 'state' of something or someone; for example, 'John had flu.'

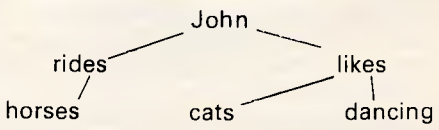
The 'state' here is that of illness.

Will any word fit into one of our categories? The answer, unfortunately, is 'not always'. But there are many cases where the classification works.

Word structures

Having classified words, we need to put them into a structure, and the one I've adopted is the familiar tree structure. The tree hierarchy starts from the base, that is the key word, and spreads out to various branches which represent words associated with the key word. From the branches hang the buds, that is the words related to the key word via the branch words.

If the analogy isn't clear, a practical example should help to straighten things out. In a sentence such as 'John likes cats', 'John' is a base word (and a grade 1 material object in our classification), 'likes' is a branch (and an action), and 'cats' represents a bud (and a lower-level material object). If another branch were added, for example 'rides', and further buds, for example 'dancing' and 'horses', the tree structure would be:



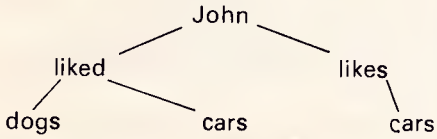
This simple structure is equivalent to storing the three statements:

'John rides horses',
'John likes cats',
'John likes dancing'.

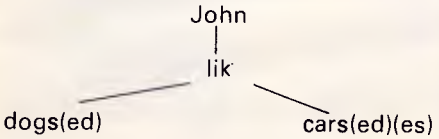
We've said that the computer requires the capacity to handle tenses. The way in which this is incorporated can be seen from the following example. Consider the three statements:

'John liked dogs',

'John likes cars',
'John liked cars'.
There is a definite distinction between *having* liked something and *still* liking it! We would normally construct the following:



However, the structure becomes more complex as we add on branches for tenses, so it is much easier to store the tense of a branch with its associated bud:



For cars we have the connecting branches 'liked' and 'likes' indicating that John both likes and *has* liked cars.

Programming

Now onto the programming. Each material object, action, value and property is stored as an ASCII string, closed by a delimiting symbol to indicate where the word ends. The delimiter is followed by three pointers. Material objects require a pointer to a possible plural ending, values and actions pointers to tenses, and properties pointers to endings. Using three pointers is sufficient to cover a range of possibilities, including the past, present and future tenses of regular verbs.

After the pointers comes a flag indicating the word's classification: flag 1 for a material object, 2 for an action, 3 for a value, and 4 for a property. Material objects are further divided into the three previously mentioned sub-classifications. Any inapplicable flag or pointer is given a value of zero.

Thus the word 'cars' would be stored as the ASCII code for 'car', followed by the delimiter, a pointer representing 's', two zero pointers, flag 1 (indicating that a cat is a material object), and finally its sub-classification (in this case, 2). A value such as 'like' would be stored as 'lik', followed by three pointers providing a range of suffixes such as '-e', '-es' and '-ed', and then ended by flag 2 indicating its classification (3).

There are two approaches to setting up a vocabulary of the words themselves. The first is to set up an array of strings and search various elements in the array. The other method, and the one adopted here, is to set aside areas of memory for the various parts of the program and use machine code search routines. This utilises the available memory best and also provides a very fast searching method.

We'll now describe in algorithmic form the technique to store a word in the vocabulary. For those who have a 6502-based machine the following is implemented using the facility of post-indexed indirect addressing (see also Fig 1).

STVADD start vocabulary memory pointer
WORDP pointer to beginning of vocabulary word, where the vocabulary word is (string)(del)(P1)(P2)(P3)(C)(Sub-C) as described earlier.
WLEN Word length, that is, string

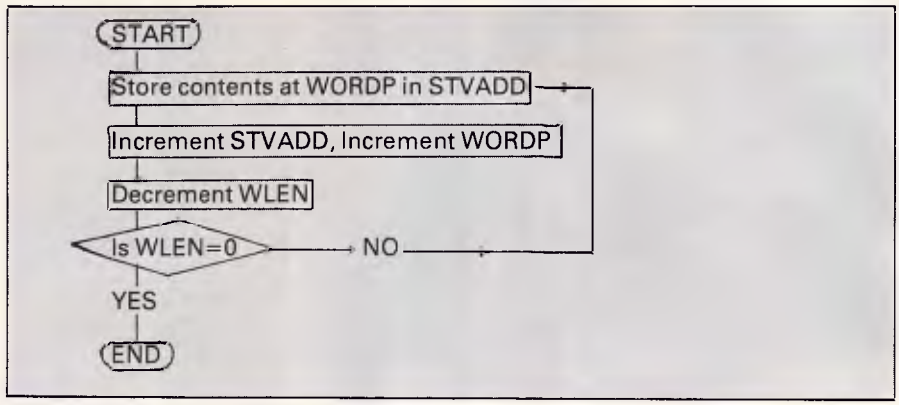


Fig 1 Algorithm for storing a word in the vocabulary

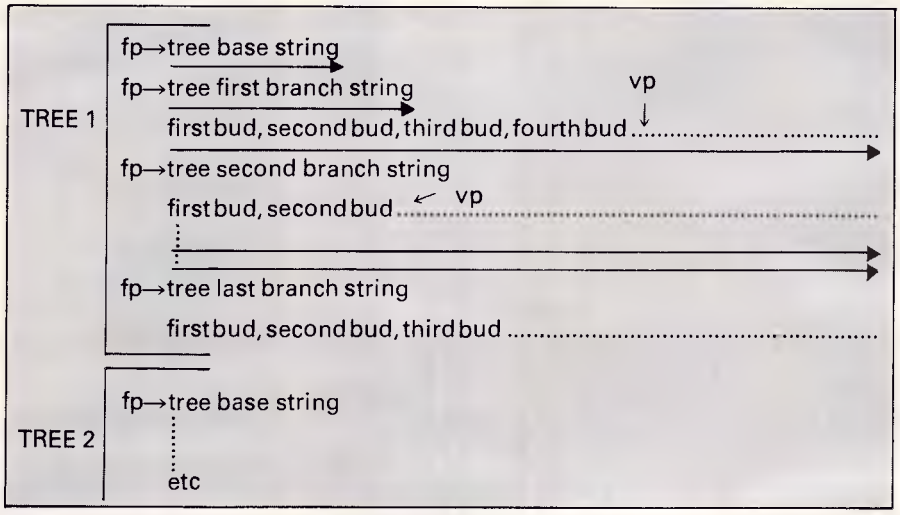


Fig 2 Storage layout of trees in memory

Pointer Table or Array	Pointer	Contents
P(0)	tree base 1	200
P(1)	tree 1, branch 1	210
P(2)	tree 1, branch 2	220
P(3)	tree 1, branch 3	230
P(4)	tree base 2	240
P(5)	tree 2, branch 1	250
P(6)	tree 2, branch 2	260
.	.	.
.	.	.
.	.	.

Fig 3 Pointer table

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The values assigned to the pointers covering tenses and endings are stored in exactly the same way, at a different point in memory. In both cases a record of the next free memory location is kept.

We will now look at how memory is to be allocated for the tree structures, and how these structures are formed, updated and searched.

The trees are laid out in memory as shown in Fig 2, where 'fp' indicates a fixed pointer to the beginning of a tree structure and 'vp' indicates the point in memory to which the tree has grown.

The arrows indicate how the memory is all sequentially laid out. Having trees of a fixed length with a fixed maximum number of buds in a tree does impose some limitations. However, this does simplify many other aspects of the program, and we trade off memory for speed of searches. Typically a useful tree system may have about five trees each with five branches, and each branch containing about 10 buds. The fixed and variable pointers associated with the tree structures are stored in tables, so to access any given bud a simple offset can be constructed from the tree number and branch number.

At this point in the pointer table the fixed pointer for the given branch will be stored. The memory starting from this fixed pointer can then be sequentially searched to find the desired bud (that is, the branch is accessed in an indexed indirect manner).

To illustrate this point, consider accessing the second branch on the second tree where each tree has a maximum of three branches. The pointer table would be as in Fig 3.

The index to the pointer table is calculated as follows:

(TREE−1)*3+(BRANCH+1),
that is,
(2−1)*3+(2+1)=6

So, pointer(6) contains 260, that is, the desired branch starts at memory location 260.

We'll now consider the 'Learn' mode of operation to explain how the tree structures are constructed. The Learn mode consists of three parts, two of which, 'add to vocabulary' and 'add to tense table' are straightforward applications of the algorithm described earlier to set up these tables. The third part of the Learn mode is constructing a tree structure or updating an existing structure.

Most of the time we are interested mainly with first class material objects and their relationship with other objects, so we'll only construct trees for first class objects. To aid explanation consider constructing a tree to contain the relation between John and his car. From the point of view of operating this part of the program all that need be entered is the statement: 'John likes cars.' This is the 'Learn string'. This statement would be read into a string variable.

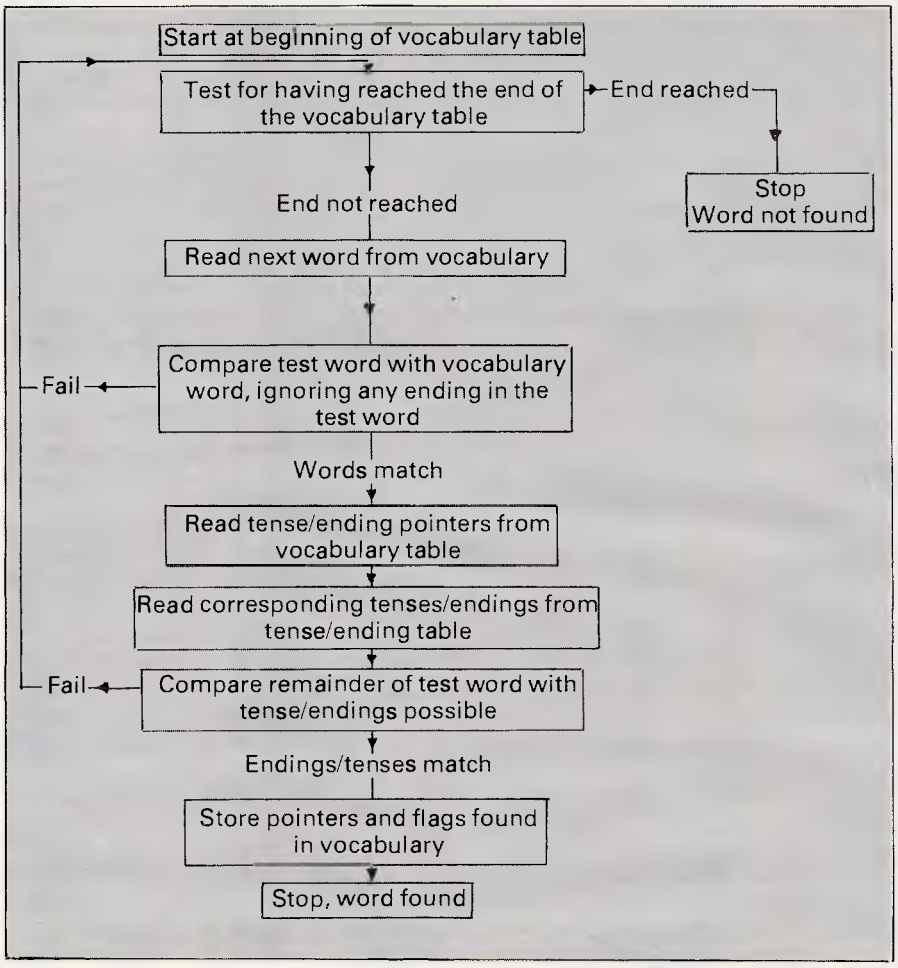

Fig 4 Word search for words in the Learn string

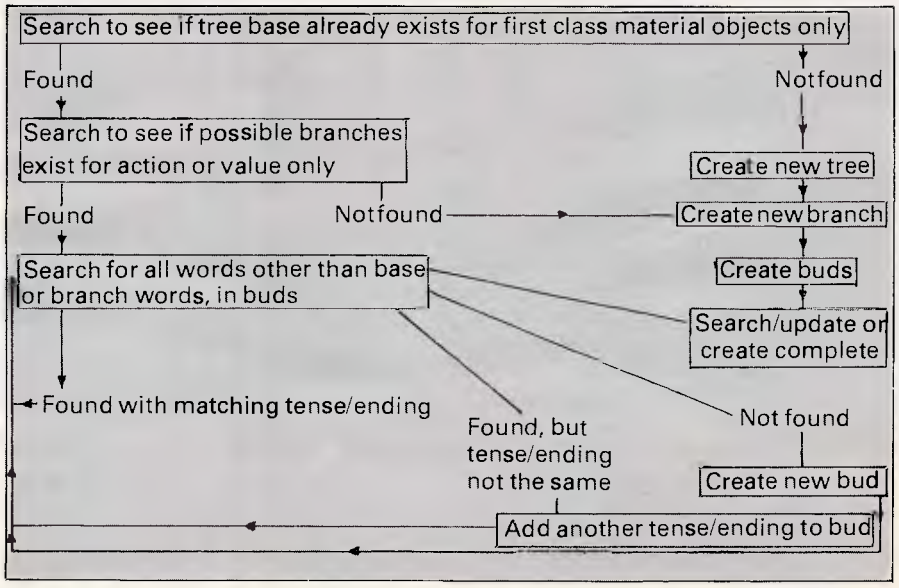

Fig 5 Cascade search

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The next stage is to split up all the words in the string and store each in a separate string. This can be done by performing searches for the space characters between words and using some simple string manipulations. Having performed this we next have to determine the classifications of each word, by searching in the vocabulary for each word, then checking for the ending or tense, and then retrieving from the vocabulary the flags which tell us the type of word we are examining.

The algorithm for this searching process is shown in Fig 4 and performed for each word in the Learn string.

Having established the word classification and found all words to exist in the vocabulary, we now want to search the existing trees to see if this information already exists, and if not, add the information to an existing tree or create a new tree. This can be illustrated in the form of Fig 5.

The search is referred to as a 'cascade search': if a test results in a word being found then the search cascades to the next level of search. The buds on the end of the branches are stored in the following format: (string)(Pointer value for tense/ending used)(delimiter)(Pointer value for tense/ending used) and so on. If we had both 'liked' and 'likes' used in conjunction with the same branch, then the bud is constructed as (LIK-)(Pointer to ED)(Pointer to ES).

Note that when adding another tense/ending pointer to an existing bud, some shifting along in memory will be needed for other buds after the one in question to make room for the new addition.

The string from which all this stemmed was very simple, containing only three words. It is left to the reader to consider some of the more complex situations that could arise, such as two first class material objects in the same statement; for example, 'John loaned June his pencil.' Here indeed more tiers may be required in the tree structure.

Intelligence level

To return to our opening paragraph, the intelligence rating of this program depends on how well it can form replies to questions presented in a form new to the computer. In its simplest form the question mode is not too difficult and yields satisfactory results. Consider asking the question:

'Does John like cars?'

Here we would look for a tree called 'John' after establishing that 'John' is a first class material object, then search for a branch called 'lik','li','like' or 'l'. Having found such a branch, we then search for a bud 'cars' and a bud tense/ending pointer which completes the branch word. For example, we could find a branch 'lik' and a bud 'cars' with a pointer to 'e', so completing the branch word 'like'. In this case a simple answer of 'yes' or 'no' would suffice.

Questions of the form 'What does John like?', are also easy to handle. In this case we simply search the branch 'lik' and then list all the associated buds. The reply could be 'John likes cars . . .'. Things start to get more complex as we permit more complex questions:

'Is it possible that John likes cars?'

Another more advanced feature would be to construct searches so that if the question 'Did John like cars?' is asked and the structure only contains the information that John likes cars, the reply is:

'No, but John does like cars.'

However, constructing a program which could handle this level of reply would indeed be a huge task. END

Braindump

Martin Lack, Marketing Manager of Arcom Pacific, gives an unashamedly biased view of the Framework "Demonstration Disk".

Wink wink, nudge nudge. Does that sample software, you know, the stuff being pushed in the magazine? Wink wink. Does it, you know. Does it work? Wink wink, nudge nudge, you know what I mean. Or is it all a big con?

Showing my age, Monty Python was first broadcast in the UK on Sunday-night TV 15 years ago. That was when I first became involved with computers. It was also the last time I ever operated the brutes. Since then, my fear of computers has grown such that I now spend all of my time understanding the business-man's needs. I leave the button-pressing technology to the rest of the team.

So last night, the press bulbs flashed, the TV cameras whirred; Martin Lack was caught, at home, using a Personal Computer. Wink wink, nudge nudge. And what *was* the heroic occasion?

To confess, I really wanted to find out if sample software worked. A market survey of one, if you like, using me with my fear of computers. (All those rude A-prompts, rejecting my commands. Anybody would think I was going to beat it!)

So what is the truth? To all you people suffering PeeCeephobia, get yourself a copy of a Framework sample disk — it's easy.

First you have to switch the machine on. (If I can operate the dishwasher . . . !) Next you insert the PC-DOS disk in the floppy slot. A couple of button presses to get rid of 'date' and 'time' and we're ready to start.

Now for some gobble-de-gook. Type DEMOFW, hit return. Wow. Look at that picture! Now you're on a delightful roller-coaster under the complete control of the machine. If you press a wrong button it politely suggests you try again. (I did this in the privacy of the closet so no-one could tell on my mistakes.)

The Framework sample disk has three separate parts. First a self-running demo which lasts about 15 minutes and familiarises you with all the major points. Remember, this is an integrated product with word processing, spreadsheet, graphics, database, communications, outlining and PC-DOS interface. There is a lot to cover. But you do get used to some of the expressions so it's worth spending the time passively reading.

Now it's your turn, the sample disk presents us with seven lessons. All are interactive. Some, like the keyboard lesson, are quite demanding. Here you have to press keys indicated by the screen. Most are control keys so if you're really not used to PCs, finding them in time really gets the adrenalin flowing. The tutorial gives you three attempts to achieve the test within 110 seconds. My score was 104.85, second go.

Whoever wrote the tutorial had a very dry sense of humour. At the end of the eight lessons you really do know the fundamentals of Framework.

For example, you know that the screen is a desk top with a pile of files in the bottom right hand corner. Opening files (frames) is really easy and combining them together is very simple.

The tutorial forces you to use the nine command instructions (eg., create, edit, graph, etc.). And you begin to realise that just like in the real world, you can drop everything you're doing, switch to a new task and then return to where you left off, with zero effort.

Linking items is also a strong point which is brought out. You point to a frame, press the function key to 'MOVE' then point to where you want it to go. It's so easy. Much more logical than all those keys you have to press to move text around in a word processing package.

Finally, you learn about outlining. Here you list the major points you want to make. Then you develop each point in a frame. You can do it in any order. Suppose like me, you want to say even more about an item. Easy, just add other frames, almost as sub-points. Frames can be words, numbers even pictures. In the end you reorganise the points to make the argument as strong as possible to the reader. Then when everything is printed out each frame is correctly numbered and, if you're like me, in quite a different order from how you started.

One feeling you get is that the number of keys you have to know to do things is very small. The arrow keys, +, –, ESC, Return, Ins, Delete and the ten function keys. This is very important because in the last phase of the tutorial you're on your own.

Yes, you get an almost complete Framework to do your own thing with. Lack of disk space restricts some of the HELP responses. And you can't Save or Print. (Which is quite sensible, after all there has to be a reason to buy the full package.)

Some of the detailed commands you have to guess because you don't have a manual. But there's always HELP and if you're really hooked, then call-up your local dealer. He has a second Framework tutorial which takes about three hours to do and gives you even more information. It comprises 20 pages of exercises and another data disk.

So how do I feel? Great. It was easy. I wasn't made to feel a fool. And I really did learn something about Framework. Was it worth it? Yes, not just for the money, more for the time I invested. I certainly now know enough to decide how it could help me and whether I should invest more time buying it.

Today Framework, tomorrow the world. I might try SuperCalc3 or even dBase III. And I'll let you know how I got on.

P.S. You know, FRED the Framework programming language must be really powerful. Thinking about it in the shower, the whole tutorial must have been written in it. If it's good enough for the Spy Academy and controlling my blunderings, how much better it would be for a serious business application! It's worth thinking about.

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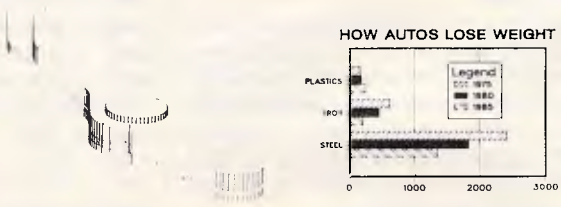

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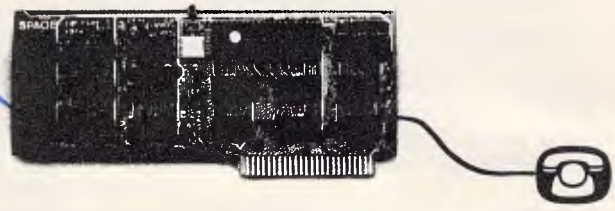

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Maximum number of characters in a computed field formula	End of screen or next field
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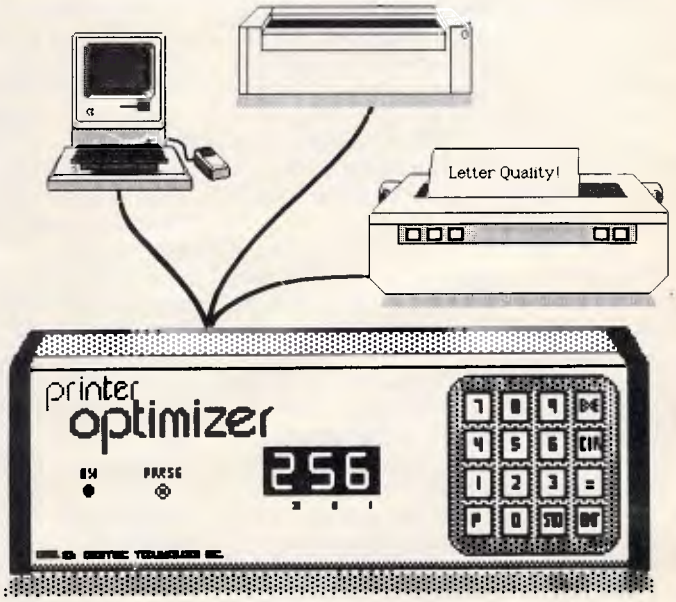

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BANKS' STATEMENT

Friend or foe?

'What's the point of labelling a package 'user friendly' when it isn't compatible with you or your machine? Martin Banks gets to know the term better.

You know how it is with journalists: they hang around in clumps during press conferences. A company executive is desperately trying to extol the virtues of a product in which no-one is interested; and the assembled hacks huddle together for protection and pray for the verbiage to stop.

To help ward off the evil spirits, the journalists talk among themselves, saying such things as 'here, have you tried this new fully-integrated, all-singing-all-dancing-does-every-function-you-ever-thought-of package called "X"?' Being of a solicitous nature, I'm curious as to why the question is asked. The reason, I am informed, is that package X is reckoned to be the most complicated piece of high functionality the journalist has ever seen.

Now this might not seem to be a particularly significant event. After all, journalists are by repute totally unable to cope with anything more complicated than a four-function calculator on which to work out their expenses. When, however, the same basic complaint is made casually to me by a user of said program, it makes me wonder. After all, if the users find it difficult to make their selected packages run, there's likely to be something amiss with either one or the other.

There was a time when the package was always wrong, certainly in the field of personal computing, if only because the business was so new and inexperienced.

But as the industry grew up, so did the software writing. Packages became easier to use and, with a little training and guidance, the simple things of computer life were easily accomplished. It was during these days that the phrase 'user-friendly' was first coined. It was meant to depict how the software industry had come out of those dark, early days of applications programming and realised that if the user couldn't make a program run, then there wouldn't be much of a market for the product in the long run.

For a time it seemed like a valid descriptor for a software package: 'This is user-friendly', they would say, and sometimes it looked as though it might be true, I have always wondered, however, about one tiny litle point. If the packages were actually user 'friendly', why did they have to tell us? Couldn't we guess?

Now this pigeon has come home to roost. There are available today new ranges of applications software that are claimed to be user-friendly, but which are, in practice, rather choosy about whom they befriend. If the user has the time to really get to know and love an application, then it will eventually respond with much friendliness, help and comfort.

Unfortunately, most users rarely have the time to develop more than a passing acquaintanceship. They just want the damned thing to work.

There's little point in having an applications package that gives PhD-standard problem-solving capabilities if you need a PhD in computer science to drive the beast. If the new packages are only advantageous in the former area, they are still of little value to the user; it would be easier to stick with VisiCalc, a piece of paper and a pencil than to try and work the newer, more complicated, hyper-powered programs.

One reason that such a situation has developed at a time when it appeared that user-friendliness might come to mean something really tangible, is the ironic fact that software technology is now outstripping hardware technology on a cost-benefit basis. For a good, intuitive programming team, the amount of time taken (and investment made) in developing a new integrated applications suite for the business community is not going to take much longer than developing each of the original individual applications programs. The lessons learnt on these still exist and are automatically integrated into the new packages.

This means that there are now program suites which offer the user the potential of highly integrated operations, with powerful, flexible packages that are the theoretical equivalent of any fancy product available for a mainframe or large minicomputer. In some ways they are, theoretically, much better products. Their price is also attractive: many of them have an end-user price tag of around $1000 which represents outstanding value for money on a bangs-per-buck basis.

But getting all the bangs to work properly on the available hardware is the problem.

It seems that we're enthusiastically trying to get the litre of potentially high-quality software poured into the 600ml carton of the current crop of computers. It can be made to fit, but with some compromises along the way. The current 600ml carton in demand is the IBM PC which is OK in so far as it goes, but arguably does not go far enough for the tasks being asked of it by these packages.

The necessary compromises needed to make the packages run on the PC also make them difficult to use. For example, the IBM PC has function keys, a control key, a shift key and the ALT key. Each of these plays an individual and unique part in getting a package to run properly: press one in conjunction with another key and a useful function results. This is all very well for the expert user, but for the average person it's rather complicated. It's bad enough having to remember the relevant keys that accompany the CTRL key in something like WordStar; multiply that by three or four and the combinations of possible functions get to be quite big — too big to remember.

In two years' time, when we can all buy a desk-top computer with the power equivalent to a medium-sized DEC VAX and costing less than $10,000, applications packages like these will make sense, and will run better than they do now. There will be the power available in the system to make all the user-friendly bits genuinely friendly. It would be nice to think that the software companies will spend some time talking to end users (and, more importantly, potential end users) to find out what the friendly bits ought to be like. This is somewhat different from the current situation: experts trying to give the end users what they think the end users hope they need.

Users sit like someone with a can of beans and no can opener. Somewhere in there is goodness and usefulness . . . if only they can find it.

Illustration by Tony Healey

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If you are looking for a powerful data management system with full tailoring features and multi-file handling, then dBase III may be the answer. Available for the IBM PC and compatibles (with other machines in the pipeline), Kathy Lang believes this single-user package is well worth investigating.

dBaseIII joins the family

Ashton-Tate has long been among the market leaders with its data management system dBase II. It is regarded by many as being very difficult to learn, but even its detractors acknowledge that, until recently, it has been one of the most powerful packages on the market. In recent months, however, two major groups of competitors have emerged: on the one hand there are powerful systems such as Sensible Solution aimed largely at the professional systems developer which concentrate on providing full database facilities; and on the other the so-called 'integrated packages', which aim to provide spreadsheet, graphics and word processing closely integrated with data management. Indeed, Ashton-Tate has a horse in the latter race called Framework — reviewed in September *APC*, alongside its arch rival, Lotus' Symphony — which, like most of its competitors, requires the whole of the database to be in the computer system memory while being processed.

How and where does dBaseIII, which has already been dubbed 'son of dBaseII' fit into this highly competitive market, both by comparison with the other Ashton-Tate products, and against those of the other major suppliers?

I've tried as far as possible in this review to look at the product as though it were a newcomer to the market, but where appropriate I've added brief comments about extensions from dBaseII. Certainly Ashton-Tate expects a good many people to upgrade to the new package, since it comes complete with conversion programs to copy data files across and to help convert dBaseII program files, as well as a short manual aimed at existing dBaseII users.

dBaseIII is presently available only on the IBM PC and on close compatibles (although it is to be made available on other MS-DOS-based systems. Ashton-Tate has explicitly stated that an 8-bit version will not be supplied, so CP/M-80 users will not have access to dBaseIII.) It is distributed on two floppy disks, one containing the basic system, and the other various example files and utilities, including the separate screen formatting program. dBaseIII is protected by the PROLOK system, which obliges you to have the system disk present in drive A when it is started up, though you can then remove it and use the drive for other files. Two copies of the system disk are provided, but you cannot produce further back-up copies of your own. You can, of course, back-up data disks in the normal way, and the system disk need not contain any files which are changed during runs of the package.

The basic format of dBaseIII is a set of records all having the same format, stored in a single file, with the ability to link up to 10 data files together at any one time. Such linkages must be made explicitly by the user; although dBaseIII does provide powerful commands to help in this, there is no equivalent of the 'data dictionary' approach taken, for instance, by Sensible Solution. Most data is stored in fixed-length fields; however, the package also allows you to create a special type of field called a 'Memo' field, which can be of almost unlimited length, and which takes up only the space it actually needs (more on this below).

At present, dBaseIII is only a single-user system, and Ashton-Tate is very cagey about the prospects for a multi-user version; however, it probably doesn't need a crystal ball to see that a likely first step in that direction would be via an Ethernet option, as has already been done for dBaseII.

dBaseIII provides a wide range of commands to carry out the necessary processing tasks. These can be given directly by the user, or stored in a file to be executed as a group (either with interaction from the user or in 'batch' mode), or activated by a set of menus provided by the dBaseIII ASSISTant — which should make it easy (and much easier than is the case with dBaseII) to graduate to entering in commands directly, without prompting from the system. (The Help facilities and the documentation are also a distinct improvement on dBaseII.) In addition to commands which may be given either from the keyboard or from a file, there is a group of commands which control the execution of command files; these provide facilities comparable with many programming languages (and more powerful than those in many forms of Basic).

Constraints

The major constraints on use of dBaseIII are shown in Fig 1. All the limitations should now be sufficiently permissive to be acceptable to even the most demanding user, although some professional developers may run out of files, especially if memo fields are in use. (Although you may have up to 10

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Maximum file size	OS Limit
Max record size	400/512,000
Max no fields	128
Max field size	254/4096(UL)
Max digits	19
Max prime key length	100 characters
Special disk format?	No
File size fixed?	No
Link to ASCII files?	Yes, various
Data types	Numeric, Char, Logic, Date, Memo
Fixed record structure?	Yes
Fixed record length stored?	No for Memo fields Yes for others
Amend record structure?	By copying
Link data files?	Yes
Number data files open	10 (fewer if using memo fields)
Number sort fields	Not stated
Number keys	7
Max key length	100 chars, UL fields
Subsidiary indexes kept up-to-date?	Yes
Data validation	Average
Screen formatting	Default or 'Paint-a-screen' or Col and row pos
Unique keys	No on entry, yes on retrieval
Report formatting	Default or Col and row
Save calculated data	Input, update.
Totals & Statistics	Yes
Save selection criteria	Permitted
Combining criteria	And, Or, Not
>1 criterion/field?	Yes
Wild code selection?	String Within
Browsing methods	Any Field
Interaction methods	Menu, commands, full tailoring
Reference Manual†	****
Tutorial Guide†	****
Reference Card†	****
On Line Help†	****
Hot-line?	Dealer support

Fig 1 Features and constraints

data files open, you may only have 15 files open altogether at any one time, and these include format and index files as well as data files.)

The provision for varying length items is generous, and should provide a reasonable compromise between flexibility and speed. Numeric, ordinary character, date and logical fields use the maximum amount of space whatever their actual length, but memo fields are treated rather differently. Each occupies a 10-character field in the main record; this field acts as a pointer to a record in another related file, which contains one record for each memo field actually used in the parent file. These records take up exactly the amount of space needed to store the text entered, up to a maximum of 4000 characters. This related file counts towards your maximum of 10, but otherwise can be regarded as part of the main file.

You *may* edit and print memo fields using a conventional word processor rather than dBaseIII's own editor, and in that case memo fields may be of virtually unlimited length. Even without that provision, any or all fields may be memo fields, so that with 128 fields available (a welcome improvement on dBaseII), you can have a record of 512,000 characters in length. That would, however, be of distinctly limited utility, since memo fields may not be indexed, and there are some limitations on their processing. But in conjunction with conventional fields, the dBaseIII approach could provide an appropriate solution to many problems where the data is of mixed type.

dBaseII *aficionados* will notice the introduction of a Date format. This normally displays in the standard American format MM/DD/YY, but a battery of functions is provided to make it easy to display the date in any way you wish, including the ability to access the day of the week from the (numeric) date.

File creation and indexing

Initial creation of a data file involves issuing the CREATE command, either directly or through ASSIST, and specifying for each item its name, type, and length (for ordinary character and numeric fields).

The process of specifying this information has been well thought out; some basic information is always displayed, such as the number of characters used in the record so far, with help on how to enter the information available either all the time or by pressing the Help key, as you choose. The file is then ready for information to be entered. You can copy and then modify this structure to make it easier to set up a file with similar characteristics. You can also modify the structure at any time, just by amending the screen representation of the structure, and the data will be preserved. To do this, you must have enough disk space available to allow dBaseIII to make a complete copy of the data file on the same disk. (If you haven't, then you must use the combination of Modify and Copy which is necessary in dBaseII.)

Any file may be indexed automatically by using up to seven keys. A key may consist of a combination of fields, totalling up to 100 characters. These indexes may be used both to control the order in which information is displayed when editing and reporting on files, and also for fast access to individual records. To ensure that indexes are kept up-to-date as records are added and changed, you must remember to tell dBaseIII the names of the indexes when you begin to use the file — this doesn't happen unless you request it. (Since each index increases the time taken to make changes, dBaseIII doesn't want to keep up-to-date indexes that you have created for a specific non-recurring need. Remembering to activate the indexes can, however, be a bit of a pain unless you put the necessary USE command in a procedure to reduce the typing and memory strain.)

Data input and updating

dBaseIII provides one command for adding records, three ways of changing them from the keyboard, and two more for making batches of alterations automatically, as well as the full control available if you program your own input and editing procedures through the tailoring commands (on which more later). Simple addition of records is provided through the APPEND command, which just adds records to the bottom of the file. To change records, you can use EDIT to display an individual record retrieved either by scrolling through the file, or by selecting a record with a particular key value, or by specifying the record number. Or you can amend a set of records, one at a time, using the CHANGE command to specify which set you want (all those whose accounts are overdue, or all the children in a particular class). Finally, the BROWSE command allows you to show several records on the screen at the same time so that you can make changes to one while still seeing others. All these commands give you full screen editing facilities.

Amending batches of records may be done with REPLACE, which simply replaces a field or fields in all or a group of records with the results of a calculation. Where several files are related to one another, one file may be UPDATEd with information from another. This updating may involve replacement, or a calculation such as addition or subtraction. For example, where one file holds stock information and another holds orders, the stock file can have its levels reduced to reflect the sales represented by the orders. UPDATE allows you to specify the fields to be used to relate the files; these must be indexed files. (This is an improvement on the equivalent dBaseII features, which permit only replacement or addition, not subtraction or other calculation.) The UPDATE command gives similar facilities to

those provided by 'Posting' in some other packages.

Screen display

When you define the structure of a file, dBaseIII automatically sets up a display format, which will be used to show individual records on the screen unless you specify an alternative format. Such a format may be specified in a Format file, set up directly using the dBaseIII editor and defining field positions, prompts and messages by row and column positions.

If you think that sounds like hard work, the alternative is to use dBaseIII's separate formatting program, dFORMAT, which allows you to use simple 'paint-a-screen' techniques to define the layout, and then builds the appropriate Format file for you from that specification. dFORMAT can be used from within dBaseIII if you have enough memory, or you can use it direct from PC-DOS. (What 'enough' is, depends on what else you are using, but it ran quite happily on our 384k system.) Whichever way the Format file is constructed, once you have issued a SET FORMAT TO command, that format is used for all commands which display one record on the screen at a time (such as APPEND, CHANGE and EDIT).

Other commands, such as DISPLAY (which shows specified fields from selected records without permitting editing) and BROWSE (which displays selected fields from all records starting at the current position in the file, and allow you to edit these records) have a fixed display format of one line per record. DISPLAY 'wraps round' lines which are too long to fit, while BROWSE keeps to one line but allows you to 'pan' across each record with the cursor keys — and you can 'freeze' specified fields so that these are kept displayed at the left of the screen while those to the right change.

Memo fields are treated slightly differently. While amending or editing records using the 'one record per screen' display mode, you can edit a particular memo field; dBaseIII will then present the field on an otherwise blank screen, giving you simple editing commands for the purpose. These are, like all dBaseIII editing commands, based on the WordStar conventions.

In addition to the specific screen display formats, any report may be displayed on the screen instead of being printed.

Printed reports

As with screen display, dBaseIII provides both simple 'default' facilities and more powerful 'DIY' features through the ability to store sequences of commands.

The REPORT command allows you to set up a tabular format with headings for the report and for each field; column widths may be specified, or you may let dBaseIII use the defined maximum field size. Two levels of sub-totals can be produced, provided the file is already sorted or indexed appropriately. Totals can be printed, and any field may contain the result of an expression if desired.

Once set up, a report format can be modified, or copied and modified to provide the basis for another similar report. (This is another improvement on dBaseII, in which report formats could not be edited.) Fields from several related files may be included in a single report, provided the appropriate commands to define their relationship are issued first.

Once a report format has been defined, you can show the report on the screen to check it, and then print it just by adding the TO PRINT parameter to the REPORT command.

For most people, REPORT should provide sufficient flexibility for all printed reports.

One irritating feature has carried over from dBaseII: both packages use the semi-colon to indicate that a command is continued on the next physical line of the screen or a command file. This character should logically have no such effect in data items, but in fact when REPORT encounters a semi-colon in a field value it starts a new line, without of course printing the semi-colon.

Several applications I have come across use semi-colons for delimiters in fields such as titles, so this practice can be a real nuisance. The problem could be avoided by allowing the user to redefine the 'continue' symbol where necessary.

Where you need greater flexibility than REPORT can provide, you can write dBaseIII command files to produce completely tailored reports. This can be done directly using column and row coordinates in the '@' SAY command. No paint-a-screen features are provided directly for producing formatted reports in dBaseIII, though you could use dFORMAT with some adaptations.

Selection & sorting

Most dBaseIII commands operate on the whole file if you don't specify otherwise. If you want to be selective, you can specify a scope (a range of record numbers) and/or a FOR parameter which sets conditions for the inclusion of a record in the processing. For example, you can ask the package to display all records which meet the condition

```
FOR MARSTAT="SINGLE" .AND.
 (EYE_CLR="BL" .OR. EYE_CLR="BR")
```

You will then see only those records where the person is single and has blue or brown eyes. As you can see, brackets may be used to make sure that, where several conditions are needed, they operate correctly together.

Conditional expressions may include the usual range of comparison operators such as less than, greater than, and so on, and a 'string containing' operator to provide for conditions such as 'does this field contain the characters *tennis*' which would find values such as tennis, table-tennis, tennis racquet. Conditions may be linked with And, Or and Not.

Benchmarks

BM1	Time to add 1 new record	Inst
BM2	Time to select record by primary key	Inst
BM3	Time to select record by secondary key	Inst
BM4	Time to access 20 records from 1000 sequentially on 3-character field	50 secs inc scroll
BM5	Time to access record using wild code	Inst
BM6	Time to index 1000 records on 3-character field	1 min 50 secs
BM7	Time to sort 1000 records on 5-character field	1 min 55 secs
BM8	Time to calculate on 1 field per record and store result in record	3 min 25 secs
BM9	Time to total 3 fields over 1000 records	1 min 25 secs
BM10	Time to add 1 new field to each of 1000 records	1 min 58 secs

Time to import a file of 1000 records: 1 min 55 secs

Fig 2 Benchmarks using IBM-PC/XT (hard disk)

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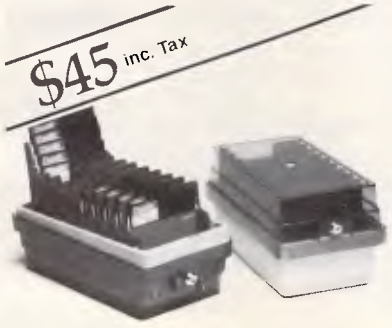

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Selection conditions may be placed on most commands; for example, modifying the CHANGE command in this way can give a very precise method of finding a particular subset of records to amend using the screen editor. BROWSE cannot be used selectively in this way, though you could use the FILTER command first. This provides a global filter, which applies to all subsequent commands until countermanded. Such an approach can be especially useful if you are processing several separate sub-groups within a group; you could set a FILTER on the whole file, and then use the FOR parameter to select sub-groups within that selection when issuing individual commands.

As with any dBaseIII command, a sequence of commands used to display or edit selectively may be acted upon immediately, or stored for future re-use.

In addition to the indexing facilities, dBaseIII also provides a SORT command which allows you to sort the records into a particular physical order. Initial indications are that this command is much faster than its equivalent in dBaseII.

Calculation

dBaseIII's facilities for calculations are very good. You can use the system as a desk calculator, you can set up batch calculations to replace existing fields, and by using the command file facilities you can arrange for calculations to take place on input data. (By popular request, dBaseIII includes an extra function not available in dBaseII, Square Root.)

By using memory variables (up to 256 are allowed), it is possible to do most calculations not requiring more than limited use of arrays, which need to be simulated in a rather tedious fashion if they must be used.

Tailoring

dBaseIII provides a powerful tool for the system developer, in the shape of a set of commands which can be used to tailor a system for a particular application. All commands which can be issued from the keyboard can also be stored in a file. In addition, there are commands for controlling the execution of these command files, including DO WHILE, IF...ELSE...ENDIF and DO CASE. Command files may be called with parameters, making it possible to build up suites of procedures which can be used in different aspects of applications without duplicating effort.

Using the facilities for formatting the screen, you can build menus for novice users. Calculations and tests may use memory variables, which may be global or local to particular procedures and stored for future re-use. (Up to 256 memory variables are allowed; there is no provision for contiguous lists of variables.)

Multiple files

Up to 10 data files may be open at any one time, though not all could be using indexes, since the overall file limit is 15. Each file is opened in a separate area, indicated by a number or letter according to your choice. Only one file may be active at a time—that is, several may be available for reading but only one for writing. Fields in non-active files may be referred to by prefacing their names with the file name or by the letter or number of the area in which they were opened.

Security & housekeeping

Security provisions are limited to some self-help procedures aimed at preventing accidental deletion of records. Any record deleted is not actually expunged and lost until an explicit PACK command is issued. The only exception to this is the ZAP command, which allows you to empty an entire file — it does require confirmation, though!

dBaseIII provides facilities for copying and deleting any file, and for directory information. The package gives almost the full path facilities provided by DOS. You can run any legal DOS program from within dBaseIII, provided there is enough memory. (This improves upon the rather clumsy dBaseII feature of QUITting to a .BAT file which included a dBase command for return.)

Links with outside

dBaseIII can read any ASCII text file in fixed length or comma-delimited format. I used the fixed length format successfully, but couldn't persuade the package to read beyond the first field of each record of my comma-delimited file. The package can also write files in these formats, allowing you to prepare files for word processors such as WordStar's Mail-Merge.

User image

dBaseIII is a command-based package, which can be more difficult for novices than menus. A special command called ASSIST is provided to help out here: all the commands you are likely to need initially are available through menus. These use the proper command names, and allow you to short-cut much of the prompting as you become more practised. Once into the main part of the package, there is still quite a lot of help available if you need it, always through the F1 function key. This is the only function key which cannot be reset; dBaseIII provides facilities to allow you to set the others, and to dictate the colour of the screen and areas of enhancement if you have a colour monitor.

Documentation

dBaseIII comes with a single manual slightly larger than the standard IBM format. It is divided into separate sections for tutorial, reference and glossary, and has one index for the whole manual (quite a promising index too). In addition, separate booklets provide a good reference summary, and a 'bridge' for dBaseII users describing the automatic conversion programs and the small number of situations they cannot cater for, plus a list of new and

Summary

Package Type	Powerful and sophisticated data management facilities with full tailoring. Menu-driven for novices if necessary
Strong points	Powerful and flexible data entry, display and selection facilities; good multi-file features; unusually good calculation features; very good documentation and onscreen help in relation to the complexity of the package.
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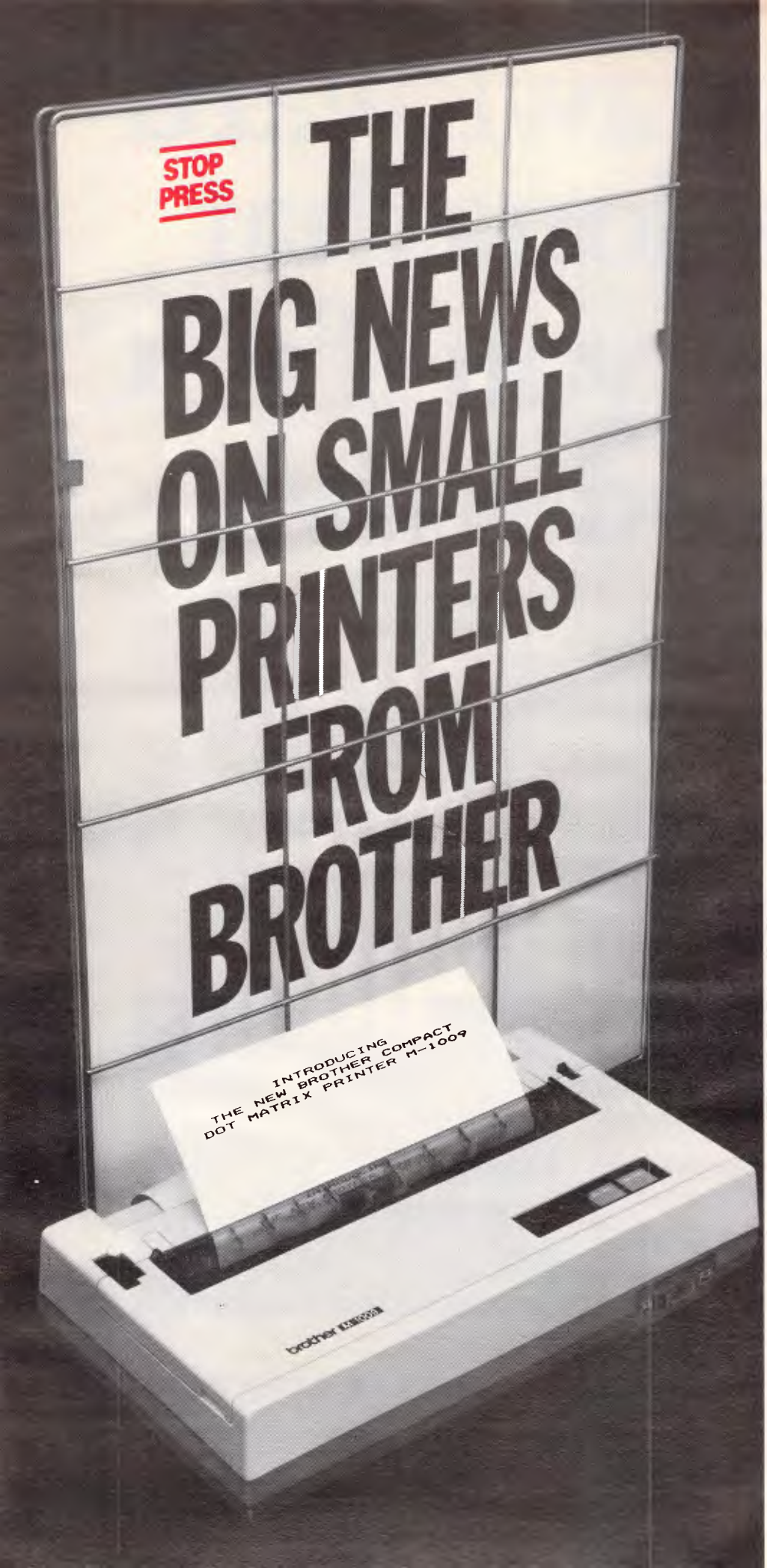

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changed features.

The tutorial manual is written around a set of example files, which make up a simple accounting suite; the example files needed are supplied on the second disk, and you are encouraged to go through the lessons with them, up to and including setting up inter-related files. Although this should make a good introduction for a beginner, someone with a little experience of computing will undoubtedly get on a lot more easily than someone without.

The reference manual consists of an introduction to the main ideas of dBaseIII, plus a list of the commands and their functions followed by a detailed explanation of every command, with short examples. I thought it quite well done, and I guess most people who criticised the dBaseII documentation will be satisfied with the new versions.

The only part of dBaseIII not covered in the manuals is dFORMAT, which comes complete with its own 'online' manual.

Having done quite a lot of research into what people do and don't like about manuals, I am deeply sceptical about putting large manuals online, but the size of the subject in this case is just about small enough to make the idea feasible. The most obvious lack is a thorough explanation of the concepts involved — it may be there, but I couldn't find it despite the online index. However, I did manage quite easily to find out how to set up a simple screen form, and I enjoyed using the program, so on the whole I would regard the exercise as a success.

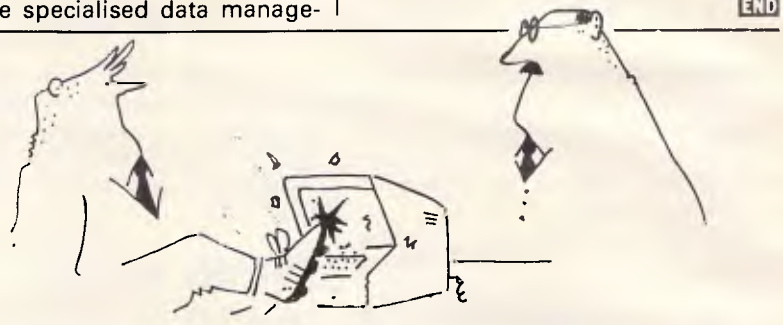
Conclusion

dBaseIII is well worth investigating. It has ironed out most of the wrinkles in dBaseII, and should give its competitors in the specialised data management systems market a good run for their money.

As for the 'integrated' packages, clearly dBaseIII is superior in terms of the amount of information it can handle, and it is very fast: times for the Benchmark using a hard disk are shown in Fig 2, and they don't look wildly inferior to those for in-memory systems, for data sets up to the size that such systems can handle.

I look forward to a further opportunity to use the package in conjunction with Symphony or Framework, to see just how 'integrated' one could get using a large database with a multi-function memory-based package.

END



'No, no Jones, that's not what we mean by re-booting the system!'

A chip off the old block

Nick Ryman-Tubb explains how to program the 68008 CPU and introduces the other members of the 68000 family.

The 68000 family is fast becoming the processor every one wants to use, and already features in machines like the Fortune, Wicat, Sage II, Corvus Concept and TRS 80 model 16, not to mention Apple's Macintosh.

Three good reasons why the micro makers are clamouring for this chip are its elegant instruction set, fast instruction cycle and the availability of CP/M-68k and the multi-user Unix operating systems. National Semiconductor is fighting back with its NS 16000 family, but it isn't getting the same level of support despite having the advantage of supporting virtual memory operations directly. But the youngest Motorola relation, the MC68010 Virtual Memory Processor, has just arrived on the scene and is object code upward compatible with the MC68000. What's more, its virtual memory system is unique in physically detecting a bus error and then acting upon this condition through a relocatable exception vector.

The 68000 family

Each member of the 68000 family is upward compatible with its relations at the machine code level, and all share the same basic features as follows: 32-bit address and data registers; 56 powerful instruction types; memory mapped I/O; 14 addressing modes; and five main data types. Fig 1 shows the 68000 family tree.

Considerable confusion about whether the 68000 is a 16-bit or 32-bit processor has been caused because, while most internal registers and data paths are 32 bits wide, the 68000 can only communicate with the outside world 16 bits at a time. It's best described as 32:16-bit CPU, the numbers referring to maximum register size and external data bus size respectively. In the same way, the Intel 8088 used in the IBM micros could be termed a 16:8-bit CPU. Result? The MC68000 can process twice as much data in a cycle as the 8088 can.

The MC68008

The MC68008 (Fig 2) is fully software compatible with the 68000 CPU, but has an 8-bit data bus instead of 16 bits (32:8-bit CPU). This means that for every instruction op-code needed, the MPU must make two fetches from memory.

While this might slow down the operation of the processor when compared with its 16-bit father, it is still very fast compared with the Z80. This is due to the pipelining technique used within the CPU. While most 8-bit CPUs fetch and execute instructions in series, the MC68008 can fetch the next instruction while executing another. This greatly speeds up the fetch/execute cycle, which reduces the speed difference between the 16-bit and the 8-bit external data bus versions.

The 68008 has 20 external address lines which means that it can address up to 1024k of memory. Its father, the MC68000, has 24 address lines and so can address 17.7Mbytes of memory.

The MC68008 has 56 basic instruction types with six basic types of addressing modes: register direct, register indirect, absolute, program counter relative, implied and immediate.

The instruction set is 'regular', which means that you can use all of the 14 addressing modes with nearly all of the instructions. The instruction set has been thoughtfully put together, and is

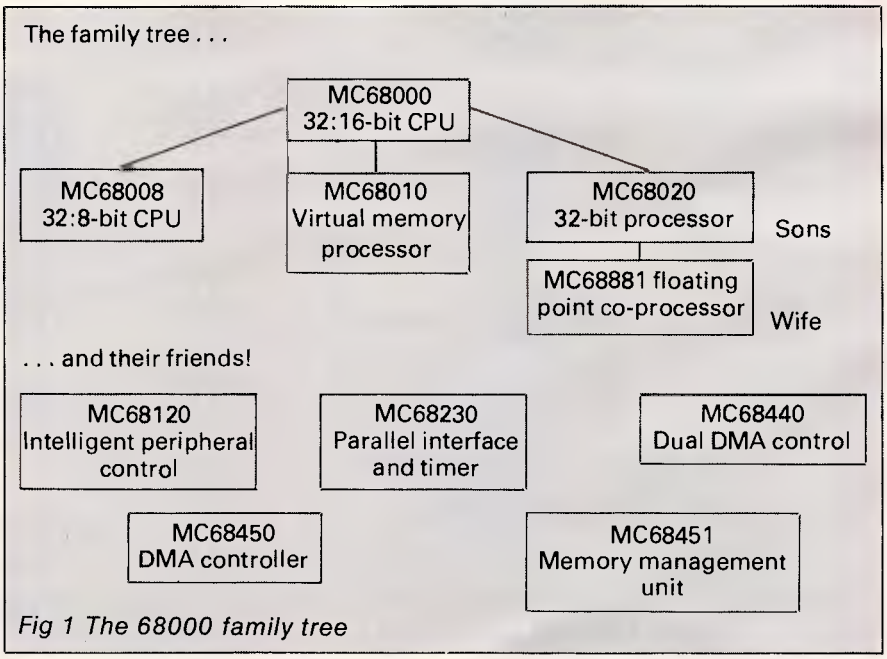


Fig 1 The 68000 family tree

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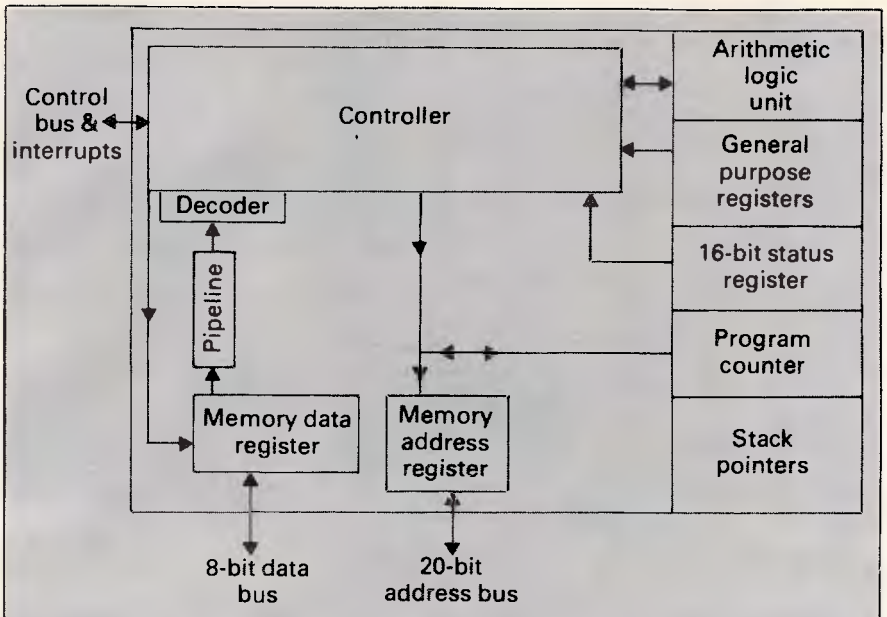

Fig 2 The MC68008

Data Register Direct:	MOVE	D0,D3
Address Register Direct:	ADD	A1,A4
Immediate:	MULU	#$22,D2
Absolute Short:	JMP	$1200
Absolute Long:	JSR	$123456
Address Register Indirect:	SUB	(A0),D4
Address Register Indirect with postinc:	AND	(A2)+,D4
Address Register Indirect with predec:	MOVE.L	−(A7),D0
Address Register Indirect with index:	ROL	$20(A3),D3
Address Register Indirect with index & disp:	BCLR	$12(A1,A2),D5
Program counter relative with disp:	JSR	$8(PC)
PC relative with index and disp:	JMP	$55(PC,A1),D3
Quick Immediate:	ADDQ.B	#2,D1
Implied Register:	MOVE	SR,D0

Fig 3 Addressing modes

especially good for compilers (such as C or Pascal), where the LINK and UNLK instructions can be used for holding local variables within a procedure. Other instructions include data movement, logical operators, integer arithmetic, rotate and shift operations, BCD operators, bit manipulation and control instructions.

Five data types are supported: bits (single binary digits), BCD digits (four bits = a nibble), bytes (eight bits), words (16 bits = two bytes) and long words (32 bits = four bytes).

All the instructions are words and can have up to a further four extension words (these hold the data for the instruction). All the instructions on the MC68008 must start on an even byte address, and data must be padded out so that it, too, starts on an even boundary.

The standard format of the mnemonics, in 68000 assembly language programming, is:

MNEMONIC.size source,destination

The size can be B(=Byte), W(=Word) assembler defaults to word, or L(=Long word)

Both the source and destination values could be any of the 14 addressing modes. Some instruction mnemonics only allow one or two of the addressing modes to be used, such as the move quick instruction (MOVEQ #0,D1). The addressing modes available are shown in Fig 3 with an example mnemonic.

Registers

The MC68008 has eight 32-bit data registers, seven 32-bit address registers, two stack pointers, a 16-bit status register and a 32-bit program counter. The eight data registers can be used with bytes, words or long words. Numbers can be put into any of these data registers to represent counters, indexes or anything.

For example, if we wanted to put the number 12 into a data register as a byte then we would use the example shown in Fig 4.

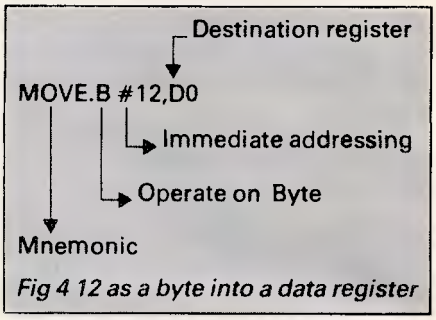

Fig 4 12 as a byte into a data register

This is like LET A=12 in Basic, only much faster!

There are seven address registers which can handle words or long words. Address registers are normally used to point to memory. Each memory cell has a unique number: data can be stored within this cell and then accessed by using the address registers.

For example, let's assume that we have a list of numbers stored in memory as words. We can point an address register to the start of the list by the instruction:

MOVEA.L #124,A2

This will fill all 32 bits of the A2 register with 124. Other instructions can now be used to get at the list of numbers pointed to by A2:

MOVE.W (A2),D4

This instruction will put the contents of memory pointed to by A2 into the data register, D4. So D4 will be equal to 76.

Address register seven (A7) can act as a stack pointer as well as a normal address register. So, if we want to put three numbers onto the stack, say, 19, 20 and 30, first set up the stack pointer:

MOVEA.L #5002,A7,

and then put 10 onto the stack:

MOVE.W #10,−(A7).

This mnemonic will decrement the contents of A7 by two (5002 − 2 = 5000). It will then use this address to store the data (that is 10). For the other two numbers we write:

MOVE.W #20,−(A7), and
MOVE.W #30,−(A7).

If we now wish to remove these values, we must do so in the order 30,20,10. The first number put in is the last out, that is:

MOVE.W	(A7)+,D0	D0=30
MOVE.W	(A7)+,D1	D1=20
MOVE.W	(A7)+,D2	D2=10

There are in fact two stack pointers — one for the operating system, and one for the user (which you can use). The

A chip off the old block

CPU will sort out which one you are using. Some assemblers allow you to use 'SP' instead of 'A7' in the mnemonic. This makes the code easier to understand.

The program counter is 32 bits long and is used by the processor to hold the address of the next instruction to be executed. However, since there are only 20 external address lines on the MC68008, only the first 20 bits in the PC are valid. The status register consists of two bytes, one for the system (normally the operating system in a general purpose computer) and one for the user (your programs). The function of each is as follows:

User Status:

C=carry: this is used to hold the most significant bit from a logical or arithmetic operation.

Z=zero: this bit will be set to 1 if the previous operation yielded a zero result.

V=overflow: this bit will be set if a result greater than that specified is produced.

N=negative: this bit will take on the same value of the most significant bit of a result (it is usually set to 1 if the result is negative).

X=extend: this is always the same as the carry flag!

The System Status:

T=trace mode: this generates an exception interrupt after each instruction (like single-stepping).

S=supervisor mode: when this is set to 1, then the system operates in supervisor mode which has special privileges.

I_2 I_1 I_0: the interrupt mask bits.

(NB: You cannot change these values unless you are in the supervisor mode — that is, within the operating system.

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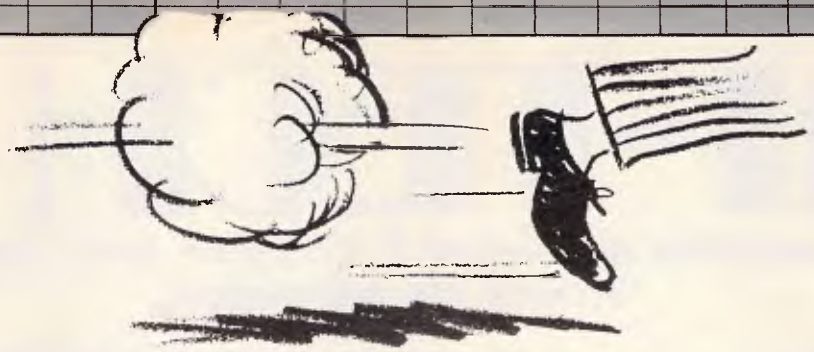

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Make new friends in exotic, faraway places (and nearer home) — start your own computer bulletin board system. Peter Tootill, co-editor of Network News, advises on the rewards and pitfalls of such a venture.

What are the reasons for running a BBS? I'm often asked this question by people who use my bulletin board system, who are also curious to know what is involved: what hardware and software are needed, and so on. BBS operators can be divided into two groups — hobbyists and businesses. The reasons for running a BBS as a hobby are difficult to define. If you're interested in micro-communications, it can help to keep your phone bill down: people will call you from all over the world and they will foot the bill. It's rather like ham radio — it's the contact and interaction with other people that make it interesting.

There's also a certain fascination in seeing your micro respond to commands typed by someone you can't see — who may be just across the road or thousands of miles away.

What's involved?

One of the first things to realise is that running a BBS takes time and dedication. It's not something to be undertaken on the spur of the moment, whether as a hobby or for business purposes. The operator needs to do 'housekeeping' every day: clearing out messages that have been read, or are no longer relevant; keeping an eye on whether there's any bad language (it does happen); backing-up disks regularly; and rescuing much-used files that have become damaged. The time it takes depends on how much the system is used, but it will probably take around half an hour a day, every day.

Most full-time public BBSs can expect around 40 calls — more if they're very popular, or have a large local call catchment area, less if there are a few systems around to share the load. Many callers will leave messages, so you can see how quickly disks fill up. The more storage space you have, the longer you'll be able to go before being forced into action because a disk is full.

Another consideration is whether to install a separate phone line for the BBS. If you're going to use it for business purposes, then there's no question about it. However, for the hobbyist it's more difficult; but if you can afford it, get a separate line.

But the main decision to make is whether you intend to run a part-time BBS or a 24-hours a day system. A part-time system (evenings only, perhaps) can be run using your own home phone line, as long as you can educate your friends not to hang up and report a fault each time they hear the modem tone. The 'ring-back' method can be used to avoid this problem; some clever modems will even answer the phone, and if they don't get a carrier within a certain time they'll assume it's a voice call and ring, just like an ordinary telephone.

If you want to run a 24-hour system, you really *do* need a separate phone line. Even for a part-time system a separate line is preferable, as you'll find that no matter how carefully you specify system times, people will call outside them. Whatever the reason, it can be aggravating and has been the reason for many BBSs closing down.

Hardware

To set up your own BBS the minimum hardware requirements are a microcomputer, an RS232 interface, an auto-answer modem, a floppy disk, a real time clock and a printer. The last two items are not always necessary, but would normally be found in a reasonably capable system.

Let's look briefly at the items in turn. Almost any micro will do. BBSs run on everything from Spectrums to IBM PCs, and minicomputers and mainframes can also be used.

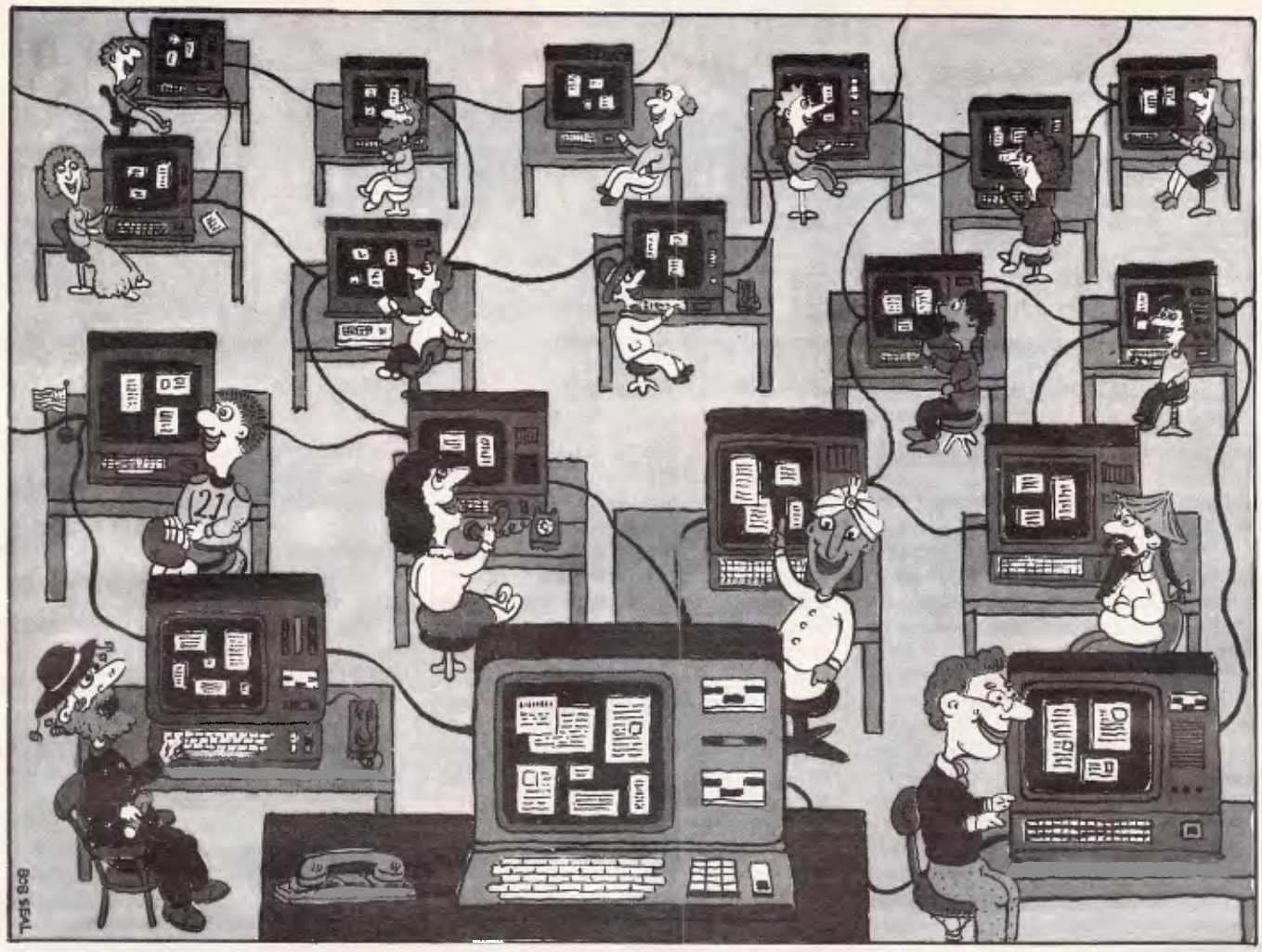
Many computers have built-in RS232 interfaces. In addition to the two data lines, the interface must have at least one control line that can be used to keep an eye on the carrier detect circuit. This is required so that if the caller hangs up or the line is poor and the modem loses the carrier tone, the software can be informed and reset itself to standby mode to await the next call.

Some modems will automatically answer the phone when it starts ringing; others just tell the computer that there's a call coming in and need to be told to answer it. The latter will need an extra control line (usually the RI signal on pin 22 of the 25-way plug).

One other control signal may be needed on the RS232 interface if you intend to run the system at more than one speed. This is very common in the States, where systems offering Bell 103 (300/300) and Bell 212 (1200/1200) are popular. The modem answers the call and if it's of a high speed, lets the computer know. Modems which can detect the speed on an incoming call are rare as yet, but if you get the chance to use one, make sure that it's compatible with your software and RS232 interface.

An auto-answer modem is essential. The modem needs to be able to answer the phone by itself and to hang up again at the end of the call, or when the carrier drops for any reason. Answering and releasing the line may be done automatically or on instructions from the computer. There are two methods of auto-answering: in one, the modem does the work, answering the phone when it rings, checking for the carrier and hanging up at the end of a call; in the other, it keeps the computer informed of what's happening and waits for instructions (that is, it tells the computer the phone is ringing, answers it when instructed to do so, and so on). A 'ring-back' system is easier to implement with the latter method.

Your main consideration is to ensure that the modem is compatible with your software. It's no good the modem waiting for instructions if the software is waiting for the modem to answer the phone! Indeed, the matter of compatibility can be critical as some software is designed specifically for a particular make of modem. This is particularly true of BBS software for the Apple II, which has a number of plug-in modem cards available in the US. The US is the prime source of BBS software, which is not surprising as the idea was formed there, and



other parts of the world are still several years behind in some respects.

The interaction between software and hardware is even more important when you want to run a two-speed BBS. The way in which the modem recognises the high speed call and notifies the software must be compatible with the BBS program.

Another way of running a multispeed BBS is for the software to do the work; for this to happen, the baud rate of the modem must be controlled by the computer in some way. There's more than one way of doing it, but the obvious method of setting the modem to a particular baud rate and then checking to see if carrier detect is on is not reliable. It's quite possible for the carriers of two different modes to be close enough for the modem to think it has a correct carrier when in fact it hasn't. One simple method is to send a message such as 'press return if you can read this' at each different mode and wait for a recognisable carriage return to be received. It it doesn't come in a reasonable period of time, the computer could change the baud rate and send the message again. This is somewhat crude, but effective.

A number of US dual-speed modems work in a similar way. The caller sends a few carriage returns and the modem, knowing what to expect, analyses the incoming signal to see at what speed it's travelling. These dual-speed auto-answer modems have a lot of processing power built in, and this will often extend to auto-dial as well as auto-answer features. They are often termed 'intelligent' modems.

Disks are also essential. It's possible to build a fairly basic BBS system that keeps all its information in memory, but it would be severely limited as to the facilities it could offer and the number of messages it could store. If there's a power failure, all the information in RAM would be lost. It isn't practical to use cassettes for running the system, although they could be used to save the RAM contents occasionally so that something could be recovered in the event of a power failure. Floppy tape/microdrive storage can be used, but its viability depends on the access time and the amount of data to be stored.

Software

There are a few general points to consider here:

★ Will it suit your needs?
★ Will it run on your micro?
★ Is it flexible enough to be tailored to suit your future needs?

However, the most important consideration for the hobbyist is 'How much is it?' BBS software can cost you nothing for a public domain package such as Remote CP/M or the C language Citadel system (which comes from the CP/M and C users' groups respectively). On the other hand, you can pay hundreds of dollars for one of the sophisticated commercially published packages. Be warned, however — price is not always a good guide to the features and flexibility of the software.

Because of the variation in the way that 'compatible' micros are set up when it comes to such things as RS232 ports, you'll probably find that any BBS package will require a certain amount of installation before it will run on your system, unless it was specifically written for that make and model. CBBS, for example, is for CP/M systems but you need to be familiar with assembly language programming to be able to install it on particular systems.

You should approach the problem of choosing BBS software from two directions. Firstly, write down your requirements, as far as you can define them. Secondly, ring as many BBS sys-

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tens as possible and see what features they have that you like, and those that you dislike. Take note of how different BBSs using the same software vary: this will provide some indication of the package's flexibility. If they all look the same, it may be that the operators cannot personalise the system to suit their own requirements. If they vary widely, then the software must have a reasonable amount of flexibility. BBS software is an area where you can try out a lot of different packages and talk to the people using them without ever leaving your desk or your own lounge room.

This research will provide a reasonable idea of what to look for in terms of software, and as most BBSs will give you details of the hardware they use, it will help with that aspect too.

Writing your own BBS software is not as difficult as you might imagine. Apart from a small machine code driver, the main programming can be done in Basic. In a 300-bit/sec system, the software has only to keep up with the system operating at 30 characters a second, and even slow Basics can manage that. The main BBS program will consist of some file-handling routines to: save and retrieve messages; maintain a user log; and display information files. Downloading can be done in this way too. The machine code routine referred to above is needed to perform a few background tasks and possibly to handle the RS232 input and output, if such commands are not built into your system. The background routines are as follows:

1) Keep an eye on the carrier detect circuit, and tell the BBS software if it gets low.

2) Provide nulls after carriage returns if the caller needs them.

3) Provide line feeds after carriage returns if the caller needs them.

4) Convert lower case output to upper case if the caller cannot handle the former.

The other features that can be provided are many and varied, and the best way to proceed is to write software in modules. These can then be chained to a main 'core' program that does the major work, but has the facility to load a further module for any extra features; quite successful BBS software has been written in this way.

At least two disks are desirable for ease of back-up, which should be done frequently as disks are heavily used in most BBS applications. Disk errors are not uncommon; if you don't have a recent back-up, information can be lost.

It's difficult to generalise about the capacity you need. I have heard of BBSs running with as little as 200k; I started my system with about 500k, but that didn't last long. It depends on the space your disk operating system and the BBS software need, plus a fairly generous allowance for message and information files.

Software for downloading is another disk-eater. One megabyte is approximately the right amount to think about, but a hard disk is ideal. It not only gives you plenty of space, but radically speeds up the system operation.

'Real time clock' is computer jargon for something that enables the computer to tell the time. It's normally used by the BBS software to mark the entry time of messages, and to perform certain standard operations at set intervals. It's not essential unless the software you use needs it, but many modern micros have a built-in clock fitted as standard. Battery back-up is useful, so that the time is not lost if there's a power failure.

'A ring-back system is one way of running a BBS. The caller dials the number, lets the phone ring once, hangs up and then calls again; and the second call should be answered by the modem.'

A printer is very useful for keeping track of calls and for general listings of files, userlogs, and so on, but there's no special need for a sophisticated one. As the printer will only be printing the occasional message, it doesn't need to be able to keep up with the BBS transmissions (which will only be running at thirty characters per second on a 300bps system).

A ring-back system is one way of running a BBS. The caller dials the number, lets the phone ring once, hangs up and then calls again; and the second call should be answered by the modem. The advantage of this system is that ordinary callers don't get a loud whistling in their ears when they are expecting a human voice. The easiest way to implement the ring-back method is by means of appropriate software. The program simply needs to monitor the modem's ring indicator circuit (pin 22 on the RS232 connector), and when the phone rings it counts the number of rings. If there are only one or two, it starts a timing loop and answers the phone if it rings again inside this loop. If the phone doesn't ring again, the software resets itself to standby mode.

It's possible to do the same thing in hardware, using a ring detector and timer circuits. Indeed, this might be the only way to do it if the software can't be made to support the ring-back system.

Applications

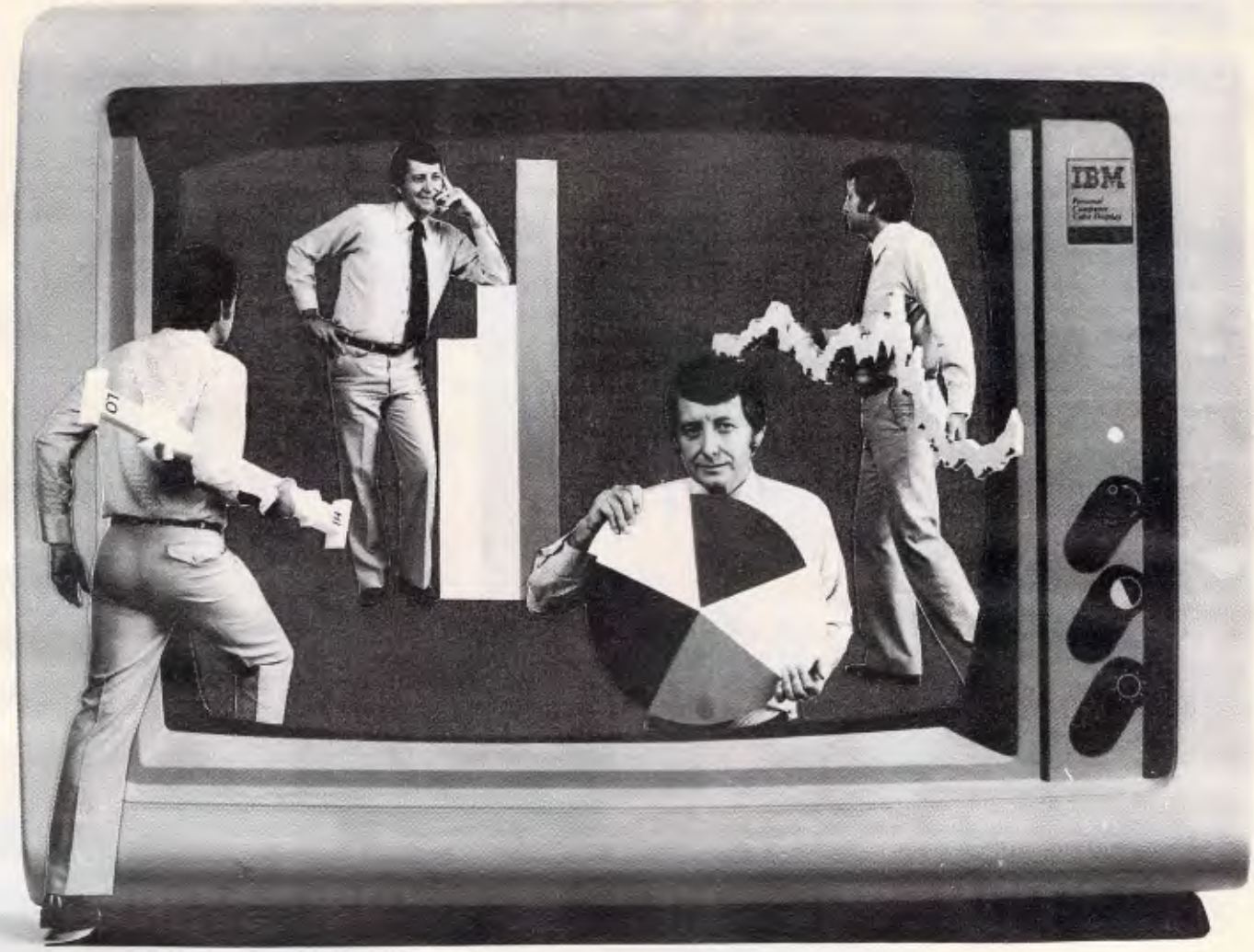
There are many areas in which businesses can and do use bulletin board systems. Some of the more obvious ones are electronic mail ordering, cataloguing and stock level information. The BBS can be private (for employees only), for employees and customers, or public. In the latter case it could form, for example, a natural extension to the mail order side of the business.

Another common application is customer support: a 24-hour two-way telephone answering system. Other applications are legion: a publisher uses one for uploading author's copy while another system forms a collecting point for information for a bibliographic database. The message facilities can be useful for companies with field staff who are frequently absent from the office, and in such situations it's often used for passing orders back, and for telling the staff member of his next task. BBSs can even be tied to packet switching systems to give cheap access via the worldwide networks.

'There are many areas in which businesses can and do use bulletin board systems. Some of the more obvious ones are electronic mail ordering, cataloguing, and stock level information. The BBS can be private, for employees and customers, or public.'

The possible applications are wide, especially with the advent of portable computers with built-in terminal software. Here's an area where a little lateral thinking could produce some new ideas for business applications. Can you think of a novel use for a BBS in a business environment.

I must point out that it's very difficult to make a BBS pay its own way. You may charge callers a subscription, or sell goods by mail using a BBS. Both are possible, but to charge a subscription



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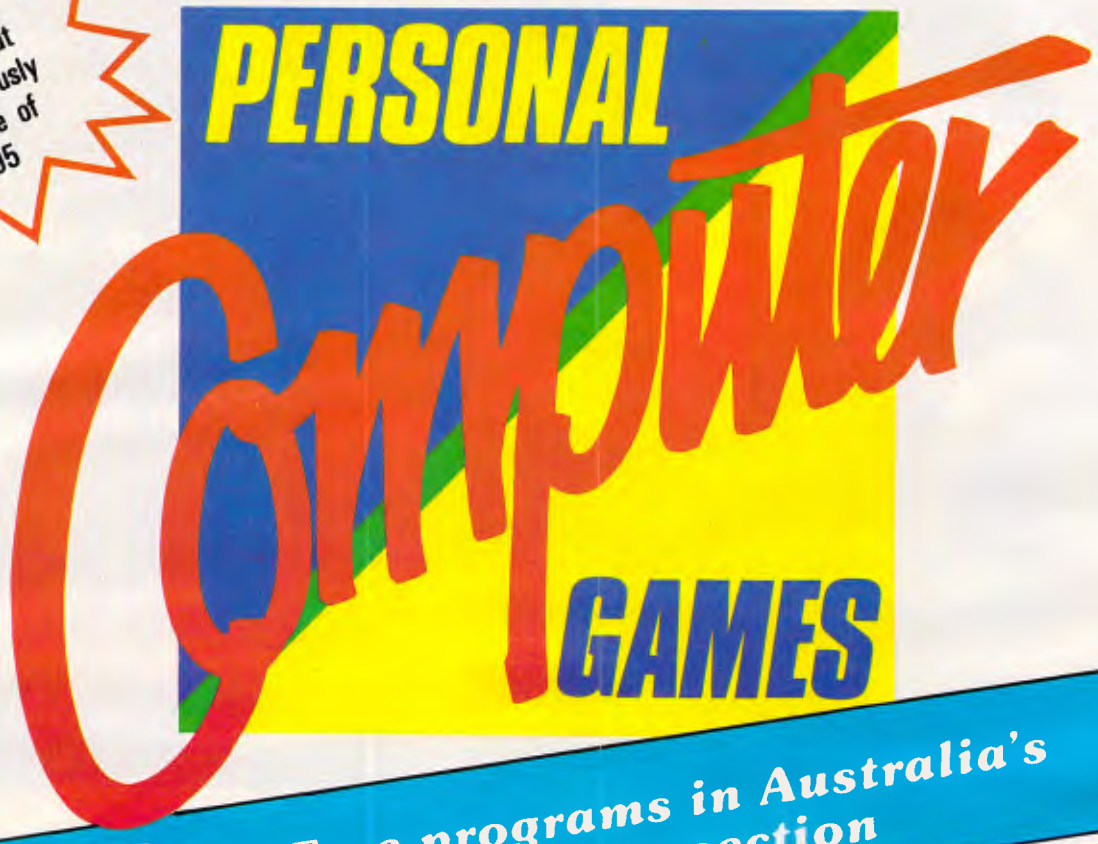

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you have to have something to offer that other *free* systems don't have. Why should someone pay you a sub when they can call other BBSs for nothing? Mail order can work, but again you need to have something special to offer callers. Mail order goods are available from a wide range of places and competition is tough.

Few BBSs make money for their operators unless run in conjunction with an existing business. In such cases it's usually in advertising and publicity, or as part of their existing mail order business that it becomes financially viable, not in terms of direct income generated.

Conclusion

Don't be easily discouraged from running a BBS by the above dos and don'ts. If you're serious you'll find it's a very rewarding hobby, and will make you many friends locally, interstate, and around the world.

However, commitment is essential in terms of time and effort to keep the system ticking over, and to keep it interesting for regular callers. It takes over your micro: sometimes the only way you can get to use it is to take the phone off the hook, and then feel guilty about all the people who are trying to get through and can't! Is it worth it? Well, I think so.

If you're interested in micro communications, look out for Peter Tootill's book, The Communicating Micro, *just published by Sunshine Books.*

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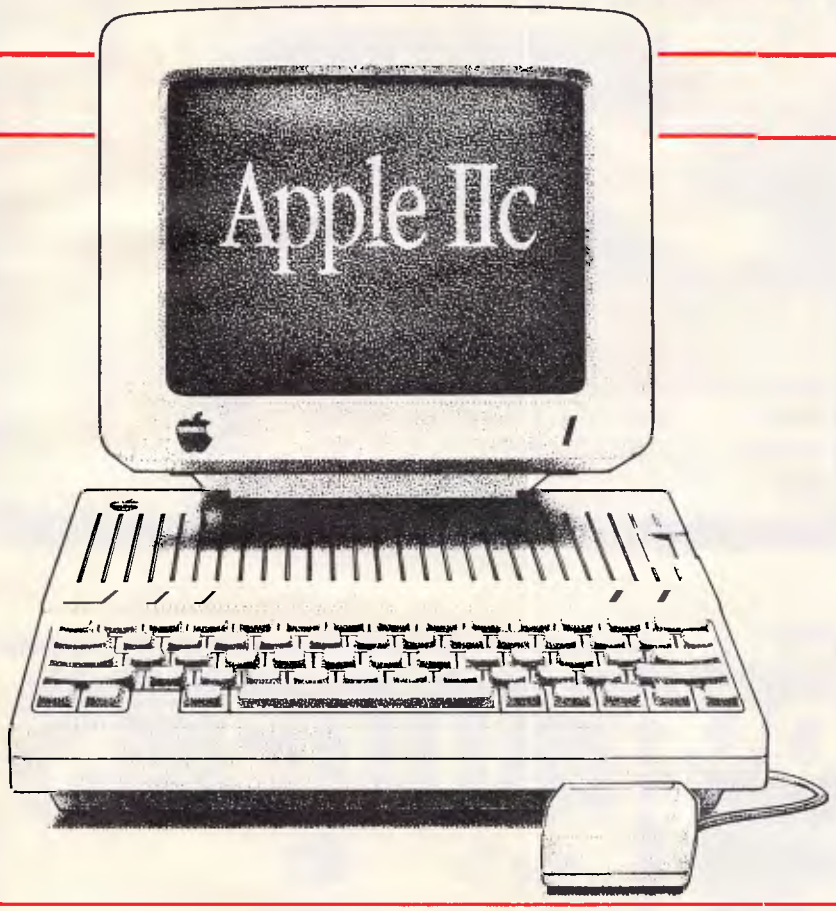

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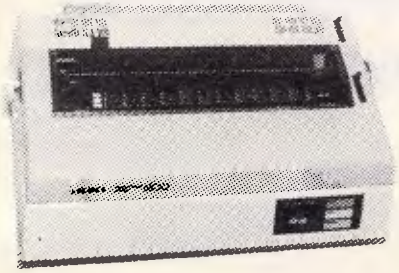

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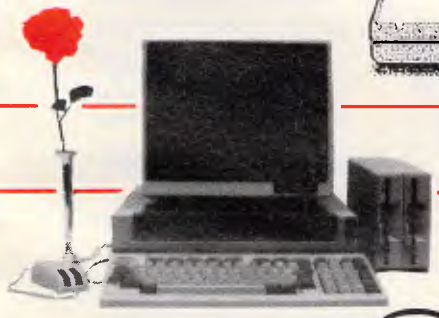

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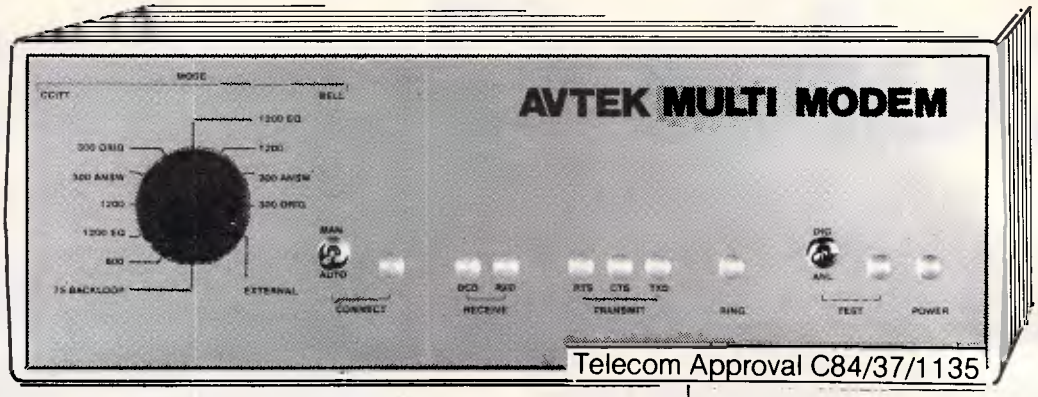

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TEACH YOURSELF LISP

Dick Pountain continues his 'Teach Yourself' series with a look at some of Lisp's non-applicative features.

Lisp arose from a purely mathematical system of notation for working with functions, and implementing it on a computer was almost a side issue.

In our examples so far, we've treated Lisp as a purely functional (or 'applicative') language. Our programs have been functions, or functions applied to functions, and so on, which were evaluated by Lisp. We've used no special I/O operations at all — when a program printed its result onscreen, this was merely the value of a function which Lisp obligingly puts on the screen for us — when a program needed input from us, we merely supplied it in the shape of parameters to the function.

However, there comes a time when we have to realise that we aren't doing maths but working on a computer, with physical bits like memory, VDU, keyboard, and so on.

Let's start with the non-applicative feature I/O. Input is quite straightforward: the function READ causes a program to pause and wait for input from the keyboard; this input is returned as the value of READ, which requires no arguments. READ will only accept one expression (a number, an atom or a list) as its input, and looks for a carriage return to tell it you've finished. If you type a whole line of words, followed by CR, only the first will be returned to the program by READ. Try it by typing in:

```
* (CONS (READ) ' (A B C))
```

Some dialects have the additional function READLINE which reads in everything you type up to the CR, not merely one expression. MuLisp has READCH which reads only one character, like the Basic INKEY$.

READ is also used to read from files in most Lisp systems, but the methods of redirecting input from keyboard to disk or cassette are extremely machine-dependent; I leave you to the mercy of your manual.

Output is a little more complicated. The most commonly used function is PRINT, which behaves very much like the Basic PRINT. It prints the value of its single argument on the screen, and then performs a newline. One thing that initially confused me is the fact that PRINT, being a function, also returns a value, which is again the value of its argument. If you type:

```
* (PRINT 'HELLO)
HELLO
HELLO
```

you begin to see double. One of the HELLOs is the *side effect* of PRINT (to print on the screen, which is what we use it for) and the other is its value as a function, returned as normal. Inside a program you'll normally discard the returned value, but if your program starts to stammer you'll know why.

Most Lisp dialects provide the function PRIN1, which behaves like PRINT but without the newline. Some dialects will also supply functions with names like PRIN and PRINC, which have a variety of more specialised behaviours. The most common of these is to print output in a form re-readable by Lisp, which entails giving special treatment to any characters illegal in a Lisp name. The utility of such functions arises because PRINT, like READ, can usually be redirected to write to a file instead of the screen, and it's not much use writing files that can't be read back in.

Saving and loading programs are done by the special functions SAVE and LOAD, which are usually very blunt instruments indeed, merely storing the whole of the workspace, definitions and variables. This has the merit of restoring a session exactly as you left off, but makes any kind of library-building rather tiresome. Supersoft Lisp and MuLisp both have more selective ways of saving

```
(DEFINE PRINT-NUMBERS-NICELY ()
     (PROG (NUM)
          (SETQ NUM 0)
           LOOP
          (SETQ NUM (PLUS NUM 1))
          (COND ((EQUAL NUM 100) (RETURN 'CENTURY!!)) )
          (PRINT NUM)
          (GO LOOP)
     )
```

Fig 1 The function GO label acts like a Basic GOTO

```
(DEFINE PRINT-NUMBERS ()
     (PROG (NUM)
          (SETQ NUM 0)
           LOOP
          (SETQ NUM (PLUS NUM 1))
          (PRINT NUM)
          (GO LOOP)
     )
)
```

Fig 2 PROG takes its value from the RETURN statement

```
(DEFINE MATCH (PATTERN LIST)
     (COND      ( (AND (NULL PATTERN)(NULL LIST)) T     )
                ( (OR  (NULL PATTERN)(NULL LIST)) NIL   )
                ( (OR  (EQUAL (CAR PATTERN) '? )
                       (EQUAL (CAR PATTERN)(CAR LIST)))
                   (MATCH (CDR PATTERN)(CDR LIST))      )
     )
)
```

Fig 3 MATCH allows the wildcard character '?' to match any expression

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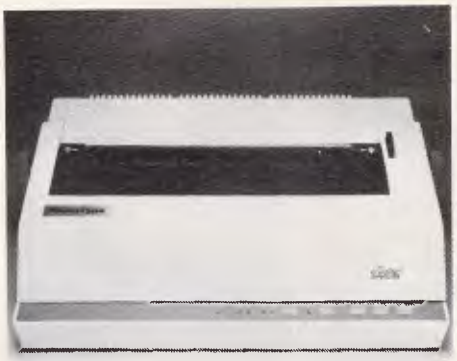

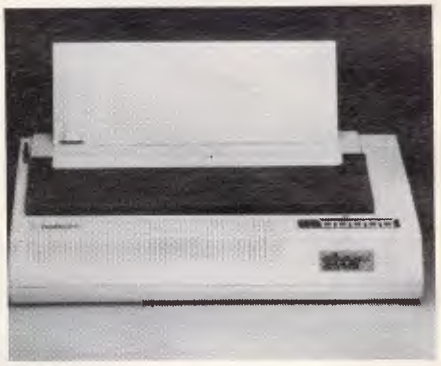

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```
(DEFINE MATCHER ;;
     (PROG (PATT LIST RESULT)
          (PRINT 'TARGET-LIST?)
          (SETQ LIST (READ))
          (PRINT 'PATTERN?)
          (SETQ PATT (READ))
          (COND ((MATCH PATT LIST)(SETQ RESULT 'SUCCESS!) )
                ( T               (SETQ RESULT 'FAILED)    ) )
          (RETURN RESULT)
```

Fig 4 Interactive program with prompts

```
DEFINE EXAMPLE (ARG1 ARG2 ARG3)
     (PROG (LOCAL1 LOCAL2)
          (RETURN ( Rest of definition.....))
```

Fig 5 PROG is a dummy, its body a return clause

```
(DEFINE MATCH (PATTERN LIST)
     (COND      ( (AND (NULL PATTERN)(NULL LIST))     T      )
                ( (OR  (NULL PATTERN)(NULL LIST))     NIL    )
                ( (OR  (EQUAL (CAR PATTERN) '? )
                       (EQUAL (CAR PATTERN)(CAR LIST)))
                     (MATCH (CDR PATTERN)(CDR LIST))          )
                ( (EQUAL (CAR PATTERN) '*)
                     (COND  ( (MATCH (CDR PATTERN) LIST )     )
                            ( (MATCH  PATTERN (CDR LIST))     )
     )
```

Fig 6 '' as a second wildcard will match any number of expressions*

individual function definitions.

Now that we are deep into the fleshpots of non-applicative functions, we might as well go the whole hog. Any Basic programmer who has been following this series and trying out the examples will probably have experienced, as I once did, a peculiar kind of unease. How exactly in Lisp do you program a sequence of actions of the sort: do this, *then* do this, *then* do this . . . ?

This type of sequence is a natural way of expressing programs in Basic (or Pascal, Forth or most other languages). In Basic the very layout of program text dictates this structure, with numbered statements following one another. But most of the Lisp functions we've seen have a nested structure, with function calls inside function calls inside function calls, and once you enter the body of a definition there seems to be no way of controlling sequence at all.

Using only the constructs we've seen so far, it isn't easy. In fact, it would only be possible using the body of a COND clause (in which, if you remember, the expressions are evaluated one after another and the value of the last one is returned). There's another way though. It's a function called PROG, which is rather like COND in that it acts as a control structure. It also provides a way of introducing local variables for use inside a definition, and a method for ordinary looping without using recursion. In other words, PROG allows you to write Basic programs in Lisp! (PROG, sometimes called PROGN, stands for PROGression).

Like COND, PROG can take any number of non-evaluated arguments: that is, they don't require a quote in front of them. Its first argument is always a list of variables: these are the local variables which are to be used inside the PROG structure. Then comes a series of expressions (you can think of them as statements) which are evaluated *one* after another. Some of these expressions can be atoms which act as labels, with the function GO<label> acting like a Basic GOTO, causing evaluation to begin again at <label>. Fig 1 makes this clear.

If you try this function, you'll find that it prints the whole numbers from one upwards without end. It is, in fact, *exactly* equivalent to the Basic program:

```
100  NUM=0
200  NUM=NUM+1
300  PRINT NUM
400  GOTO 200
```

except that NUM is global in Basic while it's local to the PROG in Lisp. In other words, were a variable called NUM already in use in the program, then its value would be saved on entering the PROG and restored upon leaving it.

Incidentally, in most dialects of Lisp, PROG variables are automatically set to NIL on entry, but the (SETQ NUM 0) is still necessary. Why? The atom LOOP (no brackets) is a label which GO uses to cause backward looping.

PROG must, of course, return a value and the normal rule here is that if the last statement is reached and is not a GO (if the PROG runs off the end), then the value returned is NIL. If the value returned by a PROG is important to your program, then it can be controlled more precisely by RETURN. When a RETURN is reached, the PROG finishes immediately and takes its value from the RETURN statement in Fig 2.

By using a judicious combination of PROGs and CONDs, you can create any kind of program structure. Don't overdo it though, or you'll merely succeed in introducing all the bad habits of Basic into your Lisp: tangled webs of GOs are just as hard to decipher as GOTOs or GOSUBs. If you persist with Lisp you'll soon get a feel for which types of problem are best solved by recursion and which by looping with PROG, and the former will tend to predominate.

As PROG is rather frowned upon by Lisp purists, it isn't surprising that it's subject to a great variation between dialects. Some squeaky-clean versions don't allow it at all. Serious Software's Spectrum Lisp has PROGN, which uses WHILE <condition> instead of GO and has no RETURN. Acornsoft has a PROGN without looping, but uses a different function — Loop . . . WHILE or . . . UNTIL — to give Pascal-like structured loops. MuLisp has no PROG but a LOOP, which repeats as long as none of its conditional clauses evaluates to T; rather like a COND biting its own tail.

Let's finish with a rather more meaty program example. The function MATCH performs a crude pattern matching between two lists, allowing the wildcard character ? to match any expression: (FRED IS A ?) will match (FRED IS A PLUMBER). Fig 3 shows the definition.

Reading this in English should tell you how it works: 'If both lists are empty then they match, or if one of them is empty and the other isn't then they can't match, or if their CARs are the same (possibly a wildcard) then see if their CDRs are the same.' Notice the use of the Boolean functions AND and OR whose effect is exactly what you'd expect.

Now let's use PROG, PRINT and READ to put this function into a simple interactive program with prompts (Fig 4). The PROG here adds nothing to the function-

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ing of MATCH but is purely cosmetic; instead of evaluating a function you have a 'proper' program. By adding a suitable LOOP, you can have it continue prompting until told to quit. This is probably the best use for PROG, as an outer 'shell' to your program, the inner levels being wholesome recursive Lisp functions (like MATCH).

Another important use is to create local variables in those dialects which don't allow the use of 'spare' formal arguments for this purpose. In this case, the PROG is a dummy, whose body is one large RETURN clause (Fig 5).

The MATCH function is a simple example of an immensely important Lisp technique which is the basis for many of its applications to Artificial Intelligence. Pattern matching is at the root of natural language manipulation (for example, parsing sentences) and database searching.

Let's modify MATCH to accept * as a second wildcard which matches *any number* of expressions (including none). Now we have (FRED *) matching (FRED IS A PLUMBER),(FRED BLOGGS) or (FRED) while (A * D ?) matches (A B C D E) but not (A B C D).

Adding a final clause which tests for * will do the trick (Fig 6). Notice that the clauses of that new embedded COND don't perform any action except to cause a recursion. Don't be downhearted if you can't immediately see how it works; try tracing the recursion on paper using real example lists. The detection of an * in PATTERN causes the recursion to scurry down the successive CDRs of LIST (using the MATCH PATTERN (CDR LIST) expression) until LIST is empty, which ends that branch of the recursion (with T if * was the last item in PATTERN, or with NIL allowing the rest of the lists to be matched). The key to understanding this function is that in MATCH PATTERN (CDR LIST), PATTERN is not 'reduced' by taking its CDR: this means that when an * is encountered it will be kept until LIST is empty.

This is part five of our six-part Teach Yourself Lisp series. Back issues can be obtained from our office at 77 Glenhuntly Road, Elwood, Victoria 3184.

'Left-right—lookout!—mindthatsupernova— watchthatKlingonbattlecruiser!'

Apple and IBM sh

AppleBus hits town, but not from Apple. Laurel Allen hops on line.

The Australian distributor, Austor, has announced the first Macintosh network. Not only does Sun01 network the Apple II, Macintosh and Lisa, but it also lets Macintosh share data with PC-DOS and MS-DOS machines. Austor's Sun01 is in fact the long-awaited AppleBus, but it gets to us before Apple delivers its own network in January. Austor says the only difference between the Apple future offering and Sun01 is that the AppleBus will come in white boxes: the Frog

are network

design of Germany "Snow white" colour scheme.

Like the Corvus network, Sun01 lets a number of operating systems live on the same disk. Unlike Corvus, it networks Apple II, Mac, Lisa, IBM and compatibles, HP, Sirius, Apricot and other operating systems to a limit of seven on the same 10 to 92 megabyte disk. And you can have four units of 92Mb in two cabinets for a total of 368Mb with one controller.

Up to 32 devices can share the disk: 31 Macintoshes, or a collection of different computers, printers and other devices. Macs get a low $149 per unit connect cost with cheap twisted pair cable at up to 1000 feet length per network.

Sun01's offering finally validates the Macintosh as a socially acceptable computer: it talks to IBM.

A software utility, Sun*Share lets Mac share data with PC-DOS and MS-DOS machines. The rush of software for the Mac promised by Apple in September has been delivered on time. The range of business products now available, combined with the Sun01 networking, make Mac a practical standard option for most users.

The Sun01 hard disk unit is about the same size as an average PC system unit, but slightly longer and flatter and comes in memory graduations of 10 to 92Mb all with an optional built-in back-up tape. Drives just announced for Australia are: 16Mb $4225, 25Mb $5012, 25Mb $7528, 65Mb $9828 and 92Mb $10830. A streaming tape unit is extra at $2338. Storage expansion within the same cabinet goes up to 184Mb and a rumour of a 150Mb drive means that four units could give you 600Mb on line (for a price, of course!)

The unit is also faster; "Sun01 has managed to increase the speed of data transfer on the file server by 50% to 7.5 mega bits per second, compared with the Corvus 5 mega bits", says Andrew Holland, technical advisor with Austor.

The hard disk is divided into virtual drives that look like floppy drives to each computer. You can do all the hard disk "set-up" on the Mac via the Sun*Mac interface which acts as an intelligent controller of the hard disk drives.

The Sun*Mac interface is connected to the Mac via the AppleBus, which uses the highspeed RS422 ports at the back of the Mac. Any Mac may then access the hard disk, and treat the hard disk as if it were a large floppy. All directories, folders and icons work the same way, only faster. MacWrite, for example, takes 12 seconds to load on the hard disk compared with 30 seconds on a 128k Mac.

On the down side though, the Macintosh finder can access volumes up to 8Mb in size only, giving room for 128 folders.

To share with non-AppleBus computers, a quadplexor, (four-way multiplexor) is used. This lets the Sun*Mac share the hard disk with up to three other devices such as non-AppleBus computers or a printer server. By using more levels of multiplexing, up to 16 non-Apple devices and up to seven operating systems can be used. And you can have more than one Sun*Mac interface on a drive allowing more than 31 Macintoshes per Sun01 disk.

A Sun*Safe tape back-up unit gives a 21 Mb back-up with a back-up rate of 1.5 minutes per megabyte. The Sun*Serve printer/modem's server supports two RS232 devices, the baud rate being switch selectable.

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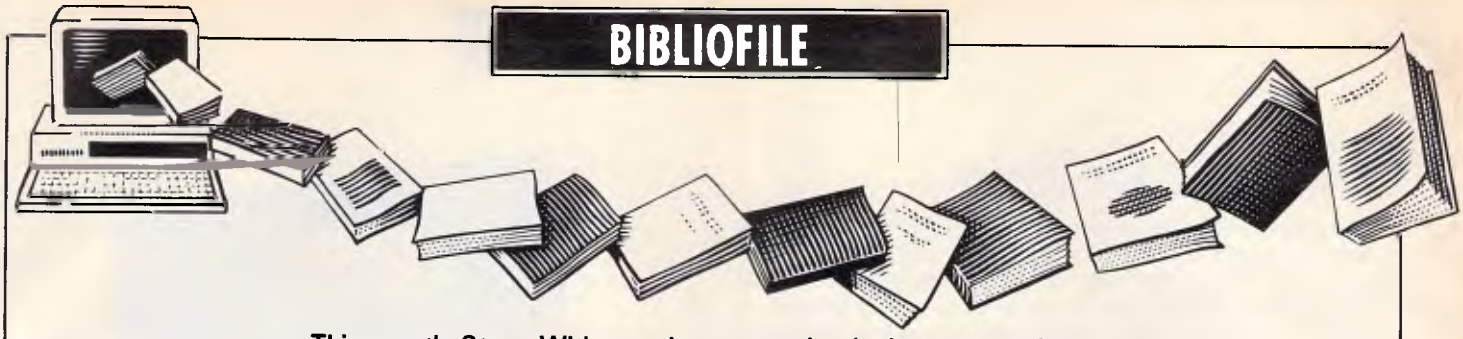
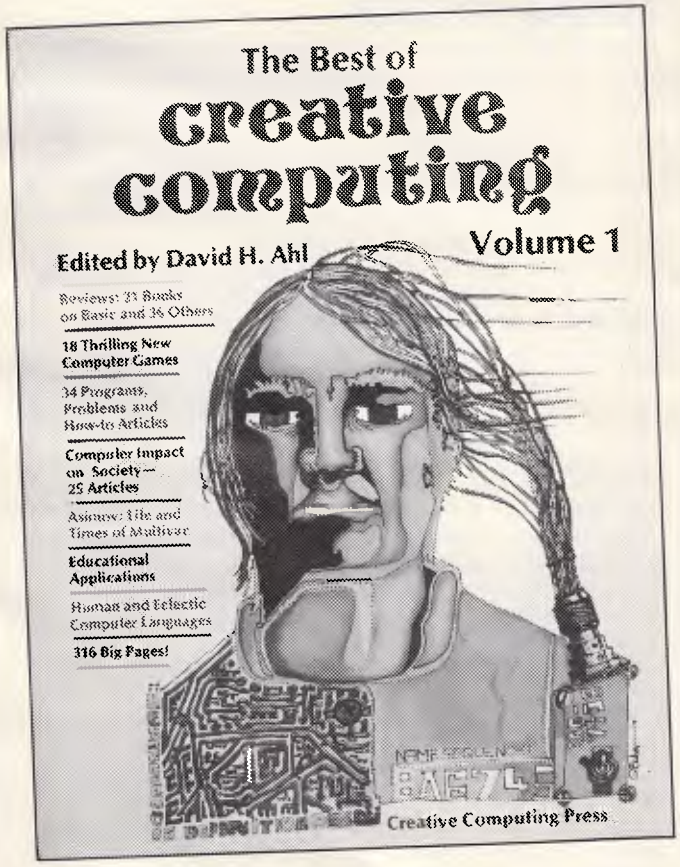


This month Steve Withers takes a creative look at computing; how to turn your programs into hard cash; and presents us with a little food for thought.

The Best of Creative Computing — Volumes 1 & 2

Creative Computing has just celebrated its tenth anniversary, making it one of the earliest and longest running popular computing magazines. Volume One comprised six issues from late 1974 to the end of 1975. The big change since that time is that people now own computers — the Altair 8800 didn't appear until Christmas 1974, and that is usually regarded as the birth of the microcomputer industry. All those years ago (!)people interested in computers relied on access to big machines at school, college, or work. There were a few hardy souls who built their own machines, but they were very rare individuals. Volume Two included one article on building an Altair, and another on turning it into a system.

This might make you think that articles from that period are of little interest or use, apart from their curiosity value. Think again: there's a discussion of the problem of students



'breaking in' to computer systems, a description of smalltalk (can you get that language for your micro yet?), and the effect of computers on privacy. Sure, there is a great deal of information with curiosity value — "within five to 10 years video disk players will be commonplace in homes and schools". There are also some listings of classic games like Wumpus and Star Trek that tend to be overlooked by those used to arcade-style 'twitch' games.

Other timeless material includes fiction (Volume One includes a short story by Isaac Asimov) and poetry as well as games and puzzles. Books like these tend to be on the expensive side for recreational reading, but they are worthwhile reading for those with an interest in the early days of our hobby.

The Best of Creative Computing Volume One
The Best of Creative Computing Volume Two

Editor: David Ahl
Publisher: Creative Computing Press
Price: $20.00 each

Programs for Profit

Can you *really* make money with a personal computer? The authors of this book think so, and they provide ideas, programs, and advice for people that agree. Despite the title, the programs are probably the least important part of the book — even if you came up with an idea with money-making potential, how would you go about finding customers or setting prices?

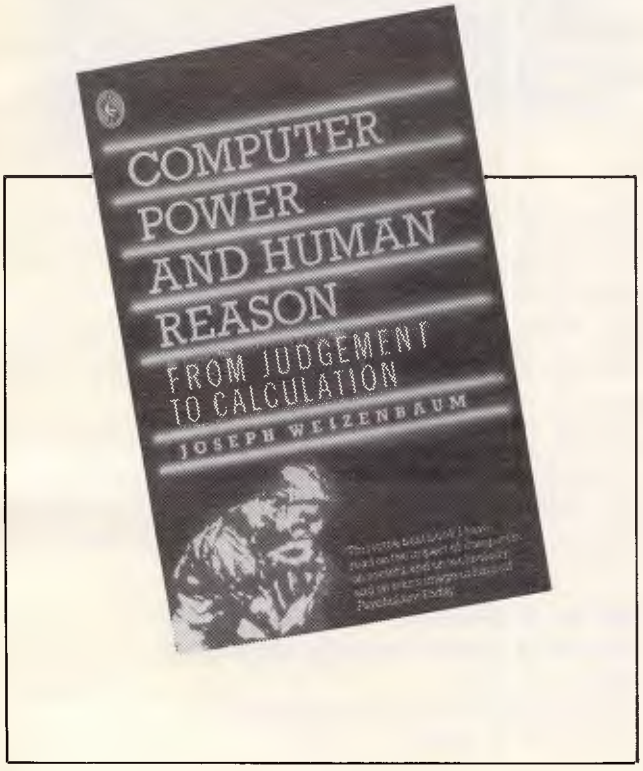
Taking the programs first, there are complete Microsoft Basic source listings for five applications: mailing lists, accounts payable, accounts receivable, (gridiron) football information program, and a 'tickler' system. The accounting programs would probably need modifications to suit Australian practises, and the football information system certainly would. The point is that the ideas are valid. In any case, it wouldn't be hard to justify the purchase price by pointing to the two remaining programs.

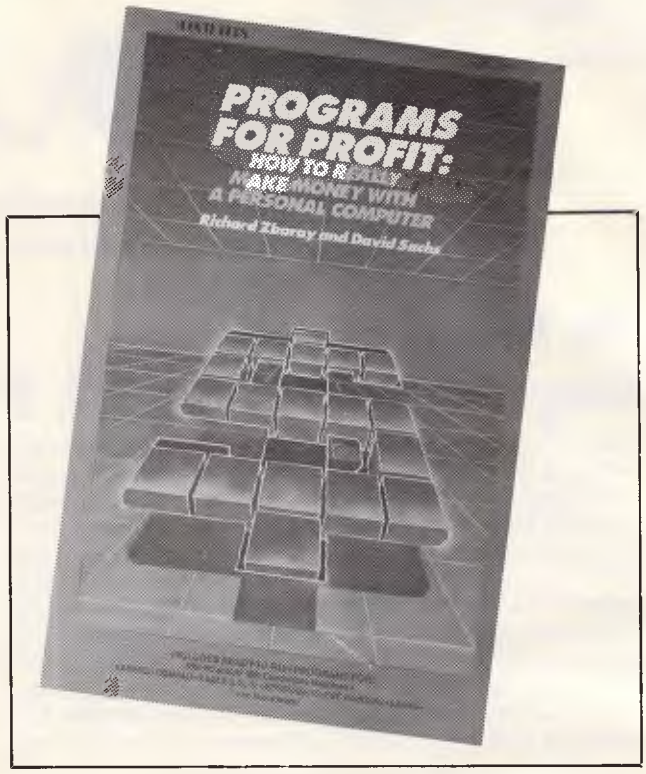
While the emphasis of the book is on providing specialised bureau services, other possibilities are examined. One obvious opportunity is selling your own programs, but you might be surprised by the number of different ways Zboray and Sachs suggest this can be done. They even offer a few ideas in related areas (like evaluating programs for software companies on a freelance basis).

If the idea of starting your own business, even part-time, appeals to you, then *Programs for Profit* could well give you that extra surge of enthusiasm needed to turn thoughts into action.

Programs for Profit

Authors: Richard Zboray and David Sachs
Publisher: McGraw-Hill/Byte Books
Price: $17.95





Computer Power and Human Reason

Although this book was originally published in 1976 it has only recently appeared in paperback form, reflecting the fact that a wider audience have become interested in computers and computing. The popular press has given the most attention to the chapter on compulsive programmers, probably because of an assumption that people don't like to think too hard — *Computer Power* demands concentration as well as reflective thought between chapters.

The central theme of the book seems to be an appeal against the inappropriate use of computers. This of course requires an analysis of humankind, the tools it employs, and the effect one has on the other. Weizenbaum says this of tools: "they symbolize the activities they enable, ie, their own use. An oar is a tool for rowing, and it represents the skill of rowing in its whole complexity. No one who has not rowed can see an oar as truly an oar." He goes on to point out the impact certain tools have had on our view of the world. Since the invention of the clock people tend to eat at appointed times, not when they feel hungry. The whole idea of time as something that passes rather than a rhythm (eg, of day and night) has a profound effect on humanity, leading to a rejection of that which is experienced in favour of that which is measured.

The idea of 'knowing' is important to Weizenbaum's thesis. If a person who has never rowed cannot 'know' an oar, what can a computer 'know' of such human concepts like justice, loyalty, compassion, or love. He expresses concern that attempts are being made to apply computers to applications that require the application of humanity, in the belief "that life is what is computable and only that". He describes his famous Eliza program, written apparently as an exercise in the analysis of English sentences. The most

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famous of Eliza's scripts was that which allowed it to simulate a Rogerian psychotherapist. The results worried Weizenbaum, because he found that some psychiatrists felt that Eliza was the precursor of systems that could replace human therapists, and that people quickly accepted Eliza as being real, in that they truly felt that conversing with it could help them with their real problems.

My original (late 1970s) reaction to this story was to wonder if it really mattered. After all, I reasoned, psychiatrists probably apply set techniques to their patients' problems, so what's wrong with automating the process? In the case of Eliza, it didn't matter that people believed the program could help them even though they knew it didn't 'understand' their problem. Eliza could simply act as a mirror for self-examination. Weizenbaum answers this by pointing out that this argument is based on a fraud, that this acceptance can only occur because our society is tending to go along with the idea that the difference between people (as intelligent beings) and computers is one of degree rather than kind. For him, the matter is simple: "there are some human functions for which computers *ought* not to be substituted. It has nothing to do with what computers can or cannot be made to do. Respect, understanding, and love are not technical problems".

Give your brain a treat — read *'Computer Power and Human Reason'*, and then think about its message.

Computer Power and Human Reason

Author: Joseph Weizenbaum
Publisher: Penguin (A Pelican Book)
Price: $7.95

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TJ'S WORKSHOP

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

COMMODORE SCREEN SCROLL

This program consists of a set of scroll routines. These allow the screen to be scrolled up, down, left or right one character at a time. The program was written containing no jumps, so the code can be located anywhere in memory. When the program loads it asks for the start location for the machine code: I would suggest 49152. The code is then loaded starting at the specified address and the appropriate locations for each scroll are displayed. If the start address is 49152, then the scrolls are called as follows:

SCROLL LEFT...SYS 49152
SCROLL RIGHT...SYS 49255
SCROLL DOWN...SYS 49373
SCROLL UP...SYS 59626

The scroll up is a call to the KERNAL ROM scroll routine and always has the same value.

In games or business programs, often only a portion of the screen is required to scroll while the rest of the display remains fixed. The following POKE will adapt the scrolling routines to maintain fixed 'windows' on the screen while the rest of the display scrolls as normal.

POKE 49199,0:POKE 49171,24 — top six lines don't scroll left
POKE 49252,193:POKE 49180,48 — bottom six lines don't scroll left
POKE 49324,0:POKE 49356,8 — bottom five lines don't scroll right
POKE 49381,207 — bottom six lines don't scroll down
POKE 49282,0:POKE 49347,240:POKE 49309, 255:POKE 49310,4 — top six lines don't scroll right.

The program incorporates a checksum feature to make sure the hex data is correct. If you get a 'DATA ERROR' message when you run the program, check the data statements again.

S Bolton

```
1 REM ****     SCREEN  SCROLL     ****
2 REM                 BY
3 REM
4 REM             SEAN BOLTON
5 REM
6 REM ****         (C) 1984        ****
7 REM
8 T=0:W=Z
9 POKE53281,11:PRINT"[redacted]":INPUT" E
NTER THE START ADDRESS";Z:W=Z
10 READA$
20 IFA$="S"THEN100
30 X=ASC(A$):A$=MID$(A$,2):Y=ASC(A$):A$=
MID$(A$,2)
40 IFX>57THENX=X-7
50 IFY>57THENY=Y-7
60 X=X-48:Y=Y-48:Q=(X*16)+Y:POKEZ,Q:Z=Z+
1:T=T+Q
70 IFA$=""THEN10
80 GOTO30
100 IFT<>31580THENPRINT" DATA ERROR.....
.":END
110 PRINT:PRINT" SCROLL LEFT......SYS"W
120 PRINT" SCROLL RIGHT.....SYS"W+103
130 PRINT" SCROLL DOWN......SYS"W+221
140 PRINT" SCROLL UP........SYS 59626"
150 END
510 DATA18D8,AD0005,8DFD02,AD0006,8DFE02
,A200,A920,9D0004,9D1805,9D3006
520 DATA9DF806,188A18,C9F0,F007,18,6928,
AA,18,90E4,A200,BD0104,9D0004
530 DATABD0105,9D0005,BD0106,9D0006,E8,E
0FF,D0E9,18,ADFD02,8DFF04,ADFE02
540 DATA8DFF05,AD0007,8DFF06,18,A200,BD0
107,9D0007,E8,E0E9,D0F5,60
550 DATA18D8,ADFF04,8DFD02,ADFF05,8DFE02
,ADFF06,8DFF02,18,A2FE,BD0004,9D0104
560 DATABD0005,9D0105,BD0006,9D0106,E000
,F004,CA18,90E6,18,ADFD02,8D0005
570 DATAADFE02,8D0006,18,A2E9,BD0007,9D0
107,E000,F004,CA,18,90F2,18,ADFF02
580 DATA8D0007,18,A200,A920,9D0004,9D180
5,9D3006,9DF806,18,8A,18,C9F0,F007
590 DATA18,6928,AA,18,90E4,60
600 DATA18D8,A2F0,BDCF06,9DF706,CA,D0F7,
18,A2F0,BDDF05,9D0706,CA,D0F7,18
610 DATAA2F0,BDEF04,9D1705,CA,D0F7,18,A2
F0,BDFF03,9D2704,CA,D0F7,18,A920
620 DATAA228,9DFF03,CA,D0FA,60
630 DATA5
```

SPECTRUM ON ERROR GOTO

This routine allows any Spectrum owners to make the computer perform certain operations when an error has occurred in a Basic program. Many Basics found on more expensive machines, such as the Apple, have an instruction such as

ON ERROR GOTO 1000,

which makes the computer execute from line 1000 in the program when an error has occurred — such as 'Integer out of range' or 'Out of memory'. At line 1000 then, the type of error found in the program could be used to tell the user what has happened, and why.

This routine uses the variable 'error' (if it has been assigned a value) and jumps to the line number that this variable contains. If the variable does not exist, or has the value 0, then there will be no jump and the usual report will appear. If the line number is larger than the largest one in the program, then the 'OK' report will appear — just as GOTO 9999 will produce the 'OK' report if there is no such line number as 9999.

The routine also creates two new variables (or alters

them if they already exist) called 'err' and 'erl'. The variable 'err' is assigned the code of the error — 0 to 27 (0 = OK, 4 = Out of memory, and so on). All these codes are in appendix B of the manual. The variable 'erl' is assigned the line number at which the error occurred.

If, however, there is an error in a direct command, such as RANDOMIZE 65536, the variable 'erl' will contain the number 65534 which is the line number of any direct command.

As it stands, the routine will not make the computer jump if the error is one of the following:
STOP statement;
BREAK — CONT repeats;
STOP in INPUT;
BREAK into program; and
OK

A jump to the specified line can be made by entering:
FOR f=60125 TO 60144: POKE f,0: NEXT f (for the 48k).

This will cause a jump to the line number in the variable 'error' every time the computer tries to print a report other than OK.

Now here's the problem: if you do enter the line above, you must be sure that the line you want when an error occurs contains no error itself! If there is one, the computer will keep jumping to that line *ad infinitum* — you will not be able to BREAK into it.

If the line does contain an error, but you haven't entered the line above, you will be able to break into the loop.

J Torjussen

```
  30 REM *    ON ERROR GOTO     *
  50 REM *      Written by      *
  70 REM *    James Torjussen   *
 110 REM *        for the       *
 130 REM *  48K  ZX Spectrum    *
 160 REM
 170 CLEAR 59999
 180 PRINT  OVER 1;AT 8,13;"PLEA
SE";AT 10,14;"WAIT"
 190 PLOT 129,30: DRAW  OVER 1;0
,145,253*PI
 200 DATA "33882ab25c363e2bf92b2
b223d5c1807fd363102cd9517cdb0163
e00cd0116fd3600ffcd2c0fcd171bfdc
b007e2013fdcb3066cad5ea2a595ccda
711fd3600ff18d82a595c225d5ccdfb1
978b1c208ecdffe0dca6eeafdcb3046c
4af0dcd6e0d3e19fd964f328c5cfdcb0
1fefd3600fffd"
 210 DATA "28e9360a01cd8a1b3a3a5
cfeffca7aebfe08ca7aebfe0cca7aebf
e10ca7aebfe14ca7aeb2168ec225d5cc
db22830132a595c2b010800cd5516233
6a52336722336f2233a3a5c3c3600233
600237723360023600216cec225d5cc
db22830132a595c2b010800cd5516233
6a52336722336"
 220 DATA "2cefec23ed4b455c36002
33600237123702336002162ec225d5cc
db228381f23cdb433cda22d78b128143
e0032445c3d323a5ced43425c11d5ead
5c3761b76fdcb01aefdcb304ec4df0e2
a3a5c3cf5210000fd7437fd7426220b5
c21010022165ccdb016fdcb37aecd6e0
dfdcb02eef147"
 230 DATA "2b1ffe0a3802c607cdef1
53e20d7781191113cd0a0caf113615cd0
a0ced4b455ccd1b1a3e3ad7fd4e0d060
0cd1b1acd97103a3a5c3c281bfe09280
4fe152003fd340d01030011705c21445
ccb7e280109edb8fd360afffdcb019ec
375eaed43495c2a5d5ceb215aece52a6
15c37ed52e560"
 240 DATA "20bf69cd6e192006cdb81
9cde819c1793db02828c5030303032be
d5b535cd5cd5516e122535cc1c5132a6
15c2b2bedb82a495cebc1702b712b732
b72f1c36eea3e0a010000c38aeb45525
24f520d4552520d45524c0d000000000
0000000000000000000000000000000
0000000000000"
1000 LET a=10: LET b=11: LET c=1
2: LET d=13: LET e=14: LET f=15:
 LET h=60000: LET l=200
1010 FOR g=1 TO 5
1020 READ a$: LET s=VAL a$(1)*40
96+VAL a$(2)*256+VAL a$(3)*16+VA
L a$(4): LET a$=a$(5 TO )
1030 LET t=VAL a$(1)*16+VAL a$(2
): LET s=s-t: POKE h,t: LET h=h+
1: LET a$=a$(3 TO ): IF a$<>"" T
HEN  GO TO 1030
1040 IF s<>0 THEN  PRINT AT 19,0
;"Error in line ";l: STOP
1050 LET l=l+10
1060 NEXT g
1070 PRINT  OVER 1;AT 8,13;"PLEA
SE";AT 10,14;"WAIT"
1080 PRINT  OVER 1;AT 9,15;"OK!"
1090 PLOT  OVER 1;129,30: DRAW
OVER 1;0,145,253*PI
1100 LET a$="To use, type RANDOM
IZE USR 60000"
1110 FOR f=1 TO LEN a$: PRINT AT
 19,32-f;a$( TO f): BEEP .02,20:
 PAUSE 4: NEXT f
```

NEC HAND-HELD HINTS

There are several external device names, not all of them explained in the manuals:
RAM: RAM memory
CAS: cassette
COM: RS232 communications link
LCD: screen
LPT: parallel printer and it is perfectly correct to use
OPEN "LPT:" FOR OUTPUT AS#1
PRINT #1, A$;B$
instead of
LPRINT A$;B$
which can sometimes be useful (see the program in Basic Reference Manual p9-15 for an example; correct "SCRN:" to "LCD:" on line 410).

Contrary to what the Basic Reference Manual states on p4-103, it's possible to use both the data recorder and RS232 circuit simultaneously. I wrote a program which reads a text file from the data recorder and sends it through RS232 to my printer. It works well, simply because I didn't notice the remark on p4-103 and didn't realise that such a connection should be impossible.

Finally, here's a memory dump program for the PC-8201A which can be used to find out some interesting things about the machine (for example, locations of file control blocks, undocumented keywords, and so on). The program works in two modes: ASCII (characters only) or full dump (hex values and characters).

Notes:

(1) Output may be suspended by <CTRL—S> and resumed by <CTRL>—Q>.

(2) Output may be interrupted by pressing the space bar (do not use STOP as it does not properly close the file and reclaim the buffer space).

M Wiechowski

```
 10 GOTO 35
 11 'Hex -> Dec
 12 D=0: FOR I%=1 TO LEN(H$)
 13 H1$=MID$(H$,I%,1): D%=ASC(H1$)-48
 14 IF D%>9 THEN D%=D%-7
```

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```
15 D=16*D+D%:NEXT I%:RETURN
16 'Dec->hex4
17 H$="":FOR I%=1 TO 4
18 D%=D-16*FIX(D/16):D=FIX(D/16)
19 IF D%<10 THEN H$=CHR$(D%+48)+H$
20 IF D%>9 THEN H$=CHR$(D%+55)+H$
21 NEXT I%:RETURN
22 'Dec->hex2
23 H$="":FOR I%=1 TO 2
24 D%=D MOD 16:D=FIX(D/16)
25 IF D%<10 THEN H$=CHR$(D%+48)+H$
26 IF D%>9 THEN H$=CHR$(D%+55)+H$
27 NEXT I%:RETURN
28 'Outchar
29 IF V%<32 THEN PRINT#1,".";:RETURN
30 IF V%>130 THEN PRINT#1,".";:RETURN
31 PRINT#1,CHR$(V%);:RETURN
32 'Interrupt?
33 Z$=INKEY$:IF Z$=" " THEN RETURN 54
34 RETURN
35 'Main
36 MAXFILES=1:CLS
37 INPUT"From (hex)";H$:GOSUB 11:F=D
38 INPUT"Output (LCD:,LPT:,COM:)";OF$
39 OPEN OF$ FOR OUTPUT AS#1
40 INPUT"Ascii only";Q$:CLS
41 IF Q$="Y" OR Q$="y" GOTO 49
42 FOR I=F TO 65535! STEP 8
43 D=I:GOSUB 16:PRINT#1,H$;" ";
44 FOR J=I TO I+7:V%=PEEK(J):D=V%
45 GOSUB 22:PRINT#1,H$;" ";:NEXT J
46 FOR J=I TO I+7:V%=PEEK(J)
47 GOSUB 28:NEXT J:PRINT#1,""
48 GOSUB 32:NEXT I:GOTO 54
49 FOR I=F TO 65535! STEP 32
50 D=I:GOSUB 16:PRINT#1,H$;" ";
51 FOR J=I TO I+31:V%=PEEK(J)
52 GOSUB 28:NEXT J:PRINT#1,""
53 GOSUB 32:NEXT I
54 CLOSE:MAXFILES=0:END
```

VISICALC TIPS

(1) Printing tips

Have you noticed that the start and end positions of a print are seldom on the screen together? You can waste time running the cursor down to the place you think you used last time without wrap-around on the printer. On the other hand, you could put the bottom print cell coordinate into a cell just left or above the starting cell. Perhaps you already do. If not, try it! See below for an example in cell C1.

There are important restrictions to consider when creating a sheet as to the size of the numbers used and the amount of columns to screen or print. The numbers below form an easy guide to checking and initial design of sheets.

Chars/col 5 6 7 8 9 10 11
12 13 14 15 16
Scr 64 Y 12 10 9 8 7 6 5
5 4 4 4 4
N 13 11 10 9 8 7 6
6 5 5 5 5
Prt 80 Y 16 13 11 10 8 8
7 6 6 5 5 5
N 17 14 12 11 9 9
8 7 7 6 6 6

(2) Error flags

Just suppose you miss a decimal point in your data entry and the results are way out. Can you quickly find the line or even the cell to change it, or perhaps there are more than one? Don't panic, try this. Use the * format for a cell on the far right or bottom of a sheet.

Let's say you are checking a calculation less than 100%. If the sum calculated in a total column has 100 taken from it and the result is a positive number, then the cell will 'flag' the error using asterisks. Errors less than the column width can be found; for example, a column width of 8 will show an error value of 6 as six asterisks.

Or you can temporarily change the cell's format back to no format for the value to appear to help find the culprit A cross reference grid of a row and a column of error checks will exactly point to the error, though it can waste precious memory if taken too far. I use a column on the right in a split screen of a couple of columns and enter data on the left screen, then call the calculation manually (!) to check for errors. See columns U and V below. The formulae are U4/F*(V) @SUM(E5...H5)-A5. The formula quoted above is U 12/F*(V) + I12 – 100.

John Wilkinson

```
A4 (V)  +#2-(A1*A2)                                                    C

  ...A....B....C....D....E....F....G....H....I..   ..U...V..
1     1 1=BH D2T56 MAIN HALL USAGE FOR W/E.....
2    84   78          <----OFF PEAK--   84---->  2.** = ERRO
3 OFFP PEAK   TOT  DAY CASL ADVB UB40 OTHR %USE  3.OFFP PEAK
4    84   78  162  MON                      0  4.
5    84   78  162  TUE                      0  5.
6    84   78  162  WED                      0  6.
7    84   78  162  THU                      0  7.
8    84   78  162  FRI                      0  8.
9        162  162  SATXXXXXXXXXXXXXXXXXXXXXXXX  9.
10       156  156  SUNXXXXXXXXXXXXXXXXXXXXXXXX 10.
11 ========================================== 11.==========
12  420  708 1128 %USE    0    0    0    0    0 12.
13 OFFP PEAK  TOT DAY  CASL ADVB UB40 OTHR %USE 13.
```

CENTRE YOUR TEXT ON THE 64

Here's a machine code routine to produce a command for the Commodore 64 which locates itself at the top of memory, $C000 in hex or 49152 in decimal. The program replaces the LET command with the new command CEN (this is done by using a system wedge).

CEN "The text to be centred" places the text in the centre of the screen. It centres text up to 38 characters long. The command can also be used with strings as can be seen with the following example:

```
10 A$="COMMODORE 64"
20 CEN A$
30 END
```

The following is a short version of the listing in Basic.

```
10 A$="COMMODORE 64"
20 S=INT (40-LEN(A$))/2
30 FOR I=1 TO S
40 PRINT CHR$(32);
50 NEXT I
60 PRINT A$
70 END
```

The routine should prove useful in tidying up many of your programs.

S Jonas

```
10 REM          CENTRE COMMAND
15 REM       FOR THE COMMODORE 64
20 REM    COPYRIGHT 1984 BY S.JONAS
25 REM   TO USE TYPE  CEN "TEXT HERE"
30 REM
35 T=0:FORI=0TO169
40 READA:POKE 49152+I,A
45 T=T+A:NEXT
50 IFT<>24554THENPRINT"CHECK SUM ERROR":END
55 PRINT"   CENTRE COMMAND     [C]1984 BY S.JONAS"
```

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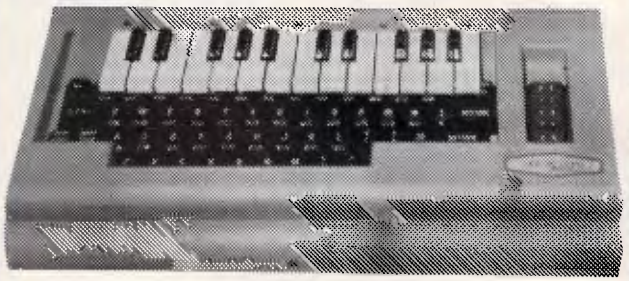

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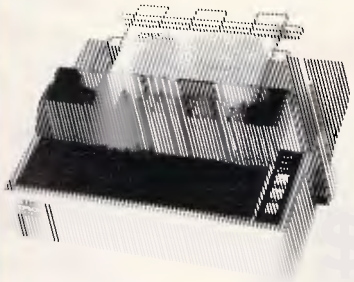

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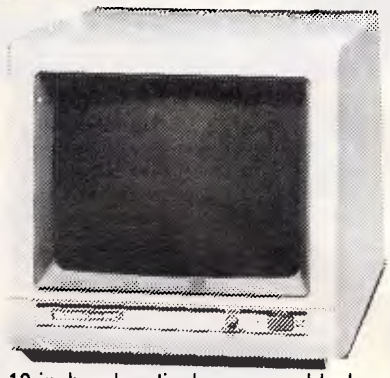

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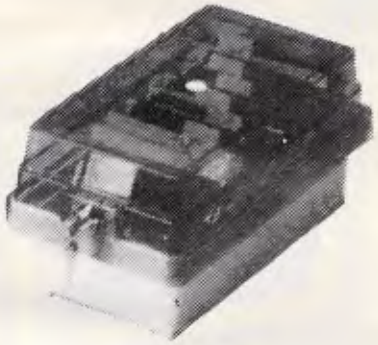

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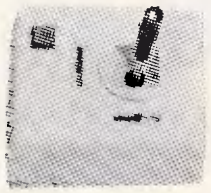

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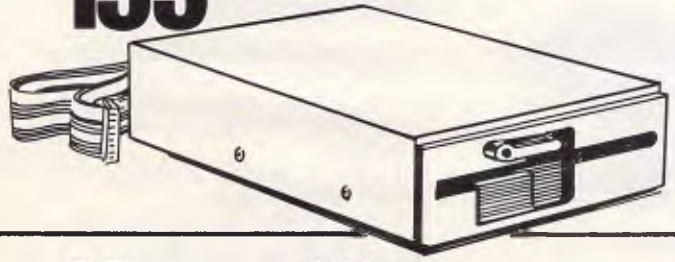

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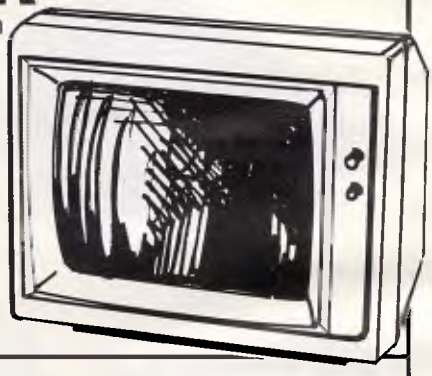

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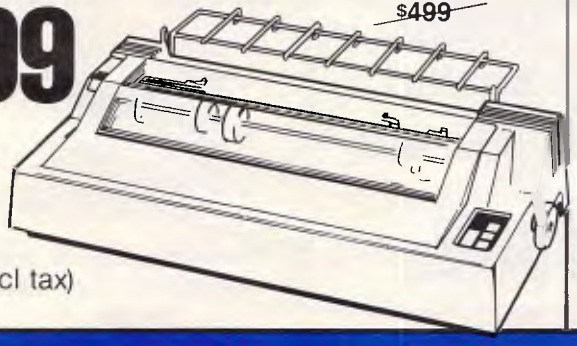

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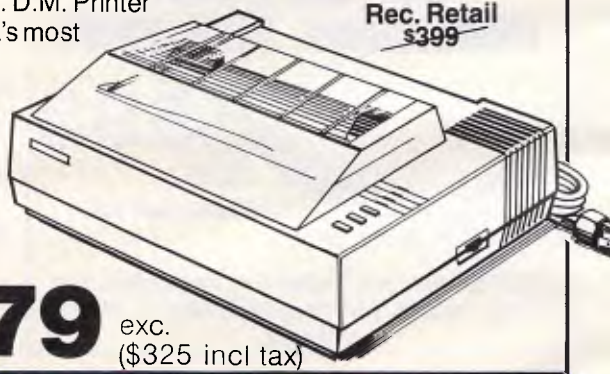

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```
60 PRINT"TO USE TYPE CEN "CHR$(34)
   "TEXT HERE"CHR$(34)
70 SYS49152:PRINT"CENTRE OK.":END
100 DATA 169,0,133,251,169,160,133,252
110 DATA 160,0,177,251,145,251,200,208
120 DATA 249,230,252,165,252,201,192
130 DATA 208,239,169,38,141,2,3,169
140 DATA 192,141,3,3,76,116,164,169
150 DATA 67,141,190,160,169,69,141,191
160 DATA 160,169,206,141,192,160,169,69
170 DATA 141,28,160,169,192,141,29,160
180 DATA 169,54,133,1,76,131,164,72,162
190 DATA 0,169,0,157,176,192,232,208
200 DATA 248,32,158,173,32,163,182,165
210 DATA 13,208,3,76,8,175,164,25,192
220 DATA 39,176,247,160,0,162,0,177,26
230 DATA 157,176,192,232,200,196,25,144
240 DATA 245,132,251,132,252,169,40,56
250 DATA 229,251,133,251,74,133,251,168
260 DATA 169,32,153,0,193,136,16,248
270 DATA 164,251,162,0,189,176,192,153
280 DATA 0,193,200,232,228,252,208,244
290 DATA 162,0,189,0,193,32,210,255
300 DATA 232,201,0,208,245,104,96,0
```

MACHINE CODE RELOCATOR

The following routine will relocate 6502 machine code by physically changing addresses of JMP and JSR instructions.

The user is first prompted to enter the start, end and relocation addresses of the code. The routine will check the code and alter it where necessary.

For example:
Start address? &2000
End address? &2006
Relocation address? &4000

A typical piece of code would be changed as shown.

Address	Original code	Relocated code
&2000	CLD	CLD
&2001	BCS&2006	BCS&2006
&2003	JMP&2500	JMP&4500
&2006	RTS	RTS

The relocated code will not be transferred to address &4000. It must be transferred by the user. The easiest way for BBC users to achieve this is:

SAVE Example 2000 + 64000 4000
LOAD Example

As the routine stands it will only run on the BBC, but it needs little alteration to run on other 6502-based machines. Non-BBC users should omit line 660 since it checks for operating system calls in the BBC ROM. Commodore 64 users should remember that the 6510 CPU is a version of the 6502 and so the relocator can be run on the 64 with little modification.

R Lober

```
10REM 6502 machine code relocater.
20REM By R.A.Lober
30REM 25.7.84.
40REM Do not renumber this program.
50
60REM Written in simple BBC Basic.
70REM & so should easly be
80REM translated to other 6502
90REM based machines :Commodore,
100REM Atari, Orics, Apple II & IIIs
110
120REM This routine DOES NOT move any
130REM code but over writes it
140REM changing address. Therefore
150REM code must be moved by the
160REM user.
170
180REM This routine will not take
190REM account of data tables & text
200REM & so the user must be accurate
210REM when giving start & end
220REM addresses.
230
240CLS
250CX=0: REM Number of JMPs & JSRs.
260
270INPUT"Start address ";A$:SX=EVAL&$
280INPUT"End address ";A$:EX=EVAL&$
290INPUT"Relocate address ";A$:RX=EVAL&$
300IF EX<SX PRINT"Illegal entry ":GOTO270
310IF SX<TOP AND SX>PAGE PRINT"Area used by BASIC":GOTO270
320REM Main loop.
330
340FOR BX=SX TO EX
350IX=?BX
360GOSUB410
370NEXT
380PRINTCX;" JSRs & JMPs found."
390END
400REM Check op code & find len.of data
410
420IF IX=&4C OR IX=&20 GOTO630
430NX=0:FX=-1
440REPEAT
450RESTORE (NX*10)+560
460IF FX=-1 NX=NX+1
470REPEAT
480READ FX
490UNTILFX=IX OR FX=-1
500UNTILFX<>-1 OR NX=4
510BX=BX+(NX-1): REM Skip data bytes.
520IF FX=-1 PRINT"Unknown op code &";~IX;" at byte ";~BX
530RETURN
540
550REM Tables of op codes.1,2 & 3 bytes
560DATA 00,&0A,&4A,&2A,&6A,&18,&D8,&58,&B8,&CA,&88,&E8,&C8,&EA,&48,&8,&68,&28,
&40,&60,&38,&F8,&78,&AA,&AB,&BA,&9A,&8A,&98,-1,-1
570DATA &69,&29,&C9,&E0,&C0,&49,&A9,&A2,&A0,&9,&E9,&65,&25,&6,&24,&C5,&E4,&C4,
&C6,&45,&E6,&A5,&A6,&A4,&46,&5,&26,&66,&E5,&85,&86,&B4,&C1,&41,&A1,&1,&E1,&81,&7
1,&31,&D1,&51,&B1,&11,&F1,&91,&75,&35,&16,&D5,&D6,&55,&F6,&B5,&B4,&56,&15,&36
580DATA &76,&F5,&95,&94,&90,&B0,&F0,&30,&10,&D0,&50,&70,&96,&B6,-1,-1
590DATA &6D,&2D,&E,&2C,&CD,&CC,&EC,&CE,&4D,&EE,&20,&AD,&AE,&AC,&4E,&D,&2E,&6E,
&ED,&BD,&BC,&BE,&DD,&DE,&5D,&FE,&BD,&BC,&5E,&1D,&3E,&7E,&FD,&9D,&D9,&59,&B9,&BE,
&19,&F9,&99,&6C,-1,-1
600DATA -1
610REM Change address of JSR & JMPs.
620
630L=BX?1:H=BX?2
640A=(256*H)+L
650IF A>&C000 GOTO690 :REM don't change if it is an OP system address
660A=A+(RX-SX)
670BX?1=A MOD 256
680BX?2=A DIV 256
690BX=BX+2: REM skip address bytes
700CX=CX+1
710RETURN
```

FLASH A MESSAGE ON VIC 20 SCREEN

This routine will allow you to have two messages simultaneously scrolling across the top and bottom of your VIC 20 screen. The top message scrolls from right to left and the bottom from left to right.

The messages are contained in data statements at the end of the routine. Any messages that will not fit in one data statement can be contained in several and concatenated (as seen in the example) as long as the overall message does not exceed 211 characters.

The routine can be used to display instructions at the start of a game, or maybe adapted to flash up messages during a game.

D Walker

```
10 PRINT CHR$(147):POKE 36879,8
20 FOR I=7168 TO 7679: POKE I,PEEK(I+25600):NEXT
30 FOR I=7168 TO 7175: READ A:POKE I,A: NEXT
40 DATA 24,24,24,231,231,24,24,24
50 POKE 36869,255
60 FOR I=7680 TO 8185:POKE I,0:POKEI+30720,2:NEXT
65 I=7168
70 A=PEEK(I):B=PEEK(I+1):C=PEEK(I+2):D=PEEK(I+3)
75 E=PEEK(I+4):F=PEEK(I+5):G=PEEK(I+6):H=PEEK(I+7)
80 POKE I+1,A: POKE I+2,B: POKE I+3,C: POKE I+4,D
85 POKE I+5,E: POKE I+6,F: POKE I+7,G: POKE I,H
90 GOTO 70
```

VIC 20 IN SCROLL MODE

The following routine prints a grid on the screen and then scrolls it down pixel by pixel in a downward direction.

This is achieved by swapping the bytes around in the user defined character to create a constantly inverting

character, thus giving the illusion of scrolling. Note this does not have to be used with a grid but can be altered to be used with any rectangular character.

J Ketskemety

```
10 READ A$,B$,C$ : A$=A$+B$+C$
15 READ D$
20 B$="*.*.*.*.*.*.*.*.*.*.*.":A$=B$+A$+B$
25 D$=B$+D$+B$
26 A=1 : C=LEN(D$)-22
30 PRINT "[CLR/HOME][CD * 11]PRESS ANY KEY TO CONT."
40 PRINT "[HOME][CD]"
50 PRINT "[RVS ON][RED]"MID$(A$,A,22);"[RVS
   OFF][BLUE]"
51 PRINT "[HOME][CD *21]";
53 PRINT "[RVS ON][PURPLE]" MID$(D$,C,22);"[RVS
   OFF][BLUE];
55 GET Z$
56 IF Z$<>""THEN 150
57 FOR D=1 TO 25: NEXT D
60 A=A+1 : IF A>=LEN(A$)-20 THEN A=1
65 C=C-1:IF C<1 THEN C=LEN(D$)-22
70 GOTO 40
100 DATA "TO MAKE A MESSAGE SCROLL FROM RIGHT TO LEFT
    ACROSS THE TOP OF THE SCREEN
110 DATA "SEPARATE IT INTO SMALL SECTIONS AND PUT IT
    IN
120 DATA "DATA STATEMENTS.  INCLUDE IN LINE100 1
    STRING VARIABLE FOR EACH DATA STATEMENT.
130 DATA "211 CHARACTERS MAXIMUM!"
150 PRINT "[CLR/HOME][GREEN]FINISHED![BLUE]"
```

EARTH-SHAKING ATARI DISPLAY

A handy visual effect for use in games programs is a shaking screen to simulate an earthquake or large explosion. An obvious way of achieving this effect would be to use the Atari's scroll registers.

However, the following program demonstrates a much simpler method. The first byte of the Display List holds an '8 blank lines' instruction (decimal 112).

By POKEing different 'blank lines' instructions (eg 0,16,32,48,64,80,96) into this location, the screen's vertical position may be shifted by up to 7 scan lines.

N Pearce

```
10 DL=PEEK(560)
+256*PEEK(561)
20 SOUND 0,34,0.14
30 FOR I=0 TO 40
40 POKE DL, INT (RND(0)*8)*16
50 NEXT I
60 POKE DL,112
70 SOUND 0,0,0,0
```

SX 64 SCREEN SIGNAL TAPS INTO VIDEO

I have discovered that in addition to using the small screen provided with the Commodore SX 64, it is possible to view the screen on our TV set via a Sanyo video recorder.

This is achieved with a standard combined sound and vision lead, and BNC connector.

Attach the connector to the Video In socket at the back of the recorder. Place the 5-pin DIN plug from the cable into the video socket on the SX 64. The two phono plugs go into the BNC and Audio In socket on the recorder.

You should now have both sound and vision output from the computer to the TV set. But you must switch the Tuner/Ext In switch to Tuner In.

You can also record signals output from the SX 64 on to video tape.

WL

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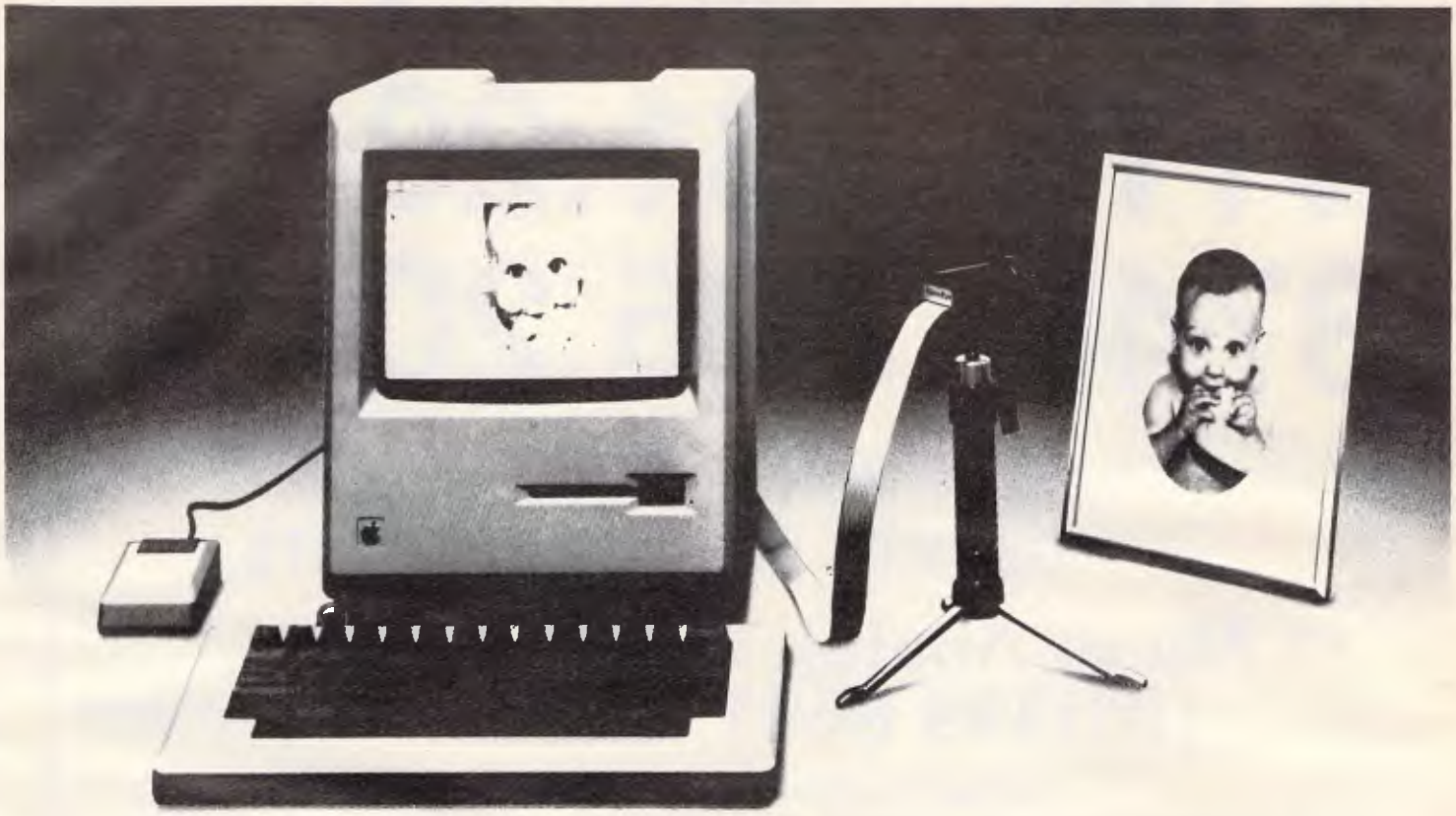

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DIY voice synthesiser

Peter Vernon explains how to build your own voice synthesiser which can be connected to any computer.

Would you like a talking computer? Voice output adds to the excitement of computer games, emphasises messages from the computer (imagine your computer shouting "Hey, I've finished" after a long printing job!) and helps visually handicapped people who may otherwise be unable to use a computer. With appropriate software this project can be used in all of these applications, and many more. It's a basic version of a speech synthesiser based on the Votrax SC-01 integrated circuit speech synthesiser, designed for minimum cost.

The Votrax SC-01 chip has been around for a while now, as microelectronics go, and some very advanced voice synthesisers have been developed around it. The "Personal Speech System", for example, from Votrax itself, is controlled by an on-board Z80 microprocessor with "text-to-speech" translation software. It includes a sound generator chip and a clock too, so all sorts of special effects are possible.

This project is nothing like that. In keeping with one of the basic themes of the Compucircuits series, the circuit shown here is the simplest working design in which the SC-01 can be used to provide speech output from a microcomputer, So that the circuit can be used with as wide a range of computers as possible, it is designed so that it connects to a centronics-type parallel printer port.

(That's not to say it's cheap. While the handful of other parts costs around $20, the SC-01 chip itself costs $82.95. It's also a fragile chip, sensitive to static electricity and very intolerant of a reversed supply voltage. Hande it carefully . . .)

How it works

All spoken languages are made up of a limited number of basic sounds called 'phonemes' which when put together produce words. The English language uses about 42 different phonemes, depending on the accent of the speaker.

The SC-01 is a single chip phoneme based speech synthesiser which accepts a coded value between 0 and 63 and produces one of 64 sound units (silences of various lengths are also considered 'sound units'), as shown in table 1. Programming the SC-01 is a matter of breaking down the words to be spoken into individual phonemes, then converting these phonemes into appropriate data codes according to table 1. These codes are sent to the speech synthesiser with an LPRINT CHR$() or OUT statement to the parallel port to which the synthesiser is connected. In response, the synthesiser sounds the phonemes which make up the programmed word.

The circuit

The speech synthesiser project is designed to connect to a centronics-type parallel port. Only six data bits are required to specify the 64 phoneme sounds which the SC-01 can produce. Data bits D0 to D5 are connected to the inputs of a buffer, IC1, which passes them directly to the data inputs of the Votrax chip. A STB (strobe) signal instructs the SC-01 that the data is ready.

The strobe signal for the SC-01 has special timing requirements which may not be met by all computer printer ports. For this reason IC2 is included, a monostable which 'stretches' the length of the strobe pulse from the computer before it is applied to the SC-01 itself.

When a phoneme is being sounded by the SC-01 the A/R (Acknowledge/Ready) signal from the Votrax chip will be at '0', indicating that the voice synthesiser chip is busy. Transistor TR1 inverts this signal (so that a '1' means busy) in order that the voice synthesiser interface will match the specifications of standard centronics input ports.

Sending data to the voice synthesiser is thus a matter of putting the data on the lower six bits of the data port and activating the STB pulse. The A/R signal will go to '1' for as long as the SC-01 is producing a sound and then return to '0', indicating that the chip is ready to accept the next phoneme code. In most cases the LPRINT statement of Basic will automatically take care of these timing requirements.

The remaining sections of the circuit provide a timing clock for the SC-01 and amplify the audio output of the chip. The

Parts list

Integrated circuits

1 74LS376 hex bus driver
1 74LS121 monostable multivibrator
1 SC-01A speech synthesiser
1 LM386 audio amplifier

1 BC547 NPN transistor
1 7805 +5V voltage regulator

Capacitors

1 1000uF/25VW electrolytic
1 220uF/25VW electrolytic
1 100uF/25VW electrolytic
1 10uF tantalum
4 0.1uF greencap
2 .01uF greencap
1 150pF ceramic

Resistors (1/4W, 5%)

1 x 100k, 1 x 22k, 1 x 10k
1 x 6.8k, 1 x 4.7k, 1 x 10 ohms
2 x 10k trimpots

Miscellaneous

15cm length of 10-way ribbon cable
1 loudspeaker
1 22 pin socket for SC-01 chip

Standard TTL types may be substituted for the 'LS type specified, eg., you may use the 74121 rather than the 74LS121

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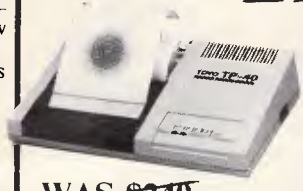

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components connected to pins 15 and 16 of the SC-01 set the overall timing of the chip, and consequently the pitch of the sounds produced. Potentiometer VR1 (marked 'Pitch Control') on the circuit diagram varies the pitch of the speech produced. However, since the clock rate also affects the rate at which phonemes are processed, a high pitch means rapid speech (a sort of Donald Duck effect), while a low pitch means slow speech. The middle range gives the most satisfactory effects for everyday use.

Audio output from the SC-01 is amplified by IC4, an LM386 integrated circuit amplifier. Potentiometer VR2 controls the gain of the amplifier and hence the volume of the sounds produced. The amplifier can produce a maximum output of 1 watt, quite enough to drive a loudspeaker.

The SC-01 and audio amplifier sections of the circuit require a 12V DC power supply and the TTL logic requires 5V. Power for the speech synthesiser is provided by a 12V DC plugpack, with an LM7805 voltage regulator to provide the 5V supply. This regulator may become quite hot in use, and should be fitted with a heatsink (metal fins which bolt onto the metal tab of the regulator package to improve heat dissipation).

```
10 CLEAR 100:CLS
20 DIM B0$(50), B(50)
30 PRINT "Enter phoneme codes separated by spaces."
40 PRINT "Press RETURN to see ASCII codes."
50 PRINT "To exit program type 'QUIT'"
60 C=0:PRINT
70 INPUT A0$
80 IF A0$="QUIT" THEN END
90 A0$=A0$+" "
100 IF LEN(A0$)=0 THEN GOTO 170
110 C=C+1
120 FOR I=1 TO LEN(A0$)
130 IF MID$(A0$,I,1)<>" " THEN NEXT I
140 B0$(C)=LEFT$(A0$,I-1)
150 A0$=MID$(A0$,I+1,100)
160 GOTO 100
170 REM find corresponding ASCII code
180 FOR A=1 TO C
190 READ A1$,D
200 IF A1$="OUT" THEN GOTO 300
210 IF A1$<>B0$(A) THEN GOTO 190
220 B(A)=D:RESTORE:NEXT A
230 PRINT "The ASCII codes are;"
240 FOR A=1 TO C
250 PRINT CHR$(B(A));
260 LPRINT CHR$(B(A));:REM sends sound to
    synthesiser connected to printer port
270 NEXT A
280 LPRINT "?";:REM stops all sound
290 GOTO 60
300 PRINT "ERROR - NO ";B0$(A);" CODE":END
400 DATA "EH3",64,"EH2",65,"EH1",66,"PA0",67
410 DATA "DT",68,"A2",69,"A1",70,"ZH",71
420 DATA "AH2",72,"I3",73,"I2",74,"I1",75
430 DATA "M",76,"N",77,"B",78,"V",79
440 DATA "CH",80,"SH",81,"Z",82,"AW1",83
450 DATA "NG",84,"AH1",85,"OO1",86,"OO",87
460 DATA "L",88,"K",89,"J",90,"H",91
470 DATA "G",92,"F",93,"D",94,"S",95
480 DATA "A",32,"AY",33,"Y1",34,"UH3",35
490 DATA "AH",36,"P",37,"O",38,"I",39
500 DATA "U",40,"Y",41,"T",42,"R",43
510 DATA "E",44,"W",45,"AE",46,"AE1",47
520 DATA "AW2",48,"UH2",49,"UH1",50,"UH",51
530 DATA "O2",52,"O1",53,"IU",54,"U1",55
540 DATA "THV",56,"TH",57,"ER",58,"EH",59
550 DATA "E1",60,"AW",61,"PA1",62,"STOP",63
560 DATA "OUT",64
```

Listing 1: this program converts Votrax phoneme codes to ASCII symbols which can be sent to the voice synthesiser.

How to build it

Printed circuit boards and other components for this project will be available from Mike Boorne Electronics, PO Box 8, Turramurra, NSW, 2074 or Geoff Wood Electronics Pty Ltd, 656A Darling Street, Rozelle, NSW, 2039. There may be a short delay, as many manufacturers do not work over Christmas, but PCBs should be ready in January. SC-01 chips are immediately available.

If you do not wish to use the printed circuit board the speech synthesiser can be built on strip board, which consists of copper strips plated onto circuit board material with a grid of holes at 0.1 inch intervals. Building the circuit in this way requires cutting the copper strips of the board (with a craft knife or similar) and soldering wire links from one track to another so that connections are made as shown on the circuit diagram, and no other connections exist between the pins of the chips, the individual components and the power supply lines.

No matter which method of construction you choose, be sure to use a socket for the SC-01. Wire the circuit as shown, and without inserting the SC-01 in its socket, connect the power supply and switch on. Use a multimeter to check that the power supply voltages are correct for each IC, paying particular attention to pins 1 and 18 of the SC-01. You should be able to measure 12V on pin 1, with pin 18 as ground, or zero volts, and 5V on pin 16 of IC1 and pin 14 of IC2. Pin 6 of the amplifier, IC4, is also connected to 12V.

When you are sure that the power supply voltages are correct, switch off the circuit and then insert the SC-01 in its socket, making sure that it is oriented correctly. When you switch on the circuit

again you should hear some sound from the voice synthesiser, based on the random state of the input lines.

If all is correct so far, switch off the power again and connect the speech synthesiser to the printer port of your computer. Switch on the voice synthesiser, then the computer and try the program shown in listing 1.

Software

Writing text-to-speech translation software is a non-trivial task. The best reference on the subject is Steve Ciarcia's article in the October 1982 issue of BYTE magazine. Basically the process relies on coding a number of rules which determine which phoneme patterns will be substituted for the incoming ASCII character. The rules are based on look-tables, the context of the character and punctuation, and the more rules you encode into your program, the more accurate your text to speech translation software will be. To be of use, the program must also run quickly enough to simulate real speech, and that means using assembly language.

We've made no attempt to produce a text-to-speech translator. The Basic program shown here is designed to assist you in constructing your own vocabularies for the voice synthesiser, but you will also need a copy of the Votrax "Phonetic Speech Dictionary for the SC-01 Speech Synthesiser", which should be supplied with the chip. The dictionary supplies a list of commonly used words and the Votrax phoneme codes required to produce the sounds for each word. Constructing a vocabulary is a matter of looking up each word and then converting the phoneme codes into values to be sent to the synthesiser. The program in listing 1 assists in this part of the process by automating the conversion of phoneme codes into data values. With the program running, simply type in a series of phoneme codes separated by spaces. On pressing 'Return' the program will display a series of ASCII symbols corresponding to the codes you have typed. Copy these symbols into DATA statements in your own program to permanently store the codes for each word which you want the voice synthesiser to speak.

If you use the LPRINT statement to drive the voice synthesiser, you should be aware that in some versions of Basic the code for LPRINT actually translates some ASCII codes into other values. The Apple II, for example, restricts the ASCII codes which can be sent to a printer, and the TRS-80 Model 1 translates the code for a carriage return into multiple linefeed statements. If you experience problems using LPRINT, try the more direct OUT statement.

Note also that in using LPRINT you should end each statement with a semicolon to suppress the carriage return sent by Basic. Carriage return (CHR$(13)) is the Votrax code for the 'n' sound and unless suppressed will produce a sort of hum between each spoken word.

Hexadecimal phoneme code	Votrax Phoneme Symbol	As in;	ASCII character
00	EH3	jacket	@
01	EH2	enlist	A
02	EH1	heavy	B
03	PA0	(47ms pause)	C
04	DT	butter	D
05	A2	make	E
06	A1	pail	F
07	ZH	pleasure	G
08	AH2	honest	H
09	I3	inhibit	I
0A	I2	inhibit	J
0B	I1	inhibit	K
0C	M	mat	L
0D	N	sun	M
0E	B	bag	N
0F	V	van	O
10	CH	chip	P
11	SH	shop	Q
12	Z	zoo	R
13	AW1	lawful	S
14	NG	thing	T
15	AH1	father	U
16	OO1	looking	V
17	OO	book	W
18	L	land	X
19	K	trick	Y
1A	J	judge	Z
1B	H	hello	[
1C	G	get	\
1D	F	fast	]
1E	D	paid	↑
1F	S	pass	←
20	A	tame	(space)
21	AY	jade	!
22	Y1	yard	"
23	UH3	mission	#
24	AH	mop	$
25	P	past	%
26	O	cold	&
27	I	pin	'
28	U	move	(
29	Y	any	)
2A	T	tap	*
2B	R	red	+
2C	E	meet	,
2D	W	win	-
2E	AE	dad	.
2F	AE1	after	/
30	AW2	salty	0
31	UH2	about	1
32	UH1	uncle	2
33	UH	cup	3
34	O2	bold	4
35	O1	aboard	5
36	IU	you	6
37	U1	tune	7
38	THV	the	8
39	TH	thin	9
3A	ER	bird	:
3B	EH	ready	;
3C	E1	be	<
3D	AW	call	=
3E	PA1	(185ms pause)	>
3F	?	(stop speech)	?

Table 1 shows the hexadecimal code and ASCII character corresponding to each phoneme that the SC-01 chip can produce. In each case the code makes the sound shown highlighted in the sample word.

Conclusion

The SC-01 circuit shown here is the minimum working design for a voice synthesiser based on the Votrax chip.

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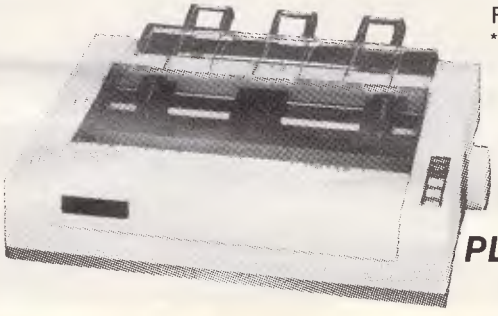

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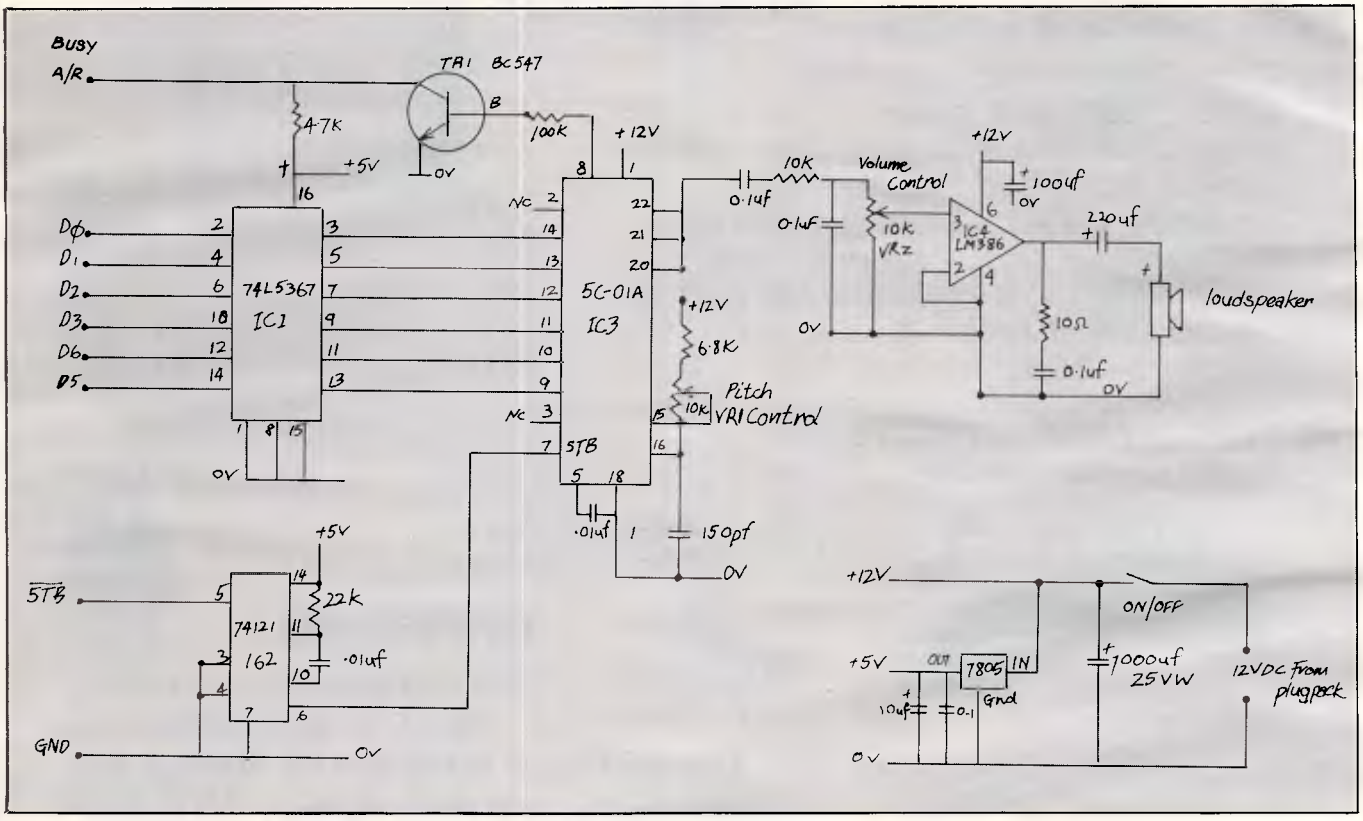
Software to drive the voice synthesiser is the first limiting factor in getting your computer to talk. Listing 2 is a simple demonstration, using DATA statements compiled with the help of the phoneme code converter program of listing 1.

The circuit and software shown here are a starting point only. They allow you to incorporate speech into your computer programs with a minimum of expense and are capable of further development. Please keep us informed of any novel applications or developments of the voice synthesiser.

```
10 FOR C=0 TO 4
20 READ A$:LPRINT A$;
30 NEXT C
40 LPRINT "??";
50 DATA "9KIRCC","KIRCC",")44+CC"
60 DATA "Y2L%67*:", "_%<YJT"
```

Listing 2: a program to say 'This is your computer speaking'



Voice synthesiser circuit

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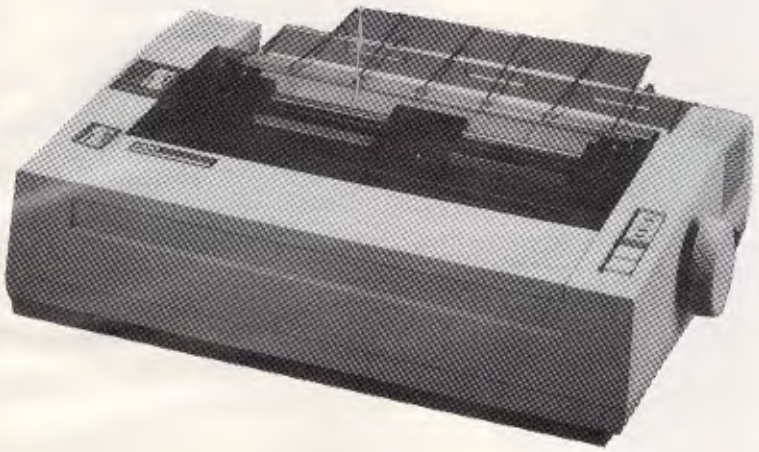

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Print Direction	Bi-directional with logic seeking
Input Buffer	1 KB
Character set	Standard Mode 96 ASCII characters with descenders 11 semi graphics. 8 international characters Italic characters IBM-PC Matrix Printer Mode 96 ASCII characters with descenders 64 block characters. 9 international characters. IBM-PC Graphic Printer Mode Additional ASCII contain European, Graphic. selected characters. math and extra symbols.
Font Registraction	Up to 40 characters
Character Structure	9 x 9
Character Size	Ordinary characters 1.99(W) x 2.24(H) mm Superscript/ subscript characters 1.9(W) x 1.36(H) mm
Characters per line	Ordinary (pica/elite) 80/96 Double width elongated (pica/elite) 40/48 Compressed (pica/elite) 132/158 Compressed and elongated (pica/elite) 66/79 Superscript, subscript (pica/elite) 80/96
Paper Feed	Friction feed. Sprocket feed
Paper Width	Fanfold 4-10 inches Cut sheet 4-9 inches
Copies	3 max.
Interface	Standard Centronics-style 8 bit parallel Optional RS232C with 2K buffer (X/ON-X/OFF and ETX/ACK protocol)
Ink Ribbon	Cassette (Service life: 3 mil characters)
Head Service Life	Over 100 mil characters

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Character sets	ASCII characters — 192 (96 normals and 06 italis). JIS characters — 160 (64 katakanas and 96 alpha-numerics). Semi-graphic units — 103. International Specials — 2 for U.S.A., 1 for UK, 8 for German, 8 for French, 4 for Swedish, 2 for Italian, 6 for Spanish, 48 for Greek, 6 for Danish and 2 for Japan.
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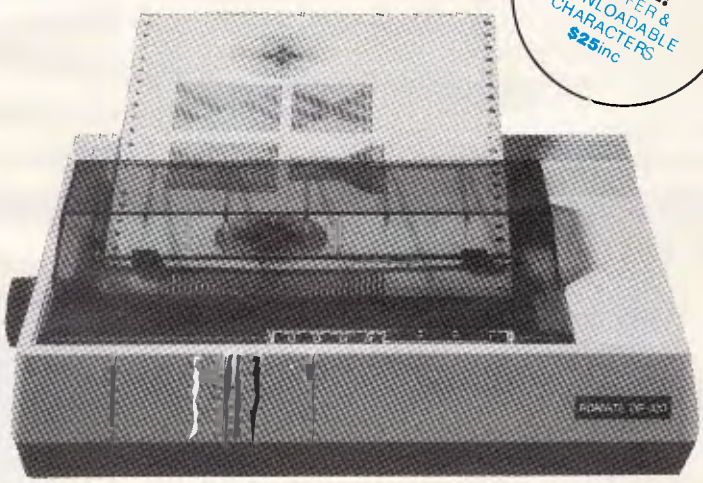

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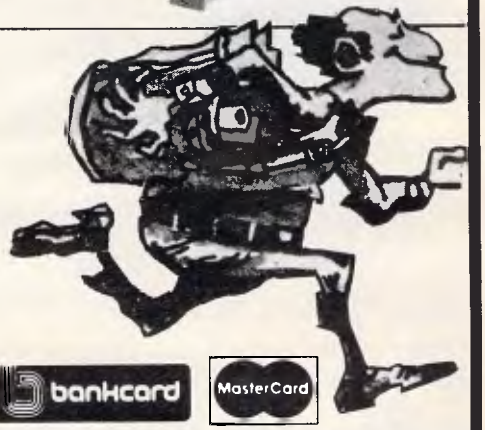

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Viatel

By this time you've probably heard that Telecom has chosen the British Prestel standard for its public viewdata service. Apparently the system will run on GEC computers in Melbourne, with a live service starting next February.

Australia is the tenth country to buy a national viewdata system from GEC and Prestel, and there are already some private systems of this type running here. Viatel will have several enhancements including a keyword search facility — this news is already making Prestel users in the UK feel envious!

System Listings

We received several letters recently concerning new systems that have come online as well as various other corrections to our list. This information has been incorporated into this month's listing — special thanks to David Downs, Michael Cooper and Petar Nikolich.

Sydtrug

The Sydney TRS-80 Users Group operates a 24 hour BBS on (02) 332 2494 which is accessible by subscribing members, with limited access for visitors. This BBS features full facilities for messages, group news, discussion groups and the exchange of public domain software.

Australian systems

Micro Design Lab RCPM

Telephone: (02) 663 0150. Hours: 5pm–7am weekdays. 24 hours weekends.

MI Computer Club BBS

Telephone: (02) 662 1686. Program downloading. Hours: 24 hours daily.

Sydney Public Access RCPM

Telephone: (02) 808 3536. System Operators: Barrie Hull and David Simpson. Membership required. Hours: 24 hours daily.

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Telephone: (02) 332 2494. System Operator: Michael Cooper for Sydtrug.

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Dick Smith Electronics RIBM

Telephone: (02) 888 2002. System Operator: Ian Lindquist. Hours: 24 hours daily.

Sorcerer Users Group RCPM

Telephone: (02) 387 4439. System Operator: John Woolner. Hours 6pm–8am weekdays, 24 hours weekends. Ring back system.

Ausborne Users Group RCPM

Telephone: (02) 568 2791. System Operator: Milton McGlynn-Worthington. Hours: 24 hours daily.

Newcastle Microcomputer Club RCPM

Telephone: (049) 68 5385. System Operator: Tony Nicholson. Hours: 5pm–8.30am weekdays, 24 hours weekends.

MICOM RCPM CBBS

Telephone: (03) 762 5088. System Operator: Peter Jetson. Hours: 24 hours daily.

Sorcerer Computer Users Association CBBS

Telephone: (03) 836 4616. System Operator: Bruce Alexander. Program downloading for SCUA members. Hours: 24 hours daily.

Melbourne PC User Group

Telephone: (03) 528 3750. System Operator: LLoyd Borrett. Hours: 24 hours daily.

Telebraille

Telephone: (03) 755 1341. (Austpac ?237520000). Operator: Jim Eadie. Hours: 24 hours daily.

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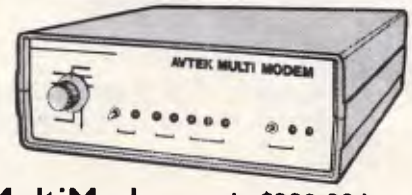

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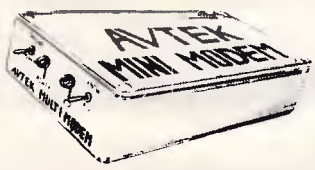

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Telephone: (09) 279 8555. System Operator: Greg Watkins. Hours: 24 hours daily.

New Zealand Systems

NZ Micro Club RBBS

Telephone: 0011 64 9 762 309. System Operator: Chris Cotton. Hours: 24 hours daily. Software up/downloading.

This information is correct and current to the best of our knowledge. Please send corrections and updates to: Steve Withers, C/- *Australian Personal Computer*, 77 Glenhuntly Road, Elwood, Victoria 3184.

Overseas systems

North America

SYSTEM	*NUMBER*	*NOTES*
SPACE Citadel	0011 1 206 839 4759	
Ckcms Citadel	0011 1 206 329 0436	
Eskimo North Minibin	0011 1 206 527 7638	
Conn-80	0011 1 212 441 3755	TRS-80 Color Computer

EUROPE

ELFA ABC-MONITOR, Sweden	0011 468 730 0706	Half Duplex
ABC-Banken, Sweden	0011 463 511 0771	
ABC-MONITOR, Sweden	0011 468 801 523	Password required
CBBSD Gothenburg	0011 463 129 2160	75/1200 baud
CBBS Sweden*	0011 463 169 0754	
BUG, Sweden	0011 468 463 528	BBC Micro
XD-BBS Helsinki	0011 358 072 2272	
Commodore BBS, Finland	0011 358 116 223	
Tedas, Munich	0011 49 89 596 422	
Decates, Germany	0011 49 66 154 51433	

UK

CBBS South West	0011 44 626 890 014	
Liverpool Mailbox	0011 44 51 428 8924	
BASUG	0011 44 742 667 983	
Computer Answers	0011 44 1 631 3076	
CBBS Surrey	0011 44 4862 25174	
Blandford Board	0011 44 258 54494	
Microweb TBBS	0011 44 61 456 4157	BBC Micro
Stoke Information Technology Centre RCPM	0011 44 782 265 078	

Africa

Connection 80, Cape Town	0011 27 21 457 750
TRShop, Cape Town	0011 27 21 5367
Clan Computers, Durban	0011 27 31 66356
Peters Computers, Johannesburg	0011 27 11 834 5134
Peters Computers, Johannesburg	0011 27 11 834 5135
War Games, Johannesburg	0011 27 11 642 3722

* After receiving the tone and connecting your modem, either type <C/R> or <COM C/R>. The system then asks for a password which is 'cbbs' in *lower-case* letters. If you only get a '>' from the system, it needs resetting, so type <I> C/R.

SOFTWARE

How to write great software

Part III

Mike Bolan in his previous articles in this series showed ways to develop and test a functional user interface and defined some important design features for successful software. Using these strategies you will have a good definition for a program which meets the needs of your target market group.

As your program (coding in whatever language you have chosen) is completed, it must be rigorously tested for function. As many bugs as possible must be found and corrected and everything tested over again under all possible operating conditions. Such "alpha" and "beta" site testing systems are pretty well understood and it's tempting to assume that's the end of it. However, the target user group has to test the product also and this cannot be done until the package is closer to completion with draft manuals written etc.

The entire process of selling a software solution, from conception of idea by the developer to a user successfully solving a problem with the software, should be understood by the developer. Many tough decisions have to be made about support, returns, sales staff training, manuals, demonstration disks, packaging etc. It is better to make those decisions during the design stage than to face incessant difficulties later.

Documentation

If you've followed my advice so far your manuals are already halfway to completion, but don't forget that documentation describes that which is not obvious in the software itself and in that sense can be viewed as a list of failures! There is enough truth in this definition to be instructive: keep the manuals as small and accessible as possible; make them graphic if you can; consider printing reduced screen dumps of your software to explain key points; make sure that there is an overview of your system and how to get it all going and *remember that the manual is a critical sales tool.* If it's too technical or confusing for the buyer there's a good chance that he or she won't buy your software. A person is also unlikely to buy if your manual looks cheap, ie. printed on a dot matrix printer. Resist the temptation and have your manual professionally printed.

Write your manual so that people who look at it want to use the software to solve their problems. Include applications tips and examples so that your manual becomes part of the entire problem solving tool that you are offering. Perhaps the most important thing about the manual is to test it on your target market before you go to print. Instructions which make sense to programmers are often incomprehensible to human beings! This testing process is also a key part of development ... if you cannot interest anyone in testing your manual it's going to be very hard for a dealer to interest people in paying money for it. Now is the time to learn how to describe accurately the advantages of your system in words that the target user understands and can relate to.

Demonstrations

If other people will be selling your product, and that really is the only way to achieve good market penetration, then you must consider their needs too. Your target buyer is probably working most of the day and is likely to be shopping around for solutions during lunch or during late night shopping when many of the more skilled retail sales staff are out and part timers are staffing the counters. It is unreasonable to expect them to be able to represent the advantages of your system accurately to any potential buyer without major help from you.

Produce a good, relevant demonstration disk which can be simply inserted and run to show the benefits of your software. Design this disk with as much care as you used in designing your program. Such a demonstration is probably your main chance to impress the browser. Also make certain that there is enough information for the salesperson to choose to show your demonstration disk. Your demo disk can be just a series of screens presented in order by a simple program, it doesn't have to be a copy of your software.

Computer retailers are bombarded with information every day and you need to make certain that your product catches their eye and that they know when to show it. This is tough in a country the size of Australia with hundreds of widely scattered sales outlets, but it is an issue which you must address.

Designing for Distribution

I liken software distribution to a chain, with the developer at one end and the user at the other. Between them are other people and businesses, each with individual needs, and these are like the chain's links. If any of the links is broken then sales of the package may well stop altogether. Figure 1 shows the distribution chain and some of the needs of the people in the chain. Design your package to help all of them and you will be helping yourself tremendously.

The publisher needs a package which is easy to maintain. Replacing faulty disks and answering queries is expensive and totally unprofitable. Good documentation, provision for users to make back-up disks or providing an extra master disk makes the publisher's business more profitable. Good packaging helps by increasing demand and lowering other

marketing costs. Naturally if the software helps round-out the publisher's whole product line then other business may result which will motivate the publisher to remember and concentrate on your product.

The distributor has similar requirements to the publisher and also needs good supplies of the product when demand picks up (another reason to make production of reliable disks as easy as possible). Software packaging designed for storage efficiency and easy identification is also a help.

The retailer has additional needs and will want to display the product in the retail store. Here you need to concentrate on package design. Consider the "record sleeve" style currently in use by electronic arts and others which has many visible surfaces full of exciting information and attractive graphics as an alternative to the "3 ring binder in a box" style. Remember many of the retail sales staff may have no familiarity whatsoever with the applications of your software and they will need an accurate features/benefits list of your product. The retailer also needs other business and if your software works with a large range of peripherals it will make that business easier. A well prepared system overview section is important to help sales staff demonstrate the product, find appropriate vertical markets and point out major features to customers. It should also define the minimum amount of equipment needed to use the product successfully. Visit some of the outlets which you hope will carry your software and design solutions for them to help them sell for you.

The buyer wants a complete solution to a problem, not something which introduces other problems. Describe how all supported peripherals are hooked up, what other software your package is integrated with, how many pages (not k) of data they can expect to store on disk, what mathematical rules and so on the program uses to arrive at a result. Buyers also want to feel that they have bought a reasonable bargain and here is where you will start to price your package.

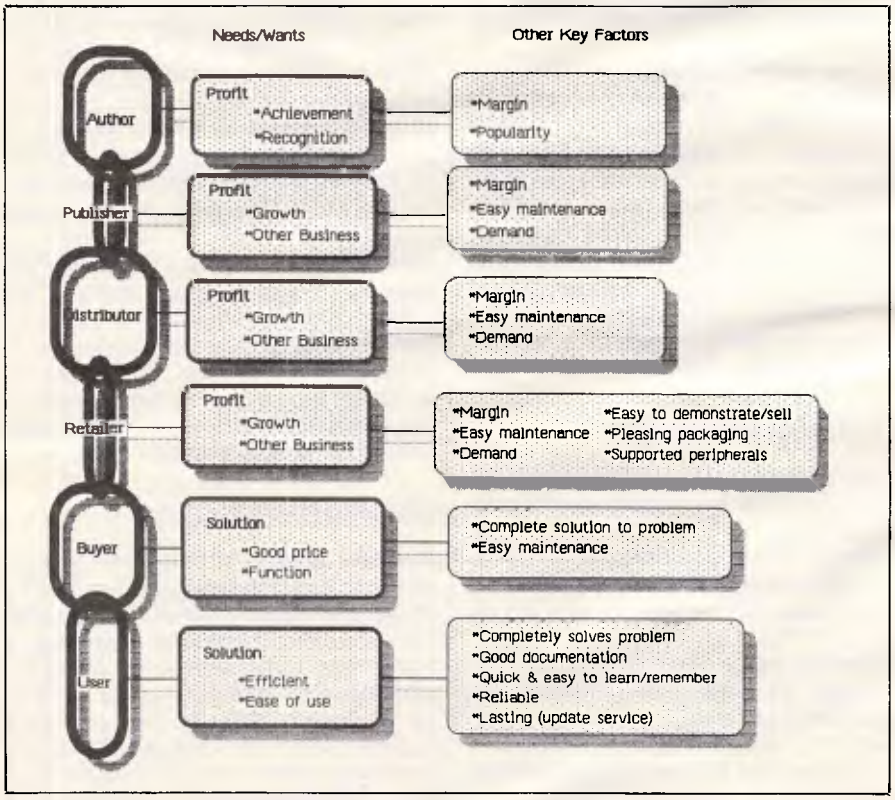
Pricing

Everyone in the chain is going to want money for handling your package but the bottom line is "what is a solution to this problem worth to the end-user"? If your solution is sufficiently worthwhile to justify buying a computer then you must add that into the price (you might be able to interest the computer manufacturer in helping market your product). If you have designed a system for managing a medical practice, you need to establish what that system is worth to the doctor ... $5,000? ... $10,000? If we conclude that $10,000 is about tops, we can then deduct the cost of the computer and associated peripherals. If peripherals etc. will cost $8,000 then we have $2,000 to play with for our software package. That's $2,000 retail, don't forget, so we can knock off a component for sales tax straight away, at 20% that's around $400, leaving $1,600 for us. The dealer will need a margin of around 35% to make it worthwhile so that's another $560 accounted for, leaving $1,040. We've still got the publisher and distributor to consider (now you see why so many people want to cut out the middle men!) and just figuring one at 35% puts us down to about $680 so we can expect to get say $650 from our $2,000 retail package after incidentals. We've got to pay our costs to date from this revenue as well as providing on-going support. Since our package is one which will be critical to the doctor once in use, we will probably decide to support it with a "hot-line" telephone service or perhaps we'll offer modem connect support. In any case this will cost us money and needs to be figured into the value of the package.

Now we have a revenue that we can use for sales requirements to provide various levels of profit. Looking at a range of such projected prices will allow us to settle on a suitable retail price. We also need this information to allow us to plan packaging and documentation. Glossy colours cost an awful lot to print and we shouldn't do it unless we believe that the market will pay the proposed retail price.

Conclusion

In this brief series I have described some of the issues which must be addressed if you really want your software to be great. The micro world is characterised by change. The plain software offerings which sold until fairly recently are being totally replaced with more sophisticated packages as the microcomputer buyer becomes demanding. Launching a package has become an expensive business and many companies find — too late — that their planning was inadequate. Your software will be compared with the best on the retailer's shelf. You don't have to spend a fortune to compete but you do have to be very well prepared. Use the information in these articles as a guide, research your market well, design your package to sell and your solution will be truly great.



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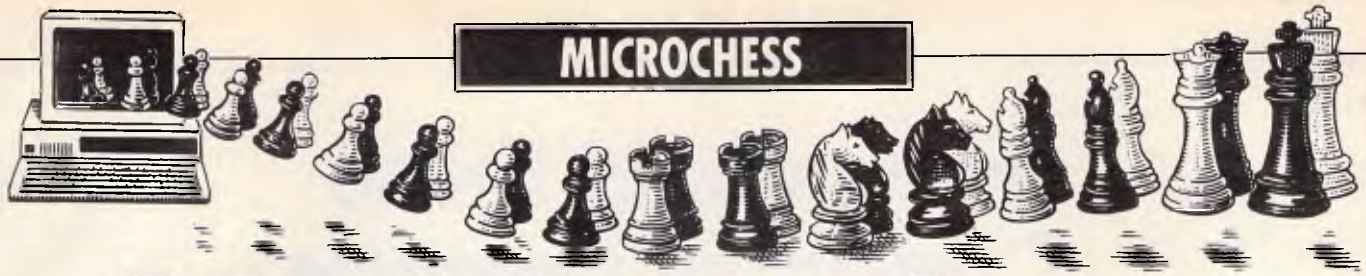


Of might and men

The recently released Colossus Chess 2.0 for the Commodore 64 claims to be the best home computer chess program on the market. An impressive statement and one which Tony Harrington cannot dispute.

It is good to see that the drive for faster and better chess programs is not just restricted to dedicated chess computer suppliers.

Colossus for the Commodore 64 is the second home computer chess program by Martin Bryant. It's nice to see that Bryant hasn't been resting on his laurels and has gone on to write a program which thrashes White Knight (his first program) by 11.5 to 5.5 over a 16-game match.

Although this result is taken from the manual, where Bryant claims to have played Colossus against just about every home computer program around, I have found no reason to dispute it. Colossus is definitely better and stronger than White Knight.

For a start, the manual consists of 14, clearly and concisely laid-out pages. The board graphics are neat, and the colours of the squares and the background border can be set by the user. This is something of a double-edged benefit. Beginners should note that this feature needs to be used carefully. My first attempt to vary the colours — provoked by the fact that with the default values, with black as the colour of the dark squares, the black pieces didn't show up well — created an illegal chessboard.

As the old adage has it, chessboards should always be set up with 'white in the right' — that is, a white square in the bottom right-hand corner. My attempt to redesign the colour scheme switched the dark and light squares. The result was that the set looked as if I was playing with the black pieces on an incorrectly set up board. For a moment or two I thought Byrant had got so involved with the program that he'd forgotten what a chessboard looked like!

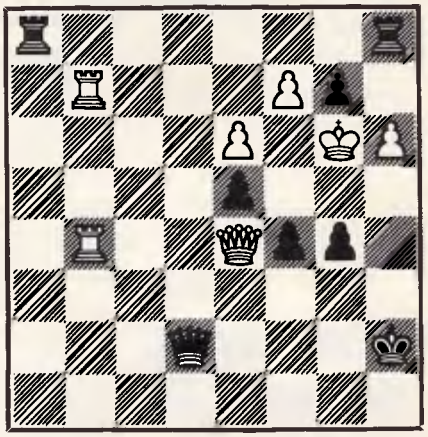
As well as the graphics display, there is an excellent 'status' screen, which has a number of very good features. It shows the time elapsed on both clocks and — an intriguing feature — during Colossus's thinking time, it shows the number of positions currently examined. The two left-most figures on this counter revolve at an amazing rate. More usefully, perhaps, this screen also shows the best line found so far by the program, up to its current look-ahead level (also displayed). You toggle between the board display and the status screen by pressing the space bar.

There are six playing modes, ranging from tournament level to problem mode. In practice, since mode 3 allows any clock setting, from blitz upwards, there is an endless set of playing levels. The program clock can be set independently, so weak players can give the computer a time handicap. Strong players can try handicapping themselves.

One of the good things about the design of this program — aside from its playing strength — is that all the commands are easily input. Compared to the highly complex command sequences we saw in last month's review of the Fidelity Elite, the commands are all of the single-key, capital letter type. All numerical input, even the clock setting, is done by pressing the up-arrow key to increase the default number, and the down-arrow key to decrease it. Position set up is the easiest I have come across yet and takes all the sting out of setting up complex positions.

Like several other home computer programs, it enjoys an advantage over dedicated chess computers in that games can be replayed on the screen at any stage from the beginning. Unlike all other home computers though, the replay is done automatically, with any move interval between one and 20 seconds. There are also backward move and forward move commands for stepping manually in either direction, for as many moves as you like (though there is an upper limit, imposed by the 64's memory, of around 120 moves).

Colossus has an excellent problem-solving mode (mode 6). Its strategy is to search all logical moves, beginning with the King and proceeding down through the pieces until it has found all possible mates. When one mate is found it asks 'Continue?' and goes on to check for others which, of course, there shouldn't be in a good chess problem. The manual claims that it can solve mate-in-seven problems. I tried it on



mate-in-two problems, which it solved almost instantly, and on the above mate-in-three problem, from Donald Bloss's book, *Rate your own Chess*.

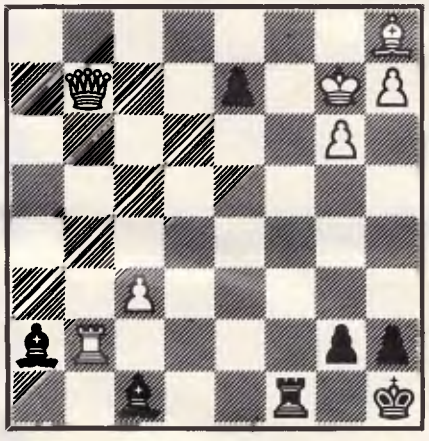
The program took 104 seconds to find the correct solution, which is 1) f4-f5+ e6×f5 2) Qd2×h6+ g7×h6 3) Ra8-g8 mate. In terms of speed, this performed on a par with a US Chess Federation rating of around 1740, according to Bloss's rating chart, but not too much should be made of this since: a) the ratings only begin to mean something over a series of problems; and b) Colossus's cast-iron technique of starting all its problem-solving by looking

first at combinations beginning with the King, then the Queen, and so on, slow it down. Once it started looking at combinations beginning with the f-pawn it found the mate almost instantly, despite the five-ply finale.

The seven-move-mate limit cannot be exceeded because the program has a maximum look-ahead of 14 ply. Put into 'infinite mode' (mode 5) it will hunt for the best move, searching all combinations of all moves. It gradually extends its search, ply by ply, until it either finds a mate or reaches the limit of its search, when it will report the best move available to it, according to its evaluation.

Interestingly, the program recognises self-mate problems as well as the more standard variety (self-mate, as the name implies, is where white has the first move and tries to mate himself in the shortest possible sequence). Bryant claims that this is a first for Colossus — certainly I am not aware of any other program that recognises self-mates. It is not a feature that will excite users unless they happen to be chess problem enthusiasts.

Much to its credit, Colossus, unlike White Knight, and almost all other home computer chess programs, recognises and can use underpromotions. To test this point, I set up the following problem — which, I might add, has nothing to recommend it as a chess problem except for the fact that it proves conclusively whether a program will underpromote when searching for a mate in problem mode.



The only one move mate in the position is the blindingly obvious 1) e7-e8=N checkmate. But for programs that haven't been told that pawns can become anything other than Queens when they reach the eighth rank, this is an impossible problem. They simply report that there is no mate in one — a technical absurdity. Colossus, I am happy to report, found the right move.

It is much harder to tell whether it would underpromote spontaneously in a game, when the situations called for it, but I am prepared to give it the benefit of the doubt. The more sceptically minded may test this for themselves by finding a game where a player underpromotes successfully and keying in the appropriate position.

All in all, Colossus is a very neat, powerful little program.

Games section

White: V Korchnoi. Black: Nuchess. Notes by Grandmaster Dr John Nunn.

On 9 April 1984, the Dutch city of Delft witnessed a chess battle between Grandmaster Viktor Korchnoi, currently rated fifth in the world, and Nuchess, designed by David Slate and William Blanchard. The program ran on a Cray-1.

The game wasn't of much sporting interest since Nuchess made some weak moves early on which were more than enough for an opponent of Korchnoi's calibre. The two main errors were both of the same type and, although the game went on for a long time, the crucial phase lasted just five moves.

1	Ng1-f3	d7-d5
2	c2-c4	e7-e6
3	g2-g3	Ng8-f6
4	Bf1-g2	d5×c4
5	Qd1-a4+	Bc8-d7

(5 . . .Nb8-d7 is more common, but although the bishop development is unusual it is quite playable.)

6	Qa4×c4	Bd7-c6
7	0-0	b7-b5?

(A very bad move. The program is tempted by the gain of time inherent in chasing back the white queen, but pays no regard to the long-term weaknesses created by this rash pawn advance.

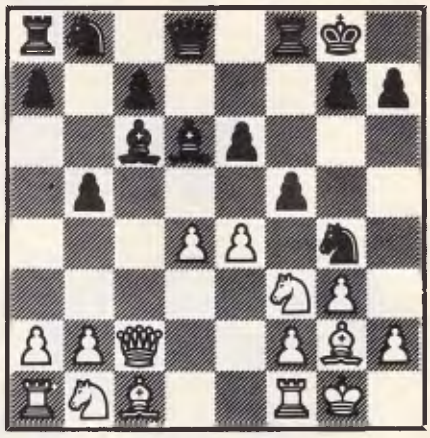
7 . . . b7-b5? means that the b-pawn can never again guard the squares c5 and c6, which is particularly serious here because Black no longer has a d-pawn which might have given alternative protection to these squares. The squares on the c-file become permanent Black weaknesses.)

8	Qc4-c2	Bf8-d6
9	d2-d3	0-0
10	e2-e4	Nf6-g4

(Defending against the threat to win a piece by e4-e5.)

11	d3-d4	f7-f5?

(The same mistake again! Now it is the e6 square which is deprived of protection, but unlike the earlier error, which could only be exploited gradually, this one leads to immediate loss of material.)



12	Nf3-g5	

(Straight away Korchnoi attacks the new weak point.)

12		. . . Qd8-d7
13	Qc2-b3	

(By reinforcing the pressure against e6 White puts Black in an impossible position. 13 . . . Rf8-f6 loses to 14 e4-e5, while after 13 . . . Rf8-e8 14 e4×f5 the pin along the b3-g8 diagonal nets two pawns.)

13		. . . Bc6×e4
14	Ng5×e6	Be4×g2
15	Ne6×f8+	Qd7-f7
16	Qb3×f7+	Kg8×f7
17	Kg1×g2	Kf7×f8

(The series of exchanges has given Korchnoi the advantage of rook for knight. If there is no compensation, this material plus is almost always enough to win.)

18	Nb1-c3	a7-a6
19	a2-a4	b5-b4
20	Nc3-d5	Nb8-c6
21	Bc1-f4	Bd6×f4
22	Nd5×f4	Nc6×d4
23	Ra1-c1	

(Black is finally made to suffer from the c-file problems caused by 7 . . . b7-b5? and must now return the pawn.)

23		. . . Ra8-a7
24	Rc1-c4	Nd4-f3

(This leads to further exchanges leaving Korchnoi a piece up.)

25	Rc4×b4	Kf8-f7
26	Kg2×f3	Ng4×h2+
27	Kf3-g2	Nh2×f1
28	Kg2×f1	Kf7-e7
29	Rb4-b8	c7-c6
30	a4-a5	Ra7-d7
31	Rb8-b6	g7-g5
32	Nf4-h3	g5-g4
33	Nh3-f4	Rd7-d2
34	b2-b4	Ke7-d6
35	Rb6×a6	Rd2-b2
36	Ra6-b6	Rb2-b1+
37	Kf1-e2	Rb1-a1
38	Ke2-e3	Ra1-a3+
39	Ke3-d4	Ra3-a2
40	Nf4-d3	h7-h6

(and Black resigned.)

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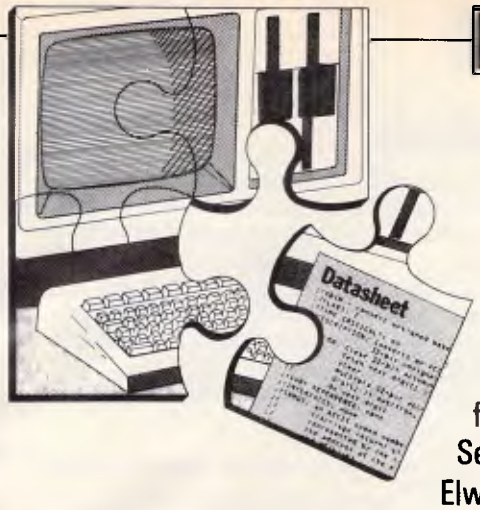

SUBSET

David Barrow presents more documented machine code routines and useful information for the assembly language programmer. If you have a good routine, an improvement or conversion of one already printed, or just a helpful programming hint, then send it in and share it with other programmers. Subroutines for any of the popular processors and computers are welcome but please include full documentation. All published code will be paid for. Send your contributions to Sub Set, APC, 77 Glenhuntly Road, Elwood, Victoria 3184.

Z80 listed options

To save you having to continually type in execute commands, MENU from Geoffrey Ticehurst lists the options available to you. It prompts your selection with a moving arrow and passes control to the program of your choice.

Although written for the TRS-80 keyboard input system, you should find that it will easily convert to the system used by your own computer.

DATASHEET

```
;=================================================
:= MENU      Menu option select routine.
;=================================================
:JOB         To display options, seek user choice and pass
:            control to option program.
:ACTION      Print options and address top option.
:            REPEAT UNTIL space bar pressed:
:            [ Highlight current option.
:              IF down-arrow pressed THEN:
:              [ De-highlight current option and address
:                next wrapping from bottom to top option. ] ]
:            Jump to chosen option through jump table.
;-------------------------------------------------
:CPU         Z80
:HARDWARE    TRS-80 Model 1 Keyboard buffer, and display.
:            Memory containing option list.
:SOFTWARE    "UNKEY" - local subroutine, to wait key release.
;-------------------------------------------------
:INPUT       HL addresses screen RAM options destination.
:            DE addresses the first byte of the option list.
:            B = number of options.
:            Each option must have bit 7 of the end byte set.
:            Option jump table of 3-byte JP instructions must
:            follow immediately after CALL MENU.
:OUTPUT      All registers changed. Control is passed to the
:            program section dealing with the wanted option.
:ERRORS      No check for option list running off screen.
:REG USE     AF BC DE HL
:STACK USE   10
:RAM USE     None.
:LENGTH      81
:CYCLES      Not given.
;-------------------------------------------------
:CLASS 2     -discreet  *interruptable  *promable
:-**---      -reentrant  -relocatable  -robust
;=================================================
;
MENU   PUSH BC         :Save option count and        C5
       PUSH HL         :screen address.              E5
MENUA  PUSH BC         :Save option count & screen   C5
       PUSH HL         :address for option display.  E5
POPTS  LD   A,(DE)     :Get option character         1A
       INC  DE         :and address next.            13
       BIT  7,A        :Test for option end,         CB 7F
       PUSH AF         :saving test flag.            F5
       AND  7FH        :Clear possible end flag,     E6 7F
       LD   (HL),A     :store to screen and          77
       INC  HL         :address next screen place.   23
       POP  AF         :Restore option end test      F1
       JR   Z,POPTS    :flag & loop if not end.      28 F4
       POP  HL         :Restore screen address       E1
       LD   BC,40H     :and move HL to address       01 40 00
       ADD  HL,BC      :next line down.              09
       POP  BC         :Restore option count and     C1
       DJNZ MENUA      :repeat for all options.      10 EA
       POP  HL         :Restore top line address     E1
       DEC  HL         :Address place 2 chars to     2B
       DEC  HL         :left for arrow position.     2B
       POP  BC         :Restore option count,        C1
       LD   C,B        :saving it in C.              48
;
MENUB  PUSH HL         :Save top line address.       E5
MENUC  LD   (HL),5EH   :Display right arrow and      36 5E
       LD   A,(3840H)  :get any keyboard input.      3A 40 38
       BIT 7,A         :Test for space-bar and       CB 7F
       JR   NZ,MENUD   :exit MENUB if pressed.       20 13
       BIT  4,A        :Test for down arrow and      CB 67
       JR   Z,MENUC    :repeat if not.               28 F3
       CALL UNKEY      :Wait down arrow release.     CD lo hi
       LD   (HL),20H   :Clear right arrow from       36 20
       LD   DE,40H     :display and address next     11 40 00
       ADD  HL,DE      :line down, repeating if      19
       DJNZ MENUC      :bottom option not passed.    10 E8
       POP  HL         :Else get top line address    E1
       LD   B,C        :and option count then        41
       JR   MENUB      :restart on top option.       18 E3
;
MENUD  CALL UNKEY      :Wait space-bar release.      CD lo hi
       POP  HL         :Tidy up stack.               E1
       LD   A,C        :Compute: options - options   79
       SUB  B          :missed = option index.       90
       LD   B,A        :Multiply option index        47
       SLA  A          :by 3 for 3-byte JP           CB 27
       ADD  A,B        :instructions.                80
       LD   B,0        :Move offset to required JP   06 00
       LD   C,A        :into BC, get return address  4F
       POP  HL         :as jump table base address,  E1
       ADD  HL,BC      :add offset to address JP     09
       JP   (HL)       :instruction and jump to it.  E9
;
:....Wait for release of key being pressed.
UNKEY  LD   A,(3B40H)  :Get key store and test if    3A 40 3B
       OR   A          :any bit set = key pressed.   B7
       JR   NZ,UNKEY   :Repeat until none pressed    20 FA
       RET             :then return to MENU.         C9
;=================================================
```

6502 control listing

Code dump routines sometimes print the ASCII characters alongside the hex, in case data and not machine code is coming through.

Control codes are usually skipped or printed as spaces.

CTRPRT intercepts these codes on their way to the print routine, and prints the standard two- or three-letter abbreviations. The result — readable hex dumps.

DATASHEET

```
;=================================================================
:= CTRPRT   Control character name print.
;-----------------------------------------------------------------
:JOB        To intercept an ASCII control code destined for
:           a print routine, converting it to its three
:           letter abbreviation enclosed in brackets.
:ACTION     IF character is a control code, THEN:
:           [ Use code * 3 as index to abbreviation table.
:             Copy abbreviation to stack. Put "<" on stack.
:             FOR count of 4:
:             [ Pull byte. IF NOT "*" THEN: [ Print. ]. ]
:             Set character = ">".
:           Exit to Print routine.
;-----------------------------------------------------------------
:CPU        6502
:HARDWARE   None.
:SOFTWARE   "WRCHAR" - subroutine to print ASCII char. in A.
;-----------------------------------------------------------------
:INPUT      A contains ASCII character or control code.
:OUTPUT     If input is a character ($20+), A is unchanged.
:           If input is a control code, output A = ">".
:ERRORS     None.
:REG USE    A P
:STACK USE  4
:RAM USE    M0
:LENGTH     146 (Code: 50.  Data: 96).
:CYCLES     Not given.
;-----------------------------------------------------------------
:CLASS 2    -discreet  *interruptable  *promable
:-***-*     *reentrant  -relocatable  *robust
;=================================================================
:


CTRPRT CMP  #32       :Pass straight through if      C9 20
       BCS  CPEND     :not a control code.           B0 2B
       STA  M0        :Else code table offset        B5 M0
       ASL  A         :is 3 * code number.           0A
       ADC  M0        :                              65 M0
       STX  M0        :Save X and move offset        86 M0
       TAX            :to X as code index.           AA
       LDA  CTAB+2,X  :Get last letter               BD lo hi
       PHA            :to stack.                     48
       LDA  CTAB+1,X  :Get middle letter             BD lo hi
       PHA            :to stack.                     48
       LDA  CTAB,X    :Get first letter              BD lo hi
       PHA            :to stack.                     48
       LDA  #$3C      :Get LESS-THAN symbol          A9 3C
       PHA            :to stack.                     48
       LDX  M0        :Restore X.                    A6 M0
       LDA  #4        :Set count of stacked          A9 04
       STA  M0        :letters in M0.                85 M0

CPLP   PLA            :Get character off stack       68
       CMP  #42       :but if "*" space filler       C9 2A
       BEQ  CPLTST    :then miss printing it.        F0 03
       JSR  WRCHAR    :Go print character.           20 lo hi

CPLTST DEC  M0        :Repeat for four stacked       C6 M0
       BNE  CPLP      :characters.                   D0 F4
       LDA  #$3E      :End with GREATER-THAN.        A9 3E
CPEND  JMP  WRCHAR    :Exit to print last char.      4C lo hi

:
CTAB   .BYTE 7B,85,76,B3,79,72 :NUL SOH    4E 55 4C 53 4F 48
       .BYTE 83,84,88,69,84,88 :STX ETX    53 54 5B 45 54 5B
       .BYTE 69,79,84,69,78,81 :EOT ENQ    45 4F 54 45 4E 51
       .BYTE 65,67,75,66,69,76 :ACK BEL    41 43 4B 42 45 4C
       .BYTE 66,83,42,72,84,42 :BS* HT*    42 53 2A 4B 54 2A
       .BYTE 76,70,42,86,84,42 :LF* VT*    4C 46 2A 56 54 2A
       .BYTE 70,70,42,67,82,42 :FF* CR*    46 46 2A 43 52 2A
       .BYTE 83,79,42,83,73,42 :SO* SI*    53 4F 2A 53 49 2A
       .BYTE 68,76,69,68,67,49 :DLE DC1    44 4C 45 44 43 31
       .BYTE 68,67,50,68,67,51 :DC2 DC3    44 43 32 44 43 33
       .BYTE 68,67,52,78,65,75 :DC4 NAK    44 43 34 4E 41 4B
       .BYTE B3,89,78,69,84,66 :SYN ETB    53 59 4E 45 54 42
       .BYTE 67,65,78,69,77,42 :CAN EM*    43 41 4E 45 4D 2A
       .BYTE 83,85,66,69,83,67 :SUB ESC    53 55 42 45 53 43
       .BYTE 70,83,42,71,83,42 :FS* GS*    46 53 2A 47 53 2A
       .BYTE B2,83,42,B5,83,42 :RS* US*    52 53 2A 55 53 2A
;=================================================================
```

6502 squash

Routines to compress and expand Z80 data held to 12-bit accuracy were given in the August issue.

David Heale has converted them to 6502 code. David's SQSH preserves the source data, unlike the Z80 version.

As both routines use post-indexed addressing, the pointers (in M0 to M3) are unchanged. Any loop repeatedly calling them to deal with a long list will have to increment them to the next four- or three-byte block.

DATASHEET

```
;=================================================================
:= SQSH     Squash Data.
;-----------------------------------------------------------------
:JOB        To compress two 16-bit words of numerical data,
:           held to 12-bit accuracy, into 3 bytes.
:ACTION     Move source byte 1 to destination byte 1.
:           Discard s2-hi. Move s2-lo to d2-hi.
:           Move s3-hi to d2-lo. Move s3-lo to d3-hi.
:           Discard s4-hi. Move s4-lo to d3-lo.
;-----------------------------------------------------------------
:CPU        6502
:HARDWARE   RAM: 4 bytes source, 3 bytes for destination.
:SOFTWARE   None.
;-----------------------------------------------------------------
:INPUT      M0,1 addresses first byte of 4-byte source.
:           M2,3 addresses first byte of 3-byte destination.
:OUTPUT     M0,1 & M2,3 and source data are unchanged.
:           Y =3.  A = last squashed byte.
:ERRORS     No check for destination overwrite of source.
:REG USE    A Y P
:STACK USE  None.
:RAM USE    M0 M1 M2 M3
:LENGTH     41
:CYCLES     98
;-----------------------------------------------------------------
:CLASS 2    -discreet  *interruptable  *promable
:-****-     *reentrant  *relocatable  -robust
;=================================================================
:
SQSH   LDY  #0       :Index first bytes.            A0 00
       LDA  (M0),Y   :Move source 1                 B1 M0
       STA  (M2),Y   :to destination 1.             91 M2
       INY           :Index second bytes.           C8
       LDA  (M0),Y   :Get source 2,                 B1 M0
       ASL  A        :lo-nibble                     0A
       ASL  A        :into A                        0A
       ASL  A        :hi-nibble                     0A
       ASL  A        :and store                     0A
       STA  (M2),Y   :in destination 2.             91 M2
       INY           :Index third bytes.            C8
       LDA  (M0),Y   :Get source 3,                 B1 M0
       LSR  A        :hi-nibble                     4A
       LSR  A        :into A                        4A
       LSR  A        :lo-nibble                     4A
       LSR  A        :and merge                     4A
       DEY           :(indexing second byte)        88
       ORA  (M2),Y   :with s2 lo-nibble             11 M2
       STA  (M2),Y   :and store in destination 2.   91 M2
       INY           :Index third bytes.            C8
       LDA  (M0),Y   :Get source 3,                 B1 M0
       ASL  A        :lo-nibble                     0A
       ASL  A        :into A                        0A
       ASL  A        :hi-nibble                     0A
       ASL  A        :and merge                     0A
       INY           :(indexing fourth byte)        C8
       ORA  (M0),Y   :with s4 lo-nibble.            11 M0
       DEY           :Index third byte and store    88
       STA  (M2),Y   :in destination 3.             91 M2
       RTS           :Exit, data compressed.        60
;=================================================================
;=================================================================
:= EXPD     Expand Data.
;=================================================================
:JOB        To expand 3 bytes of numerical data, compressed
:           by "SQSH", back to two 16-bit words with the
:           four most significant bits of each set to zero.
:ACTION     Move source byte 1 to destination byte 1.
:           Move s2-hi to d2-lo. Clear d2-hi.
:           Move s2-lo to d3-hi. Move s3-hi to d3-lo.
```

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SUBSET

```
;           Move s3-lo to d4-lo. Clear d4-hi.
;-------------------------------------------------------------
:CPU        6502
:HARDWARE   RAM: 3 bytes source, 4 bytes for destination.
:SOFTWARE   None.
;-------------------------------------------------------------
:INPUT      M2,3 addresses first byte of 3-byte source.
:           M0,1 addresses first byte of 4-byte destination.
:OUTPUT     M0,1 & M2,3 and source data are unchanged.
:           Y =4.  A = last expanded byte.
:ERRORS     No check for destination overwrite of source.
:REG USE    A Y P
:STACK USE  None.
:RAM USE    M0 M1 M2 M3
:LENGTH     42
:CYCLES     100
;-------------------------------------------------------------
:CLASS 2    -discreet  *interruptable  *promable
:-*****-    *reentrant  *relocatable  -robust
;=============================================================
;
EXPO   LDY  #0      :Index first bytes.              A0 00
       LDA  (M2),Y  :Move source 1 to                B1 M2
       STA  (M0),Y  :destination 1.                  91 M0
       INY          :Index second bytes.             C8
       LDA  (M2),Y  :Get source 2,                   B1 M2
       LSR  A       :hi-nibble into                  4A
       LSR  A       :lo-nibble A,                    4A
       LSR  A       :clearing hi-nibble              4A
       LSR  A       :and store in                    4A
       STA  (M0),Y  :destination 2.                  91 M0
       LDA  (M2),Y  :Get source 2,                   B1 M2
       ASL  A       :lo-nibble                       0A
       ASL  A       :into                            0A
       ASL  A       :hi-nibble A,                    0A
       ASL  A       :clearing lo-nibble A,           0A
       INY          :(index third bytes)             C8
       STA  (M0),Y  :and store in destination 3.     91 M0
       LDA  (M2),Y  :Get source 3,                   B1 M2
       LSR  A       :hi-nibble                       4A
       LSR  A       :into                            4A
       LSR  A       :lo-nibble A                     4A
       LSR  A       :and merge with                  4A
       ORA  (M0),Y  :s2-lo, then store               11 M0
       STA  (M0),Y  :in destination 3.               91 M0
       LDA  (M2),Y  :Get source 3 lo-nibble,         B1 M2
       AND  #$0F    :clearing hi-nibble,             29 0F
       INY          :(index fourth byte)             C8
       STA  (M0),Y  :and store in destination 4.     91 M0
       RTS          :Exit, data expanded.            60
;=============================================================
```

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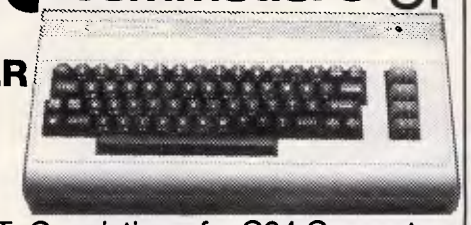

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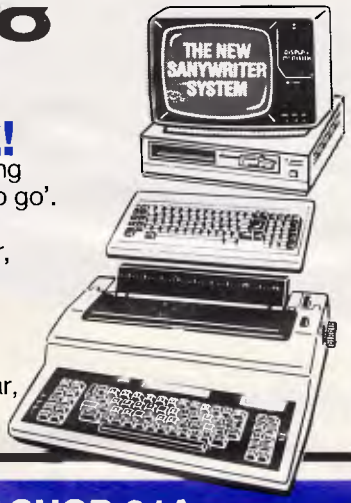

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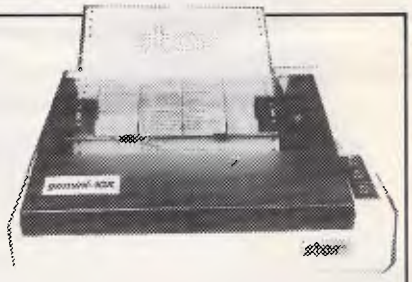

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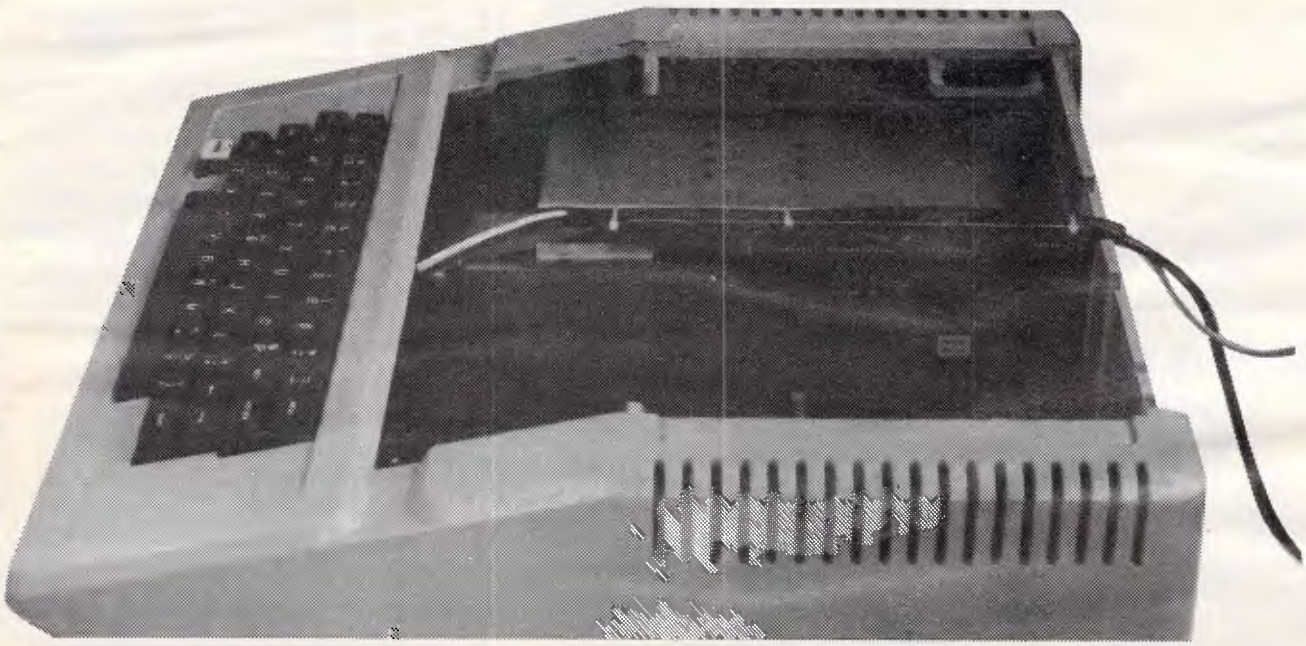

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• Onboard battery backed calendar clock can time and initiate calls or keep an activity log. The lock is ProDos compatible and is automatically recognised. It is also accessible for other uses.

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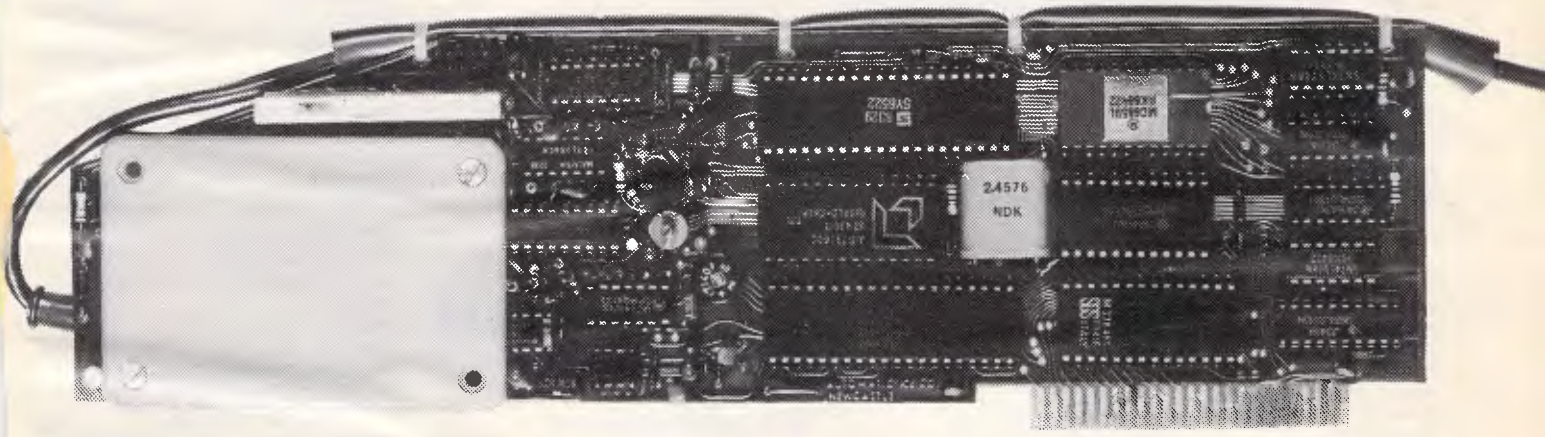

NOTE: This device has been submitted to Telecom but is not yet approved.

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C64 *LOOK!* C64

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This month's selection has a utilities flavour and covers a wide range of machines.

Spectra-draw is a program for the Spectravideo SV318 and SV328. Two simple changes listed with the program will enable it to run on MSX machines. It's well worth the effort and rivals some commercial paint-box programs in quality.

Basic programmers who want to gain an insight into the speed and power of machine code should try 'Life' for the Sinclair Spectrum. This 13-line program is a complete version of the popular computer game and produces new generations at a rate of nine per second — try doing that with Basic. Any machine code experts who think they can write a faster and shorter version please send a copy.

Finally, there's a utility which adds two graphic commands to the Commodore 64, a cassette indexer for the TRS-80/System 80, the first part of a Tandy Color Computer/Dragon adventure, a 'day finder' written in Lisp and a (mostly) machine language game for the '64.


Games


Scientific/mathematic


Business


Toolkit/utilities


Educational/Computer Aided Learning

Spectravideo Spectra-draw

by Graham Bland

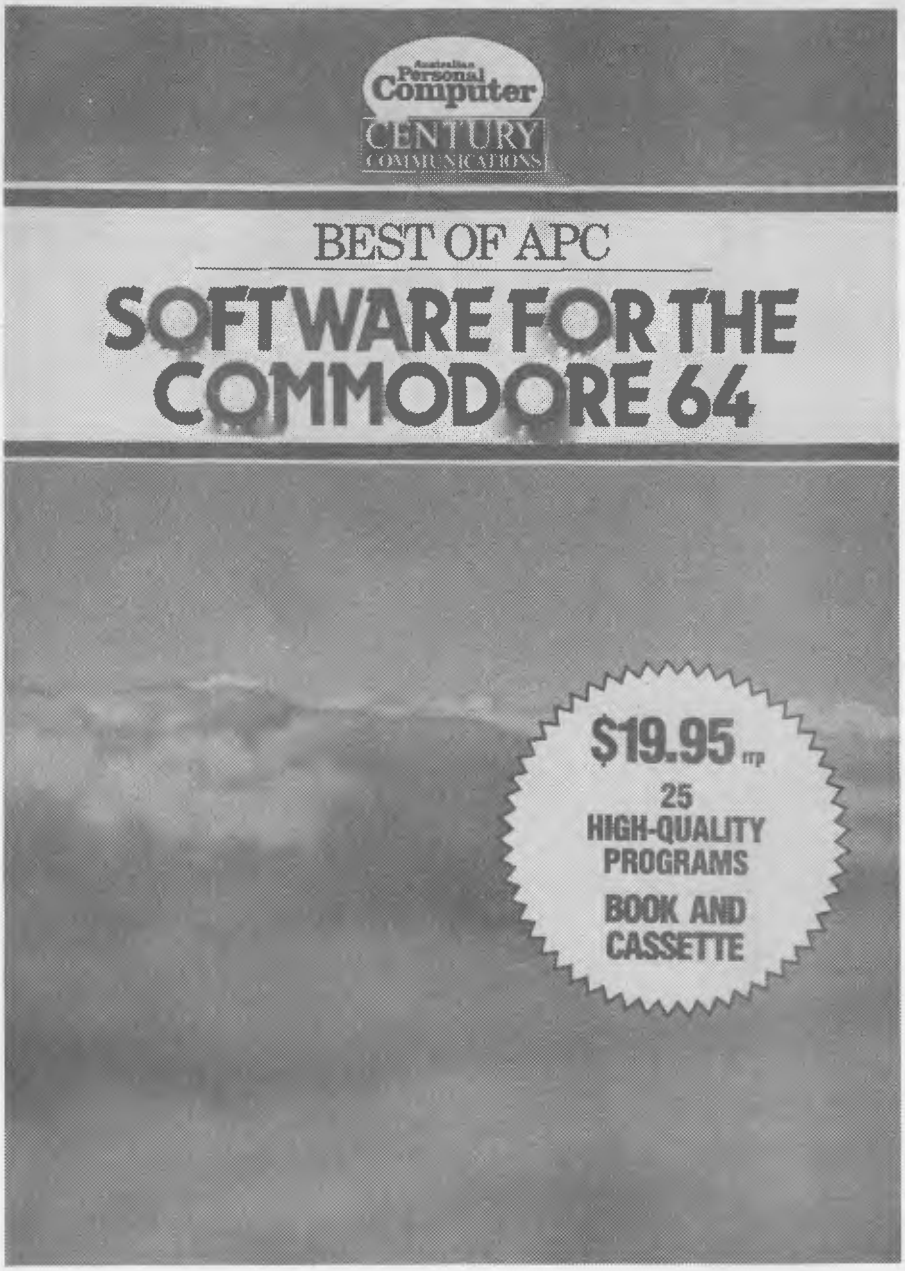
Spectravideo 'Spectra-draw' is a program for the SV318 and SV328 machines. It allows you to design custom screens using the cursor as a paint-brush. While the idea of a paint-box program is not original, this version has some excellent features and rivals most of the commercially available programs of this nature. Features include:

1 Multi-coloured screen design.
2 Magnification of an area for intricate detailed design.
3 Paint-brush, eraser, pencil and mirror drawing styles.
4 Line, box and circle drawing.
5 Fill and air brush routines.

One nice little feature is the cursor character which looks like a paint-brush when paint-brush is used, a spray can when the air brush is used, and so on. The program contains all the necessary instructions within it.

```
10 REM ****************************
20 REM *                          *
30 REM *     SPECTRA-DRAW         *
40 REM *                          *
50 REM *    G. BLAND  1984        *
60 REM *                          *
70 REM ****************************
80 CLEAR
90 REM *
100 REM * Disable CTL-C with dummy
110 REM * interrupt routine
120 STOP ON : ON STOP GOSUB 4580
130 DEFINT A-Z
140 RESTORE
150 REM *
160 REM *
170 REM *  Main Menu
```

```
180 REM *
190 SCREEN 0,0 : COLOR 15,4 : CLS
200 LOCATE 14,1,0 : PRINT "SPECTRA-DRAW":LOCATE 14,2:PRINT"............"
210 LOCATE 8,7 : PRINT "1. Run SPECTRA-DRAW"
220 LOCATE 8,9: PRINT "2. List Instructions"
230 LOCATE 8,11: PRINT "3. Exit To BASIC"
240 LOCATE 8,15:PRINT "Enter Option [ ]"
250 T$="+" : R$ = " "
260 LOCATE 22,15:PRINTT$;
270 A$=INKEY$ : IF A$ = "" THEN SWAP T$,R$: GOTO 260
280 IF ASC(A$)<49 OR ASC(A$)>51 THEN GOTO 260
290 LOCATE 22,15:PRINT A$
300 LOCATE 8,20 : PRINT "Proceeding..."
310 FOR I = 1 TO 5000 : NEXT
320 IF A$="1" THEN GOTO 350
330 IF A$="2" THEN GOTO 4150
340 IF A$="3" THEN GOTO 4630
350 REM * Enable Spacebar Interrupt
360 REM *
370 STRIG(0) ON: ON STRIG GOSUB 1960
380 REM *
390 REM * Set Function Key Traps
400 REM *
410 KEY ON : ON KEY GOSUB 2430,2570,2660,2920
420 DIM Z(8,2): REM * Joystick offsets
430 DIM GC(8,8):REM * Edit Colours
440 DIM IK(2,7):REM * Icon Ref. Table
450 DIM CP(2,14): REM * Icon Placement reference Table
460 REM *
470 REM * Define Pythagorus Function
480 REM *
490 DEF FNC(M,N,O,P)=SQR((ABS((M-O)^2))+(ABS((N-P)^2)))
500 REM *
510 REM * Initialise Joystick Offsets
520 REM *
530 FOR I = 1 TO 8: FOR J = 1 TO 2
540 READ A : Z(I,J) = A
550 NEXT J : NEXT I
560 DATA 0,-1,1,-1,1,0,1,1,0,1,-1,1,-1,0,-1,-1
570 REM *
580 REM * Initialise Icon Array
590 REM *
600 FOR I = 0 TO 1
610 FOR J = 0 TO 6
620 READ A : IK(I,J)=A
630 NEXT J
640 NEXT I
650 REM *
660 REM * Initialise Icon Placement Table
670 REM *
680 FOR I = 1 TO 14
690 READ A : CP(1,I)=A
700 READ B : CP(2,I)=B
710 NEXT I
720 REM *
730 REM *  Array Data
740 REM *
750 DATA 1,3,5,7,9,11,13,2,4,6,8,10,12,14
760 DATA 38,4,34,4,37,20,52,20,36,36,52,36
770 DATA 37,52,52,52,36,68,54,68,37,84,54,84
780 DATA 38,100,54,100
790 REM *
800 REM * Screen Initialisation
810 REM *
820 SCREEN 1 : CLICK OFF
830 COLOR 15,15,15 :CLS
840 S=12 : IC= 12 : T=1 : CC=1
850 GOSUB 1340:GOSUB 1600: GOSUB 1260: S = 0
860 REM *
870 REM * Main Loop
880 REM *
890 UL=1:RL=255:BL=190:LL=67
900 KA = 4 : X=160 : Y = 96 : S=12: IC =12 : BC = 1 : PC=1 : BH = 0 : PH = 0
910 EC = 1 : EH = 0 : T = 1 : TH = 15
920 MC =1 : MH = 0
930 REM *
940 REM * Place Current Cursor
950 REM *
960 PUT SPRITE 0,(X,Y),T,8
970 REM *
980 REM * Poll Joystick
990 REM *
1000 IF STICK(0) = 0 THEN 960
1010 REM *
1020 REM * Add offsets and validate
1030 REM *
1040 X=X+Z(STICK(0),1):Y=Y+Z(STICK(0),2)
1050 IF X<LL THEN X=LL
1060 IF X>RL THEN X=RL
1070 IF Y<UL THEN Y=UL
1080 IF Y>BL THEN Y=BL
1090 REM *
1100 REM * If Pen selected - Draw
1110 REM *
1120 IF S=12 AND PC=1 THEN PSET(X,Y),CC
1130 REM *
1140 REM * If Brush Selected - Paint
1150 REM *
1160 IF S = 1 AND BC = 1 THEN GOSUB 2990
1170 REM *
1180 REM * If Eraser Selected - Erase
1190 REM *
1200 IF S =11 AND EC = 1 THEN PSET(X,Y),15
1210 REM *
1220 REM * Mirror Mode Plot
1230 REM *
1240 IF S=4 AND MC = 1 THEN PSET(X,Y),CC:PSET(256-(X-66),Y),CC:PSET(256-(X-66),1
92-Y),CC:PSET (X,192-Y),CC
1250 GOTO 960
1260 REM *
1270 REM * Place Sprite "Icons"
1280 REM *
1290 FOR I = 1 TO 14
```



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```
1300 PUT SPRITE I,(CP(1,I),CP(2,I)),1,I
1310 NEXT
1320 RETURN
1330 REM *
1340 REM * Screen Definition Routine *
1350 REM *
1360 LINE (0,0)-(64,112),1,B:LINE (66,0)-(254,192),1,B
1370 LINE (32,0)-(32,112),1 : LINE (0,114)-(64,126),1,B
1380 LINE (32,114)-(48,126),1,B
1390 LINE (2,116)-(30,124),1,BF
1400 REM *
1410 REM * Draw colour palette
1420 REM *
1430 C=1
1440 FOR I = 2 TO 18 STEP 16
1450 FOR J = 2 TO 98 STEP 16
1460 LINE (I,J)-(I+12,J+12),C,BF
1470 C=C+1
1480 NEXT J
1490 NEXT I
1500 REM *
1510 REM * Draw Icon Lattice
1520 REM *
1530 FOR I = 16 TO 112 STEP 16
1540 LINE (32,I)-(64,I),1
1550 NEXT I
1560 LINE (48,0)-(48,112),1
1570 LINE (0,128)-(64,192),1,B
1580 RETURN
1590 REM *
1600 REM * Sprite Definition
1610 REM *
1620 FOR N = 0 TO 15
1630 S$ = ""
1640 FOR S = 1 TO 8
1650 READ A$ : S$ = S$ + CHR$(VAL(A$))
1660 NEXT S
1670 SPRITE$(N)=S$
1680 NEXT N
1690 RETURN
1700 REM *
1710 REM * Sprite Definition Data
1720 REM *
1730 DATA 240,192,160,144,8,4,2,1
1740 DATA 240,240,240,000,240,96,96,96
1750 DATA 224,64,64,64,64,64,64,224
1760 DATA 60,66,129,153,153,129,66,60
1770 'DATA 60,126,255,231,231,255,126,60
1780 DATA 254,146,146,254,146,146,254,0
1790 DATA 255,129,129,129,129,129,129,255
1800 DATA 255,255,255,255,255,255,255,255
1810 DATA 254,170,170,170,170,170,170,254
1820 DATA 255,129,255,129,255,129,255,0
1830 DATA 255,255,255,255,129,129,129,255
1840 DATA 224,62,34,250,136,136,136,248
1850 DATA 255,195,165,153,153,165,195,255
1860 DATA 128,64,32,16,8,4,0,0
1870 DATA 112,136,128,128,128,136,112,0
1880 DATA 112,136,136,136,168,144,104,0
1890 DATA 64,224,64,0,0,0,0,0
1900 REM *
1910 REM * Spacebar Interrupt Routine
1920 REM *
1930 REM * Determine Current Screen
1940 REM * Area and Branch
1950 REM *
1960 IF KA = 1 THEN GOTO 2030
1970 IF KA = 2 THEN GOTO 2130
1980 IF KA = 3 THEN GOTO 2340
1990 IF KA = 4 THEN GOTO 3120
2000 REM *
2010 REM * Colour Selection Routine
2020 REM *
2030 IF POINT(X,Y)=15 THEN PLAY "v10l16o2c":RETURN
2040 PLAY "l24o5co6c":CC=POINT(X,Y)
2050 REM *
2060 REM * Update Colour Indicator
2070 REM *
2080 LINE (2,116)-(30,124),CC,BF
2090 RETURN
2100 REM *
2110 REM * Icon Selection Routine
2120 REM *
2130 PLAY 'l24o5Co6c":V=INT((X-32)/16): W = INT(Y/16)
2140 IF W<6 THEN IC=IK(V,W) : EG = 0 : FG = 0 : ST = 0 : GOSUB 2280 : RETURN
2150 REM *
2160 REM * Handle CLS function
2170 REM *
2180 IF V=0 AND EG=1 THEN LINE (66,0)-(256,192),15,BF:LINE (66,0)-(256,192),1,B
: EG=0 : FG=0 : GOSUB 2280 : RETURN
2190 REM *
2200 REM * Handle Exit to Main Menu
2210 REM *
2220 IF V=1 AND FG=1 THEN GOTO 80
2230 REM *
2240 REM * Set Status Indicators
2250 REM *
2260 IF V=0 THEN EG=1:LINE (34,116)-(46,124),8,BF : FG = 0 : GOSUB 2280 : RETURN
2270 IF V=1 THEN FG=1:LINE (50,116)-(62,124),8,BF : EG = 0 : GOSUB 2280 : RETURN
2280 REM *
2290 REM * Reset CLS and Exit Status
2300 REM *
2310 IF EG = 0 THEN LINE (34,116)-(46,124),15,BF
2320 IF FG = 0 THEN LINE (50,116)-(62,124),15,BF
2330 RETURN
2340 REM *
2350 REM * Handle Edit Update
2360 REM *
2370 V = INT(X/8) : W = INT((Y-128)/8)
2380 IF GC(V,W) = 15 THEN GC(V,W)=CC : GOTO 2400
2390 IF GC(V,W) < 15 THEN GC(V,W)=15
2400 PLAY "l24o5co6c"
2410 PSET(AX+V,AY+W),GC(V,W)
```

```
2420 LINE ((V*8)+2,(W*8)+130)-((V*8)+6,(W*8)+134),GC(V,W),BF: RETURN
2430 REM *
2440 REM * Handle Function Keys
2450 REM *
2460 REM * (F1) : Colour Select
2470 REM *
2480 IF KA = 3 THEN EX=X : EY =Y
2490 IF KA = 1 AND EF =1 THEN X=EX : Y = EY : PUT SPRITE 0,(X,Y),T,S : KA = 3: S
=0 :LL=I : UL=129:BL=190:RL=63: RETURN
2500 IF KA = 1 AND EF = 0 THEN X=AX : Y = AY : PUT SPRITE 0,(X,Y),T,S : KA = 4:
S=IC :LL=67 : UL=1:BL=190:RL=254: RETURN
2510 IF KA = 3 AND EF=1 THEN X=24 : Y =104 : PUT SPRITE 0,(X,Y),T,S : KA = 1: S=
0 :LL=1 : UL=1:BL=112:RL=31: RETURN
2520 IF KA<4 THEN RETURN
2530 KA = 1
2540 LL=1 : UL=1:BL=111 : RL = 31 : AX=X : AY = Y
2550 X = 16 : Y = 64 : S = 0
2560 PUT SPRITE 0,(X,Y),T,S : RETURN
2570 REM *
2580 REM * (F2) : Icon Select
2590 REM *
2600 IF KA = 2 THEN X=AX : Y = AY : PUT SPRITE 0,(X,Y),T,S : KA = 4: S=IC :LL=67
 : UL=1:BL=190:RL=254: RETURN
2610 IF KA<4 THEN RETURN
2620 KA = 2
2630 BL=111 : RL = 63 : LL= 33: UL=1: AX=X : AY = Y
2640 X = 48 : Y = 64 : S=0
2650 PUT SPRITE 0,(X,Y),T,S : RETURN
2660 REM *
2670 REM * (F3) : Editing Screen
2680 REM *
2690 IF KA = 3 THEN X=AX : Y = AY : PUT SPRITE 0,(X,Y),T,S : KA = 4: S=IC :LL=67
 : UL=1:BL=190:RL=254: EF = 0 : RETURN
2700 IF KA < 4 THEN RETURN
2710 KA = 3 : EF = 1
2720 BL=190 : RL = 63 : LL= 1: UL=129: AX=X : AY = Y
2730 X = 60 : Y = 132 : S=0
2740 PUT SPRITE 0,(X,Y),T,S
2750 REM *
2760 REM *  Set up Edit Array
2770 REM *
2780 FOR I = 0 TO 7
2790 FOR J = 0 TO 7
2800 GC(I,J)=POINT (AX+I,AY+J)
2810 NEXT J
2820 NEXT I
2830 REM *
2840 REM * Plot Edit Area
2850 REM *
2860 FOR I = 0 TO 7
2870 FOR J = 0 TO 7
2880 LINE ((I*8)+2,(J*8)+130)-((I*8)+6,(J*8)+134),GC(I,J),BF
2890 NEXT J
2900 NEXT I
2910 RETURN
2920 REM *
2930 REM *  (F3) Switch Cursor Colour
2940 REM *
2950 SWAP T,TH : RETURN
2960 REM * MMMM
2970 RETURN
2980 MM = 1 : RETURN
2990 REM *
3000 REM * Paintbrush Routine
3010 REM *
3020 PW = 3
3030 IF  X + PW > RL THEN PW = PW -1 : GOTO 3030
3040 FOR I =0 TO PW
3050 PSET (X+I,Y),CC
3060 NEXT
3070 RETURN
3080 REM *
3090 REM * Service the interrupt
3100 REM * by currently selected icon
3110 REM *
3120 ON IC GOTO 3130,3170,3220,3270,3470,3520,3570,3700,3830,3900,4070,4110
3130 REM *
3140 REM * Lift / Put down Paintbrush
3150 REM *
3160 SWAP BC,BH  : RETURN
3170 REM *
3180 REM * Draw A Line
3190 REM *
3200 IF ST = 1 THEN LINE (P1,P2)-(X,Y),CC: ST = 0 : PUT SPRITE 15,(0,209),I,15 :
RETURN
3210 P1 = X : P2 = Y :ST = 1: PUT SPRITE 15,STEP (-1,-1),I,15 : RETURN
3220 REM *
3230 REM * Plot Plain Circle
3240 REM *
3250 IF ST = 1 THEN GOSUB 3310 : ST=0 : PUT SPRITE 15,(0,209),0,15 : RETURN
3260 P1 = X : P2 = Y : ST = 1 : PUT SPRITE 15, STEP (-1,-1),1,15 : RETURN
3270 REM *
3280 REM * Toggle Mirror Status
3290 REM *
3300 SWAP MC,MH : RETURN
3310 REM *
3320 REM * Calculate Radius
3330 REM *
3340 R = FNC(X,Y,P1,P2)
3350 REM *
3360 REM * If the circle arcs beyond
3370 REM * the screen boundary then
3380 REM * redraw all outside the
3390 REM * drawing area.
3400 REM *
3410 IF P1 - R < LL THEN RD = 1
3420 IF P2 + R > BL THEN RD = 1
3430 IF P2 - R < UL THEN RD = 1
3440 CIRCLE (P1,P2),R,CC,,,8/7
3450 IF RD = 1 THEN LINE (0,0)-(64,192),15,BF : GOSUB 1260 : GOSUB 1330 : GOSUB
1400 : RD = 0
3460 RETURN
3470 REM *
```

```
3480 REM * Draw A Box
3490 REM *
3500 IF ST = 1 THEN LINE (P1,P2)-(X,Y),CC,B: ST = 0 : PUT SPRITE 15,(0,209),1,15
 :RETURN
3510 P1 = X : P2 = Y :ST = 1: PUT SPRITE 15,STEP (-1,-1),1,15 : RETURN
3520 REM *
3530 REM * Draw A Box And Paint Fill
3540 REM *
3550 IF ST = 1 THEN LINE (P1,P2)-(X,Y),CC,BF: ST = 0 : PUT SPRITE 15,(0,209),1,1
5 :RETURN
3560 P1 = X : P2 = Y :ST = 1: PUT SPRITE 15,STEP (-1,-1),1,15 : RETURN
3570 REM *
3580 REM * Box with vertical fill in
3590 REM *
3600 IF ST = 1 THEN LINE (P1,P2)-(X,Y),CC,B: GOSUB 3620 : ST = 0 : PUT SPRITE 15
,(0,209),1,15 :RETURN
3610 P1 = X : P2 = Y :ST = 1: PUT SPRITE 15,STEP (-1,-1),1,15 : RETURN
3620 REM *
3630 REM * Vertical Box Fill
3640 REM *
3650 STP = 2 : IF X-P1<0 THEN STP= -2
3660 FOR I = P1 TO X STEP STP
3670 LINE (I,P2)-(I,Y),CC
3680 NEXT I
3690 RETURN
3700 REM *
3710 REM * Box with horz. fill in
3720 REM *
3730 IF ST = 1 THEN LINE (P1,P2)-(X,Y),CC,B: GOSUB 3750 : ST = 0 : PUT SPRITE 15
,(0,209),1,15 :RETURN
3740 P1 = X : P2 = Y :ST = 1: PUT SPRITE 15,STEP (-1,-1),1,15 : RETURN
3750 REM *
3760 REM * Horizontal Box Fill
3770 REM *
3780 STP = 2 : IF Y-P2<0 THEN STP= -2
3790 FOR I = P2 TO Y STEP STP
3800 LINE (P1,I)-(X,I),CC
3810 NEXT I
3820 RETURN
3830 REM *
3840 REM * Paint Enclosed Area
3850 REM * Redraws Border in Current
3860 REM * Colour
3870 REM *
3880 LINE (66,0)-(256,192),CC,B
3890 PAINT (X,Y),CC : RETURN
3900 REM *
3910 REM * Air Brush Routine
3920 REM *
3930 REM * Establish A Spray Area
3940 REM *
3950 SV = 8
3960 IF (X-SV)<LL THEN SV=SV-1 : GOTO 3960
3970 SW = 8
3980 IF (X+SW)<UL THEN SW=SW-1 : GOTO 3980
3990 SR = INT(RND(1)*6): IF SR<2 THEN 3990
4000 REM *
4010 REM * Spray Area in Curr. Colour
4020 REM *
4030 FOR I = 1 TO SR
4040 PSET (X-INT(SV*RND(1)),Y-INT(SW*RND(1))),CC
4050 NEXT I
4060 RETURN
4070 REM *
4080 REM * Toggle Eraser Value
4090 REM *
4100 SWAP EC,EH : RETURN
4110 REM *
4120 REM * Lift/Place Pencil
4130 REM *
4140 SWAP PC,PH : RETURN
4150 REM *
4160 REM * User Information
4170 REM *
4180 CLS
4190 PRINT "Function Keys":PRINT"............."
4200 PRINT : PRINT
4210 PRINT"[F1] Colour Selection:":PRINT
4220 PRINT "Position the Cursor over the desired"
4230 PRINT "colour and press the space bar.":PRINT : PRINT
4240 PRINT"[F2] Object Selection:":PRINT
4250 PRINT "Position the Cursor over the desired"
4260 PRINT "object and press the space bar."
4270 PRINT "To (C)lear the Drawing Screen, or "
4280 PRINT "(Q)uit to the Main Menu, press the"
4290 PRINT "space bar TWICE.  In both cases, a"
4300 PRINT "warning will be given in the form of"
4310 PRINT "a red box."
4320 LOCATE 0,23: PRINT "Press a Key for More..";
4330 A$=INKEY$ : IF A$="" THEN 4330
4340 CLS:PRINT : PRINT "[F3] Local Screen Edit - or 'FAT BITS'": PRINT
4350 PRINT"An 8x8 area local to the cursor is ":PRINT"Displayed in the edit fiel
d."
4360 PRINT "Pressing the Spacebar will alternately"
4370 PRINT"remove and replace specific pixels on":PRINT "the main screen."
4380 PRINT"Colour selection is available during":PRINT"a local edit.":PRINT
4390 PRINT"[F4] Cursor Switching":PRINT
4400 PRINT "This key will change the cursor from"
4410 PRINT "Black to White or Vice Versa."
4420 LOCATE 0,23: PRINT "Press a Key for More..";
4430 A$=INKEY$ : IF A$="" THEN 4430
4440 CLS
4450 PRINT "Object Summary":PRINT "..............":PRINT : PRINT
4460 PRINT"Paint Brush, Eraser, Pencil, Mirror -":PRINT
4470 PRINT "Pressing the space bar will lower or":PRINT"raise the Object.": PRIN
T
4480 PRINT "Line, All Boxes, Circles -":PRINT
4490 PRINT"One press of the space bar determines"
4500 PRINT "the startpoint of a box or line or the"
4510 PRINT "centre of a circle.  A second press ":PRINT "defines the end point f
or the object."
4520 PRINT "and the article is drawn."
4530 PRINT: PRINT"Air Brush, Paint Filler -":PRINT
```

```
4540 PRINT "One press sprays or fills in an area":PRINT "of the screen."
4550 LOCATE 0,23:PRINT"Press any key to return to menu...";
4560 A$=INKEY$ : IF A$ = "" THEN 4560
4570 GOTO 160
4580 REM *
4590 REM * Dummy CTL-C Trap
4600 REM *
4610 RETURN
4620 REM * Terminate
4630 SCREEN 0,0: LOCATE ,,1: COLOR 15,4 : CLS
4640 END
```

Hi-res Plot

by H Herbert

'Hi-res Plot' is a graphics utility for the Commodore 64. The 64 has no graphics commands, and the usual PEEK and POKE method is both slow and clumsy. Hi-res Plot adds two graphics commands to the 64's vocabulary: INIT sets the machine in hi-res graphics mode and clears both screen and colour memory; and PLOT(X),(Y) sets any pixel on the screen. X must be in the range 0 to 319 and Y in the range 0 to 199. The routine is in machine code with no checksum done when POKEing it in, so type in and save the program *before* you run it — any error in the machine code may cause the machine to crash and lose the program.

Lines 310 to 450 are a demonstration program using these new commands, so should be omitted when the commands are used in your own programs.

For programmers using Hi-res Plot with a large Basic program, or Basic and machine code programs, the routine is located at $C000 and can be easily relocated if necessary.

```
10 A=49152:PRINT"□000"TAB(10)"ENTERING HI RES PLOT"
20 READA$:IFA$="END"THEN310
30 FORI=1TO16:D=ASC(MID$(A$,2*I-1,1))-48
40 IFD>9THEND=D-7
50 P=D*16:D=ASC(MID$(A$,2*I,1))-48
60 IFD>9THEND=D-7
70 P=P+D:POKEA,P:P=0:A=A+1:NEXT
80 GOTO20
100 DATAA59DF0034CEDF6A57A85F8A57B85F920
110 DATA7900C93AD01F207300C950F00EAEAEA
120 DATAEAEAEAEAEAC949D00C4C1DC14C0BC1EA
130 DATAEAEAEAEAEAA5F8857AA5F9857B4CEDF6
140 DATA20730020F1AE20BFB1A56485FBA56585
150 DATAFA20F1AE20BFB1A56585FC2062C0D0A7
160 DATAF0A5A92085FEA90085FDA5FC29F84A4A
170 DATA4AA8F01018A5FD694085FD9002E6FEE6
180 DATAFE88D0F066FBA5FA6A4A4A0A0A2A9003
190 DATAE6FE1865FD85FD9002E6FEA5FC290718
200 DATA65FD85FD9002E6FEA900A885FBA5FA29
210 DATA07AAE83866FBCAD0FBA5FB11FD91FD60
220 DATAA9200D11D08D11D0A9080D18D08D18D0
230 DATAA92085FEA90085FDA000A90091FDC8D0
240 DATAFBE6FEA5FEC940D0F1A90085FDA90485
250 DATAFEA000A92791FDC8D0FBE6FEA5FEC908
260 DATAD0F12073004C07C04C35C0A000207300
270 DATAD92FC1D0F3C8C003D0F34C40C0A00020
280 DATA7300D932C1D0E1C8C003D0F34CC0C04C
290 DATA4F544E49540000000000000000000000
300 DATAEND
310 REM*START OF DEMONSTRATION PROGRAMME*
320 PRINT"□□□□□□□□□□AT THE END OF PLOT HIT 'B' TO RETURN TO"
330 PRINT"□□"TAB(17)"BASIC"
340 FORN=1TO5000:NEXT
350 POKE53280,0
360 POKE808,0:POKE809,192:REM*CHANGE STOP VECTOR*

370 A=49396:POKEA,39:REM*SET COLOUR*
380 :INIT:REM*NEW COMMANDS MUST FOLLOW COLON*
390 FORX=0TO319STEP.5:Y=90:PLOT(X)(Y)
400 Y=INT(90+80*SIN(X/50)):PLOT(X)(Y)
410 NEXT
420 GETA$:IFA$=""THEN420
430 POKE53265,155:POKE53272,21:REM*RETURN FROM BIT MAP MODE*
440 PRINT"□":REM*CLEAR SCREEN OF COLOUR DATA*
450 END


READY.
```

System 80/TRS-80 Automatic Cassette Indexer

by Alan Kirk

All you have to do is run the program, insert the cassette to be indexed and leave it for 30 minutes.

On your return, the program will produce a catalogue of the programs it found which can then be printed out to form a cassette inlay.

The program differentiates between Basic, machine code, Basic data files, assembler and rubbish. It will add the type to the entry for each program it finds, together with the program's name and position on the tape.

```
5 REM   ++++++++++++++++++++++++++++++++++++++++++++++
6 REM   + GENIE/TRS-80  Automatic Cassette Indexer +
        +                  By Alan Kirk             +
        + 1984 (C)                        Version 1.2 +
        ++++++++++++++++++++++++++++++++++++++++++++++

10 CLEAR 500:DEFINT A-Z:DEFSTR B,D,E,L,M,N,P:DIM PN(40),PK(40):CLS
20 POKE 16526,0:POKE 16527,125:F=1:DF=STRING$(3,211):LI=STRING$(64,45):EA=CHR$(2
11):MA=STRING$(2,176)
30 FOR I=0 TO 16:READ A:POKE I+32000,A:NEXT
40 PRINT@18,"Automatic Cassette Indexer":PRINT@82,STRING$(26,131)
50 PRINT"   Press :-        'F1' for internal cassette.":PRINT TAB(18)"Or for ext
ernal, just play."
60 IFINP(255)=127 THEN 60ELSEPRINT"Reading tape.....":PRINT@320,LI;
70 X=USR(0):FOR I=0 TO 9:NA=NA+CHR$(PEEK(32032+I)):NEXT
80 IF LEFT$(NA,3)=DF THEN NA=MID$(NA,4,1):M="BASIC":GOTO120
90 IF LEFT$(NA,1)="U" THEN NA=MID$(NA,2,6):M="MACHINE CODE":GOTO120
100 IF LEFT$(NA,1)=EA AND MID$(NA,8,2)=MA THEN M="ASSEMBLER":NA=MID$(NA,2,6):GOT
O120
110 IF LEFT$(NA,3)<>DF THEN NA="????":M="DATA FILE"
120 GOSUB 350:PRINT"File no."|F|"is "|M|".":PRINT"The name of this "|M|" file is
: '"|NA|"'":PRINTLI;:PN(F)=NA:PK(F)=M
130 OUT 255,0:IF INP(255)=127 THEN C=C+1
140 IF C=17 THEN 180
150 OUT 255,0:IF INP(255)=255 AND (C)1 AND C<15) THEN C=0
160 IF PEEK(14400)=128 THEN 200
170 GOTO 130
180 F=F+1:C=0:OUT 255,0:OUT 255,1:OUT 255,0:POKE 15422,32:POKE 15423,32:NA="":GO
TO 70
190 DATA 243,205,150,2,33,32,125,6,9,205,53,2,119,35,16,249,201
200 CLS
210 PRINT@0,|:INPUT"Do you wish to print out a catalogue"|B:IF B="N"THEN 330 ELSE
 IF B<>"Y" THEN 210
220 IF PEEK(14891)=0 THEN 240
230 IF PEEK(14312)<>63 GOSUB 320:GOTO 210
240 IF INP(253)<>63 GOSUB 320:GOTO 210
250 INPUT"Enter TABULATION value"|TA:IF TA<1 OR TA>50 THEN 250
260 LPRINT TAB|TA|"CATALOGUE FOR TAPE0"
270 LPRINT TAB(TA)|STRING$(18,42):LPRINT:LPRINT
280 LPRINT TAB(TA)" File no.   Name.       Type.":LPRINT TAB(TA)|STRING$(39,45)
290 FOR I=1 TO F:LPRINT TAB(TA)|"!";TAB(TA+3)|I;TAB|TA+12)|PN(I)|TAB(25)|PK(I)|T
AB(TA+38)|"!"
300 NEXT I
310 LPRINT TAB(TA)|STRING$(39,45)|STRING$(3,13):GOTO210
320 PRINT:PRINT"###   PRINTER NOT ON-LINE   ###":RETURN
330 CLS:INPUT"Do you wish to scan another tape (S), or finish (F)"|B
340 IF B="S" THEN RUN ELBE IF B="F" THEN END ELSE 330
350 IF PEEK(16416)+PEEK(16417)*256 =>16192 THEN PRINT@384,|
360 RETURN
```

Brimstone Part One

by Paul Gallagher

Brimstone is a three-part adventure game for the Dragon 32/Tandy Color; parts two and three will be published in the next two issues of *APC*. Part one will be of particular interest to Advanced Dungeons and Dragons players, as it provides a means of evolving new characters by closely following the AD+D format. It was designed by an AD+D player to generate new characters, and also allows preparation of the characters' subsequent development when group AD+D sessions are not in session. It's so comprehensive that it represents a game in its own right, as well as being a useful tool for AD+D players.

The program creates and equips a single character at a time, and then allows the final result to save as a file. No knowledge of Dungeons and Dragons' character formation is required as full instructions are given in the program. Several characters can be thus generated and combined into a variety of adventure parties.

Next month we'll publish the first scenario for your newly-developed character. This will be a traditional dungeon which uses the basic AD+D rules and 'dice' percentages. Up to four characters can adventure together, so you may like to get a team of characters together with friends to tackle the 75-room, seven floor dungeon that's coming. Alternatively, one person could control between one to four characters making up an adventure party. Survivors of that dungeon can progress to part three, 'The Tavern', in two months' time.

It's also easy to create your own dungeons, so if the following scenarios are a success we'll publish more dungeons sent in by other 'Dungeon masters'.

```
5 'BRIMSTONE PART I:coPywrite P.Gallagher 1984
10 DIM E$(22),F$(1,22):GOTO50
20 K$=INKEY$:IFK$=""THEN20ELSERETURN
30 PRINT@257,STRING$(31,32):PRINT:PRINT:PRINT:PRINT:PRINT:RETURN
40 '**********************************
50 CLS:PRINT@167,"DUNGEON & DRAGONS":PRINT@230,"CHARACTER GENERATOR"
60 GOSUB20 '*DELAY*
70 PRINT:PRINT"THIS SUB-PROGRAM GENERATES SIX  INITIAL CHARACTERS FOR YOU TO  C
HOOSE ONE & THEN ADAPT IT TO  YOUR REQUIREMENTS."
80 PRINT:PRINT"THIS PROCESS CLOSELY FOLLOWS THEA.D.& D.PLAYER'S HANDBOOK."
90 PRINT:PRINT"YOU CAN THEN SAVE YOUR CHARACTERFOR SUBSEQUENT ADVENTURES IN A  P
ARTY OF UP TO FOUR."
100 '**BASIC ABILITIES ROUTINE**
110 FORI=1TO3
120 S(1)=S(1)+RND(6):S(2)=S(2)+RND(6):S(3)=S(3)+RND(6):S(4)=S(4)+RND(6):S(5)=S(5
)+RND(6):S(6)=S(6)+RND(6)
130 I(1)=I(1)+RND(6):I(2)=I(2)+RND(6):I(3)=I(3)+RND(6):I(4)=I(4)+RND(6):I(5)=I(5
)+RND(6):I(6)=I(6)+RND(6)
140 W(1)=W(1)+RND(6):W(2)=W(2)+RND(6):W(3)=W(3)+RND(6):W(4)=W(4)+RND(6):W(5)=W(5
)+RND(6):W(6)=W(6)+RND(6)
150 C(1)=C(1)+RND(6):C(2)=C(2)+RND(6):C(3)=C(3)+RND(6):C(4)=C(4)+RND(6):C(5)=C(5
)+RND(6):C(6)=C(6)+RND(6)
160 D(1)=D(1)+RND(6):D(2)=D(2)+RND(6):D(3)=D(3)+RND(6):D(4)=D(4)+RND(6):D(5)=D(5
)+RND(6):D(6)=D(6)+RND(6)
170 R(1)=R(1)+RND(6):R(2)=R(2)+RND(6):R(3)=R(3)+RND(6):R(4)=R(4)+RND(6):R(5)=R(5
)+RND(6):R(6)=R(6)+RND(6)
180 NEXT:GOSUB 20 '*DELAY*
190 CLS:PRINT"CHARACTER     1  2  3  4  5  6";
200 PRINT:GOSUB740'**ABILITIES**
210 FORX=1TO6
220 PRINT@(74+X*3),"";:PRINTUSING"##";S(X);
230 PRINT@(106+X*3),"";:PRINTUSING"##";I(X);
240 PRINT@(138+X*3),"";:PRINTUSING"##";W(X);
250 PRINT@(170+X*3),"";:PRINTUSING"##";C(X);
260 PRINT@(202+X*3),"";:PRINTUSING"##";D(X);
270 PRINT@(234+X*3),"";:PRINTUSING"##";R(X);
280 NEXTX
290 PRINT@384,"CHOOSE ONE SET OF ABILITIES";:INPUTA
300 IFINT(A)<1ORINT(A)>6THEN290
310 S=S(A):I=I(A):W=W(A):C=C(A):D=D(A):R=R(A)
320 CLS:PRINT"CHARACTER ";A;"  BASIC ABILITIES"
330 GOSUB740'**ABILITIES**
340 GOSUB830'**ABILITY VALUES**
350 GOSUB970'**RACE ADJUSTMENT**
360 PRINT@15,R$
370 GOSUB830'**ABILITY VALUES**
380 GOSUB30 '**CLEAR**
390 GOSUB1060'**CHARACTER CLASS**
400 PRINT@15,R$;" ";C$
410 GOSUB30 '**CLEAR**
420 PRINT@320,"WHAT IS THIS CHARACTER'S NAME" INPUTN$:PRINT@0," ";N$;" - ";R$;"
";C$
430 GOSUB30 '**CLEAR**
440 PRINT@352,"DO YOU WISH TO CONVERT ANY OF  ";N$;"'S ABILITIES.(Y/N)" INPUTQ$
450 GOSUB30 '**CLEAR**
460 IF Q$="Y"THEN ON A1 GOSUB 1150,1240,1330,1460 '*ABILITY TRADE*
470 GOSUB1870'** GOLD & HP **
480 ON A1 GOSUB 1630,1690,1750,1810 '*SUB-CLASS ROUTINE*
490 LL=1:PRINT@0,N$;" - ",R$;" ";C$;" (LEVEL",LL;")";
500 IF S>17 THEN B$=RIGHT$(STR$(B),2):PRINT@30,"/";B$
510 PRINT@114,"GOLD";GP;"GP";
520 IF C$="RANGER"THEN HP=HP+RND(8)
530 IF C<7 THEN HP=HP-1
540 IF C=15 THEN HP=HP+1
550 IF C>15 THEN HP=HP+2
560 PRINT@146,"BASIC",HP;"HP",
570 GOSUB1930'*STR. ADJUSTMENTS*
580 PRINT@178,"HIT@ +";STR$(SB);
590 PRINT@210,"DAMAGE@ +";STR$(DB);
600 PRINT@242,'CARRY:";WA;
610 GOSUB30:PRINT@263,"**** WEAPONS ****":PRINTC$;", YOU MAY CHOOSE FROM:";
620 ON A1 GOSUB 2060,2140,2240,2380,2060,2480,2610,2240,2240,2240 '***** WEAPONS
 *****
630 AC=9:GOSUB30 '**CLEAR**
640 ON A1 GOSUB 2730,2820,2820,3110,2730,2730,3110,2820,2820,3110 '***** ARMOUR
& AC *****
650 GOSUB20 '**DELAY**
660 GOSUB3190 '**EQUIPMENT**
670 IFA1=1THENGOSUB3940'              ** MU SPELLS **
680 IFA1=2THENGOSUB4350'              ** CLERIC SPELLS **
690 IFA1=5THENGOSUB4260'              ** ILLUSIONIST'S SPELLS **
700 IFA1=7THENGOSUB4460'              ** DRUID'S SPELLS **
710 GOSUB3740'*FINAL CHARACTER*
720 GOSUB4560 '*SAVE ROUTINE*
730 END
740 '******** ABILITIES********
750 PRINT@64,"STRENGTH      ";
760 PRINT@96,"INTELLIGENCE ";
770 PRINT@128,"WISDOM       ";
780 PRINT@160,"CONSTITUTION ";
790 PRINT@192,"DEXTERITY    ";
800 PRINT@224,"CHARISMA     ";
810 RETURN
820 '****************************
830 '***** ABILITY VALUES ******
840 IF S>18 THEN S=18
850 PRINT@78,"";:PRINTUSING"##";S;
860 IF I>18 THEN I=18
870 PRINT@110,"";:PRINTUSING"##";I;
880 IF W>18 THEN W=18
890 PRINT@142,"";:PRINTUSING"##";W;
900 IF C>18 THEN C=18
910 PRINT@174,"";:PRINTUSING"##";C;
920 IF D>18 THEN D=18
930 PRINT@206,"";:PRINTUSING"##";D;
940 IF R>18 THEN R=18
950 PRINT@238,"";:PRINTUSING"##";R;:RETURN
960 '****************************
970 '**RACE ADJUSTMENT ROUTINE**
980 PRINT@257,"WHAT RACE DO YOU WISH TO BE:":PRINT"  HUMAN":PRINT"  ELF":PRINT"
 DWARF":PRINT"  HALFLING":PRINT"  HALF-ELVEN    ";:INPUTR$
990 IF R$="HUMAN"THEN RETURN
1000 IF R$="ELF"THEN D=D+1:C=C-1:RETURN
1010 IF R$="DWARF"THEN C=C+1:R=R-1:RETURN
```

```
1020 IF R$="HALFLING"THEN S=S-1:D=D+1:RETURN
1030 IF R$="HALF-ELVEN"THEN D=D+1:RETURN
1040 GOTO970 'CHOOSE AGAIN
1050 '*****************************
1060 '*****CHARACTER CLASS******
1070 PRINT@257,"WHAT CHARACTER CLASS DO YOU":PRINT" WISH TO BE:  MAGICIAN":PRINT
@334,"CLERIC":PRINT@366,"FIGHTER":PRINT@398,"THIEF":INPUTC$
1080 IFC$="MAGICIAN"ANDCR$="HUMAN"OR R$="ELF"OR R$="HALF-ELVEN")ANDI>8 AND D>5 T
HEN A1=1:RETURN
1090 IFC$="CLERIC"ANDCR$="HUMAN"OR R$="HALF-ELVEN")AND W>8 THEN A1=2:RETURN
1100 IFC$="FIGHTER"AND S)8 AND C>6 THEN A1=3:RETURN
1110 IFC$="THIEF"AND D>8 THEN A1=4:RETURN
1120 GOSUB30:PRINT@290,"YOUR PRIME ABILITIES ARE TOO    LOW OR YOUR RACE IS INEL
IGIBLE  FOR THIS CLASS.":PRINT"  PLEASE CHOOSE AGAIN.":GOSUB20:GOSUB30:GOTO1060
1130 '*****************************
1140 '*ABILITY VALUE TRADE*
1150 '** MAGICIAN **
1160 PRINT@299,"1) 2 WISDOM."
1170 PRINT@331,"2) 3 STRENGTH."
1180 FORX=1TO2STEP0:GOSUB1550
1190 IF O=1 AND I<18 AND W)10 THEN I=I+1:W=W-2:GOSUB830'*ABILITY VALUES*
1200 IF O=2 AND I<18 AND S)11 THEN I=I+1:S=S-3:GOSUB830
1210 IF O=3 AND I<17 AND W)10 AND S)11 THEN I=I+2:W=W-2:S=S-3:GOSUB830
1220 IF O=4 THEN RETURN
1230 NEXTX'************************
1240 '** CLERIC **
1250 PRINT@299,"1) 3 STRENGTH."
1260 PRINT@331,"2) 2 INTELLIGENCE."
1270 FORX=1TO2STEP0:GOSUB1550
1280 IF O=1 AND W<18 AND S)11 THEN W=W+1:S=S-3:GOSUB830
1290 IF O=2 AND W<18 AND I)10 THEN W=W+1 I=I-2:GOSUB830
1300 IF O=3 AND W<17 AND S)11 AND I)10 THEN W=W+2:S=S-3:I=I-2:GOSUB830
1310 IF O=4 THEN RETURN
1320 NEXTX'************************
1330 '** FIGHTER **
1340 PRINT@299,"1) 2 INTELLIGENCE."
1350 PRINT@331,"2) 3 WISDOM."
1360 FORX=1TO2STEP0:GOSUB1550
1370 IF R$="HALFLING"AND S)16 THEN RETURN
1380 IF R$="ELF"AND S)17 THEN B=RND(75)
1390 IF R$="HALF-ELVEN"AND S)17 THEN B=RND(90)
1400 IF (R$="HUMAN"OR R$="DWARF") AND S)17 THEN B=RND(100)
1410 IF S)17 OR O=4 THEN RETURN
1420 IF O=1 AND S<18 AND I)10 THEN S=S+1:I=I-2:GOSUB830
1430 IF O=2 AND S<18 AND W)11 THEN S=S+1:W=W-3:GOSUB830
1440 IF O=3 AND S<17 AND I)10 AND W)11 THEN S=S+2:I=I-2:W=W-3:GOSUB830
1450 NEXTX'************************
1460 '** THIEF **
1470 PRINT@299,"1) 2 INTELLIGENCE."
1480 PRINT@331,"2) 1 WISDOM."
1490 FORX=1TO2STEP0:GOSUB1550
1500 IF O=1 AND D<18 AND I)10 THEN D=D+1:I=I-2:GOSUB830
1510 IF O=2 AND D<18 AND W)9 THEN D=D+1:W=W-1:GOSUB830
1520 IF O=3 AND D<17 AND I)10 AND W)9 THEN D=D+2:I=I-2:W=W-1:GOSUB830
1530 IF O=4 THEN RETURN
1540 NEXTX'************************
1550 '*GENERAL ABILITY TRADE*
1560 PRINT@257,C$;", YOU MAY CONVERT:";
1570 PRINT@363,"3) BOTH.";
1580 PRINT@395,"4) NONE.";
1590 PRINT@416,"YOU CANNOT DECREASE ANY ABILITY BELOW NINE.";:INPUTO
1600 RETURN
1610 '*****************************
1620 '*** SUB-CLASS CHOICE ***
1630 '** ILLUSIONIST **
1640 IF R$<>"HUMAN"OR I<15 OR D<16 THEN RETURN
1650 GOSUB30 '*CLEAR*
1660 PRINT@288,"YOUR ABILITIES ARE HIGH ENOUGH  TO ADVENTURE AS AN ILLUSIONIST.
DO YOU WISH TO CONVERT TO THIS  SUB-CLASS.";:INPUTQ$@1670 IF LEFT$(Q$,1)="Y"THEN
C$="ILLUSIONIST":A1=5
1680 RETURN'**********************
1690 '**DRUID/MONK**
1700 Q$="":IF R$="HUMAN"AND S)14 AND W)14 AND C)10 AND D)14 THENGOSUB30: PRINT@2
88,"YOUR ABILITIES ARE HIGH ENOUGH  TO ADVENTURE AS A MONK, DO YOU  WISH TO CONV
ERT TO THIS CLASS.":INPUTQ$
1710 IF LEFT$(Q$,1)="Y"THEN C$="MONK":A1=6:RETURN
1720 IF (R$="HUMAN" OR R$="HALF-ELVEN")AND W)11 AND R)14 AND LEFT$(Q$,1)<>"Y"THE
N GOSUB30:PRINT@288,"YOUR ABILITIES ARE HIGH ENOUGH  TO ADVENTURE AS A DRUID.DO
YOU  WISH TO CONVERT TO THIS CLASS.":INPUTQ$
1730 IF LEFT$(Q$,1)="Y"THEN C$="DRUID":A1=7
1740 RETURN:'**********************
1750 '**RANGER/PALADIN**
1760 Q$="":IF R$="HUMAN"AND S)11 AND I)8 AND W)12 AND C)8 AND R)16 THENGOSUB30:
PRINT@288,"YOUR ABILITIES ARE HIGH ENOUGH  TO ADVENTURE AS A PALADIN.DO YOUWISH
TO CONVERT TO THIS CLASS.":INPUTQ$
1770 IF LEFT$(Q$,1)="Y"THEN C$="PALADIN":A1=8:RETURN
1780 IF (R$="HUMAN"OR R$="HALF-ELVEN")AND S)12 AND I)12 AND W)13 AND C)13 AND LE
FT$(Q$,1)<>"Y"THEN GOSUB30:PRINT@288,"YOUR ABILITIES ARE HIGH ENOUGH  TO ADVENTU
RE AS A RANGER.DO YOU WISH TO CONVERT TO THIS CLASS.":INPUTQ$
1790 IF LEFT$(Q$,1)="Y"THEN C$="RANGER":A1=9
1800 RETURN'**********************
1810 '** ASSASSIN **
1820 IF R$="HALFLING"OR S<12 OR I<11 OR D<12 THEN RETURN
1830 GOSUB30 '*CLEAR*
1840 PRINT@288,"YOUR ABILITIES ARE HIGH ENOUGH  TO ADVENTURE AS AN ASSASSIN.
DO YOU WISH TO CONVERT TO THIS  SUB-CLASS.";:INPUTQ$@1850 IF LEFT$(Q$,1)="Y"THEN
C$="ASSASSIN":A1=10
1860 RETURN'**********************
1870 '** INITIAL MONEY & HP **
1880 IF C$="CLERIC"THEN GP=(RND(6)+RND(6)+RND(6))*10:HP=6+RND(2)
1890 IF C$="FIGHTER"THEN GP=(RND(4)+RND(4)+RND(4)+RND(4)+RND(4))*10:HP=8+RND(2):
IF C=17 THEN HP=HP+1ELSE IF C=18 THEN HP=HP+2
1900 IF C$="MAGICIAN"THEN GP=(RND(4)+RND(4))*10:HP=4
1910 IF C$="THIEF"THEN GP=(RND(6)+RND(6))*10:HP=6
1920 RETURN'**********************
1930 '**STRENGTH ADJUSTMENTS**
1940 IF S<12 THEN SB=0:DB=0:WA=500:RETURN
1950 IF S=12 OR S=13 THEN SB=0:DB=0:WA=600:RETURN
1960 IF S=14 OR S=15 THEN SB=0:DB=0:WA=700:RETURN
1970 IF S=16 THEN SB=0:DB=1:WA=850:RETURN
1980 IF S=17 THEN SB=1:DB=1:WA=1000:RETURN
1990 IF S=18ANDB<1THEN SB=1:DB=2:WA=1250:RETURN
2000 IFB<51THENSB=1:DB=3:WA=1500:RETURN
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2010 IFB<75THENSB=2:DB=3:WA=1750:RETURN
2020 IFB<90THENSB=2:DB=4:WA=2000:RETURN
2030 IFB<100THENSB=2:DB=5:WA=2500:RETURN
2040 IFB=100THENSB=3:DB=6:WA=3500:RETURN
2050 '**************************
2060 '***** WEAPONS *****
2070 '**MAGICIAN/ILLUSIONIST**
2080 PRINT@352,"1. DAGGER(2),  2. 2DARTS(1)     3. STAFF(2)":PRINT"YOU MAY PURCH
ASE ANY ONE.";:INPUTW1
2090 IFW1=1THENW$(1)="DAGGER":GP=GP-2
2100 IFW1=2THENW$(1)="2DARTS":GP=GP-1
2110 IFW1=3THENW$(1)="STAFF":GP=GP-2
2120 PRINT@114,"GOLD";GP;"GP";
2130 RETURN'********************
2140 '**CLERIC**
2150 PRINT@320,"1. FLAIL(3)  2. HAMMER(1)       3. MACE(8)   4. STAFF(2)"
2160 FORX=1TO2:PRINT@448,"YOU MAY PURCHASE ANY TWO.";:INPUTW1
2170 IFW1=1THENW$(X)="FLAIL":GP=GP-3
2180 IFW1=2THENW$(X)="HAMMER":GP=GP-1
2190 IFW1=3THENW$(X)="MACE":GP=GP-8
2200 IFW1=4THENW$(X)="STAFF":GP=GP-2
2210 PRINT@114,"GOLD";GP;"GP";
2220 NEXT:RETURN
2230 '**************************
2240 '*FIGHTER CLASS & ASSASSIN*
2250 PRINT@320,"1.DAGGER(2)   2.BATTLE-AXE(5)   3.SPEAR(1)    4.BROAD-SWORD(10)
5.MACE(8)     6.SHORT-SWORD(8)  7.LONG-BOW(12)8.CROSS-BOW(12)";
2260 FORX=1TO3:PRINT@448,"YOU MAY PURCHASE ANY THREE.";:INPUTW1
2270 IFW1=1THENW$(X)="DAGGER":GP=GP-2
2280 IFW1=2THENW$(X)="BATTLE-AXE":GP=GP-5
2290 IFW1=3THENW$(X)="SPEAR":GP=GP-1
2300 IFW1=4THENW$(X)="BROAD-SWORD":GP=GP-10
2310 IFW1=5THENW$(X)="MACE":GP=GP-8
2320 IFW1=6THENW$(X)="SHORT-SWORD":GP=GP-8
2330 IFW1=7THENW$(X)="LONGBOW":GP=GP-12
2340 IFW1=8THENW$(X)="CROSS-BOW":GP=GP-12
2350 PRINT@114,"GOLD";GP;"GP";
2360 NEXT:RETURN
2370 '**************************
2380 '**THIEF**
2390 PRINT@320,"1. DAGGER(2)  2.2DARTS(1)       3. SLING(2)   4.SWORD(8)"
2400 FORX=1TO2:PRINT@448,"YOU MAY PURCHASE ANY TWO.";:INPUTW1
2410 IFW1=1THENW$(X)="DAGGER":GP=GP-2
2420 IFW1=2THENW$(X)="2DARTS":GP=GP-1
2430 IFW1=3THENW$(X)="SLING":GP=GP-2
2440 IFW1=4THENW$(X)="SWORD":GP=GP-8
2450 PRINT@114,"GOLD";GP;"GP";
2460 NEXT:RETURN
2470 '**************************
2480 '**MONK**
2490 PRINT@320,"1. CROSSBOW(12)  2. DAGGER(2)   3. HAND-AXE(1)   4. JAVELIN(1)
5. POLE-ARM(6)   6. SPEAR(1)    7. STAFF(2)      8. CLUB(2)";
2500 PRINT@448,"YOU MAY PURCHASE ANY ONE.";:INPUTW1
2510 IFW1=1THENW$(1)="CROSSBOW":GP=GP-12
2520 IFW1=2THENW$(1)="DAGGER":GP=GP-2
2530 IFW1=3THENW$(1)="HAND-AXE":GP=GP-1
2540 IFW1=4THENW$(1)="JAVELIN":GP=GP-1
2550 IFW1=5THENW$(1)="POLE-ARM":GP=GP-6
2560 IFW1=6THENW$(1)="SPEAR":GP=GP-1
2570 IFW1=7THENW$(1)="STAFF":GP=GP-2
2580 IFW1=8THENW$(1)="CLUB":GP=GP-2
2590 PRINT@114,"GOLD";GP;"GP";
2600 RETURN'********************
2610 '**DRUID**
2620 PRINT@320,"1. DAGGER(2)  2. 2DARTS(1)      3. HAMMER(1)  4. SCIMITAR(15)
5. SPEAR(1)   6. STAFF(2)";
2630 FORX=1TO2:PRINT@448,"YOU MAY PURCHASE ANY TWO.";:INPUTW1
2640 IFW1=1THENW$(X)="DAGGER":GP=GP-2
2650 IFW1=2THENW$(X)="2DARTS":GP=GP-1
2660 IFW1=3THENW$(X)="HAMMER":GP=GP-1
2670 IFW1=4THENW$(X)="SCIMITAR":GP=GP-15
2680 IFW1=5THENW$(X)="SPEAR":GP=GP-1
2690 IFW1=6THENW$(X)="STAFF":GP=GP-2
2700 PRINT@114,"GOLD";GP;"GP";
2710 NEXT:RETURN
2720 '**************************
2730 '**ARMOUR & ARMOUR CLASS**
2740 '**MU/ILLUSIONIST/MONK**
2750 PRINT@320,"YOU ARE NOT ALLOWED TO WEAR ANY ARMOUR.YOUR ARMOUR CLASS = 9":AC
=9
2760 IFD<7THEN AC=AC+1:PRINT"  DEXTERITY PENALTY -1:  AC=";AC;
2770 IFD=15THEN AC=AC-1:PRINT"  DEXTERITY BONUS +1:  AC=";AC;
2780 IFD=16THEN AC=AC-2:PRINT"  DEXTERITY BONUS +2:  AC=";AC;
2790 IFD=17THEN AC=AC-3:PRINT"  DEXTERITY BONUS +3:  AC=";AC;
2800 IFD=18THEN AC=AC-4:PRINT"  DEXTERITY BONUS +4:  AC=";AC;
2810 RETURN '********************
2820 '**CLERIC/FIGHTER CLASS**
2830 CLS:PRINT"YOU MAY PURCHASE ANY ARMOUR:"
2840 PRINT" 1.LEATHER OR PADDED(5)"
2850 PRINT" 2.LEATHER + SHIELD(17)"
2860 PRINT" 3.RING MAIL(30)"
2870 PRINT" 4.RING MAIL + SHIELD(42)"
2880 PRINT" 5.SCALE MAIL(45)"
2890 PRINT" 6.SCALE MAIL + SHIELD(57)"
2900 PRINT" 7.CHAIN MAIL(75)"
2910 PRINT" 8.CHAIN MAIL + SHIELD(87)"
2920 PRINT" 9.SPLINT OR BANDED MAIL(90)"
2930 PRINT"10.SPLINT/BANDED + SHIELD(102)"
2940 PRINT"11.PLATE MAIL(400)"
2950 PRINT"12.PLATE MAIL + SHIELD(412)"
2960 PRINT@450,"GOLD";GP;"GP";:INPUTAA
2970 IFAA=1ANDGP>5THENA1$="LEATHER":GP=GP-5:AC=8
2980 IFAA=2ANDGP>17THENA1$="LEATHER+SHIELD":GP=GP-17:AC=7
2990 IFAA=3ANDGP>30THENA1$="RING MAIL":GP=GP-30:AC=7
3000 IFAA=4ANDGP>42THENA1$="RINGMAIL+SHIELD":GP=GP-42:AC=6
3010 IFAA=5ANDGP>45THENA1$="SCALE MAIL":GP=GP-45:AC=6
3020 IFAA=6ANDGP>57THENA1$="SCALEMAIL+SHIELD":GP=GP-57:AC=5
3030 IFAA=7ANDGP>75THENA1$="CHAIN MAIL":GP=GP-75:AC=5
3040 IFAA=8ANDGP>87THENA1$="CHAINMAIL+SHIELD":GP=GP-87:AC=4
3050 IFAA=9ANDGP>90THENA1$="SPLINT MAIL":GP=GP-90:AC=4
3060 IFAA=10ANDGP>102THENA1$="SPLINTMAIL+SHIELD":GP=GP-102:AC=3
3070 IFAC=9THEN2960
3080 PRINT@450,"GOLD";GP;"GP. ARMOUR CLASS=";AC
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3090 GOSUB2760 '*DEXTERITY BONUS*
3100 RETURN '*******************
3110 '**DRUID/THIEF/ASSASSIN**
3120 PRINT@288,"YOU MAY WEAR ONLY LEATHER ARMOURYOU CAN PURCHASE FROM ":PRINT"1.
LEATHER(5) 2.PADDED(4)",:INPUTAA
3130 IFAA=1THENA1$="LEATHER":GP=GP-5:AC=8
3140 IFAA=2THENA1$="PADDED":GP=GP-4:AC=8
3150 PRINT@114,"GOLD";GP;"GP";
3160 PRINT@448,"YOUR ARMOUR CLASS =";AC
3170 GOSUB2760 '*DEXTERITY BONUS*
3180 RETURN '*******************
3190 '***** EQUIPMENT *****
3200 CLS:PRINT"THE FOLLOWING EQUIPMENT IS ON   SALE AT THE LOCAL MARKET: GP"
3210 PRINT:PRINT" 1.LEATHER BACKPACK          2"
3220 PRINT" 2.TEN CANDLES                     1"
3230 PRINT" 3.SMALL WOODEN CHEST              1"
3240 PRINT" 4.LANTERN & OIL                   8"
3250 PRINT" 5.METAL MIRROR                    8"
3260 PRINT" 6.BELT POUCH                      1"
3270 PRINT" 7.50FT.ROPE                       1"
3280 PRINT" 8.TINDER BOX,FLINT&STEEL          1"
3290 PRINT" 9.20 TORCHES                      1"
3300 PRINT"10.1 WEEK OF RATIONS               4"
3310 K$=INKEY$:IFK$=""THEN3310
3320 CLS:PRINT"11.WINE IN SKIN                1"
3330 PRINT"12.WOLVESBANE&GARLIC BUDS          1"
3340 PRINT"13.VIAL OF HOLY WATER             25"
3350 PRINT"14.HOLY CROSS                      2"
3360 PRINT"15.FLASK OF OIL                    1"
3370 PRINT"16.CART                           50"
3380 PRINT"17.PONY                           15"
3390 PRINT"18.LIGHT WARHORSE                I50"
3400 PRINT"19.SMALL BORT                     75"
3410 PRINT"20.THIEVES'PICKS & TOOLS          30"
3420 PRINT:PRINT"PRESS R TO REVIEW."
3430 PRINT"       F TO FINISH."
3440 PRINT"       OR ENTER THE THE ITEM            NUMBER REQUIRED.";
3450 FORX=1TO2STEP0
3460 INPUTK$:IFK$="R"THEN3190
3470 IFK$="F"THENRETURN
3480 K=VAL(K$):CLS:PRINT:PRINT"GOLD";GP;"GP";
3490 IFK<1ORK>20THEN3460
3500 IFK=1ANDGP>2THEN E$(1)="LEATHER BACKPACK":GP=GP-2
3510 IFK=2ANDGP>1THEN E$(2)="CANDLES":GP=GP-1
3520 IFK=3ANDGP>1THEN E$(3)="SMALL WOODEN CHEST":GP=GP-1
3530 IFK=4ANDGP>8THEN E$(4)="LANTERN & OIL":GP=GP-8:LI=LI+10
3540 IFK=5ANDGP>8THEN E$(5)="METAL MIRROR":GP=GP-8
3550 IFK=6ANDGP>1THEN E$(6)="BELT POUCH":GP=GP-1
3560 IFK=7ANDGP>1THEN E$(7)="50FT.ROPE":GP=GP-1
3570 IFK=8ANDGP>1THEN E$(8)="TINDER BOX":GP=GP-1
3580 IFK=9ANDGP>1THEN E$(9)="TORCHES":GP=GP-1:LI=LI+20
3590 IFK=10ANDGP>4THENE$(10)="RATIONS":GP=GP-4
3600 IFK=11ANDGP>1THENE$(11)="WINE IN SKIN":GP=GP-1
3610 IFK=12ANDGP>1THENE$(12)="WOLVESBANE&GARLIC":GP=GP-1
3620 IFK=13ANDGP>25THENE$(13)="HOLY WATER":GP=GP-25
3630 IFK=14ANDGP>2THENE$(14)="HOLY CROSS":GP=GP-2
3640 IFK=15ANDGP>1THENE$(15)="FLASK OF OIL":GP=GP-1:LI=LI+10
3650 IFK=16ANDGP>50THENE$(16)="CART":GP=GP-50
3660 IFK=17ANDGP>15THENE$(17)="PONY":GP=GP-15
3670 IFK=18ANDGP>150THENE$(18)="LIGHT WARHORSE":GP=GP-150
3680 IFK=19ANDGP>75THENE$(19)="SMALL BOAT":GP=GP-75
3690 IFK=20ANDGP>30THENE$(20)="PICKS & TOOLS":GP=GP-30
3700 PRINT@32,"GOLD";GP;"GP"
3710 PRINTE$(K):PRINT:E=E+1:F$(1,E)=E$(K):E(1)=E
3720 CC=CC+1:IFCC>7THENPRINT@224,"OVERLOADED-NO MORE EQUIPMENT    MAY BE PURCHAS
ED.":GOSUB20:RETURN
3730 IFGP=0THENRETURNELSENEXT
3740 '*** FINAL CHARACTER ***
3750 CLS:PRINTN$;":";R$;" ";C$;"(LEVEL";LL;")"
3760 GOSUB740'**ABILITIES**
3770 GOSUB830'***VALUES***
3780 IFS>17THENPRINT@80,"/";B$
3790 PRINT@114,"GOLD";GP;"GP";
3800 PRINT@146,"BASIC";HP;"HP";
3810 PRINT@178,"HIT@ +";STR$(S8);
3820 PRINT@210,"DAMAGE@ +";STR$(DB);
3830 PRINT@242,"CARRY:";WA;
3840 PRINT@256,"*WEAPON*: ";W$(1)
3850 PRINT@298,W$(2);" ";W$(3)
3860 PRINT@320,"*ARMOUR* ";A1$;"(AC";AC;")"
3870 PRINT@352,"EQUIPMENT:  ";
3880 FORX=1TOE(1):IF F$(1,X)=""THEN 3900
3890 PRINTF$(1,X);";";
3900 NEXT
3910 PRINT@448,S$(1);" ";S$(2);" ";S$(3);
3920 GOSUB820:RETURN
3930 '*************************
3940 '**MAGIC USER'S SPELLS**
3950 IF I=9THEN SP=35:SM=6
3960 IF I>9ANDI<13THENSP=45:SM=7
3970 IF I=13ORI=14THENSP=55:SM=9
3980 IF I=15ORI=16THENSP=65:SM=11
3990 IF I=17THEN SP=75:SM=14
4000 IF I=18THEN SP=85:SM=18
4010 CLS:PRINT"YOUR INTELLIGENCE ALLOWS YOU TO KNOW A MAXIMUM OF";SM;"FIRST LEVE
L SPELLS.":PRINT"THE CHANCE TO KNOW EACH SPELL   WHEN YOU FIND THEM IS";SP;"%"
4020 PRINT"YOU AUTOMATICALLY KNOW:          1.READ MAGIC.":S$(1)="READ MAGIC"
4030 PRINT"CHOOSE ONE SPELL FROM:"
4040 PRINT"2.CHARM PERSON."
4050 PRINT"3.mAGIC MISSILE."
4060 PRINT@320,"4.sLEEP.":INPUTS2
4070 PRINT@448,"";:PRINT
4080 IFS2=2ANDF(2)=0ANDRND(100)<SP THENS$(2)="CHARM PERSON"
4090 IFS2=3ANDF(3)=0ANDRND(100)<SP THENS$(2)="mAGIC MISSILE"
4100 IFS2=4ANDF(4)=0ANDRND(100)<SP THENS$(2)="sLEEP"
4110 IFF(2)=1ANDF(3)=1ANDF(4)=1THENF(2)=0:F(3)=0:F(4)=0
4120 IFS$(2)=""THENF(S2)=1:PRINT@448,"UNSUCCESSFUL-TRY ANOTHER SPELL.";:GOTO4060
4130 PRINT@416,S$(2);" SUCCESSFUL.":FORX=1TO800:NEXT
4140 PRINT@205,S2;".";S$(2);
4150 PRINT@256,"5.FEATHER FALL"
4160 PRINT"6.SHIELD(v)"
4170 PRINT@320,"7.DETECT MAGIC":INPUTS3
4180 IFS3=5ANDF(5)=0ANDRND(100)<SP THENS$(3)="FEATHER FALL"
4190 IFS3=6ANDF(6)=0ANDRND(100)<SP THENS$(3)="SHIELD(v)"
4200 IFS3=7ANDF(7)=0ANDRND(100)<SP THENS$(3)="DETECT MAGIC"
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4210 IFF(5)=1ANDF(6)=1ANDF(7)=1THENF(5)=0:F(6)=0:F(7)=0
4220 IFS@(3)=""THENF(S3)=1:PRINT@448,"UNSUCCESSFUL-TRY ANOTHER SPELL.";:GOTO4170
4230 PRINT@416,S@(3);" SUCCESSFUL."
4240 GOSUB20 '*DELAY*
4250 RETURN '*******************
4260 '** ILLUSIONIST'S SPELLS**
4270 CLS:PRINT@96," *ILLUSIONIST'S SPELL-BOOK*"
4280 S@(1)="COLOUR SPRAY":S@(2)="hYPNOTISM":S@(3)="DETECT MAGIC":PRINT:PRINT
4290 PRINT@200," 1.";S@(1)
4300 PRINT@232," 2.";S@(2)
4310 PRINT@264," 3.";S@(3)
4320 PRINT:PRINT@329,"-----***-----"
4330 GOSUB20:RETURN
4340 '*************************
4350 '** CLERIC'S SPELLS **
4360 CLS:PRINT@100,"**CLERIC'S SPELLS**
4370 IF W<13 THENPRINT@160,"YOU ONLY HAVE SUFFICIENT WISDOM TO CARRY ONE SPELL..
.."
4380 IF W=13 THENPRINT@160,"YOUR WISDOM GIVES YOU A BONUS.. ENABLING YOU TO CARR
Y TWO SPELLS"
4390 IF W>13 THENPRINT@160,"YOUR WISDOM GIVES YOU A BONUS...ENABLING YOU TO CARR
Y.....  THREE SPELLS."
4400 S@(1)="CURE LIGHT WOUNDS"
4410 PRINT@262,"1.";S@(1)
4420 IF W=13 THENPRINT@294,"2.COMMAND(h)";:S@(2)="COMMAND(h)"
4430 IF W>13 THENPRINT@294,"2.COMMAND(h)":S@(2)="COMMAND(h)":PRINT@326,"3.DETECT
 MAGIC";:S@(3)="DETECT MAGIC"
4440 PRINT:PRINT@390,"------***------":GOSUB20
4450 RETURN'*******************
4460 '** DRUID'S SPELLS **
4470 CLS:PRINT@100,"**DRUID'S SPELLS**"
4480 IFW<13THENPRINT@160,"YOUR WISDOM ALLOWS YOU TO CARRY TWO SPELLS...."
4490 IF W>12 THENPRINT@160,"YOUR WISDOM GIVES YOU A BONUS.. ENABLING YOU TO CARR
Y.....  THREE SPELLS:"
4500 S@(1)="eNTANGLE":S@(2)="DETECT MAGIC"
4510 PRINT@262,"1.";S@(1)
4520 PRINT@294,"2.";S@(2)
4530 IFW>12THENS@(3)="CURE LIGHT WOUNDS":PRINT@326,"3.";S@(3)
4540 PRINT:PRINT@390,"------***------":GOSUB20
4550 RETURN'*******************
4560 '**SAVE CHARACTER ROUTINE**
4570 N@(1)=N@:R@(1)=R@:C@(1)=C@:M@(1)=LEFT@(N@,8)
4580 B@(1)=B@:A@(1)=A1@:L(1)=LL:W1@(1)=W@(1):W2@(1)=W@(2):W3@(1)=W@(3)
4590 S$@(1,1)=S@(1):S$@(1,2)=S@(2):S$@(1,3)=S@(3)
4600 S(1)=S:I(I)=I:W(1)=W:C(1)=C:D(1)=D:R(1)=R
4610 GP(1)=GP:HP(1)=HP:SB(1)=SB:DB(1)=DB:WA(1)=WA:AC(1)=AC:SP(1)=SP:SM(1)=SM:LI(
1)=LI
4620 CLS:PRINT@5,"*DO YOU WISH TO SAVE*":PRINT@39,"*THIS CHARACTER*"
4630 PRINT@77,"";:Q@=INKEY@
4640 IFQ@="N"THENEND
4650 IFQ@="Y"THEN4670
4660 GOTO4630
4670 PRINT:PRINT" PREPARE TAPE & THEN PRESS       ANY KEY....."
4680 K@=INKEY@:IF K@=""THEN4680
4690 PRINT@234,"**SAVING**":PRINT@268,N@(1):OPEN"O",@-1,M@(1)
4700 PRINT@-1,N@(1),R@(1),C@(1),L(1),B(1),I(1),W(1),C(1),D(1),R(1)
4710 PRINT@-1,B@(1),GP(1),HP(1),SB(1),DB(1),WA(1),W1@(1),W2@(1),W3@(1),A@(1),AC(
1),LI(1),E(1),Q(1)
4720 FORX=1TO8:PRINT@-1,F@(-1,X),SS@(1,X):NEXTX:FORY=1TO5:PRINT@-1,T@(1,Y):NEXTY
4730 CLOSE@-1:PRINT@234,"***DONE***":RETURN
```

Spectrum Life

by ITR and JH

This must be the shortest and fastest 'Life' program ever written for the Spectrum. For anyone who hasn't yet seen the game of Life, here are two simple rules:

1) A cell dies if it has more than three or fewer than two neighbours.
2) A cell is born if an empty space has exactly three neighbouring cells.

A random screen of cells is generated first, then successive colonies. Eventually, a colony will either die out, become stable and static or stable and dynamic. Pressing any key at any time will return the routine to Basic. To re-start the program, type in the following two lines and RUN the program:

```
10 RANDOMIZE USR 32768
20 GOTO 10
```

The machine code routine is 159 bytes in length, residing at address 32768. The 'playing area' uses the attribute area onscreen, with each generation built up in a 768-byte table, then block loaded onto the screen. The program produces approximately nine generations per second; the code is simple and interesting to disassemble and modify.

```
10 CLEAR 32767
20 FOR F=32768 TO32926
30 READ N: POKE F,N:NEXT F
40 BORDER 0: PAPER 0:CLS
50 RANDOMISE USR 32768: GOTO 50
100 DATA 4,17,6,3,33,-2,-1,58,252,-1,31,
    31,31,31,174,15,203,22,43,203,22,43
110 DATA 203,22,43,203,22,58,-2,-1,230,
    1,237,68,2,3,27,122,179,32,219,221,33,0
120 DATA 88,33,0,129,17,0,88,1,0,3,237,176,
    219,-2,238,-1,192,38,88,17,0,91
```

```
130 DATA 14,32,237,176,33,224,90,17,224,87,
    14,32,237,176,38,129,1,0,3,221,126,1
140 DATA 237,68,221,86,33,146,221,86,32,146,
    221,86,31,146,221,86,-1,146,221,86,223,146
150 DATA 221,86,224,146,221,86,225,146,221,
    86,0,245,122,167,40,23,241,54,0,-2,4,48
160 DATA 6,-2,2,56,2,54,-1,35,221,35,11,120,
    177,32,194,24,148,119,241,254,3,32
170 DATA 240,54,255,24,236
```

Dayfinder

by Mark Needham

Following the *APC* Teach yourself Lisp series (August - October issues), here is a short Lisp program to determine which day of the week any given date in history was on, or will be on in the future. The program will run on practically any Lisp system as it's written using common Lisp commands. Dayfinder allows you to find out what day you were born on, what day your next birthday will be on, or what day it will be on in a hundred ears' time. The program will work out the day for any given date based on the current calendar system. Also submitted with the program was a Basic version, which graphically illustrated that Lisp can be very readable and understandable, unlike most Basics.

To run the program, type:

(WHAT-DATE '(dd mm yy yy))

where dd is the day, mm is the month, and yy yy is the year. So, for example, to find the day for the 16th of September 1984, type:

(WHAT-DATE '(16 9 19 84))

The day, month and two parts of the year must be separated by spaces, and the whole date must be surrounded by brackets as shown with an apostrophy in front. The number entered is checked for illegal dates.

As Lisp is an extenable lanaguage, it would be easy to incorporate this routine into any Lisp program.

```
(DEFUN WHAT-DATE (DATE)
(FIND-DATE DATE)
(SETQ DATE-OK T)
(COND
((OR (GREATERP MONTH 12)(LESSP MONTH 1)
(GREATERP YEAR1 99)(LESSP YEAR1 0)
(GREATERP YEAR2 99)(LESSP YEAR2 0)
(GREATERP DAY 31)(LESSP DAY 1))
(SETQ DATE-OK 0)))
(COND
((EQ DATE-OK T)
(SETQ MONTHS (LIST 31
(COND ((EQ (REMAINDER YEAR2 4) 0) 29)
(T 28)) 31 30 31 30 31 31 30 31 30 31))
(SETQ TEMP MONTHS)
(SETQ A MONTH)
(LOOP
(SETQ B (CAR TEMP))
(SETQ TEMP (CDR TEMP))
(UNTIL (ZEROP (SETQ A (SUB1 A)))))
(COND
((GREATERP DAY B)(SETQ DATE-OK 0)))))
(COND
((EQ DATE-OK 0)(PRINC 'ERROR))
(T
(SETQ DAYS (QUOTE (SUN MON TUE WED THU FRI SAT)))
(SETQ MONS (QUOTE (JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC)))
(SETQ A (QUOTE (5 4 3 2 1 0 6)))
(CALC-DATE)
(PRINT-DATE)
)))


(DEFUN FIND-DATE (DATE1)
(COND ((EQ DATE1 NIL)(SETQ DATE1 (QUOTE (-1)))))
(SETQ DAY (CAR DATE1))
(COND ((LISTP (CDR DATE1))(SETQ DATE1 (CDR DATE1)))
(T (SETQ DATE1 (QUOTE (-1)))))
(SETQ MONTH (CAR DATE1))
(COND ((LISTP (CDR DATE1))(SETQ DATE1 (CDR DATE1)))
(T (SETQ DATE1 (QUOTE (-1)))))
(SETQ YEAR1 (CAR DATE1))
(COND ((LISTP (CDR DATE1))(SETQ DATE1 (CDR DATE1)))
(T (SETQ DATE1 (QUOTE (-1)))))
(SETQ YEAR2 (CAR DATE1)))

(DEFUN CALC-DATE ()
(SETQ T1 (ADD1 (REMAINDER YEAR1 7)))
(LOOP (SETQ D1 (CAR A))
```

```
(SETQ A (CDR A))
(UNTIL (ZEROP (SETQ T1 (SUB1 T1))))
(SETQ T1 (REMAINDER (TIMES 5 (QUOTIENT YEAR2 4)) 7))
(SETQ D1 (SKIP (PLUS D1 T1)))
(SETQ T1 (REMAINDER YEAR2 4))
(COND ((GREATERP T1 0)
(SETQ D1 (SKIP (PLUS D1 T1 1)))))
(SETQ N 0)
(SETQ L MONTH)
(COND ((GREATERP L 1)
(SETQ L (SUB1 L))
(LOOP (SETQ N (PLUS N (CAR MONTHS)))
(SETQ MONTHS (CDR MONTHS))
(UNTIL (ZEROP (SETQ L (SUB1 L)))))))
(SETQ N (REMAINDER (PLUS N DAY -1) 7))
(SETQ D1 (ADD1 (SKIP (PLUS D1 N))))
(LOOP (SETQ TODAY (CAR DAYS))
(SETQ DAYS (CDR DAYS))
(UNTIL (ZEROP (SETQ D1 (SUB1 D1))))))


(DEFUN PRINT-DATE ()
(PRINTC)
(PRINC TODAY BLANK (QUOTE THE) BLANK DAY BLANK
(COND ((OR (EQ DAY 1) (EQ DAY 21) (EQ DAY 31))
(QUOTE ST))
((OR (EQ DAY 2) (EQ DAY 22))
(QUOTE ND))
((OR (EQ DAY 3) (EQ DAY 23))
(QUOTE RD))
(T (QUOTE TH)))
BLANK
(QUOTE OF) BLANK)
(LOOP (SETQ MON (CAR MONS))
(SETQ MONS (CDR MONS))
(UNTIL (ZEROP (SETQ MONTH (SUB1 MONTH)))))
(PRINC MON BLANK YEAR1 YEAR2))


(DEFUN SKIP (X)
(COND ((GREATERP X 6)
(DIFFERENCE X 7))
(T X)))
```

Commodore 64 Gremlin's Garden

by Tony Crowther

Gremlin's Garden features some brilliant sprite animation and user defined graphics, and the action is machine code controlled for speed and smooth motion.

It's an update of an old favourite, Snake — in which you guide a caterpillar round a garden, collecting butterflies and avoiding mushrooms. To complicate matters, every time you pick up a butterfly, another mushroom grows and if that isn't enough, you have the option of adding an extra hazard in the form of a bird which sets after you in non-stop pursuit.

Average scores should be around 4,000 points — high scorers should look for 8-10,000 points.

How it works

0 Sets screen and border colours to blue, sets up four user defined graphics for the mushrooms. Calls set-up routine at line 3050.

1-9 Switch to user defined graphics, set volume to maximum, select multicolour sprites and set sprite pointers.

10 Sets all sprite positions to 0, calls title screen.

11-16 Set initial positions.

18 Prints mushroom and updates score

20 Calls machine code routine for movement.

30 If nothing happens then loop.

35 If butterfly collected then update score, print another mushroom.

40-110 Print collision message, check for high score and update, restart game.

500-711 Data for redefined characters and sprites.

800-853 Data for machine code routines.

1000-1004 Define screen and colour strings and take a slice for random position.

2110-2130 Get input for bird option and check joystick for start.

3000-4001 Set up sprites and machine code.

```
0 POKE53280,6:POKE53281,6:FORI=0TO31:REA
DA:POKE12288+192*8+I,A:NEXT:GOTO3050
1 SYS49152:POKE53248+24,29:POKE53275,255
2 PRINT"{CLR}":POKE54296,15
3 POKE53286,0:POKE53285,1
4 POKE2040,201:FORI=0TO4:POKE2041+I,200:
NEXT:POKE2047,210
```

```
5 POKE53248+21,255
6 POKE53264,0
7 POKE53248+28,255
8 POKE53288,3:POKE53289,5:POKE53290,3:PO
KE53291,5:POKE53292,3
9 POKE53287,2
10 SYS49225:FORI=0TO11:POKE53248+I,0:NEX
T:GOSUB2000
11 POKE53262,150:POKE53263,150
15 A=RND(1)*200+40:POKE2046,209:POKE5329
3,2
16 B=RND(1)*170+50:POKE53260,A:POKE53261
,B
17 FORI=1TO10:A=PEEK(53278):A=PEEK(53279
):NEXT
18 GOSUB1000
20 SYS49253
30 IFPEEK(1022)=0THEN20
35 IFPEEK(1022)=2THENGOSUB150:GOTO15
40 PRINT"{HOME}{CUR DN}{CUR DN}{CUR DN}{
CUR DN}{BLK}                YOU ARE HIT"
50 FORI=0TO100:POKE54276,0:POKE54273,I:P
OKE54277,2:POKE54276,33:NEXT
60 GOTO100
100 IFSC>HITHENHI=SC
105 PRINT"{HOME}{CUR DN}{WHT}{CUR DN}{CU
R DN}{CUR DN}{CUR DN}{CUR DN}{CUR DN}{CU
R DN}{CUR DN}"TAB(31)HI
110 GOTO9
150 POKE54276,0:POKE54273,200:POKE54277,
27+32:POKE54276,17:RETURN
500 DATA3,15,15,31,31,31,63,63
501 DATA192,240,240,248,248,248,252,252
502 DATA29,1,1,3,3,7,28,0
503 DATA184,128,128,192,192,96,184,0
600 DATA0,0,0,2,160,0,10,168
601 DATA0,10,168,0,42,170,0,42
602 DATA170,0,42,170,0,42,170,0
603 DATA10,168,0,10,168,0,2,160
604 DATA0,0,0,0,0,0,0,0
605 DATA0,0,0,0,0,0,0,0
606 DATA0,0,0,0,0,0,0,0
607 DATA0,0,0,0,0,0,0,0
608 DATA0,0,0,48,3,0,14,172
609 DATA0,11,184,0,42,170,0,42
610 DATA170,0,42,170,0,37,150,0
611 DATA41,154,0,10,168,0,2,32
612 DATA0,0,0,0,0,0,0,0
613 DATA0,0,0,0,0,0,0,0
614 DATA0,0,0,0,0,0,0,0
615 DATA0,0,0,0,0,0,0,0
616 DATA0,48,0,2,176,0,10,176
617 DATA0,38,184,0,41,170,0,38
618 DATA175,192,42,154,0,10,102,0
619 DATA42,168,0,2,160,0,2,0
620 DATA0,0,0,0,0,0,0,0
621 DATA0,0,0,0,0,0,0,0
622 DATA0,0,0,0,0,0,0,0
623 DATA0,0,0,0,0,0,0,0
624 DATA0,0,0,2,160,0,10,168
625 DATA192,10,107,0,41,110,0,10
626 DATA170,0,10,170,0,41,110,0
627 DATA10,107,0,10,168,192,2,160
628 DATA0,0,0,0,0,0,0,0
629 DATA0,0,0,0,0,0,0,0
630 DATA0,0,0,0,0,0,0,0
631 DATA0,0,0,0,0,0,0,0
```

```
632 DATA0,0,0,2,0,0,2,160
633 DATA0,42,168,0,10,162,0,42
634 DATA154,0,38,175,192,41,170,0
635 DATA38,184,0,10,176,0,2,176
636 DATA0,0,48,0,0,0,0,0
637 DATA0,0,0,0,0,0,0,0
638 DATA0,0,0,0,0,0,0,0
639 DATA0,0,0,0,0,0,0,0
640 DATA0,0,0,2,32,0,10,168
641 DATA0,41,154,0,37,150,0,42
642 DATA170,0,42,170,0,42,170,0
643 DATA11,184,0,14,172,0,48,3
644 DATA0,0,0,0,0,0,0,0
645 DATA0,0,0,0,0,0,0,0
646 DATA0,0,0,0,0,0,0,0
647 DATA0,0,0,0,0,0,0,0
648 DATA0,0,0,0,32,0,2,160
649 DATA0,10,170,0,38,104,0,41
650 DATA170,0,254,166,0,42,154,0
651 DATA11,166,0,3,168,0,3,160
652 DATA0,3,0,0,0,0,0,0
653 DATA0,0,0,0,0,0,0,0
654 DATA0,0,0,0,0,0,0,0
655 DATA0,0,0,0,0,0,0,0
656 DATA0,0,0,2,160,0,202,168
657 DATA0,58,104,0,46,90,0,42
658 DATA168,0,42,168,0,46,90,0
659 DATA58,104,0,202,168,0,2,160
660 DATA0,0,0,0,0,0,0,0
661 DATA0,0,0,0,0,0,0,0
662 DATA0,0,0,0,0,0,0,0
663 DATA0,0,0,0,0,0,0,0
664 DATA3,0,0,3,160,0,3,168
665 DATA0,11,166,0,42,154,0,254
666 DATA166,0,41,170,0,38,104,0
667 DATA10,170,0,2,160,0,0,32
668 DATA0,0,0,0,0,0,0,0
669 DATA0,0,0,0,0,0,0,0
670 DATA0,0,0,0,0,0,0,0
671 DATA0,0,0,0,0,0,0,0
672 DATA0,0,0,12,12,0,43,58
673 DATA0,150,229,128,149,149,128,149
674 DATA149,128,37,150,0,37,150,0
675 DATA9,152,0,37,150,0,150,37
676 DATA128,150,37,128,40,10,0,0
677 DATA0,0,0,0,0,0,0,0
678 DATA0,0,0,0,0,0,0,0
679 DATA0,0,0,0,0,0,0,0
680 DATA0,0,0,0,0,0,0,0
681 DATA0,0,32,0,0,32,0,0
682 DATA84,0,4,84,64,21,17,80
683 DATA21,85,80,85,85,84,85,85
684 DATA84,81,85,20,64,84,4,0
685 DATA84,0,0,16,0,0,16,0
686 DATA0,84,0,0,84,0,0,68
687 DATA0,0,0,0,0,0,0,0
688 DATA0,0,0,0,0,0,0,0
689 DATA0,0,32,0,0,32,0,0
690 DATA84,0,4,84,64,5,17,64
691 DATA21,85,80,21,85,80,21,85
692 DATA80,17,85,16,16,84,16,0
693 DATA84,0,0,16,0,0,16,0
694 DATA0,84,0,0,84,0,0,68
695 DATA0,0,0,0,0,0,0,0
696 DATA0,0,0,0,0,0,0,0
697 DATA0,0,32,0,0,32,0,0
698 DATA84,0,4,84,64,5,17,64
699 DATA5,85,64,5,85,64,5,85
```

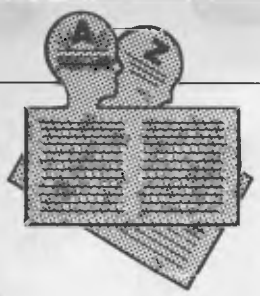
```
700 DATA64,5,85,64,4,84,64,4
701 DATA84,64,0,16,0,0,16,0
702 DATA0,84,0,0,84,0,0,68
703 DATA0,0,0,0,0,0,0,0
704 DATA0,0,0,0,0,0,0,0
705 DATA0,0,32,0,0,32,0,0
706 DATA84,0,0,84,0,1,17,0
707 DATA5,85,64,5,85,64,21,85
708 DATA80,17,85,16,16,84,16,0
709 DATA84,0,0,16,0,0,16,0
710 DATA0,84,0,0,84,0,0,68
711 DATA0,0,0,0,0,0,0,0
800 DATA120,169,51,133,1,169,0,133
801 DATA250,169,204,133,251,169,0,133
802 DATA252,169,44,133,253,160,0,152
803 DATA41,7,201,5,144,8,177,250
804 DATA10,145,252,76,54,192,201,2
805 DATA176,8,177,250,74,145,252,76
806 DATA54,192,177,250,145,252,200,208
807 DATA222,230,251,230,253,165,253,201
808 DATA50,208,210,169,55,133,1,88
809 DATA96,162,0,169,50,157,80,195
810 DATA169,150,157,81,195,232,232,224
811 DATA100,208,240,96,1,2,4,8
811 DATA100,208,240,96,1,2,4,8
812 DATA16,32,64,128,173,173,0,220
813 DATA41,2,240,3,206,80,195,173
814 DATA0,220,41,1,240,3,238,80
815 DATA195,173,0,220,41,4,240,3
816 DATA238,81,195,173,0,220,41,8
817 DATA240,3,206,81,195,173,0,220
818 DATA73,127,24,141,255,3,234,234
819 DATA234,162,100,189,79,195,157,81
820 DATA195,202,208,247,162,0,160,0
821 DATA185,80,195,157,1,208,185,81
822 DATA195,157,0,208,232,232,152,24
823 DATA105,12,168,224,12,208,233,173
824 DATA255,3,240,40,160,201,201,2
825 DATA240,31,200,201,6,240,26,200
826 DATA201,4,240,21,200,201,5,240
827 DATA16,200,201,1,240,11,200,201
828 DATA9,240,6,200,201,8,240,1
829 DATA200,140,248,7,76,241,192,0
830 DATA234,238,239,192,173,239,192,201
831 DATA3,144,54,162,0,142,239,192
832 DATA173,0,208,56,237,14,208,141
833 DATA252,3,173,1,208,56,237,15
834 DATA208,141,253,3,201,128,144,6
835 DATA206,15,208,76,33,193,238,15
836 DATA208,173,252,3,201,128,144,6
837 DATA206,14,208,76,49,193,238,14
838 DATA208,173,239,192,201,1,208,15
839 DATA238,255,7,173,255,7,201,214
840 DATA144,5,169,210,141,255,7,169
841 DATA0,141,254,3,173,30,208,141
842 DATA251,3,41,128,240,13,173,251
843 DATA3,41,64,208,6,169,1,141
844 DATA254,3,96,162,200,160,230,200

845 DATA208,253,232,208,248,173,251,3
846 DATA41,64,240,13,173,251,3,41
847 DATA128,208,6,169,2,141,254,3
848 DATA96,173,31,208,141,249,3,41
849 DATA128,240,9,173,249,3,56,233
850 DATA128,141,249,3,173,249,3,41
851 DATA64,240,9,173,249,3,56,233
852 DATA64,141,249,3,173,249,3,240
```

```
853 DATA6,169,1,141,254,3,96,76,101,192
1000 A$="{RVS ON}{^*}{^A}{CUR DN}{CUR L}
{CUR L}{^B}{^C}":B$="{CUR RT}{CUR RT}{CU
R RT}{CUR RT}{CUR RT}{CUR RT}{CUR RT}{CU
R RT}{CUR RT}{CUR RT}{CUR RT}{CUR RT}{CU
R RT}{CUR RT}{CUR RT}{CUR RT}{CUR RT}{CU
R RT}{CUR RT}{CUR RT}{CUR RT}{CUR RT}{CU
R RT}{CUR RT}{CUR RT}{CUR RT}{CUR RT}{CU
R RT}{CUR RT}{CUR RT}"
1001 D$="{HOME}{CUR DN}{CUR DN}{CUR DN}{
CUR DN}{CUR DN}{CUR DN}{CUR DN}{CUR DN}{
CUR DN}{CUR DN}{CUR DN}{CUR DN}{CUR DN}{
CUR DN}{CUR DN}{CUR DN}{CUR DN}{CUR DN}{
CUR DN}{CUR DN}{CUR DN}{CUR DN}{CUR DN}"
1002 C$="{OR}{BRN}{LT RED}{GY 1}{GY 2}{L
T GRN}{GY 3}{LT BLU}{BLK}{WHT}{RED}{CYN}
{PUR}{GRN}{YEL}":A=INT(RND(1)*14)+1:PRIN
TMID$(C$,A,1)

1003 A=INT(RND(1)*12)*2:PRINTLEFT$(D$,A+
1);
1004 A=INT(RND(1)*14)*2:PRINTLEFT$(B$,A+
1);A$"{HOME}"
1005 SC=SC+(L*10):L=L+1
1006 PRINT"{HOME}{CUR DN}{CUR DN}{CUR DN
}{CUR DN}{CUR DN}{CUR DN}{WHT}"TAB(31)SC
1010 RETURN
2000 POKE53269,0:GOSUB3000:L=0:SC=0:POKE
198,0
2010 PRINT" {GRN}       GREMLIN'S GARDEN
2020 PRINT"{CUR DN} {WHT}    WRITTEN BY A
.CROWTHER
2030 PRINT"{CUR DN}{CUR DN}{CUR DN}{YEL}
     COLLECT BUTTERFLIES
2040 PRINT"    AVIOD MUSHROOMS AND BIRD
2050 PRINT"{CUR DN}{LT BLU}      OPTIONS
   'A'    'B'
2060 PRINT"       BIRD      YES    NO"
2065 PRINT"{CUR DN}{CUR DN}{CUR DN}{CYN}
      JOYSTICK PORT 1{"
2070 PRINT"{HOME}{CUR DN}{CUR DN}{CUR DN
}{CUR DN}{CUR DN}"TAB(32)"{BLK}SCORE"
2080 PRINTTAB(31)SC"{CUR L}      "
2090 PRINTTAB(32)"{CUR DN}HISCORE"
2100 PRINTTAB(31)HI
2110 GETA$
2111 IF(PEEK(56320)AND16)=0THENA$="A"
2120 IFA$="A"THENPOKE53269,255:L=20:GOTO
3000
2130 IFA$="B"THENPOKE53269,127:GOTO3000
2135 GOTO 2110
3000 PRINT"{HOME}";
3001 A$="                                        "
3002 FORI=1TO24:PRINTA$:NEXT:PRINTA$"{HO
ME}"
3003 RETURN
3050 PRINT"{CLR}LOADING DATA FOR PROGRAM
"
3060 PRINT"PLEASE WAIT!!"
4000 FORI=0TO895:READA:POKE12800+I,A:NEX
T
4001 FORI=0TO433:READA:POKE49152+I,A:NEX
T:GOTO 1


READY.
```



USER GROUPS INDEX

DIRECT ACCESS

Below is a complete list of User Groups known to us in Australia and New Zealand. User Groups' Secretaries are asked to provide us with alterations, additions and corrections as promptly as possible to avoid a longer than necessary delay before publication. During the next five months these changes will be published and the next complete listing will appear in the May 1985 issue of APC.

NAME OF GROUP:	CATERING FOR:	MEETINGS:	CONTACT:
NEW SOUTH WALES			
A.P.F. User Group	A.P.F.	—	Norm Mc Mahon 288 Kissing Point Road, Turramurra, 2074 (02) 44 2645
Apple User Group	Apple	2nd Monday of each month at the Sydney Grammar School Science Auditorium, College Street, City at 6.30pm.	Apple User Group PO Box 505 Bankstown 2200
Ausborne User Group	Osborne	Every 3rd Wednesday of the month at 6.30pm at the North Sydney Council Chambers, 200 Miller Street.	Ian Stretton Napier Box C530 Clarence Street, Sydney 2000
Australian Unix User Group	Unix	—	Chris Campbell P.O. Box 324, Pymble 2073 (02) 449 4400
Australasian ZX User Group	Sinclair Computers — ZX80, ZX81 and Spectrum	—	Send S.A.S.E. to: P.O. Box 397, Dapto 2530 (042) 615 451
Broken Hill MicroBee Users Group	MicroBee	—	Peter Cotter 533 Radium Street, Broken Hill 2880 (080) 88 1621 After Hours
Compucolor User Group	Compucolor	—	President NSW CCII User Group Tony Lee 52 Cowan Road St Ives 2075
Compu-tech Computer Club	Commodore VIC 20, C-64 and PET	VIC-20 chapter meets 1st Tuesday of every month. C-64 and PET chapter meets 4th Tuesday of every month.	Geoff Rayner P.O. Box 115, Mayfield 2304
Hunter User Group	General	Meets at University of Newcastle, Room W308 Education Building on the 2nd Wednesday of each month at 7.30pm.	Secretary, P.O. Box 39, Broadmeadow 2292
Illawarra Apple Core	Apple computer	Meets on the 4th Monday of each month at Holy Spirit College, Bond Street, Bellambi at 8pm.	Bob Williams (042) 96 6115
Illawarra Super 80 User Group	Super 80	Meets on the 1st Monday of each month at 5.30pm at 86 Market Street, Wollongong	P.O. Box 1775, Wollongong 2500
MicroBee User Group	MicroBee	—	Eric Eulenstein 202 Kooba Street, Albury 2640 (060) 25 1601
Newcastle Microcomputer Club	General	Meets on the 2nd and 4th Monday of each month at 7.30pm in Room G12, Physics Building, University of Newcastle.	P.O. Box 293, Hamilton 2303 or Anthony Bliss (049) 67 2433 Tony Nicholson (049) 52 6017

USER GROUPS INDEX

NAME OF GROUP:	CATERING FOR:	MEETINGS:	CONTACT:
NSW Peach User Club	Hitachi Peach	Monthly meetings are held on the 1st Saturday of each month. Contact them for location details	Daniel Soussi 37 Mooramie Street, Kensington 2033
PC User Group	IBM PCs and compatibles	Meeting on 17 December at the training rooms of Deloitte Haskins and Sells, Level 7, 18 Bent Street, Sydney.	
Southern Districts Commodore User Group	Commodore	Meets on the 1st and 3rd Wednesday of every month.	A Toms President 3 Lucille Crescent Casula 2170
Sydney Apple User Group	Apple	Meets at the Sydney Grammar School Science Auditorium on the 2nd Monday of each month at 6.30pm	Frank Revill (047) 36 448
Sydney Forth Group	General	Meets at Room LG19, John Goodsell Commerce Building, University of NSW on 2nd Friday of each month at 7pm	Peter Tregeagle 10 Binda Avenue, Yowie Bay 2228 (02) 524 7490 (AH)
Sydney MicroBee User Group	MicroBee	Meets on the 3rd Saturday of each month at the McMahons Point Community Centre, Blues Point Road, North Sydney from 1pm to 5pm, and the 1st Tuesday of each month at the Auburn Girls High School, Braemar Street, Auburn from 7pm to 9pm.	President/Editor Colin Tringham S.M.U.G. PO Box C233 Clarence Street Sydney 2001
T.I.S.H.U.G.	Texas Instruments TI-99/4 and other 16 bit TMS 9900-based personal computers	—	John Robinson P.O. Box 149, Pennant Hills 2120
Texas Instruments User Group	Texas Instruments	Meetings are held on the 1st Saturday of each month at St John's Hall, Victoria Street, Darlinghurst.	Shane Anderson Editor TISHUG PO Box 595 Marrackville 2204
The Blue Mountain Computer Club	General	Meetings are held at Springwood Civic Centre on the 2nd and 4th Friday of each month at 7.30pm	Eric Lindsay 6 Hillcrest Avenue, Faulconbridge (047) 512 258 (AH)
The Central Coast Apple User Group	Apple and Apple compatible	Meetings are held on the 1st Tuesday of each month at the Niagara Park Public School from 7.30pm.	662 The Entrance Road Warmbernal 2260
Wollongong Computer Club	General	—	P.O. Box 397 Dapto 2530 (042) 615 451

VICTORIA

Apple User Society of Melbourne	Apple	Meetings are held on the first Saturday of each month at the Burwood Regional Community Education Centre, Burwood Highway, Melbourne.	Graham Willis AUSOM PO Box 43 Forest Hills 3131
Compucolor User Group	Compucolor	Meets on the second Wednesday of each month at the Community Centre, Surrey Hills, Victoria.	CUVIC PO Box 420 Camberwell 3124
Forth Interest Group	Forth	Meets on the 1st Friday of each month at 8pm. Contact secretary for details	Lance Collins, P.O. Box 103, Camberwell 3124 (03) 29 2600
Geelong Commodore Computer Club	Commodore	—	D Gerrard Geelong Commodore Computer Club C/- 15 Jacaranda Place Belmont Geelong 3216
Lap Computer User Group	All lap computers	—	The Secretary Lap Computer User Group Box 2884DD GPO Melbourne 3001

USER GROUPS INDEX

NAME OF GROUP:	CATERING FOR:	MEETINGS:	CONTACT:
Melbourne Atari Computer Enthusiasts Group	Atari	Usually held at the Rotunda at Monash University on the 1st Sunday of each month at 11.40am	Peter Coleman M.A.C.E. Secretary, P.O. Box 133, Mulgrave North 3170
Melb PC User Group	IBM and compatibles	Next meeting to be held on December 12, 5.15pm at Clunies Ross Hall, 191 Royal Parade, Parkville.	Stephen Wagen C/- Pannell Kerr Forster 14th Floor 500 Bourke Street Melbourne 3000
Melbourne VIC 20 User Group	VIC-20	Meetings are held on the 4th Wednesday of every month at Box Hill TAFE Building No 4, 465 Elgar Road at 7.30pm	John Ruddock P.O. Box 252 Northcote 3070
NEC Portable User Group	NEC 8201A	Meetings are held on the 2nd Wednesday of each month at Myers Computer Centre, Lonsdale Street, Melbourne, 7.30pm.	D Green (03) 611 3380 (BH)
Osborne User Group	Osborne	—	Osborne User Group PO Box 169 Camberwell 3124
Otrona Attache User Group	Otrona Attache	—	David Broadbent Chairman (03) 528 2792
Peninsula Group	General	Meets at the Frankston Library on the 2nd Tuesday of each month	M.G. Thompson (03) 772 2674
RCA VIP, ETI 660, Dream 6800 or Comx 35 Micros	RCA VIP, ETI 660, Dream 6800, Comx 35	—	Frank Rees 27 King Street, Boort 3537
Sorcerer Computer Users (Australia)	Sorcerer	—	Gordon Ohlenrott GPO Box 2402 Melbourne 3001
Spectravideo User Group	Spectravideo	—	Mitch Raitt Fernhill Tidals Road Warrandyte 3113
The Color Computer Club	TRS-80 Color Computer	Meets on the 1st Friday of each month at Geelong College at 8pm	Andrew Gay 3 Quamby Avenue, North Geelong 3215 (052) 78 3424
The Eastern Suburbs Eighty User Group	TRS-80/System 80	Meets on the 4th Wednesday of each month at the Junior Science Lab, Kingswood College, 355 Station Street, Box Hill, Victoria	Cameron McKern ESEUG 8 Chestnut Street Surrey Hills 3127 (03) 288 1713 (AH)
TI-99/4 Users Group Melbourne	TI-99/4	Meets monthly at Victoria College, Burwood	Wayne Worladge 123 Ashburn Grove, Ashburton 3147 (03) 25 1832
A.C.T.			
ACT Apple	Apple	Meets on the 2nd Thursday of each month	Eddie Tsui, Secretary P.O. Box 1231, Canberra City 2601
ACT VIC 20 User Association	VIC 20	Meets each month. Details available from Association	Chris Groenhout 25 Kerferd Street, Watson 2602 (062) 412 316
ASUG	Sirius (Victor 9000)	—	Rob Judd 31 Altree Crescent, Phillip 2605
Atari User Group of Canberra	Atari	Meetings are held on the first Monday of each month at 8pm. 1st Floor, Building A, Canberra TAFE College, Reid.	ACTARI PO Box E112 Old Canberra ACT 2600
Canberra Micro-80 Users Group	TRS-80, System 80 and any other Z80 based microcomputers	Meets on the 3rd Monday of each month in the large lecture theatre of Building J, Canberra Technical College, Constitution Avenue, Reid at 7.30pm	M.J. Cottee 33 Crawford Crescent, Flynn 2615 (062) 58 8822

USER GROUPS INDEX

NAME OF GROUP:	CATERING FOR:	MEETINGS:	CONTACT:
MICSIG	General	Meetings held on 2nd Tuesday of each month at the Oliphant Building, Australian National University at 7.45pm.	Registrar, MICSIG, P.O. Box E237, Old Canberra ACT 2600
NEC User Group of Canberra	NEC	Meets on the 1st Tuesday of each month at the Main Conference Room, CSIRO Headquarters, Limestone Avenue, Canberra at 7.30pm.	Mal Smith PO Box 173 Belconnen 2616 (062) 541 614
The Australian ZX Users Association	ZX80, ZX81 and Zx Spectrum Microcomputers	—	AZUA 19 Godfrey Street, Campbell 2601

QUEENSLAND

Adventure Club	General	—	Ms Christine Ogden 37 Samford Road Leichhardt, Ipswich Queensland 4305
Apple-Q Brisbane User Group	Apple	Meets every 3rd Sunday of the month at Hooper Education Centre, Kuran Street, Wavell Heights 8.30am — 4.30pm	David Bourne P.O. Box 721, South Brisbane 4101
Australian Computer Education Association	General	—	Guy Coppens, ACEA PO Box 4075 (07) 379 9365
Commodore Computer Users Group Queensland	Commodore	Meetings are held on the 1st Tuesday of the month at 7.30pm at Milton State Primary School, Bayswater Road, Milton	John Egan P.O. Box 274, Springwood 4127 (07) 287 2705
Cranium Computers	General	—	Chris Lucey 34 Lawless Street, Blackwater 4717
Medfly User Group	Medfly	—	Medfly User Group 120 Highgate Street Coopers Plain 4108
Ohio Superboard User Group	Ohio Scientific Microcomputers	—	Ed Richardson 146 York Street, Nundah 4012
Osborne Users Group	Osborne	—	Glen McBride (07) 371 4243 (AH) (07) 377 2763 (BH)
Peach Computer Users Group Queensland	All MB6890 users	Meets every 4th Tuesday at 7.30pm, Taringa Primary School, Brisbane	Leo Burke (07) 356 6080 or Brian Williams 19 Patrick Street, Norman Park
PC 1500/PC 2 Club	PC 1500 and PC 2 users	—	Mark Tischler P.O. Box 3, Wavell Heights, Brisbane 4012
S.C.C.U.G.	Commodore	Every Monday night at 7pm (ex school holidays), Labrador State School, Turpin Road, Labrador	Bill Fitzpatrick 5/19 Huth Street, Labrador 4215 (075) 32 0061
Sinclair Computer Club	Sinclair Spectrum	Meets every third Sunday of each month, 2.00pm at Everton Park State High School, Brisbane.	Mrs V Lewis Secretary 37 Samford Road Leichhardt Ipswich Queensland 4305
T.I.B.U.G.	TI 99/4 users	Meets 1st Friday every month	R Saunders P.O. Box 57, Aspley 4034
Townsville MicroBee User Group	MicroBee	Meets at 7.30pm on the 2nd Monday of each month at Town & Country Computers, CTL Centre, Anne Street, Aitkenvale	John Johnson (077) 79 5628 After Hours

USER GROUPS INDEX

NAME OF GROUP:	CATERING FOR:	MEETINGS:	CONTACT:
The Brisbane Spectravideo User Group	Spectravideo	Meetings are held every 3rd Wednesday of each month at the Logan City Education Centre, Block G, Woodridge Primary School, Wembley Road, Woodridge.	Peter Daunton Computer Connection Shop 10 Logan City Centre Pacific Highway Underwood 4119 (07) 341 3466 (BH)
TRS-80/System 80 Computer Group	TRS-80/System 80	Meets on the 1st Sunday of each month, 2pm, at Lindum Hall, Lindum Road, Lindum.	W Allen Secretary 16 Laver Street Macgregor 4109 (07) 343 5771
User Group for the TRS-80 Model I and III, MC-10, COCO, System 80, Apple and Commodore 64	TRS-80 Model I and III, MC-10, COCO, System 80, Apple and Commodore 64	—	Chris Lucey 34 Lawless Street Blackwater Queensland 4717 (079) 826 146

SOUTH AUSTRALIA

Commodore User Group	Commodore	Meets on the 2nd Tuesday of each month at the Royal Caledonian Hall, 379 King William Street at 7.30pm.	Commodore User Group PO Box 427 North Adelaide
Kaypro User Group	Kaypro	—	Ralph Engler Kaypro User Group 16/34 John Street Payneham SA 5070
MicroBee Users Group of South Australia	MicroBee	—	Brian Uren GPO Box 767, Adelaide 5001 (08) 260 5038
Sorcerer User Group of South Australia	Sorcerer	Meetings are held on the 2nd Wednesday of every month at Adelaide University in the Eric Russel room of the Lower Napier Building	Don Ide 14 Scott Road, Newton 5074
IBM PC SA User Group	All 8088 users are welcome	Meets on the first Thursday of each month at the location advertised in the newsletter	Don Richards P.O. Box 68, Walkerville 5081 (08) 261 9590
SA Foundation for Computer Literacy	Caters for children aged from six years of age with special emphasis on the needs of handicapped, educably disabled and socially disadvantaged children.	—	SA Foundation for Computer Literacy PO Box 210 Norwood SA 5067
SA Microprocessor Group	General	Meetings are held on the 2nd Friday of each month at the Adelaide Archery Club Rooms, Cnr Bundeys and War Memorial Drive, North Adelaide.	Secretary (08) 793 445
TRS-80 User Group	TRS-80	—	R.G. Stevenson 36 Stuart Street, Adelaide 5000 (08) 51 5241 (BH) (08) 337 6682 (AH)
Adelaide Atari Computer Club	Atari	Meets at Gilles Street Primary School on 1st Monday of each month (2nd if 1st is on a public holiday)	N Pearce P.O. Box 333, Norwood 5067
Beebnet Inc	BBC & Econet users	—	P.O. Box 262 Kingswood 5062
Hitachi User Group	Hitachi	—	Geoff Drury 27 Creslin Terrace, Camden Park 5038 (08) 295 2778 After Hours

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S/ware h.d driver, Apple II CP/M	$ 75
S/ware h.d driver, Apple II CPM ALS	$ 75
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USER GROUPS INDEX

NAME OF GROUP:	CATERING FOR:	MEETINGS:	CONTACT:
TASMANIA			
Devonport Computer Interest Group	General	Meets 4th Thursday of each month. Contact group for location details	John Stevenson RSD 422, Sheffield 7306 (004) 92 3237
Tandy Hobart User Group	All Tandy Computers	—	Kristen Rees Secretary GPO Box 127IN Hobart Tasmania (002) 72 1426
Tasbeeb	BBC	Meets on the 1st Monday of each month, 8pm at the Elizabeth Matriculation College, D Block (entrance off Warwick Street) Hobart.	John Hannon PO Box 25 North Hobart Tasmania 7000 (002) 342 704
Tasmanian Computer Group	General	Meets 1st Tuesday of each month. Contact group for location details	Allan Appleby 17 Ninabah Street, Howrah 7018 (002) 30 2386 (BH)
TI 99/4 User Group	TI 99/4 users	Monthly meetings at the University of Tasmania, room 373, on every 3rd Sunday	Rex C. Shepherd 1 Benboyd Court, Rokeby 7019
NORTHERN TERRITORY			
NT Computer Club	Commodore 64, VIC 20 and other machines	Meetings are held at Wulagi Primary School on the 1st and 3rd Thursday of each month at 7.30pm.	Ian Diss NT Computer Club 349 McMillans Road Anula NT 5793 (089) 27 9208
WESTERN AUSTRALIA			
Osborne User Group (OSWEST)	Osborne and other machines running CP/M	Meetings are held on the first and third Wednesday of each month at the Palmyra Recreation Centre (first Wednesday), Subiaco Exhibition Hall (third Wednesday). Meetings are held at 7.30pm.	The Secretary Oswest PO Box 199 Mundaring 6554

NEW ZEALAND

ACES (Auckland Computer Education Society): C/- Director, Computer Centre, Secondary Teachers College, Private Bag, Symonds Street, Auckland. Meets 3rd Thursday, Teachers College, Epsom Avenue, Auckland.

ATARI Microcomputer Users Group: Ian Mason, 25 Manutara Avenue, Forrest Hill. Telephone: 467 347 (H). Meetings: 2nd Tuesday, Western Suburbs Radio Club, Gt North Road, New Lynn.

EPSON HX20 Users Group: C W Nighy. Telephone: 774 268. Meetings: 1st Wednesday, 231 Khyber Pass Road, Auckland.

HP41C Users Group (AK): Grant Buchanan. Telephone: 790 328 (W). Meetings: 3rd Wednesday, Centre Computers, Great South Road, Epsom.

NZ TRS-80 Microcomputer Club: Olaf Skarsholt, 203a Godley Road, Titirangi. Telephone: (09) 817 8698 (H). Meets 1st Tuesday, OSNZ Hall, 107 Hillsborough Road, Mt Roskill.

OSI Users Group (AK): Ken Hartley, 77 Boundary Road, Blockhouse Bay. Meets 3rd Tuesday at the VHF Clubrooms, Hazel Avenue, Mt Roskill.

Christchurch '80 Users Group: Brendon Thompson, P.O. Box 4118, Christchurch. Telephone: (03) 370 381 (A.H.).

Nelson Commodore Users Group: Peter Archer, P.O. Box 860, Nelson, NZ. Telephone: (054) 79 362.

NZ PC 1500 User group: Allan Thomas, P.O. Box 155, Napier, NZ.

Taranaki Microcomputer Society: Keith Smith, P.O. Box 7003, Bellblock, New Plymouth, NZ. Telephone: Waitata 8556.

NZ Microcomputer Club Inc: P.O. Box 6210, Auckland. Monthly meetings the 1st Wednesday of each month at 7.30pm at the OSNZ Hall, 107 Hillsborough Road, Mt Roskill.

OSI/BBC User Group Inc. Gary Plumpton, 15 Reiman Street, New Lynn, Auckland, New Zealand.

The following User Groups are part of the NZ Micro Club, all meetings start at 7.30pm.

APPLE Users Group: Ross Bryon. Telephone: 761 670 (H). Meetings: 3rd Tuesday each month at the OSNZ Hall, 107 Hillsborough Road, Mt Roskill.

BBC Users Group: Dave Fielder. Telephone: 770 630 Extn 518 (W). Meetings: 2nd Wednesday at the VHF Clubrooms, Hazel Avenue, Mt Roskill.

BUSINESS Users Group: Cathy Arrow. Telephone 491 012 (H).

Meetings: 4th Tuesday each month. Even months at the VHF Clubrooms, Hazel Avenue, Mt Roskill. Visits to business computer establishments are arranged for odd months.

CP/M Users group: Kerry Koppert. Telephone: 695 355 (H). Meetings: 1st Wednesday 9pm (after the Club meetings) each month at the OSNZ Hall, 107 Hillsborough Road, Mt Roskill.

IBM PC Users Group: Terry Bowden. Telephone: 452 639 (H), 778 910 (W). Meetings

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- SIMPLE WORD-PROCESSING
- MAILING LISTS
- STANDARD LETTERS
- LABELS

THINK OF AN APPLICATION

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

BUSINESS
CUSTOMERS, QUOTES, ORDERS, SALES, INVOICES, ACCOUNTS, CREDITORS, NAMES, LETTERS, ADDRESSES, FINANCIAL, LABELS, SUPPLIERS, PRODUCTS, CATALOGUES, PERSONNEL, DRG STRUCTURE, DEPTS

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

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

INDUSTRY
VEHICLES, REPAIRS, MAINTENANCE, PRODUCTION

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

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

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

1. MONEY-BACK GUARANTEE

If you are not satisfied with META4, return it within 14 days for a cheerful refund. If you buy from a dealer, check he is prepared to do this before you buy.

2. TELEPHONE CONSULTING

If there is something you want clarified after you have purchased META4, ring us up. Maximum time for any one call 15 minutes.

BASIC CONCEPTS

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

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

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

RECORDS — META4 stores the ANSWERS to a set of QUESTIONS in a room as a RECORD. There can be many RECORDS in a room.

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

BUILDINGS — A building is a collection of related ROOMS and DOORWAYS. A BUILDING corresponds to the traditional concept of a Data Base.

META4 IS PORTABLE

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

EASE OF USE

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

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

META 4 IS EXTENDABLE

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

SELLING YOUR META4 APPLICATIONS

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

DETAILED FACILITIES

- Menu drives
- True DATA BASE — RELATIONAL/NETWORK
- Variety of Answer-types e.g. CALCULATED, DATE, YES/NO, NUMERIC, TEXT, LIST
- FULL PROMPTING
- Automatic VALIDATION
- Powerful Selection & Reporting
- All facilities fully EXTENDABLE to user's own applications
- No programming
- Full DATA DICTIONARY defined as a META4 application
- Automatic TOTALLING of lists
- Automatic COPYING of ANSWERS from one room to another
- Automatic MAINTENANCE of records in other rooms (Secondary Index facility)
- Copying of information to and from other products such as WORDSTAR
- B-Tree ISAM Source Code

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ASI604	— Aquarius PC — 16 Bit Personal Computer 256K. IBM Compatible 327K. Drive and 10 Mbyte. Hard Disk	$3950.00	$4740.00
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DCB541	— Disk Drive Controller Board	$ 135.00	$ 155.00
HSA712	— 10 Megabyte Winchester Hard Disk, Slimline	$1450.00	$1725.00
HDA001	— Hard Disk Adaptor, Connects Winchester Drive and CPU, controls maximum two 5.25" hard disks	$ 600.00	$ 720.00
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Kaga Denshi RGB Monitor Type 3	$ 750.00	$ 875.00	Kaga Denshi RGB Interface	$ 30.00	$ 35.00

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P88/2-FT5002	— 80 Column Printer 100cps N.L.Q., Proportional Friction/Tractor/Graphics	$ 399.00	$ 460.00
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P.S. If you have written any Programs and you think they might be useful to others. Please send them to us so we all can share them.

USER GROUPS INDEX

3rd Thursday each month at the OSNZ Hall, 107 Hillsborough Road, Mt Roskill.

NZ COMMODORE Users Group (AK): John Walker. Telephone 8339 589, P.O. Box 5223, Auckland. Meetings: 3rd Wednesday each month at the Remuera Primary School Hall, Dromorne Road, Remuera.

NZ Microcomputer Club Inc: Selwyn Arrow (Chairman). Telephone: 491 012, P.O. Box 6210, Auckland, (See above for full details).

NZ OSBORNE Users Group (MZOG): Brian Jones. Telephone: 659 738 (H). Meetings: 1st Thursday each month at 20 Kingsley Street, Grey Lynn.

POCKET COMPUTER Users Group: Peter Taylor, 14 Gollan Road, Mt Wellington, Auckland 6. Telephone: 576 618 (H).

SINCLAIR Users Group: Doug Farmer. Telephone 567 589 (H). Meetings: 4th Wednesday at the VHF Clubrooms, Hazel Avenue, Mt Roskill.

SORCERER Users Group (NZ): Selwyn Arrow. Telephone: 491 012 (H). Meets 1 pm at Saturday Micro Workshop (see above).

SORD Users Group (NZ): Graeme Hall, 5 Brouder Place, Manurewa. Telephone: 266 8133 (H).

TI 99/4A Users Group: Ray Tucker. Telephone: 568 155 (H).

ToMorrow Users Group: Chris Cotton. Telephone: 789 153. Meetings: 3rd Thursday, 20 Kingsley Street, Grey Lynn. BYO floppy disk.

WIZZARD Users Group: Richard McFadgen, 11 Hilling Street, Titirangi. Telephone: 8178 219 (H).

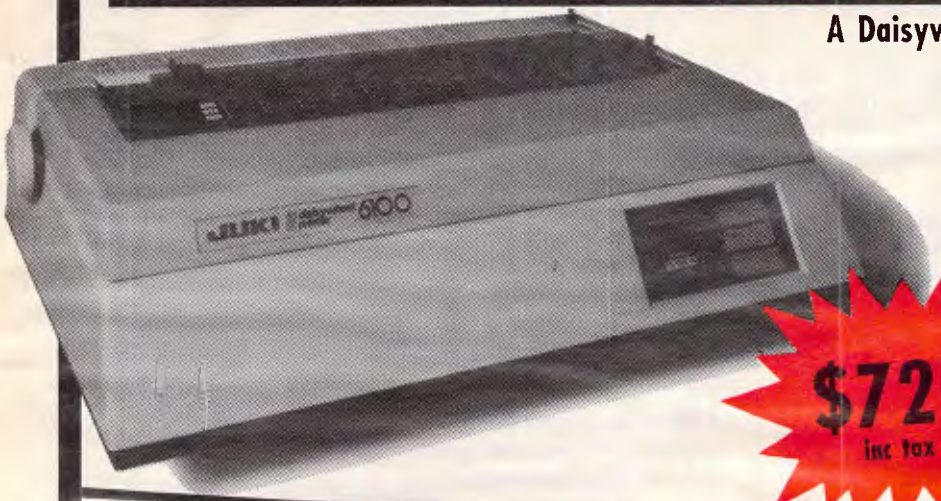
1802 Users Group: Brian Conquer. Telephone: 695 669 (H).

2650 Users Group: Trevor Sheffield. Telephone: 676 591 (H).

68xx(x) Users Group: John Kucernak. Telephone: 606 935 (H).

All the above use the Micro Club's postal address.

MAKE AN IMPRESSION THIS XMAS



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MEET IT OR BEAT IT.

BENCHMARKS

A list of Benchmarks used when evaluating micros is given below.
An explanation can be found in the February '84 issue.

```
100 REM Benchmark 1
110 PRINT "S"
120 FOR K=1 TO 1000
130 NEXT K
140 PRINT "E"
150 END
```

```
100 REM Benchmark 2
110 PRINT "S"
120 K=0
130 K=K+1
140 IF K<1000 THEN 130
150 PRINT "E"
160 END
```

```
100 REM Benchmark 3
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/K*K+K-K
150 IF K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 4
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 5
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 GOSUB 190
160 IF K<1000 THEN 130
170 PRINT "E"
180 END
190 RETURN
```

```
100 REM Benchmark 6
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB220
170 FORL=1 TO 5
180 NEXTL
190 IF K<1000 THEN 140
200 PRINT "E"
210 END
220 RETURN
```

```
100 REM Benchmark 7
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 230
170 FOR L=1 TO 5
180 M(L)=A
190 NEXTL
200 If K<1000 THEN 140
210 PRINT "E"
220 END
230 RETURN
```

```
100 REM Benchmark 8
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K^2
150 B=LOG(K)
160 C=SIN(K)
170 IF K<1000 THEN 130
180 PRINT "E"
190 END
```

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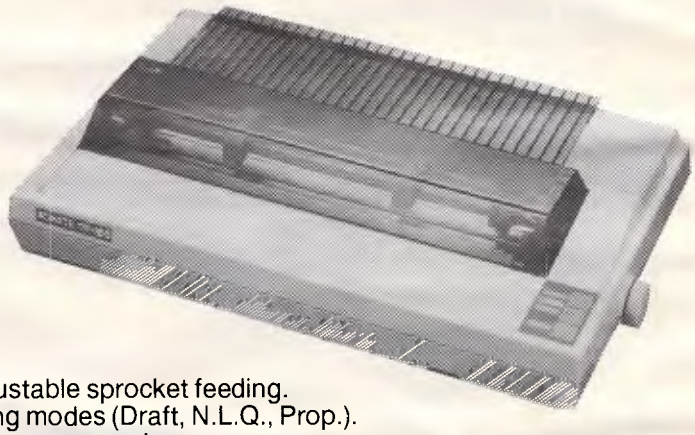
SPECIFICATIONS

PRINTING MECHANISM
Print Method: Impact Dot Matrix
Print Rate: 160 characters per second
Print Direction: Bidirectional in text mode
Unidirectional in bit graphics
Number of Pins in Head: 9
Line Spacing: 1/6", 1/8", n/72", n/216"
Programmable

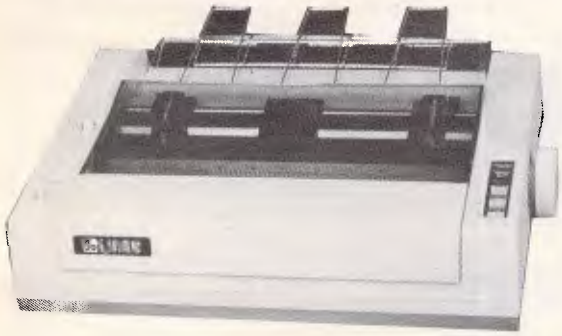
PRINTING CHARACTERISTICS
Character Set: 96 ASCII Characters. with descenders, plus 9 International Character Sets and 96 Italic Characters 128 Downloadable Characters
Printing Modes: 9 x 9 matrix standard
(10 CPI) 11 x 18 double strike (advance paper 1.216" and repeat line)
18 x 9 emphasized (shift right dots)
18 x 18 double strike emphasized

INTERFACE
Standard: Centronics-style 8 bit parallel
Multi-Font Interface
Word Processing Card
Optional: RS-232C Intelligent Serial w/2K Buffer or 32K Buffer and XON/XOFF protocol
Centronics Parallel w/2K Buffer or 32K Buffer
Inteligent IEEE-488 Interface
Simple IEEE-488 Interface

PERSONAL AND YET PROFESSIONAL



PX120 NEAR LETTER QUALITY PRINTER



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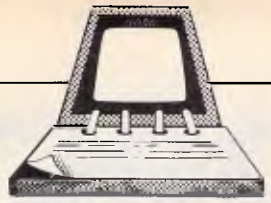

DIARY DATA

Readers are strongly advised to check details with exhibition organisers before making travel arrangements to avoid wasted journeys due to cancellations, printer's errors, etc.

Singapore	Instrumentasia '85 Contact: Singapore Exhibition Services Pty Ltd, 11 Dhoby Ghat 15-09, Cathay Building, Singapore 0922 Tel: 338 474	Jan30–Feb2,1985
Sydney	4th *Australian Personal Computer* Show Contact: Australian Exhibition Services Pty Ltd, Suite 3.2 Illoura Plaza, 424 St Kilda Road, Melbourne 3004. (03) 267 4500	March 13–16, 1985
Perth	Computers '85 Computer Exhibitions International, 190 Hay Street, East Perth 6000	May 1–4, 1985
Sydney	Data '85 Contact: Graphic Directions, 28 Foveaux Street, Surry Hills, 2010. (02) 212 4199	May 22–25, 1985
Melbourne	5th *Australian Personal Computer* Show Contact: Australian Exhibition Services Pty Ltd, Suite 3.2 Illoura Plaza, 424 St Kilda Road, Melbourne 3004. (03) 267 4500	July 17–20, 1985

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First, there was the world-beating Sinclair ZX80. The first personal computer for under $249.

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Now there's the Sinclair ZX Spectrum! With up to 48K of RAM. A full size moving-key keyboard. Vivid colour and sound. High-resolution graphics. And a low price that's unrivalled.

Professional power — personal computer price!

The Sinclair ZX Spectrum incorporates all the proven features of the ZX81. But its new 16K BASIC ROM dramatically increases your computing power.

You have access to a range of eight colours for foreground, background and border, together with a sound generator and high-resolution graphics.

You have the facility to support separate data files.

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Yet the price of the Sinclair ZX Spectrum 16K is an amazing $249! Even the popular 48K version costs only $359!

Ready to use today, easy to expand tomorrow

Your Sinclair ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the Sinclair ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of Sinclair ZX Spectrum professional-level computing.

There's no need to stop there. The ZX Printer — available now — is fully compatible with the Sinclair ZX Spectrum. And later there will be Microdrives for massive amounts of on-line storage, plus an RS232/network interface board.

Key features of the Sinclair ZX Spectrum

- Full colour – 8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
- Sound – Beep command with variable pitch and duration.
- Massive RAM – 16K or 48K.
- 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.

Sinclair ZX Spectrum Software on cassette — available now

The Sinclair software library is growing every day, and they all make use of the Sinclair ZX Spectrum's colour, sound and graphics. Choose from: Space Raider, Planetoids, Embassy Assault, Raiders, Backgammon – **each $19.50**; Planet of Death, Inca Curse, Ship of Doom, Espionage Island, Club Record Controller, Collectors Pack, Biorhythms – **each $22.50**; Chess, Flight Simulation, Vu-Calc Spreadsheet, Vu-3D Graphics, Reversi – **each $25.00**; View File Data Base, Cyrus-is-Chess – **each $27.70**; Scrabble, ZX Forth – **each $44.00**. ORDER NOW WITH YOUR SINCLAIR ZX SPECTRUM.

ZX Interface 1 $149

This interface incorporates the three functions of Microdrive controller, local area network, and RS232 interface. Connect it to your Sinclair ZX Spectrum and you can control up to eight Microdrives, communicate with other computers, and drive a wide range of printers.

The potential is enormous, as it adds to the versatility of your Sinclair.

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.

The ZX Microdrive available now $149

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.

Each Microdrive can hold up to 100 Kbytes using a single interchangeable storage medium.

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	Sinclair ZX Printer	169.00	
	Sinclair ZX Micro Drive	149.00	
	Sinclair ZX Interface 1	149.00	
	Postage and packing: orders under $350	5.00	
	orders over $350	10.00	

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1407/

LAZING AROUND

by J J Clessa

Quickie

Here is a remark attributed to that famous geometrician, Pl Thagorus: 'Now I have a rough predictor of circle areas and volume.'

Prize Puzzle

And now one for the micros.

In the annual festival games held at the town of Little Dingbat, the main event is the marathon.

This year, all the entrants were numbered sequentially (1, 2, 3 . . .)

By coincidence, all those who completed the race carried numbers which were either exact primes or exact powers of other numbers. Furthermore, the total of the race numbers of the finishers was exactly equal to the total of the race numbers of those who dropped out.

How many entrants were in the race?

Answers, on postcards only or backs of envelopes, to *APC* Prize Puzzle, December 1984, 77 Glenhuntly Road, Elwood, Victoria 3184, to arrive not later than 28 December 1984.

August Prize Puzzle

The problem was quite easily cracked by micro and several people sent in their programs and printouts.

The winning entry came from Peter Sutton of St Lucia. Congratulations Peter, your prize is on its way.

The solution to the problem was that the Dawsons and Firths were the RC families — the children of these families were given $31.25 each.

Keep puzzling.

Once upon a time, Tony Heatherington was an ordinary home computing editor.
Now he's The Incredible Hulk, Hercules, and a fighter on a war-torn beach.
All because of this month's great selection of games for the Commodore 64 and Spectrum.

Guaranteed to leave your brain unhinged

TITLE: Psytron
COMPUTER: Spectrum
SUPPLIER: International Software Distributors
PRICE: $19.95

Psytron is another step in an encouraging trend away from pure arcade games towards a new breed of arcade strategy games. You'll need arcade skills, but these will be utilised as a means to a more tactical end. In other words, the days of mindlessly zapping aliens are thankfully numbered.

Here, you are the Psytron — a half-human, half-computer being whose mission is to defend the massive Beta-5 installation from attacking aliens.

You must continually scan the base's 10 sectors and destroy any attacking spacecraft. However, some of these attacking craft will drop saboteurs, so you must be ready to switch to droid mode to chase and destroy them before they do any damage. You must monitor damage reports, allocate repair crews, and order supplies from the orbiting supply ship.

The advertising blurb claims that this is enough to leave a human brain unhinged, and I agree. Luckily, there is a series of training levels that you must complete successfully before progressing to the next level.

To complete a level, you must attain a pass mark in your last five attempts. This means that there are six different games, as each level is sufficiently challenging to stand on its own.

Level six is called the Final Conflict, and is the accumulation of all the game's aspects that were introduced gradually in previous levels — it's time to unhinge your brain and hang on for as long as possible. The object of the Final Conflict is to survive as long as possible, an hour being the ultimate goal.

The graphics are efficient and smooth, the action frantic as you attempt to monitor ten screens simultaneously.

A point to remember is that you are judged on your ability to restrict damage to the base, not on the number of aliens destroyed. It's pointless zapping aliens over the power plant while they're taking apart the pleasure dome.

Oh no, it's Jade Jaw

TITLE: The Incredible Hulk
COMPUTER: Commodore 64
SUPPLIER: Ozi Soft
PRICE: $29.95

The Hulk is the first in the Questprobe adventure series, based on and starring the superhero characters from the Marvel comics.

You are the thin, bespectacled nuclear physicist Bruce Banner who, if provoked, turns into the green superhero the Hulk. You possess immense strength and muscular power, and can leap tall buildings, stop charging rhinos and tear a copy of *APC* in half.

It's a typical Scott Adams adventure which features excellent graphics, but the text is written in comic book style which may deter some potential Hulks.

It's supplied with an instruction book which contains descriptions of the game's major characters, including a friendly Ant man called Hank and Ultron, a super-robot that improved its own design and has an obsessive hatred of mankind.

The game falls squarely into the problem solving group of adventures, so perhaps it's just as well that Adventure International will sell you a hint book if you're really in trouble.

I used these hints but still got stuck — this made me so angry that I . . . aagh! . . . No! . . . Not again . . .

'We'll fight them on the beaches ...'

TITLE: Beach-head
COMPUTER: Commodore 64
SUPPLIER: International Software Distributors
PRICE: $29.95

Beach-head is a multi-level arcade war game which will stretch your abilities to the limit. To succeed in your mission to destroy the fortress of Kuhn Lin, you must survive four levels and retain sufficient forces to proceed to the next stage.

The first stage is optional but recommended as it cuts down the number of aircraft that attack you in the second stage. All you have to do is steer your fleet of nine ships through a cavern littered with mines and torpedoes. The surviving ships are then attacked by aircraft which you must shoot down before they inflict too much damage. The enemy ships then open fire and you're thrown into a duel where the survivor is the one to fire first at the correct elevation. The elevation is controlled with the joystick and a message reporting the result of the shot appears at the bottom of the screen.

The favoured few ships that survive this onslaught will land two tanks on the beach. They must advance one by one up to the fortress negotiating enemy tanks and gun positions *en route*. To win the game you must destroy 12 targets on the fortress but you'll do well to take out three targets with one tank. Subsequent tanks have a harder journey up the beach, so the game should keep its appeal for some time.

The screen shots illustrate the game's graphics but you'll have to play it to sample the superb sound effects.

Diamonds are a meanie's best friend

TITLE: Boulder Dash
COMPUTER: Commodore 64
SUPPLIER: International Software Distributors
PRICE: $24.95

Boulder Dash is a multi-scrolling screen game in which you must dig your way through rock in an attempt to find diamonds. Once you have collected enough diamonds, a doorway appears and you can progress through to the next screen.

However, also in this rock are a number of boulders which will fall on your head if you dig under them, but if you're quick enough you can get out of the way.

This is more than a little reminiscent of an arcade game called *The Pit*, but *Boulder Dash* takes that simple idea to its limits. For example, the boulders don't just plummet straight down: they collide and bounce off each other. Knocking one boulder can start an avalanche. Every screen is different and therefore each requires a new set of tactics.

Some screens have diamonds guarded by meanies in enclosed areas, others have free-roaming meanies, and one doesn't appear to have any diamonds. All you can see is a huge green amoeba that's getting bigger by the second, and lower down the screen a trapped group of meanies.

It's up to you what you try, but I'm sure whatever you pick you'll enjoy the challenge.

Labour of love

TITLE: Hercules
COMPUTER: Commodore 64
SUPPLIER: Mailsoft
PRICE: $24.95

Hercules is a platform game in the now familiar *Manic Miner* style but taken to its limits.

To complete the 12 labours of *Hercules* you must solve 50 screens. These screens are allocated to each of the labours and success in one screen leads to the next. Completion of every screen in the first 11 labours is the only route to the twelfth and final labour.

To complete a screen successfully you must get *Hercules* from the start position to the doorway of the next screen.

Unfortunately it's not that simple, as you have to cope with disappearing platforms, breaking ropes and critters out to get you. You don't have much time to plan your moves as it's quite likely that the platform you are standing on will burst into flames losing you one of your three lives.

Trial and error is the name of the game until you've been through many levels (and lives), at which time you may begin to anticipate what will happen. A suicidal urge may also be of assistance, as on several levels the only course of action open to you is to leap into oblivion in the hope that a platform will appear to break your fall.

One interesting feature of the game is that you tackle the labours in a random order so that you don't get stuck in one place — you get stuck in several places instead.

Upgrade to suit

Are you thinking of upgrading your VIC 20 to a Commodore 64 but afraid of losing your existing programs? Andrew Bennett suggests a quick and painless method of converting your old VIC programs.

If you've upgraded from a VIC 20 to a Commodore 64, or intend to, you may have wondered if you'll lose the use of your existing programs. This article will help you to convert your programs for the '64, which in turn will give you a better understanding of both machines.

Programs usually consist of one, or a mixture, of the following five parts:

1 The usual Basic keywords (PRINT, for example).
2 POKEs and PEEKs into areas of memory.
3 User-defined character sets and high resolution graphics.
4 Sound effects and music.
5 Machine code, either as full length programs or as subroutines for Basic.

If you use a disk drive with your VIC you'll have no problems loading your programs into the '64, but if you use a cassette, life is a little more complicated. Although the VIC and the '64 use very similar cassette systems, VIC programs will not load off tape into the '64. The only solution is to get a friend (or a friendly dealer) with a disk drive to transfer your programs to disk and then into the '64, where you can save them to tape ready to convert at home.

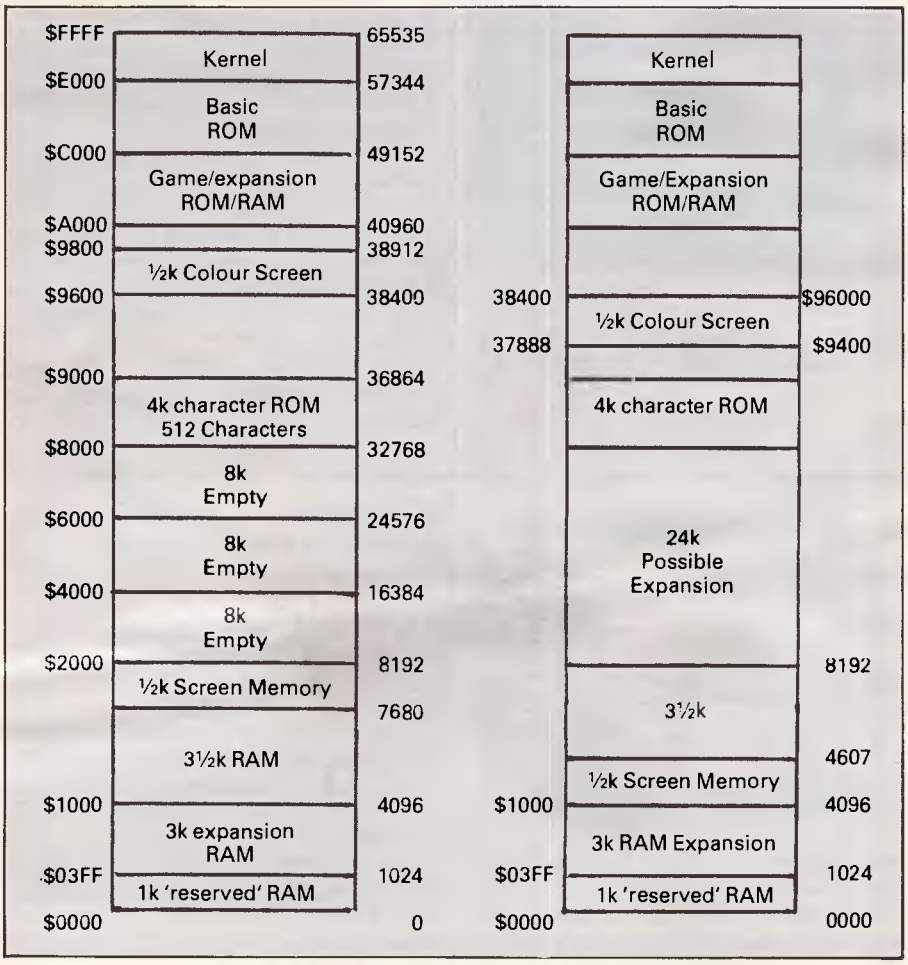

Fig 1 VIC 20 memory maps

Basic keywords

The '64 and the VIC use the same Basic as Commodore's first computer, the PET. Each machine has the same Basic keywords which perform in exactly the same way.

On the VIC, you can type program lines up to 88 characters long, but on the '64 you're restricted to 80 (the '64 will run lines over 80 characters but they then become difficult to edit).

The command most affected by the change of machines (excluding the above) is the PRINT statement. The '64 has a 40-column by 25-line screen compared with the VIC's miserly 22 columns by 23 lines. This means that your neatly formatted VIC screens will now fill only the left half of the '64's screen. It's a straightforward if time-consuming job to move the text around within your program's PRINT statements to achieve a good layout, changing TABs and SPCs to take into account the bigger screen size.

While doing this you might be able to use the '64's eight extra colours; these are accessed using the Commodore key and the number keys. (It's best to leave re-doing the screen formatting parts of your VIC programs until last as it's a purely cosmetic operation.)

POKEs and PEEKs into areas of memory

The memory maps in Figs 1 and 2 show how different the memory maps of the two machines are. Fig 3 shows the differences in greater detail.

The screen and colour memories of the two computers work in the same way: you have to set the colour on the colour screen before a character will show up on the normal screen. On the VIC, the contents of location 36879 dictate the border and screen colours,

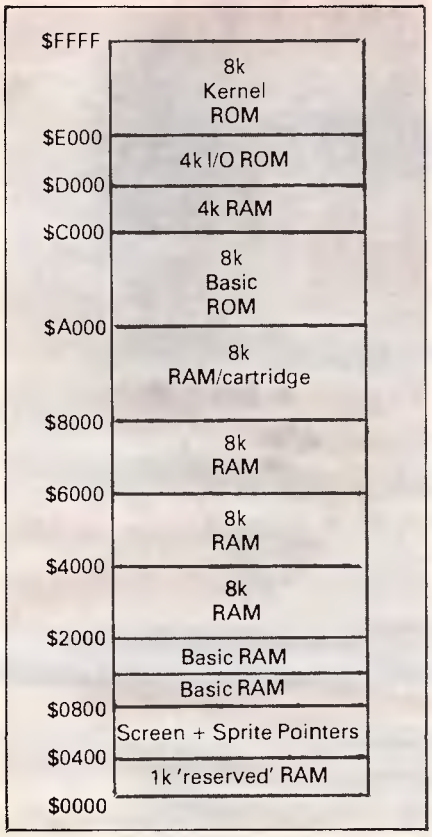

Fig 2 Commodore 64 memory map

while on the '64 they are handled separately by location 53280 for the border colour and location 53281 for the screen colour. These take a value between 0 which is black and 15 which is grey 3. Any program that POKEs and PEEKs to and from the screen (a game, for example) will have to be considerably rewritten to take into account the '64's bigger screen. On the '64, any moving character which wrapped round onto the next line on the VIC will continue moving on the same line for some 18 characters.

Further problems stem from the fact that the VIC's memory map changes depending on the amount of expansion that has been added. A program for a VIC with 3k expansion will have to be converted slightly differently from one for an 8k expanded VIC (Fig 1 should be of assistance here).

User-defined character sets are handled in much the same way by both computers. On the '64, however, the ROM which holds the '64's normal character set co-habits with the '64s I/O ROM at 53248 ($D000). If your program has its own characters stored as data statements at the end of the program, you'll simply have to convert the part of the program that reads in the data. Even if your program accesses the VIC's character machines for the VIC's character set, very few changes will have to be made. The '64's character ROM starts at location 53248 ($D000) but before it can be accessed your program must 'turn off' the I/O ROM. This is done with two simple POKEs:

POKE 56334, PEEK(56334) AND 254
POKE 1, PEEK(1) AND 251

The '64's character set can now be extracted from the ROM. As on the VIC, the letters are first with @ at the beginning (at 53248 on the '64). After the required number of characters have been read in, two more POKEs put the I/O ROM back in place in the '64's memory map:

POKE 1, PEEK(1) OR 4
POKE 56334, PEEK(56334) OR 1

New character sets can be placed in any one of seven places on the '64 but when used with Basic location 14336 is the best place for them. To switch from a character set in ROM to one at 14336, simply POKE location 53272 with 30. To protect your character set at 14336 from being overrun by your Basic programs, the top of Basic must be set to 14080. This is done by POKEing locations 52 and 56 with 55, which leaves about 12k of memory available for your Basic program.

On the VIC, high resolution graphics

Computer	Extent of Basic memory	Position of Screen	Position of Colour Screen
Unexpanded VIC	4069–7679 ($1000–$1DFF)	7680–8191 ($1E00–$1FFF)	38400–38911 ($9600–$97FF)
VIC + 3k	1024–7679 ($0400–$1DFF)	7680–8191 ($1E00–$1FFF)	38400–38911 ($9600–$97FF)
VIC + 8k (or more)	4608–???? ($1200–$????)	4096–4607 ($1000–$11FF)	37888–38399 ($9400–$95FF)
Commodore 64	2048–40959 ($0800–$9FFF)	1024–2023 ($0400–$07E7)	55296–56319 ($D800–$DBFF)

(???? — upper limits depend on amount of expansion)

Fig 3 Breakdown of differences between VIC and Commodore memory

Bit Pattern	VIC	Commodore 64 Hi-Res	Commodore 64 Characters
00	Screen Colour	Screen Colour	Screen Colour
01	Character Colour	Upper 4 Bits of Screen Memory	Background Colour #1 (53282)
10	Border Colour	Lower 4 Bits of Screen Memory	Background Colour #2 (53283)
11	Auxiliary Colour (36878)	Colour Memory	Colour Memory

Fig 4 Multi-colour mode bit patterns

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are achieved by filling half the screen with a blank user-defined character set and then doubling the character size so that 256 characters fill the entire screen. On the '64, things are slightly easier in that you put aside 8k of memory for the 320 × 200 high resolution screen. High resolution mode is entered with the following:

POKE 53265, PEEK(53265) OR 32
POKE 53272, PEEK(53272) OR 8

The last of these POKEs tells the '64 where to find the hi-res screen, in this case 8192 ($2000). On the '64, the colours for this mode are given by the contents of the screen matrix (1024-2023), whereas on the VIC the colours for points which are plotted come from the colour screen. Like the VIC, the '64's high resolution screen is laid out as rows of characters. To plot a point (X,Y) on the '64 the following should be used:

BYTE = 8192 + 320*INT(Y/8) + 8*INT(X/8) + (Y AND 7)
POKE BYTE, PEEK (BYTE)
OR 2 ↑ (7–(X AND 7))

This is similar to the method used on the VIC.

Another mode that both computers have in common is multi-colour mode, which allows up to four colours to be shown in each character square. On the VIC, this is enabled by placing a colour code greater than seven in the colour square corresponding to the required character. The same method is used on the '64 but the mode must first be 'turned on' with the following:

POKE 53270, PEEK(53270) OR 16

After the above the mode is almost the same as both computers. On both, the resolution of the screen is halved so that bit pairs represent the four colours; the main difference being the location from where the computers access the colours. Fig 4 shows the differences.

Sound effects and music

One of the main advantages the '64 has over the VIC is sound. The VIC has three tone and one white noise channel, giving a range of five octaves. The '64 has three channels offering nine octaves. Each of the '64's channels can take a different waveform from a selection of triangle, sawtooth, pulse and white noise. The '64's SID (Sound Interface Device) chip also offers enveloping (where the note's shape is changed by setting Attack, Decay, Sustain and Release) and various filters. Of course, when you are converting from the VIC you'll want your program to sound the same as it did on the VIC. You'll be able to enhance your VIC sounds later by using more of the SID's facilities.

A	10	K	37	U	30	/	55	6	19	*	49
B	28	L	42	V	31	£	48	7	24	@	46
C	20	M	36	W	94	+	40	8	27	↑	54
D	18	N	39	X	23	–	43	9	32	←	57
E	14	O	38	Y	25	0	35	=	53	SP	60
F	21	P	41	Z	12	1	56	f1	04		
G	26	Q	62	,	47	2	59	f3	05		
H	29	R	17	.	44	3	84	f5	06		
I	33	S	13	;	50	4	11	f7	03		
J	34	T	22	:	45	5	16	RET	01		

Fig 5 Machine code value locations

Volume control

Both computers handle the volume control of their sound in the same way. This is done by POKEing a certain memory location with a value between 0 and 15 (15 being the loudest). On the VIC, this location is 36878 and on the '64 it's 54296.

Each of the VIC's three channels or voices is pre-set to give notes in a certain range depending on the voice. On the '64, any note in a nine octave range can be played through any of the three channels. Playing a note on the VIC is simply a matter of setting the volume and then POKEing a number between 128 and 255 into one of the three channels.

This process is slightly more complicated on the '64 in that the SID chip has to know which waveform is to be used and the shape of the note to be played before any sound can be heard. To enable the '64 to have a larger range than the VIC, two locations must be set for the pitch of each note. I suggest that you first set the Attack/Decay register of the voice you are using to 136, for example, and the Sustain/Release register to zero. You should also set the waveform of the voice to either triangle or sawtooth. These values will give a note that sounds almost like that of the VIC. If your VIC program uses white noise (location 36877) then set the waveform to noise.

Machine code

Converting machine code from the VIC to the '64 is not as hard as it might at first appear if you have a working knowledge of machine code; both computers use one of the 65XX family of CPUs. Like the Basics of the two machines the machine codes are exactly the same, and if you've learnt 6502 on the VIC you'll find 6510 familiar.

You'll find that illegal calls to the VIC's ROM will not work on the '64 but legal ones will, since Commodore has left the Kernel jump table alone. The first 1k of memory is exactly the same on both machines except for locations 0, 1, 2, 784, 785, 786, 197 and 203 decimal.

On the VIC, locations 1 and 2 hold the start address for programs called by the USR command in the conventional lo-hi 65XX fashion.

On the '64, the two lowest locations are used by the 6510 in the memory paging system. USR calls on the '64's user locations 784-786 so when you're converting programs with USR in them, remember to POKE the address of the machine code subroutine into locations 785 and 786 on the '64.

Any VIC programs that use locations 784 — 787 for storage will have to use alternatives. If your programs use location 197 or 203 to find which key is being pressed, you should note that the '64 reads the keyboard in a different way to the VIC. These locations now have the values shown in Fig 5.

Remember that on the '64 you have 4k of memory (at $C000 or 49152 decimal) set aside for your machine code programs or data. If you have a simple monitor/assembler you should find that this will work on your new '64 but the X command (exit to Basic) will cause the '64 to crash.

Conclusion

With the information and tables in this article you should be able to convert most machine code utilities to the '64, but games and most full-length programs will be beyond all but the most determined 'assemblerites'.

As the '64 is a much 'bigger' machine than the VIC in more aspects than memory, you should try to keep in mind when converting your programs that you now have available a much larger screen resolution, sprites and the advanced SID chip.

You'll find that converting your old programs will help you adapt quickly to your new machine.

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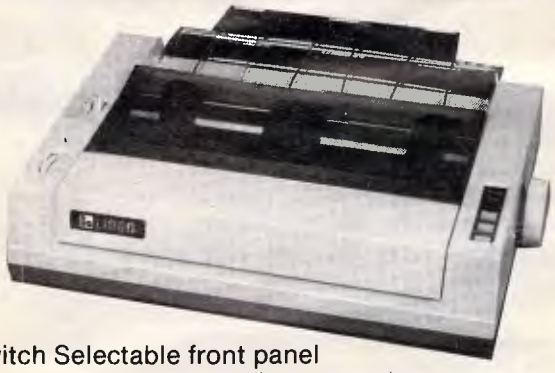

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CHIP CHAT

Most people think Futuretronics went into receivership because it ran out of money. Mr Alpar, a director of Futuretronics states, in a report on the front page of the Financial Review on November 22, that the National Bank had no reason to appoint receivers. To quote the Fin Review: 'According to Mr Alpar . . . no circumstances have arisen which would entitle the bank to appoint receiver managers to run the affairs of Futuretronics . . .

' "We're saying that the appointment (of receiver managers) is null, ineffective, and void," he *(Mr Alpar)* said last night.'

Clearly Mr Alpar is not impressed. He is reported in the paper to have also said: "It was like a military takeover. You would have loved it."

So, general opinion is that Futuretronics ran out of money and Mr Alpar reckons the National Bank shouldn't have moved in.

Chip Chat isn't going to offer an opinion (preferring to sit safely on the fence and avoid any possibility of falling foul of either party in this matter). But Chip Chat has used all this by way of introduction to its suggestion that Futuretronics may have been heading for hot water anyhow with its teany, weany bit naughty advertisements. Now it's time to direct your attention to the picture of 'Mr T' elsewhere on this page. Remember seeing him on your TV screen? Remember Mr T telling you about those other turkeys and how absolutely terrific Atari graphics are (were?)? Futuretronics kindly provided us with a purported demo on disk to plug into our Atari. And to no-one's great surprise, Mr T appeared to have lost his sparkle. In fact, he even lost his ability to move. The demo, Chip Chat assumes, was the best that could be achieved on the Atari. It bore, however, virtually no resemblance (in terms of animation) to what was being shown on TV ostensibly from the Atari micro also shown on TV. The advertisement was not aimed at computer literates who might know to question the ability of an Atari to produce the animation shown on TV (and it was implied to be directly out of the Atari shown in front of the monitor on the commercial, wasn't it?) It was aimed at novices, who might bolt down to the local Atari outlet and purchase a machine with the express purpose of creating something akin to the Mr T animation and who would likely be bitterly disappointed/annoyed to find it can't.

Guess who?: Here's a Chip Chat quiz courtesy of our American correspondent David Ahl. There are no prizes, so, on with the questions.

(1) Who used to be in charge of the largest microcomputer manufacturer (some years ago), and is now farming and taking courses in medicine?

(2) Which Hollywood film editor wrote a word processing package with customisation for 72 different hardware configurations?

(3) Which expert blackjack player is now making a living writing computer books?

(4) Who held key positions at Commodore, Apple, and Victor, and is now with NNA?

(5) Who founded or financed Chuck E. Cheese Pizza Time Theater, Sente Software Distribution, Androbot, and one other company?

And now the answers:

(1) Ed Roberts — founder and chief executive officer of MITS, maker of the

ROYAL EASTER SHOW 1985

THE ROYAL AGRICULTURAL SOCIETY OF N.S.W. SYDNEY

Computer Software Competition

The Royal Agricultural Society of N.S.W. with the support of a number of major suppliers in the data processing field, is introducing a computer software competition in conjunction with the 1985 Show.

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The competition will be conducted in two Sections:

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Further information may be obtained by writing to

The Director
RAS of N.S.W.
Computer Software Competition
G.P.O. Box 4317
Sydney N.S.W. 2001
or by telephoning
Miss Carol Rowan on (02) 331 9122

CHIP CHAT

Altair 8800, the first mass-produced microcomputer (1975).

(2) Michael Shrayer — the Electric Pencil package had to be customised for different processors, video boards, and memory sizes.

(3) Ken Uston — he is banned at most casinos throughout the world and turned to computers two years ago.

(4) Chuck Peddle — his brief stint at Apple in 1980 didn't work out; now he has founded NNA (No Name Available, so called because every name he tried to get was already registered).

(5) Nolan Bushnell — after founding Atari and selling out to Warner in 1980, his later ventures haven't fared so well.

The November 'Prize Crossword' winner is T Robinson and the solutions are:

ACROSS
3 Negation 6 Firmware 7 Stores 8 Set 9 Blow 10 Director 12 Parity 13 Program 15 Failure 17 Wafers 18 Magnetic 22 Read 23 End 24 Divide 25 Computer 26 Generate

DOWN
1 Writer 2 Tablet 3 Network 4 Automation 5 Operator 6 Fused 11 Card reader 14 Real time 16 Embrace 19 Grammy 20 Twenty 21 Coder

BLUDNERS

For those of you trying to run Connect-Four for the Commodore 64, you might find this subroutine useful which was omitted from the August issue of *APC*.

```
1749  :
1750  REM: EVALUATE X,Y
1760  E=EC (X)
1770  FOR D=0 TO 3:Q=X (D) :R=Y
      (D)
1780  FOR C1=1 TO 2:N=0:
      I=X+Q: J=Y+R
1790  IF B(I,J) <>C1 THEN 1820
```

And from Chris Stamboulidis who submitted the program 'Mini Calc' published in the October issue of *APC*: "There was one point which I omitted to mention in the documentation.

When writing numerical constants during the entry of functions, ensure that they are enclosed by '<' and '>'.

For example, to multiply the contents of cell 2,4 by 0.3, you would write:

"[2,47]*<.37>"

Also, the SAVE routine should be modified to prevent possible problems with 'INPUT#'ing strings with commas inside them. The following lines should now read:

```
970 INPUT "HIT <RETURN> TO SAVE"; NA$:FOR T % = 1 TO 9: FOR Y%=
    1 TO 43
980 PRINT#"MIN",CHR$(34)L$(T%, Y%),CHR$(34)I$(T%,Y%): NEXT:NEXT
990 GOTO 170
```

Electric Desk™

An integrated multi-tasking productivity program that combines four business functions: word processing, database management, spreadsheet analysis, and communications. Electric Desk features a window function, a macroprogramming language, and context-sensitive help screens.

Database

- Instantaneous access to any record by index value
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- Automatically dials phone numbers with a single key stroke
- Maximum of 50 fields per record
- Maximum of 1000 characters per record and 1000 characters per field
- Maximum of 65,000 records per database
- Maximum of 5 index fields per database
- Record layout can be "painted" on the screen
- Data and field names can be displayed in normal, bold, underline, or reverse video
- Edit criteria can be defined to minimize entry errors
- Full screen editor to enter and change data
- Screen can be divided into windows
- Work on up to nine different databases simultaneously (system memory permitting)

Communications

- Log on two different information services or host computers simultaneously
- Divide the screen into windows
- Define keyboard macros to execute several commands with one key stroke
- User definable baud rate, parity, stop bit, and word length
- Log in scripts for automatically dialing host computers and information services and entering password information
- Send and receive ASCII files
- Edit files that have been received using the word processor

Word Processor

- Automatic line wrap
- Continuous reform of text as new text is inserted
- Paragraph indentation
- Search and replace
- Delete block of text
- Insert block of text
- Cut and paste
- Automatic chapter, table and page numbering
- Right justify text
- On-screen ruler, with user selected left, right, top and bottom margins, and tab stops
- Normal, bold, italics, bold italics and two user definable type styles
- Superscript and subscript
- Single line, double line, or triple line spacing
- User selected headers, footers and page numbering style
- Information from the spreadsheet and database can be merged into a document prepared using the word processor
- Keyboard macros can be defined to automatically type common phrases or execute several commands with one key
- Screen can be divided into windows
- Work on up to nine different documents simultaneously (system memory permitting)
- Move text from one document to another or from one window to another
- Move text from document to the spreadsheet
- Any ASCII file can be edited using the word processor

Spreadsheet

- 255 rows by 255 columns
- Variable column widths
- Edit, copy, delete, and move a cell or range of cells
- Insert or delete rows and columns
- Import ASCII files into the spreadsheet
- Overlay one spreadsheet on top of another spreadsheet
- Number formats: 0 to 6 decimal places, exponential and percent
- Label formats: Right, Left, and Center justification
- Cells can be protected to prevent accidental editing
- Spreadsheet titles can be locked so that they do not disappear from view when the spreadsheet is scrolled
- Vertical and horizontal windows (viewports) can be defined to view different portions of the same spreadsheet simultaneously
- Screen can be divided into windows
- Work on up to nine different spreadsheets simultaneously (system memory permitting)
- Embedded printing commands can be used to print out portions of the spreadsheet using different type styles
- Spreadsheet functions:

Mathematical Functions

ABS (x)	Absolute Value
EXP (x)	Exponential
INT (x)	Integer Part
LN (x)	Log base e
ROUND (x,n)	Round a number to n digits
SQRT	Square Root

Logical Functions

IF (condition, true value, false value)

Special Functions

CHOOSE (x, v0, v1,....vn)	Select argument value
HLOOKUP (x, range, row#)	Horizontal table lookup
VLOOKUP (x, range, col#)	Vertical table lookup

Financial Functions

IRR	Internal Rate of Return
NPV	Net Present Value
FV	Future Value
PV	Present Value
PMT	Mortgage Payment

Statistical Functions

COUNT	Number of items in a list
SUM	Sum of all items in a list
AVG	Average of all items in a list
MIN	Minimum of all items in a list
MAX	Maximum of all items in a list

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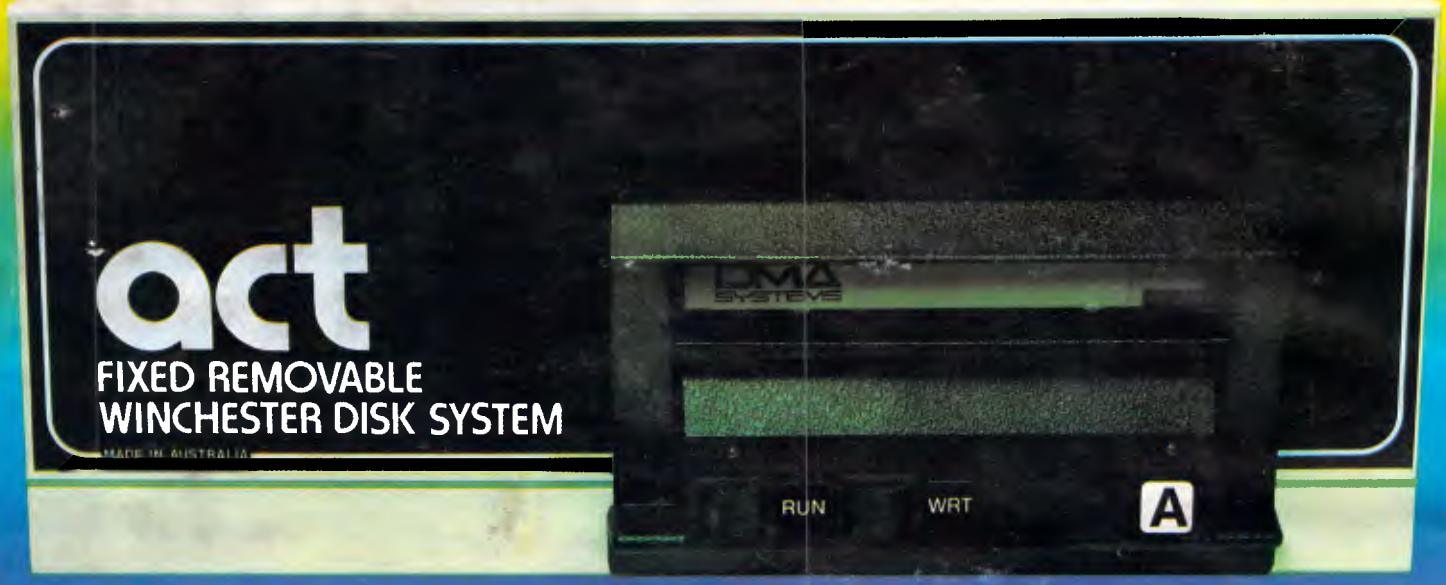

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