Australian Personal Computer

SECOND HAND COMPUTERS — windfall or pitfall?

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Universe

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Software compatibility, and

Forget conventional networking. Universe provides superior speed and security necessary in multiuser applications. Running the widest range of 8 and 16 bit software, it has the ability to network IBM PCs and workalikes in the fastest multiuser/ networking microcomputer system in the world.

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IBM PCs and workalikes can run applications written for Concurrent PC DOS, CP/M-86 and PC-DOS, while having access to all the benefits of the network. PC users share files, records, printers and other network resources.

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DMA hard discs and the new high-speed 80286/Z80H dual processor CPU furnish performance necessary to handle multiple 8 and 16 bit programs.

Tough
The Universe is built on a strong square tube frame.

Stays Cool
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Flexible
Universe accepts an extensive range of terminals, printers, modems, even electronic telex.

Expandable
20 slot shielded S100 buss. Obsolescence proof using IEEE 696 S100 cards.

Speed and Security – essential to your business

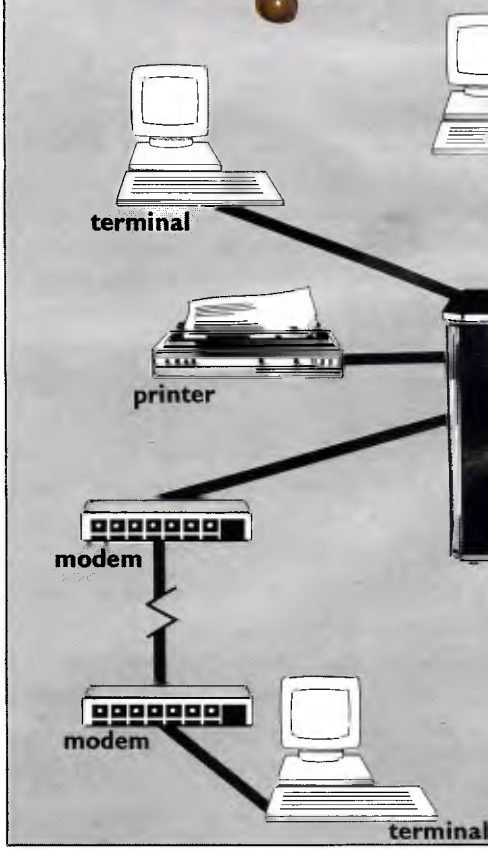
Most networks are slow and insecure. Universe shines here, with full multilevel security enhancements normally found on well engineered minicomputers. Universe is engineered from the ground up to provide facilities essential for the smooth running of a large multiuser system.

Important Security features

Encrypted login passwords. Users are restricted to specific terminals, directory areas, programs and nodes on the network.

File passwords. File and record lockout and a full password hierarchy. Your System Manager can quickly and easily configure the system so that each terminal only has access to those facilities and data its operator needs. For example:

- ☐ Option to restrict any account to specific programs or workstations



Multiuser

of a minicomputer.
reliability of a supermicro.

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Fast
High speed (8MHz) dual processor design (80286 plus Z80H) with options for 68000, 16032 etc.

Durable
Ebony glass top and acrylic epoxy finish

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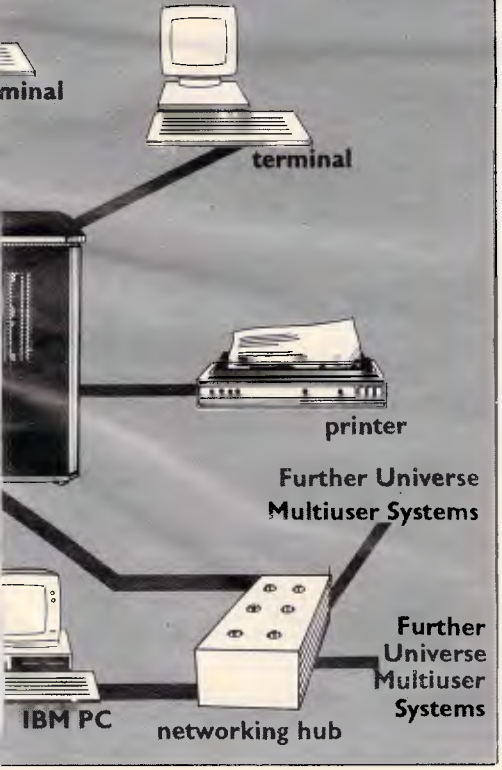
3 Winchesters plus removeable cartridge totalling up to 300 Megabytes total storage.



- ☐ Files may be automatically dated for future reference. Optional timestamping shows both creation and last access.
- ☐ Optional passwords on computers within a local area network.

Operating features

- ☐ Low cost serial terminals support both 16 bit (CP/M, Concurrent DOS, MP/M-86) and 8-bit (CP/M, MP/M II) software
- ☐ 200 character type-ahead buffer per terminal
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- ☐ A secure electronic mail facility. Optional electronic Telex.
- ☐ A multiuser appointment calendar
- ☐ Optional 8087 maths coprocessor
- ☐ Inter-terminal communication. Electronic mail is here!
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Our very first system buyer is still a valued customer. We take special pride in supporting every existing customer and in providing the highest standard of service at every stage. As part of this support, the Universe is continually being refined in reponse to the needs of existing customers and Australian business.

AED

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FEATURES

BENCHTESTS & REVIEWS

See things more clearly with Roland monitors

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The CD 240 is a 12" super high resolution RGB monitor, specifically designed for the most demanding Computer Aided Design and business applications. Incorporating the latest technology, it allows extremely intricate screen images to be precisely displayed. With a 720 dot x 400 line pixel resolution, a .31 dot pitch and 25KHz scan rate, the CD 240 produces a brilliantly sharp image. Utilising the STB Super Res. 400 board, this monitor is totally compatible with all IBM Personal Computers and provides the additional benefits of a non-glare display. The dark glass, black matrix screen, ensures exceptional contrast and precise delineation of characters.

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Roland DG

All the news that's fit to print from APC's world-wide network of reporters.

The Japanese and lasers in print

You may have to wait a few months but it's coming — a $400 printer which will genuinely do better printing than a daisywheel, and will also do graphics, and print at 200 characters per second, is already on Epson's catalogue for 1986.

Some people are having a lot of trouble believing this news, as they apparently can't see why Epson would want to make such a complex piece of technology for such a low price. 'It will ruin their existing market,' explain these sceptics.

There are two answers to this. The first is the warning that yes, it will ruin Epson's existing market, and it will also ruin everyone else's. There is bound to be a price war on existing printers, and worse, Japanese printer makers are now expected to dump their old stuff at fire-sale prices.

But the second part of the answer is that, really, Epson has no choice, and neither do the other major matrix printer people. As for the daisywheel people, their knell is now being rung.

In the States, the trend is obvious. In Australia, it's virtually invisible: a trend which shows low-cost laser printers taking over more and more of the top-quality print market for personal computers.

You may doubt that machines such as Hewlett-Packard's Laserjet and Apple's LaserWriter are selling well but in the States, something like 8000 HP Laserjets are sold each month, and almost 3500 Apple LaserWriters (costing nearly twice as much, at $US7000) per month, too.

No daisywheel printer can compete with laser printer quality — just the print, never mind the graphics, or the speed, or the silence.

However, the Japanese have always been ahead of the world on matrix printers. The reason is simple enough: the Kanji (Chinese characters) which are used in Japanese writing.

To do neat Kanji you can't manage with around nine needles on a matrix print head, and today's Japanese near-letter quality (NLQ) printers have 24 needles. As there are so many needles, they have to be very low-power or the head would burn the paper.

Citizen, a large supplier of matrix printers, is now believed to have dropped out of the Japanese matrix printer market — this belief is attributed to the company, Star, which makes them for Citizen.

Tandy has heard on the grapevine that its long-time Australian rival, Dick Smith Electronics, is about to release an ultra cheap IBM PC compatible. Nothing else, we suggest, could have prompted such a drastic reduction in the price of its Model 1000.

For $1,799 you can now walk out of a Tandy Electronics' store with a PC-compatible equipped with one floppy disk drive, 128k of RAM and six-pack integrated package and a monochrome monitor. Get it while it lasts.

The reason is simply and baldly stated: there are too many old matrix printers in stock. The printer makers over-estimated demand for ordinary machines, but haven't adjusted production to match the reality.

Today, Epson sells a printer called the LQ1500. It's quiet, fast, and very good at printing. It costs over $2,000.

That same quality of printer, using new technology and without a few bells and whistles, is what Epson has lined up for mid-1986, and it will be sold direct to computer makers such as Commodore for $120. That means that it will be in the shops for $400 or less.

A bitter blow

In the States, they are already getting Commodore Amiga models. The expected cries of delight are softer than I would have hoped.

Problems with the system software were to be expected, and Commodore did expect them, hence the decision to supply it all on disk rather than in ROM. But after all the excitement of the specifications, the reality has been a bitter blow to many users.

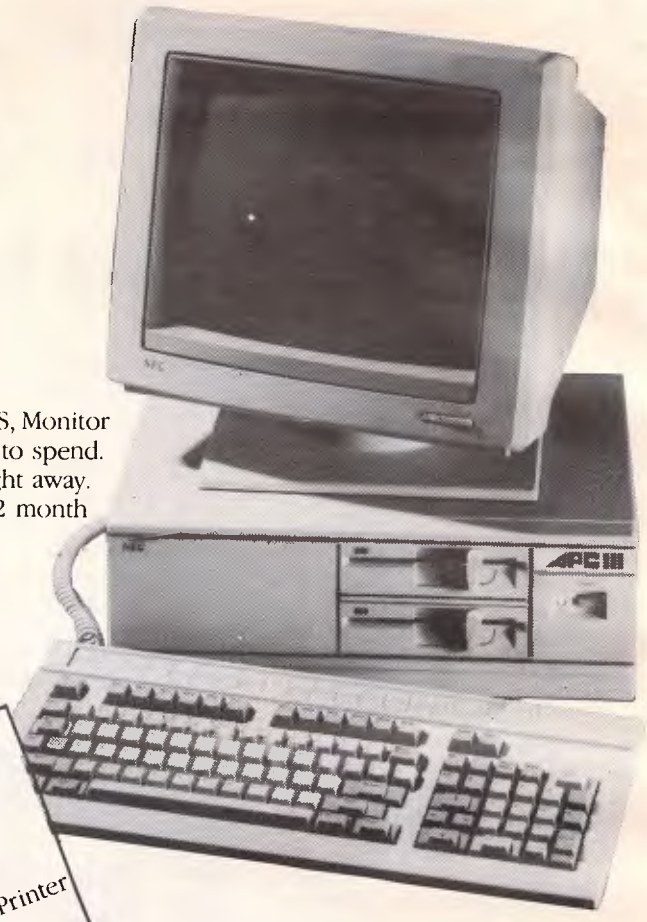
What worries me, however, is that Amiga is failing to make an impression on software houses.

One California author, Dave Winer of Living Videotext, complained sadly that his attempts to put ThinkTank onto the Amiga had not been crowned with instant success.

'They've given us a development machine which doesn't work,' he said, 'and left us. When Apple first gave us a Macintosh, that didn't work either, but they also gave us five engineers. We're not getting that help with Amiga problems.'

Apple's decision to cut

Complete bargain systems from NEC. No hidden extras here!!



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SOFTWARE
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prices on the Macintosh, nicely timed, means that software houses which were thinking of giving the Amiga bandwagon a push will now think twice.

It becomes important, say software people, for Amiga to be at least as keen as Apple, and probably more so.

Further reports will reach you as I receive them.
Guy Kewney

If you want to get ahead, get a blitter

The chip which does a lot to make the Commodore Amiga special is the blitter, and a similar chip is on the way for the Atari 520ST.

So, at least, goes the gossip among several software houses.

A blitter is an invention of the Palo Alto Research Centre run by Xerox in Stanford. It has a simple function: it moves the contents of memory somewhere else.

The Amiga's blitter (or 'bimer' — bit image manipulator) works in parallel with the Motorola 68000 chip. I don't know what Atari's plan is in detail, but the rumour is specific: it refers to the Mind Set computer.

The Mind Set was a cult machine, without a big company to push it, and without the resources to go for price, and it failed, largely, to win buyers. But it had a blitter, and that chip, say my sources, is going to be in the big Atari.

I think it needs it, at Atari.

At a meeting of software writers before a recent Atari presentation, Jack Tramiel's son Len was approached by a group of programmers who expressed a lack of enthusiasm for the machine's disk.

'It's very slow,' they told him. 'It's a quarter of the speed of the Macintosh disk.'

He told them what they could do if they didn't like it. I believe they are considering that option — unless, of course, he offers them a new model after Christmas, with a blitter.
Guy Kewney

dBase-alike

'Compatibility' is now spreading to the software market: Foxbase a 'dBase II compatible' is now available in Australia from Cerebral Solutions.

Advantages of Foxbase over dBase II are claimed to be increased speed (between four and 40 times faster), the absence of bugs, a maximum of 48 fields per record (versus 32 in dBase) and twice as many memory variables as dBase.

Because Foxbase uses existing dBase data and command files, converting dBase II applications shouldn't be too difficult. Call (02) 923 2288 for more details.

MacNews

From Microsoft there's a new version of Basic, Version 2.1. Users who purchased the previous Basic after October 1 are eligible for a free upgrade; other purchasers can upgrade for $25 . . . Also from Microsoft is a Fortran compiler which works on either the 128k or 512k Macintosh. Microsoft states that its Fortran is a full implementation of the ANSI Fortran 77 standard and not a subset; it retails for $495 . . .

Imagineering plans to release an internal 'clip-on' board which will boost the 512k Macintosh to 2Mb all of which, according to the suppliers, can be used by memory-based programs such as Jazz. The board is expected to retail for $1,800.

Sperry is yet another contender in the PC/AT compatible stakes. Its recently announced PC/IT is based on the 80286 processor (the same used on IBM's PC/AT) and comes with half a megabyte of RAM, eight expansion slots and two serial and one parallel port. Up to eight terminals can be attached to the IT.

Sperry's angle in this crowded market (every clone manufacturer needs one) is the IT's ability to run Sperry's well-known Mapper fourth generation language and be able to connect to Sperry's Usernet LAN.

Wirth's latest

The Australian distributors of Turbo Pascal, Software City, would appear to have done an about face in offering a $30 trade-in on Turbo Pascal for purchasers of a Modula-2 language from Interface Technologies.

Both Pascal and Modula-2 were developed by Niklaus Wirth; Modula-2 being seen as superior to Pascal, by Niklaus Wirth anyhow. So if you'd like to help Software City upset Borland, the author of Turbo Pascal, purchase Modula-2 for $30 off the standard retail price and sacrifice your copy of Turbo Pascal. Alternatively wait six months and purchase Borland's implementation of Modula-2, which is apparently well under way.

Software City is on (02) 621 4242.

Compaq sets up shop

The importance of dealers in the prospects of business computers' sales was brought home by the appointment of Ian Penman as head of Compaq's Australian subsidiary.

He was previously dealer manager for personal computers at IBM Australia; the shrewd executives of Compaq in the US (it is one of the very few companies to be going against the tide of decreased profits last year) appreciate the importance of quickly developing a strong

dealer base in Australia and who better to do it than the ex-dealer manager for PCs at IBM.

"We're not going to have 200 dealers, but a smaller number of high quality dealers," said Penman; again this reflects US philosophy. Asked whether IBM was putting pressure on its dealers to refuse Compaq's product, Penman admitted he believed so, but that "it is all a storm in a teacup" and he expected IBM and Compaq PCs to sit alongside each other in many stores.

Compaq has now released pricing details of its IBM PC/AT compatible range: the base model with 256k of RAM and a single floppy will retail for $8,495 (as compared to IBM's $8,470 for an equivalent machine); and the top of the range with 640k of RAM, 30Mb hard disk, and floppy disk tape back-up will retail for $13,345.

Franchise competition

ComputerLand is about to find itself with some stiff competition in the form of Entre.

Applications from potential franchisees have been invited for an initial 24 'Business Centres', and according to Jim Gallagher of Entre there has been a large amount of interest shown by a wide variety of curious parties including, interestingly, some ComputerLand franchisees. Looks like it's going to be a buyers' market in the computer retail chain market.

Here comes another one

Amstrad continues to produce new models at a prolific rate. Annoyed 664 purchasers, who are just beginning to swallow the pill of AWA releasing the 6128 onto the market at the same price as the 664 (but with far better value for money — see September's test) now have to contend with another Amstrad offering. Dubbed the PCW8256 to thoroughly confuse everybody with numbers, it will be launched this month (November) only four months after the 664 became availale in the shops.

Included in the price are a single disk drive, 256k of RAM, monochrome monitor, Basic, Logo, word processor, and — wait for it — a dot matrix printer.

Watch for a full Benchtest next issue.

PC telex link

Instead of purchasing a traditional telex machine from Telecom, owners of a wide variety of PCs can use a product called TelexLink from System Solutions to access the world-wide telex network.

The unit can be connected to a number of microcomputers, not necessarily all the same brand, via a serial port through a port contention unit or through the serial port of a local area network. Telex messages can be prepared 'offline' on virtually any standard word processor and sent for transmission to the TelexLink unit. Messages can be sent to one or multiple destinations without operator intervention.

Call (008) 22 1786 (toll free) for more information. TelexLink sells for $5,336.

With the Anti-Software Piracy Association poised to launch its second major raid against Hong Kong software pirates in as many months, ASPA believes the time is ripe to present a more public face.

ASPA officials based in Hong Kong have devised this logo, which the association hopes will continue instilling fear in pirates still operating in 'the Colony'.

The association, which originally consisted of Imagineering, Lotus Development Corp and Ashton-Tate, now has MicroPro and the home market software house Broderbund as members. Imagineering's managing director, Jodee Rich, says MicroPro and Broderbund have contributed "substantial" sums of money to ASPA's fighting fund, which originally totalled $US100,000.

While the association intends to concentrate its activities in Hong Kong it might also be seeing some action in Australia as a result of the recent work of some Sixty Minutes' style journalism in 'Computing Australia', a new trade newspaper: a reporter allegedly purchased for $150 from Greg Hudson of Down Under Software copied disks of Lotus 1-2-3 and WordStar plus accompanying photocopied manuals. Imagineering, Australian distributor of these products, is pursuing the matter.

Big Blue's latest LAN

When IBM enters a new market, rivals usually tremble. But on October 15, when IBM announced its own local area network (LAN) industry reaction was practically euphoric. For years, makers of network equipment had lived under a cloud: Customers wanted to link their computers but were reluctant to risk the investment until the world's biggest computer maker had unveiled its system. Now that it has, the market for LANs is likely to blossom. "This is the most significant announcement since the IBM Personal Computer," says L. William Krause, president of 3COM Corp., a maker of LAN equipment.

IBM's long-overdue system is a so-called open network: Its specifications are public, and anyone who wants to can produce the combination of circuit boards, wiring, and software that makes up the LAN. So on the same day as IBM's announcement, six makers of LAN hardware said they would build links to the IBM system. And Texas Instruments Inc. unveiled a set of chips that will make it easier for these companies to copy the IBM design.

SInce the early 1980s, computer designers and manufacturers have been promoting the local area network as the best way to link office personal computers, terminals, and printers. Without a network, workers using personal computers can't easily trade information electronically. With one, they can use the same data simultaneously and exchange messages — thus boosting productivity.

Answers to the thirteen most asked questions about Sony's new Model 10.

- ☑ It has full communication capability.
- ☑ It connects to a mainframe (via RS-232-C).
- ☑ It has multi-terminal emulation capability.
- ☑ It stores the downloaded information on its inbuilt 3½" micro floppydisk drives.
- ☑ It has the right ergonomic qualities and features.
- ☑ It performs full-powered word-processing.
- ☑ It has powerful on-screen maths ability.
- ☑ It does records processing, automatic letter processing, and forms fill-in.
- ☑ It checks your spelling.
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Also, computers linked by a network can share expensive devices such as laser printers and large disk-storage files.

By this year, the advantages of LANs had already created a bustling market. The No. 1 LAN is Ethernet, developed by Xerox Corp. in the late 1970s and marketed by Digital Equipment Corp., among others. But the large companies that use IBM mainframes have remained wary. Some wanted IBM equipment only. Others needed to see IBM's entry to be convinced that local area networks were more than an experiment. One such company, Metropolitan Life Insurance Co., could use 50 to 75 networks to link clusters of its 2,000 personal computers but has been waiting to see IBM's system, says Daniel J. Cavanagh, senior vice-president.

"Now, they'll go out and buy networks — and they won't all buy IBM," says Eric H. Killorin, publisher of *PC Netline*, an industry newsletter. Adds Howard C. Salwen, president of network equipment supplier Protcon Inc.: "It doesn't matter if the product is good, bad, or indifferent. The point is, it's here."

IBM's network carries few surprises. Called the "token ring," it runs off a $US695 circuit board that can be added to any IBM-compatible personal computer. The board prepares data for transmission and sends it by cable to the other computers on the net. The system is named for an electronic "token" that guides each message to the proper destination. IBM claims that its system is more reliable than Ethernet, because it can quickly locate the trouble spot whenever communications are interrupted.

IBM will deliver its initial version — for personal computers only — by early next year. The components for a system of eight personal computers will run $US828 per machine. That's competitive with existing personal computer networks.

One "pleasant surprise" is that the network can run on ordinary telephone wiring, says Louise Herndon Wells, an industry analyst with market researcher Dataquest Inc. Eighteen months ago, to prepare major customers for the system, IBM began selling special cabling that has been criticized as expensive, inflexible, and especially difficult to use in older buildings. "I wouldn't have advised large customers to run the IBM wiring system," says Wells. "But I think customers will really like this." And by using existing telephone wires, IBM challenges American Telephone & Telegraph Co., which has stressed the cost savings of phone wiring with its networks.

The IBM PC/AT has a hard disk, which you can't see inside. This picture shows the inside, which can only be opened up in a room with air so clean that even a smoke particle would feel conspicuous.

The newsworthy part of the picture is the fact that this clean room is in Havant, Hants, where IBM now makes its AT disks. Until this plant started to make them, IBM had to rely on sub-contractors, and problems with these suppliers have been the stuff of legend, even in the short life of the AT:

The hope is that, now, supplies of the AT will suddenly become easy.

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The boost IBM gives to local area networks is expected to show up soon. Dataquest says the market for LAN cables and connections hit $US489 million in 1984. It figures that LAN sales in 1986 will hit $US1.4 billion, as big customers who are likely to buy the IBM system start building larger networks. Until now, network sales have been generated by customers hooking approximately 800,000 personal computers into clusters of 8 or 10 machines. But each IBM network can handle up to 260 personal computers. And IBM's "open system" approach is expected to speed the system's acceptance, just as it did for the PC.

The Silicon Valley startups that make their living off network products are ready to participate in this strategy. 3COM, which has built a large business on Ethernet products, was one of a half-dozen companies that climbed aboard the IBM bandwagon on October 15. Ungermann-Bass Inc., another major manufacturer of Ethernet equipment, also announced token ring hardware for the IBM PC. Nestar Systems, Bridge Communications, and Proteon said that they would make their LANs compatible with IBM's. "If they have a half a brain, the Ethernet vendors will have token ring compatible products," says Killorin.

Even Sytek Inc., the one obvious victim of IBM's entry, is planning a link to the token ring. Because of delays in token ring development, last year IBM's Entry Systems Div. started selling a Sytek LAN as the IBM PC Network. Now, with both networks priced about the same, industry watchers say that customers will choose the IBM-built setup. Kenneth J. Biba, Sytek senior vice-president for marketing and planning, says IBM will continue to promote his company's product as "the way to sell small networks." The token ring, he adds, will be aimed at large networks. But others doubt that this will protect Sytek. "This leaves the PC Network an organizational orphan," says David L. Terrie, an independent computer consultant.

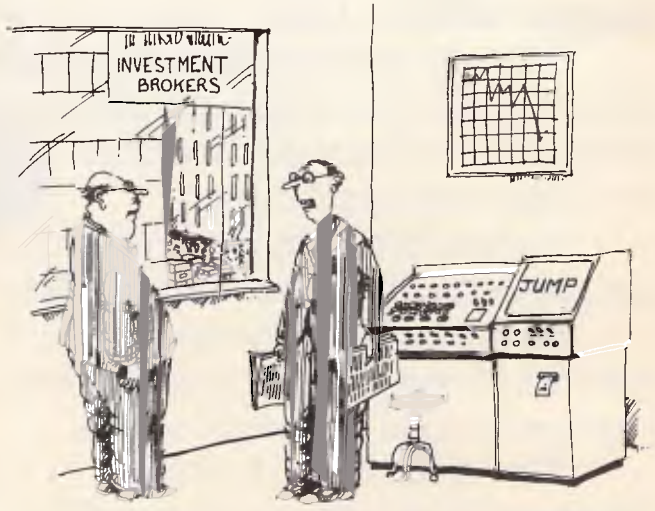
In its initial form, the IBM token ring has one big drawback: Nothing bigger than a personal computer can attach to it. And it won't realize its full market potential until it can accommodate larger computers. "It's a known requirement," says Richard H. Goldberg, group director of marketing for IBM's Telecommunications Products Organization. "We know we have holes." But TI says it already has several potential chip customers who plan to build adaptors to tie IBM's large systems to the token ring network. And IBM's own connections could start appearing within six months. Once they do, industry watchers predict, the IBM system will become the dominant network.

But it won't happen overnight. Ethernet has gained critical mass recently as customers began using hardware from 3COM, Ungermann-Bass, and others to create PC clusters. A $300 million-a-year business has grown up around Ethernet. And it is firmly entrenched where IBM is weakest: technical and scientific computers and work stations. Maureen A. Lawrence, Digital's manager of networks and communications marketing, claims that IBM's network will have "no impact" on DEC's Ethernet program. DEC has sold 35,000 Ethernet connections since 1983, and Lawrence says sales rose 450% in the fiscal year ended June 84 "IBM has waited too long," adds Dataquest's Wells. "Ethernet is going to be the very strong alternative."

But IBM's late start may not make much difference in the long run. The token ring establishes the local area network as a legitimate technology. And eventually, when reliable networks are in place to extend the capabilities of individual computers, industry analysts foresee a resurgence in computer sales that will benefit the entire industry.

By Geoff Lewis and Marilyn A Harris in New York and Richard Brandt in San Francisco.

Australian modem manufacturer, Sendata, has produced an 'all-in-one' unit. It's capable of 1200/1200, 300/300 and 1200/75 baud and has auto answer and disconnect facility; but all this doesn't come particularly cheap at $1,300.



'We've fed all the permutations into the computer and it comes up with the same answer each time.'

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One day, your students are going to want to use computers in the real world.

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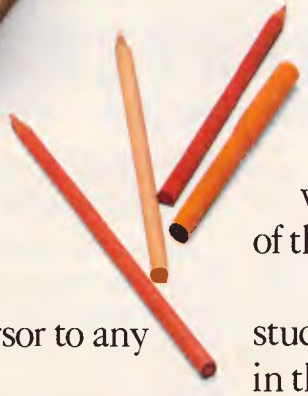
However, most educational computers pale by comparison with the power and sophistication of Apricot.

Most can only deliver a puny 64k of memory capacity compared with the F1e's 256k. And Apricot's power base can be further enhanced to a massive 768k.

The Apricot F1e has a full 92 keys on the board which includes a numeric keypad. (Some educational computers try to get by with just 60 keys.) And as you can see, the keyboard is cordless.

ents the power the real world.

As is the optional mouse, operating the monitor by infra-red remote control. Your students simply point the mouse to move the cursor to any part of the screen.



Which brings us to the quality of the crisp, high resolution colour image, which at 640 x 256 dots is in a class of its own. (Colour is standard, not as some of our competitors have it, an extra.)

What's more, Apricot is not a childish cassette-based system, but a built-in 315k, 3.5" disk drive of professional business standards.

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Or innovative new software packages such as the icon-based GEM programme.

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Apricot Edusystems.

Dow McIntosh Kelly BAR 090

Briefs

Dangerous statement of the month goes to Daryl Mahon of Canon Australia: "If you can't sell [IBM PC] compatibility in Australia at present you shouldn't be in the business of selling computers" — would NEC or Apple like to comment? ... VisiCorp, the author of VisiCalc, is hoping a new spreadsheet for the Macintosh will pull it out of the wars. 'Crunch' was actually developed by Paladin Software but this company merged with VisiCorp earlier this year. SCA on (03) 699 7255 can be called for more information... Parity's cash problems continue with the withdrawal of Andas's offer of merger and financial support (following its own loss of $3.8 million for the last financial year)... IBM is rumoured to have ceased production of its standard PC and intends to make the XT its basic model, that is of course except for the JX. No announcement is expected to this effect regarding the standard PC until next year — IBM doesn't want another inventory problem like it has with the PCjr which is being drastically discounted this Christmas to clear stocks... Don't be surprised to see a 720k disk capacity IBM PC JX in Australia for the *APC* Show next March in Sydney. The 360k model currently on sale would appear to be a means for IBM to rid itself of these low capacity drives, as 720k machines are already available in Japan. IBM's stated reason for supplying 360k models in Australia — to maintain capacity compatibility with the standard PC — is clearly ridiculous as the JX's drives are 3½ inch as opposed to the PC's 5¼ inch units...

Purchasers and prospective purchasers of Sycero, an applications program generator (reviewed in *APC*, September) can get details of dealer and corporate seminars by Markus Bolton, MD of System C Ltd the company which designed Sycero, by calling (02) 43 1316... A new company with high hopes is not unusual, but Advance Peripherals is one with a solid looking base. Directors/owners include a part owner of Computer Supplies which was recently sold to Verbatim Australia.

Distributors with a product to push might give Advance Periphals a call on (03) 329 2384.

Telecom's 'free enterprise exercise' with its Computer-Phone appears to be failing with only 300 machines being sold since its launch in January. Still, when you're making so much money from a (monopolistic) telephone service, why not blow a bit in an open market — and ruin other manufacturers chances of making an honest dollar. Stick to telephones, Telecom.

END

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YANKEE DOODLES

Microsoft and IBM have signed a pact for the joint development of operating systems, and Commodore officials have been touting for dealers. Our US correspondent reports.

A job well done

Microsoft and IBM have signed a long-term agreement for joint development of operating systems and other software. William Gates, chairman of Microsoft, said the companies planned to pursue software projects in networking, communications and a user interface, as well as continuing development of PC-DOS (MS-DOS). All products developed under the agreement would be licensed to both IBM and Microsoft. Microsoft would be free to remarket and license the products to its other customers.

The agreement is 'longterm' without a specific ending date. No payments were made to Microsoft; rather, payment for each project will be negotiated separately. Under the agreement, long-term plans can be discussed more openly which should prevent the development of similar but incompatible products such as IBM's TopView and Microsoft's Windows.

Third-party software publishers and makers of IBM-compatible computers were pleased with the agreement as it appears to commit IBM to the 'open architecture' concept. Clone makers had been fearful that IBM would market a new, proprietary operating system that would cut them out of a lucrative market.

Financially, the agreement is a welcome one to Microsoft, which now gets about 10 per cent of its annual $140 million in revenue from IBM. Slightly less than half of the firm's revenue comes from the sale of system software and the balance from applications software. Microsoft had expected considerably more pay-off from its commitment to the Apple Macintosh. Bill Gates said: 'We once thought Macintosh would account for half of our retail application software sales, but that was based on the assumption that (Apple) would do a good job.'

Amiga defence

Reeling from tumbling sales and a $50 million inventory write-down, top officials from Commodore hit the road in August to drum up support for the Amiga.

Currently being delivered is the C128, replacement for the best-selling Commodore 64, but it isn't likely to match the latter's huge success. The 128 will be sold in approximately 10,000 mass merchandise stores in the US, one-third less than the 15,000 stores that handled the Commodore 64 at its peak.

Commodore officials are visiting 40 cities in an attempt to attract dealers for the Amiga; as of late August, only 260 dealers had signed. No deals have been reached with any major retail chains, although the Computer Factory, a 20-store New York based chain, has signed up. A Commodore spokesman said that deals with several major chains are 'imminent'.

Despite rave reviews in several magazines, Commodore already seems to be on the defensive about the technically dazzling Amiga. Commodore spokesman Joe Thorsen cites its ability to run IBM PC programs with the addition of a $100 conversion program, but apologises that it will run 'a bit slowly'. He fails to mention that it also requires an external 5¼in disk drive. Why the emphasis on IBM PC software so soon? The Amiga is hardly a PC clone, and I can't imagine that PC compatibility should be a prime selling point.

Will the Amiga save Commodore? Not with marketing like this.

Too fast to work

Ultra-fast transistors being developed at Cornell University may lead to fundamental revisions in computer architecture and integrated circuit design — and greatly expand communications capabilities.

Lester Eastman, professor at Cornell's School of Electrical Engineering, said that the switching times of these 'ballistic' transistors will be so fast (1.5 picoseconds) that other computer components will be unable to keep up and will have to be restructured.

Faster switching times are possible in ballistic devices as electrons pass through a very short length of semi-conductor material almost without collision. The electron gains speed as it travels, just as a rock dropped from a bridge increases in velocity. Ballistic transistors can be made even faster by giving the electrons an initial boost —the equivalent of throwing the rock from the bridge — and by applying an electric field to keep the signal hurrying along.

'We have been able to reach speeds up to six times faster than those in conventional silicon structures by using layered hetero-junctions of gallium arsenide and other materials,' Eastman reports. These structures are made using machines capable of depositing materials only a few atomic layers thick.

Until computer circuits can be redesigned to take full advantage of the switching times of the new transistors, the slowest part of the process will be the transit time from one part of a circuit to another. Like racing cars roaring from the starting line into rush-hour traffic, the signals will come faster than the electrodes can move them. Although everyone wants faster computers, ballistic transistors may have to be deliberately slowed down to work.

Random bits

AT&T is eliminating 24,000 jobs from its Information Systems Division, the largest single lay-off in US business history. The firm blamed the lay-offs on the massive overlap in positions as a result of merging AT&T Technologies (formerly Western Electric) with AT&T Information Systems, but outside analysts also point to the weakening of the computer market . . . Commodore International also said it would lay off employees: 700 people are affected, about 15 per cent of its work-force . . . Earnings at DEC fell by 23 per cent on a 12 per cent increase in revenue in the quarter ended 30 June, while rival Data General reported an $8.3 million loss in the quarter . . . Also reporting a loss was the games software house Activision . . . In contrast, Compaq reported a five-fold increase in profits to $5.7 million in the quarter, credited in part to the firm's Deskpro and Portable 286 models introduced in April . . . Ashton-Tate recently acquired Multimate Int'l Corp, maker of a high-selling word processing package, for $19 million. The marriage makes good sense as the new company will have strong products in integrated, database and word processing software. It will also benefit from Multimate's strength in the corporate market, and Ashton-Tate's presence in retail stores . . . The Federal Communications Commission (FCC) staged a summer raid on Seequa Computer Corp, alleging that it was selling computers which violated FCC radio wave emission levels. The FCC referred over 20 criminal charges against Seequa executives to the US Attorney's Office in Baltimore . . . Steve Jobs has sold an 850,000 share of his Apple stock for about $13.8 million. After the sale Jobs is still Apple's largest shareholder with around six million shares, or 9.7 per cent of the company. Jobs has officially resigned as Apple chairman, and is setting up a new company to get into educational computing — where Apple is still the dominant force in the US. There are rumblings of future trouble, too, with the news that he is taking five leading Apple names with him . . . After soaring sales when it was introduced in June, Lotus Jazz (for the Macintosh) has largely fizzled out. Dealers mainly blame its slowness and clumsiness . . . Quote of the month: Philippe Kahn, president of Borland International, on the contrast between his success (based on selling good software cheaply) and the woes of other companies in the software industry: 'My competitors are just too greedy to make any money.'

END

BENCHTEST

Sony SMC-T11

Kester Cranswick gets hold of a hand-built prototype from the consumer electronics giant, Sony. LCD screen, inbuilt printer, modem AND telephone are packed into what Sony reckons is the next generation lapheld micro. It's due to be launched in November at a surprisingly low price, read on . . .

Sony has had some pretty small successes in the past. Its personal cassette player, the Walkman, launched a thousand imitators and a colloquilism. It was the first company to launch a hand holdable television set, the Watchman. It is one of the leaders in the 8mm video cassette field. And, in 1982 it introduced something called the Typecorder.

The Typecorder was a lapheld computer with a word processor, a liquid crystal viewfinder display and a microcassette for data storage. It found much favour with journalists and heralded the era of the lapheld, now dominated by companies such as Data General, Tandy, NEC, Epson and a host of other vendors. Well, Sony didn't get into the lapheld ring to be knocked out at the first bell. The SMC-T11, subject of this Benchtest, is described by Sony as a 'the second generation laptop'. No doubt present laptop makers will follow suit in due course.

Laptops have gone two ways until now. Many manufacturers have followed in the footsteps of Big Blue, with MS-DOS compatible computers boasting 80 column, 25 line screens, built-in disk drives and able to run most PC software. They are priced from $3,000 or so up to much more than the price of a good desktop with hard disk. Designed for the salesman or executive who needs to maintain compatability with office hardware, they are basically deskless PCs. Few will fit in a briefcase.

The other tack is to go for small, simple hardware, often with built-in software. The benefit is a lower price, but a less sophisticated machine. Often purchased in bulk for use in a vertical market these very portable micros have enjoyed remarkable success.

Sony has gone down this second road with the SMC-T11, and left the rivals for dead.

Hardware

Look at the photographs and you'll see one big difference between Sony and the rest — a built-in printer. It is powered by batteries, as is the rest of the device . . . What you can't see is a built-in 300 baud modem and a built-in telephone. Nor can you see the built-in word processor, scheduler, telecommunications and Basic software. All that comes for a price of around $2,000 and you should be able to buy the SMC-T11 sometime in November. Sony told me that it already has some large back orders to meet.

Technically there's nothing particularly special about the new machine. The amazing thing is that everything you need for truly portable computing is packed into one case measuring 295 x 280 x 60mm and weighing 3.6 kilograms.

How much more could be packed into a box this size?

A folding handle emphasises the portability. A detachable cover protects the keyboard and display; inside the cover are sockets to store two spare printer ribbon cassettes and the cover of the handset socket. The printer has two black perspex panels that fold down over it to protect the works. Virtually every place that dirt might get into is protected.

Power comes from four D-sized 1.5V cells. These are easily obtained and fit in a compartment at the back of the computer. Unless you are using the printer heavily, you'll get many hours use per set of batteries. Heavy users can get an optional AC adaptor that plugs in the back. Changing batteries does not lose the contents of the memory.

The main components of the new computer are a Z80A processor with 96k of ROM and 32k of internal RAM. The keyboard is the same as that found on the MSX computers. For display, there is an 80 column, eight line liquid crystal display panel. The printer is an 80 column near letter quality unit printing on normal or thermal paper at the rate of 15 characters per second. The modem is a 300 baud full duplex device.

Running around the exterior of the Sony gives an idea of its potential. Beneath the battery compartment is a lighten/darken knob that affects the printing. A socket of the new miniature Telecom variety is also found on the left hand side. This will take an accessory Sony telephone handset.

The back has a difficult to open, fold down panel covering an array of ports. The six volt AC adaptor socket is easily recognized. Next to that is a tiny switch that clears the memory of all files except the ROM software. This is only to be used in emergencies. You can also turn the memory off if you store the Sony away and want to save power by turning off power to the memory.

Next along are two more Telecom sockets. One is for a plug to connect the computer to a Telecom wall socket, so the inbuilt telephone can communicate with the outside world. The other is for an extension, enabling other telephones or possibly other SMC-T11s to be connected. The protective panel can't be closed with the telephone sockets in use.

Next you'll see two DIN plugs. One is for a cassette player. Programs and data can be transferred to or from this type of external storage device. It is the same interface as found on MSX computers, using 2400 baud frequency shift keying (FSK) data transfer. Almost any home cassette player can be used.

The other socket is for an acoustic coupler, in case the user does not have access to a telephone jack and wants to communicate from, say, a public telephone. This acoustic coupler will presumably have to be a Sony product, using the inbuilt modem hardware.

Next to that is a 25 way D-type RS-232C port. To this can be connected a full blown modem or an Epson-compatible serial printer. No doubt inventive people will devise interfaces for things such as barcode readers in due time.

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- Cash

The last port on the rear is marked ROM pack. Into this, I was told, goes Microsoft Multiplan, supplied with the Sony on a 32k ROM pack. This ROM overlays 32k of internal applications ROM. I was not able to see this ROM pack in action, but the theory is that Sony or third party suppliers will either develop specialised third party applications or transfer existing packages to ROM cartridges, for use with the computer.

Another option is to fit battery powered 32k static RAM cartridges for data storage. This ups total RAM to a respectable 64k; again, vertical markets would find this a welcome option.

Going to the other side of the SMC-T11 you'll see a sprung flap that covers an expansion slot. It is a general purpose port, but one of the first things to be fitted will be MSX-DOS, 13cm disk drives, as used with MSX computers. These hold, unformatted, 500k of data, and data can be interchanged with applications running on MSX micros.

On this side there are also knurled knobs to alter the volume of the inbuilt speaker and to adjust the contrast of the LCD display. A reset button is inset here. This does a soft reset, leaving you with the opening menu.

The only other external features are a speaker grille next to the printer, a microphone next to the carrying handle, a paper release lever and a paper advance wheel.

Six screws and three cables hold the keyboard/screen section on. My sample was a handbuilt prototype, so internally things may change a little in the final production versions. For instance, the four EPROMS will no doubt become ROMs.

Around the printer unit, there are arrays of nylon or plastic gears. Given it is a portable printer, this is excusable, though users should realize that a printer of this type is no match for a stand alone device built to stand years of abuse.

The PCBs are layered and devoted to different functions. One handles the telephone. Another is the modem board. The main processor is old faithful, a Z80A running at 3.58MHz. Sony calls it an MSX engine, as it is the same processor as that in the MSX micros. Things are packed in pretty tightly, with little room for internal expansion.

The keyboard can be standard MSX layout, modified slightly to fit the smaller size of the SMC-T11. There are 47 buff coloured alphanumeric keys and a large space bar for data entry. A key marked NUM transforms part of the keyboard to a numeric keypad.

For editing there are home, delete, insert, tab, backspace and return keys. CAP is the caps lock key. Other control keys are ESC, CTRL, ALT, GRAPH and CODE.

These last two extend the character set to give a very wide range of characters. Besides normal qwerty keys, there are fractions, mathematical and scientific symbols, French, German and Greek characters and an array of block graphics. There are 220 characters in all.

Immediately beneath the screen is a large power switch. There is no auto-off feature, but as this computer is also a working telephone, the designers figured that users operating it on a desk would not appreciate their telephone switching off every few minutes. If the machine is turned off in the middle of an application, it carries on from where it was when turned back on again.

Five function keys, shiftable to give ten functions, are next along. The functions are usually displayed on the eighth line of the screen and vary with the application.

Next to the function keys is a bright red 'break' key. It has the effect of a Control C. Pressing this is the easiest way to get out of a program loop. If that doesn't work, use the on/off switch. If that doesn't work, try the reset button. As a last resort, the memory on/off button will have a drastic effect but will get you back in control.

There is a button marked Prt Sc next to the break button. This gets the printer to print out a snapshot of whatever is on the screen.

Finally there is a cluster of cursor control keys. When pressed in conjunction with the ALT key, cursor up and down keys do reverse or normal linefeed.

The keyboard is good to use. The keys are slightly convex, have a light action and are fine for inputting text or numbers. As laphelds go, it is a good keyboard.

The display, marked to indicate that it is supplied by Citizen, does not earn the same degree of praise. LCD displays have never been a match for the normal cathode ray tube. In daylight, they can have the contrast adjusted to be quite comfortable, but under lamplight or in dim conditions, LCD is difficult to use. Sony is not the first to have had this problem, and it is one of the drawbacks of using a lapheld. However, the Sony's display is recessed quite a bit, and toplighting can cause a shadow to darken the first line of the display. Also the 80 column screen doesn't give the clearest of displays and the cursor is only an underline character, and hard to see at the best of times. It is best to work with lighting coming from over your shoulder.

Look at the photographs and you'll see one big difference between Sony and the rest — a built-in printer.

Software

When first switched on, the menu of applications is shown. The review sample displayed the inbuilt applications of Basic, List, Remote, Schedule, Telecom and Word. In addition the current storage device is indicated, the amount of free memory, the day, date and time, and the function key attributes.

According to the display, there are five storage options. A, B and C are RAM devices: A, the internal RAM; B and C are presumably accessed through the RAM port; D and E options are disk options. This array of drive devices indicates there is more expansion potential to the Sony than the specifications lead you to believe.

25,600 bytes are free with no files in the RAM. For large applications, external storage will be needed, but this is enough for the typical lapheld computer user.

Cursor keys move a file highlighter block through the menu and the name of the currently selected file is displayed above the menu. If it is a non-application file, the date and time the file was last amended are displayed, along with its size. Pressing the return key starts a highlighted application, or, if a user created file is highlighted, both the relevant application and the selected file, are run.

Files can have eight character names

HHX stands for Hand Held Extended, and HHX Basic is written to take account of the fact that the Sony has no VDU display, no joystick ports and so on.

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with three letter extensions. Wildcards are not catered for. The operating system is MSX-DOS which is easy to use but quite unsophisticated. The only functions are to delete, rename or copy the highlighted file. The delete function asks for a confirmation before the deletion takes place. Batch file processing is not catered for.

Two other system commands are possible. Date allows the time and date to be reset, using the cursor control keys. Load searches disks for a named program, and loads it into RAM. So, the Sony has a simple operating system that can be mastered in minutes and provides some useful utilities.

Being a journalist, the first utility I applied myself to was the word processor. I was working without documentation (only a preliminary Basic manual came with the review sample), but was able to figure out how the word processor works.

It is entered by either selecting an existing document, or highlighting the Word application. In the latter case, you are prompted for a file name. The program loads in 'the blink of an eye', displaying seven lines for text, and function key commands.

Text is entered normally, with automatic line feed. Cursor movement is by the cursor control keys. Shift/arrow keys give start or end of document, start of end of current line. There is a find function, with a prompt for the text. The cursor is positioned at the start of the first occurrence of the target text after the current cursor position. Any occurrence, whether a whole or part of a word, is selected. No wildcard searches are possible and Shift/F1 finds the next occurrence of the string. A beep indicates there are no more matches to the target string.

Cut, copy and paste are useful options to have. The beginning of the text is marked by pushing F5. Move the cursor to the end of the section and push F2 or F3 to cut or copy the selected text. F4 copies selected text to the current cursor position. This can be repeated as many times as desired. Tandy Model 100 users should feel quite at home here.

A most unusual feature for a lapheld machine is a page preview facility. A small drawing of what a printed page will look like appears on the screen by pressing the Shift/F2 key.

To print a document, press shift and F3. A view of the document is shown for a few seconds, and printing commences. At 15 characters per second, it is slow, but the quality is very good. The printer is a 24 dot thermal transfer printer, using an inked ribbon cartridge for non-thermal paper. Type size and spacing is fixed, and each document is headed by the document title, plus the date and time at which it was created. A page number is printed at the bottom of each A4 page.

While the printer buzzes away when it is being used, it cannot be called noisy. The supplied ribbon cartridges can be changed in seconds and give quite a bit of printing before they are exhausted. Carrying a spare is no bad idea. The other choice is to use expensive thermal paper. Print density can be altered by a thumbwheel at the side of the printer.

Power is really drained by the printer. A 'Low Power' sign flashes on the LCD screen and is accompanied by a beep almost every time the printer is used. With fresh batteries, you can print perhaps half a dozen pages of text, in addition to getting a day's computing. If the power level gets too low, the printer simply refuses to function, though you can carry on using the computer.

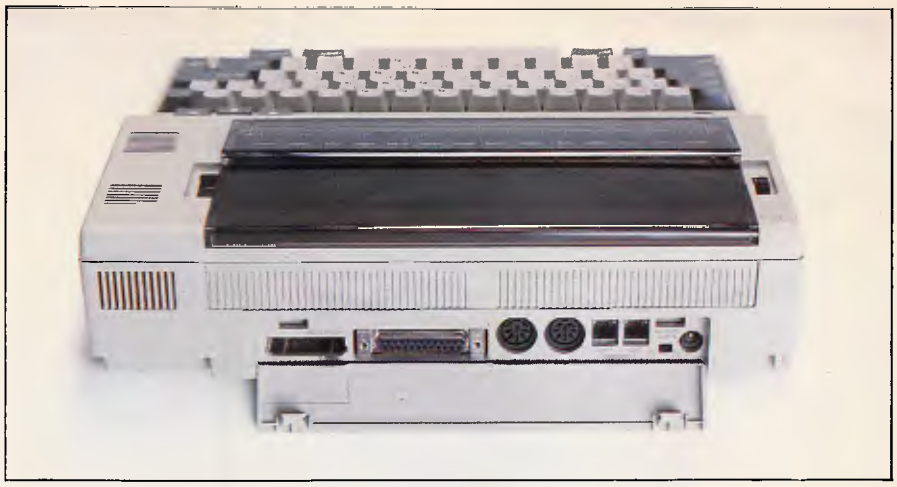
There is one other feature of the word processor. Pressing shift and F4 inserts a pair of inverse F symbols, indicating function. These are meant to give things such as text centring and so on, but as no documentation was supplied, I was unable to determine exactly what features were available by this means.

That is the word processor, perhaps better thought of as a text editor. It is easy to use but limited in its features. For the occasional letter, it is fine. You can enter and correct text, preview the final document and get a good quality printout. For anything more, the limitations start to show.

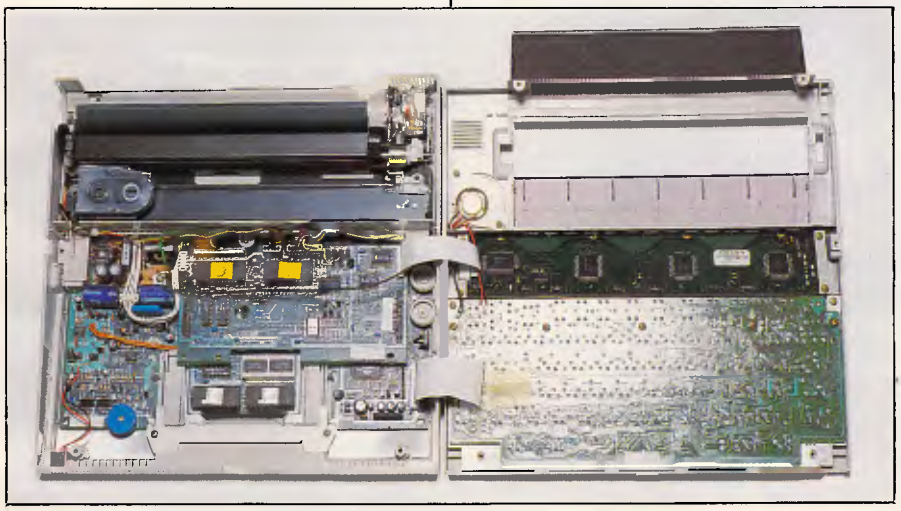
With an AC adaptor, the printer becomes less of a drain on power. Alternatively, documents can be created and then transferred to another computer via the built-in modem, for reading or printing out on a stand alone printer.

An application called List can be used in conjunction with the documents created by any of the applications. Its function is to find specified strings in any files in RAM, displaying or printing out all lines containing the target string.

You start by selecting a file to be searched. Then, enter the word to be



That difficult-to-open back panel reveals a host of ports.



Inside the prototype: surprisingly few chips

found. Again, no wildcards can be used, and whole word match is not an option. The file to be searched can be changed with no trouble, and a new string entered. Exit gets back to the main menu. If you used the SMC-T11 to store documents of names and addresses, sales information, diary notes or other such listings, List is a useful utility indeed.

Sony has gone down this second road with the SMC-T11, and left the rivals for dead.

The diary application is called Schedule. It is again easy to use and fairly simple in what it does.

The display is a columnar display of dates, time period, action and message. Entries can be added or deleted (the delete command asks for confirmation by displaying 'Expunge'!) and a string may be found in the usual manner. A single entry or a block of entries can be printed out too.

Adding an entry is simple enough. The current date is the default date, and can be altered with cursor control keys. Start and finish times are entered in an hour minute format. The user can opt for an alarm to sound at the start time, with a message of up to two 48 character lines. The alarm interrupts any current application, or even turns the Sony on.

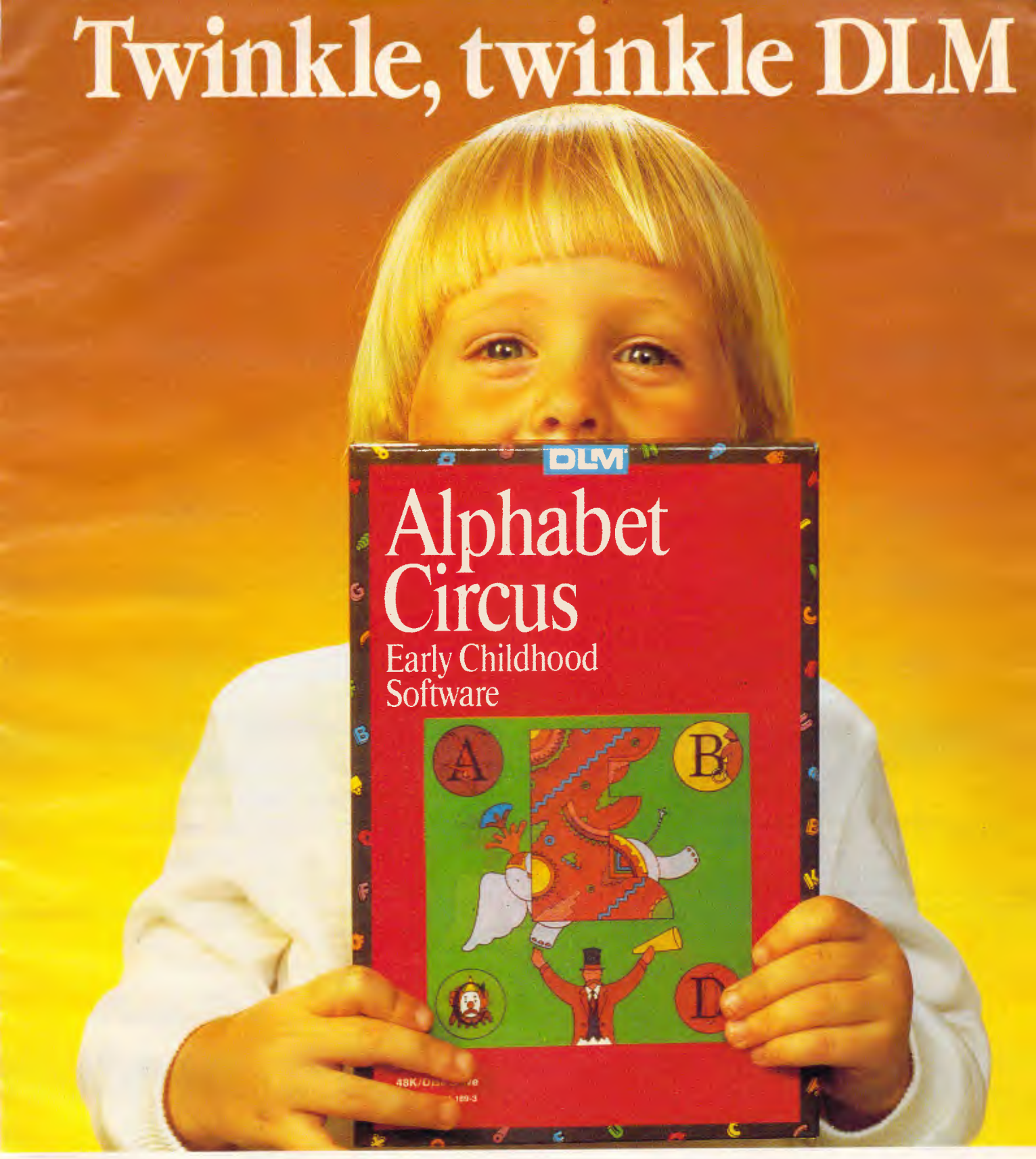
Alternatively, the scheduler will run a nominated program at the specified time. The Sony will beep and you will be prompted to confirm that the program should be run. An application of this might be to start a terminal session. Auto-run is not possible, unfortunately, as it could have been useful.

So far, the applications have been pretty typical of those of a lapheld computer, with the exception of having a printing facility built-in. The next application, Telecom, adds a whole new dimension to the Sony.

Remember the One Per Desk, the computer/telephone unit released by Telecom? Well, think of the SMC-T11 as a portable One Per Desk, with less computing power.

Telecom is the application for sustained telephone operation. However, the telephone function is available in any application, by pressing the Alt key and a function key. Alt and F1 get a dial tone up, with the sound coming from the grille near the printer. Alt and F2 switch operation to the remote handset I men-

Twinkle, twinkle DLM



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tioned. Alt and F3 mute the phone, so you are not interrupted by incoming calls. Alt and F4 prompt you to key in a number and then dials that number. The Sony acts as a handless telephone when you are making a call, with a microphone on the base picking up your voice. For privacy, you'll need the handset.

Alt and F5 hang up the telephone, after a call, or if no answer is obtained. While a call is being made, you can continue to use the Sony in any of its applications. This feature alone puts it well ahead of the opposition. Admittedly, the Sony shouldn't be used with a switchboard system, as it doesn't have the functions to support line transfer and the like, but, if you work at a desk with a line that doesn't go through a switchboard, it is a marvellous feature. You get a modest amount of computing power and a telephone in the one box for a quite reasonable cost.

... What you can't see is a built-in 300 baud modem and a built-in telephone.

The Telecom application adds more features to the basic phone functions. The find command searches a file called PHONE.BOK for a name or number. I was not able to find out how to create the Phone.Bok file, as a simple file of that name created with the text editor does not work and no documentation for this application was available with the prototype tested here. The string to be located can be changed, the next occurence of the string found, and the number in the entry called. It looks a promising program.

Call prompts for a number to be dialled. There is also a redial option, redialling the last called number.

Status configures the telephone and modem. There are many variables to alter: either the modem or the RS-232C port can be accessed; originate or answer can be set; full or half duplex baud rates from 110 baud to 19200 baud are possible, with five to eight data bits, one, 1.5 or two stop bits and any parity. Xon-Xoff, CTS/RTS or Xmodem protocols can be established, the printer switched on or off and tone or pulse dialing set. You can preset an area code or prefix number, set up auto answer and even nominate a program to answer an incoming call. All these parameters are set with the cursor control keys.

The terminal command of Telecom turns the Sony into a communications terminal. Files can be uploaded, with screen width specified, or downloaded. Text received can be viewed a screen at a time and the terminal configuration changed. The printer will make hard copy of anything you get on the screen.

All these commands make Telecom a very useful application. A base computer could be easily accessed for downloading of files; messages can be sent via Minerva or some other electronic mail system; and telexes can be sent by the same means, prepared off line with the text editor. The fact that the computer, modem, printer and telephone all come in one unit is a real advantage.

There is another application too, called Remote. This turns the Sony into a dumb terminal, accessed by a remote computer via the modem. A person with the Sony at home could send files to it from the field, simply by plugging it into the telephone socket.

If you exercise your imagination a little, you'll see the possibilities for this machine are endless. A program could be written to have the SMC-T11 act as an answering machine.

Multiplan is the other major application. It is an old but proven spreadsheet from Microsoft, bundled with many micros. Given the capabilities of the Sony, it should fit in nicely. Files can be transferred in the same way as text files, and the spreadsheet does not need to use graphics. With the text editor, Multiplan and Telecom, Sony has assembled a good range of useful packages.

On top of that there is HHX Basic which is derived from MSX Basic, and the two Basics are largely compatible. HHX stands for Hand Held Extended, and HHX Basic is written to take account of the fact that the Sony has no VDU display, no joystick ports and so on. In theory, applications written under MSX Basic, or using the MSX operating system, have a good chance of running on the Sony. They can be downloaded from either tape or disk.

In the review sample machine, the Basic had more than a few bugs. Poor documentation meant that I wasn't quite sure if some functions were meant to exist, and were bugged, or had not found their way into the Basic. For instance, less than and greater than operations did not function, so *APC's* benchmark programs had to be modified slightly.

Benchmark results were disappointing. On five of the tests, there was almost time to make a cup of coffee while the computer did its thing. The results are published, but I hope that the final version of the machine is nowhere near as slow as the prototype. If you need speed, try one or two benchmarks before buying.

HHX Basic is close to GWBasic, in having fourteen digit accuracy, and many of GWBasic's features. It supports integer, floating and fixed point variables, single or double precision figures, hexadecimal, octal and binary bases.

The function keys are preprogrammed with the most-used commands — list, run, print, load and system. They can be reprogrammed, so that, for instance, you could set up shift/F1 to input a string or Basic command that might be entered many times in a program.

There are other aids to programming too. Auto generates line numbers automatically. Renumber will renumber a program. Delete deletes specified lines. There are comprehensive error trapping facilities, trace functions, resume and a line edit facility (that didn't work in the sample).

Another bug in the Basic was caused by typing in GET X$. Press return and the computer seized up entirely. Only the memory reset switch on the back restored control! Again, try before you buy.

HHX Basic is strong in the mathematical area, with definable functions, modulus arithmetic, variable swapping and much more.

Graphics, of course, are limited by the LCD screen. Within HHX Basic, lines and circular shapes can be drawn quickly on the 480 x 64 pixel resolution screen and constructing charts to illustrate data is not difficult. Text can be added quite simply too, and the whole lot can be printed out with one keystroke.

Databases can be devised with the large number of file handling commands. Random and sequential disk files are supported, file directories can be displayed from Basic, with wildcard selection, and files can be merged, deleted, renamed. The Basic file handling routines are more difficult to operate than those from the native operating system, but far more sophisticated.

Similarly, input/output routines and access to system routines are possible from Basic. Variables can be sent to a nominated register, ports strobed for input, assembly language subroutines called and so on. As a Z80A processor is used, there is plenty of machine code material to draw on.

Two commands deal specifically with the telephone function. DIAL dials a specified number, while TEL selects the hands-free or handset phone, or hangs up the phone.

HHX Basic is therefore powerful and versatile. There is plenty of scope for customised programs that handle all the facilities of the SMC-T11. It is a pity that users will have to learn the Basic to be able to write good applications, but it can be expected that if the machine sells in numbers, applications will soon be made available. Even some MSX programs could find their way onto the handheld Sony.

Conclusion

If you exercise your imagination a little, you'll see the possibilities for this machine are endless. A program could be written to have the SMC-T11 act as an answering machine. An incoming call could activate a program that sent files to a remote computer, or even caused a prerecorded message to be played back.

Databases of some complexity could be constructed, using a RAM pack or external disk drive. These databases could be interchanged with applications running on MSX micros, so the Sony could act as a remote data acquisition

Benchmarks

BM1	6.6
BM2	24.3
BM3	61.1
BM4	61.6
BM5	63.5
BM6	101.5
BM7	149.0
BM8	231.2
Average	87.35

All timings in seconds. For a full listing of the Benchmark programs, see End Zone.

Technical specifications

Processor:	Zilog Z80A, running at 3.58MHz
RAM:	32k internal
ROM:	96k applications software
Mass storage:	Optional 32k SRAM cartridge, 500k 13cm MSX-DOS disk drive
Keyboard:	74 key, MSX style qwerty keyboard
Size:	29.5cm x 28cm x 6cm
Weight:	3.6kg
I/O:	3 x Telecom sockets, AC, 2 x DIN, RS-232C, RAM cartridge slot, expansion port
Software:	HHX Basic, Word, Telecom, Multiplan, Schedule, Remote, List

In perspective

Comparing the Sony to MS-DOS portables is a little unfair, as they are considerably more expensive and aimed more at the executive who needs access to sophisticated MS-DOS software. A fairer comparison is with portables such as the Epson PX-8, Tandy Model 100 and NEC PC-8021A.

The Epson has a similar price and uses the once-popular CP/M operating system. It is bundled with excellent software, such as WordStar and Cardbox, plus a scheduler and terminal package. It has more RAM and a built-in microcassette, but no modem and no telephone. It is a more capable computer, but not so much of an all in one as the Sony.

Tandy's machine is much cheaper and less sophisticated. It has a text editor and other simple programs but only a 40 column screen and seems a toy by comparison to the Sony. Much the same applies to the NEC, though it has a wide range of independent applications written for it.

The Sony also brooks comparison with the Telecom One Per Desk, embodying a similar concept with less power but total portability and a better price.

In short, the SMC-T11 strikes a good balance between useful applications and usability. At $2,000 it is a great device for those who need some computing power but don't want to go to the expense of a machine they may never use to its full potential.

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terminal. With a bar code reader, it could be used in retail outlets.

Insurance sales people could have databases written and simply enter proposal details. The Sony could print out a proposal form on the spot and relay data back to a central computer. Sales people could carry databases of product lines, generate invoices on the spot and send orders back to the main office, along with sales figures.

In the office, the Sony is ideal for executives who need a computer only for the odd letter and the occassional financial calculation. The scheduler has a use in that environment too, the modem could open up the world of telecommunications and the telephone is handy to have.

But the SMC-T11 is not beyond criticism. Things such as a better display with a clearer cursor would help. The native file handling system is rather limited and I would like to see a more sophisticated file handling system. The printer is also limiting, in consuming so much power. A parallel printer port might make life easier.

On the plus side, the fact that a computer with bundled software, a telephone, a printer and a modem are all together in the one box at a cost of around $2,000 is amazing. The applications are fine for the person not used to computers and HHX Basic is a versatile language for those with some experience in Basic programming.

The Sony offers a sound basis on which to get some really good applications going. When RAM packs become available, when ROM software is released, with a disk drive or two and running MSX software, the Sony will beat the rest of the non-MS-DOS laphelds hands down.

It is part of a strategy that was conceived with MSX. That alliance is the icing on the cake of what is an excellent little lapheld with bags of potential.

END

'Every now and then I let it do a self-portrait.'

Only one careful user...

Yes, it's true. There is an active secondhand market for computers and peripherals — but it has such a low profile, you really have to dig to find what you need. And beware of the pitfalls.
Pierre Cochrane investigates.

Most micros that come onto the secondhand market are sold by private owners through classified advertisements. Secondhand corporate and business machines are almost always sold to brokers for resale. Finance companies sell off machines when their leases have expired. Thieves sell stolen computers to personal contacts, through a friend of a friend, and through classified ads. Auctions are held by dealers to sell old machines and peripherals that have been sitting around on the shelves for months. And user group members barter with each other at meetings and open days and also hold occasional auctions to raise funds.

All this activity is part of the underground sub-culture, the domain of hackers and dealers eager to do a deal. Manufacturers, distributors and computer shops would happily throttle the trade if they could, because they are desperately trying to protect the market for new systems and the profitability of each sale.

"AWA is loath to trade in old equipment," Richard McTigue, the company's marketing manager, said. "However, if there is some valuable new business to write, we will consider a trade in."

Hinke Haisma, director of The Computer Shop, said: "We have so many stock items on sale that we don't want to add secondhand equipment to our inventory — it would be like taking on a whole new product range and we don't have the mechanisms or people in place to handle that."

But what if you have an old machine that you want to trade in before upgrading to a new system?

"We recommend that people sell their old computer equipment through publications such as the Trading Post," Haisma said "By the time you take off sales tax and a dealer's commission of 15 per cent there isn't much of the sale price left for the owner."

Classified

Buying a secondhand system out of the classified ads may strike you as a risky business, and it is. But there are some good deals to be made if you are patient and take the time to find exactly what you are looking for and are prepared to haggle. It also helps if you know the rules of the game.

All private computer owners believe their machines become more valuable with age, not less, because they add on cards, peripherals, games and buy software packages. The sad truth is that a micro's resale value falls by 10 per cent the moment the proud owner takes it out of the shop. It then depreciates 15 to 20 per cent per year so after five years the micro's paper value is $0. Any hacker worth his salt will tell you that is blasphemy. A computer is worth what you can do with it, and that depends on its configuration. The more cards inside the machine and the more peripherals hanging off it, the more valuable it is, and that's just for the hardware. Convinced that their machine has a high utility value even though it is old, the private owner sets a high asking price, of around $1000 for an Apple II+ in good condition and $1500 for an Apple IIe.

Glancing through the Weekly Trading Post of October 16, 1985 I saw these ads:

- Macintosh 512k, external disk drive, 10 disks, Macwrite/Macpaint + other business programs, 9in Imagewriter and cable, in original carton. Must sell. $5300. Menal. (The Computer Shop is selling this same system new for $5100.)
- Apple IIe 64k, 80 column, Kaga color monitor, Gemini printer and card. $1950. Lakemba.

(For an old system with only 64k RAM, sold privately, this price is inflated)

- Brother M1009 $285 . . .

(This dot matrix printer sells new for $295.)

- Commodore 64 family pack, disk drive, Flight Simulator. $700 Palm Beach.

(Who's kidding who?)

- Dick Smith System 80, 48k. $800 North Ryde.

(This is an 'antique' which is no longer supported by Dick Smith. Risky.)

Business and corporate owners have a schedule which depreciates the value of computer equipment against tax, over a write-off period of three years. Consequently from a resale point of view, a business micro has a three-year life.

A three year old PC might be just the system you are looking for. Unfortunately for the bargain hunter, this is the domain of the secondhand dealer who

buys retired business systems as a job lot or takes them on consignment.

Secondhand dealers

There are two kinds of dealers active in the secondhand marketplace: software houses that act as intermediaries helping a client move existing machinery when installing new systems; and brokers with warehousing operations that hold stock of a wide range of manufacturers' equipment.

The Computer Warehouse, based at West Ryde, Sydney, has been in business for six years and opened a New Zealand office in December, 1984. Primarily, the Computer Warehouse is interested in selling mainframes and minis, selling an average of 10 PCs a week.

"We carry a wide range of mainframes and minis including IBM, Wang, Honeywell, Burrows, Dec, Datapoint, Prime, H-P and ICL", Frank Barrett, from the Computer Warehouse said. "We sell PCs to anybody who wants them, and buy PCs from anybody interested in selling them to us at the right price. We don't deal in Apples, Ataris, Commodores, only MS-DOS PCs and up."

The Computer Exchange in Chippendale is Sydney's other major secondhand dealer. It has been in business for eight years selling IBM, DEC, Prime, NCR, H-P, ICL, Quantel, Honeywell, Burrough and Wang. They also deal in a wide range of micros selling IBM, HP, Sirius, Apple and CP/M systems. The Computer Exchange moves 10 to 15 micros a week.

Most secondhand dealers are only interested in selling systems and are not in the business of providing technical support or maintenance contracts. This has artificially skewed the resale value of secondhand systems heavily in favor of those manufacturers who support systems that have been resold.

"IBM doesn't mind us being in the secondhand market" said Zamani, of the Computer Exchange. "IBM will support maintenance and backup systems we sell because it gives their equipment a good reputation and good secondhand value. Some companies like ICL and Burrough don't support secondhand systems wholeheartedly, and this affects their resale value.

"The thing to look for when buying secondhand mainframes or minis is a Maintenance Agreement Qualification (MAQ) letter from the manufacturer, saying that the equipment has been continuously maintained by the manufacturer and that the manufacturer will continue maintenance for the new owner. With this letter the buyer is protected because the manufacturer is under an obligation to arrange for ongoing maintenance for the equipment."

Dealer prices

Showroom prices are a little higher than prices quoted in the classifieds for popular makes, but less for compatibles and discontinued models because dealers are very sensitive to the laws of supply and demand.

"If a machine is popular it holds its value," Zamani said. "Once demand disappears, the systems value disappears. Last year we sold two 4-year-old Lanier wordprocessors for $8000 each. This year we had to sell the same system for $300 just to get rid of it."

"Machines that have been high volume sellers retain their value much more strongly than machines that failed in the marketplace. We will get a much better price for an IBM PC than for a Televideo even if the IBM is the older machine.

"Machines that are still the current model are worth about twice those that have been discontinued. Age is also an important consideration. There is quite a high psychological barrier to buying equipment more than three years old, because of the speed of technological change and price adjustments which are usually downwards.

"The machines operating system affects the price. MS-DOS is more popular than CP/M. Consequently you pay a premium for MS-DOS machines."

To ensure that you are not being overcharged for a system look at the current list price for equivalent systems then work out your own range of prices based on table 1.

Age	*Discount*
1-2	*20-30 per cent*
3	*50 per cent*
5-7	*70-80 per cent*

Table 1: rough guide to PCs' retained value according to age

The rule is very much Caveat Emptor (let the buyer beware), but most dealers acknowledge they have a reputation for service to maintain and it is not in their interests to be hard nosed.

The real bonanza for buyers of a secondhand system is getting their hands on as many cards, cables, software packages and peripherals as possible, thrown into the deal for the cost of the hardware. It's easier and usually cheaper, to buy a fully configured secondhand system with a full suite of software in one go, than trying later to buy bits and pieces and add-ons.

Without software, the machine is useless, so make sure the original software that came in the box with the system is thrown in for the price of the hardware. Dealers may haggle and try to sell software separately. Also check that a full range of application packages, games and whatever other software you need, is available for the machine you intend to buy. It would be difficult to find a range of Commodore VIC 20 software for example, now that that machine has been replaced by the Commodore 64.

Business systems suffer the same fate, particularly those that sold in small volume in Australia like Rank Xerox, NCR, & Sirius, to name but a few.

It is a truism that those selling secondhand computers have to know more about the machines than those selling new ones. Secondhand dealers have to take the computers apart, test them from start to finish, repair them, polish them, then persuade you that the machine is worth buying.

But rather than asking a secondhand dealer to express an opinion on how reliable the system is, check it out yourself. Here's a checklist of faults to look for:

Keyboard Malfunctioning keys on the keyboard. Sticky keys. Keys that don't feel right when they are depressed. Loose keys that fall off when you hold the keyboard upside down and shake it. Dirt between and under the keys. Keys that don't work.

Disk drive Noisy disk drives which may be wearing down, nearing retirement age. Alignment and speed-load a disk and see that it boots, format a disk and make a backup copy to check this.

Cards You can only check cards that are hooked to a device that gives you a visual indication of whether they are working. Print out a test file to check the printer card and printer.

Check the color and graphics output of

What you will pay

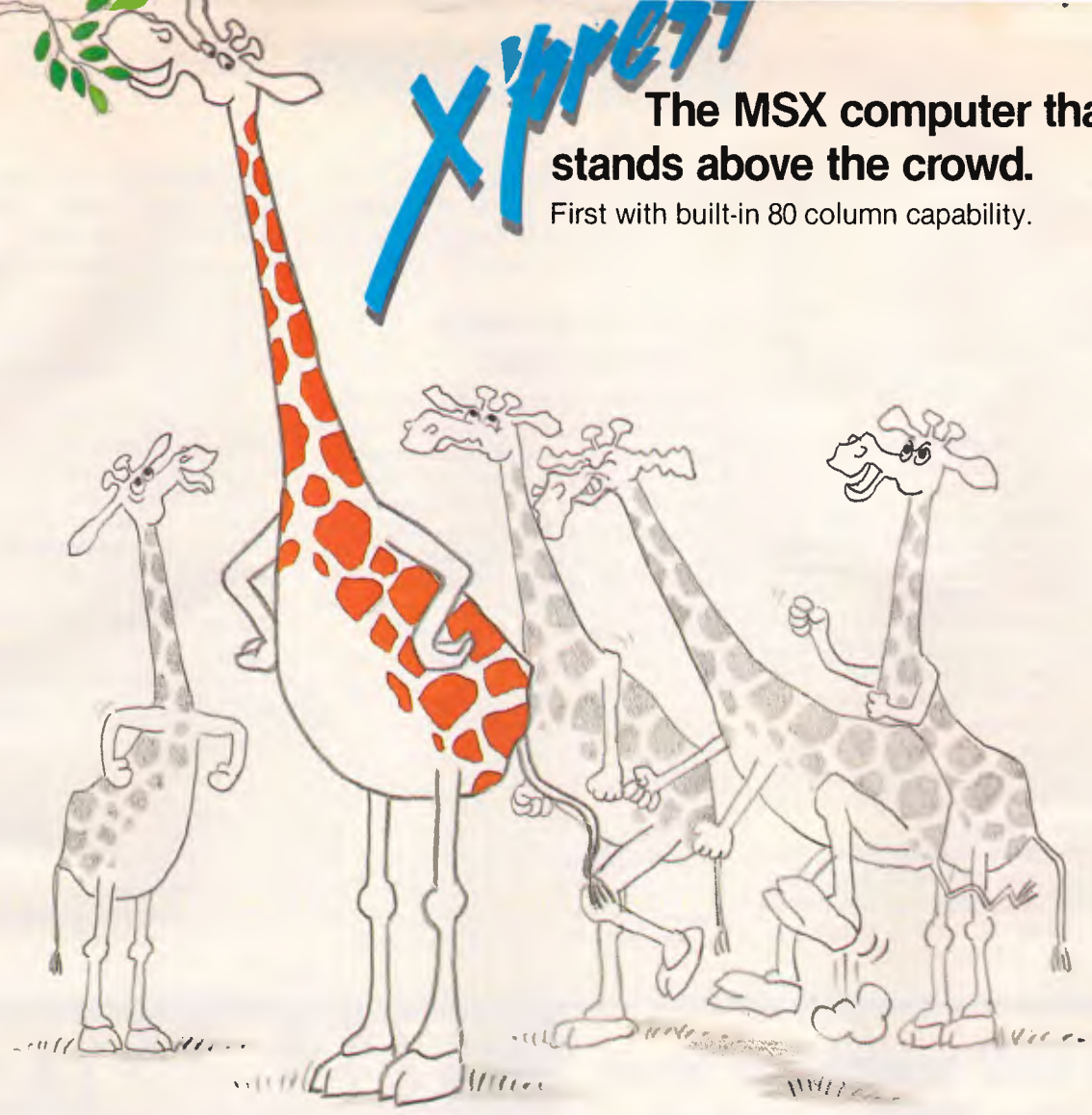
Secondhand Systems Dealer Price Survey 17/10/85

Apple II+	$1000
Apple IIe	$1500
Apple Compatibles	$700
CP/M 8-bit Systems (all makes)	$700-900
IBM PC (fully configured)	$3000
IBM PC Compatibles	$2500
Morrow	$2500
NCR Decision Mate 5	$3000
NEC APC 3	$2500
Sanyo MBC 550	$2000
Toshiba EW 100	$2000

X'press

The MSX computer that stands above the crowd.

First with built-in 80 column capability.



The X'PRESS is final proof that not all MSX computers are born equal.

The X'PRESS stands head and shoulders above other MSX computers with its unique built-in 80 column capability, a boon to word-processing and running of CP/M programs. Other built-in features include a 360K byte 3½" microfloppy disk drive and RS-232C interface.

Add to this a host of readily available peripherals like a 64K RAM expansion cartridge, data cassette, stringy floppy drive, a second microfloppy drive and modem, and the X'PRESS becomes the heart of a powerful MSX computing system.

Despite all the built-in features, the X'PRESS is priced a notch below other MSX computers with matching features as optional peripherals.

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a graphics card. Ask to run a diagnostic check of the RAM cards if the owner/dealer has a diagnostic program. If not, run the computers self-check diagnostic program. If there are any other cards in the machine, ask to see them working.

Hot/cold test. Time permitting, leave the computer running for two hours to see if it is liable to overheating or has intermittent faults.

Printer Check to see if the interface is compatible with your computer. Test the full character set — if any characters are faint or missing, leave it as new print heads for dot-matrix printers are expensive. Beware of defective step motors — check for erratic spacing, slow carriage returns or overprinting, listen to the motor, if it is dying it will sound off; check inside for loose components and cracked rollers. If it has an automatic paper feed, check to see it works properly. Take your time; printers are mechanical components and age much more quickly than computers because they have many more moving parts.

The final check Check that you have been given the correct leads. Check mains adaptors. Check manuals. Ensure you are given a receipt stating the amount paid and the warranty period.

Warranty Ask the dealer for a one-month warranty. Under law, dealers must not verbally refuse you (individuals are not required to provide a warranty).

Back-of-a-truck merchandise

Just as in the used car market, if you buy a stolen machine, or a machine on a lease that hasn't been paid out, and the rightful owner can prove title, you lose the machine and the money you paid for it. But buying a 'hot' machine is only part of the story. This advertisement from the Weekly Trading Post, October 16, 1985 highlights the human story behind the growing number of computer thefts:

"Reward: stolen computer and repair equipment from Balgowlah area. The thieves have almost destroyed the livelihood of this person and family. Stolen are 2 x 6890 Peach Computers, 2 x 1407 pixel color monitors, 1 Teak double-sided, double-density drive unit, 2 x CF80 drive units, 1 frequency counter CF8100F, 1 signal generator 8656 2 x Crows Ywatsu SS3510, plus all software and testing programs etc. Please would anybody with any information phone Manly police station."

NSW Police Department statistics for property break-ins where computer parts and accessories were stolen from January 1980 to June 1984 give us some idea of the dimensions of this growing problem. See table 2.

Statistics for the second half of 1984

Year	Reports	Cleared	% Cleared	Value
1980	24	2	8.33	$142,980
1981	35	6	17.14	$124,326
1982	102	13	12.75	$313,469
1983	326	32	9.82	$1,785,132
1984 (June)	275	21	7.64	$1,224,456

Table 2: NSW Police Department statistics for property break-ins involving computer parts and accessories.

are not yet available.

Stolen machines are out there and can be bought cheaply. But apart from the ethics it's 'too dicey'. These machines can't be insured. Getting them repaired can prove to be a headache, particularly if they are sent back to the original vendor to be serviced.

Auctions

Auction action can be fast and furious, and you can find some real bargains, but remember there's no after-sale support. If the purchase breaks down, you are on your own.

The Computer Exchange conducts monthly auctions at its premises in Chippendale. The time and venue is advertised in the computer section of The Australian newspaper. A catalogue is available on request. A wide range of computers and peripherals are put under the hammer, and values can be staggering. Some examples of last month's auction:

NEC Spinwriter 5500	$300
5Mb Corvus Hard disk	$300
Hercules Graphics Card	$50
Brother HR5 printer	$50

Auctions are heaven for computer buffs who have the happy knack of being able to make things work and are happy to live in a world filled with components and cables. If you get carried away at auctions you can end up with a closet full of bits and pieces that aren't compatible. It's no good buying a parallel printer if you have a serial port on your computer. Buying the black box to convert parallel to serial will cost you more than the secondhand printer is worth.

"Only bid on good equipment," author Bob Marx said. "I went to several auctions looking for a daisywheel printer to print out my latest novel and I got burnt. Don't buy incompatible equipment in the hope that you will be able to interface it.

"Service technicians charge $45 to $60 an hour, which can really add up. Don't buy anything that needs new cables, unless you can make the cables yourself, because having a cable made can cost you $70. You can't let yourself get carried away at an auction. If in doubt, save your money, and get the hell out of there."

Conclusion

"Dealing in the secondhand market is worthwhile" George Waldthausen, from Talman EDP Consultants said. "There are some great bargains if you buy gear that is going to be supported by the manufacturer, and provided you know what you are doing."

The law expects goods to be of merchantable quality and fit for the purpose for which they are sold. The customer has rights and can sue the supplier if necessary. But that kind of action is not often worth the hassle. It is far better to check everything first. Don't be in a hurry to do your money. If the machine is discontinued, screw hard to get a better deal and if the salesperson is being unreasonable, walk away.

Happy hunting.

(Editor's note: Secondhand PCs, software and peripherals are actively being bought and sold on Telecom's Viatel. Refer to Viatel page number 66617.)

END

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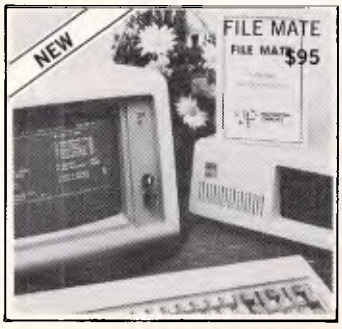

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HOW MANY SIMILAR SYSTEMS ARE IN USE AT YOUR COMPANY? _____

DO YOU USE A LOCAL AREA NETWORK OR MULTI-USER COMPUTER? _____

TYPE? _____

IF NOT, DO YOU PLAN TO? _____ WHEN? _____

WHAT OTHER SOFTWARE DO YOU USE? _____

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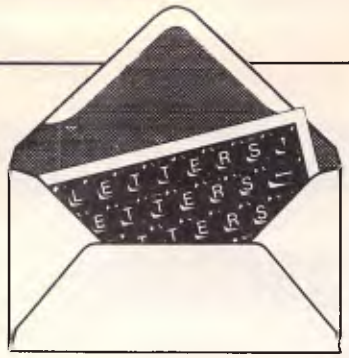
Dealer Name:



LETTERS

This is the chance to air your views — mail to 'Letters', Australian Personal Computer, 2nd Floor, 215 Clarence Street, Sydney 2000. Please be as brief as possible and add 'not for publication' if your letter is to be kept private.

Customer relations

As a recent purchaser of an Amstrad CPC664, I was appalled to read in the October issue of *APC* of the imminent launch of the CPC6128 at around the same price as the 664 system.

I bought my green-screen 664 in July this year and I have absolutely no complaints about the machine, indeed this letter is being written with its aid. However, to learn that a vastly superior machine is to be produced very soon after the 664 for the same price is, to say the least, galling. I would have expected such marketing ploys from other micro manufacturers but I had thought that Amstrad was above that.

I suspect that I am not the only person in this position, and Amstrad should take some positive steps to restore the goodwill of its existing customer base. The very least step should be an offer to replace the main 664 unit, manuals, and so on, with the 6128 unit at a fairly nominal price. Bearing in mind the price structure, perhaps a direct swap would be fairer.

If such offers are not made, I am sure many 664 owners will want to change to the 6128, but with the 6128 price as stated in *APC*, it would appear that the 664 will become unsaleable without a substantial drop in price, and this would apply to the 464 as well. As second-hand trading will be affected, the 664 owner will not be able to change to a 6128 without a substantial financial loss.

I urge Amstrad, therefore, to seriously consider the proposals I have made, and to quickly restore its existing customers' confidence.
K Spackman

There's a lot of users annoyed with Amstrad and we think they deserve some support, but the 'injury' needs to be put into perspective.

Obviously, any manufacturer is going to try to produce better machines at better prices — it's unlikely to stay in business unless it does. Equally obviously, upgrading previous machines won't help it stay in business in purely financial terms.

Having said that though, the brief gap in terms of time between the 664 and the 6128 — and the bigger gap in terms of performance — isn't much of a way to encourage present and potential purchasers.

We're keen to see what can be done to get a better deal for 664 users, but first we need some ammunition. Write to us and Amstrad if you agree with this letter.

Speedy electron

I wish to point out some serious errors in the article titled 'All in the Chip' (September *APC*). They all relate to Figure 1, page 77.

The column labelled 'Typical Speed' has all entries, except the last, in units of time. The quantity speed has units of kph, m/s etc.

The last entry in the table associates electrons as travelling at a speed c; the speed of electromagnetic waves in a vacuum. It is well known that no electrons, even in LSI circuits,can travel at c.

Nowhere in the article is there any mention or discussion of the basis or relevance of the table's last column, (dealing with electrons). So why is it in the table?

It is most unfortunate that the authors failed to notice these blunders. Hopefully much of the article's audience will not be confused.
D Sidors

Fuzzy logic

Martin Banks (Banks' Statement, *APC* October) falls into the common trap of believing that fuzzy logic is a recent innovation.

In fact, under its original name of 'quantum logic', non-Aristotelian logic which permits partial truths has been around since the pioneering work of Vasil'ev, a professor of logic at the University of Kazan, who published papers on this from 1910 onwards. The first formal propositional calculus was published by Lukasiewicz in 1920, using three values (0, 1/2, 1) and then generalised by Zawirski in 1931.

The modern concepts as used in AI were really fully developed by Watanabe, particularly while he was at the IBM Research Laboratories at Yorktown Heights, New York, and emerged in a series of papers and books from 1956 onwards. Lotfi A Zadeh did not coin the term 'fuzzy states' until 1965.

However, the whole field stems from decision analysis theory originally developing from the statistical work of Reverend Thomas Bayes in 1760, one of the founding fathers of probability theory with the concept of assessing 'degrees of belief'.

One of my favourite illustrations of many-valued or 'fuzzy' logic is the physical thought experiment, in which a cat is sealed in a black box for one hour. Inside this black box, the cat is wired up to a device which will electrocute it if a block of radioactive material decays. The material in question has a half-life of one hour (that is, a probability of decay of 0.5 in one hour). At the end of the hour, what is the truth value of the statement 'The cat is alive'? It must be 0.5!

All this goes to show that even *APC* (and Martin Banks) can be a bit fuzzy at times, as can cats.
H Oakley

Really random numbers

I have an Amstrad CPC464 and I want to write certain simulation programs. In order to verify them, I need to know the formula of the random number generator (congruence formula) of the machine; unfortunately it is not in the manual. If you don't know it, can you suggest a method to crack it?
NA Papadakin

No one at Amstrad was

LETTERS

*able to give me the formula used by the generator, which is apparently buried deep in the ROM. Almost all micros use an integer formula of the form: SEED := (CONST1 * SEED + CONST2) MOD CONST3 where SEED is used as the basis of each 'new' random number (each number being generated from the previous one). MOD is the remainder function (so 10 MOD 7 is 3) and CONST1, CONST2 and CONST3 are constant values. CONST1 and CONST2 are usually fairly small in relation to CONST3. Preferably all the constants are prime numbers.*

Successive calls return a jumbled sequence of numbers ranging in value from one to CONST3, which repeats itself every CONST3 calls.

Some computers, such as the Apple II, jumble the sequence still further by using the code or timing of the last key-press in place of CONST2. Luckily the Amstrad doesn't do this, or analysis of the sequence could become extremely difficult.

The problem should be solved if you put the command RANDOMIZE 22 (or any other constant number) at the start of your program. The RANDOMIZE function provides a new 'seed' for the random number generator, so you always get the same sequence of numbers after using RANDOMIZE with a specific value. This makes the output of the generator predictable, so it can be reliably analysed. JL

JX outrage

Having recently returned from Japan I was quite surprised to hear that IBM launched the new JX computer in Australia with only a 360k drive unit.

In Japan a 720k drive now comes with the JX and I assumed that the JX would have been launched here with the 720k drive.

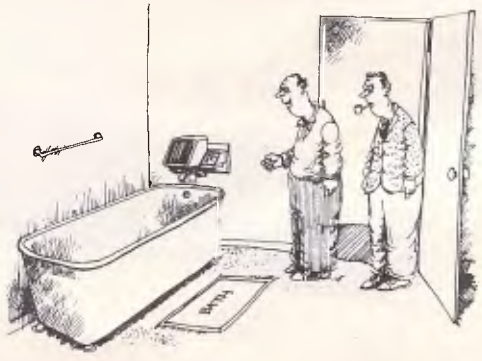
It seems to me that IBM is trying to rid itself of the 360k drives left in Japan and will offer the units to the unsuspecting and eager Australian public with plans to release the 720k (and incompatible) drive sometime in the future.

There was obviously a demand in Japan for a 720k drive to be in keeping with all the new lap held compatibles being released.

Why then must the Australian public be subjected to this when IBM could release the 720k to start with?

I guess that would be too easy.

J Thompson



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- Expansion capability.

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The built-in LocoScript word processing software is amongst the most powerful available and includes such features as pagination, simultaneous editing and printing, automatic paragraph realignment, automatic document editing and reforming and simple cut & paste editing.

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AWA-THORN
Broadening your horizons

Playing by the rules

The current knowledge engineering bottleneck, which is retarding the development of expert systems, can be avoided by allowing a computer to work out its own rules about the world. Ed Stenson explains rule induction, a process which does just this.

One of the main requirements of any intelligent system is that it should have an ability to learn. People are very good at recognising and remembering errors of judgment, and applying that knowledge the next time a similar situation crops up.

There are many demonstration AI programs showing the feasibility of computer learning, but few 'real' programs rely on learning techniques. For example, it is very difficult to write a chess program capable of learning chess from scratch in the way a human player would pick it up, or of analysing a game to decide where it had made its mistakes.

However, learning can sometimes be applied to good effect in rule-based expert systems, as illustrated by Donald Michies recent expert system shell, Expert-Ease (reviewed *APC*, 1984). Expert-Ease uses a technique called 'rule induction' to work out its own rules for use in its knowledge base. The knowledge engineer need not supply explicit rules to the system (a method found to be painfully slow when used to develop the knowledge bases for 'conventional' expert systems such as Mycin and Prospector), but instead provides a set of examples of an expert at work (for example, a doctor diagnosing an illness from a set of symptoms) called a 'training set'.

A training set is relatively easy to obtain. Often, a suitable set of examples in a given subject will exist in the subject's literature. Failing that, an expert can usually supply examples of worked problems with relatively little effort, as problem-solving is likely to form a large part of his daily work. The knowledge engineer's work is therefore greatly simplified, as his efforts are restricted to tracking down errors or omissions in the training set. As one leading researcher in inductive systems has put it: 'The lure of induction techniques is the possibility of providing the expert with assistance where he needs it most. The expert with assistance where he needs it most. The expert will still be responsible for concepts or new ways of viewing objects in the domain and the rules of thumb for

	Round?	Colour?	Marsupial on front?	Bird on front?	Water-based habitat?	Coin
	Yes	Bronze	Yes	No	No	1
	Yes	Bronze	No	No	No	2
	Yes	Silver	Yes	No	No	5
	Yes	Silver	No	Yes	No	10
	Yes	Silver	Yes	No	Yes	20
	No	Silver	Yes	Yes	No	50
	Yes	Gold	Yes	No	No	$1
Least squares coefficients for each attribute	37	21	29	29	37	

Fig 1 A simple training set

navigating it.' The main obstacle to expert system development, the knowledge engineering bottleneck, is neatly sidestepped in the process as the knowledge engineering has effectively been automated.

Rule induction

To illustrate how an inductive expert system works, consider a simple guessing game between two players. The first player takes a coin at random and hides it behind his back. The second player must determine what the coin is by asking a series of well-chosen questions. He may ask questions about the size, shape, colour, and so on, of the coin, but he may not ask direct questions such as 'Is it a cent piece?' His score is related to the number of questions he needs to ask; the more questions he asks, the fewer points he gets.

Taking a careful look at a set of Australian coins, it turns out that five questions are sufficient to identify any of them uniquely:

1) Is the coin round?
2) What colour is the coin?
3) Is there a marsupial on the front?
4) Is there a bird on the front?
5) Does the animal on the front live largely in water?

Fig 1 summarises the answers to these questions for the seven coins of the nation and is, in fact, a simple training set. The training set as it stands will not cope with foreign coins, New Zealand for example, as they carry different designs, but it could be extended if necessary. If this training set were given to an inductive expert system, a computer could join in the guessing game and would probably beat the average human more often than not.

Each row of the training set is one very simple example (known as an 'instance' in the jargon) of expert decision-making. Each column holds an 'attribute' and its set of 'values'. Colour? is an attribute, taking the values bronze, silver or gold. The right-hand column is the 'decision' corresponding to each instance and is termed the 'class'. Therefore, a coin that

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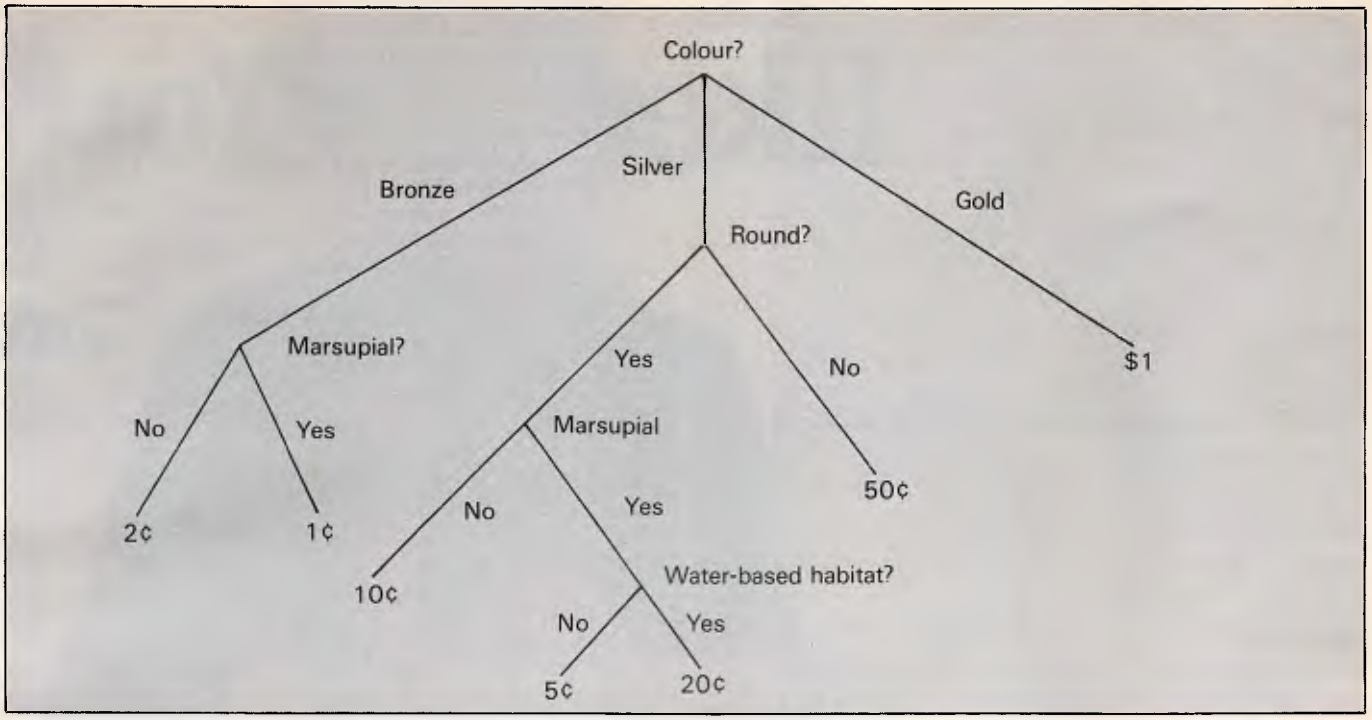

Fig 2 A decision tree for the coins training set

is round and bronze, with a marsupial on the front, but no bird or water-based animal, is a cent piece.

The expert system could simply use a training set as a look-up table. To determine the identity of an unknown coin, the system would ask for the values of the five attributes, search the table for the relevant entry, and print the class it found as its answer, but that's not a very intelligent way to behave because the system seldom needs to ask every question to find an answer. For example, suppose that the first question the system asked was 'What colour is the coin?' and that the reply was 'bronze'. The machine immediately knows that the coin must be a 1¢ or a 2¢ piece, and if it can find the right question to distinguish between the two it can identify the coin exactly. However, a 1¢ has a picture of a marsupial on the front while the 2¢ does not, so the machine next asks 'Is there a marsupial on the front?' and receives the answer 'Yes'. The computer realises that the coin must therefore be a cent piece, even though it has only asked two of its five questions. For this particular knowledge base it transpires that a maximum of four questions should always be sufficient to produce an answer (although which four questions depends on the coin itself), but, you may ask, how did the machine know that it should ask about a marsupial at this particular point?

The inductive system works by transforming the training set into a decision tree such as the one shown in Fig 2. It always starts its search for an answer at the top of the tree (known as the root, oddly enough) and, guided by the answers it receives, walks down the tree until it reaches a leaf. Each leaf is either assigned a class or marked as a null, the latter indicating a possible gap in the expert system's knowledge. Clearly, the question asked at any stage in the tree depends on the answers to all the previous questions, and this property of an inductive expert system often makes it seem to follow a line of reasoning just like a human expert.

The attribute Colour? is a ternary attribute (that is, it can take three states) and the remaining four attributes are all binary, so the maximum number of leaves that the tree could have in this case is $3x2x2x2x2=48$. The expert system makes do with a seven-leaf tree as it recognises that many of the leaves (that is, decisions) simply cannot ever occur. There is no bronze-coloured coin that is not round, for example.

It is this redundancy that an inductive expert system exploits to achieve its apparent intelligence. It's no great crime for the system to ask a stupid question in our guessing game (although it does cost the machine points), but if an expert system in a hospital or on an oil rig was known to ask pointless questions, it would rapidly lose the patience of its users. In a situation where a very quick response is needed, the system must be able to make reliable deductions based on an absolute minimum of evidence.

Do it yourself

Constructing your own inductive expert system (shown schematically in Fig 3) is therefore a matter of writing an editor to allow the training set to be typed in, writing a tree generator (which is easier than it sounds), and writing a routine to ask the user questions and move around the

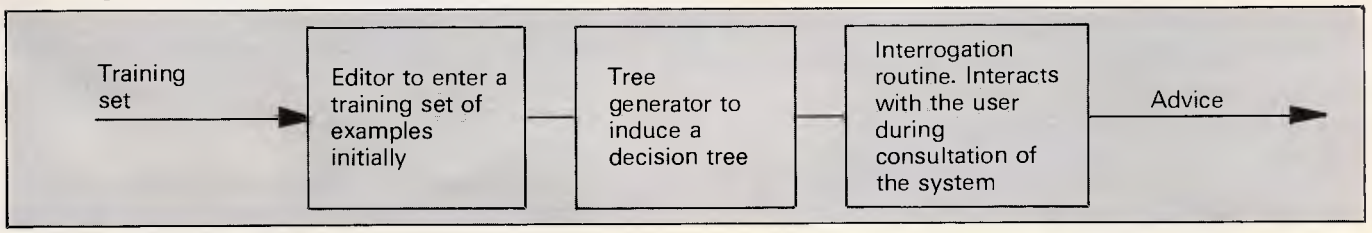

Fig 3 An inductive expert system

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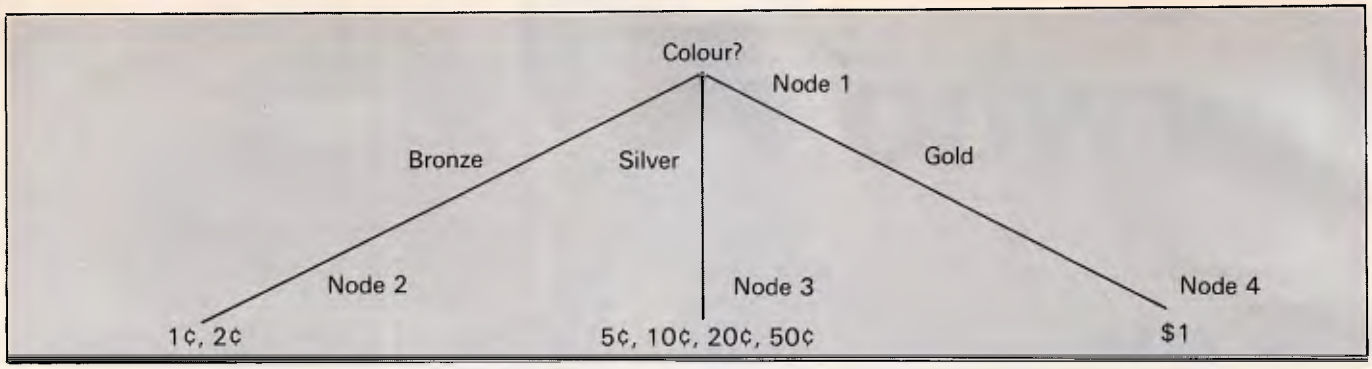

Fig 4 The first level of the tree during tree generation

tree on the strength of the answers (which is also easier than it sounds). Users of disk-based machines will probably store the training set and tree as files; if so, a word processor might be pressed into service as an editor, at least as a temporary measure. Cassette-based machines can hold a modest training set and tree in RAM, a 48k machine being especially useful.

Do not be put off by the AI pundits who insist that expert systems must be programmed in Lisp or Prolog. Procedural languages are perfectly acceptable for inductive expert systems so use C or Pascal if you have them, but do use Basic if not. Lisp and Prolog are excellent for many problems, but cannot really be recommended for inductive expert system implementations.

Many different (but equivalent) trees may be drawn to represent a particular training set (depending upon which question is chosen at each node), but the system must select the best. To do this it uses information theory, a subject that has grown from the field of communications to cover efficient means of handling and transmitting information.

Each question in the tree must be carefully selected to yield the maximum amount of information possible. Let's consider the machine's choice of its first question in the guessing game. Suppose it asks 'Is the coin round?' Most coins are round, only the 50¢ is not, so the question seems like a good way of identifying a 50 cents piece. If the expert system gambles that the unknown coin is a 50¢, it could ask the Round? question and, if the coin is indeed a 50¢, immediately win the game. However, usually the coin will not be a 50¢ (six times out of seven if the coins are picked at random) and so, although the question serves to eliminate the 50¢, it is generally of little help.

On the other hand, suppose that the system asks 'What colour is the coin?'. If the answer is 'gold', then the machine should think itself lucky and can assume straight away that the coin is a $1. If the answer is 'bronze' then, as stated earlier, just one further question will distinguish between a 1¢ and a 2¢. If the coin is silver (5¢, 10¢, 20¢ or 50¢) then two more questions will yield its identity.

The Colour? question is unlikely to completely identify the coin, but it does give a great deal of information regardless of the answer. The Round? question tells us a lot about the coin if, by chance, it happens to be a 50¢, but otherwise tells us virtually nothing.

How can a computer judge how much information a question will give? Roughly speaking, the better the instances are separated by a question, the better the question. To explain that, the Round? question separates the seven instances of the training set into two piles. Six for yes and one for no. The Colour? question produces three piles: two bronzes, four silvers and one gold, so it tends to separate the instances better. AI is full of rules of thumb ('heuristics' in the jargon). Along these lines, a good heuristic to pick a question is to calculate the sum of the squares of the height of each pile and to pick the smallest (that is, a least squares selection). That might sound involved, but it demands no great mathematical ability. For the Round? question the answer is:

$$6^2 + 1^2 = 37$$

and for the Colour? question we get:

$$2^2 + 4^2 + 1^2 = 21$$

Colour? gives a smaller answer so, by our rule of thumb, it separates the instances better to give us, on average, more information. A complete set of least squares coefficients for the first question is given in Fig 1. On this basis, Colour? is picked as the first attribute to ask for and the machine can begin to grow its decision tree (Fig 4).

There are now three new nodes in the tree to look at. The instances in the training set are split up by assigning them to their relevant nodes, and the procedure is repeated at the new nodes until a situation is reached where each node has only one class assigned to it. This has already happened for the right-hand node ($1) in our example, so it can be marked as a leaf and henceforth left undisturbed by the tree generator.

On a more pragmatic note, the tree can be stored as a series of forward and backward pointers (with each node pointing to its parent node and to its offspring)

Node number	Number of offspring	Pointer to offspring 1	Pointer to offspring 2		Pointer to offspring n	Attribute
1	3	2	3		4	Colour?

Fig 5 Format for storing a decision tree in tabular form

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although, strictly speaking, forward pointers are sufficient. The nodes can be numbered 1,2,3,4,... as they are created and referenced in this way by the tree-walking routine. A good format to use when storing each node is shown in Fig 5. The node number is noted together with the number of offspring it has (zero if it's a leaf), pointers to each of the offspring, and a token indicating which attribute should be requested by the interrogation routine when it gets to the node. The interrogation routine need simply ask the user for the value of the attribute and use that value to select which of the offspring nodes to move on to next.

Conclusion

There is some debate as to whether an inductive expert system is really an expert system at all. Certainly it is not a conventional expert system (differing as it does from the production system architectures of Mycin and Prospector) but it does employ rules, so it can definitely be called a rule-based system and it is capable of learning. One of the main differences between a Mycin-style system and an inductive expert system is that Mycin uses around 400 individual rules (of the IF x THEN y type) whereas an inductive expert system generates and uses one all-encompassing rule — the tree itself. Also, an inductive system cannot easily explain its line of reasoning in the way that Mycin can, nor can it cope very well with uncertain data. These problems must be addressed if induction is to make a real contribution to AI.

Expert systems are still in their infancy, and no hard and fast definition has emerged as yet.

It remains to be seen exactly what type of fields an inductive expert system might be used within. The matter of selecting which attributes to look at is far from straightforward. The attributes used in the training set for the coins example were discovered by spending five minutes in an armchair looking at a handful of loose change, but it is less obvious what attributes should be used in, say, a medical diagnosis system. A partial solution is to include any attribute into the training set if it might conceivably be of use (for example, the state of the weather, the Dow Jones index, your mother's birthday) as an inductive expert system will automatically ignore an attribute if it has no bearing on the decision process. However, such an approach tends to complicate the knowledge acquisition process (the business of actually finding a training set in the first place) and is really a last-resort measure.

Inductive expert systems alone will probably not form the basis of complete expert systems when the Fifth Generation finally arrives, but they are a good first step on the road to 'AI for everyone' which the Japanese have set out to follow. More importantly though, they seem likely to become increasingly common as add-on rule generation modules for use within conventional expert systems.

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TIM IV

TIM IV, a basic data management package, has had great success in the US among non-programmers. But will its limited features be suitable for Australian users? Kathy Lang finds out.

TIM IV (short for Total Information Management) has been an extremely popular package in the US for several years, providing basic data management features for the non-programmer at a reasonable price. Its originators, Innovative Software, continue to support and develop it alongside its recent integrated package, Smart, which contains a more powerful data management system at correspondingly greater cost. While TIM IV has been available in this country for a while, it has so far had an extremely low profile and very little promotion. The most recent version of the package is distributed by Sourceware, which markets it as a middle-of-the-road package alongside the more powerful Smart suite of modules.

My own feelings is that there are many users who need straightforward data management facilities but do not want to pay the price, either in money or complexity, of a grander package with all the bells and whistles. With this in mind, it's worthwhile to look at a package which seems to fit that bill, and which is also widely used across the US.

Each record in a TIM IV file has the same format and occupies the same amount of space, so it is more suitable for applications where the information has a regular structure than for those which handle large amounts of text. You can link files with dissimilar structures, but only in a limited way, to allow the updating and checking of interrelated sets of information. Unlike the great majority of its competitors among data management systems (as distinct from integrated packages), TIM IV allows you to convert your data into a form which can be read by several different spreadsheet packages, allowing you to build up your applications gradually if necessary. TIM IV is operated by a system of menus and sub-menus, plus function keys; there are, however, no facilities for stringing together frequently-used procedures. This makes TIM IV extremely easy to use, but less suitable for use by system developers.

'... there are many users who need straightforward management facilities but do not want to pay the price ... of a grander package ...'

TIM IV is available for the IBM PC and compatibles, as well as a number of other 16-bit systems including the Wang, DEC and Texas Instruments PCs.

Constraints

The main constraints of TIM IV are shown in Fig 1. Those likely to be most serious are the limit on the length of character fields (60 characters) and the relatively small number of fields allowed (40). TIM IV provides several unusual field formats, including inverted fields, which allow you to store a field in the manner required for display, but to have it sorted with the two elements reversed. The most obvious example of its use is for names, where you frequently want to store both christian name and surname, to display the names in that order, but to sort them with surname first. The inverted field type avoids the need to have two fields for this purpose. Dates may be in American (MM/DD/YY) or Australian (DD/MM/YY) format. Fields may contain calculated values, or totals of other field values.

File creation and indexing

The first step in creating a file is to define the name, length and type of each field. TIM IV makes this a relatively easy task — you just have to fill in a table with these entries. There are also some shorthand features: for example, to create a file similar to another, you can copy the structure and amend it accordingly. Any of the first 36 fields may be keys. Each major key field may have one or more subsidiary keys (in order that you can index by town within state, for example) up to a maximum of 16 minor keys to each major key, provided the total length of a major key and its related minor keys does not exceed 80 characters. Indexes can be added and deleted at any time; both processes are fast.

The next stage is to create a screen display format — there is a default format which shows one field per line of the screen. A single record may actually span two physical screens. The process of designing a customised screen is straightforward, but cursor movement is not very fast and gives flickers on the screen.

When a record format has been defined and data entered, it can be changed only by copying, but TIM IV has a special routine for this which allows you to have the old form of the file on one floppy disk and the new form on another.

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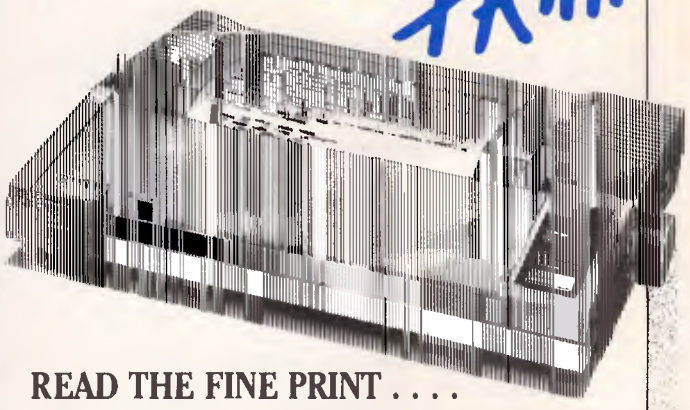

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This, of course, allows you to restructure much larger files than those systems which oblige you to have a program disk mounted continuously.

Data input and updating

Records are added using the default screen layout or one designed during file creation. There are several useful touches to speed entry. One function key gives a repeat of the value of the equivalent field in the previous record (an approach which I prefer to entering an instruction to that effect in the record definition). If a record does not require entries in every field, you can save it when the record is complete. You are not obliged, as you are in many packages, to press RETURN once for each empty field.

When retrieving records for editing, you can request records which match any key value, and these will be retrieved using the appropriate index. Alternatively, you can match part of a key field, or all or part of any non-key field, in which case the file will be searched sequentially. You can access the first record, or jump to a particular record by record number. Better still, you can jump forward or backward one record or many, relative to the current record, which allows you to browse quickly and easily using any index. Such provisions are unusually flexible for a package in this class.

When records are deleted, they are simply marked for deletion so that you can change your mind if necessary — up to the point where you ask for all deleted records to be expunged. The drawback to the TIM IV method of adding and editing records is that indexes are updated in a batch, either at the end of the session or later when you request it. This removes an overhead from record amendment, but means that you cannot retrieve new records, or retrieve for a second time records whose key field values have changed, until after the batch update has taken place.

As an alternative to amending individual records on the screen, you can set up conditions for the selection of subsets of records which will be automatically amended in the same way. For example, you can request that any two fields be added together, or a field incremented by 10 per cent. There are limitations on this feature, so you should check carefully that your particular requirements are met if you need automatic updating.

Screen display

For editing and viewing TIM IV records, whether selected by individual key value or by setting selection criteria, you can use the individual record format set up when the file is created. If you simply wish to view TIM IV records, then any list or report can be shown on the screen as an alternative to being printed or being sent to a file.

Max file size	32767 records
Max record size	2400 characters
Max no fields	40
Max field size	60 characters
Max digits	Not stated
Max prime key length	80 characters
Special disk format?	No
File size fixed?	No
Link to ASCII files?	Yes, several formats
Data types	Numeric, char, data, and so on
Fixed rec structure?	Yes
Fixed record length stored	Yes
Amend rec structure?	By copying
Link data files?	Yes, in limited ways
No data files open	Two
No sort fields	36 (by using indexes)
No keys	36
Max key length (chars, fields)	80, 17
Subsidiary indexes kept up-to-date?	In a batch, after amendment
Data validation	Adequate
Screen formatting	Paint-a-screen or default
Unique keys	No
Report formatting	Columns, lists, default
Store calculated data	Input, batch updating
Totals & statistics	Totals + sub-totals
Store selecn criteria	Mandatory
Combining criteria	And, Or (may use brackets)
>1 criterion/ field?	Yes
Wild code selection?	String within field
Browsing methods	Any field
Interaction methods	Menus, commands
Reference Manual+	***
Tutorial Guide+	No
Reference Card+	**
Online help+	***
Hot-line?	Not stated

*= rating, maximum five stars

Fig 1 Features and constraints .

Printed reports

TIM IV provides a variety of formats for printing your results. A simple 'screen print' facility allows you to get an immediate listing of the current record, while the Quick Print feature gives a report on all the fields of all the currently selected records in the file, using the default field widths from the file creation information.

For more sophisticated formats, two basic report types are provided: lists and reports. Lists permit the printing of several lines for each record, usually with several records printed side by side; this format is most often used to print address labels. Reports provide for columnar display of information, with field and record selection. Two levels of sub-total are permitted, using key fields to dictate where the breaks are to occur. You can request just the printing of totals, which can be useful for obtaining summary information.

Both list and report formats can be amended, so you can experiment to get the format you need without starting from scratch each time. Text is 'wrapped' within narrow columns if necessary, but there is no special provision for writing personalised letters. To do this, you would need to pass sets of data across to a word processor with this capability.

Selection and sorting

To select subsets of TIM IV records, you set up one or more tests in a single command. These tests may be of a field against another, or against a constant; comparisons may include the usual range of operators such as less than, greater than, and so on, together with testing for a value being within a range, or for a value containing a set of characters. You can therefore test for a name having the letters JOHN somewhere in it, or being between SMITH and THOMPSON. Tests may be linked with And and Or in any combination, and brackets may be used to ensure correct ordering.

It is therefore possible to devise a wide variety of tests. Before a selection can be performed, the set of tests must be stored with a name for subsequent use, so selecting subsets is always a two-stage process. You may, however, include provision for one or more test values to be entered when the selection is actually implemented. Included within the setting-up process is the order in

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Technical Data - HR31 200

CRT Size:	14" Diagonal (34cm)
Tube:	Black Matrix
Sync-H. Scan Frequency:	15.7kHz
V. Scan Frequency:	60Hz
Signal Type:	RGB 1: TTL Level Positive Sync H/V: TTL Level Positive
Display Size (H x V):	245mm x 170mm
Retrace Time (H x V):	0.5Ms x 0.4msec
Resolution:	640 x 200 lines
Input Terminals:	9 pin "D" type connector
Dimensions:	11"(H) x 15"(W) x 13"(D) 266(H) x 367(W) x 318(D)mm
Shipping Weight:	15.9kg

Model HR31 200

Models HR 39 & HR 134

Technical Data - HR 39 & HR 134

CRT Size:	12" Diagonal (29cm)
Phosphor:	HR 39 (Green); HR 134 (Amber)
Sync-H. Scan Frequency:	18.432kHz
V. Scan Frequency:	50/60Hz
Signal Input:	Video - TTL Level Positive Sync. H - TTL Level Positive Sync. V - TTL Level Negative
Video Response:	20MHz
Display Size (H x V):	203mm x 135mm
Display Time (H x V):	44Ms x 18.99msec
Resolution:	Centre 1,000 lines Corner 800 lines
Display Formats:	9 x 14 matrix, 2000 characters in 80 x 25 format
Input Terminals:	9 pin "D" type connector
Dimensions:	10.5"(H) x 15"(W) x 12"(D) 257(H) x 367(W) x 294(D)mm
Shipping Weight:	11.36kg

All models: 240V AC/50Hz

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which the records are to be selected: that is, you state at that stage which key is to be used for ordering the output.

TIM IV does not provide sorting facilities as such — all ordering is controlled by indexes. It is, however, simple and fast to set up new indexes, and the limitation on numbers is very generous. As output in any form may be ordered by any key, this approach is likely to be much more efficient than physically sorting complete records.

Calculation

During input, TIM IV can calculate fields on the basis of formulae defined when the file is set up. Fields can also be automatically recalculated to provide a batch updating facility, as described under 'Data input and updating'. In either case, you build up the formula by selecting options rather than by entering the complete formula, so there are restrictions on the complexity of the formula which can be applied. The third possibility for calculating fields is described in the next section, as it relates to the ability to update one file from another.

Multiple files

TIM IV has limited facilities for relating two files together. The data file which controls the process is called the 'driver file', and the related file is called the 'target file'. The match between the two is made by a key; where the key is composed of several elements, these must be in the same order in the key in each file. TIM IV expects to find one record in the target file for every record in the driver file (although not necessarily *vice versa*). Amendments can be made to either the target or the driver file; in each case, a field may be replaced by, have added to or subtracted from it the field value in the updating file.

Where the target file is updated by the driver, TIM IV calls the process 'posting', which is intended for such circumstances as updating a client's record containing his total indebtedness from an invoice record or a credit note. If the driver is being updated by the target file, TIM IV calls the operation 'look-up', and it would be most useful when you were creating, say, an order using a customer code, and wished to copy the customer's full name and address from the target file.

In a similar fashion, using a key to link the two files, you can include information from two files in a single report.

Clearly these options cannot cover all the possible relationships you might want to create between linked sets of information, but they do comprise those most commonly found in commercial applications, and will be adequate for many situations.

Tailoring

There are no facilities for tailoring TIM IV to provide a particular 'user image' for individual applications — you cannot, for example, set up a menu of your own for novice users. The TIM IV manual does, however, include a full definition of the structure of the system's files, and a set of Basic subroutines with which to access them, so that you could relatively easily extend the package's facilities by writing supplementary programs in Basic if you needed to.

Security & housekeeping

TIM IV files can be protected with a four-character password if you wish. A variety of utilities are included within TIM IV, the most noteworthy being a directory of files and a back-up routine to copy files to floppy disk.

'The facilities for linking files together are simple but not particularly powerful; they should, however, be sufficient for many applications . . .'

Links with outside

TIM IV provides unusually good facilities for communicating with other packages, especially spreadsheets — an incomprehensible omission from most data management systems. You can write data out either in DIF format, for input to packages such as SuperCalc 3, or in SYLK for Microsoft's Multiplan. The data may be a set of records, or you can have the data summarised into a table of the type more usually handled in spreadsheets. This latter feature is, as far as I know, unique, and would be extremely useful in some applications. If you have a data management system, you rarely want to handle the data in the same way in the spreadsheet. It is much more likely that you will want to extract summary information from the database and use it to make predictions about future trends.

For word processing — perhaps for including TIM IV data in personalised letters — you can write files in formats which can be read by WordStar's Mailmerge option, by Word Plus, Word Perfect and Peachtext. The Mailmerge format is ASCII comma-delimited, so it can be read by most programming languages too, including Basic.

User image

TIM IV is a menu-driven package, but it does not take this to ridiculous levels of nested sub-menus. In general, each main menu option, such as Add a record and Create a new file, has just one level of sub-menu, if any; the rest of the control is exercised using question-and-answer to a limited degree, plus function keys.

BM1	Time to add one new record	2secs+merge
BM2	Time to select record by primary key	4secs 2secs
BM3	Time to select record by secondary key	7secs 2 secs
BM4	Time to access 20 records from 1000 sequentially on three-character field (same field as in BM2 key)	3secs 14secs
BM5	Time to access record using wild code	3secs 4 secs
BM6	Time to index 1000 records on three-character field	2mins 4secs
BM7	Time to sort 1000 records on five-character field	2mins
BM8	Time to calculate on one field per record and store result in record	13mins 10secs
BM9	Time to total three fields over 1000 records	3mins 40secs
BM10	Time to add one new field to each of 1000 records	12mins 20secs

Time to import a file of 1000 records: 9mins

Notes: NT = Not tested NP = Not possible + = including scrolling
Where two times are given, first is to access to first record, second is access to each subsequent record

Fig 2 Benchmark times recorded on IBMPC/XT/H

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You can jump directly from one main menu option to another without invoking the main menu each time, so a reasonable compromise has been struck between ease of use for the novice and speed for the more experienced user. The one aspect I found troublesome was the use throughout the package of field numbers rather than names. Where there is likely to be confusion, TIM IV usually displays the list of field names with the number alongside, and it is indeed faster to type numbers than names, but the dangers of confusion and inaccuracy still outweigh the advantages.

The other difficulty I had, although it was an irritant more than a serious drawback, was with the messages concerning program disks. Even if you install the system on a hard disk, you are regularly prompted to replace one program disk with another.

All that is needed with a hard disk is to press RETURN, but it does slow things down and I could not find a way to avoid it.

For those who have a colour screen, TIM IV is displayed in colour, but I could not find a way to adapt the colours to my own requirements. Those chosen are not displeasing, but I still prefer to be able to exploit the facilities on which good money has been expended.

Documentation

TIM IV comes with a very readable manual which does duty both as tutorial and reference. The content succeeds in this aim quite well, but the order is a little unusual. You are taken through each main menu option in turn, in alphabetical order, which means that adding a record is described before creating a file. It's OK when you get used to it, but I found it rather offputting at first.

An appendix contains a list of all TIM IV options ordered by the menu in which they occur, so this provides a kind of menu 'road map' although as a list rather than in the diagrammatic form I prefer. There are also four detailed examples of using TIM IV in specific applications, and data files for use with these are provided on the disk — always a valuable way to get to grips with a package. There are no tutorials as such, but I'm rather sceptical about the extent to which users actually work through these when they are available — most people seem to look for an example close to what they want to do and adapt that, which can be done with the TIM IV approach.

Online help is available on request. You can either ask about the use of a particular option from the main menu, or, in some circumstances, press a function key to get more detailed information from within an option. The detail is not great, but the package is so simple to use that this is not really a problem.

Conclusion

TIM IV provides a good range of data management facilities for straightforward applications. It is better suited to information which has a regular structure, and the limit of 60 characters per field restricts its use in areas needing to store substantial amounts of text. The indexing capabilities are extremely good, being both flexible and powerful, although the approach of updating only in a batch at the end of an editing session will cause problems in some applications.

The package's reporting features include a good label-producing routine and some basic columnar reporting, but no letter writer. The features for linking to other packages are, however, unusually good, so personalised letters could be produced in conjunction with a word processor.

The ability to output data in a variety of spreadsheet formats, both 'as is' and in aggregated form, gives flexibility.

And the facilities for linking files together are simple but not particularly powerful; they should, however, be sufficient for many applications, and exceed what is usually provided in this price bracket.

All in all, TIM IV is good value for money, and should give very satisfactory results to people whose requirements it fits.

Summary

Supplier:	Sourceware
Telephone:	(02) 411 5711
Cost:	$549
Systems:	PC, some MS
Version reviewed:	4.02
Type:	Novice users, structured data
Features:	Data management system with good features for straightforward applications. Formatted screens, simple reporting, powerful selection with plenty of keys, simple relationships between files, and unusually good features for writing spreadsheet and word processor files.
Drawbacks:	Updating of indexes not immediate, so can't retrieve a new record until next session. Limited intra-file links.
Ease of use:	Good: menu-driven plus simple commands and function keys.

'Now, thanks to this, I don't miss any obscene calls when I'm out.'

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New life?

Have you ever thought of your computer as a living thing, capable of thought, movement and reproduction? Unlikely as the idea may seem, some controversy exists as to the possibility of this sci-fi state becoming reality. Geoff Simons adds to the argument.

One of the consequences of artificial intelligence (AI) work in recent years is that we are now forced to re-examine many of the conventional adjectives traditionally applied to human beings — words such as conscious, free, thinking, aware, perceptive and intelligent. The stuff of classical psychological research is surprisingly important in modern computer science.

In particular, we are seeing an evolution of the term 'intelligent'. It does not seem that long ago when reputable computer journals spoke of 'intelligent' processors, 'intelligent' terminals, and so on, with the adjective always in quotes as if to signal that it was not true intelligence that was being talked about. Today the quotation marks have completely disappeared, and it is commonplace to read of machine intelligence. Of course, there is debate as to the nature of this intelligence, but with the parade of all the modern subsclasses of AI — problem-solving, advisory expert systems, pattern recognition, language understanding, and so on — the status of machine intelligence, however it is interpreted, is becoming increasingly secure.

Life-forms

There is also another startling possibility, distinct from mainstream AI but quickly seen as a similar threat to human vanity. This is the idea that computers and robots, appropriately configured, can properly be regarded as emerging life-forms. This daunting notion can be seen to be tenable when the decision is taken to regard all life-forms as essentially behaving systems of a certain type. I will argue why this decision is a reasonable one, but first it is worth pointing out that the idea of machine life is far from original.

To go back a long way, there are plenty of animated robots in Assyrian and Greek mythology. Homer (*Iliad*, Book XVIII) talked of maidens of gold, manufactured by the god Hephaestus, who were able to move and show intelligence and wisdom. Moving on to 1872, Samual Butler suggested in *Erewhon* that machines would become conscious and able to reproduce their kind. He even declared that contemporary machines were prototypes of future mechanical life. In this century the computer scientist Joseph Weizenbaum — scarcely sympathetic to many of the claims of AI — has written that he is prepared to regard a robot, suitably configured, as a type of organism. Similarly the cybernetician James Albus has suggested that robots are an evolving life-form, and others have proposed that life-forms might be based on electronic circuits. But the point needs to be argued . . .

Many traditional definitions of life simply list what are considered to be the essential qualities of living things. Organisms may be expected to grow, to exhibit metabolisms, to process information, to develop survival strategies, and to reproduce. Already we can see the ways in which computers take in energy ('eat'), process information ('think'), grow, age, and involve themselves in the generation of new computers ('reproduce'). The emerging reproductive capability of computer-based systems is evident in many different circumstances: for example, computers are used to design new computer circuits and to supervise the manufacture and assembly of new systems such as complex disk drives, sophisticated integrated circuits, and complex computer-based facilities. (If the reader is quick to point out that human beings are essential agents in machine reproduction, I need only mention that many species on earth cannot reproduce without the assistance of other species: for example, plant reproduction is completely dependent upon insects and birds.)

Reproduction

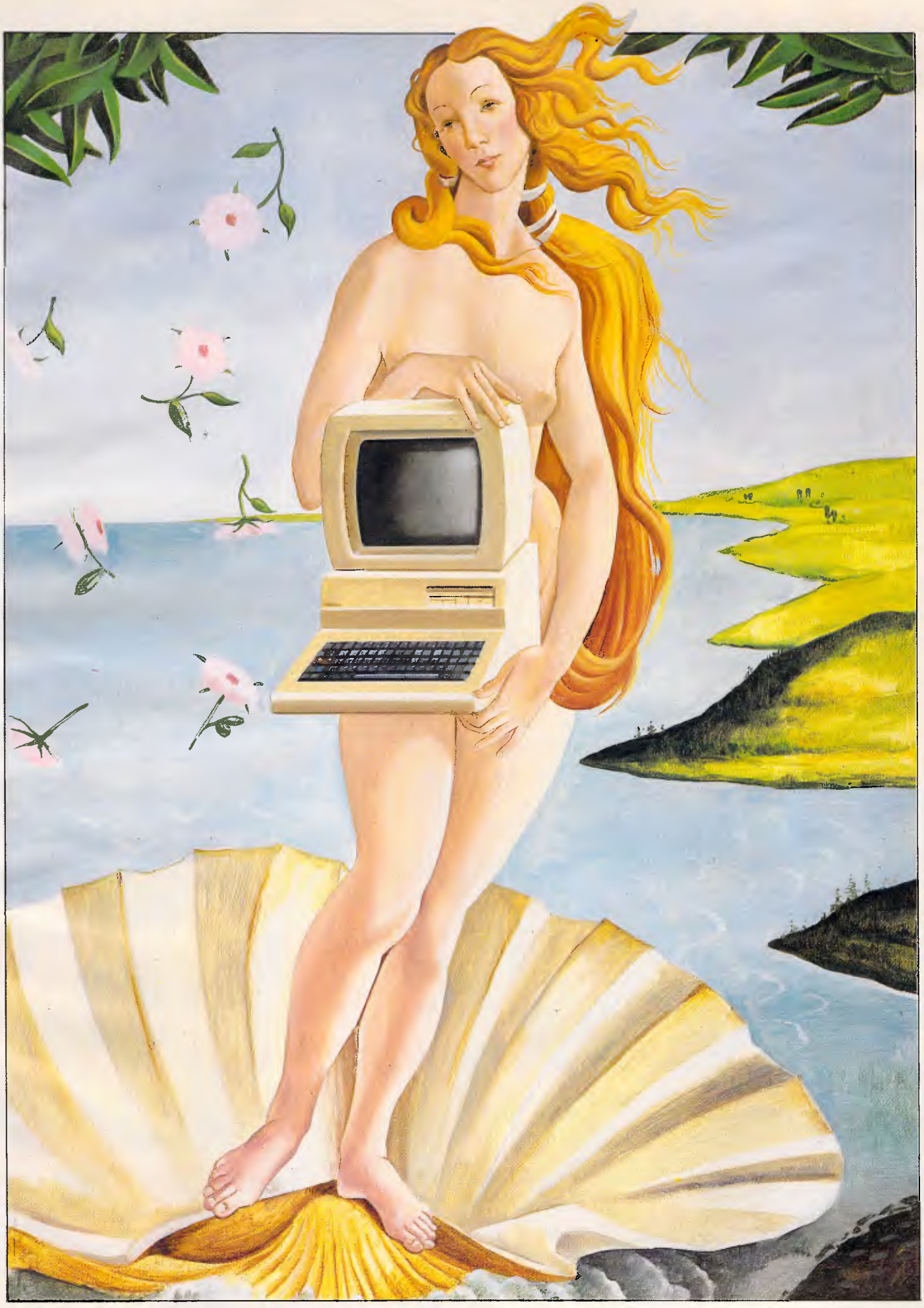
In general, the reproductive process in any life-form entails the processing of matter/energy and information, the transmitted information being in effect the template of the new system. Information, used to define the structure of the new system, can be carried in many forms. Traditional life-forms have relied upon DNA templates whereas emerging computer life-forms may be expected to store their species-specific templates in solid-state memories. In fact, it has been clear for several decades that genetic methods are not the only ways in which reproduction can be achieved, and I have considered in detail elsewhere the various reproductive strategies being evolved by emerging computer life-forms.

But reproduction is only one feature of living things, and even this does not characterise them all — as many a childless couple knows. It is necessary to broaden the argument to lay the foundations for a systems definition of life rather than the traditional (and excessively parochial) biochemical definition.

The millions of disparate species on earth all function in ways appropriate to their own natures. We do not expect all animals and plants to use energy, to process information and to reproduce in the same way. We should not demand that computers and robots perform in the same way as human beings in order to qualify as alive. We need to search for general criteria by which *any* life-form can be recognised as such, irrespective of the means — hydrocarbons, electronics, metaphysical substances, and so on — by which the life-form is animated. This entails recognising that the traditional life processes (for example, traditional chemical reactions in familiar life-forms) are nothing more than contingent means to realising the basic life functions. Put another way, there are many possible ways in which systems can accomplish the functions that are essential to life: chemistry is one, but there are conceivably many others.

A systems approach

JG Miller, in a remarkable book, developed a systems approach to the idea of life. He drew attention to a



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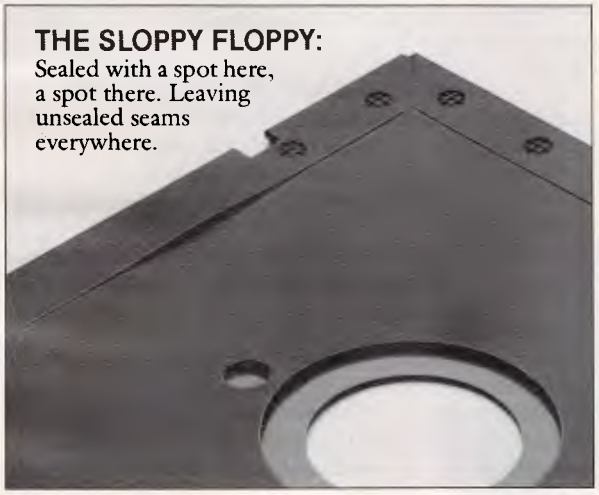

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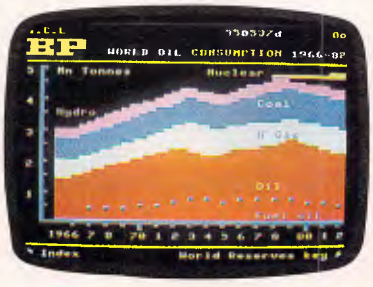

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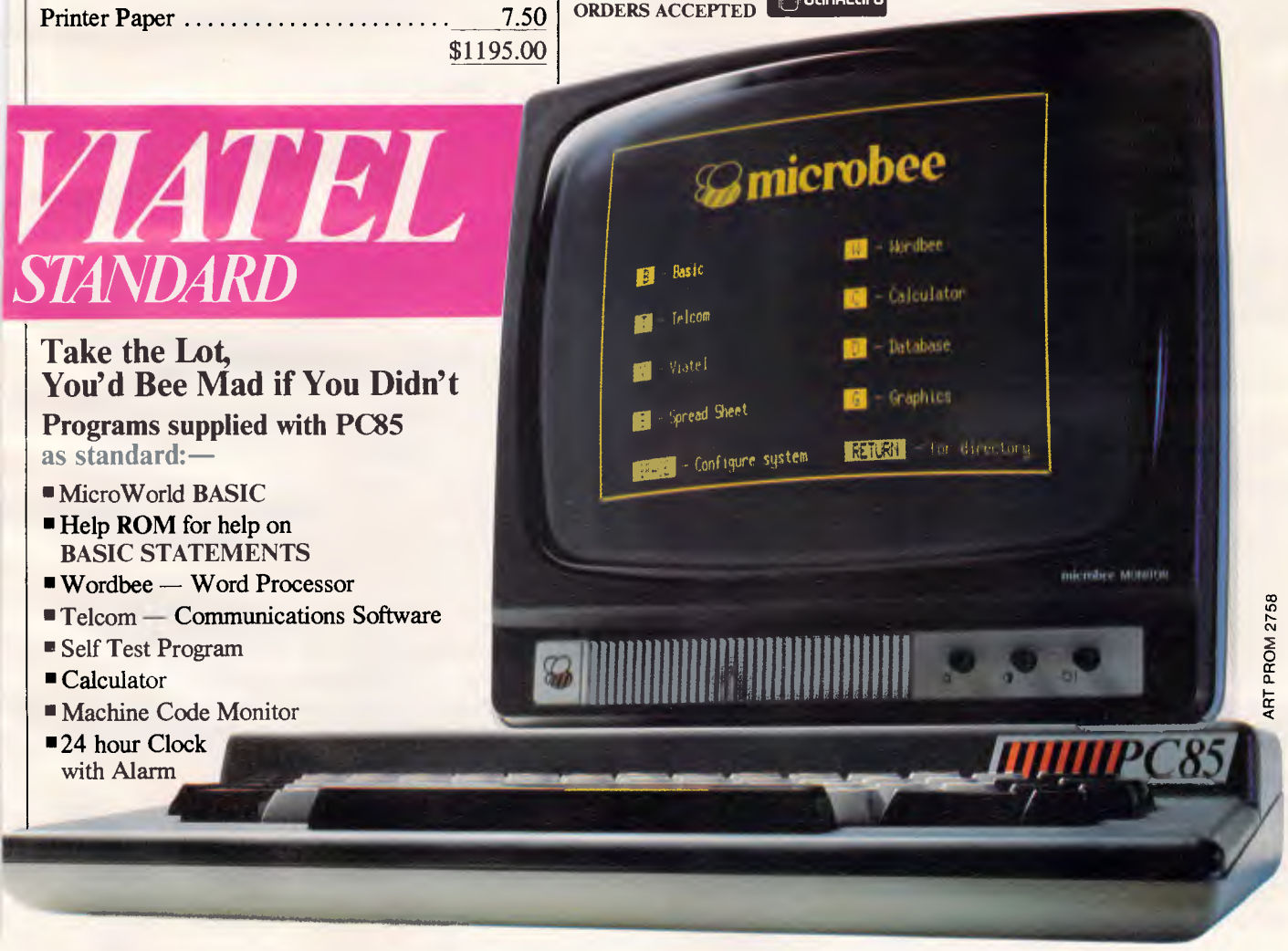

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hierarchy of structures on earth that may be said to be carrying out living processes. The seven levels in the hierarchy are defined as cells, organs, organisms, groups, organisations, societies and supranational systems. The systems at each level can deal with inputs, throughputs and outputs of various forms of matter, energy and information.

A key point for my argument is that the profound differences between the various living systems make it necessary to identify critical subsystems that are not limited to any particular type of organism or organisation. In other words, it is necessary to identify the 'critical subsystems of a living system' in such a way that no evident living system is excluded. Miller identifies 19 such subsystems, all of which can be identified in current computer systems (although he does not remark on this particular fact).

I have already looked at reproduction (the reproducer is one of Miller's critical subsystems). Other subsystems are the ingestor, the distributor, and the matter/energy store; these are variously involved in taking in energy, feeding it around the system, and getting rid of waste products (heat is an obvious waste product of all computer-based systems).

Other critical subsystems are required to handle information or to provide the life-form with the necessary physical cohesion. Here it is important to stress that the descriptions of the critical subsystems are independent of how the various subsystems are realised. There is no assumption that life has to be based on hydrocarbons. If a system can reproduce and handle energy and information in suitable ways, then the system has a claim to be regarded as living.

Behaviour

We can assume that living systems must be capable of behaving in certain ways; how the systems actually achieve the 'life behaviour' is a secondary matter. Human beings are parochially acquainted with organisms based on carbon, although this does not prevent some people from declaring that God is alive (or dead, as the case might be). It is often assumed, without analysis, that a chemical base is a necessary condition for life. However, when we adopt the systems approach to living organisms, we see that this is an unwarranted assumption.

In traditional life-forms — oaks, lice, fish, primates, and so on — the various metabolic processes are only characteristic of life in so far as they are part of the overall organic system. Metabolic 'pathways' are defined as the series of chemical reactions in which one chemical state is followed by another, which in turn is followed by another, and so on. This is of obvious chemical interest, but says nothing about biology unless we assume that the pathway is part of a subsystem that in turn is part of an overall organic system. A chemical reaction, in isolation, is nothing more than a chemical reaction. It can only gain life significance by contributing, at one level or another, to the working of the systems and subsystems that are characteristic of living things.

The central point here is that the chemical means are subservient to the system ends. It follows that in analysing what constitutes life, it is the systems that are philosophically important, not the chemistry. It is still obviously true, however, that for any chemically-based life-form, an understanding of chemistry is essential for an insight into how the organism functions. But there is the obvious corollary that an understanding of electronic circuits is likewise essential for any comprehension of the working of life-forms which are based on silicon electronics.

Any definition of life that makes biochemistry a necessary condition is unduly parochial, so chemistry can be seen to be contingent: it is one substrate for life, not the only one that is possible. Again this means that we should learn to recognise life according to life-type system activity, not according to how the activity is realised in particular instances. (We may fancifully imagine electronic creatures elsewhere in the galaxy debating whether there could ever be life-forms based on carbon molecules rather than on electrical and electronic circuits!)

When this argument is fully appreciated, it is very powerful. I have cited some writers who have speculated on the possibility of machine life, but I need have no recourse to authority: the argument will stand or fall on its merits. If the argument is valid, then computer-based systems may be regarded as alive when they satisfy certain behavioural criteria, when the systems exhibit life characteristics by processing energy and information in certain ways (for example, in the ways identified by Miller).

It is also interesting to mention apparent support for the argument from unexpected sources. For example, the famous physicist Erwin Schrodinger approached the essence of life through an exploration of physical entropy. In a seminal work he asked: 'What is the characteristic feature of life?' and replied: 'When it goes on "doing something", moving, exchanging material with its environment, and so forth, and for a much longer period then we would expect an inanimate piece of matter to "keep going" under similar circumstances.' He identified the essence of life as being behavioural rather than chemical. It is easy to see that computer-based systems, appropriately configured, can behave in all the ways that are essential to life when it is viewed from a systems perspective.

We can take any particular (systems) feature of an organism and identify its direct equivalent in computer terms. I have already hinted at how this might be done in connection with *any* life feature. As a minimum we can suggest that living systems — computer-based or not — should be able to function as discrete entities, to exploit available energy, to process energy and information (for cognitive and/or other purposes), to evolve survival strategies, and to be able to reproduce. There is nothing here that is beyond the capabilities of modern computer systems, appropriately designed. We should also remember that life can be rudimentary: we should not demand more for computers (in allowing them to qualify as alive) than we do for the simplest organisms.

Conclusion

When we think beyond the parochial biochemical view of life and see it in systems terms, the basic argument is established. We can recognise survival strategies, for example, in the emergence of the man/computer symbiosis (try to attack an important computer and you will be resisted by the police or the military), just as cleaner fish and aphids rely upon protectors (large predators and ants, respectively) for their security. Just as survival stragegies can be explored with reference to emerging computer organisms, so can many other life phenomena — such as consciousness, evolution and creativity. Nor should human involvement with computer life processes be allowed to tell against the argument.

As I have mentioned, the whole of the plant kingdom is unable to reproduce without assistance from other species (namely birds and insects). In short, when life is seen as essentially a systems phenomenon, it is clear that increasingly computer-based systems will be able to qualify as alive.

References

Miller, JG, *Living Systems*, McGraw-Hill, 1978; Schrodinger, E, *What is Life?*, Cambridge University Press, 1944; Simons, GL, *The Biology of Computer Life*, Harvester Press, 1985.

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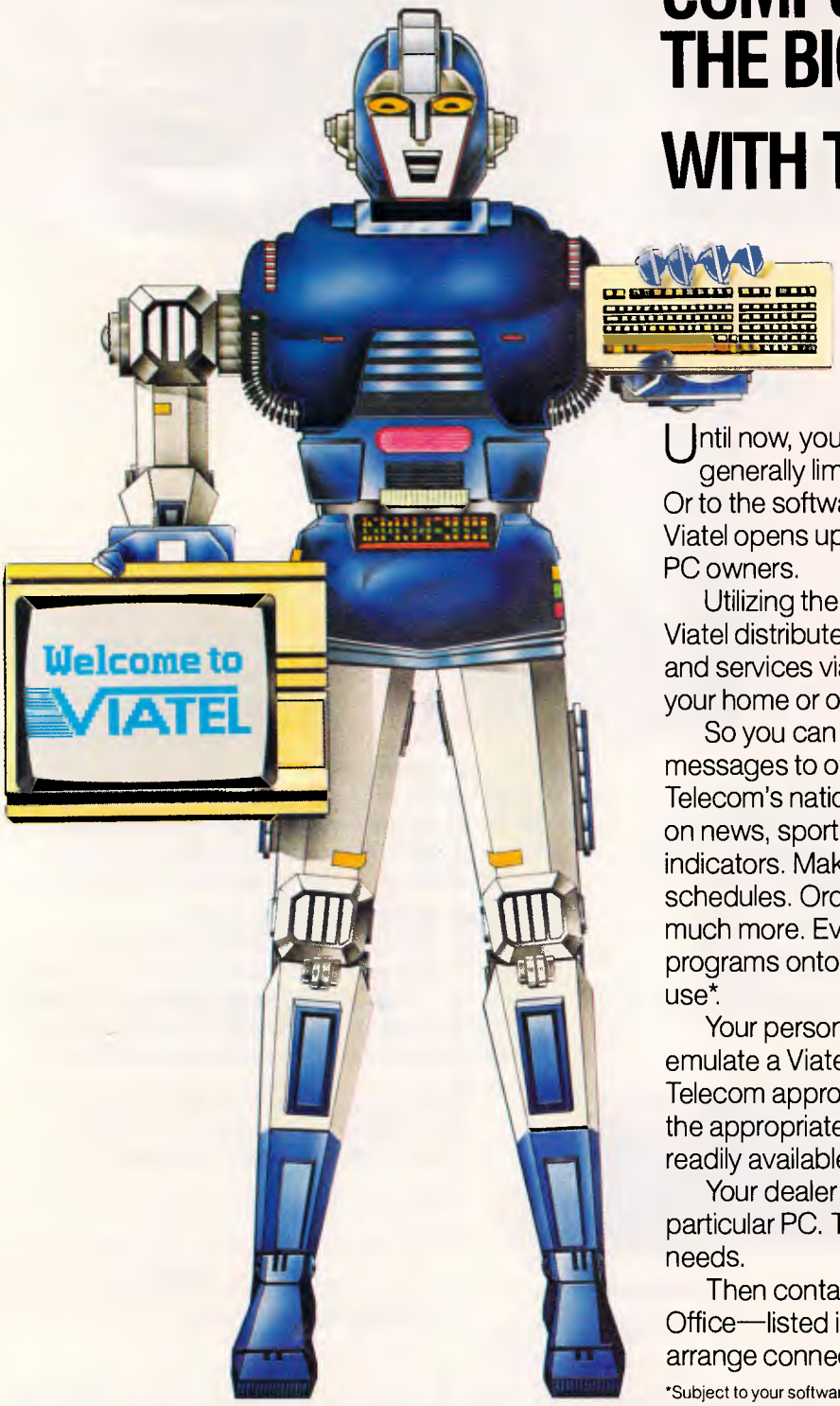

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Excel

Will Microsoft's Mac spreadsheet package Excel be a worthy challenger to Lotus Jazz? Mike Liardet weighs up the merits of a package which makes full use of the Mac's unique style.

Excel can be viewed as Microsoft's answer to Jazz. It offers sophisticated spreadsheeting facilities, graphics, and the spreadsheet style of database pioneered by Lotus 1-2-3.

Excel is designed to run on the Apple Macintosh. Not surprisingly, with all those facilities, it requires the so-called 'Fat Mac' with 512k of RAM, as well as a second disk drive. Except for the most trivial usage, a printer would be essential, with Apple's own ImageWriter being the obvious choice as it provides excellent copy of the charts and graphics generated by Excel.

The review software was a Beta-test version with a photocopied draft of the manual. It is worth emphasising that this is a very advanced Beta-test version, with very few holes and not too many bugs encountered during the review period. Unless Microsoft spends nine months gestating over a box to put it all in, Excel ought to be released very shortly.

As soon as Excel is up and running, the user is faced with the display shown in Fig 1. This is a combination of a fairly standard spreadsheet and a standard Mac applications environment.

As with most spreadsheet software, Excel simulates a window onto a small portion of a very large spreadsheet. In the initial display, six columns labelled A to F can be seen. Excel has many more columns available, labelled from G to Z then from AA to AZ, and so on, up to IV, with 256 columns in all. The rows are simply numbered, and the first 19 of 16,384 can be seen in the initial display.

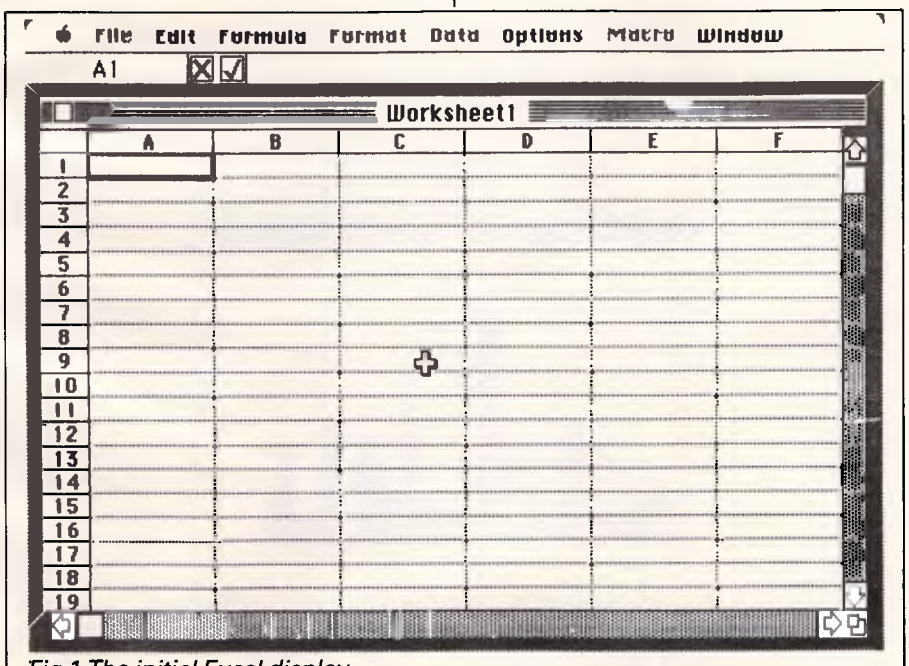

Fig 1 The initial Excel display

Taking full advantage of the Mac's superb graphics capabilities, the rows and columns are faintly delineated on the screen so it's easy to locate the row/column identification for any given cell. One cell is emphasised, and is given the current 'action point'. Anything typed at the keyboard, for example a number or fragment of text, is assumed to be intended for the current cell and is entered into it as it is typed.

The current action point can easily be changed using the mouse. So much has been written on the Mac's mouse (*APC*, April 1984) that I will be very brief here. The mouse can be used for virtually any operation you might want to perform in Excel. The cross in the middle of the screen indicates the current mouse position. When it is at the point you want on the spreadsheet, just click the mouse button and that cell will be the new action point.

Most of the display is devoted to the spreadsheet, but there is a surrounding border with arrows and cryptic symbols, as well as a couple of additional lines at the top of the screen.

These extra facilities come 'free' with the Mac, and now that a number of software developers have mastered them, there is at last a fair amount of Mac software that makes use of them. This standardisation should be of great value to the user as, having learned to use one package, say Excel, he will be able to drive all sorts of other packages that work in a similar way.

Initially Excel fills the entire screen with the single spreadsheet display, but there are facilities for shrinking or moving the window onto the spreadsheet. There is no reason to do this until additional windows have been created

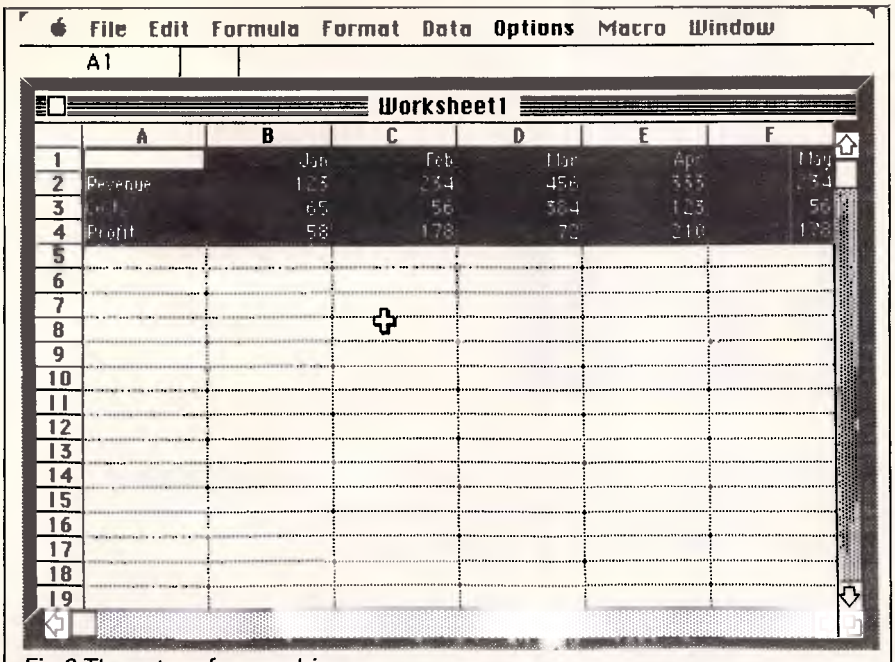

Fig 2 The set-up for graphing

and are fighting for space on the screen. Excel allows multiple spreadsheets and graphics windows, and these shrink-and-move facilities enable several sheets to be displayed side by side.

The top line of the display contains the main menu options which work in the normal Mac manner. In the spirit of standardisation, many other packages have similar-looking master menus. Nearly all have the Apple logo option, File and Edit for example, but within each menu the sub-options usually differ slightly, being tailored to the particular application.

Spreadsheeting

The basic operations on all spreadsheets involve entering numbers, text or formulae into the cells. It is surprising how little the keyboard is needed and how much of spreadsheeting involves pointing and menu operations, both of which can be performed with the mouse.

To verify that Excel can work like an ordinary spreadsheet, make A1 the active cell, and type a number followed by 'enter'. The number is displayed at A1, and the active cell drops down to A2. Enter another number. Then in cell A3, enter a formula. Formulae are preceded by an = sign so enter, say, = A1 + A2. Instantly the calculation is made and the result is displayed in A3. Move back to A1 and change the number there. Instant recalculation.

Sounds familiar? There are alternatives which reduce the amount of keyboard work which are most apparent when entering a formula. After pressing =, any cell reference can be entered by pointing in the right place with the mouse. None of the functions need be typed at the keyboard — they can be selected straight from a menu, and so on. While the formula is being set up the text appears on the line immediately below the menu line, alongside a tick and a cross. Select the tick with the mouse as an alternative to 'enter' or select the cross to abandon, and restore the original cell contents. In many cases it can be much faster working with the mouse, but keyboard addicts can work in the conventional way.

When text is too wide for the column width, it cannot be fully displayed unless there is nothing in the adjacent cell. By adjusting the column width, the whole text can be seen. Excel allows column widths to be adjusted in a very simple and direct way. The vertical line on the right of the relevant column heading can be dragged by the mouse to wherever you would like it to be. The display is then redrawn, with the entire column width changed as indicated.

Excel contains a full set of orthodox spreadsheeting facilities, various numeric display formats, row/column deletion, and so on, but wherever possible these commands are executed by pointing with the mouse rather than typing command sequences. For example, to copy part of the spreadsheet, first drag the mouse from top-left to the bottom-right of the area to be copied. It is then displayed in reverse. Click on the edit option to reveal 10 sub-options below, then pull down the mouse to select the copy operation. The inverse area reverts to normal, except for an animated dotted line around it. Now drag the mouse over the destination area. Back to edit, select paste this time, and *voila*! Made a mistake? Go back to edit and select undo to restore everything as it was.

Graphs

Suppose that we wish to draw a graph of the simple spreadsheet model of Fig 2. Firstly, we drag the mouse over the area to be plotted; as usual this is displayed in inverse. Then we must create a second sheet to hold the graph. Excel can work with three different types of sheet: the spreadsheet; the chart sheet for holding

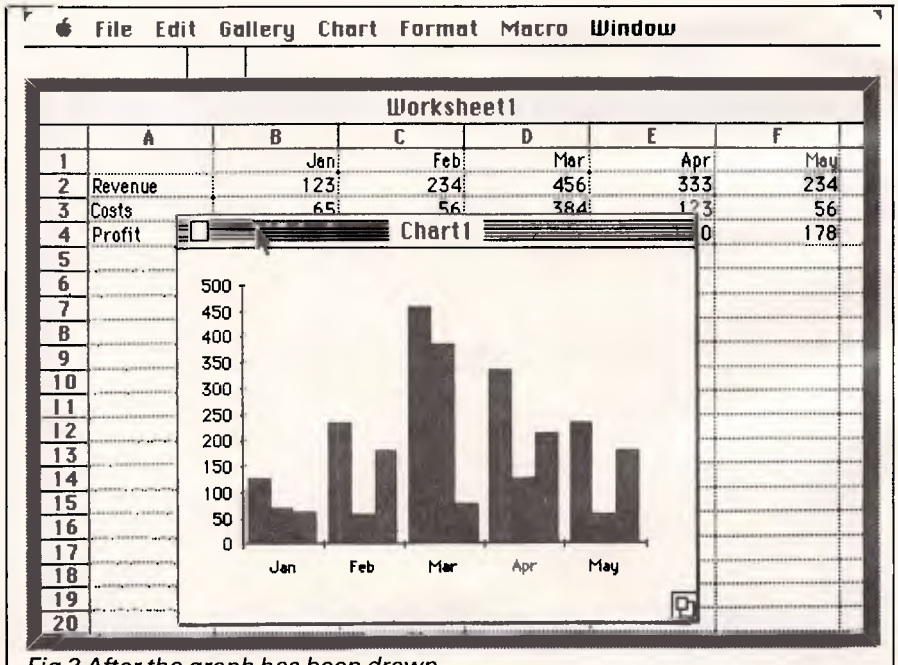

Fig 3 After the graph has been drawn

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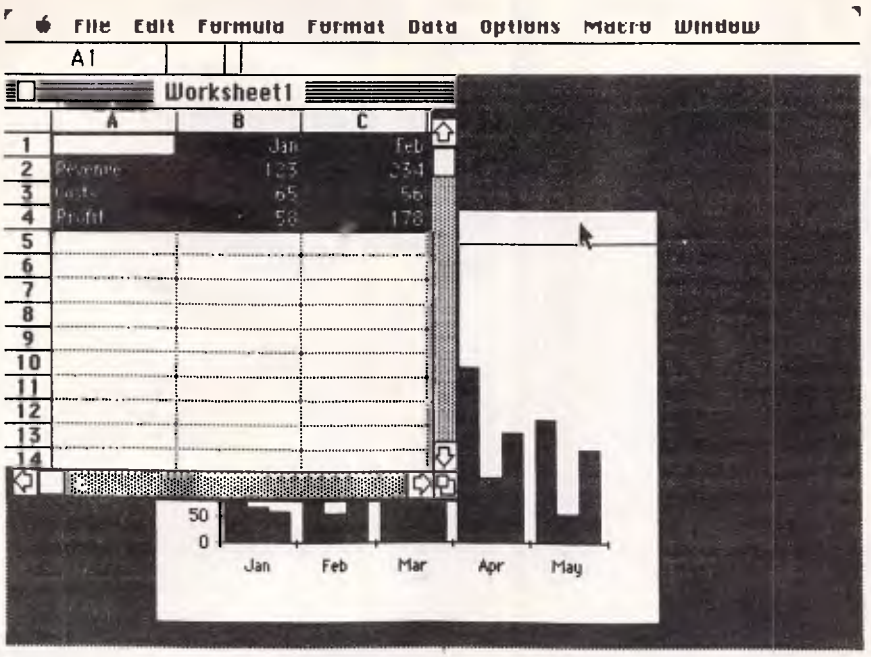


Fig 4 Redesigning the screen

graphs; and the macro sheet. To draw a graph it is necessary to create a chart sheet. This is done by pulling down the sub-options under file, then selecting 'new chart'. The spreadsheet is instantly overlaid with the chart, as shown in Fig 3.

The layout of the graph is completely planned by Excel, with scaling and the choice of cross-hatching all automatically set up. The horizontal axis annotation is taken from the top line of the spreadsheet, and the numeric values are plotted in the usual way. Excel also takes note of the row headings, but this is not evident in the bar chart.

It is very easy to change the style of the graph. Notice (at the top of Fig 3) that some of the menu options are different from those for the spreadsheet. The chart option offers a number of sub-options, one of which is to change the graph to any of six different styles: area, bar, column, line, pie and scatter.

Although Excel can handle an arbitrary number of sheets of all types, it makes sense for only one to be current at a time. In Fig 3, the chart sheet 'Chart 1' is current. If we now wish to make changes to the spreadsheet, it is necessary to make it the current one. This can be done by moving off the chart window and clicking anywhere on the spreadsheet. (In more complex situations than this, where there are a large number of sheets, it is easy to get lost.) Then the window menu option can be used. This option lists all available sheets, and the required one can be quickly identified and selected.

When the spreadsheet is current it comes to the foreground, completely covering the chart. In spite of this the chart is still in full communication with the spreadsheet, and any changes made there will be instantly reflected in the graph. Spreadsheet and graph working together can be achieved by shrinking the spreadsheet window and repositioning the chart.

First move the mouse to the overlapping squares symbol, seen in the bottom right-hand corner of Fig 2. The size of the window on the spreadsheet can be adjusted by dragging the mouse to the position at which you would like this symbol. The display is then completely redrawn, and a part of the graph window becomes visible (Fig 4). This can then be pulled out from under the worksheet by moving the mouse to the title bar (see black arrow in Fig 4), and dragging that to a new location. The graph sheet can be shrunk in size too, if necessary. We can move the mouse backwards and forwards to make adjustments to either the graph or the spreadsheet at will. The graph is always in step with the spreadsheet.

Although Excel can automatically plan a chart, it also offers numerous manual overrides for annotating axes, titling, rescaling, and so on. It is also possible to arrange for more spreadsheet cells to be plotted in the same graph. This would not be relevant for the simple spreadsheet in Fig 2, where everything is included, but can be useful for more complex cases where it is necessary to select various rows or columns.

Excel allows the graph to be augmented. Mark out the required area in the spreadsheet to be plotted in the usual way. Select copy from the edit menu, then click anywhere on the graph and select paste. The graph is then redrawn with the new values in place. This is exactly the same sequence as used for copying within the spreadsheet, except that the specified destination is not within the spreadsheet but within a chart sheet. The same general copying procedure can be used between any of the Excel sheets.

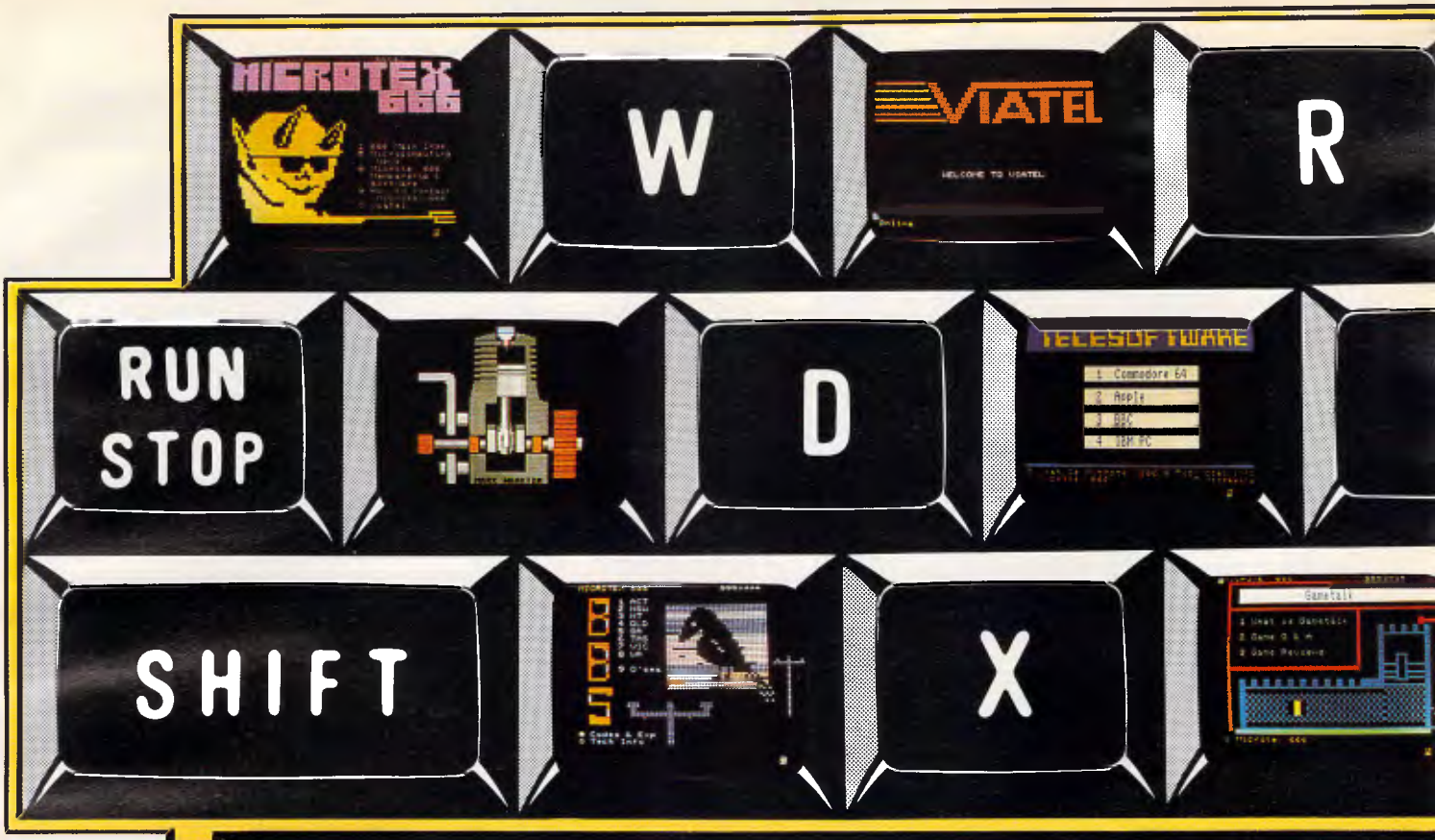
Database

It is possible to build simple databases with Excel by considering each row of the spreadsheet as a record and each column as a field. For example, Fig 5 shows part of a database for expense claims. Each record (or row) is a particular expense claim, and the first column (or field) contains the date of the claim, followed by the type, amount and claimant. The date and amount fields are both examples of formats available for numbers. Both values are stored as numbers and converted for display purposes. Among other things, this enables Excel to perform date arithmetic.

The information for a database can be set up in the standard spreadsheet fashion, including the use of formulae, if necessary. There is no 'database sheet' in Excel: the standard spreadsheet is used. One advantage of this is that, unlike many database systems, it is fairly easy to add new fields into an existing database — just use the column insertion facility.

All of the foregoing is of only marginal value without some special facilities to search or sort the records. To perform these database tasks, it is first necessary to inform Excel which part of the spreadsheet is being used as a database. It is quite possible to use other areas of the spreadsheet for non-database activities, and so Excel needs to be told which area to work on. The database area must be marked out in the usual way, being displayed in inverse. Then the 'set database' sub-option of the 'data' menu option is used. Excel has the facility to name regions and use them subsequently in formulae, and the set database is a convenient way of giving the required region the name 'database'. Of course, 'database' is a name of special significance to the database commands.

When the database region has been specified, a criterion region must be set up on which the SEARCH command will operate. It is convenient for this to be at the top of the spreadsheet, and in line



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12	1/5/84	overhead	$566	Ace Power & Light		
13	1/5/84	overhead	$600	Wheelin's Gas Co.		
14	1/5/84	overhead	$200	Ralph J Cook Garbage		
15	1/5/84	overhead	$440	City of Franklin		
16	1/6/84	inventory	$16,000	SW Wholesale		
17	1/5/84	salary	$1,000	Mary Fuller		
18	1/5/84	salary	$1,270	Carol Stensen		
19	1/5/84	salary	$945	Jim Parsons		
20	1/5/84	salary	$700	Karen Bush		
21	1/5/84	salary	$1,000	James Gregory		
22	1/5/84	salary	$1,160	Lisa La Flamme		
23	1/5/84	salary	$2,000	Andy Lubert		
24	1/15/84	overhead	$5,000	AR Office		
25	1/15/84	salary	$1,000	Mary Fuller		
26	1/15/84	salary	$1,270	Carol Stensen		
27	1/15/84	salary	$945	Jim Parsons		
28	1/15/84	salary	$700	Karen Bush		
29	1/15/84	salary	$1,000	James Gregory		

Fig 5 An example of a database

with this, it is recommended that you start the database a few lines down from there. The column headings/field names can be quickly copied to the top row, then the top row and the next one can be named as the criteria region by the 'set criteria' sub-option, similar to set database.

Having set up the criteria and database, records can be sought by filling in the required details immediately below the criterion names and using the find sub-option of data. If nothing is specified for a field name, then any record will do for that field. Each record matching the criteria is displayed in turn, and the down arrow, in the bottom-right of the window, can be used to flick on to the next. In the Beta-test version there were a few bugs, resulting in records frequently being missed.

It is possible to perform calculations on the database by using Excel's database statistical functions. Suppose the total expenses on salaries is required. Firstly, set the criteria to find all records where 'expense' is 'salary', then use the formula: DSUM (Database, 'Amount', Criteria) to perform the calculation. DSUM totals all 'amount' values from records in database-matching criteria.

There are other functions like DSUM: DAVERAGE, DMAX and DMIN, and DCOUNT to count the number of records found; and DSTDEV and DVAR for standard deviation and variance. All the database function names commence with D, and differ from their non-D cousins in that the ordinary functions only work non-selectively and will indiscriminately apply to all values in a specified region.

The data menu option contains a sub-option to sort the database. It is possible to sort either the rows or columns in ascending or descending order. Up to three fields can be specified. If on the first field there are several records with the same value, then they are ordered according to the values in the second specified field. If any of these match as well, then the third field is used to discriminate.

Advanced facilities

Excel has some very advanced facilities which may appeal to the programmer. It is possible to perform array calculations and also use a macro facility. Conventional spreadsheet users can ignore these extras, which never intrude on the normal operation of Excel, but if they make the effort to learn them they will be able to take a number of shortcuts in their subsequent spreadsheeting activities.

The array facility can be demonstrated by building a formula, for example:
SUM (B2:x2 ★ B3:x3)

Other spreadsheet systems would fail to recognise this, as it indicates a requirement to simultaneously multiply several pairs of values. In other systems we would be forced to use a less concise:
B2★B3 + C2★C3 + D2★D3 + E2★E3 . . . + X2★X3
or, more likely, allocate a row, say row 4, for the individual products and then SUM(B4:X4).

With Excel, it is also possible to include constant arrays in a formula, for example:
SUM(1,2,3) ★ B3:D3)

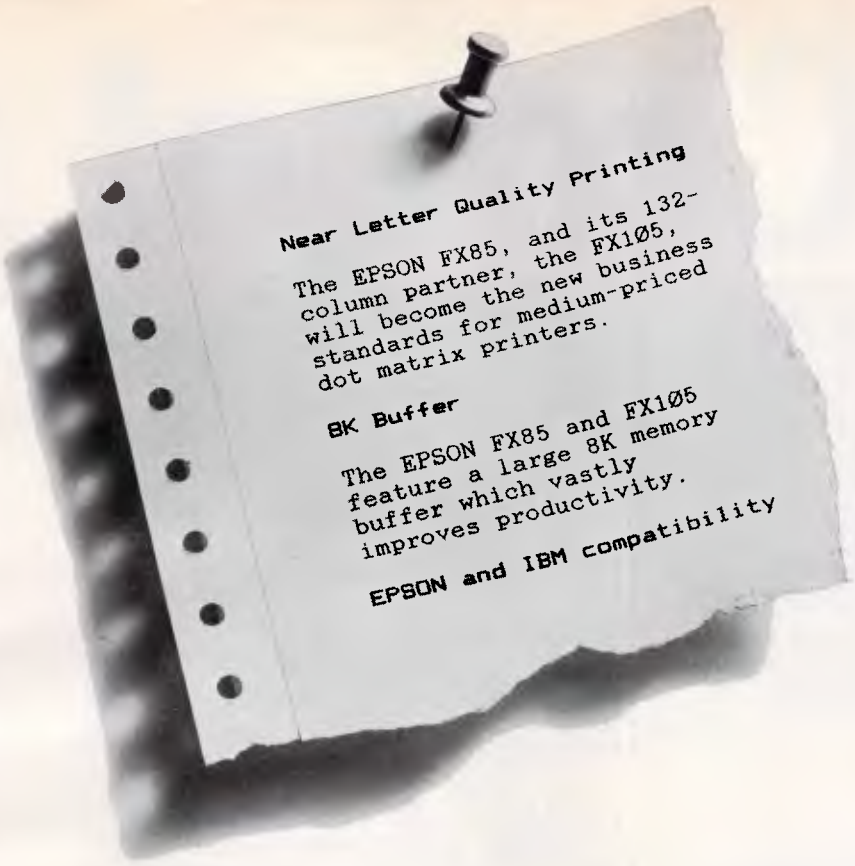
There are a number of other sophistications, such as a transpose function, which should put a gleam in the eye of the APL programmers.

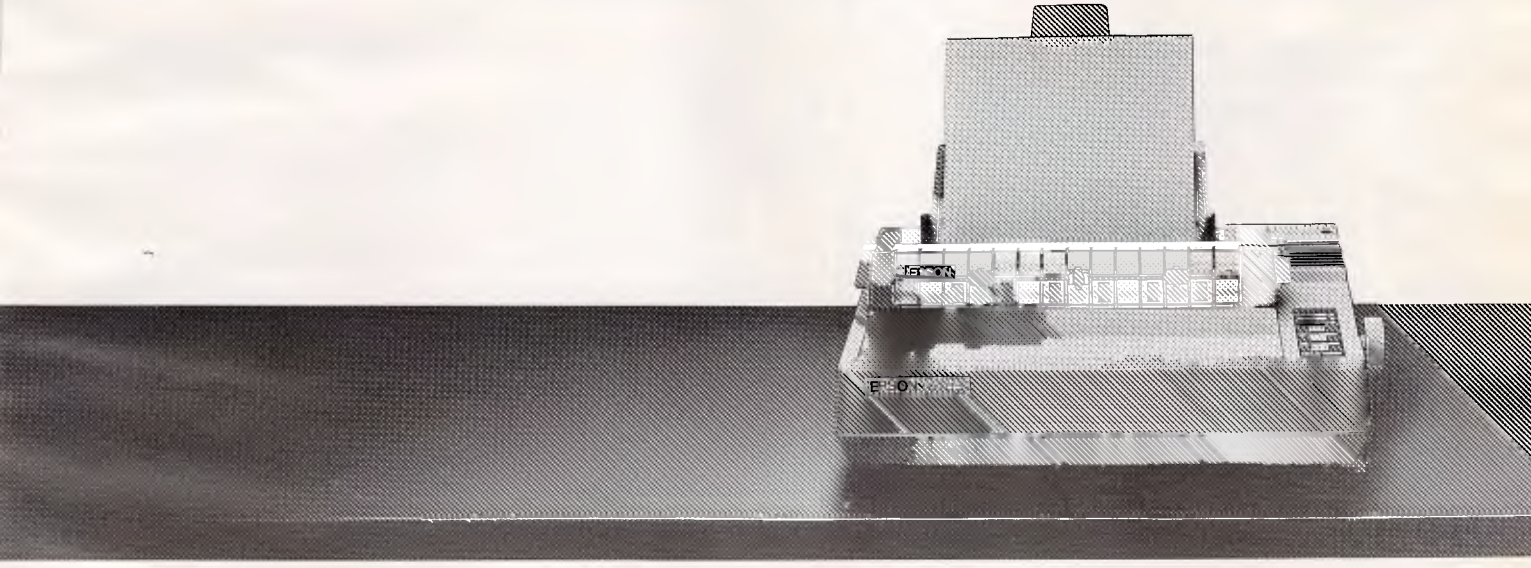
The third type of sheet provided by Excel is the macro sheet. This sheet looks very like an ordinary spreadsheet and can be used in the usual way, but it is normally used to hold macro programs. A macro program is a sequence of special formulae which can be executed in order to control the overall operation of all or part of an Excel session. It is useful to imagine the macro facility as a type of automatic keyboard, where the commands and operations are read from the macro sheet instead of from the mouse and keyboard.

The simplest way to use the macro facility is to first initialise a macro sheet, then select 'start recorder' from the macro menu. Every spreadsheet operation made subsequently is then automatically written into the macro sheet, errors and all. Window sizing and moving are ignored, but moving the active cell cursor, and entering data and formulae are all entered on the macro

	A
1	=HLINE(-3)
2	=SELECT("RC:RC[11]")
3	=HLINE(-7)
4	=FORMULA("JAN")
5	=SELECT(,"R[1]C")
6	=FORMULA("FEB")
7	=SELECT(,"R[1]C")
8	=FORMULA("MAR")
9	=SELECT(,"R[1]C")
10	=FORMULA("APR")
11	=SELECT(,"R[1]C")
12	=FORMULA("MAY")
13	=SELECT(,"R[1]C")
14	=FORMULA("JUN")
15	=SELECT(,"R[1]C")
16	=FORMULA("JUL")
17	=SELECT(,"R[1]C")
18	=FORMULA("AUG")
19	=SELECT(,"R[1]C")
20	=FORMULA("SEP")
21	=SELECT(,"R[1]C")
22	=FORMULA("OCT")
23	=SELECT(,"R[1]C")
24	=FORMULA("NOV")
25	=SELECT(,"R[1]C")
26	=FORMULA("DEC")
27	=SELECT(,"R[1]C")
28	=RETURN()

Fig 6 A macro program





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sheet. The recorder can be switched off by the 'stop recorder' option on the macro menu.

A simple macro is shown in Fig 6. It is a recording of all the operations needed to enter the 12 month names across a row. It can be run at any time by using the run macro option, and will automatically enter the month names without any further intervention at the keyboard.

The macro facility can do considerably more sophisticated tasks than setting up month headings. In this example the only macro functions used are HLINE and SELECT, but there are many others.

For complicated situations it is not usually convenient to use the record method of building macros, and the macro sheet can be worked on directly, just like any other Excel spreadsheet.

Conclusion

With the exception of its multiple spreadsheets, the scope of Excel is almost identical to that of Lotus 1-2-3 (which is, of course, not available on the Macintosh). With all the extra Mac features grafted into Excel, it is even easier to use than 1-2-3 and is a delight to work with.

Although Lotus has not released a Mac version of its spreadsheet package 1-2-3, it has released Jazz, a Mac integrated package equivalent to Symphony. Symphony is supposedly a more sophisticated product than 1-2-3, and correspondingly it must be said that Jazz does offer some features missing from Excel, for example word processing and communications. But it is possible that Microsoft has made an astute move with its blend of Excel features. Although Symphony offers more than 1-2-3, it has never outsold it.

Users seem to prefer the simplicity of a spreadsheet environment without the complication of the other facilities. Microsoft will obviously be hoping that Mac users feel the same when weighing up Jazz and Excel. Excel will retail for $750.

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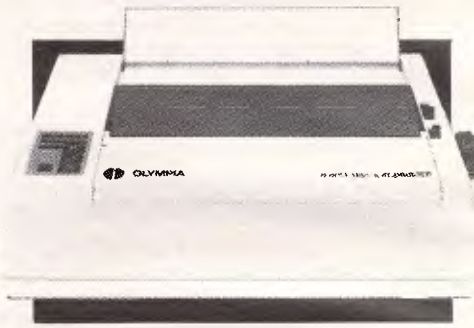

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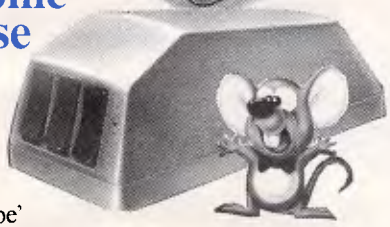

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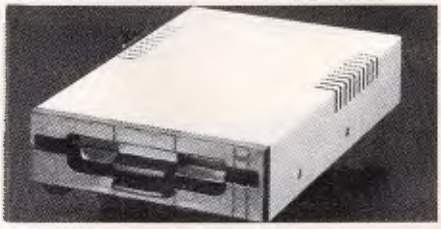

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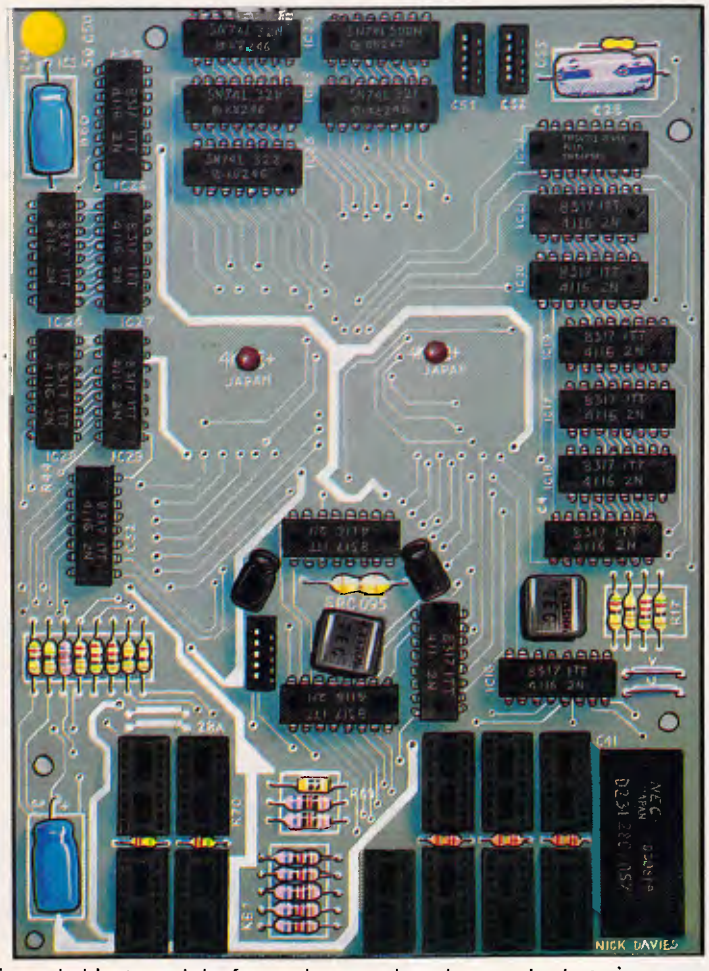
Making sense of standards

When is a standard not a standard? Martin Banks offers a light hearted view.



Let's face it, they're boring aren't they? All they seem to do is get in the way somehow. Yet, in the final analysis, what the hell would we do without them?

Pardon?

Oh, sorry; what I'm talking about is, as if you couldn't guess — standards. There now, isn't that a nasty little word? It's full of restrictions and constraints; full of the things you can't do, rather than the things you would like to do.

Rarely is this more noticeable than with PCs. For nearly every bit of them, hardware, software, firmware and concept, it seems as though there are at least 5,000 better ways of doing something than the way that has become the 'standard'. For instance, back in the days of the good old 8-bit computer there was CP/M — remember that? Computerme - with - intentionscommunicate - difficult - best-at, if you see what I mean. This was certainly not the most user friendly means of getting a PC to do something constructive.

The dear IBM PC is probably the best current example of the suffocating nature of standards. The Apple Macintosh is a far far better machine. Damn it, the old Apple II is probably a better machine except for the memory size. Yet it has been the one which has set the definitive standard for the PC, just because of a small badge.

Now we are entering the age of communications with the PC, a time when there is a great deal of development happening, and a great deal yet to happen. This goes against the ideologies of standardisation as a dose of bitters goes against a hangover. But in the end, what we are going to need is standardisation — in communications probably more than anywhere else. For example, qpoiwfu lelele ★.★fiw $#% to you. This, as if you needed any explanation, is a succinct summary on the state of my rear bicycle tyre. What do you mean, you didn't know? It was quite straight forward to me, but then again, it was me who invented the standards upon which the language was constructed some four minutes ago. Anyway, who needs language these days? Everything is communicated in binary by computer systems isn't it? One doesn't even have to learn the tricky bits such as hex or ASCII. Just let the computer sort it out. Unfortunately, it isn't quite as simple as that.

Computers may eventually communicate in binary, and binary may be a standard. What the binary is used to represent however, can be just about anything — and anything is usually far from standardised. This doesn't just mean what is communicated and its form, because that in itself has to adhere to some form of standard configuration — be it ASCII or EBCDIC character codes, DIF file structures. SDLC or HDLC protocols. It also means the ways in which the physical connections are put together.

I have assumed, for example, that in the past something as relatively simple and well known as an RS232 serial interface was a standard. Well, of course it is. The only trouble is, it isn't — not really standard that is. Ask someone who knows what they're doing to make you up an RS232 interface cable. They start asking you questions about what the computer is and what the peripheral is, and whether you have got the technical manuals for them? What are the pin-outs? This is standard in the best way that the computer industry can make it.

Even with the Open Systems Interconnection (OSI) Seven Layer Model, which seems to be the standard which every major manufacturer is accepting as such, there are significant differences appearing. IBM, which secretly wishes that everyone else would see sense and simply adopt its own Systems Network Architecture, is taking the OSI model and sticking small but very significant spanners in its works by adding features over and above the standard.

As every other manufacturer will follow IBM's lead wherever possible, this means that the standard will become increasingly less 'standard', even though everyone is using it. This makes it . . . well, you know.

I suppose in time none of this will matter. As the computers get more clever and the humans less significant, the machines will take over responsibility for the design and implementation of communications systems and equipment. Then all the work being put into speech systems and combined voice and data equipment will be classed as irrelevant, and forgotten.

By then, we will have learned how to speak in binary, which will solve all the problems.

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NOVEMBER NEWSLETTER

Hello again,

Well we're really excited with all the buzz of new things happening. The mail list is over the 20,000 mark now and has been promoted from the Apple to an IBM compatible with a consequent speed improvement on the hard disk of between 3 and 30-fold. We're running it on dBASE with FRAMEWORK linking it to a HP Laserjet printer. Our latest colour catalog is out now. If you didn't get one in the mail ring now and we'll send you one free.

Dennis' Auto Ice Apple modem has been going out the door in pre-release form with excellent reports, but in the meantime we have come up with a low cost Hayes Smartmodem alternative that we're really excited about. It doesn't have all the bells and whistles but it is available NOW, it is CHEAP and it WORKS. Just plug it in to slot 2 and your phone socket, fire up the VIATEL disk included and you're off and running. A ripper!

New shipments include the SUPER 5 EN P1090 printer which is great value at $369 inc.. SWS60 disk boxes (Australian made) $22 ex, 25 inc, Apple/IBM Joysticks at $45/$50 and 10"/15" perspex printer stands (Australian) at $35/$45.

Best sellers this month are MICRO-E0 disks (selling up to 20,000 per wk) the LOGITEC FT5002 printer, disk cleaning kits and, oddly enough, coloured paper for PRINTSHOP.

Also, a timely word of thanks to our courier, KWIKASAIR. We ship around 90 parcels a day to some of the oddest locations in Australia, with an overnight delivery rate of 93%! And they haven't lost a parcel yet. Fantastic. We've tried all the couriers and they're the best! GDONYA KWIKASAIR.

Incidentally, if you think buying by mail-order is a little risky or just "infra-dig" then look at some of our bigger customers. CSIRO, TELECOM, ALL AUSTRALIAN UNIVERSITIES, COMMONWEALTH BANK, DEPT HOUSING, ALL STATE EDUCATION DEPTS, ALL STATE AGRICULTURE DEPTS, COOPERS-LYBRAND, DELOITTE'S, TUBEMAKERS, CDMSTEEL etc etc.

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Why do we do it? We're the biggest computer mail-order company in Australia already, but . . . there's something magical about selling a MILLION DISKS a year. We're half way there! Incidentally, these are premium quality, Australian manufacture, Control Data disks or Verbatim (specify if you require Verbatim) not cheap Asian imitations.
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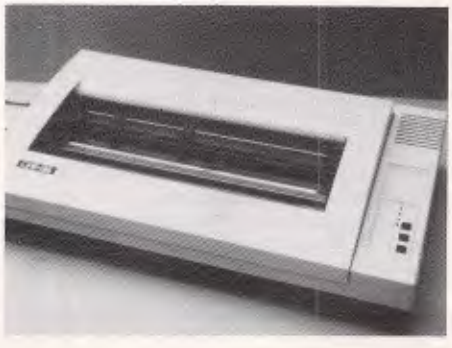

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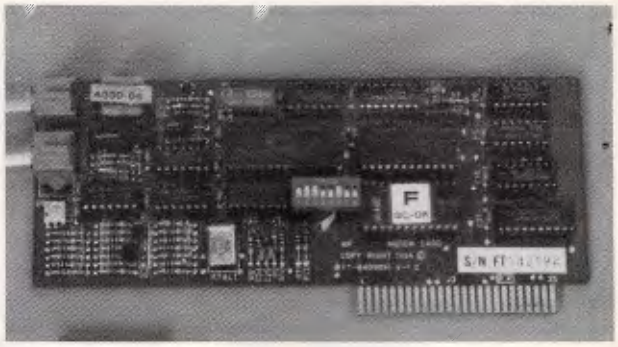

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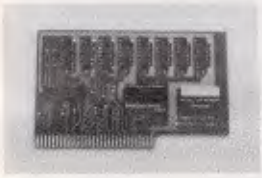

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PageMaker & LaserWriter

Peter Bright looks at a very different package for the Macintosh, PageMaker, which along with Apple's LaserWriter, can help you turn out a very professional-looking publication.

It's not often that you receive a piece of software which is totally different from anything you've seen before. PageMaker is one such package. It isn't a spreadsheet, it isn't a database, it isn't even a word processor.

PageMaker is a layout package. It allows you to arrange text and graphics as pages, in the same way as a newsletter, magazine or newspaper. In conjunction with Apple's new LaserWriter printer, you can use it to generate very professional reports and newsletters, lay out business forms, generate overhead transparencies, and so on.

Until now, comparable electronic layout machines have cost tens of thousands of dollars. PageMaker runs on the Apple Macintosh.

The minimum configuration to run PageMaker is a 512k Mac with twin disk drives and an ImageWriter printer. It will become obvious, however, that if you want to get the best out of the system, you will also need access to a LaserWriter, and if you are doing large numbers of layouts, probably a hard disk as well.

The system supplied for review was actually a pre-release version of PageMaker, so there was no packaging and the manual was a photocopy of the proofs. The system was supplied on two disks — one system disk and one program disk. In addition to the usual files, the system disk contained two special LaserWriter drivers. These are different from the standard Apple LaserWriter drivers, so you must make sure you have the correct ones present. The program disk contains the PageMaker code, which at over 200k represents a fair portion of the available disk space.

PageMaker boots in the usual way by double-clicking its icon. You can either run it directly on its own, or with another program such as MacWrite, by using the Switcher RAM partitioner from Apple. This is particularly useful because you can then write your masterpiece in MacWrite, switch to PageMaker, and have the page laid out in seconds.

The release version of PageMaker will contain a Switcher configuration resource to allocate enough RAM to PageMaker. After some experimentation, I found that 300k was the optimum.

When PageMaker has loaded, you are faced by a blank desk-top with a pull-down menu bar marked File, Edit, Tools, Page, Type, Lines and Shades. To start a new layout, you simply select New from the File menu.

The first stage of a new layout is to tell the system what size paper you are using, how big the margins are and how many pages you want. Each PageMaker file is limited to 16 pages, but you can enlarge this and still keep the automatic page numbering correct by having more than one layout file.

Paper sizes are US Letter, US Legal, A4 and B5. You can elect either for the page to be the normal way up, or on its side if you need extra width.

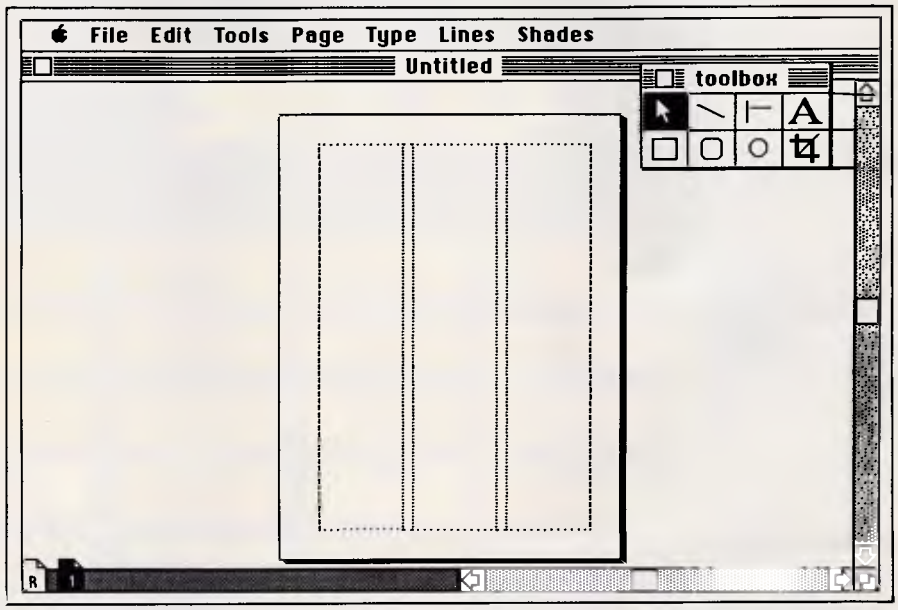
The layout window

When you have selected the type of paper you want, you are greeted by the main layout window. The best analogy of this window is to a layout artist's pasteboard.

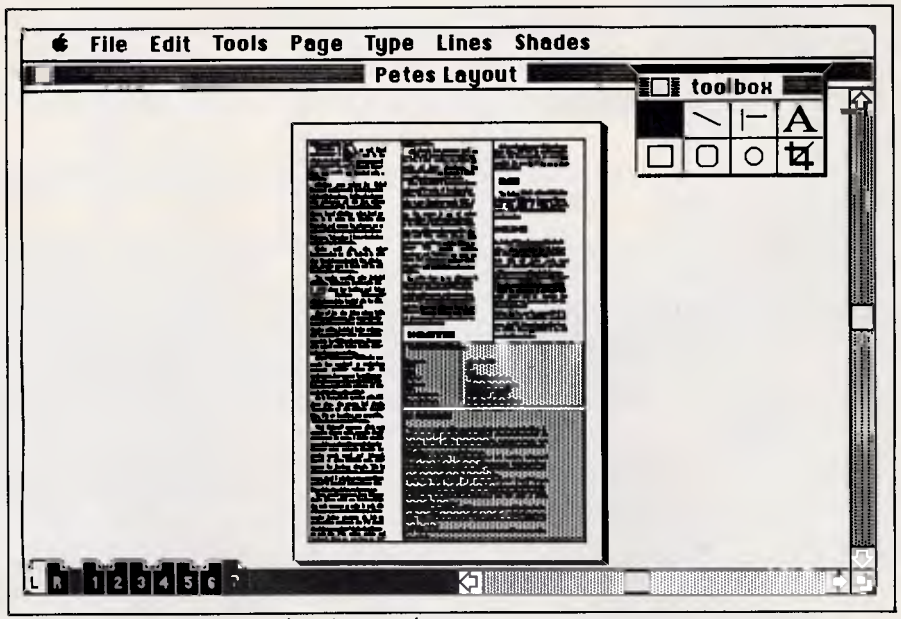
In the middle of the window is a blank page with the margin guides in place. The rest of the white portion of the window is the cutting board where you can keep scraps of text and pictures that you may want to use later on the page.

The bottom of the window contains a scroll bar and an icon display of the number of pages in the file and the current page; you move between pages simply by clicking the page icon. The system also contains 'Master' pages, in which you can lay out information that you want to appear in all the pages of your layout. This can save a lot of time if all your pages look similar.

In the top right-hand corner of the layout window is another small window labelled 'Toolbox'. This contains eight icons which allow you to move parts of a



The layout window



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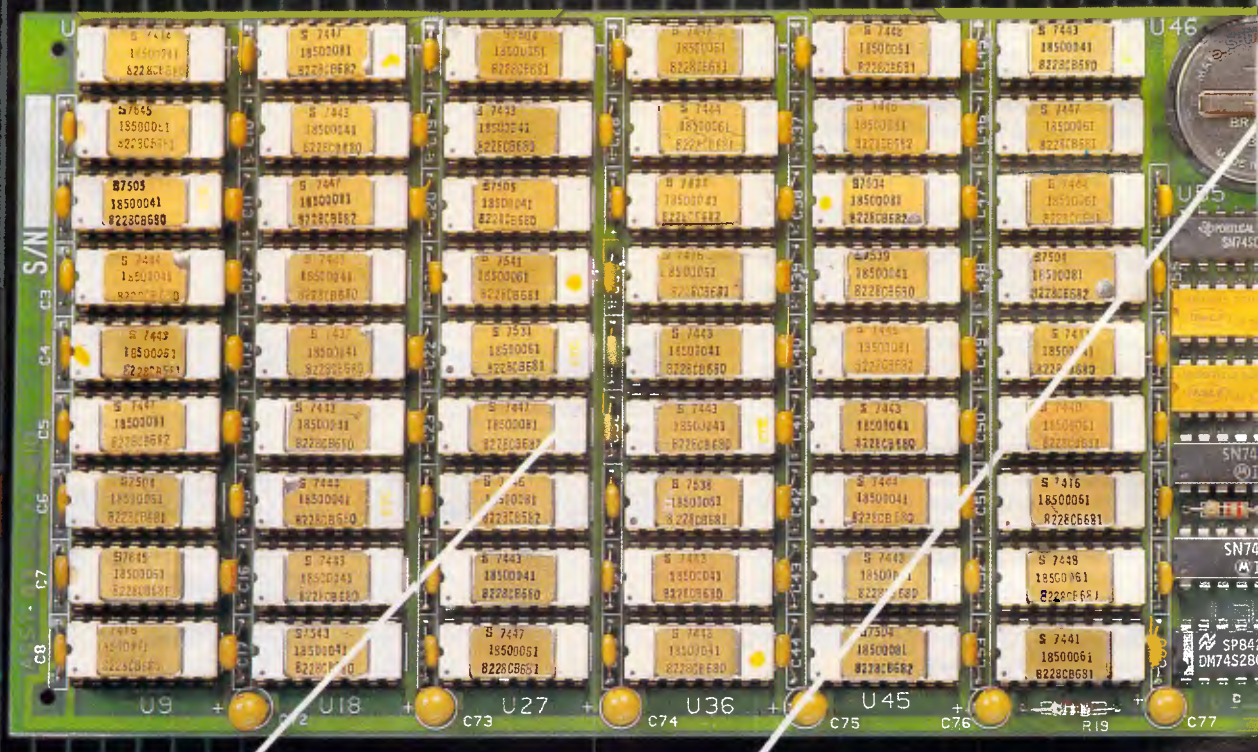

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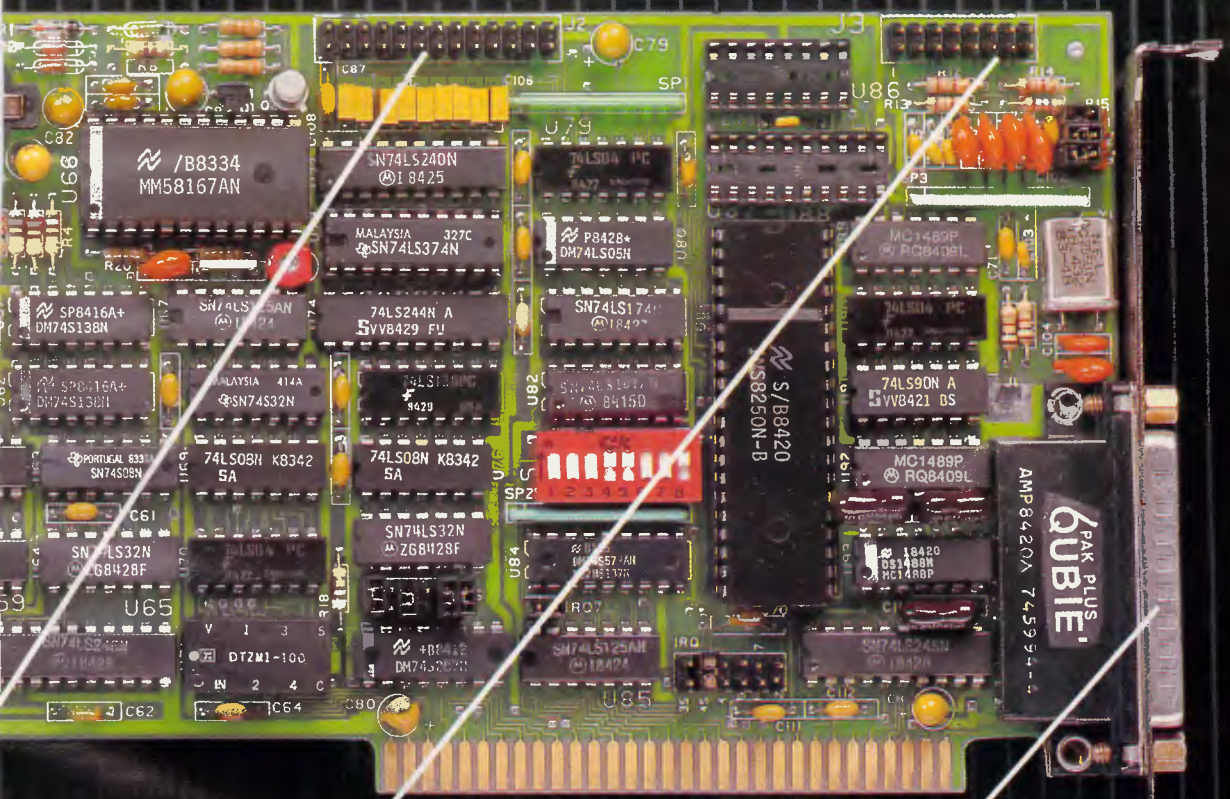

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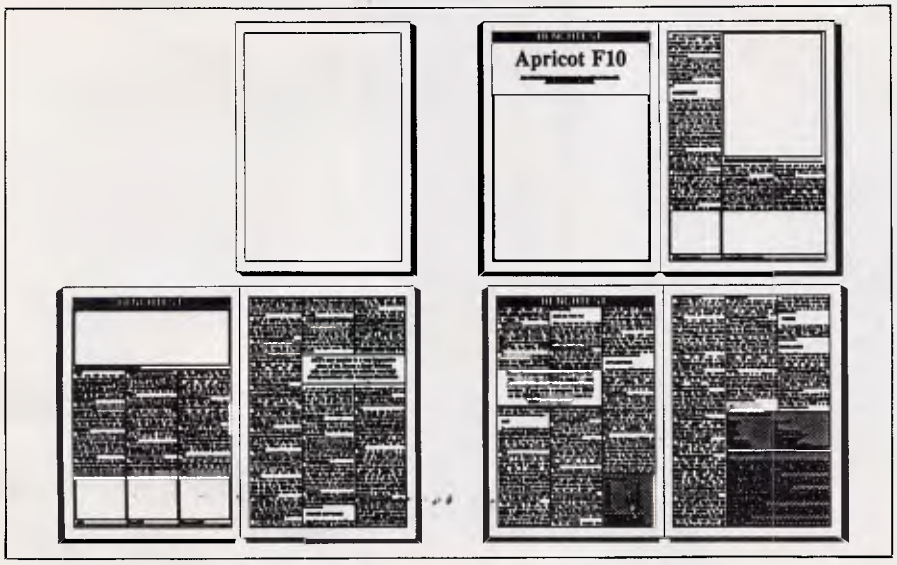
layout around, edit text, crop graphics to fit a space, and draw rectangles, rounded rectangles, ovals and lines on the layout.

The normal display for the layout window is to show a picture of the whole page on the screen. As soon as you start laying out text and graphics, you need to be able to see a close-up of the section you are working on. The PageMaker Page menu allows you to display portions of the page at actual size, or in 50 per cent or 70 per cent reductions. If you are doing detailed work with small point sizes, you can choose 200 per cent magnification.

Before I began to prepare and lay out a page, I usually went to the Tools menu and selected 'Show Rulers'. As the name implies, this displays vertical and horizontal rulers along the top and left side of the layout window. You can choose the scale on the rulers from either inches, millimetres, or picas and points. The current position of the mouse pointer is displayed on the rulers so that you can use them accurately.



'Thumbnails' print up to 16 pages on the LaserWriter

The layout

The first thing to do when laying out the page is to decide how many columns the page is to have. *APC* usually uses a three-column grid, but PageMaker lets you have between zero (that is, the whole page) and 10 columns. PageMaker then displays appropriate column guides in the layout window. If you decide you want a special column layout, you can pick up the column guide with the mouse pointer and drag it to where you want.

One of the great advantages of PageMaker over some of its rivals is that it can accept text and graphics from other packages. Text can come direct from MacWrite or Microsoft Word, files and graphics can come either from MacPaint or MacDraw. In addition, you can bring in either text or data via the Macintosh Clipboard.

The use of the new Apple LaserWriter is central to the concept of PageMaker. Although you could use the standard ImageWriter at a pinch, it really isn't up to the job.

The use of the word 'laser' in the name of the new printer shouldn't be taken at face value. Contrary to some myths, it doesn't use a 'star wars' laser beam to burn the characters onto the paper. In fact, the LaserWriter has much more in common with a humble office photocopier than with laser cannon or other military hardware.

Laser printers of this type work by using exactly the same copier drum, toner and mechanism as a photocopier. The main part of the printer is a rotating drum which has a static charge over its surface. When the print data arrives at the printer, a small semiconductor laser is pulsed across the surface of the drum. Where the laser light hits the drum, the electrostatic charge is destroyed; therefore by tracing the laser across the drum, you can construct an electrostatic 'negative' of the page to be printed.

After the drum has been set up, it is coated with particles of charged plastic 'toner'. These particles only adhere to the parts of the drum where the electrostatic charge wasn't destroyed by the laser beam. Next, a sheet of paper is run past the rotating drum, which deposits the toner onto the paper. Finally, the paper is run through heated rollers which melt the plastic toner onto the paper.

Obviously, it wouldn't have made sense for Apple to construct all the printer mechanism, so it went to Canon which has a reputation for photocopier manufacture and which also makes a basic laser printer, sold in a modified form by Hewlett-Packard.

Although the Canon, Hewlett-Packard and Apple laser printers all use the same basic mechanism, there is a marked difference in their performance. The Canon isn't particularly intelligent as laser printers go, and is really designed as a fast, quiet alternative to daisywheel printers. The Hewlett-Packard is more intelligent and can handle both text and graphics, although graphics can only take up a certain proportion of the page.

By contrast, the Apple LaserWriter is very intelligent. It actually outstrips the Macintosh in terms of processing power, using a 16-bit Motorola 68000 running flat out at 12MHz (the Mac's 68000 runs at 8MHz). It has 1.5 Mbytes of RAM (even the Fat-Mac only has 0.5Mbytes) and has 512k of ROM (the Mac has 64k).

The need for all this processing power soon becomes apparent when you realise that in order to be able to do full graphics, the machine needs to hold a bit-map of the whole A4, printed page. This alone takes over 1Mbyte of RAM.

The LaserWriter comes complete with two interfaces to the outside world. One is a standard RS232 interface which is designed solely for connecting the printer to machines such as the IBM PC. If you use this interface, you lose the graphics capabilities.

The second interface is an Apple Talk network socket, which allows you to use the printer with a dedicated Mac or share it on the network among a work group. I will be looking at Apple Talk in greater depth next month, but one problem that is relevant here is that Apple Talk is a slow network so there is no question of sending a 1 Mbyte page bit-map down the network from the Mac to the printer.

To get around this problem, Apple has used a printer control language, originally designed for professional typesetting machines, called Postscript. Its great advantage is that instead of describing the page as a bit-image, it describes the shapes of the objects on the page. A typical Postscript page description uses around 10k rather than the 1 Mbyte needed for a bit-map.

In use, the LaserWriter is a very impressive machine. To

TELL YOUR COMPUTER WHAT TO DO

VoiceCommand

A Spoken Word

With a single spoken word you can tell your computer what to do. With VoiceCommand, your computer will accept your voice as an alternative to the keyboard entry of commands and data. Your voice can direct any software program on the IBM-PC or compatible.

High Productivity Tool

One spoken word is worth a thousand key strokes. VoiceCommand allows the construction of a vocabulary of up to 32,000 words that activate complex strings of commands. Often-used commands that require many keystrokes are reduced to single words with VoiceCommand. The ease of the spoken word eliminates errors associated with the less familiar keyboard commands. And, while you are speaking, VoiceCommand frees your hands to perform other tasks.

Simple Universal Interface

VoiceCommand creates a universal interface to operating systems and application programs. The VoiceCommand system translates the spoken word into the computer commands for different application programs as well as operating systems. All PC/DOS and MS/DOS software can be used with VoiceCommand.

Secure Access

Voice recognition provides secure access to computer programs. A set of spoken words — computer commands and data — are established for each person using VoiceCommand. Since each spoken word creates a unique voice pattern, the words are accessible only by their originator.

Voice and Keyboard Mixture

Voice commands, spoken into a standard microphone, activate the computer just as if they were entered on the keyboard. Voice and keyboard commands may be used at the same time, allowing you full control of all aspects of each program.

Easy To Install

VoiceCommand enables speech recognition capabilities to be added to any application without requiring changes to the application.
Hardware — To install VoiceCommand hardware, a VoiceCommand card may be inserted in any expansion slot in your system.
Software — To install the VoiceCommand software, you need only copy the VoiceCommand diskette and initialise the Executive System.
Microphone — The microphone is installed by plugging the connection cable into the VoiceCommand board.

Easy to Train

It is easy to train your computer to understand the spoken word. Three to four repetitions of the spoken vocabulary constructed for each application produce a workable set of reference patterns.
It is easy to learn to use VoiceCommand because there is no complex command code. Non-technical users may define their own vocabulary.

System Capabilities

- 32,000 word vocabulary
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If you are dealing with graphics, it is usually preferable to use MacDraw files rather than MacPaint. This is because MacPaint stores its graphics as a screen bit-map, while MacDraw stores its graphics as a series of graphic commands. The advantage of using commands is that they will work in different scales and resolutions, but with a bit-map, scaling is more difficult. Another factor is that the LaserWriter is a lot happier with MacDraw files than it is with MacPaint.

When text is brought in, most of its word processor attributes are retained, so font, point size, underline, bold, and so on, remain the same in PageMaker as they were when sent from the word processor.

While this is generally a good idea, it can be slightly problematic. When I word process on MacWrite, I use a 12-point Geneva. However, to lay out a piece in *APC* style, the text needs to be 9-point Helvetica. The obvious answer is to word process directly into Helvetica, but I find that this is too small to read easily on the Mac screen. After I have finished the piece, I have to physically select all the text (MacWrite doesn't have a 'Select All' facility) and then change the typeface and point size, before I can run the text into PageMaker.

To import text or graphics into PageMaker, you use the PLACE... command from the File menu. This shows a directory of available text graphics on the disks and allows you to select the file you want.

When you are back in the layout window, the cursor icon will have changed from a pointer to either a text, MacWrite, or MacPaint icon to show that you are in place mode. To place the text, you simply position the icon where you want the text to start and press the mouse button. PageMaker will then run the text from the datafile down the column you have selected, automatically wordwrapping the text so that it is the correct width for the column.

When it has finished, the text will be displayed in the column along with starting and ending block markers. If there is overmatter (too much text) the ending block marker will show a '+'. If you want to make another column, you can select the '+' on the end-of-block marker, the pointer will change back to the text icon and you can carry on as before. PageMaker will only lay out one column of text at a time.

When you have placed a block of text, there are a number of things you can do with it. You can move it around; this is done by selecting the arrow-shaped pointer in the toolbox, and you can then click the block and drag it around the screen *ad infinitum.*

Next, you can change the length of the block. This is the most useful of all the features. For example, you might lay out text down a whole column from the top to the bottom of the page, and then decide that you want a picture at the bottom of the column, so you need to make a space. All you need to do is select the end-of-block marker and move it up the column until you have enough space for the picture. The extra text will now automatically be moved to the next column and space will be made.

Finally, you can change the appearance of a block of text. To do this, you select the Edit icon (capital A) from the Toolbox. You can then edit exactly as in any Mac word processor — you can delete words, add extra text, justify, underline, and so on.

To change the font or point size of selected text, you select Type Specs... from the Type menu. This allows you to choose from the usual Mac fonts with the addition of Times and Helvetica, which are built into the LaserWriter. According to the manual, point size is selectable between four and 127 point, but, on the review system, the range was six to 72 point.

In addition, you can set attributes such as bold, underline, superscript, and so on. You can also specify leading; this is the amount of space between the lines of print specified in multiples of one point. It is usually set to auto, but if you want more control, you can set it yourself.

Laying out graphics is achieved in much the same way. You use the PLACE... command from the file menu to select the graphic file you want to use. The pointer will then change into either a MacPaint or MacDraw icon. You then move the icon to where you want the graphic to be displayed and click the mouse button.

If you want to move the graphic around, you can select the arrow pointer from the Toolbox and drag it around the screen. Using the arrow pointer, you can also scale the graphic to make it fit into a specific space. You can make a graphic thinner or wider, taller or shorter, or both, by selecting one of its 'handles' and dragging it with the mouse. Holding down the Shift button the keyboard while you scale the graphic will automatically

make it work with the Mac, you have to install special driver files in place of the ImageWriter driver. Although the LaserWriter drivers take up more valuable space on your system disk, they don't use the temporary print files that you need with the ImageWriter.

The print quality is extremely good — the LaserWriter has Times and Helvetica typesetting fonts built in. Other Macintosh fonts can be printed, but they aren't of quite the same quality. Different point sizes, outline, underline, and so on, are fully supported. The printer is also very quiet — it makes no more noise than a desk-top photocopier.

In real terms, the LaserWriter is also a very fast printer. The trouble is that, whereas you can watch a daisywheel printerhead printing the lines, the LaserWriter just sits and thinks and then prints a whole page at once.

Maximum print resolution is 90,000 dots per square inch. This is superb by normal computer printer standards, but isn't quite up to typesetter standards, where 1.5 million dots per square inch is standard.

The actual time taken to print a page varies according to what you want the printer to do. As you would expect, plain text is the fastest — it takes about 30 seconds to print a standard page of text. Life gets harder if you are printing graphics, where it can take anything from 30 seconds to 15 minutes for the printer to work out what the bit-map should be like and print the page. The worst time I experienced was 11 minutes for a complex page.

The main problem with my system was that the printer tied up my Mac while it was printing. I found this frustrating, as I could have been getting on with something else. Apple points out that the LaserWriter is designed for use on a network when it would be hooked into a fileserver which could spool print files. While this is true, I feel that Apple could have fitted a bigger buffer inside the LaserWriter so that it could take larger documents without tieing up the Mac.

The main drawback of the LaserWriter is its price. At $11,300, the price is nearly double that of the Hewlett-Packard Laser Printer, which is based on the same print mechanism. However, this machine was designed for use on a network, so its cost can be shared among a number of users. In addition, it offers features which are just not possible on other laser printers: PageMaker, for example, can only work at its best due to the possibilities opened up by the LaserWriter.

All in all, the LaserWriter is a superb machine. For general-purpose text printing it is expensive unless it is used in a network, but as a partner to a package such as PageMaker, it's cheap at the price.

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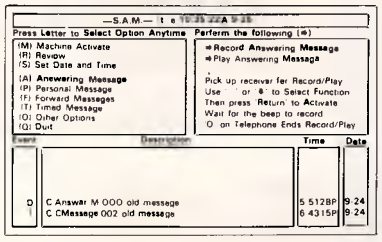

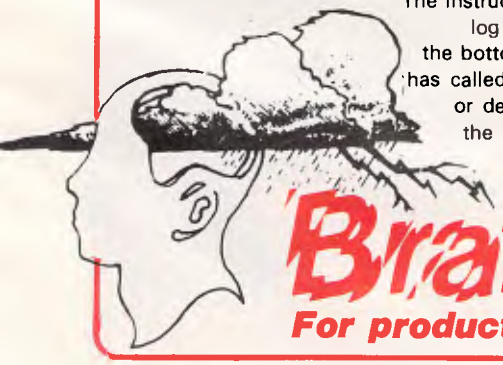

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ensure that it stays in proportion.

In addition to scaling a graphic, PageMaker also lets you 'crop' it, trimming the edges of the picture so that it fits the space. The advantage is that the graphic stays at full size; the disadvantage is that you may lose quite a lot of the original picture.

In addition to allowing you to import pictures from graphics packages, the PageMaker Toolbox also has some drawing facilities built into it which are useful for drawing rules to separate columns, boxes around pictures, ovals for logos, and so on. A particular advantage is that you can specify shades for boxes. Benchmarks in *APC*, for example, are run with a 20 per cent grey tint overlaid. To do this, you just draw a box around the Benchmark area and specify 20 per cent shading from the Shades menu.

Drawing rules is similarly easy. You specify the rule width from 0.25 of a point to 12 point, and then draw the line using one of the line-drawing tools in the Toolbox.

In use, I found all the features of PageMaker extremely easy to use. Its great advantage is its flexibility: even if you know nothing about the skills of layout, you can keep playing with the page until you get it right.

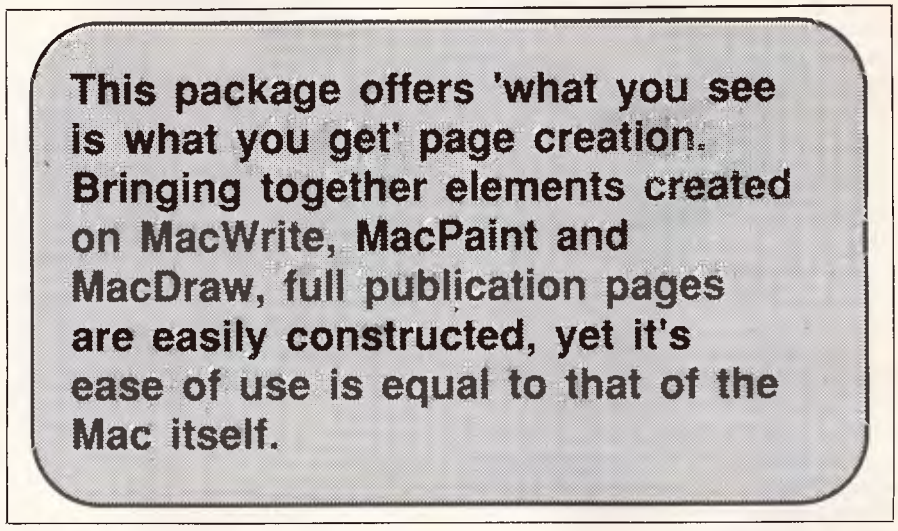
As an experiment, I laid out one of my Benchtests in the *APC* style. Usually when I write a Benchtest, I print it out and it goes to the sub-editors, who convert it into English. From there it goes to the typesetters, then copies of what has been typeset come back to us for correction. We check them and use them to do the page layouts, although the finished versions are actually done back at the typesetters by a layout artist using a scalpel, a ruler and a Rotel pen. The whole process takes at least a week and usually two. Using PageMaker, I laid out my Benchtest the same day it was written.

Printing

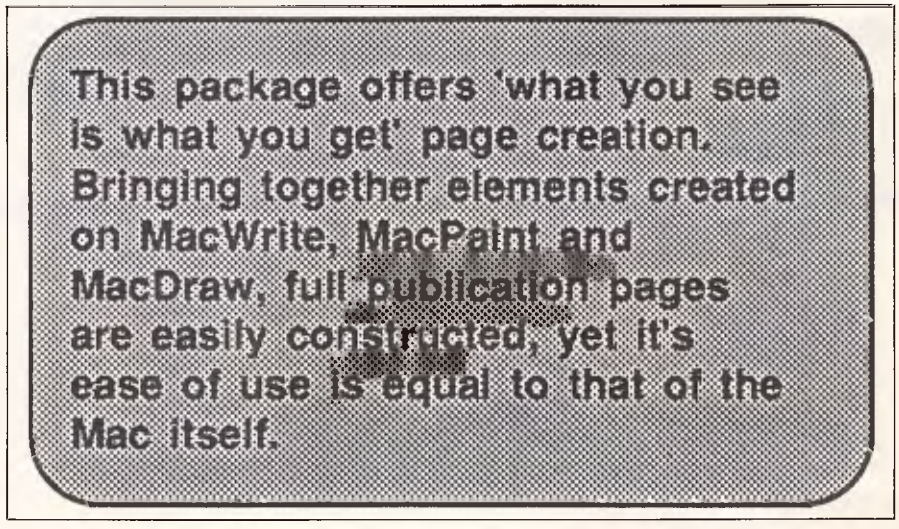
I used PageMaker with both the standard Apple ImageWriter dot-matrix printer, and with Apple's LaserWriter. Although the output on the ImageWriter was good by dot-matrix standards, I wouldn't use it for anything other than drafts of layouts.

The LaserWriter is superb (see the review within this article). There is no other computer printer that can match the quality of the LaserWriter when used with PageMaker.

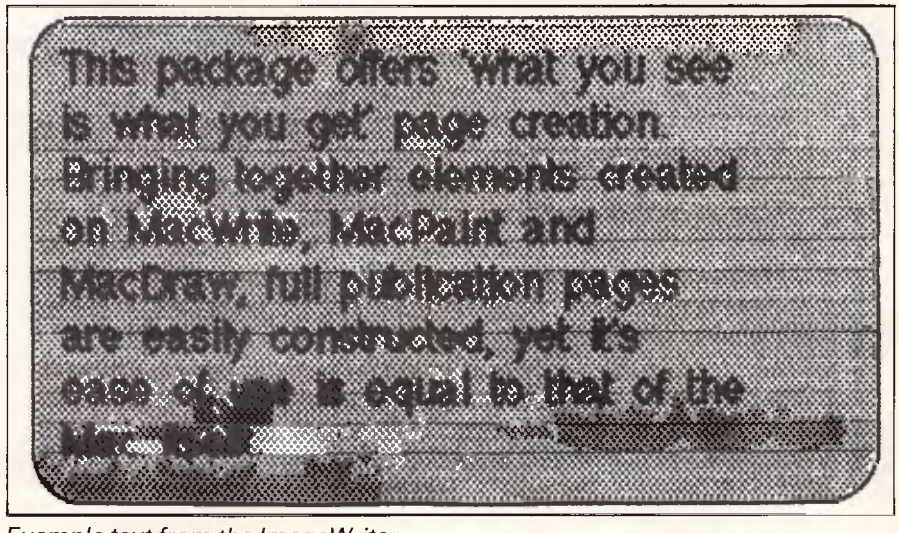
Using the LaserWriter printer driver, you can either print the page full size, or you can scale the whole page. It can be important sometimes to match the bit images of the graphics and the LaserWriter or typesetter you are using. You can also produce 'thumbnails' of all the pages on one sheet of paper. This looks good and is useful for making sure that double-page spreads are correct before you print the whole publication.



Example text from a Linotype typesetter



Example text from the LaserWriter



Example text from the ImageWriter

However, even the LaserWriter isn't quite good enough for use in magazines such as *APC*, on which professional phototypesetting machines work at around 1500 dots per inch rather than the Laser Writer's 300. But all is not lost. PageMaker talks to the LaserWriter in a language called Postscript. This language is also used by some Linotype professional phototypesetting machines, so it should be possible to take your Mac disk, plug into a Postscript-compatible typesetting machine and produce professional typeset pages.

As an additional feature, Linotype is also working on a phototypesetting machine which will plug directly into the Mac just like any other printer. No prices are available yet (it is likely to be *very* expensive), but this would open up the whole professional layout field to the Mac and PageMaker.

Documentation

I was only supplied with a photocopy of the pre-production manual, but it looked very good. The manual was prepared using PageMaker and the LaserWriter. The quality of the text is good, with plenty of screendumps. I liked the handy hints section at the back, which explains different printer resolutions and the print reductions necessary for the best results.

I used PageMaker for about a month before the manual even arrived, and this kind of ease of use seems to be par for the course for Mac software these days.

Conclusion

I can't count the number of times I've shown someone my Macintosh, and they've said: 'But it's just a toy! It may look pretty, but an IBM is much more useful.' Now at last I can show PageMaker to them and say 'Let's see your IBM do that!'.

At first sight, it may seem that PageMaker is a specialised product only for those interested in publishing. However, the more you think about it, the more uses you can find. It adds a new dimension to internal company reports, presentations, newsletters, and form design. Any executive who needs to present high-quality reports could find a use for PageMaker.

Indeed, PageMaker isn't designed for heavy magazine production. I'm sure that if you found the right typesetter you could produce a decent colour magazine, but it would not be as easy as using professional electronic make-up equipment. But then professional electronic composition machines cost tens, or hundreds of thousands of dollars — PageMaker is expected to sell for approximately $795.

I was extremely impressed with PageMaker. It's the best Mac layout package I've seen so far.

PageMaker is distributed by Software Corporation of Australia (02) 328 7074.

END

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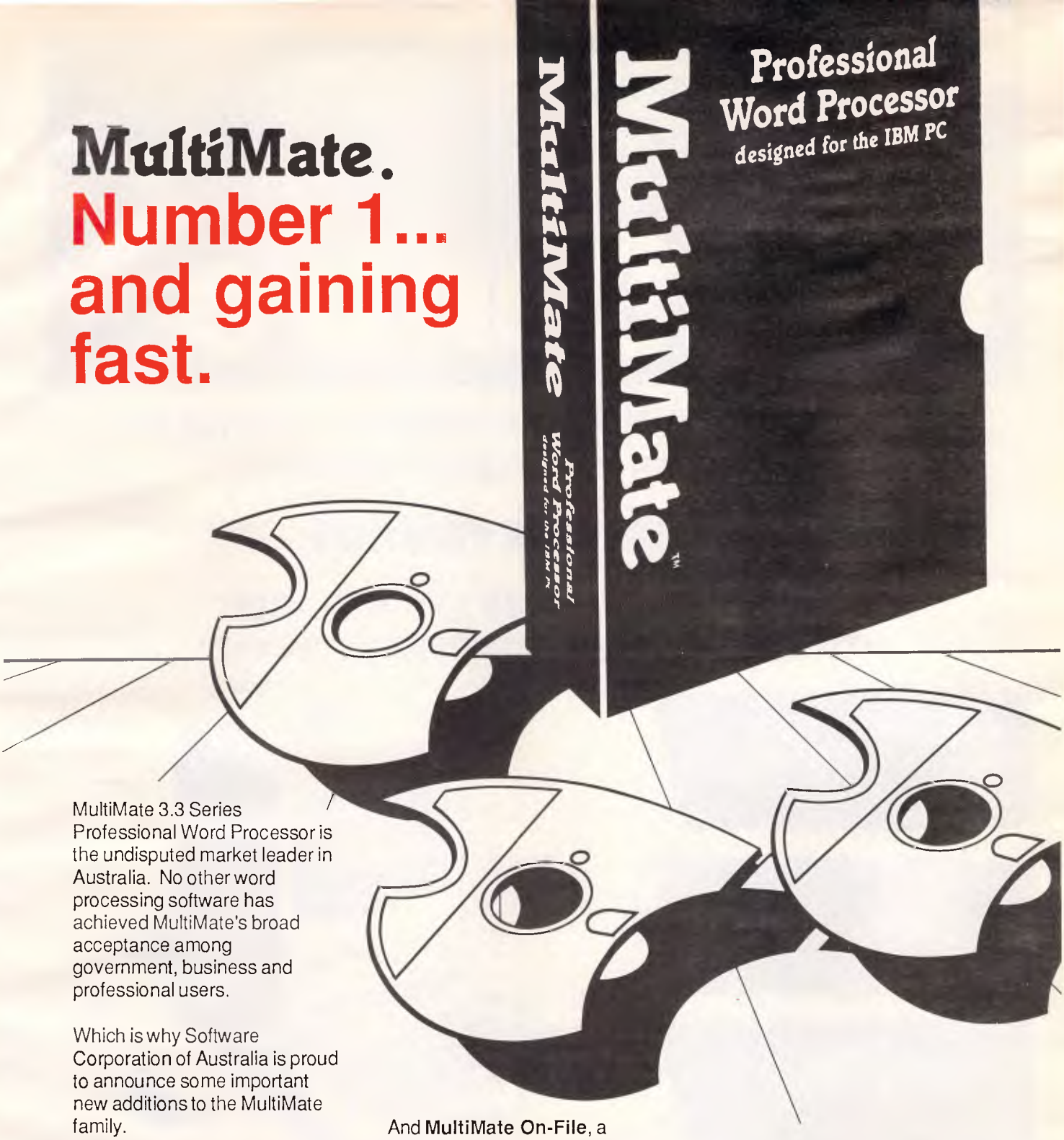

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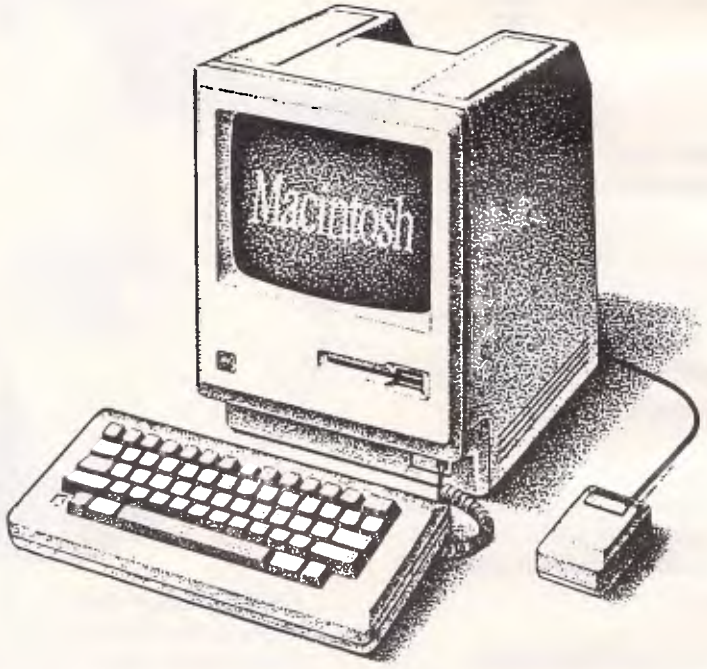

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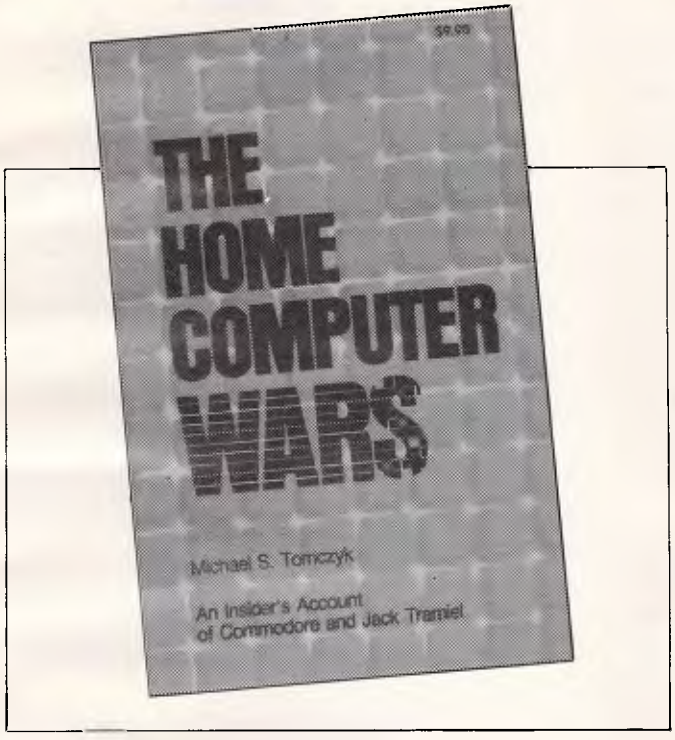
In this month's book selection, David Taylor et al throw themselves into the trenches to avoid the computer wars. Read on . . .



War of words: inside Atari

This book, if I might just sum up, is a stinker. Ostensibly it's the 'inside' story of how Jack Tramiel (for four years the author's boss) founded Commodore, fought off arch-rival Atari, then quit Commodore, retired, went round the world, came back and bought up Atari. But the person we get to know, alas, isn't so much the irrepressible Tramiel as the insufferable Tomczyk. He's not a shy man, still less a modest one. Mad as a hatter is how I'd describe Mr Tomczyk.

His obsessively gee-whiz story is dedicated 'to all the people who said I'd never make it, because they're the ones who made me try the hardest,' among them Tomczyk's Mrs 'for making me feel like a genius when I felt like a shlub' and his mother 'for giving up her singing career so I could be a writer.'

The next thing I knew, begins writer Tomczyk, *I was sitting in a foxhole with a bunch of smiling young geniuses. I poked my head out of the trench to see what was going on and a floppy diskette came whirring by. I ducked and it missed me by inches. Somebody handed me a chip and yelled 'Start Computing!' That's the kind of war it was.*

For this Mom gave up singing?

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BIBLIOFILE

Wait, here's Jack Tramiel. *His large dark brown eyes were set deep beneath thick wiry brows and tended to bulge slightly... When he spoke his lips curled, twisting and contouring into a thousand shapes and portraying a thousand emotions . . . Sometimes he looked and moved like an Asian bear... I guess you could say he had a schizophrenic face. It matched his moods, but then we were all rather schizoid at Commodore. You had to be. It was war.*

And this, I imagine, must be shellshock. There are a further 300 pages in this vein.

Tramiel was himself a survivor of the Nazi holocaust and apparently ever after saw his business in terms of war — his men as tough troops, fighting off the Japanese, slashing prices to conquer the home front — not to mention more prosaic analogies: 'Business is like sex: you have to be involved.'

Tomczyk is a Vietnam veteran and asserts that he was, as a result, battle-hardened for the rigours of corporate in-fighting, back-stabbing and character assassination which, we're repeatedly told, were the norm at Commodore.

Maybe so, but Tomczyk's holy-smoke narrative style parodies all attempts to get any interesting insight. You're left incredulous right enough, not so much at the way things were (and presumably still are) with Tramiel, but by the fact that one of his acolytes can produce such gunk.

Not, as you may have gathered, recommended.

Title: The Home Computer Wars
Author: Michael S Tomczyk
Publisher: Compute! Books
Distributor: Holt Saunders
Price: $33.50

Disk development

Any home computer that has aspirations for use in business must have a disk system. Amstrad, the manufacturers of the CPC464, realise this and sell a neat add-on disk drive which is virtually identical to that which is built in the CPC664.

This new book sets out to explain the principles and advantages of using the Amstrad CPC464 disk system. The book is comprehensive in coverage carrying the reader all the way from wiring up a three-pin mains plug to disk utilities in machine code!

In chapter one, the fundamentals of disks and disk-drives are briefly laid out. Chapter two begins to explain what the DFS (the Disk Filing System) is and what it does, before passing swiftly on to the additional commands available. Chapter three is entitled 'digging deeper', promising that we shall learn something new and useful. However, the chapter concerns itself with making copies and backups of programs and complete disks plus a list of error messages; hardly 'digging deeper'.

Adding a disk system to the Amstrad gives the user the cheapest entry into the wonderful world of CP/M: Chapter four does go some way towards explaining the more useful of the many commands and functions that are provided. Unfortunately, the superficial style that began in the first chapter is by now firmly in place and the

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explanations are brief.

And so the book continues in the same vein.

At the asking price I don't consider 'The Amstrad CPC464 Disk System' to be very good value for money at all.

Title: The Amstrad CPC464 Disc System
Author: Ian Sinclair
Publisher: Collins
Price: $20.95

Using the Mac

The preface says that this book is for those who own a Mac or those who are considering owning a Mac, and want to get a feel for these programs, but if I were in that situation, the last thing I'd do would be to spend $36 on a book telling me about it. I'd just go out and get it, or read about it in a magazine. Maybe some people do like to read about what it's like to have a Mac, and to its credit, this book does offer a few more suggestions for using the programs than you'll find in the manual.

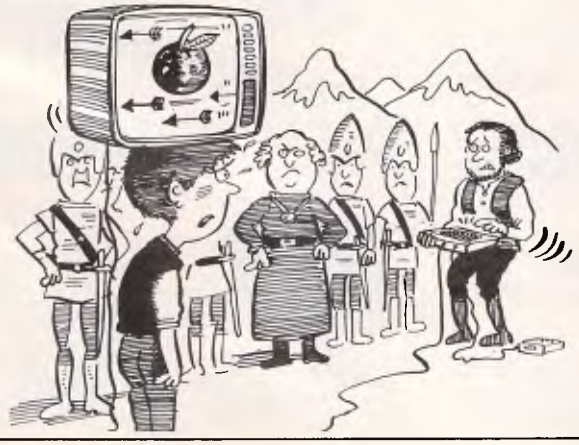
The first chapter explains how to use a Mac; there is absolutely nothing here which comes as a surprise to the present users of the Mac. If you don't have a Mac it's all pretty academic.

Chapter two describes how to use MacWrite, and it's almost impossible to imagine this chapter being of any interest to anyone who does not have a Mac. In fact it would be quite frustrating to read all the commands and instructions without being able to practise them. And so on through chapters about other standard Mac software, one from each category such as spreadsheets, databases and so on. It does not even cover all the areas of software available; there are utilities and vertical software not mentioned.

There is a part about communications, and the only useful part for me was a section on Think Tank, which is a very useful program but difficult to use properly. But there is no problem page and nothing to help the user who gets in trouble. As far as I can see this book would be a complete waste of money for anyone who has a Mac.

Title: Macintosh — A Concise Guide to Applications Software
Author: Dirk van Nouhuys
Publisher: Wiley
Price: $35.60

END



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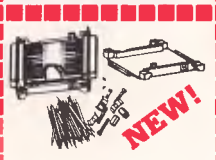

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- 42 single key BASIC command
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- Dimension: L340xW110xH42mm

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(ETI 666, Feb. '85)

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Modem? What do I want with a modem? Think of these advantages:
- Can't afford a floppy disc? Use your telephone to access one for the cost of a call.
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- Want to get in touch with fellow computer enthusiasts? Use 'electronic mail'.
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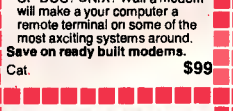

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(ETI Nov.'84) ETI 755

Cat. K47550 **$139.00**

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- Provides full 12V bipolar output signal
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For computers not capable of split baud rates. Buffers characters at 1200 and converts to 75 baud

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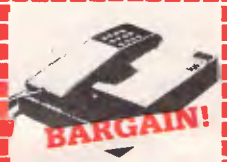

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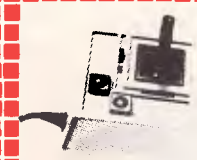

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Slimline 8" Disk Drive. Double sided Density No AC power required. 3ms track to track. 1.6 Mbytes unformatted, 77 track side 10s/su10 bit soft error rate.

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Standard 80 column Dot Matrix Printer. High quality printing by NLQ mode. 3K Buffer. High-speed, low-energy consumption 9 wire dot head gives: Printing speed 180 C.P.S.

Logic seeking printing or incremental printing with high response, stepping motor. Use of fan-fold, roll or cut-sheet paper is possible with adjustable sprocket pin feed and friction feed. Both fixed and proportional character pitches are available. Emphasized and double print modes are possible. 9 graphic modes are available. 8 language international character font internalized.

SPECIFICATIONS:

Printing Type: Impact Dot Matrix

Maximum Printing Range: 203mm

Print Types: ASCII 96 Others 7 language

Character Format: Character Mode Standard 9 x 9 dots NLQ 18 x 20 dots Graphic Mode

Printer Modes: (a) Fixed pitch mode (b) Proportional pitch mode

Character Size: 2.42(H)x 1.99(W)

Printing Speed: 180 Character per sec. (pica)

Paper Feed Method: (a) Adjustable sprocket pin feed paper width 4-10 inch (pull through) (b) Friction feed paper width 4-8.5 inch

Paper Feed Pitch: (a) Standard pitch 1/6 inch (b) Min. pitch 1/216 inch

Ink Ribbon: Special ribbon cassettes

Power Requirements: 240V + 10% 50 Hz

External Dimensions: 408(W) x 314(D) x 96(H)mm

Weight: Approximately 7.2kg

Ambient Environment: (a) 5-C-40-C (less than 80% RH)

(b) Horizontal operating surface

Reliability: (a) MTBF $3x10^6$ lines (excluding print head and ink ribbon)

(b) Print head life: $100x10^6$ characters

(c) Ink Ribbon life: $2.5x10^6$ characters

Interface: Parallel interface 8-bit parallel (Conforms to Centronics)

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JUKI PRINTER

Professional daisy wheel printer 18CPS full incremental mode Diablo 630 emulation. Large range of daisy wheels. 8K internal buffer available.

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D/D D/D Cat. C12504	$39.95	$37.95

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D/D D/D Cat. C12425	$31.95	$29.95

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Quality 20 minute tapes.

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1-9	10+	100+
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Incredible deals to suit everyone including our special package deals!

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640K RAM Colour graphics. Multifunction Card, Disk Controller Card, 2 serial and 1 parallel ports, 2 disk drives and 3 months warranty **only $2,100**

256K PACKAGE DEAL Includes Colour Graphics Card, Multifunction Card, Disk Controller Card, 2 serial and 1 parallel ports. A 120 C.P.S. printer and a monochrome monitor and 3 months warranty! **only $2,400**

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SCREENTEST

ViewStore

Kathy Lang assesses ViewStore, a BBC B data management system aimed at novice users which has links to other View packages.

As a regular user of a 16-bit machine with a hard disk, it was with some trepidation that I approached the task of using a data management system on the BBC Model B with a single disk drive — it gives about a quarter of the processor speed and about 10 per cent of the memory of my usual system. In most respects, I was agreeably surprised by both the features and the performance of ViewStore, which forms part of a group of packages centring on its word processor, View.

ViewStore comes in two parts: the main commands, including those for editing, are in a RAM chip which you can fit to the BBC (or the BBC+) yourself; and a disk containing a variety of utilities for creating and running reports, setting up a data file, and so on. You must have at least one disk drive to use ViewStore — it doesn't work from cassette tape. The package is initiated by typing a *STORE command from within Basic; thereafter, asterisk commands such as *COPY and *CAT are still available from within ViewStore when you are at the command level (that is, not running a utility or editing data).

ViewStore has some of the attributes of a conventional flat-file package in that each record in a data file has the same number of fields and occupies the same amount of space, and you cannot relate two dissimilar sets of records. Within those limits, it is a powerful and flexible package, with a number of features rarely found in much more sophisticated systems.

Constraints

The major limitations on the use of ViewStore are shown in Fig 1. The constraints on record and file size shown are maxima; the actual limits depend on the amount of memory and disk space you have, and the details are shown in Fig 2. Other points worth noting are the choice of date formats — DD/MM/YY or MM/DD/YY — and of character formats. The primary differences between these is in the way selection works. For alphanumeric fields, matching is carried out on the whole field, while for text fields, each word within the field is tested for matching. This could be quite a help in applications with a lot of free text (more on this under 'Selection & sorting').

Validation facilities include testing to see if a number or character string lies within a range of values, and checking whether it matches an item in a prespecified list.

File creating and indexing

The first step in creating a data file is to define the fields: you must give a type for each field, you may give a name and also the size of the field. Unusually, this indicates the width of field to be displayed, not necessarily that stored. You can specify whether the field is to be scrolled or not, thus 'freezing' the display of fixed items such as codes and numbers, but allowing you to display *just* part of a long text field and scroll within it when the cursor is in the field. This could be very helpful in providing compact display of records containing long text fields.

Field names may be no longer than field widths. You can get round this by having a caption or message attached to each field, which is displayed at the top of the screen when the cursor is in that field. The other attribute to be decided when the file is set up is indexing. Unless told otherwise, ViewStore displays information in the order in which it is entered. Each file may have a number of indexes attached to it, each index providing an ordering based on a single field (or the first few characters of it, if you prefer).

The number of indexes depends on the filing system you are using. For DFS you can have up to four indexes kept up-to-date, and a further three read-only indexes which have to be reconstituted when you have made changes which affect their ordering, or added new records. If you subsequently wish to change the index field specifications, you can alter the file definition and then use the Index utility to create the desired new indexes.

ViewStore will also ask you to define the maximum record size and the maximum file size. The usual way to define maximum record size is to request the total of field sizes plus an allowance for fields which may be greater than their displayed size. This gives some flexibility, but in practice you may still have to ask for the largest size any record could attain.

As to file size, you need not specify this at set-up time, but if you do not and the disk contains other files, you may find that the file cannot be extended even though there is disk space left. For this reason, it is recommended to have one data file per disk on floppy systems, or allocate as much space as you could ever need. (You would certainly have to watch

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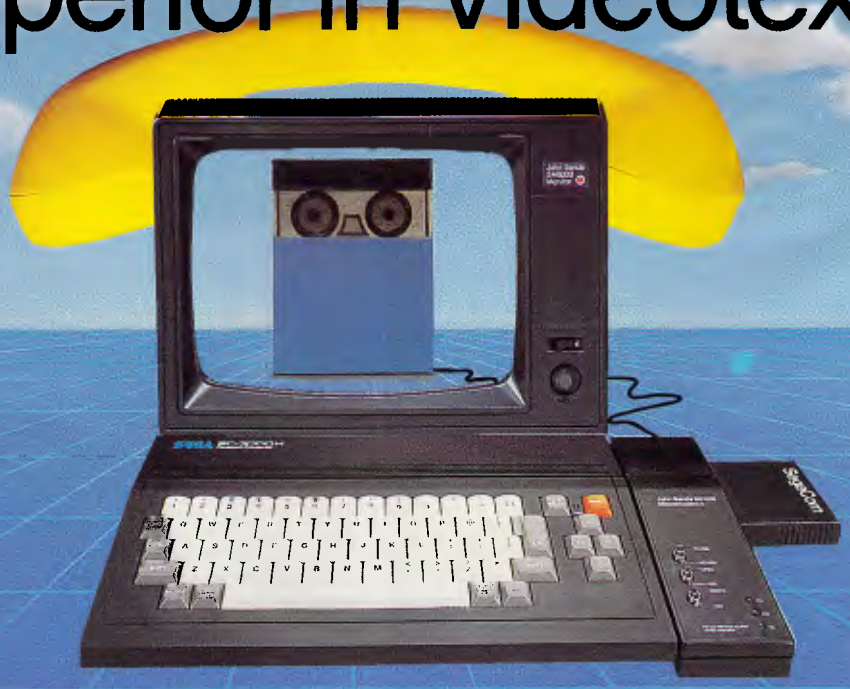

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Max record size (ch)	60,706 chars
Max no fields	254
Max field size	239 chars
Max digits	10
Max prime key length	105 chars
Special disk format?	No
File size fixed?	No
Link to ASCII files?	Yes, several formats
Data types	No,char, date,text
Fixed rec structure?	Yes
Fixed record length stored?	Yes
Amend rec structure?	Copy data file
Link data files?	No
No data files open	Not possible
No sort fields	Unlimited
No keys	7
Max key length (chars,fields)	105,1
Subsidiary indexes kept up-to-date?	4 kept up-to-date automatically
Data validation	Good
Screen formatting	Paint-a-screen, default
Unique keys	No
Report formatting	Cols, default, close link to WP
Store calculated data	No
Totals & statistics	Totals, sub-totals, calculations in reports
Store selec'n criteria	Permitted
Combining criteria	And, Or
>1 criterion/field?	Yes
Wild code selection?	String within
Browsing methods	Any key
Interaction methods	Menus, commands
Reference manuals+	***
Tutorial guide+	***
Reference card+	****
Online help+	**

*= rating, maximum five stars

Fig 1 Features and constraints

the space problem, especially if you have single-sided disks. ViewStore files cannot span disks, so with one single-sided disk drive you would be limited to about 800 records of 100 characters each after allowing space for indexes).

When a file has been set up with data entered into it, reorganisation is possible in two ways. If the changes fall within the additional space allowed at the beginning, fine. Otherwise, the file must be copied using the Convert utility.

Data input and updating

You can add or amend records on the screen either in a one-record-per-line format, or in a mode which mirrors the conventional card index. To retrieve records for editing, you state which index you wish to use, and then specify the value of the key field for the record to be edited. When a record has been retrieved, you can then browse forwards or backwards in the file in order by the current index, using the cursor keys. If you specify a key value which does not exist, ViewStore provides the next record in the file. Key value specifications can include wild codes: * matches any sequence of characters, while ? matches any single character, just as in the BBC's own commands. (You can, if you wish, omit the specification of an index and just scroll through records in the order of entry.)

All editing is interactive — there are no facilities for specifying automatic updating if a group of records all require the same change. Nor are there any facilities for calculating the value of a field from another when data is input.

Screen display

When you are adding, editing or viewing records, you can show the data either in a table format very similar to that used by spreadsheets, or in what ViewStore calls 'card' mode, where each record can occupy more than one line of the screen. An initial form of card mode is set up by ViewStore from the information provided when the record format is defined; you can either modify this, or create new formats of your own. ViewStore will then fit as many records on the screen as it can, using this format. This is a good deal more flexible than is normally possible, as most packages oblige you to have one record per screen when editing.

You can have as many different ways of displaying a set of records as you wish. Field widths may be zero, providing a way to allow junior staff to display and edit parts of files which contain confidential information, such as salaries.

ViewStore also provides two forms of display for groups of records selected for viewing only. A simple list format is available if you want to show records selected on the basis of non-key fields; this shows one record per line, with as many fields as ViewStore can fit onto one screen width (that is, without sideways scrolling), and without sorting. For more sophisticated formats, or when you need to sort the records into another order, it is possible to display on the screen reports set up with the Report utility.

Printed reports

The simple list format, one record per line, can also be used to provide printed output, but normally you will want to produce more sophisticated reports, and ViewStore has a report utility for this purpose. This allows you to use as many lines for each record as you wish, and to specify precisely where the fields are to be placed. This is done by setting up, under ViewStore's instructions, a data file which contains the instructions for formatting the report. This approach makes it possible to edit the report format using the same techniques as you use for editing data.

A simple example of a ViewStore report format is shown in Fig 3; the % symbols represent the format to be used to display the fields shown on each line. Items may be field values (the full length or only part), expressions, register values, page ejects or comments. Register values make it possible to accumulate expressions over all records and over a sub-total range. You can specify as many levels of sub-totals as you wish, but the file should first be sorted into the appropriate order to make the specification meaningful.

ViewStore also provides a special type of report for printing address labels, allowing, among other features, the ability to print several sets of labels. Any type of report can be produced either on the whole data file, or on a selected set of records.

The ViewStore manual states that the package comes set up for a very basic type of printer which does not provide emphasis, and that if you want to use a more sophisticated printer you should seek help from your dealer. In fact, I could not get the line lengths to work out properly even with an Epson matrix printer, without issuing an *FX command

	Screen Mode 0	Mode 3	Mode 7
Maximum record size	5k chars	9k chars	25k chars

	40-track drive	80-track drive	ADFS drive	Winchester drive
Maximum file size	100k chars	200k chars	720k chars	10Mbytes upwards

Fig 2 Model-specific constraints

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(which not everyone wants to know about), so you should check this aspect with your dealer before you buy.

Selection & sorting

The fastest method of selecting individual ViewStore records or sets of records is via the indexes. These can be maintained automatically, or set up *ad hoc* as you need them. They are based on single fields, and on values which match exactly or are as near as possible to the test value. For more powerful and varied selection, there is a utility called Select. This allows you to either list records directly to the screen or printer, in order by the index currently in use, or to save the selected records in a file for subsequent use, in which case they may be sorted first.

You can compare the values of fields with constants, using the usual range of comparison operators including equal, not equal, less than and greater than; both the values and, unusually, the field names may contain wild codes. The ability to include wild codes in field names means, for example, that if you have four address lines called Addr1, Addr2, and so on, and you want to find all your customers who live in Penrith, you can ask for a match on 'Addr*ViewStore-Penrith', and the correct record will be selected regardless of where the town occurs in each record.

ViewStore allows you to have as many tests in a single selection as you wish, provided the total length does not exceed 255 characters. To combine tests, you can use AND and OR in any combination, using brackets to control the order of evaluation and ensure the correct selection. Matching is, however, case-blind, so a test for 'FORD' would match 'Ford' and 'ford' as well.

For ordinary alphanumeric fields, tests are said to be satisfied if the whole field (allowing for wild codes) matches the test value. For items set up as text fields, tests are carried out on each word within the field. This could prove very useful in an application such as a library catalogue, where you might want to find key words within an abstract without necessarily storing them in separate fields.

Using the Select utility, you can request sorting on as many fields as you wish: for example, surname within department within region in a personnel application. You can restrict the sort to the first few characters for a field if that will suffice for uniqueness. The number of sort fields is limited only by the total number of characters to be sorted, which may not exceed 250.

The output from Select may, and must if the records are to be sorted, be sent to a workfile. This file is in a special format which can be read by the Report and Label utilities; it can also be translated, using the Convert utility, into a data file which can then be processed using the full range of ViewStore features. You should take care to rename any file of selected items which you wish to keep, as only one Select workfile is retained — the next selection which you make and store overwrites the previous set of selections.

Calculations

When producing ViewStore reports, items printed may be expressions; you may also accumulate field values in registers. Each register has two values — a totals value which is reset at the beginning of the report, and a sub-total value; all sub-total registers are reset when a set of sub-totals is printed. (If you have several levels of sorting, you would need to think about the level at which to accumulate sub-totals.)

Altogether 26 registers are provided. Of these, one is used to store the page count, and another to count the number of records processed.

Multiple files

ViewStore does not provide any facilities for handling several sets of records of dissimilar structure.

Tailoring

Apart from the usual facilities for adapting screen and report formats to your requirements, ViewStore's tailoring facilities are limited to an ability to store the key sequences used to carry out functions that you need to do often in the same way. This can also be a help when developing more complex reports. You can store the appropriate instructions and responses for displaying the report on the screen, re-issue them as often as you need, editing the report format each time until the report is correct, and then finally change the sequence to send the report to the printer.

There are two ways to invoke such stored command sequences. You can store them in a file, called an Exec file, and invoke them by typing *Exec followed by the file name, or you can store them as a sequence to be invoked by pressing a function key. The major difference is that command sequences stored in files can subsequently be edited while those stored as function key sequences cannot — they can only be replaced.

Security & housekeeping

Each type of file used by ViewStore — data, index, report, format, and so on — is stored in a separate directory on disk. You can pre-assign these directories in order that ViewStore will always look for them on a specific drive, thus saving typing and more remembering. All the standard DFS and other BBC commands are available through ViewStore by typing the command name prefixed by an asterisk, just as in Basic.

As you add or amend records to ViewStore, the edited records are automatically written to disk. Therefore, unless you do something very silly such as turning off the power or pressing BREAK in the middle of a session, your precious data should be safe, and even in those circumstances you may well survive. My own criticism is that this means there is no way to abandon an editing session — if you make a real mess, the

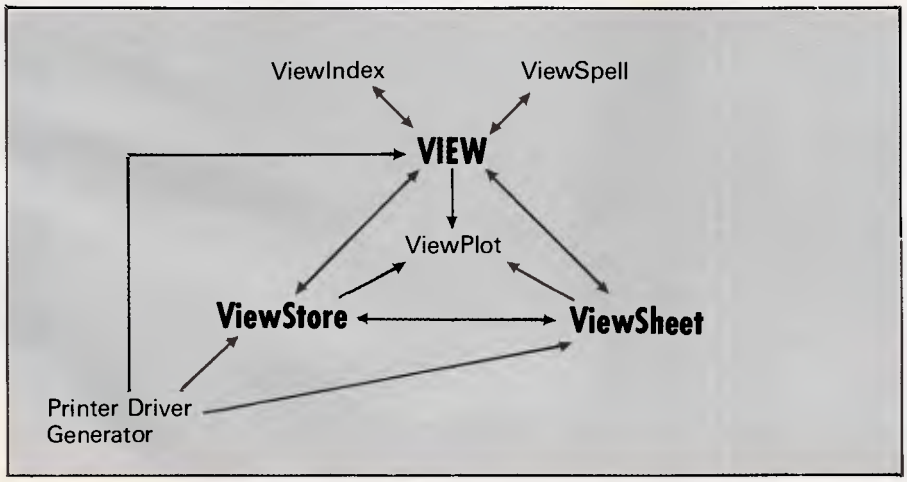

Fig 3 View interrelationships

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only way out is to restore the back-up copy (a means which, of course, we all take regularly). There isn't even any way, as far as I could discover, to 'start over' editing a single record — if you make a change by mistake, you have to re-enter the original information.

Links with outside

ViewStore is quite flexible about the record formats it can read and write, although I couldn't figure out a way to write or read DIF format files (of the kind used by most spreadsheets). This probably wouldn't matter to most people, as ViewStore can read and write files used by the View spreadsheet. Indeed, ViewStore can read and write flexibly to all the other View modules (see Fig 3). A particularly useful and unusual feature is the ability to write totals and sub-totals in ViewSheet format, as what you usually want to do is to forecast changes from aggregate information, not from the raw data. (For example, you would be interested in projecting sales figures from the total sales of the last 12 months, not from individual sales records. The latter could be summed in your spreadsheet after transfer, but only if they would all fit in memory, which is unlikely.)

Apart from other View product formats, ViewStore can read and write most regular ASCII files. You can specify field and record delimiters (which can be more than one character each), as well as skipping headers and trailers, and there are many other useful features.

User image

You might expect that a package with basic features would be simple to use, but that is not always the case. Happily, ViewStore is extremely easy to use, with its blend of a few commands for major operations, such as setting up a report, and sensible use of function keys for tasks such as switching between the table and card modes of display and examining the record format. The most extensive use of lengthy typed commands is in the setting up of selection criteria, and here I strongly agree with ViewStore's designers that the simplicity and power of this method of specifying complex selections overwhelmingly compensates for the small extra penalty of learning the simple selection syntax.

The two modes of display complement each other well, especially when you remember that it is also possible to have several different forms of the card display. The unusual flexibility of this approach did a lot to make up for the drawbacks of using a data management program on a television screen, but I still think that for most people, the investment in an 80-column monitor would be well worthwhile. (This is especially true if you want to exploit the selection facility fully. My only criticism is that the prompt, which appears on every line, uses 17 precious characters out of 40 on a TV screen.)

The extensive and flexible use of wild codes is also an unusual and valuable feature. It saves a lot of typing, but it also allows you to do a good many things that would be impossible in other packages. (The example of selecting a suburb from several address fields provides a good illustration of this.)

Documentation

ViewStore is supplied with a manual, a keyboard template, and a reference summary card suitable for carrying in a pocket or handbag. The first few chapters of the manual explain the editing and retrieval features, using as illustration a sample data file distributed on the utilities disk. The remainder of the manual describes features not so easily illustrated in this way, such as setting up a data file of your own, but throughout the language is reasonably clear and the approach understandable.

The only exception to this is in the section on report formats, when the examples are referred to but not reproduced on the printed page. This is the only place where this happens to any extent, and the one place where it should not have happened, as report formats are quite difficult to come to grips with whatever the method of implementation.

The manual is typeset and well-printed (although in one colour only), with the screen displays being photographs of real monitors. There is a good index, but apart from the page number there are no headers or footers at all. This lack of any clues about one's whereabouts is a real problem in a manual which must subsequently do duty as a reference document. Including the chapter title on each page would have made life so much easier.

Conclusion

I found ViewStore easy to use and remarkably powerful for a package on a small system. It could certainly be used for plenty of home file tasks, and would not be inappropriate in a small office; the only real problem being disk capacity. (The program will run on Winchester hard disks, though.)

The documentation is also of a reasonably high standard, especially the reference card.

I do, however, have one real bone to pick. How can anyone distribute a disk filing system without a disk formatting program? The aggravation that this deficiency caused me far exceeded any minor hitches I experienced in coming to grips with the package.

END

Summary

Supplier:	Barson Computers
Tel:	(02) 888 9444
Cost:	$136 ROM and manuals, $67 ROM only
Systems:	BBC B, BBC B+
Type:	Novice use, structured records
Features:	Stores records of homogeneous structure in flat file format. Flexible record display, powerful selection including matching words within fields, good reporting features including labels. Good links to other View packages, especially ViewSheet
Drawbacks:	Main disadvantage is limited disk size on most BBCs — can be used on hard disk. No file link feature
Ease of use:	Very good. Sensible mix of commands and function keys, extensive use of wild codes. Good prompting, little other help

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This month's selection of games has Stephen Applebaum enter the Great American Road Race, playing mind games with political advisors in the Kremlin and soaring through the clouds in an F-18 Hornet.

Pumping gas

GAME: The Great American Cross-Country Road Race
MACHINE: Commodore 64/128
SUPPLIER: Imagineering
PRICE: $19.95 cassette, $34.95 disk

The Great American Cross-Country Road Race is no ordinary motor racing game; it is a colourful odyssey across the varying terrain of the US. Although there are obvious touches of Pole Position and smatterings of Enduro, Road Race is a classy program with some inventive moments.

The object of the game is simply to drive from the east coast to the west coast of the US, on what must be some of the country's busiest highways. There are four races, the longest of which is the American Tour, taking in every city between the two coasts. Shorter, but no less arduous, are straight runs between two major cities; Los Angeles to New York, Seattle to Miami, or San Francisco to Washington.

After selecting a race, a map screen allows you to choose a route. Not only does this allow you to plan your route, but also helps you avoid bad weather.

During a race, you are presented with a view looking down the road. Below the main display is a mileage indicator, a speedometer, a rev counter, and a radar for detecting police cars. Gear changes can be made by declutching (releasing the fire button) and pushing the joystick forward. Pulling the stick back causes the car to break.

As you speed along the road, other cars, motorbikes and even trucks hurtle past in abundance, but they can soon be caught by putting your foot (thumb) down on the gas. Remember to keep an eye on your fuel gauge —it's easy to run out of gas and have to pump the accelerator all the way to the next fuel station.

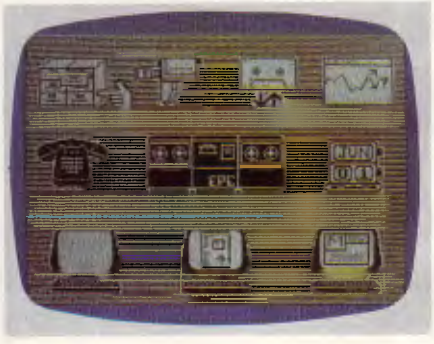
On some of the longer races you have to drive through the night, watching out for any grey objects that emerge from the darkness. These are either signposts or other vehicles, so they're best avoided. When you finally reach a city, the word welcome' flashes up on the top of the screen and a tune, plagiarised from Pole Position, plays to herald your arrival.

Unlike many of the current racing games, The Great American Cross-Country Road Race has plenty of variation; there are snowy wastelands to drive across, raindrenched highways to skid over, and even the odd police car to outmanoeuvre. Highly recommended for those who yearn for the open road.

Tinker, tailor . . . mole

GAME: The Fourth Protocol
MACHINE: Commodore 64, Spectrum
SUPPLIER: Computermate
PRICE: $39.95 cassette

Games based on books or films often tend to be smash-and-grab affairs, with little more than the most tenuous of threads linking the software to the original material. The Fourth Protocol,



based on Frederick Forsyth's book of the same name, by no means falls into this trap, thanks to the programmer's eye for detail and obvious respect for the author's work.

Forsyth's explosive plot centres around the last few weeks leading up to a general election. Political advisors in the

Kremlin want the Labour Party returned to power because they believe it could be duped into withdrawing Britain from NATO, so creating an opening for a Russian invasion and, ultimately, a Soviet take-over of mainland Europe. To try to ensure Labour's re-election, Moscow prepares plan Aurora — a scheme to explode a small nuclear bomb, following it up with a condemnation of the US whom it will blame for the atrocity. This, it is hoped, will coax people into voting for Labour, the only party advocating unilateral disarmament.

The game is quite true to the book. There are three parts to the program, the first two of which are purely icon-driven, while the third is an arcade phase requiring both the nimble use of a joystick and some very fast typing.

Program one begins with you being appointed head of CI(A) (the M15 section responsible for security of government buildings) and on the trail of a mole within the organisation. Positioned around the screen are several large icons, each of which provides a facility for either storing, retrieving or finding new information. Placing a cursor over any of the icons produces a menu from which a function can be selected.

One of the most often-accessed icons is a large telephone. This allows you to call up various computers, and talk to other characters dotted throughout the government and the CI(A).

At the top of the screen is a video camera. This represents your surveillance team, or 'watchers', as they are called. A number of these super-snoopers can be sent out to keep watch and report back information on the person's whereabouts, personal life, and so on. Details acquired in this way can be filed for later reading.

Information gained from watchers and various other sources should lead you to the name of the traitor, and for who he or she is working. Unless you solve the puzzle within a 40-day (1 hour 20 minutes) time span, you cannot progress to the second challenge. A save option means that you don't need to complete the game in one sitting.

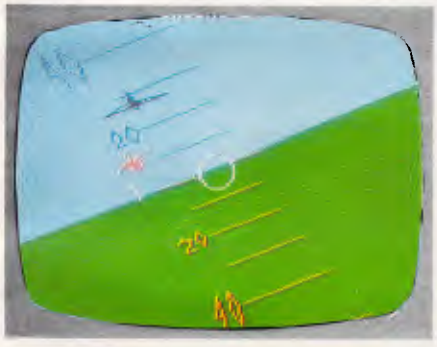
Game two is much the same as the first, except this time you are out of the office and wandering around the streets of London trying to locate the bomb. There are many locations to explore, so rather than hoofing round the capital, you can catch a bus, take a taxi, or sample the delights of the Underground.

Apart from getting run over by a London bus, there are many other obstacles that will impede you in your search. These range from the odd terrorist to a rail strike. Should you last long enough, you'll hopefully stumble across the password giving you access to part three.

Having found the bomb, it must be defused. In the Commodore 64 version, the screen depicts a room containing a filing cabinet in which the device is stored. As you try to open it, KGB agents rush in and must be dealt with before you are overpowered, leaving the bomb to go off.

The final part of the Spectrum version is quite different, featuring a shoot-out between agents from both sides. Not until all the KGB stooges have been killed can the cabinet be tackled and the bomb defused.

The Fourth Protocol is an excellent game — not only in its story line and execution but also its graphics, all of which go to make it a must for adventure enthusiasts who like a game with substance.



Souped-up cessna

GAME: Jet
MACHINE: IBM PC/XT/JX/JR
SUPPLIER: Imagineering
PRICE: $99.95

Anyone who has been bitten by Microsoft's Flight Simulator, and anyone who hasn't, would know that the brains behind that masterpiece was Bruce Artwick of Sublogic, a company which specialises in flight simulation software. Well, Sublogic has done it again with a new simulation called "Jet".

Jet is a simulation of the F-16 Falcon and F-18 Hornet tactical fighters, complete with armaments and adversaries. The F-18 is a carrier based aircraft, whereas the F-16 takes off from land. You may select either a "strike" mission (against earth bound objectives) or a dog fight scenario — in both cases against fierce opposition.

Of course, the first step in preparing for any battle is the selection of ordinance. Four different types of missile may be loaded, each of which has its own trade-offs in terms of weight, accuracy and range. The enemy consists of land based anti-aircraft defence positions as well as MiG-21 and MiG-23 fighters. Nine levels of difficulty are available, including a practice mode in which the enemy fights back, but all their shots happen to miss. I was astounded when, in practice mode, an M16 sat on my tail firing volley after volley to no avail, after which the pilot flew over my starboard wing and performed a barrel roll right in front of me. I waited until he did it again and then let him have it! Not very sporting, but very satisfying.

Like the original flight simulator, Jet provides an "out of cockpit" view, but with a "heads up" display (a standard feature in all the best fighters). Just like the real aircraft, Jet is "fly by wire", meaning that the controls are computer assisted. This makes it far easier to fly than the original. Included are afterburners, airbrakes, zoom, tracking radar, range measurement and an ejection seat.

Jet lacks the complex controls of the original simulator, which means it is far easier to get up and fly. Additionally, the heads up display shows only essential information, providing a less cluttered screen. Jet does not have the umpteen environmental parameters o, the original, either. However, it is compatible with Flight Simulator II scenery, and I for one plan to go on a bombing run through New York.

Jet runs on the IBM PC and compatibles, as well as the PC Jr. It requires 128k of memory,and can be configured to display in monochrome or colour, but does require a graphics adaptor in either case. It can also make use of the Hercules card, and the new IBM enhanced graphics adaptor.

Jet is very much a different type of simulation from the original, but then an F-18 is very different from a Cessna 182. All in all, I think Sublogic has another winner on its hands.

END

Computer talk

Graham Storrs tries to improve communications between computers and people/computers by presenting speech recognition in the form of Basic natural language programming — nouns, prepositions and all.

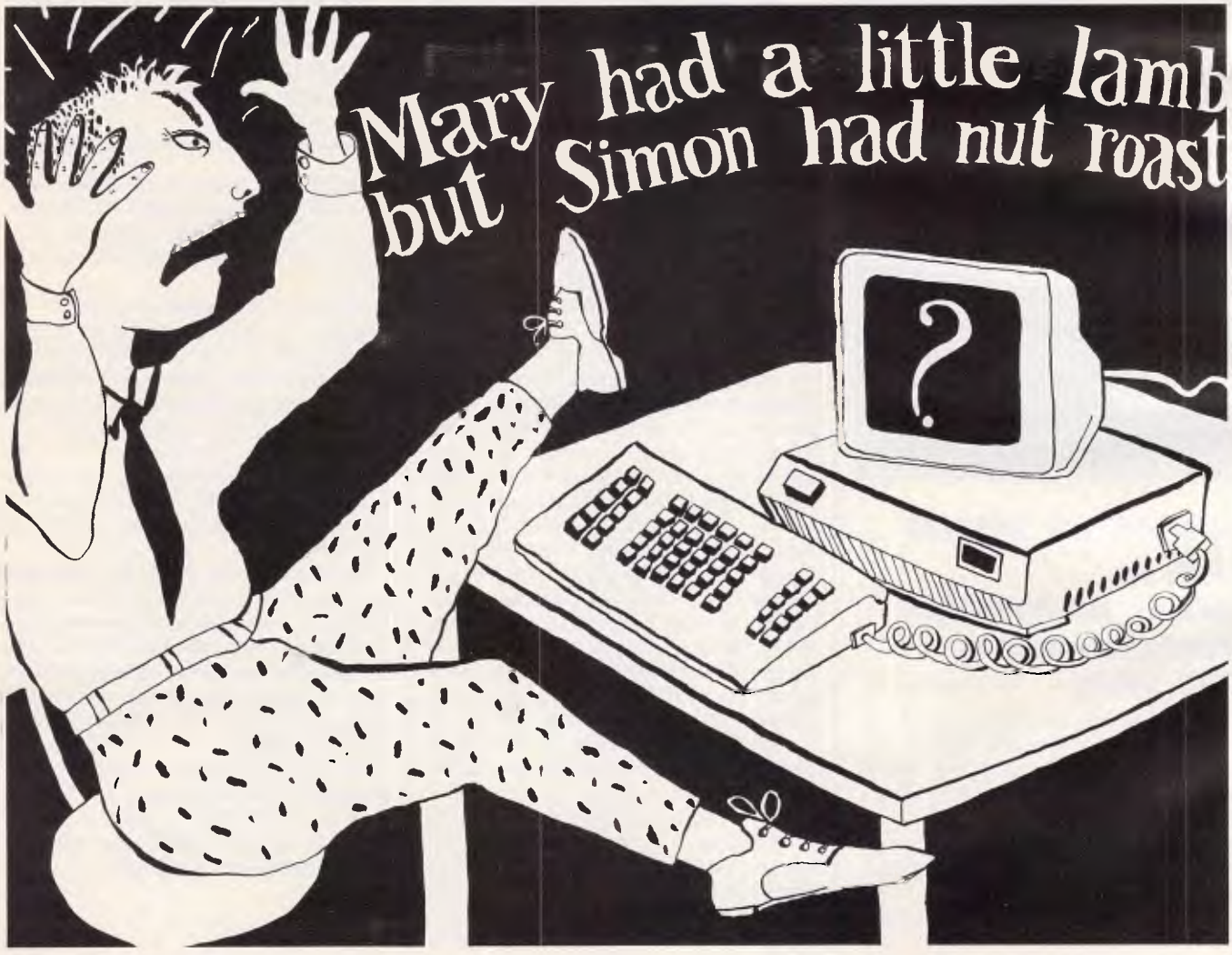
Natural languages are the languages that people use every day to speak to one another. For the past two decades, a major theme in artificial intelligence (AI) research has been the development of computer programs that can understand and use natural language.

This is an important area for two main reasons. Firstly, many people believe that communicating with a computer in natural language will be far easier than using a man-made language such as a command language or a programming language. Secondly, people could communicate better with each other — with a computer to do the translation, businessmen and politicians would be able to speak directly to their foreign counterparts.

Yet the problem of giving language ability to a machine is not a trivial one. Several programs exist which handle a wide range of sentence constructions and can discourse quite intelligently about particular, limited knowledge areas. There are programs that will paraphrase or translate newspaper stories about particular subjects, and ones which will allow users to ask questions in English of large databases, but there are no programs which display a *general* competence at any natural language.

Syntax

There are two main aspects to the natural language problem: parsing the sentences and extracting the meaning. Parsing



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BEEMAN MAYRHOFER STOTT/CC422

involves resolving a sentence into its component parts and labelling the parts according to their grammatical roles: this is called 'syntactic analysis'. In the sentence 'The little girl inserted a blank cassette into her new computer', we can identify a noun phrase ('The little girl') followed by a verb phrase ('inserted a blank cassette into her new computer'). The noun phrase is composed of a determiner ('The'), an adjective ('little') and a noun ('girl'). The verb phrase has a verb ('inserted') followed by a noun phrase ('a blank cassette') and a prepositional phrase ('into her new computer'), and the prepositional phrase is a preposition ('into') followed by a noun phrase ('her new computer') (see Fig 1).

Note that the parse in Fig 1 gives a hierarchical structure. These structures are known as 'parse trees' and are the usual end-product of most kinds of parse. It is the parse tree that is the input for processes at higher levels that extract the meaning of the sentence.

Like many computer people who come fresh to this field, you are probably wishing you had paid more attention in your English classes at school! Indeed, what we have used to analyse this sentence is a rather simple type of grammar known as 'context-free' grammar. There are many other kinds which make more use of the structure of a sentence, and even the meanings of the words, in determining how the parts should be labelled (see last December's *APC* for details of other approaches).

Just to show that you don't need Prolog or Lisp to write natural language programs, the listing in Fig 2 is a Basic program that will parse our example sentence. It applies context-free grammar through a series of nested procedure calls. Think of the program as trying to prove that a sentence exists. It does this by testing that the input string is a noun phrase followed by a verb phrase with a call to line 570. This in turn calls the line 680 procedure which tests that a determiner is followed by an adjective then a noun. The tests for each of these are done by the function at line 850, which tests the next word in the input string against a list of words in a dictionary that fit the syntactic category specified by the input parameter P. The program works down the tree for the verb phrase in the same way.

As it succeeds in finding words to fit its expectations, the program prints them, showing by indentation how they fit into the parse tree (Fig 3). The program incorporates a simple form of backtracking so that if the parse fails, it can try a different sentence structure. This is achieved with the loop at lines 130 to 160; it is left to the reader to add new structures and procedures for coping with them. The backtracking too can be extended to try alternative substructures — different types of noun phrase, for example.

'... many people believe that communicating with a computer in natural language will be far easier than using a man-made language...'

The first thing you might want to do will be to extend the program's vocabulary so that it will accept a greater range of sentences. If you do, don't forget to change the values in the array LAST(i) or you will get in a mess. A final improvement would be to modify the program to create an internal representation of the finished parse tree, rather than simply printing it and then losing it.

Formally equivalent to context-free grammars are transition nets. Fig 4 shows the nets we would need to interpret the 'little girl' sentence. Each net is a set of nodes (represented as circles) with one node being the end node (double circle) all joined by arcs (arrowed lines).

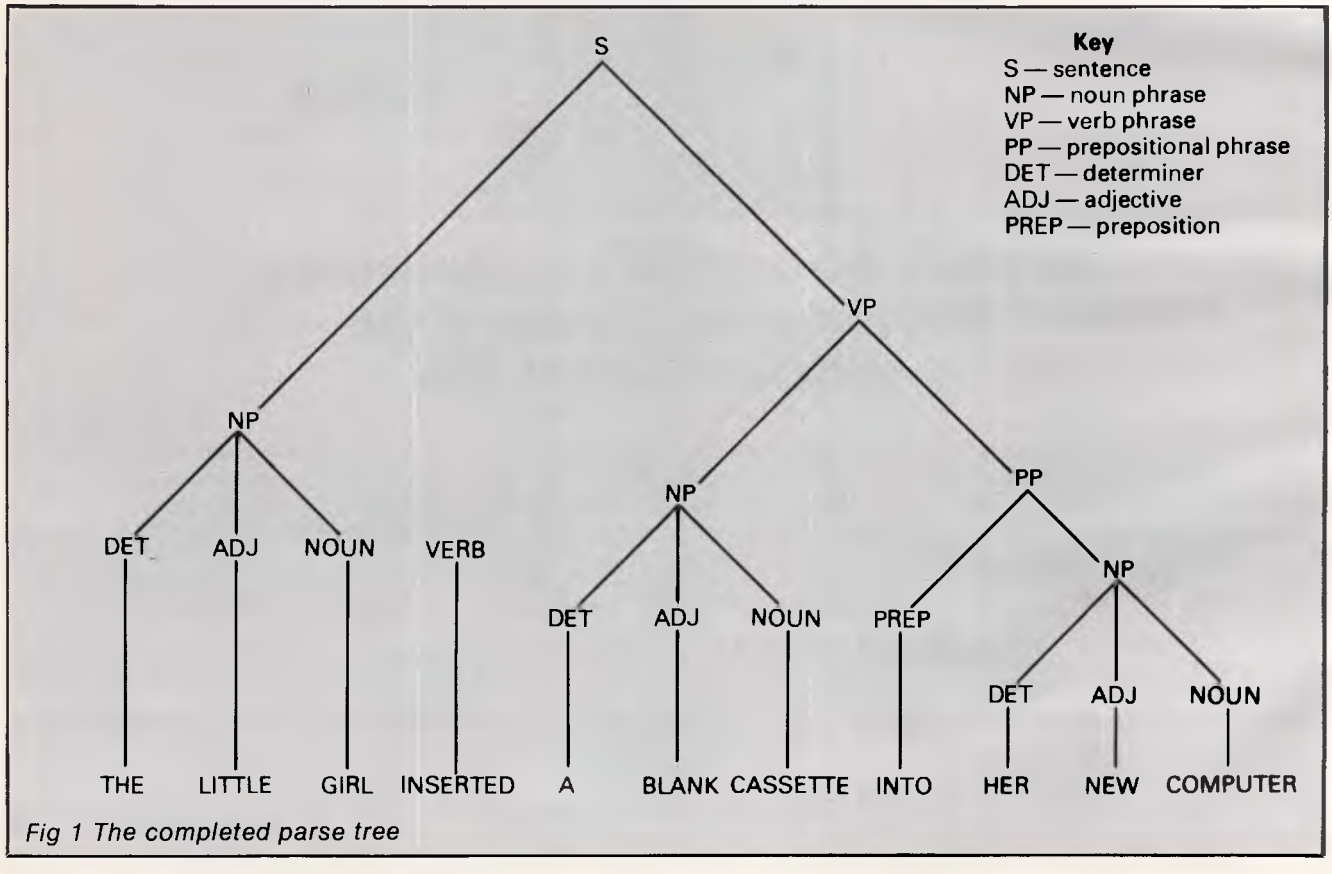

Fig 1 The completed parse tree

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The arcs are labelled with the grammatical unit they analyse.

To work through a sentence, we start at the 'sentence' net. A sentence, we see, is a noun phrase followed by a verb phrase. The arrow beside NP in the diagram indicates that we should look at the 'noun phrase' net to see whether a noun phrase can be found; this tells us a noun phrase is a determiner followed by an optional adjective and ending with a noun. None of these arc labels have arrows, so they can be satisfied by finding individual words. 'The little girl' gives us the necessary words, so we reach the end node of the noun phrase net and go back to the sentence net to cross the verb phrase arc, and so on.

A more powerful form of transition net is the augmented transition net (normally just called ATN) which allows other linguistic properties to be attached to the parse, such as tense and mood. This allows the parser to check that verbs 'agree' in their tense or that nouns have the right determiner. For example, if the parser finds the determiner 'a' (as in 'a blank cassette') it can attach the 'singular' property to the noun phrase and spot mistakes such as 'a blank cassettes'.

Parsing has a great many difficulties concerned with problems of reference: that is, discovering the objects that words refer to. In 'John loves Mary and she quite likes him', both 'John' and 'him' refer to the same real-world object (the person named John). Similarly, 'Mary' and 'she' co-refer to another single object. The parser must be able to detect such cases of co-reference.

More difficult are anaphoric references, where words refer back to objects mentioned in earlier sentences. A naval database might receive the following queries: 'Tell me the tonnage of the Enterprise. What is her class? Her captain? His last ship?' Here, 'her' refers back to the ship named in the first sentence, while 'his' refers to the captain of the ship named in the first sentence.

The general problem here is context. When human speakers converse, they have a topic of discussion which sets a context which helps them disambiguate the words they are using. 'It ran all over the floor' would mean something different to someone talking about spilled water than it would to someone talking about their pet guinea pig. In fact, a great deal of comedy, especially farce, is based upon the misunderstandings that can occur when people interpret sentences using the wrong context. Even within a general context, the 'focus' of the discussion can change very quickly and frequently between different aspects of the topic. For this reason, a

```
10 '    A Sentence Analyser using a context free grammar
20 '
25 TRUE=-1 : FALSE=0
30 DIM DICT$(5,5)          ' the word "dictonary"
40 DIM WORD$(12)           ' an array for holding the words in the sentence
50 DIM LAST(5)             ' gives the number of words in each category
60 '
70 GOSUB 220               ' perform initialisation
80 WORD=0                  ' marks the current word being analysed
90 TYPE=0                  ' marks the sentence form being tried
100 FAIL=FALSE
110 SUCCESS=FALSE
120 GOSUB 440              ' Get String
130 '
140 TYPE=TYPE+1
150 ON TYPE GOSUB 210
160 IF (TYPE <> 1) AND (SUCCESS=FALSE) THEN GOTO 130
170 IF SUCCESS=FALSE THEN CLS:PRINT " ";S$;"  is not a legal sentence."
180 PRINT "Another sentence ?";
190 A$=INKEY$:A=INSTR(".YyNn",A$):IF A<=1 THEN GOTO 190 ELSE PRINT A$
200 IF A>3 THEN END ELSE GOTO 80
210 GOSUB 570: RETURN              ' Analyse sentence
220 '   Initialisation Subroutine
230 DET=1
240 ADJ=2
250 NOUN=3
260 PREP=4
270 VERB=5
280 LAST(DET)=3
290 LAST(ADJ)=3
300 LAST(NOUN)=3
310 LAST(PREP)=1
320 LAST(VERB)=1
330 FOR J=1 TO 5
340     FOR K=1 TO LAST(J)
350         READ DICT$(J,K)
360     NEXT K
370 NEXT J
380 DATA "THE", "A" , "HER"
390 DATA "LITTLE", "BLANK", "NEW"
400 DATA "GIRL", "CASSETTE", "COMPUTER"
410 DATA "INTO"
420 DATA "INSERTED"
430 RETURN
440 ' GetString Subroutine              Breaks sentence into words
450 '
460 WC=1                                'word count
470 PRINT "Please enter a sentence for analysis "
480 NEWWORD$=""
490 INPUT S$
500 L=LEN(S$)
510 FOR J=1 TO L
520     C$=MID$(S$,J,1)
530     IF ASC(C$)<>32 THEN NEWWORD$= NEWWORD$ + C$

                       ELSE WORD$(WC)=NEWWORD$:WC=WC+1:NEWWORD$=""
540     NEXT J
550 WORD$(WC) = NEWWORD$
560 RETURN
570 '   Parse sentence
580 CLS:PRINT S$
590 INDENT=0
600 PRINT "Trying sentence type 1"
610 PRINT "NOUNPHRASE"
620 GOSUB 680
630 INDENT=0
640 PRINT "VERBPHRASE"
650 GOSUB 740
660 IF FAIL=FALSE THEN SUCCESS=TRUE
670 RETURN
680 '   Analyse for noun phrase
690 INDENT=INDENT + 5
700 P=DET   :GOSUB 850: PRINT TAB(INDENT); "Determiner      ";W$
710 P=ADJ   :GOSUB 850: PRINT TAB(INDENT); "Adjective       ";W$
720 P=NOUN  :GOSUB 850: PRINT TAB(INDENT); "Noun            ";W$
730 RETURN
740 '   Analyse for Verb Phrase
750 INDENT=INDENT+5
760 P=VERB  :GOSUB 850: PRINT TAB(INDENT); "Verb            ";W$
770 PRINT TAB(INDENT); "NOUNPHRASE": GOSUB 680
780 PRINT TAB(INDENT); "PREPPHRASE": GOSUB 800
790 RETURN
800 '   Analyse for Preposition
810 INDENT=INDENT+5
820 P=PREP  :GOSUB 850: PRINT TAB(INDENT); "Preposition    ";W$
830 PRINT TAB(INDENT); "NOUNPHRASE" : GOSUB 680
840 RETURN
850 ' Locate a word (P) in the dictionary and return as w$
860 WORD=WORD+1
870 FOUND=FALSE
880 FOR J=1 TO LAST(P)
890     IF WORD$(WORD) = DICT$(P,J) THEN WD$=WORD$(WORD):FOUND=TRUE
900     NEXT J
910 IF FOUND=FALSE THEN FAIL=TRUE: WD$=""
920 W$=WD$
930 RETURN
```

Fig 2 Microsoft Basic parsing program

natural language understander needs to have some representation of the current context and focus.

Semantics

To understand what is meant by a natural language sentence, we need an enormous amount of knowledge. Knowledge about what words mean and what they refer to in the world (often called 'lexical' knowledge), knowledge about how words can modify each other's meanings in different ways, and general knowledge about the world. Consider the sentence: 'George hit the man with a broken leg on his nose.' You will see at once that, despite the deliberate ambiguity, the sentence can only sensibly mean one thing. This is because we have knowledge of what men are, what broken legs are, where legs are usually found, and the types of thing usually used as weapons. Similarly, in 'John loved Mary and she quite liked him', the only clue as to which pronoun ('she' and 'him') co-refers to which noun is the knowledge that 'John' is a man's name and 'Mary' is a woman's.

To take a famous example of how word meanings can change depending on the context of the sentence as a whole, consider: 'Mary had a little lamb'; then add 'but I had roast beef' and we have a completely different interpretation. Here, 'had' changes from meaning 'owned' to 'ate', 'little' goes from 'small in stature' to 'small in amount', and 'lamb' changes from the live animal to a cooked part of the animal. Or how about 'Time flies like an arrow' and 'Fruit flies like a banana'!

To sort out this tangle of meanings, a natural language program needs to represent all this semantic knowledge. In fact, finding a suitable knowledge representation for natural language understanding is the rock upon which the whole enterprise is foundering.

The earliest schemes for this were semantic networks, where words were represented as nodes in a network which were linked to other words which formed part of their definition, creating a structure rather like a dictionary (Fig 5). These are still widely used, and have become increasingly sophisticated and versatile.

Another popular representation is the 'frame'. A frame is a data structure which represents a concept, and has a number of 'slots' which need to be filled by properties of that concept. A major advantage of frames is that they can contain default values in the slots, or procedures for locating the information they need.

The notion is very similar to what linguists call a 'case grammar'. Here, linguistic objects will have a fixed set of properties that they *must* possess. The verb 'insert', for example, will have an agent (who does the inserting), an object (that is inserted) and a destination (into which the object is inserted). We can therefore describe our sentence about the little girl in terms of the cases of its main verb like this:

```
                agent
INSERT  ----------------> 'the little girl'
   :
   :          object
   : ----------------> 'a blank cassette'
   :
   :       destination
   : ----------------> 'her new computer'
```

This is very convenient if we are trying to extract the meaning of the sentence, as we already have a lot of information about the roles of the objects in the sentence and their relationships with one another. We can even mix formalisms in order, say, to use the 'property inheritance' features of a semantic net with the default values of frames. The power of such a representation can be

'To understand what is meant by a natural language sentence, we need an enormous amount of knowledge. Knowledge about what words mean and what they refer to . . .'

```
THE LITTLE GIRL INSERTED A BLANK CASSETTE INTO HER NEW COMPUTER

Trying sentence type 1

NOUNPHRASE
      Determiner        THE
      Adjective         LITTLE
      Noun              GIRL

VERBPHRASE
      Verb              INSERTED
      NOUNPHRASE
            Determiner        A
            Adjective         BLANK
            Noun              CASSETTE
            PREPPHRASE
                  Preposition     INTO
                  NOUNPHRASE
                        Determiner        HER
                        Adjective         NEW
                        Noun              COMPUTER
```

Fig 3 Sample output from the parser

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- Unique budgeting routine (see Forecasting)
- CRT transaction inquiry, unlimited journals
- Activity report, trial balance, financial statements, etc.

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- Unlimited # of customers
- Mailing labels and directories with 4 different sorts
- Automatic finance charges
- Supports partial payments
- 3 year customer history for # of invoices, sales, costs, and profits
- Customised text on statements
- Cash flow analysis
- Sales analysis
- Automatic sales forecasting by customer, salesperson or customer type

Accounts Payable
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- Automatic allocation of available cash to payables
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- Aging reports with 7 customised columns
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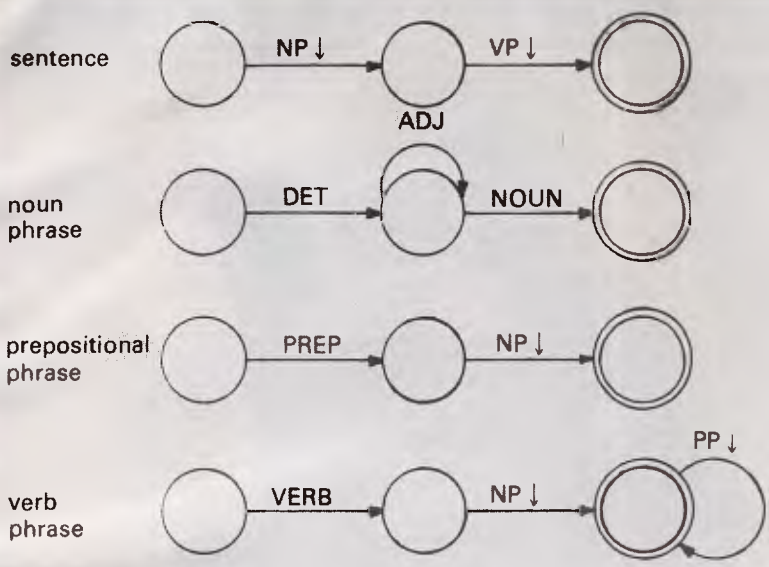

Fig 4 Transition nets suitable for parsing the example sentence (for key, see Fig 1 and text)

seen if we take another verb, 'post'. We can link this to 'insert' via an ISA link (meaning that 'post' is a sub-type of 'insert') so that 'post' inherits the slots of 'insert'. We can then set the default values of the object slot for 'post' to 'a letter' and of the destination slot to 'a post box'. We could even attach a procedure to the agent slot that would look specifically for a noun phrase referring to a person.

Cooperation

The widespread use of databases has given a new impetus to the development of natural language programs which can be used as interfaces to large collections of facts. The problem is a smaller one than general language understanding due to the 'universe of discourse' being restricted to only those things that the database knows about, yet there are enough linguistic problems even here to keep the researchers busy.

One of the more interesting problems involves 'pragmatics'. This is a branch of linguistics that deals with the practical consequences for the conversers of what is being said, not just its formal content and meaning. Consider this conversation with a database system:

User: How many Western Australian customers have a turnover greater than $2 million?
Program: None.
User: How many have a turnover of $2 million or less?
Program: None.

Something is obviously wrong. The problem is that there are no Western Australian customers in the database, so 'none' is all the system can say in the circumstances. Yet asking the first question on its own could have led the user to the false conclusion that all the Western Australian customers had turnovers less than $2 million. The system is answering truthfully but not cooperatively.

A cooperative response, and one having the right pragmatic consequences, might have been:
Program: None, because there are no customers in Western Australia.

There are many other pragmatic considerations of this kind which must be considered in natural language communications.

Translation

Not long ago, linguists believed that there was a universal or 'deep' grammar that people used, and into which all natural languages could be translated. The benefits of this for machine translation would have been tremendous, as it would have provided a common representation into which a sentence in one language could be put and from which the same sentence in any other language could be generated.

Alas, it was not so. Although there is a great deal of similarity between

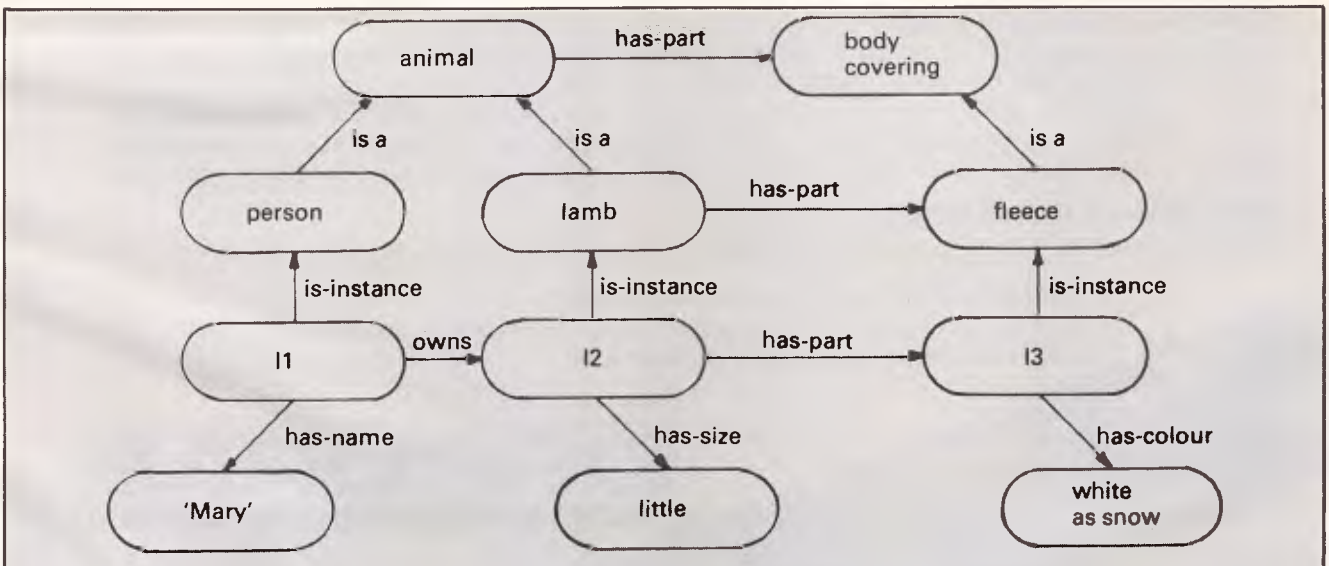

Fig 5 A semantic net. The ovals represent classes of thing or individual objects (these are labelled 11, 12, and 13). The arrows represent relationships between the classes and objects

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languages, especially those with a common root (for example, Latin), there are so many basic differences in their grammars that no single deep grammar can cope with them all. But there is great pressure these days to produce effective translators. Not only that, with the rise of institutions such as the United Nations, the need is for rapid, mass translations.

The solution to the problem has been a trade-off between accuracy and speed. To achieve a perfect machine translation is not possible, and to achieve the best possible requires a huge computational effort, which takes time. The quickest translations are literal ones, where sentences are translated word for word.

Unfortunately, literal translations rarely make any sense. This is because different languages have different ways of structuring sentences: different placings for verbs and adjectives, for example. It is also because many speech idioms either do not mean quite what they seem to (as in 'Now, where was I?' or 'Putting the cart before the horse'), or they do not have any literal meaning (as with 'losing face' and 'keeping mum').

Therefore, translation programs, of which there are several commercial offerings, take a middle course. The translation is basically literal, with appropriate modifications to accommodate, and syntactic differences in sentence construction. Some polishing of the result is then done by components which try to eliminate some of the more obvious ambiguities, and detect and substitute the more common idioms.

The final output still needs to be checked and corrected by a human translator, though. Nevertheless, the latest systems boast that over 80 per cent of their output can go through unchanged.

Speech

Of course, all the techniques and programs discussed so far deal only with text — and grammatically correct text at that.

None of them can deal with the problems of continuous speech with its disjointed, ungrammatical, highly idiomatic form, its dialect words and local idioms, and its heavy use of stress and intonation. Stress especially can change the pragmatics of a sentence. Try it yourself by saying 'Mary had a little lamb' five times with a strong emphasis on a different word each time.

Perhaps it is lucky for the natural language programmers that good, continuous speech recognition is still a few years away.

END

"Get Granny to whip us up an old fashion home recipe for Danish apple tart"

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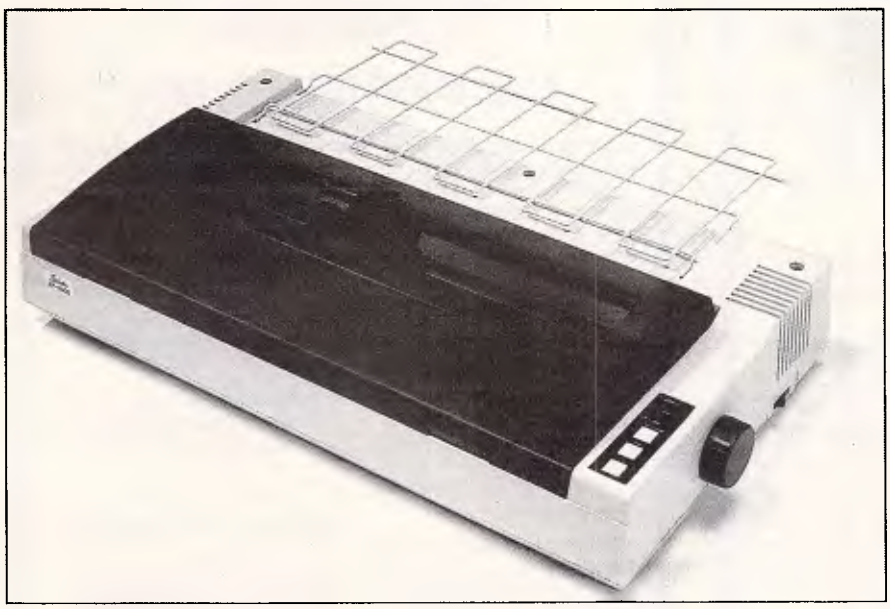

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On the transfer list

Geoff Wood presents some useful implementations of the DIF transfer file structure within spreadsheet programs, based on VisiCalc on an Apple II

The Data Interchange Format, commonly known as DIF, is intended mainly for transferring data between programs that recognise DIF files. If you have, say, a worksheet devised on a spreadsheet program with rows of figures for monthly sales and other items, you can transfer the values in these rows to Apple Business Graphics, PFS Graph or VisiPlot in order to draw a graph or bar chart. Or DIF can be used to transfer data from a spreadsheet program such as FlashCalc or VisiCalc to a database program such as DBMaster or PFS File.

However, DIF has other uses within spreadsheet programs. Firstly, it can be used to save memory in large worksheets. An area of the worksheet containing many formulae can be saved as a DIF-file, and this file can then be reloaded into the worksheet in the same area. DIF does not save the formulae but only the answers, so the DIF file uses less memory.

Another use for DIF is to copy rows or columns of cells containing formulae into other rows or cells and, at the same time, convert the formulae into numbers. This can be useful for transferring, say, quarterly summary figures into another position for annual consolidation; the monthly figures can then be blanked out, and data for the next quarter can be entered.

DIF can also be used to change a set of data from columns to rows. When you save (or load) a DIF file, you are asked whether you want to save (or load) by row or by column. If you save a DIF file by columns and reload it by rows, the columns are converted into rows and *vice versa*. The same thing happens if you save a DIF file by rows and reload it by columns.

Most spreadsheet manuals give little information on the uses of DIF, so some examples will not come amiss. The examples here are based on using VisiCalc on an Apple II, but they can be readily adapted for other spreadsheet programs on other micros.

Saving memory

Worksheets which contain many for-

Column>	A	B	C	D	E	F	G	H
Row 1	Departmental Cumulative Totals							
2					Cumulative Totals			
3								
4	Date	Depart-ment	Code	Amount	Dept A	Dept B	Dept C	Dept D
5								
6	Jan 3	Dept A	1	1000	1000	0	0	0
7	Jan 9	Dept B	2	1100	0	1100	0	0
8	Jan 13	Dept C	3	1900	0	0	1900	0
9	Jan 20	Dept D	4	2000	0	0	0	2000
10	Jan 27	Dept A	1	1200	2200	0	0	0
11	Feb 1	Dept B	2	1800	0	2900	0	0
12	Feb 9	Dept C	3	3000	0	0	4900	0
13	Feb 15	Dept D	4	1300	0	0	0	3300
14	Feb 20	Dept A	1	1700	3900	0	0	0
15	Feb 27	Dept B	2	4000	0	6900	0	0
16	Mar 4	Dept C	3	1400	0	0	6300	0
17	Mar 10	Dept D	4	1600	0	0	0	4900
	and so on to							
97	Dec 5	Dept A	1	1300	118000	0	0	0
98	Dec 10	Dept B	2	8000	0	117800	0	0
99	Dec 14	Dept C	3	1800	0	0	166000	0
100	Dec 20	Dept D	4	1200	0	0	0	138000

Fig 1 Departmental cumulative totals

Column>	A	B	C	D	E	F
Row 1	Quarterly and Annual Summary					
2					Quarterly	
3	Month	Apr	May	Jun	Total	
4						
5	Sales	30000	26000	30000	86000	
6						
7	Materials	15000	13000	16000	44000	
8	Wages	5000	4000	5000	14000	
9	Overheads	7000	6000	7000	20000	
10						
11	Profit	3000	3000	2000	8000	
12						
13						
14	Quarter	1st	2nd	3rd	4th	Total
15						
16	Sales	92000	86000			178000
17						
18	Materials	47000	44000			91000
19	Wages	16000	14000			30000
20	Overheads	22000	20000			42000
21						
22	Profit	7000	8000			15000

Fig 2 Quarterly and annual totals

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mulae can absorb large amounts of memory. For example, the worksheet illustrated in Fig 1 contains formulae in every cell in columns E to H, and it absorbs 20k of RAM. But if the area from E6 to H100 is saved as a DIF file and loaded back into the same columns, the worksheet uses only 11k of memory. This is a saving of 9k or 45 per cent of the original. A 20k worksheet is well within the capacity of VisiCalc on most micros, but this example is given purely to illustrate the extent of the saving in memory.

The memory savings are not shown accurately by the VisiCalc display, which records the remaining RAM to the nearest kilobyte only. Another indication of the saving is given by the number of sectors occupied by the worksheet on a disk. Fig 1 uses 74 sectors on a disk whereas, after changing columns E to H with DIF, the file occupies only 31 sectors, a saving of nearly 60 per cent of the original. The DIF file itself occupies only 12 sectors.

This means that worksheets with many complex formulae can be saved in DIF form on a disk in less than half the space needed for the full version. Of course, you lose the formulae but you may be interested in saving only the answers.

The formula in E10 is @IF (C10=1, D10+@MAX (E5...E9),0). Similar formulae are entered in columns F, G and H to test the value of the entry in column C for the numbers 2,3 and 4 and, if TRUE, to enter the cumulative total in column F, G or H; otherwise enter 0. The formulae are replicated down the columns using R, R, N and R for the four variables in the formulae. This example shows only 100 rows and four columns of formulae; with more rows and columns, this technique might prevent your spreadsheet program from running out of memory with very large worksheets.

If the cells you save with DIF contain values that are rounded for display purposes, the DIF file when reloaded will display the numbers with as many decimal places as will fit in the column width. (The reloaded cells can be reformatted but this can be tedious.) Alternatively, before saving the DIF file, you can use the ROUND function of Advanced VisiCalc, FlashCalc, MagiCalc and SuperCalc or the INTEGER function of PractiCalc and VisiCalc.

Conversion

Worksheets for budgets and other plans are often designed to accumulate weekly data into monthly periods, monthly data into quarterly periods, and quarterly data into annual periods. Fig 2 shows a simple worksheet with data for three consecutive monthly periods accumulated into a current quarterly total. The problem is to hold the quarterly total for accumulation into an annual total and then blank out the data for the three months.

Column>	A	B	C	D	E	F	G
Row1	Columns to Rows						
2							
3	Year	1980	1981	1982	1983	1984	Totals
4							
5	Cust A	1000	1100	1200	1300	1400	6000
6	Cust B	1100	1200	1300	1400	1500	6500
7	Cust C	1200	1300	1400	1500	1600	7000
8	Cust D	1300	1400	1500	1600	1700	7500
9	Cust E	1400	1500	1600	1700	1800	8000
10							
11	Totals	6000	6500	7000	7500	8000	35000

Fig 3 Data by columns and rows

Column>	A	B	C	D	E	F	G	H	I
Row1	Rows to Columns								
2									
3	Year	Cust A	Cust B	Cust C	Cust D	Cust E			Totals
4	1980	1000	1100	1200	1300	1400			6000
5	1981	1100	1200	1300	1400	1500			6500
6	1982	1200	1300	1400	1500	1600			7000
7	1983	1300	1400	1500	1600	1700			7500
8	1984	1400	1500	1600	1700	1800			8000
9	Totals	6000	6500	7000	7500	8000			35000

Fig 4 Data after transfer by DIF

Column>	A	B	C	D	E	F	G
Row1	Rows to Columns						
2							
3	Year	Cust A	Cust B	Cust C	Cust D	Cust E	Totals
4							
5	1980	1000	1100	1200	1300	1400	6000
6	1981	1100	1200	1300	1400	1500	6500
7	1982	1200	1300	1400	1500	1600	7000
8	1983	1300	1400	1500	1600	1700	7500
9	1984	1400	1500	1600	1700	1800	8000
10							
11	Totals	6000	6500	7000	7500	8000	35000

Fig 5 Data by rows and columns

You can enter +E5 in cell C16, +E7 in C18, and so on, and the quarterly totals will be copied, but when you blank out the monthly figures for April, May and June, ready to accept figures for the next three months, you will lose the totals in column E and the copies in the lower part of column C. By turning off the automatic recalculation feature you can hold the answers, but they will change as soon as you recalculate. An alternative is to use the # key to change the formulae in the lower part of column C into numbers, but this is tedious and prone to error with more than a few entries.

Instead, you can use DIF to save the contents of column E, then load the DIF file back into the lower part of column C. When you blank out the entries for April, May and June, the quarterly totals will be held in column C and, at the same time, the cells in column E will revert to zeroes ready to accumulate the monthly data.

Again, this example is deliberately simplified to illustrate the principle. In practice, there could be many more rows of data to save in the DIF file.

A similar technique could be used to transfer data between worksheets. The quarterly totals, saved as a DIF file, could be loaded into a different worksheet for accumulation into annual totals.

Columns to rows

How often have you spent an hour or more designing a worksheet, only to

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realise that it would have been far better to have the row headings in columns and *vice versa*? If you clear the worksheet and start again, you have wasted hours of work. DIF enables you to transfer the contents of rows into columns and columns into rows in a matter of minutes. Even though you lose formulae in the process, it is quicker to rebuild the formulae by replication than to start from scratch.

Fig 3 shows a simple worksheet with data for several customers over several years, and with totals per customer and per year. To change this worksheet from columns to rows, the first step is to locate the cursor in A3 and save a DIF file (by rows, not columns) with G11 as the lower-right cell.

The next step is to clear this area out of the worksheet, locate the cursor in A3 and load in the DIF file by columns, not rows; the worksheet will then look like Fig 4. This can be tidied by deleting the blank columns and inserting blank rows with the result shown in Fig 5. The formulae for totalling the rows and columns can then be re-entered and replicated.

Even with this simple example, it is faster to use DIF than to start again from scratch. With a bigger example, the time saved could be quite substantial.

Conclusion

These examples show that DIF is not just a means of transferring data between different programs. It can also be used within spreadsheet programs to save memory, to convert formulae into figures and to convert rows into columns.

END

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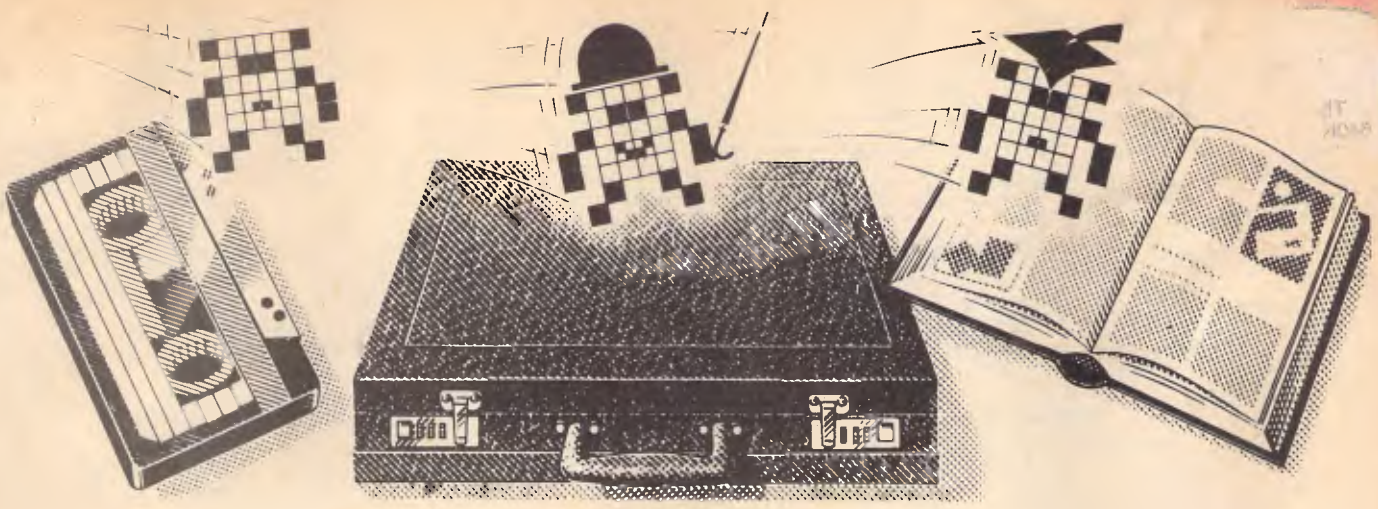

Another pot-pourri of the best of readers' programs. For details on submitting your own, see the end of this section.

Structured programmers and all those who regard Basic as a refuge for dinosaurs and poor stylists should find the Pascal Calendar interesting in this month's selection of programs. There's an educational program to help teach high school students how simple logic gates work — it has been tested on real classes, and pupils have found it to be of great help.

For the Commodore 64, there's a tiny program to print the time in the top left-hand corner of the screen and keep it there, even when the screen is altered. Atari users have a simple windowing front end for the disk operating system, making disk operations friendlier.

Probably most interesting of all, at least for the financially minded is a standard Microsoft Basic program which takes data from either the *Truth* or *Sportsman* newspapers and produces what *it* figures the odds of each home should be — with impressive results *(10% of all winnings should be sent in a brown paper bag to: The Editor C/- APC . . .).* On a lighter side there's a machine language game for the Apple; and also a cassette-based database for the MicroBee.

- *Games*
- *Scientific/mathematic*
- *Business*
- *Toolkit/utilities*
- *Educational/Computer Aided Learning*

Pascal Wall Calendar

by HM Keegan

This is a short program written in Pascal to print out a yearly calendar in either standard or academic year format. It is written in Hisoft Pascal for the Amstrad CPC464, but will easily convert to run on other Pascal compilers and machines. The program will produce a calendar for any year from 1985 to 9999, and output can be directed to a printer or the screen.

The only modifications which may be required are as follows:

Lines 67-71 are used to toggle control-P (chr(16), used to turn the printer on and off in Hisoft Pascal. This procedure can be replaced by the appropriate procedure in another compiler.

Lines 157-160 set up the screen display for the Amstrad. These statements are not strictly necessary, and can be deleted or amended if required.

Lines 63-64 are used to turn underlining on and off. The codes used here are for a Kaga printer and should be replaced if a different printer is used.

The program is carefully documented internally.

```
 1 PROGRAM wallcalendar;          (PROGRAM BY H M KEEGAN)
 2                                (WRITTEN IN HISOFT PASCAL)
 3 CONST bc='*';                  (FOR THE AMSTRAD CPC464)
 4
 5 TYPE
 6   months=(JAN,FEB,MAR,APR,MAY,JUN,JUL,AUG,SEP,OCT,NOV,DEC);
 7   monthlengths=28..31;
 8   years=1985..9999;
 9   week=1..7;
10   switch=(off,on);
11   montharray=ARRAY [1..18] OF char;
12   caltype=(academic,normal);
```

```
13
14 VAR
15   year        :years;
16   firstday    :week;
17   monthstring:montharray;
18   printswitch:switch;
19   key         :char;
20   calendar    :caltype;
21 {-------------------------------------------------------------------------}
22 FUNCTION isleap(year:years):boolean;
23
24 BEGIN
25  isleap:=(year MOD 4=0) AND (year MOD 100<>0) OR (year MOD 400=0);
26 END;
27 {-------------------------------------------------------------------------}
28 FUNCTION numdays(month:months):week;
29
30 BEGIN
31   CASE month OF
32     JAN,MAR,MAY,JUL,AUG,OCT,DEC:numdays:=31;
33     APR,JUN,SEP,NOV:numdays:=30;
34     FEB:IF isleap(year+1-ord(calendar)) THEN numdays:=29 ELSE numdays:=28
35   END;
36 END;
37 {-------------------------------------------------------------------------}
38 FUNCTION day1:week;   (determine day OF week 1st day falls on)
39
40 VAR  yr:years;
41      day:integer;
42
43 BEGIN
44   IF calendar=normal THEN day:=6 ELSE day:=5;
45   FOR yr:=1985 TO year DO
46       IF isleap(yr-ord(calendar)) THEN day:=day+2 ELSE day:=day+1;
47   day1:=(day MOD 7)+1;
48 END;
49 {-------------------------------------------------------------------------}
50 PROCEDURE spaces(num:integer);
51
52 BEGIN
53   WHILE num>0 DO
54     BEGIN
55       write(' '); num:=num-1;
56     END;
57 END;
58 {-------------------------------------------------------------------------}
59 PROCEDURE underline(uline:switch);
60
61 BEGIN
62   IF printswitch=on THEN
63     IF uline=on THEN write(chr(27),chr(45),chr(1)) (turn on underlining)
64                 ELSE write(chr(27),chr(45),chr(0)) (turn off underlining)
65 END;
66 {-------------------------------------------------------------------------}
67 PROCEDURE printer;
68
69 BEGIN
70  write(chr(16));  (toggles CTRL-P)
71 END;
72 {-------------------------------------------------------------------------}
73 PROCEDURE prtmonths(first,last:months);
74
75 VAR month:months;
76     next:week;
77
78   PROCEDURE printmonth(daysinmonth:monthlengths);
79
80   VAR day:integer;
81
82     PROCEDURE pm(sp:integer; monthstring:montharray);
83
84     VAR k:integer;
85
86     BEGIN  (pm)
87       spaces(sp); underline(on);
88       k:=1;
89       REPEAT
90         write(monthstring[k]);
91         k:=k+1;
92       UNTIL monthstring[k]='.';
93       underline(off); spaces(sp);
94     END;
95
96  BEGIN  (printmonth)
97      write(bc); spaces(10);
98      CASE month OF
99          JAN:pm(2,'J a n u a r y.....');
100         FEB:pm(1,'F e b r u a r y...');
101         MAR:pm(4,'M a r c h.........');
102         APR:pm(4,'A p r i l.........');
103         MAY:pm(6,'M a y.............');
104         JUN:pm(5,'J u n e...........');
105         JUL:pm(5,'J u l y...........');
106         AUG:pm(3,'A u g u s t.......');
107         SEP:pm(0,'S e p t e m b e r.');
108         OCT:pm(2,'O c t o b e r.....');
109         NOV:pm(1,'N o v e m b e r...');
110         DEC:pm(1,'D e c e m b e r...')
111     END;
112
113     spaces(49); writeln(bc); writeln; write(bc);
114     write('  Mon  Tue  Wed  Thu  Fri  Sat  Sun');
115     spaces(41); writeln(bc); writeln; write(bc);
116     spaces((firstday-1)*5);
117
```

```
      FOR day:=1 TO daysinmonth DO
        BEGIN
          write(day:5);
          IF ((day MOD 7)+firstday) MOD 7=1 THEN
            BEGIN
              spaces(41); writeln(bc);writeln; write(bc);
            END;
        END;
        IF (firstday+daysinmonth) MOD 7=0 THEN next:=7
                                          ELSE next:=(firstday+daysinmonth) MOD 7;
        spaces(76-(next-1)*5); writeln(bc);
        writeln; write(bc); spaces(76); writeln(bc); writeln;
    END;

BEGIN (prtmonths)
  FOR month:=first TO last DO
    BEGIN
      printmonth(numdays(month));
      firstday:=next;
    END;
END;
{-------------------------------------------------------------------------------}
PROCEDURE titles;

VAR I,J:integer;

BEGIN
  FOR I:=1 TO 4 DO
    BEGIN
      write(bc);
      FOR J:=1 TO 9 DO
          BEGIN
            write(year:4); write(year+1-ord(calendar):4);
          END;
    writeln(year:4,bc);
    END;
END;
{-------------------------------------------------------------------------------}
BEGIN (main PROGRAM)
  write(chr(4),chr(2));                    (mode 2)
  write(chr(28),chr(0),chr(23),chr(23));   (paper)
  write(chr(28),chr(1),chr(0),chr(0));     (pen)
  write(chr(29),chr(23),chr(23));          (border)

  writeln('            C A L E N D A R');
  writeln('            ---------------'); writeln;

  writeln; write('Enter year: '); read(year);

  calendar:=normal;
  writeln; write('Normal or Academic Calendar (N/A): ');
  readln; read(key);
  IF (key='A') OR (key='a') THEN calendar:=academic;

  printswitch:=off;
  writeln; write('Printer on? (Y/N): '); readln; read(key);
  IF (key='Y') OR (key='y') THEN printswitch:=on;

  IF printswitch=on THEN printer;
  writeln; titles;
  write(bc); spaces(76); writeln(bc); writeln;

  firstday:=day1;
  IF calendar=normal THEN prtmonths(JAN,DEC)
    ELSE
      BEGIN
        prtmonths(SEP,DEC);
        prtmonths(JAN,AUG);
      END;

  write(bc); spaces(76); writeln(bc); titles;
  IF printswitch=on THEN printer;
END.
{-------------------------------------------------------------------------------}
```

Commodore 64 Jiffy Clock

by Jas & Kev

MICROTEX 666

Still keying in programs? Forget it! This program is available for telesoftware downloading on Microtex 666 (page *66614#.)

This program provides an interrupt-driven clock with timing in 1/10th-of-a-second intervals. It will be temporarily destroyed by certain machine code routines and screen-scrolling, but will return rapidly.

To change the time shown when the clock is running, reload the program and use RUN 700.

Follow the instructions given in the program exactly or it may crash.

```
1 POKE53280,0:POKE53281,11:PRINT"□":C=0
2 AP=25069:PA=2
5 REM *** CHARACTERS FOR MAIN SCREEN ***
10 DATA"□ JIFFY64 IS WRITTEN BY JAS & KEV 1985 "
15 DATA"R JIFFY IS AN INTERRUPT DRIVEN CLOCK..."
16 DATA"R SYS64738 & SYS8192:SYS33792 TO RUN.."
18 REM *** READ IN CHARACTERS ***
19 FORUY=1TO3
20 READA$
```

```
30 FORX=1TO38:L$=MID$(A$,X,1)
40 PRINTTAB(X)L$"■■■■";:POKE646,15:FORT=1TO10 :NEXT:NEXT:NEXT
41 REM *** M/CODE DATA ***
42 DATA120,169,13,160,32,141,20,3
43 DATA140,21,3,88,96,169,6,141
44 DATA32,208,206,41,32,208,15,169
45 DATA2,141,41,32,162,7,169,7
46 DATA141,32,208,142,32,208,76,49
47 DATA234,2,0
48 FORI=0TO42:READA:POKEI+8192,A:NEXT
49 SYS8192
70 DATA173,166,2,240,10,169,128,13,14
72 DATA221,141,14,221,48,8,169,127,45
74 DATA14,221,141,14,221,169,127,45
76 DATA15,221,141,15,221,173,208,195
78 DATA41,128,141,208,195,173,209,195
79 DATA32,28,197,13,208,195,141,11
80 DATA221,173,210,195,32,28,197,141
82 DATA10,221,173,211,195,32,28,197
84 DATA141,9,221,169,0,141,8,221,120
86 DATA173,20,3,141,214,195,173,21,3
88 DATA141,215,195,169,76,141,20,3
90 DATA169,196,141,21,3,88,96,120,173
92 DATA214,195,141,20,3,173,215,195
94 DATA141,21,3,88,96,173,216,195,201
96 DATA6,240,3,76,8,197,169,255,141
98 DATA216,195,173,213,195,240,243
100 DATA173,11,221,170,41,128,208,5
120 DATA169,1,76,111,196,169,16,141,38
140 DATA4,173,212,195,141,38,216,169
160 DATA13,141,39,4,173,212,195,141,39
180 DATA216,138,41,16,32,14,197,141,28
200 DATA4,173,212,195,141,28,216,138
220 DATA32,22,197,141,29,4,173,212,195
240 DATA141,29,216,169,58,141,30,4,173
260 DATA212,195,141,30,216,173,10,221
280 DATA170,32,14,197,141,31,4,173,212
300 DATA195,141,31,216,138,32,22,197
320 DATA141,32,4,173,212,195,141,32
340 DATA216,169,47,141,33,4,173,212
360 DATA195,141,33,216,173,9,221,170
380 DATA32,14,197,141,34,4,173,212,195
400 DATA141,34,216,138,32,22,197,141
420 DATA35,4,173,212,195,141,35,216
440 DATA169,46,141,36,4,173,212,195
460 DATA141,36,216,173,8,221,105,48
480 DATA141,37,4,173,212,195,141,37
500 DATA216,238,216,195,108,214,195,74
520 DATA74,74,74,24,105,48,96,41,15,24
540 DATA105,48,96,160,255,56,200,233
560 DATA10,176,251,105,10,141,217,195
580 DATA152,10,10,10,10,13,217,195,96
600 DATA42131:REM * DATA CHECK *
605 OP=0:L=AP*PA
606 REM *** INITIALIZE CLOCK & RUN ***
610 FORI=LTOL+343:READX:OP=OP+X:POKEI,X:NEXT
620 READX:IFOP<>XTHENPRINT"■DATA ERROR! "OP
630 FORI=33792TO33792+2:READA:POKEI,A:NEXT
640 DATA76,218,195
700 PRINT"■ INPUT TIME "
710 INPUT" HOUR";HR
720 INPUT" SEC";SEC
730 INPUT" MIN";MIN
740 INPUT"COLOUR ■0■1■2■3■4■5■6■7■8■9■10■11■12■13■14■";COL:NOP=50128
750 INPUT"AM/PM";A$
751 IFA$="AM"THENLOP=0:GOTO754
752 IFA$="PM"THENLOP=128:GOTO754
753 GOTO750
754 POKENOP,LOP
755 POKENOP+1,HR
756 POKENOP+2,MIN
757 POKENOP+3,SEC
758 POKENOP+4,COL
759 INPUT" DISPLAY Y/N?";P$
760 IFP$="Y"THENPOL=1:GOTO763
761 IFP$="N"THENPOL=0:GOTO763
762 GOTO760
763 POKENOP+5,POL
764 PRINT"■ SYS 33792 TO START CLOCK ":END

READY.
```

Atari IWDOS

by Paul Lay

This program will work on all 8-bit Atari computers with disk drives and 32k+ of memory. When typed in, the program should be saved as 'IWDOS'; it can then be executed by RUN 'D:IWDOS'. When run, the program displays six options that should be selected via the keys A through F. A roll-down menu will then appear, and an option can be selected from these using the cursor up and down keys but without using the control keys. The RETURN key will select an option.

All DOS commands are implemented, except for binary LOAD/SAVE and some of the duplicating options. Any option that requires a filename to be entered will accept the wildcards * and ?, and drive one will be assumed unless otherwise specified. As IWDOS sits above DOS and accesses DOS functions via the XIO command, it should be compatible with all versions of DOS.

Lines 10 — 330 contain the machine code routines to control the windows;

these routines can be used in GRAPHICs mode 0. They are held in 642 bytes of memory located at the 30k boundary, and use the 29k to 30k area to store parts of the screen memory that become overlaid by a window. Three routines are available:

1) Open a window — this routine is located at address 30720 and takes the following form <var> = USR (30720,X,Y,A) where X and Y are the coordinates of the top left-hand corner of the window. The last parameter, A, is the address of a string containing the list of options to be presented in the window; this string should be in the form OPTION:OPTION:-----::.

Different options are separated by the vertical bar character (SHIFT=) and the list is terminated by two of these. For example, A=ADR("Up:Down:Left:Right::")

I=USR(30720,5,5,A) will open a window at 5,5 with the given options. Note that this routine has no error detection, so make sure that the parameters you use make sense.

2) Select an option — this routine is located at address 31274 and takes the form <var> = USR(31274). It allows the user to move the highlighted bar up and down, and make a selection from the previously opened window.

The option number selected will be returned in the variable <var> used to call the routine.

3) Close a window — this routine is located at address 31106 and takes the form <var> = USR(31106). It removes the open window from the screen and restores it to its previous state, as it was before the window was opened.

As the routines stand, only one window may be opened at a time, but the routines could be expanded to allow multiple open windows.

```
0 REM ** IWDOS (C)1985 By Paul Lay **
10 REM ** Window Routines M/C **
20 GRAPHICS 18:POKE 16,64:POKE 53774,64:POSITION 1,5:? #6;"o
ne moment please"
30 FOR I=30720 TO 31362:READ A:POKE I,A:NEXT I
40 DATA 104,104,104,141,127,121,104,104,141,126,121,165,88,1
41,129,122,165,89,141,130,122
50 DATA 162,40,173,129,122,24,109,126,121,141,129,122,144,3,
238,130,122,202,208,238,173
60 DATA 129,122,24,109,127,121,141,129,122,144,3,238,130,122
,104,141,125,121,104,141,124
70 DATA 121,169,0,133,207,169,108,133,208,172,124,121,132,20
3,172,125,121,132,204,160,0
80 DATA 140,126,121,140,127,121,140,128,121,177,203,230,203,
208,2,230,204,201,124,240,5
90 DATA 238,128,121,208,239,173,128,121,240,13,238,126,121,2
05,127,121,144,223,141,127,121
100 DATA 176,218,173,129,122,133,203,173,130,122,133,204,177
,203,32,207,121,169,81,145,203
110 DATA 200,162,0,177,203,32,207,121,169,82,145,203,200,232
,236,127,121,208,240,177,203
120 DATA 32,207,121,169,69,145,203,173,124,121,133,205,173,1
25,121,133,206,169,0,141,129
130 DATA 121,165,203,24,105,40,133,203,144,2,230,204,160,0,1
77,203,32,207,121,169,124
140 DATA 145,203,200,162,0,142,128,121,177,203,32,207,121,16
1,205,230,205,208,2,230,206
150 DATA 201,124,240,11,32,105,121,145,203,200,236,128,121,2
08,228,198,207,165,207,201,255
160 DATA 144,2,198,208,173,128,121,205,127,121,240,15,177,20
3,32,207,121,169,0,145,203
170 DATA 200,238,128,121,208,233,177,203,32,207,121,169,124,
145,203,238,129,121,173,129,121
180 DATA 205,126,121,240,3,76,190,120,165,203,24,105,40,133,
203,144,2,230,204,160,0
190 DATA 177,203,32,207,121,169,90,145,203,200,162,0,177,203
,32,207,121,169,82,145,203
200 DATA 200,232,236,127,121,208,240,177,203,32,207,121,169,
67,145,203,169,1,141,129,121
210 DATA 32,249,121,96,41,127,201,32,16,4,24,105,64,96,201,9
6,16,4,56,233,32,96,96,0,0,0,0,0
220 DATA 0,104,169,0,133,207,169,108,133,208,173,129,122,133
,203,173,130,122,133,204,169
230 DATA 0,141,129,121,160,0,32,229,121,145,203,200,162,0,32
,229,121,145,203,200,232
240 DATA 236,127,121,208,244,32,229,121,145,203,165,203,24,1
05,40,133,203,144,2,230,204
250 DATA 238,129,121,173,129,121,56,233,2,205,126,121,208,20
4,96,72,165,207,141,220,121
260 DATA 165,208,141,221,121,104,141,255,255,230,207,208,2,2
30,208,96,165,207,141,240,121
270 DATA 165,208,141,241,121,173,255,255,230,207,208,2,230,2
08,96,173,129,122,133,203,173
280 DATA 130,122,133,204,162,0,236,129,121,240,14,165,203,24
,105,40,133,203,144,2,230
290 DATA 204,232,208,237,162,0,160,1,177,203,73,128,145,203,
200,232,236,127,121,208,243
300 DATA 96,169,255,141,252,2,173,252,2,201,255,240,249,201,
12,240,55,201,14,240,6
310 DATA 201,15,240,22,208,230,32,249,121,206,129,121,208,6,
173,126,121,141,129,121,32
320 DATA 249,121,76,42,122,32,249,121,173,129,121,205,126,12
1,208,5,169,0,141,129,121
330 DATA 238,129,121,32,249,121,76,42,122,173,129,121,133,21
2,169,0,133,213,169,255,141,252,2,104,96,0,0
340 REM ** Draw Icons **
350 GRAPHICS 0:POKE 16,64:POKE 53774,64:POKE 709,0:POKE 710,
122:POKE 712,118:POKE 752,1:DIM F$(40),DIR$(300)
360 ? "  IWDOS Version 1.0 Copyright 1985"
370 FOR R=0 TO 1:FOR C=0 TO 2:COLOR 17:PLOT 2+12*C,1+6*R:COL
OR 5:PLOT 13+12*C,1+6*R:COLOR 3:PLOT 13+12*C,6+6*R
380 COLOR 26:PLOT 2+12*C,6+6*R:COLOR 18:PLOT 3+12*C,1+6*R:DR
AWTO 12+12*C,1+6*R:PLOT 3+12*C,6+6*R
390 DRAWTO 12+12*C,6+6*R:COLOR 124:PLOT 2+12*C,2+6*R:DRAWTO
2+12*C,5+6*R:PLOT 13+12*C,2+6*R:DRAWTO 13+12*C,5+6*R
400 FOR IR=0 TO 3:FOR IC=0 TO 2:READ A:COLOR A:PLOT 3+12*C+I
C,2+6*R+IR:NEXT IC:NEXT IR:FOR I=0 TO 2:READ F$
410 POSITION 7+12*C,3+6*R+I:? F$:NEXT I:POSITION 12+12*C,2+6
*R:? CHR$(193+C+3*R):NEXT C:NEXT R
```

```
420 DATA 160,160,160,16D,148,174,160,252,160,13,13,13,Disc,M
enu,,17,18,5,124,16D,124,124,149,124,11,149,12
430 DATA Cart,Contrl,,160,160,1D,160,16D,16D,16D,160,160,149
,149,149,File,Utils,,160,160,160,16D,148,174,16D
440 DATA 252,160,13,13,13,Disc,Utile,,8,149,10,32,8,136,32,1
49,32,32,149,32,Help,,,8,32
450 DATA 10,138,160,136,32,160,32,32,149,32,Copy,Utils,
460 REM ** Main Program **
470 GOSUB 1250:IF C<65 OR C>70 THEN 470
480 ON C-64 GOSUB 490,620,680,78D,900,980:GOTO 470
490 REM ** Disc Menu **
500 A=ADR("Exit|Drive #1 Directory|Drive #2 Directory|Drive
#3 Directory|Drive #4 Directory||")
510 I=USR(30720,3,6,A)
520 N=USR(31274):IF N=1 THEN 580
530 F$="D?:*.*":F$(2,2)=STR$(N-1):TRAP 610:OPEN #2,6,0,F$:TR
AP 590
540 DIR$=" Disk Drive #? Directory| |":DIR$(14,14)=STR$(N-1)
:C=0:ERR=0
550 INPUT #2,F$:DIR$(LEN(DIR$)+1)=F$:DIR$(LEN(DIR$)+1)="|":C
=C+1:IF C<10 THEN 550
560 GOSUB 134D
570 I=USR(31106):I=USR(30720,3,6,ADR(DIR$)):GOSUB 1310:IF  N
OT ERR THEN 540
580 CLOSE #2:I=USR(31106):RETURN
590 IF C=0 THEN 580
600 ERR=1:GOTO 560
610 TRAP 520:CLOSE #2:GOTO 520
620 REM ** Cart Contrl **
630 A=ADR("Exit|Return To Basic|Atari Doe||"):I=USR(30720,9,
6,A):N=USR(31274):I=USR(311D6)
640 ON N GOTO 650,660,670
650 RETURN
660 GRAPHICS 0:POP :NEW
670 POP :DOS
680 REM ** File Utils **
690 A=ADR("Exit|Delete File|Rename File|Protect File|Unprote
ct File||"):I=USR(30720,21,6,A)
700 N=USR(31274):IF N=1 THEN 76D
710 POSITION 2,21:ON N-1 GOSUB 720,730,74D,750:GOTO 76D
720 ? "Delete, enter filename.":GOSUB 1100:GOSUB 1210:TRAP 7
70:XIO 33,#2,0,0,F$:GOSUB 1200:RETURN
730 ? "Rename, enter Dn:OLDNAME,NEWNAME.":GOSUB 1100:GOSUB 1
210:TRAP 770:XIO 32,#2,0,0,F$:GOSUB 1200:RETURN
740 ? "Protect, enter filename.":GOSUB 1100:GOSUB 1210:TRAP
770:XIO 35,#2,0,0,F$:GOSUB 1200:RETURN
750 ? "Unprotect, enter filename.":GOSUB 1100:GOSUB 1210:TRA
P 770:XIO 36,#2,0,0,F$:GOSUB 1200:RETURN
760 I=USR(31106):RETURN
770 GOSUB 1200:GOTO 700
780 REM ** Disc Utils **
790 A=ADR("Exit|Format Drive #1|Format Drive #2|Format Drive
#3|Format Drive #4|Save 'IWDOS'||")
800 I=USR(30720,3,12,A)
810 N=USR(31274):IF N=1 THEN 870
820 IF N=6 THEN 890
830 POSITION 2,21:? "Are you sure (y/n)?";? '>_';CHR$(30);
840 GOSUB 1250:IF C<>78 AND C<>89 THEN 840
850 ? CHR$(C);:IF C=78 THEN 880
860 F$="D?:":F$(2,2)=STR$(N-1):TRAP 88D:XIO 254,#2,0,0,F$:GO
SUB 1200
870 I=USR(31106):RETURN
880 GOSUB 1200:GOTO 810
890 TRAP 810:SAVE "D:IWDOS":GOTO 870
900 REM ** Help **
910 DIR$="      Instructions| |Select an icon via the|A to F
keys and a window|will pull down with the|"
920 DIR$(94)="first option highlighted.|":GOSUB 1340
930 I=USR(30720,7,12,ADR(DIR$)):GOSUB 1310:DIR$(22)="Use the
? & ? keys to|move the highlighted||"
940 DIR$(65)="bar up & down through the|options available.|"
:DIR$(3D,3O)=CHR$(28):DIR$(34,34)=CHR$(29):GOSUB 1340
950 I=USR(31106):I=USR(30720,7,12,ADR(DIR$)):GOSUB 1310:DIR$
(22)="Finally,when your choice|is made,press the"
960 DIR$(64)=" RETURN|key to execute that|option.|":GOSUB 13
40
970 I=USR(31106):I=USR(30720,7,12,ADR(DIR$)):GOSUB 1310:I=US
R(31106):RETURN
980 REM ** Copy Utils **
990 A=ADR("Exit|Copy File||"):I=USR(30720,26,12,A)
1000 N=USR(31274):ON N GOTO 1070,1010
1010 POSITION 2,21:? "Copy File, enter SOURCE,DESTINATION.":
GOSUB 1100:GOSUB 1210
1020 TRAP 1080:OPEN #1,4,0,F$:N=0:FOR I=1 TO LEN(F$):IF N=0
AND F$(I,I)="," THEN N=I
1030 NEXT I:IF N=0 THEN 1080
1040 F$=F$(N+1):GOSUB 1210:TRAP 1090:OPEN #2,8,0,F$
1050 TRAP 106D:GET #1,C:PUT #2,C:GOTO 1D50
1060 CLOSE #1:CLOSE #2:GOSUB 12D0
1070 I=USR(31106):RETURN
1080 TRAP 1D00:GOSUB 1200:CLOSE #1:GOTO 1000
1090 TRAP 1080:CLOSE #1:GOSUB 1200:CLOSE #2:GOTO 10D0
1100 F$="":
1110 POSITION 2,22:? ">";F$;" "
1120 GOSUB 1250:IF C=27 THEN 1190
1130 IF C=94 THEN 1170
1140 IF  NOT (C=42 OR C=44 OR C=46 OR C=63 OR (C>47 AND C<59
) OR (C>64 AND C<91)) THEN 1120
1150 IF LEN(F$)>32 THEN 1120
1160 F$(LEN(F$)+1)=CHR$(C):GOTO 111D
1170 IF LEN(F$)<2 THEN F$="":GOTO 111D
1180 F$=F$(1,LEN(F$)-1):GOTO 1110
1190 POSITION 3+LEN(F$),22:? " ":RETURN
1200 POSITION 2,21:? CHR$(156);CHR$(156):RETURN
1210 IF F$="" THEN F$="D:":RETURN
1220 IF LEN(F$)>1 THEN IF F$(1,2)="D:" THEN RETURN
1230 IF F$(1,1)="D" THEN IF LEN(F$)>2 THEN IF (F$(3,3)=":" A
```

```
ND ASC(F$(2))>48 AND ASC(F$(2))<53) THEN RETURN
1240 FOR I=LEN(F$) TO 1 STEP -1:F$(I+2,I+2)=F$(I,I):NEXT I:F
$(1,2)="D:":RETURN
1250 OPEN #1,4,0,"K:"
1260 TRAP 1260:GET #1,C:CLOSE #1
1270 IF C>128 THEN C=C-128
1280 IF C>96 THEN C=C-32
1290 IF C<27 THEN C=C+64
1300 RETURN
1310 POKE 764,255
1320 IF PEEK(764)=255 THEN 1320
1330 POKE 784,255:RETURN
1340 DIR$(LEN(DIR$)+1)="________________________|Press any
key to continue||":RETURN
```

Wizard of Odds

by Kevin Riordan

As this is written in standard Microsoft Basic, this 'betting assistant' program should be easily converted to most machines.

Kevin includes full program details and instructions in the listing; readers are advised that *APC* does not warrant this program's accuracy or reliability in any way in regard to its advice as to betting decisions (although it did pick first, second and third in the recent Marlboro Stakes . . .)

```
1000 '~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
1010 '~                        WIZARD OF ODDS                              ~
1020 '~          A professional thoroughbred handicapping guide            ~
1030 '~                     (Kevin Riordan 1985)                           ~
1040 '~                                                                    ~
1050 '~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
1058 '
1059 '
1060 '   This program produces a reliable betting market for any race
1070 'from information provided by the user about each contender's
1080 'class, weight, current fitness, performance consistency, distance
1090 'preference, barrier draw and rider.  It is extremely interactive,
1100 'so that even a novice racegoer, armed with a comprehensive form
1110 'guide, may use it to good effect.  The author recommends the
1120 'SPORTSMAN newspaper generally for this purpose; however, users
1130 'interested exclusively in Melbourne racing will find the TRUTH
1140 'form guide adequate.
1150 '   The program is written in standard Microsoft BASIC but includes
1160 'so few of that version's more powerful features that it is easily
1170 'transportable to any machine.  By the use of 'RESTORE <line
1180 'number> rather than a more compact array access method, the bones
1190 'of the program's logic are laid bare, and those users who are not
1200 'able to RESTORE to a given line number may easily set up arrays
1210 'or disk files to handle its voluminous data.
1220 '   Apple and Commodore 64 users will, however, find a pleasant
1230 'surprise in the notes at the end of the program!
1240 '   WIZARD OF ODDS is most effectively applied to open-class races
1250 'up to and including 1600m and is especially deadly in pinpointing
1260 'the 'value' horses in big-money events.  Some recent results
1270 'demonstrate this amply:
1280 '
1290 '        RACE               WINNER            WIZARD'S ODDS     S.P.
1300 '
1310 '1984 Newmarket Hcp       HERON BRIDGE          8/1           33/1
1320 '1984 Blue Diamond Stks  STREET CAFE           8/1           40/1
1330 '1984 Doncaster Hcp      VITE CHEVAL           9/4            4/1
1340 '1984 Epsom Hcp          RIVERDALE             7/2            6/1
1350 '1984 Marlboro Cup       KING PHOENIX          7/2            8/1
1360 '1984 Caulfield Stakes   ALIBHAI               9/4            5/1
1370 '1984 Thousand Guineas   GOLEEN                6/1           15/1
1380 '1984 Ampol Stakes       RIVERDALE             4/6            9/4
1390 '1985 Carlyon Cup        ASTROLIN              7/2           12/1
1400 '1985 Doncaster Hcp      ROW OF WAVES         11/1          100/1
1410 '
1420 '   WIZARD OF ODDS is NOT an infallible winner-finder.  It does,
1430 'however, indicate betting value in any race where value odds are
1440 'available in the ring.  Users should experiment with it for
1450 'several weeks using Monopoly money before committing the family
1460 'fortune!
1470 '
1480 '
2000 GOTO 4000                'Bypass subroutines
2010 '
2020 ' Convert input date to Julian (in order to recognise Saturdays!)
2030 F%=1:IF LEN(DT$) <> 6 THEN RETURN
2040 DD%=VAL(LEFT$(DT$,2)):IF DD%<1 OR DD%>31 THEN RETURN
2050 MM%=VAL(MID$(DT$,3,2)):IF MM%<1 OR MM%>12 THEN RETURN
2060 YY%=VAL(RIGHT$(DT$,2)):IF (MM%=4 OR MM%=6 OR MM%=9 OR MM%=11)
     AND DD%>30 THEN RETURN
2070 IF MM%=2 AND DD%>29 THEN RETURN
2080 IF MM%=2 AND YY% MOD 4 AND DD%>28 THEN RETURN
2090 JD=INT((MM%-1)*30.42)-(MM%=2)+(MM%>2 AND MM%<8)
     -(MM%>2 AND YY% MOD 4 = 0)+DD%
```

```
2100 JD=JD+365*YY%+INT((YY%-1)/4)+1:F%=0:RETURN
2110 '
2120 ' General-purpose option indicator
2130 PRINT USING "##";X;:PRINT ".  ";:RETURN
2140 '
2150 ' Fetch Y/N response
2160 A$=INKEY$:IF A$="" THEN 2160
2170 A=ASC(A$) AND 95:IF A<>78 AND A<>89 THEN 2160 ELSE RETURN
2180 '
2190 ' Prepare to display a State's major tracks
2200 ON Z% GOTO 2210,2220,2230,2240,2250
2210 TT%=10:RESTORE 6010:RETURN
2220 TT%=19:RESTORE 6030:RETURN
2230 TT%=4:RESTORE 6070:RETURN
2240 TT%=3:RESTORE 6080:RETURN
2250 TT%=2:RESTORE 6090:RETURN
2260 '
2270 ' Prepare to display distances at selected track
2280 ' NSW tracks
2290 ON ZZ% GOTO 2300,2310,2320,2330,2340,2350,2360,2370,2380,2390
2300 TD%=11:RESTORE 6100:RETURN            'Randwick
2310 TD%=12:RESTORE 6110:RETURN            'Rosehill
2320 TD%=7:RESTORE 6120:RETURN             'Warwick Farm
2330 TD%=11:RESTORE 6130:RETURN            'Canterbury
2340 TD%=7:RESTORE 6140:RETURN             'Newcastle
2350 TD%=10:RESTORE 6150:RETURN            'Hawkesbury
2360 TD%=6:RESTORE 6160:RETURN             'Gosford
2370 TD%=6:RESTORE 6170:RETURN             'Wyong
2380 TD%=6:RESTORE 6180:RETURN             'Kembla Grange
2390 TD%=9:RESTORE 6190:RETURN             'Canberra
2400 ' VIC tracks
2410 ON ZZ% GOTO 2430,2440,2450,2460,2470,2480,2490,2500,2510,2520
2420 ON ZZ%-10 GOTO 2530,2540,2550,2560,2570,2580,2590,2600,2610
2430 TD%=10:RESTORE 6200:RETURN            'Flemington
2440 TD%=8:RESTORE 6210:RETURN             'Caulfield
2450 TD%=6:RESTORE 6220:RETURN             'Sandown
2460 TD%=5:RESTORE 6230:RETURN             'Moonee Valley
2470 TD%=6:RESTORE 6240:RETURN             'Ballarat
2480 TD%=5:RESTORE 6250:RETURN             'Bendigo
2490 TD%=5:RESTORE 6260:RETURN             'Colac
2500 TD%=3:RESTORE 6270:RETURN             'Cranbourne
2510 TD%=6:RESTORE 6280:RETURN             'Geelong
2520 TD%=7:RESTORE 6290:RETURN             'Hamilton
2530 TD%=6:RESTORE 6300:RETURN             'Kyneton
2540 TD%=6:RESTORE 6310:RETURN             'Moe
2550 TD%=5:RESTORE 6320:RETURN             'Mornington
2560 TD%=5:RESTORE 6330:RETURN             'Pakenham
2570 TD%=8:RESTORE 6340:RETURN             'Sale
2580 TD%=7:RESTORE 6350:RETURN             'Seymour
2590 TD%=8:RESTORE 6360:RETURN             'Warrnambool
2600 TD%=5:RESTORE 6370:RETURN             'Werribee
2610 TD%=5:RESTORE 6380:RETURN             'Yarra Glen
2620 ' QLD tracks
2630 ON ZZ% GOTO 2640,2650,2660,2670
2640 TD%=8:RESTORE 6390:RETURN             'Eagle Farm
2650 TD%=7:RESTORE 6400:RETURN             'Doomben
2660 TD%=6:RESTORE 6410:RETURN             'Bundamba
2670 TD%=8:RESTORE 6420:RETURN             'Southport
2680 ' SA tracks
2690 ON ZZ% GOTO 2700,2710,2720
2700 TD%=8:RESTORE 6430:RETURN             'Victoria Park
2710 TD%=9:RESTORE 6440:RETURN             'Morphetville
2720 TD%=7:RESTORE 6450:RETURN             'Cheltenham
2730 ' WA tracks
2740 ON ZZ% GOTO 2750,2760
2750 TD%=11:RESTORE 6460:RETURN            'Ascot
2760 TD%=11:RESTORE 6470:RETURN            'Belmont Park
2770 '
2780 ' Fetch performance consistency adjustment for lightly-raced animal
2790 ON LS% GOTO 2810,2820,2830,2840,2850,2860,2870,2880,2890,2900
2800 ON LS%-10 GOTO 2910,2920,2930,2940,2950,2960,2970,2980,2990,3000
2810 RESTORE 6500:RETURN
2820 RESTORE 6510:RETURN
2830 RESTORE 6520:RETURN
2840 RESTORE 6530:RETURN
2850 RESTORE 6540:RETURN
2860 RESTORE 6550:RETURN
2870 RESTORE 6560:RETURN
2880 RESTORE 6570:RETURN
2890 RESTORE 6580:RETURN
2900 RESTORE 6590:RETURN
2910 RESTORE 6600:RETURN
2920 RESTORE 6610:RETURN
2930 RESTORE 6620:RETURN
2940 RESTORE 6630:RETURN
2950 RESTORE 6640:RETURN
2960 RESTORE 6650:RETURN
2970 RESTORE 6660:RETURN
2980 RESTORE 6670:RETURN
2990 RESTORE 6680:RETURN
3000 RESTORE 6690:RETURN
3010 '
3020 ' Prepare to display a State's race classes
3030 ON DS% GOTO 3040,3050,3060,3070,3080,3090
3040 NC%=22:RESTORE 6700:RETURN            'NSW
3050 NC%=20:RESTORE 6800:RETURN            'VIC
3060 NC%=21:RESTORE 6880:RETURN            'QLD
3070 NC%=21:RESTORE 6960:RETURN            'SA
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3080 NC%=12:RESTORE 7030:RETURN              'WA
3090 NC%=13:RESTORE 7070:RETURN              'NZ
3100 '
3110 'Prepare to display a State's quality races by age-group
3120 ON QS% GOTO 3140,3190,3240,3280,3330
3130 ' NSW
3140 SC%=-(QC%=4)-2*(QC%=9)-3*(QC%=22):ON SC% GOTO 3150,3160,3170
3150 NR%=15:RESTORE 7110:RETURN              '2yo
3160 NR%=22:RESTORE 7160:RETURN              '3yo
3170 NR%=18:RESTORE 7240:RETURN              'WFA
3180 ' VIC
3190 SC%=-(QC%=4)-2*(QC%=8)-3*(QC%=20):ON SC% GOTO 3200,3210,3220
3200 NR%=12:RESTORE 7300:RETURN              '2yo
3210 NR%=18:RESTORE 7360:RETURN              '3yo
3220 NR%=20:RESTORE 7420:RETURN              'WFA
3230 ' QLD (Note: This State's only WFA event handled by main program)
3240 SC%=-(QC%=4)-2*(QC%=8):ON SC% GOTO 3250,3260
3250 NR%=4:RESTORE 7490:RETURN               '2yo
3260 NR%=4:RESTORE 7510:RETURN               '3yo
3270 ' SA
3280 SC%=-(QC%=5)-2*(QC%=12)-3*(QC%=21):ON SC% GOTO 3290,3300,3310
3290 NR%=5:RESTORE 7530:RETURN               '2yo
3300 NR%=8:RESTORE 7550:RETURN               '3yo
3310 NR%=4:RESTORE 7580:RETURN               'WFA
3320 ' WA
3330 SC%=-(QC%=3)-2*(QC%=7)-3*(QC%=12):ON SC% GOTO 3340,3350,3360
3340 NR%=2:RESTORE 7590:RETURN               '2yo
3350 NR%=7:RESTORE 7600:RETURN               '3yo
3360 NR%=11:RESTORE 7620:RETURN              'WFA
3370 '
3380 ' Main program
3390 '
4000 HOME:INPUT "Date of raceday (DDMMYY):",DT$:
     GOSUB 2030:IF F% THEN 4000
4010 RD=JD:PRINT:RESTORE 6000:
     FOR X=1 TO 5:
          GOSUB 2130:READ A$:PRINT A$:
     NEXT
4020 PRINT:INPUT "Which state (1-5)";RS%:
     IF RS%<1 OR RS%>5 THEN 4010
4030 PRINT:Z%=RS%:GOSUB 2200:
     FOR X=1 TO TT%:
          GOSUB 2130:READ A$:PRINT A$:
     NEXT
4040 PRINT:PRINT "Which track (1" (-TT%) CHR$(8) ")":
     INPUT TR%:IF TR%<1 OR TR%>TT% THEN 4030
4050 PRINT:INPUT "How many races do you wish to handicap";R%
4060 FOR Q=1 TO R%:
     DIM H$(24),WR(24),AC%(24),LR(24),UA%(24):
     ZZ%=TR%
4070 PRINT:PRINT "RACE"Q:PRINT:
     ON RS% GOSUB 2290,2410,2630,2690,2740:
     FOR X=1 TO TD%:
          GOSUB 2130:READ AC%(X),UA%(X):
          PRINT USING "#####";AC%(X):
     NEXT
4080 PRINT:PRINT "Which distance (1" (-TD%) CHR$(8) ")";:INPUT RL%:
     IF RL%<1 OR RL%>TD% THEN 4070
4090 MB%=UA%(RL%):RL%=AC%(RL%)
4100 PRINT:INPUT "What is the limit weight of the race";LT:LT=2*LT
4110 PRINT:PRINT "In your judgement, how many horses have":
     INPUT "genuine winning prospects in the race";H%
4120 PRINT:PRINT "Please enter each contender's details as prompted below:"
4130 FOR K=1 TO H%
4140      PRINT:PRINT:PRINT "HORSE"K:PRINT:
          PRINT "Name                  ";:INPUT ":",H$(K)
4150      INPUT "Last raced (DDMMYY):",DT$:GOSUB 2030:
          IF F% OR JD>=RD THEN 4150 ELSE LR(K)=JD
4160      INPUT "Set to carry (kg)  :",SC:SC=2*SC:
          INPUT "Barrier position   :",HB%
4170      INPUT "Lifetime starts    :",LS%:
          INPUT "Lifetime wins      :",LW%:
          IF LW%>LS% THEN 4170
4180      PRINT:PRINT 'Details correct (Y/N)?":
          GOSUB 2160:IF A=78 THEN 4140 •
4188 '
4189 'Apply performance consistency adjustment
4190      IF LS%<21 THEN GOSUB 2790:
          FOR X=0 TO LW%:
               READ CA%:
          NEXT:GOTO 4220
4200      LS%=LW%*100/LS%:IF LS%>70 THEN LS%=70
4210      RESTORE 6480:
          FOR X=0 TO LS%:
               READ CA%:
          NEXT
4218 '
4219 'Apply current fitness adjustment
4220      OT%=RD-LR(K):WR(K)=WR(K)-3*(OT%<8)-2*(OT%<15)-(OT%<22)
4228 '
4229 'Seek details of horse's qualifying run
4230      PRINT:RESTORE 6000:
          FOR X=1 TO 6:
               GOSUB 2130:READ A$:PRINT A$:
          NEXT
4240      PRINT:PRINT 'Where did "H$(K)"
          PRINT 'run its best race this":
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                PRINT "or last campaign (1-6)":
4250            INPUT QS%:IF QS%<1 OR QS%>6 THEN 4230
4260            PRINT:INPUT "Date of that run (DDMMYY):",DT$:
                GOSUB 2030:IF F% OR JD>=RD OR JD>LR(K) THEN 4260
4268 '
4269 'Convert calendar month to racing season month (August --> July)
4270            QD=JD:QM%=MM%-5*(MM%<8)+7*(MM%>7)
4279 'Determine class of qualifying run
4280            PRINT:GOSUB 3030:
                FOR X=1 TO NC%:
                        GOSUB 2130:READ A$,UA%(X):PRINT A$:
                NEXT
4290            PRINT:PRINT "In which class (1" (-NC%) CHR$(8) ")";:
                INPUT QC%:IF QC%<1 OR QC%>NC% THEN 4280
4299 'Check for Saturday class (Julian date 30317 was a recent Saturday!)
4300            IF (QD-30317) MOD 7 = 0 THEN 4390
4310            IF QS%=1 AND (QC%=1 OR (QC%>3 AND QC%<7) OR
                (QC%>8 AND QC%<15) OR QC%>20) THEN 4390
4320            IF QS%=2 AND (QC%=1 OR QC%=4 OR QC%=5 OR
                (QC%>7 AND QC%<16) OR QC%>18) THEN 4390
4330            IF QS%=3 AND (QC%=1 OR QC%=4 OR QC%=5 OR
                (QC%>7 AND QC%<17) OR QC%>19) THEN 4390
4340            IF QS%=4 AND (QC%<3 OR (QC%>4 AND QC%<10) OR
                (QC%>11 AND QC%<17) OR QC%>19) THEN 4390
4350            IF QS%=5 AND ((QC%>2 AND QC%<5) OR (QC%>6 AND
                QC%<9) OR QC%>10) THEN 4390
4360            IF QS%=6 AND (QC%=5 OR QC%=6 OR QC%>7) THEN 4390
4370            PRINT:PRINT "That was not a Saturday - was it a":
                PRINT "holiday or carnival meeting (Y/N)?"
4380            GOSUB 2160:IF A=78 THEN WR(K)=WR(K)-4
4388 'Determine whether automatic limit weight can be assigned
4389 'If so, do it, else prompt user for details
4390            PRINT:CR%=UA%(QC%):QL=100:IF CR% THEN QL=0:GOTO 4440
4400            IF QS%=3 AND QC%=21 THEN CR%=134:
                GOTO 4520  'Handle QLD WFA event
4409 'Handle quality races in all States
4410            GOSUB 3120:
                FOR X=1 TO NR%:
                        GOSUB 2130:READ A$,UA%(X):PRINT A$:
                NEXT
4420            PRINT:PRINT "Which race (1" (-NR%) CHR$(8) ")";:
                INPUT QE%:IF QE%<1 OR QE%>NR% THEN 4410
4430            CR%=UA%(QE%):GOTO 4520
4439 'Set automatic limit weight for all non-quality set weights events
4440            IF QS%=1 AND (QC%=6 OR QC%=12 OR QC%=13) THEN QL=100
4450            IF QS%=3 AND (QC%=11 OR QC%=13 OR QC%=15) THEN QL=100
4460            IF QS%=4 AND QC%=14 THEN QL=100
4470            IF QS%=5 AND (QC%=4 OR QC%=8) THEN QL=100
4480            IF QS%=6 AND QC%=13 THEN QL=100
4490            IF QL THEN 4520
4500            PRINT:PRINT 'What was the limit weight of that race"
4510            INPUT '(enter '50' if not detailed in form guide)";QL:
                QL=2*QL
4520            PRINT:PRINT "What was "H$(K)"'s":
                PRINT 'weight in that race"
4530            PRINT '(including overweight but":
                INPUT 'excluding allowance (kg)";QW:
                QW=2*QW
4539 'Prompt for track information (disregarding NZ)
4540            IF QS%=6 THEN 4620
4550            PRINT:Z%=QS%:GOSUB 2200:
                FOR X=1 TO TT%:
                        GOSUB 2130:READ A$:PRINT A$:
                NEXT
4560            PRINT:PRINT "At which track (1" (-TT%) CHR$(8) ")";:
                INPUT QT%:IF QT%<1 OR QT%>TT% THEN 4550
4570            PRINT:ZZ%=QT%:ON QS% GOSUB 2290,2410,2630,2690,2740:
                FOR X=1 TO TD%:
                        GOSUB 2130:READ AC%(X),UA%(X):
                        PRINT USING '#####";AC%(X):
                NEXT
4580            PRINT:PRINT "Which distance (1" (-TD%) CHR$(8) ")";:
                INPUT QR%:IF QR%<1 OR QR%>TD% THEN 4570
4590            QB%=UA%(QR%):QR%=AC%(QR%)
4599 'Apply barrier position adjustment
4600            PRINT:PRINT "What barrier did "H$(K):
                INPUT "draw in that race";Y%
4610            QB%=ABS((Y%>QB%)*(Y%-QB%))
4619 'Apply adjustment for beaten margin
4620            PRINT:PRINT 'To nearest 1/4 length, by what":
                PRINT 'margin was "H$(K)" beaten"
4630            PRINT '(enter '0' if the horse won":
                INPUT 'or was defeated only narrowly)";BM
4640            BM=3*BM:IF BM<0 THEN 4620   'Allow 1.5 kg per length
4650            IF BM THEN 4700
4659 'Apply bonus adjustment for handy win at qualifying run
4660            PRINT:PRINT "If "H$(K)" won, was its":
                PRINT "winning margin 2 lengths or more (Y/N)?"
4670            GOSUB 2160:IF A=89 THEN WR(K)=WR(K)+3
4680            PRINT:PRINT "Was this performance achieved":
                PRINT "after "H$(K) " had been close"
4690            PRINT "to the pace throughout (Y/N)?":
                GOSUB 2160:IF A=89 THEN WR(K)=WR(K)+3
4698 '
4699 'Allow for age improvement in 2yos and 3yos
4700            AG%=-1:IF (QS%<4 AND QC%>5) OR (QS%=4 AND QC%<6) THEN AG%=0
4710            IF (QS%=5 AND QC%<5) OR (QS%=6 AND QC%<3) THEN AG%=0
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4720            IF QC%>4 AND ((QS%=1 AND QC%<10) OR (QS%<4 AND QC%<9))
                THEN AG%=12
4730            IF QS%=4 AND QC%>5 AND QC%<13 THEN AG%=12
4740            IF QS%=5 AND QC%>3 AND QC%<8 THEN AG%=12
4750            IF QS%=6 AND QC%>2 AND QC%<6 THEN AG%=12
4760            IF OT%<43 THEN 4840 ELSE IF AG%<0 THEN 4800
4770            MO%=(RD-QD)/30.42:RESTORE 7660:
                FOR X=1 TO AG%+QM%:
                        READ NC%:
                NEXT
4780            FOR X=1 TO MO%:
                        READ TT%:
                        IF TT%=44 THEN X=MO%
4790            NEXT
4795            WR(K)=WR(K)+TT%-NC%:X=MO%
4800            PRINT:PRINT H$(K)" has not been on the":
                PRINT "track for" INT(OT%/7) "weeks or more."
4810            PRINT "By how many lengths do you estimate"
4820            INPUT "it will perform below its peak today";X
4830            WR(K)=WR(K)-3*ABS(X):GOTO 4960
4840            IF QD=LR(K) THEN 4920
                ELSE PRINT:PRINT "The qualifying run you chose for"
4850            PRINT H$(K)" was not its most":PRINT "recent start."
4860            PRINT:PRINT "Does this lead you to suspect that"
4870            PRINT "something may be amiss with the horse"
4880            PRINT "or that its form is declining (Y/N)?"
4890            GOSUB 2160:IF A=78 THEN 4920
4900            PRINT:PRINT "How many lengths do you wish to":
                INPUT "penalise it on this account";X
4910            WR(K)=WR(K)-3*ABS(X):GOTO 4960
4920            PRINT:PRINT "Does "H$(K)"'s record":
                PRINT "seem to indicate that improvement in"
4930            PRINT "its form is likely today (Y/N)?":
                GOSUB 2160:IF A=78 THEN 4960
4940            PRINT:PRINT "How many lengths' improvement do you"
4950            INPUT "expect on its qualifying run";X:
                X=ABS(X):WR(K)=WR(K)+3*X+3*(X>6)
4960            PRINT:RESTORE 7680:
                FOR X=1 TO 10:
                        GOSUB 2130:READ A$:PRINT A$:
                NEXT
4970            PRINT:PRINT "What is "H$(K)"'s":
                INPUT "most effective distance range (1-10)";Y%
4980            IF Y%<1 OR Y%>10 THEN 4960
4990            RESTORE 7680:
                FOR X=1 TO Y%:
                        READ A$:
                NEXT
4999 'Apply adjustment for distance suitability
5000            LD%=VAL(LEFT$(A$,4)):HD%=VAL(RIGHT$(A$,4))
5010            WR(K)=WR(K)+((RL%<LD%)*(LD%-RL%)/50)+((RL%>HD%)*(RL%-HD%)/50)
5019 'Allow for comparative rider skill adjustment
5020            PRINT:PRINT "Do you wish to apply an adjustment for"
5030            PRINT "comparative rider skill (Y/N)?":
                GOSUB 2160:IF A=78 THEN 5110
5040            PRINT:PRINT "On a scale of 1 to 10, where 10 ="
5050            PRINT "the champion metropolitan jockey and"
5060            PRINT "1 = a little-known bush apprentice,"
5070            PRINT "how would you rate:":PRINT
5080            INPUT "the jockey at the qualifying run";LD%:
                IF LD%<1 OR LD%>10 THEN 5040
5090            INPUT "today's jockey                    ";HD%:
                IF HD%<1 OR HD%>10 THEN 5040
5098 '
5099 'Compute final class/weight ratings'
5100            WR(K)=WR(K)-(LD%>HD%)*(LD%-HD%)-(HD%>LD%)*(HD%-LD%)
5110            WR(K)=WR(K)+CR%+QW-QL+LT-SC+QB%-BM+CA%
5120            WR(K)=WR(K)+(HB%>MB%)*(HB%-MB%)
5130            WR(K)=WR(K)-2*QM%*((QS%<4 AND QC%<4) OR (QS%=4 AND QC%<5))
5140            WR(K)=WR(K)-2*QM%*((QS%=5 AND QC%<4) OR (QS%=6 AND QC%<3))
5150            WR(K)=WR(K)-QM%*(QS%=1 AND QC%>4 AND QC%<9)
5160            WR(K)=WR(K)-QM%*((QS%=2 OR QS%=3) AND (QC%>4 AND QC%<8))
5170            WR(K)=WR(K)-QM%*(QS%=4 AND QC%>5 AND QC%<12)
5180            WR(K)=WR(K)-QM%*(QS%=5 AND QC%>3 AND QC%<7)
5190            WR(K)=WR(K)-QM%*(QS%=6 AND QC%>2 AND QC%<6)
5200            WR(K)=WR(K)+8*(QS%=1 AND QT%>4 AND (QC%>18 AND QC%<22))
5210            WR(K)=WR(K)+8*(QS%=2 AND QT%>4 AND (QC%>16 AND QC%<20))
5220            WR(K)=WR(K)+8*(QS%=3 AND QT%>2 AND (QC%>17 AND QC%<21))
5230            WR(K)=WR(K)+(QR%>1200)*((QR%-1200)/200):WR(K)=WR(K)/2
5239 'Round rating to nearest 1/2 kg
5240            WR(K)=INT(WR(K))-.5*(WR(K)-INT(WR(K))>.25)
                        -.5*(WR(K)-INT(WR(K))>.75)
5250    NEXT K
5258 '
5259 'Sort contenders into descending order by rating and display
5260    FOR K=1 TO H%-1:
                FOR J=K+1 TO H%:
                        IF WR(K)>=WR(J) THEN 5280
5270                    SWAP H$(K),H$(J):SWAP WR(K),WR(J)
5280            NEXT J:
        NEXT K:
        FOR K=1 TO H%:
                Y%=2*(WR(1)-WR(K)):IF Y%>12 THEN Y%=12
5289 'Fetch each contender's relative advantage index
5290            RESTORE 7710:
                FOR X=0 TO Y%:
                        READ AC%(K):
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                NEXT X:
        NEXT K:Y%=0
5298 'Obtain total relative advantage of all contenders, convert to
5299 '80% betting market and fetch betting odds for display
5300    FOR K=1 TO H%:
                Y%=Y%+AC%(K):
        NEXT
5310    FOR K=1 TO H%:
                AC%(K)=AC%(K)*80/Y%:IF AC%(K)>76 THEN AC%(K)=76
5320    NEXT:
        HOME:
        PRINT TAB(4) "HORSE" TAB(27) "RATING"TAB(37) "ODDS":
        PRINT
5330    FOR X=1 TO H%:
                GOSUB 2130:PRINT H$(X) TAB(28) USING "##.#";WR(X):
5340            RESTORE 7720:
                FOR K=1 TO AC%(X):
                        READ A$:
                NEXT
5350            PRINT TAB(37) A$:
        NEXT:PRINT
5360    PRINT "Want to amend a rating (Y/N)?":
        GOSUB 2160:IF A=78 THEN 5400
5370    PRINT:PRINT "Which horse (1" (-H%) CHR$(8) ")";:
        INPUT Y%:IF Y%<1 OR Y%>H% THEN 5370
5380    PRINT:PRINT "From" WR(Y%) 'to..";:INPUT WR(Y%):
        IF WR(Y%)>WR(1)+6 THEN 5380
5390    WR(Y%)=INT(WR(Y%))-.5*(WR(Y%)-INT(WR(Y%))>.25)
                -.5*(WR(Y%)-INT(WR(Y%))>.75):GOTO 5260
5400 NEXT O:
        ERASE H$,WR,AC%,LR,UA%:
        PRINT:PRINT "Another meeting (Y/N)?":
        GOSUB 2160:IF A=89 THEN RUN 4000
5410 PRINT:PRINT "Good punting!!":NEW
5997 '
5998 'DATA SECTION
5999 'Regional list
6000 DATA "NSW","VIC","QLD","SA","WA","NZ"
6009 'NSW tracks
6010 DATA"Randwick","Rosehill","Warwick Farm","Canterbury","Newcastle"
6020 DATA"Hawkesbury","Gosford","Wyong","Kembla Grange","Canberra"
6029 'VIC tracks
6030 DATA"Flemington","Caulfield","Sandown","Moonee Valley","Ballarat"
6040 DATA"Bendigo","Colac","Cranbourne","Geelong","Hamilton"
6050 DATA"Kyneton","Moe","Mornington","Pakenham","Sale"
6060 DATA"Seymour","Warrnambool","Werribee","Yarra Glen"
6069 'QLD tracks
6070 DATA"Eagle Farm","Doomben","Bundamba","Southport"
6079 'SA tracks
6080 DATA"Victoria Park","Morphetville","Cheltenham"
6089 'WA tracks
6090 DATA"Ascot","Belmont Park"
6091 '
6092 'This block contains a list of distances at each track, together
6093 'with the widest barrier at each distance which does not attract
6094 'a penalty adjustment to a horse's rating.  Insufficient data
6095 'exists for KILMORE (VIC) and CALOUNDRA PARK (QLD) to permit their
6096 'inclusion.  Also, STC authorities have recently begun to program
6097 'races over 1300m and 1450m, but it is unclear whether this
6098 'practice is likely to continue in the long term.
6099 'NSW tracks
6100 DATA 1000,10,1100,11,1200,12,1400,10,1600,12,1800,8,2000,10,
        2400,10,2600,15,2800,13,3200,18
6110 DATA 900,14,1100,8,1200,10,1300,11,1400,12,1450,12,1500,13,1750,6,
        1900,7,2000,10,2400,11,3200,18
6120 DATA 1000,13,1200,14,1400,7,1600,10,2100,10,2200,11,2400,14
6130 DATA 1000,11,1100,12,1200,13,1250,13,1280,14,1290,14,1550,6,1900,10,
        2600,14,2800,15,3400,16
6140 DATA 900,9,1200,9,1300,10,1400,11,1600,13,220,10,2300,11
6150 DATA 900,10,1000,11,1200,8,1300,10,1400,11,1600,13,1800,14,2000,15,
        2200,10,2400,13
6160 DATA 1000,10,1100,11,1200,12,1600,8,2000,10,2700,14
6170 DATA 1000,9,1100,10,1200,11,1350,13,1600,7,2000,10
6180 DATA 900,10,1000,11,1200,9,1400,11,1600,13,2000,11
6190 DATA 1000,10,1200,9,1300,10,1400,11,1600,12,2000,9,2200,12,2400,14,3200,16
6200 DATA 900,24,1000,24,1100,24,1200,24,1400,9,1600,9,2000,14,2500,9,
        2800,12,3200,18
6210 DATA 1000,12,1100,13,1200,14,1400,8,1600,9,1800,11,2000,11,2400,10
6220 DATA 1000,12,1200,8,1400,11,1600,14,2100,9,2400,12
6230 DATA 1000,11,1200,11,1600,12,2050,10,2600,14
6240 DATA 1000,12,1200,14,1400,10,1500,11,1600,12,2200,11
6250 DATA 1200,9,1300,10,1400,12,1600,14,2200,11
6260 DATA 1000,9,1100,10,1200,11,1600,10,2000,11
6270 DATA 1000,8,1300,11,2050,11
6280 DATA 1100,7,1200,9,1500,13,1700,11,2200,11,2400,13
6290 DATA 1100,7,1200,8,1400,10,1600,13,2000,9,2200,11,2400,13
6300 DATA 1100,10,1200,11,1440,9,1850,10,2000,12,2820,14
6310 DATA 1000,8,1100,10,1200,11,1600,12,2050,12,2700,13
6320 DATA 1000,7,1200,8,1500,8,2000,10,2400,11
6330 DATA 1000,9,1300,9,1400,10,1750,11,2400,10
6340 DATA 1000,11,1100,12,1200,13,1400,9,1500,10,1600,11,1700,12,2200,10
6350 DATA 1000,9,1100,10,1200,11,1400,10,1600,12,2000,10,2200,12
6360 DATA 1000,10,1100,11,1200,12,1400,14,1600,11,1700,12,2000,12,2200,14
6370 DATA 1000,9,1500,11,2000,12,2100,13,2600,14
6380 DATA 1000,7,1250,7,1500,9,1950,9,2700,12
6390 DATA 1000,10,1200,8,1400,12,1600,8,1810,7,2200,8,2400,10,3200,12
6400 DATA 1010,7,1110,8,1200,9,1350,11,1610,7,2020,8,2200,10
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6410 DATA 1000,6,1100,7,1200,8,1500,6,1666,7,2150,9
6420 DATA 800,7,1010,6,1110,7,1200,8,1300,9,1600,8,2015,10,2400,10
6430 DATA 900,24,1000,24,1450,6,1500,7,1600,8,1850,12,2000,14,2600,10
6440 DATA 1050,9,1200,11,1600,10,1800,12,2000,11,2450,11,2500,12,
     2600,13,3200,12
6450 DATA 1000,10,1350,7,1450,8,1500,9,1850,12,2250,10,2400,12
6460 DATA 1000,7,1100,8,1200,9,1400,6,1450,7,1500,8,1600,7,1800,8,
     2200,8,2400,10,3200,14
6470 DATA 900,8,1000,9,1200,8,1300,9,1400,10,1600,9,1650,10,2100,10,
     2200,11,2400,10,2800,14
6478 '
6479 'Performance consistency adjustment indices for more seasoned animals
6480 DATA -7,-6,-6,-5,-5,-4,-4,-4,-3,-3,-3,-2,-2,-2,-2,-1,-1,-1,-1,
     0,0,0,0,0,1,1,1,1,2,2,2,2
6490 DATA 2,2,3,3,3,3,3,3,3,3,3,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,
     5,5,5,5,5,5,5,5,5,5,5,6,6
6498 '
6499 'Performance consistency adjustment indices for lightly raced animals
6500 DATA 0,0
6510 DATA 0,0,3
6520 DATA 0,0,3,5
6530 DATA 0,0,3,5,6
6540 DATA 0,0,2,5,6,6
6550 DATA 0,0,1,4,6,6,6
6560 DATA 0,0,1,3,5,6,6,6
6570 DATA -1,0,1,3,5,6,6,6,6
6580 DATA -1,-1,0,2,4,5,6,6,6,6
6590 DATA -1,-1,0,2,4,5,6,6,6,6,6,6
6600 DATA -2,-1,0,1,3,5,5,6,6,6,6,6,6
6610 DATA -2,-2,0,1,3,4,5,5,6,6,6,6,6
6620 DATA -3,-2,-1,0,2,4,5,5,6,6,6,6,6,6,6
6630 DATA -3,-2,-1,0,2,3,4,5,5,6,6,6,6,6,6
6640 DATA -4,-2,-1,0,2,3,4,5,5,6,6,6,6,6,6,6
6650 DATA -4,-3,-1,0,2,3,4,4,5,5,6,6,6,6,6,6,6
6660 DATA -5,-3,-2,0,1,2,3,4,5,5,5,6,6,6,6,6,6,6
6670 DATA -5,-3,-2,0,1,2,3,4,4,5,5,5,6,6,6,6,6,6,6
6680 DATA -5,-4,-2,0,1,2,3,4,4,5,5,5,5,6,6,6,6,6,6,6
6690 DATA -6,-4,-3,-1,1,2,3,3,3,4,4,5,5,5,5,5,6,6,6,6,6,6
6693 '
6694 'Regional listings of race classes together with their class
6695 'ratings.  Those classes shown with zero ratings are dealt
6696 'with by the main program as quality events.
6698 '
6699 'NSW
6700 DATA"2yo provincial or midweek city",70,"2yo colts or 2yo open",76
6710 DATA"2yo fillies",74,"2yo quality stakes",0
6720 DATA"3yo midweek restricted hcp",92,"3yo restricted set weights",96
6730 DATA"3yo colts or 3yo open",100,"3yo fillies",98
6740 DATA"3yo quality stakes",0,"Intermediate",90,"Advanced",92
6750 DATA"Provincial stakes",92,"Regional stakes",96,"Novice",96
6760 DATA"Mares midweek restricted",106,"H & G midweek restricted",108
6770 DATA"Saturday/holiday restricted hcp",114,"Fillies & mares",116
6780 DATA"Welter/highweight",122,"Open hcp",134
6790 DATA"Quality hcp or provincial feature",138,"Weight-for-age stakes",0
6799 'VIC
6800 DATA"2yo provincial or midweek city",72,"2yo colts or 2yo open",78
6810 DATA"2yo fillies",76,"2yo quality stakes",0
6820 DATA"3yo provincial or midweek city",94,"3yo colts or 3yo open",100
6830 DATA"3yo fillies",98,"3yo quality stakes",0,"Improvers",90
6840 DATA"Progressive",96,"Intermediate",100,"Novice",102,"Encourage",104
6850 DATA"Trial",110,"4yo & upwards restricted",112,"Mares",116
6860 DATA"Welter/highweight",124,"Open hcp",134
6870 DATA"Quality hcp or provincial feature",138,"Weight-for-age stakes",0
6879 'QLD
6880 DATA"2yo maiden",66,"2yo colts or 2yo open",74,"2yo fillies",72
6890 DATA"2yo quality stakes",0,"3yo maiden",88,"3yo colts or 3yo open",96
6900 DATA"3yo fillies",94,"3yo quality stakes",0,"3yo & 4yo maiden",88
6910 DATA"Maiden",88,"Graduation (maiden & novice)",92,"Novice",98
6920 DATA"Graduation (novice & transition)",100,"Transition",102
6930 DATA"Graduation (transition & upwards)",102,"Encourage",104,"Trial",106
6940 DATA"Welter/highweight",120,"Open hcp",130
6950 DATA"Quality hcp",134,"Weight-for-age stakes",0
6959 'SA
6960 DATA"2yo colts restricted",68,"2yo fillies restricted",66,"2yo colts",72
6970 DATA"2yo fillies",70,"2yo quality stakes",0,"3yo colts restricted",88
6980 DATA"3yo fillies restricted",86,"3yo novice",90,"3yo transition",92
6990 DATA"3yo colts or 3yo open",94,"3yo fillies",92,"3yo quality stakes",0
7000 DATA"Novice",96,"Graduation",98,"Transition",100,"Encourage",102
7010 DATA"Mares hcp",112,"Welter/highweight",120,"Open hcp",130
7020 DATA"Quality hcp",134,"Weight-for-age stakes",0
7029 'WA
7030 DATA"2yo colts or 2yo open",70,"2yo fillies",68,"2yo quality stakes",0
7040 DATA"3yo graduation",84,"3yo colts or 3yo open",92,"3yo fillies",90
7050 DATA"3yo quality stakes",0,"Graduation",98,"Welter/highweight",120
7060 DATA"Open hcp",130,"Quality hcp",134,"Weight-for-age stakes",0
7069 'NZ
7070 DATA"2yo colts or 2yo open",78,"2yo fillies",76,
     "3yo colts or 3yo open",100
7080 DATA"3yo fillies",98,"3yo quality stakes",0,"Maiden",92
7090 DATA"Highweight",106,"Class 4",106,"Class 3",116,"Class 2",122
7100 DATA"Class 1",132,"Quality hcp",138,"Weight-for-age stakes",136
7107 '
7108 'Quality races in each State listed in ascending age order
7109 'NSW : 2yo
7110 DATA"Black Opal Stakes",100,"Brambles Classic",100,"Breeders Plate",88
7120 DATA"Canonbury Stakes",86,"Champagne Stakes",108,"Gimcrack Stakes",86
7130 DATA"Golden Slipper Stakes",110,"Penfolds Northern Classic",96,
     "Reisling Slipper Trial",98
```

```
7140 DATA"Silver Slipper Stakes",94,"Sires Produce Stakes",108,
       "Skyline Stakes",100
7150 DATA"Sweet Embrace Stakes",98,"Todman Slipper Trial",100,
       "Widden Stakes",84
7159 'NSW : 3yo
7160 DATA"AJC Derby",126,"AJC Oaks",124,"Canterbury Guineas",126,
       "Flight Stakes",114
7170 DATA"Frank Packer Plate",120,"Gloaming Stakes",116,
       "Hobartville Stakes",120
7180 DATA"Light Fingers Stakes",116,"Peter Pan Stakes",116,
       "Phar Lap Stakes",122
7190 DATA"Roman Consul Stakes",108,"Royal Sovereign Stakes",114
7200 DATA"San Domenico Stakes",106,"Silver Shadow Stakes",106
7210 DATA"Sir Brian Crowley Stakes",110,"Spring Champion Stakes",116
7220 DATA"AJC St Leger",118,"Storm Queen Stakes",122,"Surround Stakes",114
7230 DATA"Tea Rose Stakes",112,"Tulloch Stakes",124,"Up & Coming Stakes",108
7239 'NSW : WFA
7240 DATA"All Aged Stakes",137,"Apollo Stakes",134,"Canterbury Stakes",134
7250 DATA"Challenge Stakes",132,"Chelmsford Stakes",134,
       "Chipping Norton Stakes",134
7260 DATA"Expressway Stakes",132,"George Main Stakes",138,
       "George Ryder Stakes",138
7270 DATA"H E Tancred Stakes",140,"Hill Stakes",134,"Missile Stakes",132
7280 DATA"Premiere Stakes",134,"Queen Elizabeth Stakes",136,"Rawson Stakes",138
7290 DATA"STC Cup",134,"Theo Marks Stakes",134,"Warwick Stakes",134
7299 'VIC : 2yo
7300 DATA"Breeders Plate",98,"Blue Diamond Prelude (Colts)",100
7310 DATA"Blue Diamond Prelude (Fillies)",98,"Blue Diamond Stakes",106
7320 DATA"Debutant Stakes (Colts)",88,"Debutante Stakes (Fillies)",86
7330 DATA"Maribyrnong Plate",90,"Maribyrnong Trial (Colts)",84
7340 DATA"Maribyrnong Trial (Fillies)",82,"Mona Nursery",84,"Myer Stakes",84
7350 DATA"Sires Produce Stakes",106
7359 'VIC : 3yo
7360 DATA"Ascot Vale Stakes",108,"Autumn Stakes",112,"A V Kewney Stakes",114
7370 DATA"Caulfield Guineas",118,"Geelong Derby Trial",110,
       "Geelong Oaks Trial",108
7380 DATA"Leilani Stakes",108,"Manifold Stakes",114,"Moomba Plate",114
7390 DATA"Moonee Valley Stakes",112,"Sandown Guineas",114,"Schweppes Cup",108
7400 DATA"1000 Guineas",116,"Tranquil Star Stakes",106,"Victoria Derby",118
7410 DATA"VRC Oaks",116,"VRC St Leger",112,"Wakeful Stakes",112
7419 'VIC : WFA
7420 DATA"A J Moir Stakes",134,"Alister Clark Stakes",134,
       "Caulfield Stakes",138
7430 DATA"C F Orr Stakes",134,"Chester Manifold Stakes",134,
       "Chirnside Stakes",134
7440 DATA"Craiglee Stakes",136,"Futurity Stakes",138,"Feehan Stakes",133
7450 DATA"J J Liston Stakes",134,"Lightning Stakes",134,"Linlithgow Stakes",134
7460 DATA"L S Mackinnon Stakes",138,"Manikato Stakes",133,"Memsie Stakes",133
7470 DATA"Rupert Steele Stakes",134,"St George Stakes",134,
       "Underwood Stakes",135
7480 DATA"Reid Stakes",134,"W S Cox Plate",140
7489 'QLD : 2yo
7490 DATA"Ahern Stakes",96,"Castlemaine Stakes",106
7500 DATA"Sires Produce Stakes",100,"TAA Stakes",96
7509 'QLD : 3yo
7510 DATA"Grand Prix Stakes",116,"Queensland Derby",122
7520 DATA"Queensland Guineas",118,"Queensland Oaks",120
7529 'SA  : 2yo
7530 DATA"Breeders Stakes",94,"Cheltenham Stakes",94,
       "Queen of Adelaide Stakes",92
7540 DATA"Sires Produce Stakes",100,"South Australian Stakes",100
7549 'SA  : 3yo
7550 DATA"Adelaide Guineas",102,"Auraria Stakes",102,"Australasian Oaks",120
7560 DATA"Great Western Plate",112,"Port Adelaide Guineas",100,"S A Derby",112
7570 DATA"South Australian Oaks",110,"South Australian St Leger",108
7579 'SA  : WFA
7580 DATA"Irwin Stakes",128,"Lightning Stakes",128,"Spring Stakes",130
7581 DATA"Tobin Bronze Stakes",132
7589 'WA  : 2yo
7590 DATA"Karakatta Plate",92,"Sires Produce Stakes",94
7599 'WA  : 3yo
7600 DATA"Australian Derby",118,"Belmont Guineas",110,
       "Champion Fillies Stakes",116
7610 DATA"WA Derby",112,"WA Guineas",108,"WA Oaks",116,"WA St Leger",110
7619 'WA  : WFA
7620 DATA"C B Cox Stakes",132,"Helena Vale Stakes",130,"Hyperion Stakes",130
7630 DATA"Lee Steere Stakes",132,"Marlboro Stakes",136,
       "Prince of Wales Stakes",130
7640 DATA"Roma Cup",130,"Scahill Stakes",130,"Strickland Stakes",130
7650 DATA"Western Mail Stakes",132,"Winterbottom Stakes",132
7658 '
7659 'List enabling calculation of age improvement in 2yos and 3yos
7660 DATA 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30
7670 DATA 31,32,33,34,35,36,37,38,39,40,41,42,43,44
7678 '
7679 'Effective distance ranges
7680 DATA" 900-1000","1000-1200","1200-1400","1400-1600","1500-1800"
7690 DATA"1600-2000","1800-2200","2000-2400","2200-2600","2400-3200"
7691 '
7692 '   The following DATA line contains the values used to convert
7693 'each contender's relative class/weight advantage to an index
7694 'enabling access to the program's list of betting odds.  As long
7695 'as the first value is left unchanged at 100, the list may be
7696 'amended to cater for the user's individual taste.  The more
7697 'speculative user, for example, might like to experiment with
7698 'reduced values, thereby shortening the prospective odds of the
7699 'highest-rated runner relative to those of the others in the race.
7700 '   Experience has shown, however, that the listed values are
```

```
7701 'very reliable over a long series of races.
7710 DATA 100,85,70,57,44,32,20,16,12,8,4,2,1
7719 'List of betting odds
7720 DATA"66/1","66/1","50/1","33/1","25/1","20/1","16/1","14/1","12/1",
       "10/1","9/1","8/1","15/2","7/1"
7730 DATA"13/2","6/1","11/2","5/1","9/2","9/2","4/1","4/1","7/2","7/2",
       "13/4","3/1","3/1","11/4","11/4","5/2"
7740 DATA"5/2","9/4","9/4","2/1","2/1","15/8","7/4","7/4","13/8","13/8",
       "6/4","6/4","11/8","11/8","5/4","5/4"
7750 DATA"5/4","10/9","10/9","11/10","1/1","1/1","10/11","9/10","9/10",
       "4/5","4/5","4/5","8/11","8/11"
7760 DATA"4/6","4/6","8/13","4/7","4/7","8/15","1/2","1/2","4/9","4/9",
       "2/5","2/5","2/5","4/11","4/11","1/3"
```

Apple and Commodore 64 users will benefit from the following sections of code which enable the RESTORE <line number> feature which is heavily used in the body of the program.

```
C64 users should include the following code:
100 FOR X=679 TO 731:READ Y%:POKE X,Y%:NEXT:SYS 679
110 POKE 40996,195:POKE 40997,2:POKE 1,54
120 DATA 169,160,133,252,169,0,133,251,160,0,177,251,145,251
130 DATA 200,208,249,230,252,165,252,201,192,208,241,96
140 DATA 76,29,168,240,251,32,158,173,32,247,183,32,19
150 DATA 166,164,96,166,95,208,1,136,202,134,65,132,66,96
```

Apple users should use the following code and replace every instance of the 'RESTORE' keyword in the program code with '&', e.g. 'RESTORE 5000' becomes '&5000'.

```
100 FOR X=768 TO 794:READ Y%:POKE X,Y%:NEXT
110 POKE 1014,3:POKE 1015,3
120 DATA 76,73,216,240,251,32,123,221,32,82,231,32,26,214
130 DATA 164,156,166,155,208,1,136,202,134,125,132,126,96
```

Freddo

by K Riordan

This arcade simulation for the Apple II is a machine language program, but for the use of those without assemblers is presented in Basic data statements. Full instructions are in the listing.

```
100 REM ************************************************************
101 REM *                                                          *
102 REM *                          FREDDO                          *
103 REM *     A FACSIMILE FOR APPLE II OF A WELL-KNOWN ARCADE GAME *
104 REM *                    KEVIN RIORDAN 1985                    *
105 REM *                                                          *
106 REM ************************************************************
107 !
108 !
109 REM  ONCE YOU HAVE ENTERED AND RUN LINES 123-332 BELOW, FREDDO
110 REM    WILL SAVE ITSELF TO DISK AS A BINARY PROGRAM AND MAY BE
111 REM    PLAYED ANYTIME BY 'BRUN FREDDO'.
112 REM  CASSETTE USERS SHOULD OMIT LINE 127 AND SAVE THIS BASIC
113 REM    LOADER TO TAPE.
114 !
115 REM  OPERATING INSTRUCTIONS ARE SIMPLE. THE 'A' AND 'Z' KEYS
116 REM    MOVE FREDDO FORWARD AND BACKWARD AND CURSOR KEYS MOVE
117 REM    HIM LEFT AND RIGHT. THE 'ESC' KEY FREEZES THE ACTION.
118 REM    THERE ARE THREE LEVELS OF DIFFICULTY, AND THE HIGHEST
119 REM    IS NOT SO EASY TO REACH - OR HANDLE!
120 !
121 !
122 !
123 HOME:VTAB12:HTAB10:PRINT"LOADING MACHINE CODE..."
124 PRINTTAB(11)"(TAKES 105 SECONDS)":FORX=24576TO27829
125 READH$:D=0:FORY=1TO2:A=ASC(MID$(H$,Y,1))-48
126 D=D*16+A+7*(A>9):NEXT:POKEX,D:NEXT:HOME
127 PRINTCHR$(4)"BSAVE FREDDO,A$6000,L$CB6,D1"
128 !
129 DATA4C,FE,61,29,AD,36,3S,1E,3F,07,20,65,0C,DC,33,26
130 DATA00,08,3E,0E,36,36,FD,07,00,12,05,28,AD,F8,1E,1E
131 DATA17,2D,2D,05,00,2A,28,AD,F6,0E,F6,3F,07,28,00,36
132 DATA2E,2D,25,B4,32,36,00,2D,2D,0E,18,36,2D,AD,F6,3F
133 DATA3F,00,49,11,1C,3F,17,36,3S,0E,2D,05,20,1C,3F,07
134 DATA00,2D,2D,36,1E,1E,1E,2E,00,28,AD,F6,3F,17,76,2D
135 DATA05,20,DC,1B,20,04,00,92,12,0E,2D,05,20,24,E4,3F
136 DATA17,76,2D,05,00,49,49,AD,3F,FF,FB,2E,F5,0E,0E,25
```

```
137 DATA24,2D,2D,6D,30,2D,F4,F2,1E,27,3C,3F,37,2D,35,3F
138 DATAF7,2D,2D,35,3F,3F,FF,6A,2D,2D,6D,36,2E,FD,03,08
139 DATA18,3F,3F,3F,3F,36,3F,4D,09,28,2D,05,00,15,15,15
140 DATA76,36,1E,F6,3F,07,E0,64,0C,DF,92,17,F6,04,08,18
141 DATA08,17,3F,20,64,64,0C,2D,2D,00,2D,2D,2D,2D,2D,2D
142 DATA2D,2D,2D,2D,2D,2D,15,15,0E,76,F6,F6,1E,1E,3F,3F
143 DATA3F,3F,3F,3F,3F,3F,3F,3F,3F,3F,3F,3F,3F,3F,3F,3F
144 DATA3F,3F,3F,3F,3F,3F,07,38,38,20,1C,64,64,0C,0C,0E
145 DATA0E,0E,76,F6,F6,1E,4D,49,49,08,08,1B,2B,2D,2D,2D
146 DATA2D,2D,2D,2D,2D,4D,48,49,49,01,08,18,08,1B,38,3F
147 DATA3F,3F,3F,FF,DB,DB,03,08,18,3F,3F,3F,3F,3F,3F,3F
148 DATA3F,3F,3F,3F,07,00,2D,2D,15,15,15,2D,2D,36,3E,37
149 DATA1E,3F,60,39,3F,3F,3F,3F,3F,3F,37,1E,3F,60,39,3F
150 DATA27,24,2D,2D,25,05,28,28,2D,96,DB,28,2D,2D,2D,2D
151 DATA2D,05,00,2D,15,DF,33,0E,2D,15,F6,3F,07,68,49,08
152 DATA24,24,0C,2D,15,96,F2,3F,44,48,09,76,2D,05,20,24
153 DATAE4,3F,17,36,4D,49,21,24,2D,AD,F6,3F,1E,36,4D,E1
154 DATA1C,4D,09,24,24,2D,2D,96,3B,B7,33,2D,2D,4D,08,18
155 DATA04,20,00,2D,2D,DE,36,36,6E,49,2D,1C,24,24,3C,0D
156 DATA4D,36,36,36,05,08,18,08,1B,A8,2E,08,18,25,16,36
157 DATA36,4D,24,24,24,2D,2D,96,3B,B7,2A,2D,4D,08,18,04
158 DATA20,00,C7,C1,CD,C5,A0,CF,D6,C5,D2,A1,A1,00,D7,C1
159 DATACE,D4,A0,D4,CF,A0,D0,CC,C1,D8,A0,C1,C7,C1,C9,CE
160 DATABF,00,D9,CF,D5,A0,D3,C3,CF,D2,C5,C4,A0,00,20,D8
161 DATAF3,A2,00,B6,F8,E8,86,E7,A2,06,20,EC,F6,A9,FF,85
162 DATAB3,E6,B3,A5,B3,C8,07,B0,13,A2,00,A0,00,20,57,F4
163 DATAA4,B3,A2,00,A9,FA,20,3A,F5,4C,11,62,A2,FE,86,B1
164 DATAE6,B1,E6,B1,A6,B1,E0,0F,B0,16,A9,06,85,B3,E6,B3
165 DATAA5,B3,C8,1A,B0,EA,A6,B1,A0,00,20,57,F4,4C,3E,62
166 DATAA2,F8,86,B1,1B,A5,B1,69,30,C8,18,F0,38,85,B1,A2
167 DATAFE,B6,FC,18,A5,FC,69,02,A6,B1,E0,EB,D0,06,C8,13
168 DATA80,E2,90,04,C9,17,B0,DC,85,FC,A9,06,85,B3,E6,B3
169 DATAA5,B3,C8,1A,B0,DD,48,A5,B1,65,FC,AA,A0,00,68,20
170 DATA57,F4,4C,7E,62,A2,01,20,EC,F6,A9,FF,85,B3,E6,B3
171 DATAA5,B3,C8,B6,F0,0A,A2,FD,A0,00,20,57,F4,4C,9E,62
172 DATAC6,B3,A2,FC,86,B1,A0,00,84,B2,E6,B1,D0,02,E6,B2
173 DATAA6,B1,E0,18,F0,0A,A4,B2,A5,B3,20,57,F4,4C,BA,62
174 DATAC6,B1,E6,B3,C6,B3,A5,B3,C9,FF,F0,0A,A6,B1,A4,B2
175 DATA20,57,F4,4C,D4,62,E6,B3,E6,B1,C6,B1,A6,B1,E0,FF
176 DATAD0,02,C6,B2,E0,FC,F0,0A,A4,B2,A5,B3,20,57,F4,4C
177 DATAEA,62,A2,03,20,EC,F6,A9,5A,85,B3,E6,B3,A5,B3,C8
178 DATA68,B0,26,A2,FF,86,B1,A0,00,84,B2,E6,B1,A6,B1,E0
179 DATAFB,F0,E8,A4,B2,A5,B3,20,57,F4,18,A5,B3,69,4E,A6
180 DATAB1,A4,B2,20,57,F4,4C,1B,63,A9,B9,A2,0A,A0,00,20
181 DATA11,F4,A2,63,A0,61,A5,F9,20,01,F6,A8,B8,A2,BB,A0
182 DATA00,20,11,F4,A2,A3,A0,61,A5,F9,20,01,F6,A9,01,85
183 DATAFA,A9,05,B5,F8,A2,00,BE,50,C0,BE,55,C0,86,FE,86
184 DATAFF,20,EC,F6,A8,B8,85,B3,E6,B3,A5,B3,C9,C0,B0,13
185 DATAA2,32,A0,00,20,57,F4,A8,78,A2,00,A4,B3,20,3A,F5
186 DATA4C,7B,63,A2,03,20,EC,F6,E8,86,B1,E8,86,B3,A0,01
187 DATA84,B2,1B,A5,B3,68,14,C9,69,F0,14,85,B3,A6,B1,A4
188 DATAB2,20,11,F4,A5,F9,A2,75,A0,60,20,01,F6,F0,E3,A9
189 DATA00,B5,87,85,B8,20,21,69,20,B3,D6,A9,00,B5,B4,3B
190 DATAA8,04,E5,FA,85,B5,A6,FA,E0,03,69,00,B5,B6,A9,0E
191 DATA85,B3,18,A5,B3,69,0D,C8,5C,D0,03,4C,95,65,85,B3
192 DATAA2,03,20,EC,F6,A5,B3,C9,1B,F0,0B,C9,35,F0,07,C9
193 DATA42,F0,03,4C,C1,64,A2,00,A9,FC,38,E5,B6,C5,B6,90
194 DATA03,E8,B0,F7,8A,A2,00,38,E8,07,C9,07,90,03,E8,B0
195 DATAF7,C9,04,90,01,E8,86,06,A2,07,A9,00,18,65,06,CA
196 DATAD0,FA,85,06,A5,B6,C9,02,D0,04,A9,31,D0,02,A9,07
197 DATA85,B1,A2,00,B6,B2,86,5F,A4,B6,BB,84,5E,0A,18,65
198 DATA5E,90,02,E6,5F,E8,E4,06,90,F5,18,65,B1,85,5E,A5
199 DATAB2,65,5F,85,5F,A5,5E,C5,B1,A5,5F,E5,B2,B0,03,4C
200 DATAE2,63,A2,04,20,EC,F6,A6,B1,A4,B2,C6,B3,A5,B3,E6
201 DATAB3,20,57,F4,A6,B2,18,A5,B1,69,29,90,01,E8,A4,B3
202 DATA88,20,3A,F5,A2,03,20,EC,F6,A4,B2,18,A5,B1,69,17
203 DATA90,01,CB,AA,A5,B3,20,11,F4,A2,CA,A0,60,A5,F9,20
204 DATA01,F6,18,A5,B1,65,06,85,B1,A5,B2,69,00,85,B2,90
205 DATAA4,A2,00,A9,FC,38,E5,85,C5,B5,90,03,E8,B0,F7,8A
206 DATAA2,00,3B,E9,07,C9,07,90,03,E8,B0,F7,C9,04,90,01
207 DATAE8,86,06,A2,07,A9,00,18,65,06,CA,D0,FA,85,06,A5
208 DATA85,C9,01,D0,04,A9,69,D0,0A,C9,02,D0,04,A9,31,D0
209 DATA02,A9,07,B5,B1,A2,00,86,B2,86,5F,A4,B5,B8,84,5E
210 DATA8A,18,65,5E,90,02,E6,5F,E8,E4,06,90,F5,1B,65,B1
211 DATA85,5E,A5,B2,65,5F,85,5F,A5,5E,C5,B1,A5,5F,E5,B2
212 DATA80,03,4C,E2,63,A2,04,20,EC,F6,A6,B1,A4,B2,C6,B3
213 DATAA5,B3,E6,B3,20,57,F4,A6,B2,18,A5,B1,69,29,90,FE
214 DATAE8,A4,83,88,20,3A,F5,A2,03,20,EC,F6,A9,F8,B5,FC
215 DATA1B,A5,FC,69,0E,C9,3E,F0,1D,B5,FC,A4,B2,18,A5,B1
216 DATA65,FC,90,01,CB,AA,A5,B3,20,11,F4,A2,AD,A0,60,A5
217 DATAF9,20,01,F6,F0,DA,18,A5,B1,65,06,85,B1,A5,B2,69
218 DATA00,B5,B2,80,93,A2,03,20,EC,F6,A9,5D,85,B3,18,A5
219 DATAB3,69,0D,B5,83,C9,AB,D0,03,4C,2A,66,A4,FA,C8,84
220 DATAFC,A2,0E,A9,00,18,65,FC,CA,D0,FB,85,FC,A2,01,20
221 DATAB4,EF,20,63,EB,38,A9,78,E5,FC,A8,A9,00,20,F2,E2
222 DATA20,87,E8,20,F2,EB,18,A5,A1,69,0A,85,94,A5,A0,69
223 DATA00,B5,95,A9,00,85,81,B5,B2,85,97,A2,1D,1B,69,FA
224 DATA80,02,E6,97,CA,D0,F6,85,96,18,A5,B1,65,94,AA,A5
225 DATAB2,65,95,A8,A5,B3,20,11,F4,A2,36,A0,61,A5,F9,20
226 DATA01,F6,1B,A5,B1,69,1C,90,02,E6,B2,85,B1,A5,96,C5
227 DATAB1,A5,97,E5,B2,B0,D2,4C,8E,65,2C,10,C0,A2,00,20
228 DATAEC,F6,A9,88,85,B3,E6,B3,A5,B3,C8,C0,F0,16,A9,D6
229 DATA85,B1,E6,B1,A6,B1,E0,E5,F0,EC,A0,00,A5,B3,20,57
230 DATAF4,4C,42,66,A8,78,85,B9,A9,00,85,BA,A9,0C,B5,B8
231 DATAA9,50,85,C3,A9,0E,A2,0D,18,A5,BB,CA,D0,FA,85,B3
232 DATA20,A4,6C,A5,BB,C9,07,90,0D,C9,0C,B0,09,A4,EA,C8
233 DATA58,F0,03,4C,30,68,C9,06,B0,23,A4,B3,8B,98,0A,A8
234 DATAB9,24,6B,85,5E,B9,25,6B,85,5F,A5,B9,A0,00,C8,3B
```

```
235 DATAE9,07,C9,07,B0,F8,B1,5E,30,03,4C,30,68,A2,00,20
236 DATAEC,F6,A9,D7,B5,BF,A9,00,85,C0,85,51,B5,C3,B5,50
237 DATAE6,50,20,57,69,A2,03,20,EC,F6,A5,C3,A5,50,A9,00
238 DATAB5,51,20,57,69,A9,FF,85,C1,A9,03,85,C2,20,80,6A
239 DATAAD,00,C0,85,45,2C,10,C0,C9,9B,D0,07,2C,00,C0,10
240 DATAFB,30,8A,C9,C1,F0,12,C9,88,F0,0E,C9,95,F0,0A,C9
241 DATADA,D0,27,A4,BB,C0,0C,D0,21,A9,32,85,C1,A9,14,85
242 DATAC2,20,80,6A,A9,28,B5,C1,A9,1E,B5,C2,20,80,6A,A8
243 DATA14,B5,B7,A9,00,85,88,20,21,69,A5,89,B5,BC,A5,BA
244 DATAB5,BD,A5,BB,85,BE,A5,45,C9,C1,D0,04,C6,BE,10,40
245 DATAC9,88,D0,19,A4,BA,D0,06,A4,B9,C0,0E,90,32,38,A5
246 DATAB8,E9,0E,85,BC,A5,BA,E9,00,85,BD,10,23,C9,95,D0
247 DATA13,A4,89,C0,E0,80,19,9B,69,0E,B5,8C,A5,BA,69,00
248 DATA85,BD,90,0C,C9,DA,D0,08,A4,BB,C0,0C,F0,02,E6,BE
249 DATAA4,BE,D0,25,A6,B9,A4,8A,A9,1B,20,11,F4,A2,75,A0
250 DATA60,A5,F9,20,5D,F6,A9,0E,85,B3,20,A4,6C,A5,EA,C9
251 DATA58,D0,03,4C,85,69,4C,30,68,A4,BB,C0,07,90,0C,20
252 DATAA4,6C,20,93,6A,20,A4,6C,4C,17,68,B9,AE,69,30,0C
253 DATA65,BC,85,BC,A5,8D,69,00,85,BD,90,15,38,A9,00,F9
254 DATAAE,68,85,FC,38,A5,BC,E5,FC,85,BC,A5,BD,E9,00,B5
255 DATABD,A5,8D,D0,48,A5,BC,C9,EE,B0,45,20,93,6A,A4,BB
256 DATAB9,AE,69,30,0D,18,65,B9,85,B9,A5,BA,69,00,B5,BA
257 DATA90,15,38,A9,00,F9,AE,69,85,FC,38,A5,B9,E5,FC,85
258 DATAB9,A5,BA,E9,00,85,BA,20,A4,6C,A5,BC,85,B9,A5,BD
259 DATA85,BA,A5,BE,85,BB,C6,C3,F0,03,4C,64,66,20,A4,6C
260 DATAA2,00,86,FC,E6,FC,A5,FC,C9,10,B0,1B,20,A4,6C,A9
261 DATA00,A2,06,18,65,FC,CA,D0,FA,69,0A,85,C1,A9,14,B5
262 DATAC2,20,80,6A,4C,34,68,C6,FB,A2,00,20,EC,F6,A9,00
263 DATAA2,14,18,65,F8,CA,D0,FA,85,FC,A0,04,84,B3,E6,83
264 DATAA5,B3,C9,15,B0,19,65,FC,A2,04,A0,01,20,57,F4,A5
265 DATAB3,18,65,FC,AB,A9,12,A2,01,20,3A,F5,4C,6E,6B,A5
266 DATAFB,F0,03,4C,2A,66,20,99,F3,20,58,FC,A9,00,85,FC
267 DATAE6,FC,A5,FC,C9,05,B0,17,A9,32,85,C1,85,C2,20,80
268 DATA6A,A9,0F,B5,C1,A9,32,85,C2,20,80,6A,4C,A0,68,2C
269 DATA10,C0,A0,0F,84,24,A9,D1,A0,61,20,3A,DB,A9,0A,85
270 DATA25,20,22,FC,A9,0C,B5,24,A9,F1,A0,61,20,3A,DB,A6
271 DATAFE,A5,FF,20,24,ED,A9,10,B5,25,20,22,FC,A9,0A,85
272 DATA24,A9,DD,A0,61,20,3A,D8,2C,00,C0,10,FB,AD,00,C0
273 DATA2C,10,C0,C9,D9,D0,03,4C,FE,61,4C,6A,FA,03,60,11
274 DATA60,19,60,25,60,2F,60,37,68,42,60,51,60,59,60,67
275 DATA60,A2,00,20,EC,F6,A5,FE,B5,50,A5,FF,85,51,A9,32
276 DATA85,8F,A9,00,85,C0,20,57,69,18,A5,FE,65,B7,85,FE
277 DATA85,50,A5,FF,65,88,85,FF,85,51,A2,03,20,EC,F6,A9
278 DATA32,B5,BF,A9,00,85,C0,A4,50,A5,51,84,9F,B5,A0,A2
279 DATA90,3B,20,A0,E8,20,34,ED,A2,01,86,46,8D,FF,00,F0
280 DATA03,E8,D0,F8,86,2F,A9,00,A0,07,1B,65,46,8B,D0,FA
281 DATA38,E9,07,18,65,8F,AA,A9,00,65,C0,A8,A5,B9,20,11
282 DATAF4,A6,46,BD,FF,00,29,0F,0A,AA,BC,0E,69,BD,0D,69
283 DATAAA,A5,F9,20,01,F6,E6,46,A6,46,E4,2F,90,C8,60,07
284 DATAF9,0E,F9,0E,00,A9,FA,B5,B7,A9,00,85,B8,20,57,69
285 DATAE6,B4,A9,1A,85,FC,C6,FC,A5,FC,C9,0C,F0,0C,85,C1
286 DATAA9,1E,B5,C2,20,80,6A,4C,C6,69,A5,B4,C9,05,F0,03
287 DATA4C,2A,66,A9,D0,85,B7,A9,07,85,B8,20,57,69,20,FF
288 DATA69,E6,FA,A4,FA,C0,04,D0,03,88,84,FA,4C,C8,63,A2
289 DATA04,20,EC,F6,A9,00,85,B2,A9,DF,B5,B1,18,A5,B1,69
290 DATA30,85,81,C9,FF,F0,2B,A9,FF,85,FC,E6,FC,A5,FC,C9
281 DATA19,F0,E9,A9,06,85,83,E6,B3,A5,83,C9,1A,F0,EC,18
292 DATAA5,B1,65,FC,AA,A5,B2,69,00,A8,A5,83,20,57,F4,4C
293 DATA27,6A,A2,00,20,EC,F6,A9,19,85,83,E6,B3,A5,B3,C9
294 DATA5B,F0,2C,A2,00,A0,00,20,57,F4,A9,FB,A2,00,A4,B3
295 DATA20,3A,F5,A2,00,A0,00,18,A5,83,69,4E,20,57,F4,18
296 DATAA5,B3,69,4E,A8,A9,FB,A2,00,20,3A,F5,4C,4B,6A,60
297 DATAAD,30,C0,88,D0,04,C6,C2,F0,08,CA,D0,F6,A6,C1,4C
298 DATA80,6A,60,A9,00,85,03,85,04,A9,1A,85,02,A2,0D,A4
289 DATA02,C0,5B,D0,0A,18,A5,02,69,0D,85,02,4C,0A,6B,98
300 DATA0A,A8,B0,0D,89,24,6B,85,00,89,25,6B,85,01,4C,CB
301 DATA6A,B9,24,6C,B5,00,B9,25,6C,85,01,A4,04,B9,19,6B
302 DATA85,05,A5,03,D0,18,A0,23,B1,00,48,88,B1,00,C8,91
303 DATA00,88,D0,F7,68,91,00,C6,05,D0,EB,4C,05,6B,A0,00
304 DATAB1,00,48,C8,B1,00,88,91,00,C8,C0,23,D0,F5,68,91
305 DATA00,C6,05,D0,E9,E6,02,CA,D0,95,A5,03,49,01,85,03
306 DATAE6,04,A5,04,C9,0B,D0,B5,60,01,01,02,01,02,00,01
307 DATA01,02,02,01,00,40,00,44,00,48,00,4C,00,50,00,54
308 DATA00,58,00,5C,80,40,80,44,80,48,80,4C,80,50,80,54
309 DATA80,58,B0,5C,00,41,00,45,00,49,00,4D,00,51,00,55
310 DATA00,59,00,5D,80,41,80,45,80,49,80,4D,80,51,80,55
311 DATA80,59,B0,5D,00,42,00,46,00,4A,00,4E,00,52,00,56
312 DATA00,5A,00,5E,80,42,80,46,80,4A,80,4E,80,52,B0,56
313 DATA80,5A,B0,5E,00,43,00,47,00,4B,00,4F,00,53,00,57
314 DATA00,5B,00,5F,80,43,80,47,80,4B,80,4F,80,53,80,57
315 DATA80,58,80,5F,2B,40,28,44,28,48,28,4C,28,50,28,54
316 DATA28,58,28,5C,A8,40,A8,44,A8,48,A8,4C,A8,50,A8,54
317 DATAA8,58,A8,5C,28,41,28,45,28,49,28,4D,28,51,28,55
318 DATA28,59,28,5D,A8,41,AB,45,A8,49,A8,4D,A8,51,A8,55
319 DATAA8,59,A8,5D,28,42,28,46,28,4A,28,4E,28,52,28,56
320 DATA28,5A,28,5E,A8,42,AB,46,A8,4A,A8,4E,A8,52,AB,56
321 DATAAB,5A,A8,5E,2B,43,2B,47,28,4B,28,4F,28,53,2B,57
322 DATA28,58,28,5F,A8,43,A8,47,AB,4B,A8,4F,A8,53,A8,57
323 DATAA8,5B,A8,5F,50,40,50,44,50,48,50,4C,50,50,50,54
324 DATA50,58,50,5C,D0,40,D0,44,D0,48,D0,4C,D0,50,D0,54
325 DATAD0,5B,D0,5C,50,41,50,45,50,49,50,4D,50,51,50,55
326 DATA50,59,50,5D,D0,41,D0,45,D0,49,D0,4D,D0,51,D0,55
327 DATAD0,59,D0,5D,50,42,50,46,50,4A,50,4E,50,52,50,56
328 DATA50,5A,50,5E,D0,42,D0,46,D0,4A,D0,4E,D0,52,D0,56
329 DATAD0,5A,D0,5E,50,43,50,47,50,4B,50,4F,50,53,50,57
330 DATA50,5B,50,5F,D0,43,D0,47,D0,4B,D0,4F,D0,53,D0,57
331 DATAD0,5B,D0,5F,A6,B9,A4,8A,A5,B3,20,11,F4,A2,75,A0
332 DATA60,A5,F9,4C,5D,F6
READY.
```

BBC Logic Tester

by Anthony Philips

MICROTEX 666

Still keying in programs? Forget it! This program is available for telesoftware downloading on Microtex 666 (page *66614#.)

This is an educational program intended to provide a method of testing the understanding of simple logic circuits. It has been tested by students in final year secondary school Physics courses.

The user is asked to follow through a simple series of logic gates and predict the output at each point, given the initial input. A random series of AND, OR and NOT gates are generated, with a random set of input states for the initial gates. The user then has to give the output state for each gate, ending up with the final gate. The program marks the answers, and gives the option to try again or display the correct answers.

Each circuit is displayed with three different sets of input, and then a new circuit is generated.

Full instructions are given with the program.

```
  10 *FX225,128
  20 MODE4
  30DIMSPX(8),SPY(8)
  40DIMG(9,24),A$(9)
  50DIMGATE(8),B(16)
  60PROCINIT
  70 *FX15,1
  80 PRINT"DO YOU WANT THE INSTRUCTIONS             (ENTER Y OR N)"
  90 A$=GET$
 100 IFA$="Y"THENPROCINST:GOTO120
 110 IFA$<>"N"THEN90
 120 CLS
 130 PRINTTAB(18,21;"LOGIC";TAB(18,3);'TEST";TAB(18,5);"A.PHILLIPS";TAB(18,6);"
(c) 1985."
 140*FX15,1
 150*FX138,0,128
 160PROCFKEY
 170FOR1=1TO4
 180A=(RND(1)*100)
 190IFA>75THENPROCSETOR:GOTO230
 200IFA>50THENPROCSETAND:GOTO230
 210IFA>25THENPROCSETINV:GOTO230
 220PROCNOGATE
 230PROCDGATE(SPX(I),SPY(I),GATE(I))
 240NEXTI
 250FORI=5TO7
 260A=RND(I)*50
 270IFA>25THENPROCSETOR:GOTO290
 280PROCSETAND
 290PROCDGATE(SPX(I),SPY(I),GATE(I))
 300NEXT
 310I=8
 320IFRND(1)>.6THENPROCSETINV:GOTO340
 330PROCNOGATE
 340PROCDGATE(SPX(8),SPY(8),GATE(8))
 350PROCLINKS
 360IC=65
 370FORI=1TO4
 380IFGATE(I)=1ORGATE(I)=2THEN400
 390GOTO430
 400G1$=G1$+CHR$(IC)+"  "+CHR$(IC+1)
 410IC=IC+2
 420GOTO450
 430G1$=G1$+"  "+CHR$(IC)+"  "
 440IC=IC+1
 450G1$=G1$+"  "
 460NEXTI
 470NIP=IC-65
 480CT=6
 490ICS=IC
 500IFGATE(8)=3THENCT=7
 510CNT=3
 520REPEAT
 530IC=ICS
 540RESTORE3290
 550FOR1=1TOCT
 560READTX,TY
 570PRINTTAB(TX,TY);CHR$((I-1)+IC)
 580NEXTI
 590IC=IC+CT
 600IFCT=7ANDNIP=8THENH$="P"ELSEH$="O"
 610PRINTTAB(27,9);H$
 620FORI=1TOLEN(G1$)
 630PRINTTAB(I,I+1);MID$(G1$,I,I)
 640 NEXT
 650FORI=1TONIP:PRINTTAB(9+((I-1)*2),20);CHR$(64+I);:NEXT
 660FORI=1TO(IC-NIP-65)
 670PRINTTAB(9+((I-1)*2),24);CHR$(I+NIP+64);
 680NEXT
 690PRINTTAB(9,27);H$
 700 PROCBL(0)
 710 A=INT(RND(1)*2^NIP)
 720 PROCGIP(A)
 730CV=1
 740FOR1=1TO4
 750IFGATE(I)=1THENPROCGOR(B(CV),B(CV+1))
 760IFGATE(I)=2THENPROCGAND(B(CV),B(CV+1))
 770IFGATE(I)=3THENPROCGINV(B(CV)):CV=CV-1
 780IFGATE(I)=4THENR=B(CV):CV=CV-1
 790CV=CV+2
 800B(8+I)=R
 810NEXT
 820CV=9
 830FORI=5TO7
 840IFGATE(I)=1THENPROCGOR(B(CV),B(CV+1))ELSEPROCGAND(B(CV),B(CV+1))
 850CV=CV+2
 860B(I+8)=R
 870NEXT
 880B(16)=-1
```

```
 890IFGATE(B)=3THENPROCGINV(B(15)):B(16)=R
 900 FORI=1TONIP:PRINTTAB(9+((I-1)*2),21);B(I);:NEXT
 910GOTO930
 920PRINTTAB(8,25);"                    ";TAB(8,28);"          ";
 925PROCBL(0)
 930X=8:L=25
 940PRINTTAB(X,L);
 950Z=CT
 960Z1=Z
 970PRINTTAB(X,L);"<";
 980 PROCFKEY
 990IFASC(A$)=127THEN1120
1000IFASC(A$)=48THEN1030
1010IFASC(A$)=49THEN1030
1020GOTO980
1030PRINTTAB(X,L);" ";A$
1040A$(Z1-Z+1)=A$
1050X=X+2
1060Z=Z-1
1070IFZ>0THEN970
1080A$=GET$
1090IFASC(A$)=13THEN1180
1100IFASC(A$)=127THEN1120
1110GOTO1080
1120PRINTTAB(X,L);"  ";
1130X=X-2
1140Z=Z+1
1150IFZ>Z1 THEN Z=Z1:X=19
1160PRINTTAB(X,L);"  ";TAB(X,L);
1170GOTO970
1180PROCBL(2)
1190PRINTTAB(8,28);"> ";CHR$(127);
1200PROCFKEY:B$=A$
1210IFA$="I"ORA$="O"THENPRINTA$;:GOTO1230
1220GOTO1200
1230 A$=GET$
1240IFASC(A$)=127THEN1180
1250IFASC(A$)<>13THEN1230
1260 PRINTTAB(10,25);
1270 CR=0
1280 FORI=1TOCT
1290 P$="x"
1300 IFVAL(A$(I))=B(I+8)THENP$=CHR$230ELSECR=CR+1
1310 PRINTTAB(10+((I-1)*2),25);P$
1320 NEXT
1330P$="x"
1340Z=0
1350IFVAL(B$)=B(9+CT)THENP$=CHR$230:Z=1
1360PRINTTAB(10,28);P$
1370 PROCBL(1)
1380IFZ=1ANDCR=0THENPRINTTAB(1,30);"WELL DONE, ALL CORRECT";:GOTO1580
1390IFZ=1ANDCR<>0THENPRINTTAB(1,30);"LUCKY GUESS ON THE FINAL STATE!"
1400IFZ=0ANDCR=0THENPRINTTAB(1,30);"PRESS THE WRONG KEY HUH?"
1410IFZ<>1ANDCR<>0THENPRINTTAB(1,30);"SORRY, YOU DIDN'T DO TOO WELL..."
1420PROCBL(6)
1430A$=GET$
1440IFA$="R"THENPROCBL(1):GOTO920
1450IFA$<>" "THEN1430
1460RESTORE3290
1470FORI=1TOCT
1480READTX,TY
1490PRINTTAB(TX,TY);CHR$(B(I+8)+48);
1500NEXT
1510GH=1:FORI=1TOLEN(G1$)
1520IFMID$(G1$,I,1)=" "THEN1540
1530PRINTTAB(1,I+1);CHR$(B(GH)+48);:GH=GH+1
1540NEXT
1550PROCBL(1)
1560OP=B(16):IFB(16)=-1THENOP=B(15)
1570PRINTTAB(27,9);OP
1580IFCNT=1THENPROCBL(5):GOTO1600
1590 IFCNT=2THENPROCBL(4)ELSEPROCBL(3)
1600 REPEAT UNTIL GET$=" "
1610 FORI=0TO14:PRINTTAB(I+8,25);" ";TAB(I+8,28);" ";:NEXT
1620 PROCBL(1)
1630 CNT=CNT-1
1640 UNTILCNT<1
1650CLS
1660TIME=0:REPEAT UNTIL TIME>125
1670RUN
1680DEFPROCSETOR
1690GATE(I)=1
1700ENDPROC
1710DEFPROCSETAND
1720GATE(I)=2
1730ENDPROC
1740DEFPROCSETINV
1750GATE(I)=3
1760ENDPROC
1770DEFPROCNOGATE
1780GATE(I)=4
1790ENDPROC
1800DEFPROCDGATE(GX,GY,GN)
1810FORDX=1TO3
1820FORDY=0TO2
1830PRINTTAB(GX+DX,GY+DY);CHR$(G(((DY*3)+DX),GN));
1840NEXTDY
1850NEXTDX
1860ENDPROC
1870DEFPROCINIT
1880*FX20,1
1890RESTORE
1900FORI=1TO8:READSPX(I),SPY(I):NEXT
1910DATA4,2,4,6,4,10,4,14,4,10,12,15,8,21,8
1920FORI=1TO24
1930FORJ=1TO9
1940READG(J,I)
1950NEXTJ
1960NEXTI
1970DATA200,201,202,203,32,204,205,206,207
1980DATA208,209,210,211,32,212,213,214,215
```

```
1990DATA216,217,32,218,219,220,221,222,32
2000DATA32,32,32,223,223,223,32,32,32
2010DATA223,223,223,32,32,32,223,223,223
2020DATA223,224,32,32,225,223,32,32,32
2030DATA32,226,223,223,227,32,32,32,32
2040DATA223,224,32,32,228,32,32,228,32
2050DATA32,32,225,32,32,32,32,32,226
2060DATA32,228,32,32,228,32,223,227,32
2070DATA65,228,66,223,229,223,48,228,48
2080DATA48,228,49,49,228,48,49,228,49
2090DATA228,79,32,229,223,32,228,48,32
2100DATA228,48,32,228,48,32,228,49,32
2110DATA228,49,32,228,49,32,228,49,32
2120DATA65,228,79,223,229,223,48,228,49
2130DATA49,228,48,32,32,32,32,32,32
2140DATA32,65,223,32,32,32,32,66,223
2150DATA32,32,32,223,79,32,32,32,32
2160DATA32,32,32,78,79,84,32,32,32
2170DATA32,32,32,65,78,68,32,32,32
2180DATA32,32,32,32,79,82,32,32,32
2190DATA32,32,32,32,32,32,32,32,32
2200DATA32,32,32,32,65,223,32,32,32
2210*FX20,1
2220VDU23,200,&FE,&47,&20,&F0,&10,8,8,8
2230VDU23,201,0,0,&E0,&18,6,3,0,0
2240VDU23,202,0,0,0,0,0,&80,&40,&30
2250VDU23,203,&C,4,4,2,2,4,4,&C
2260VDU23,204,8,4,2,1,1,2,4,8
2270VDU23,205,8,8,8,&F0,&10,&20,&47,&FE
2280VDU23,206,0,0,3,6,&18,&E0,0,0,0
2290VDU23,207,&30,&40,&80,0,0,0,0,0
2300VDU23,208,7,4,4,&FC,4,4,4,4
2310VDU23,209,&FE,1,0,0,0,0,0,0
2320VDU23,210,0,&80,&40,&20,&10,8,4,2
2330VDU23,211,4,4,4,4,4,4,4,4
2340VDU23,212,2,1,1,1,1,1,1,2
2350VDU23,213,4,4,4,4,&FC,4,4,4,7
2360VDU23,214,0,0,0,0,0,0,1,&FE
2370VDU23,215,2,4,8,&10,&20,&40,&80,0
2380VDU23,216,6,5,4,4,4,4,4,4
2390VDU23,217,0,0,&80,&40,&20,&10,8,4
2400VDU23,218,4,4,4,&FC,4,4,4,4
2410VDU23,219,2,1,0,0,0,0,1,2
2420VDU23,220,0,&1C,&A2,&41,&41,&A2,&1C,0
2430VDU23,221,4,4,4,4,4,4,5,6
2440VDU23,222,4,8,&10,&20,&40,&80,0,0
2450VDU23,223,0,0,0,&FF,0,0,0,0
2460VDU23,224,0,0,0,&F0,&10,&10,&10,&10
2470VDU23,225,&10,&10,&10,&1F,0,0,0,0
2480VDU23,226,0,0,0,&1F,&10,&10,&10,&10
2490VDU23,227,&10,&10,&10,&F0,0,0,0,0
2500VDU23,228,&10,&10,&10,&10,&10,&10,&10,&10
2510VDU23,229,&10,&10,&10,&FF,&10,&10,&10,&10
2520 VDU23,230,0,1,2,4,8,&10,&A0,&40
2530ENDPROC
2540DEFPROCLINKS
2550PROCDGATE(7,3,6)
2560PROCDGATE(7,11,6)
2570PROCDGATE(7,6,7)
2580PROCDGATE(7,14,7)
2590PROCDGATE(12,8,9)
2600PROCDGATE(13,5,8)
2610PROCDGATE(13,11,10)
2620PROCDGATE(18,8,4)
2630PROCDGATE(24,8,4)
2640PRINTTAB(25,16);"TABLE SELECTION"
2650 PRINTTAB(28,18);"f0= OR GATE"
2660 PRINTTAB(28,19);"f1=AND GATE"
2670 PRINTTAB(28,20);"f2=NOT GATE"
2680PRINTTAB(29,22);CHR$230;"= CORRECT"
2690PRINTTAB(29,23);"x= WRONG"
2700X=1
2710FOR1=1TO4
27201FGATE(I)=3ORGATE(I)=4THENGN=4ELSEGN=5
2730PROCDGATE(X,(((I-1)*4)+2),GN)
2740NEXT
2750PRINTTAB(1,20);"INPUTS:";TAB(1,21);"STATES:"
2760PRINTTAB(1,24);"OTHERS:";TAB(1,25);"STATES:"
2770 PRINTTAB(1,27);"FINAL :";TAB(1,28);"STATE :"
2780ENDPROC
2790DEFPROCFKEY
2800A$=INKEY$(0)
28101FASC(A$)=128THENRESTORE2900:GOTO2860
28201FASC(A$)=129THENRESTORE2960:GOTO2860
28301FASC(A$)=130THENRESTORE2980:GOTO2860
28401FASC(A$)=-1THEN2930
2850GOTO2930
2860FORP=1TO8
2870READTX,TY,GN
2880TX=TX-3
2890PROCDGATE(TX,TY,GN)
2900NEXT
2910PRINTTAB(29,1);"TRUTH TABLE"
2920PRINTTAB(35,3);"GATE"
2930ENDPROC
2940DATA33,2,22,32,5,18,35,5,1,38,5,19
2950DATA34,9,11,37,9,13,34,12,12,37,12,15
2960DATA33,2,21,32,5,18,35,5,2,38,5,19
2970DATA34,9,11,37,9,13,34,12,12,37,12,14
2980DATA33,2,20,32,5,24,35,5,3,38,5,19
2990DATA34,9,16,37,9,23,34,12,17,37,12,23
3000DEFPROCGAND(A,B)
3010R=A AND B
3020R$=CHR$(R+48)
3030ENDPROC
3040DEFPROCGOR(A,B)
3050R=A OR B
3060R$=CHR$(R+48)
3070ENDPROC
3080DEFPROCGINV(A)
3090R=0
```

```
3100IFA=0THENR=1
3110R$=CHR$(R+48)
3120ENDPROC
3130DEFPROCGNAND(C,D)
3140PROCGAND(C,D)
3150PROCGINV(R)
3160ENDPROC
3170DEFPROCGNOR(C,D)
3180PROCGOR(C,D)
3190PROCGINV(R)
3200ENDPROC
3210DEFPROCGIP(N)
3220FORI=7TO0STEP-1
3230 Z=1
3240N=N-(2^I)
32501FN<0THENN=N+2^I:Z=0
3260 B(I+1)=Z
3270NEXT
3280ENDPROC
3290DATA10,3,10,7,10,11,10,15,14,8,14,10,20,8
3300DEFPROCBL(M)
3310IFM=1THEN3390
3320IFM=2THEN3410
3330IFM=3THEN3430
33401FM=4THEN3450
33501FM=5THEN3470
33601FM=6THEN3490
3370PRINTTAB(1,30);"ENTER ALL EXPECTED STATES EXCEPT FINAL  THEN PRESS RETURN";
3380GOTO3500
3390PRINTTAB(1,30);"
                   ";
3400GOTO3500
3410PRINTTAB(1,30);"ENTER OUTPUT STATE THEN PRESS RETURN
                  ";
3420GOTO3500
3430PRINTTAB(1,31);"PRESS SPACE BAR FOR NEXT TRY";
3440 GOTO3500
3450 PRINTTAB(1,31);"PRESS SPACE BAR FOR LAST TRY";
3460GOTO3500
3470PRINTTAB(1,31);"PRESS SPACE BAR FOR ANOTHER CIRCUIT";
3480GOTO3500
3490PRINTTAB(),30);"PRESS SPACE BAR TO DISPLAY CORRECT      STATES OR R TO TRY
AGAIN";
3500ENDPROC
3510DEFPROCINST
3520 CLS
3530PRINT''Instructions for logic test"
3540 PRINT''"The object of the exercise is to work   through the various stages
of a randomlychosen network of the three basic logic gates, AND,OR,NOT"
3550 PRINT''"I will select the series of gates and   then choose a random series
 of inputs,  you then enter the state at which you   think each intermediate sta
ge is.      You then predict the final output state."
3560 PRINT"I will then tell you how you did.       There will be three tests fo
r each      network then a new one will be built up.'
3570 PRINT''"You may look at the truth tables for thegates in use and the tables
 are selectedby the function keys."
3580 PRINT''"Press the space bar for the next page'
3590 REPEAT UNTIL GET$=" "
3600 CLS
3610PRINT''"The first three function"''keys select the truth"''tables for the t
hree gates""in use'
3620PRINT''These gates are as follows"
3630PROCDGATE(4,11,1)
3640 PROCDGATE(12,11,2)
3650 PROCDGATE(21,11,3)
3660 PRINTTAB(2,15);"OR GATE  AND GATE  NOT GATE"
3670PRINT''"Try the function keys for a bit until   you are ready to try the tes
ter."
3680*FX138,0,128
3690PRINT''f0=OR GATE. f1=AND GATE"''f2=NOT GATE.'
3700 PRINT''"Entry of the states is by either       pressing 0 or 1 for each st
age.When you are happy all are correct, press the   return key.Delete can be us
ed to correctmistakes."
3710PRINT''"Entry of the final state is as above."''"Press the space bar to use
the tester.";
3720PROCFKEY
3730*FX15,1
3740REPEAT
3750PROCFKEY
3760UNTIL A$=" "
3770ENDPROC
```

DataBee

by S Cook

This is a database program for a Micro-Bee with 32k or more.

Four to five hundred files can be squeezed into 32k, even more if the help files and spaces are deleted from the program. It does have a few restrictions, like only 5 fields available and a fairly small file space, but then it is one of the only cassette-based databases around for any micro.

In lines 1790, 1890 and 1910 are printer codes special to Epson compatible printers. For adaptation to other printers, the 'CHR(27) ; "3"; CHR (30)' sets the line feed to 30/216" and 'CHR(27); "@"' restores the printer to default settings. The 'CHR(17)' in line 1930 is a solid block.

Operation instructions:

DataBee is a command driven program. The commands are detailed below: (The brackets { and } indicate optional parameters)

INIT {name} nof — Initialise DataBee with nof being the maximum number of files allowable. The name is an optional name by which the file is saved, loaded, etc

SOFF — If you find the beeps annoying, typing "SOFF" will set the Sound OFF

SON — To counter the "SOFF" command and set the beeps back on, type

"SON"

PR FD — This command prints the fields as they have been entered

DEL {FL/FD} x {-y} — Deletes fields (FD) or files (FL). It deletes file/field number x, through to y if it is specified. (If neither "FL" or "FD" is specified, the default is "FL")

ENT {x} — To enter files (from the last entry onwards, or from entry # x if specified) use this command. The file number will be displayed (and a ">>@<<" if the file has been entered before), as well as a heading. You then type data on the rest of the line. After all headings have been entered, the program moves on to the next file. Press ESC to abort this sequence and return to the command mode

SP — Search and Print. Enter the search specifications next to each heading. The program will then search the files, and print any that fit the search specifications. Use the following search symbols:

= {string} : Search for an exact match with {string}

{string} : Search for anything that does not match {string}

< {value} : Search for any entry less than {value}

> {value} : Search for any entry greater than {value}

SC — Search and Count. Exactly the same as "SP" but will return a count instead of printing the files.

LOAD — Load the next DataBee file from cassette

SAVE — Save the files, fields and customised settings to cassette

STAT — Display STATistics on the current memory situation

WIDTH x — Set screen width to 64 columns (if x=64) or 80 columns (if x=80 and the Network ROM is fitted)

OUT xx — Set printer output to a parallel printer (if xx=P), the 300bd serial stream (if xx=S1) or the 1200bd serial stream (if xx=S or xx=S2)

PRINT {P} — Print out all of the files (to a printer if a "PRINTP" command is given

GRAPH xx yy — Graph a set of values. xx is the field number with the values to be graphed, and yy is the number of the field containing the label. (See the HELP GRAPH function for an example)

KILL — This command "kills" the help files, deleting them to make more room for files. The program has to be re-run once this command is given. Make sure you save any files before issuing this command

SORT A/D x A/N — Sort files, and print as it sorts. The A/D is set to either A (for ascending sort) or D (for descending sort). x is the field number to sort by, and the A/N is either A for a alphanumeric field or N for a numeric field

F x — Set field x (Where x is a number between 1 and 5). Use a ":" to separate the field name from the input, and "." to represent each character to be input. (The number of "." is the maximum length of input. For example F1=NAME:.....)

HELP {command} — Display the list of commands available, or help with a specific command if given.

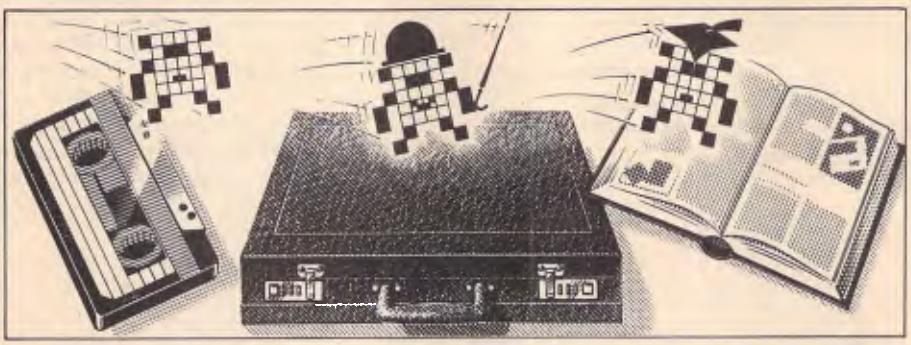
```
00100 OUT#0:CLS:PRINT" ";CHR(8);:ON ERROR GOTO 2810
00110 F6=500
00120 E7=4:P=1:W=0:L6=60:E6=0:F=200:E=1:N0$="":S7=-1:CLS:DIM Y(4),Y0(4),Z(200),F
0(200,4),F1(4):STRS(INT(FRE(0))-2000)
00130 FOR J=0 TO 4:F1$(J)="":NEXT J
00140 CLS:CUPS 28,1:INVERSE:UNDERLINE:PRINT"DataBee"\:NORMAL
00150 P0=0:PRINT"#";:GOSUB [L6,-1] 2870:PRINT
00160 IF FRE($)<500 : E7=E7+1:IF E7>=5 : E7=0 : GOSUB ['Low memory warning:'] 31
40
00170 IF FRE($)>500 : E7=4
00180 IF A0$(;1,4)="INIT" THEN 390
00190 IF A0$(;1,4)="SOFF" : S7=0:GOTO 150
00200 IF A0$(;1,3)="SON" : S7=-1:GOTO 150
00210 IF A0$(;1,5)="PR FD" THEN 590
00220 IF A0$(;1,3)="DEL" THEN 630
00230 IF A0$(;1,3)="ENT" THEN 720
00240 IF A0$(;1,2)="SP" : C7=0:GOTO 870
00250 IF A0$(;1,2)="SC" : C7=-1:GOTO 870
00260 IF A0$(;1,4)="LOAD" THEN 1340
00270 IF A0$(;1,4)="STAT" THEN 2410
00280 IF A0$(;1,4)="SAVE" THEN 1500
00290 IF A0$(;1,5)="WIDTH" THEN 1600
00300 IF A0$(;1,3)="OUT" THEN 1660
00310 IF A0$(;1,5)="PRINT" THEN 1720
00320 IF A0$(;1,5)="GRAPH" THEN 1750
00330 IF A0$(;1,4)="KILL" THEN 2400
00340 IF A0$(;1,4)="SORT" THEN 2540
00350 IF A0$(;1,1)="F" THEN 540
00360 IF A0$(;1,4)="HELP" THEN 1950
00370 IF A0$="ESC" OR A0$="" THEN 150
00380 GOSUB ["Unknown command"] 3140:GOTO 150
00390 A0$=A0$(;5):A=SEARCH(A0$,"'"):B=SEARCH(A0$,"'",2
00400 IF A=0 AND B=0 : N0$="":GOTO 430
00410 IF B=0 THEN 2950
00420 N0$=A0$(;A+1,B-1):A0$=A0$(;B+1)
00430 F7=VAL(A0$):IF F7<10 THEN 2960
00440 IF F7>F6 : GOSUB ["Maximum number of files is"+STR(INT(F6))] 3140:GOTO 150
00450 F=INT(F7):POKE 0,F:POKE 1,F/256:POKE 2,W:IF N0$<>"" : FOR J=3 TO LEN(N0$)+
2:POKE J,ASC(N0$(;J-2,J-2)):NEXT J:J=J+1:POKE J,13 ELSE POKE 3,13
00460 STRS(100):CLEAR:F=PEEK(0)+PEEK(1)*256:F6=500

00470 J=3:N0$=""
00480 IF PEEK(J)=13 THEN 500
00490 N0$=N0$+CHR(PEEK(J)):J=J+1:GOTO 480
00500 W=PEEK(2):IF W=0 : L6=60 ELSE LET L6=76
00510 S7=-1:DIM F0(F,4),F1(4),Z(F),Y(4),Y0(4)
00520 FOR J=0 TO 4:F1$(J)="":Y0$(J)="":NEXT J:E=1
00530 STRS(INT(FRE(0))-2000):GOTO 150
00540 IF E5=-1 THEN 2030
00550 A=SEARCH(A0$,"="):IF A=0 THEN 2970
00560 A7=VAL(A0$(,2)):IF A7<1 OR A7>5 THEN 2960
00570 F1$(INT(A7-1))=A0$(;A+1):IF SEARCH(A0$,"!")<0 : E6=-1
00580 GOTO 150
00590 FOR J=0 TO 4
00600   IF F1$(J)="" THEN NEXT J:GOTO 150
00610   PRINT CHR(J+49);":";F1$(J)
00620 NEXT J:GOTO 150
00630 A0$=A0$(;4):IF A0$(;1,1)=" " : A0$=A0$(;2
```

```
00640 IF VAL(A0$)<>0 : A0$="FL "+A0$
00650 IF A0$(;1,2)<>"FD" AND A0$(;1,2)<>"FL" THEN 2930
00660 A7=VAL(A0$(;3)):A=SEARCH(A0$,"-"):IF A=0 : A6=A7 ELSE LET A6=VAL(A0$(;A+1)
)
00670 IF A6<A7 : A=A7:A7=A6:A6=A
00680 IF A6<1 OR A7<1 OR (A6>5 AND A0$(;1,2)="FD") OR (A7>5 AND A0$(;1,2)="FD")
OR A6>FLT(F) OR A7>FLT(F) THEN 2960
00690 FOR J=INT(A7) TO INT(A6)
00700   IF A0$(;1,2)="FD" : F1$(J-1)="" ELSE LET Z(J)=0
00710 NEXT J:GOTO 150
00720 IF VAL(A0$(;4))<>0 : E7=VAL(A0$(;4)) ELSE LET E7=FLT(E)
00730 IF E6=0 THEN 3000
00740 IF E7<1 OR E7>FLT(F) THEN 2960
00750 E=INT(E7)
00760 UNDERLINE:PRINT\"Enter field";E;":";:NORMAL:IF Z(E)=-1 : PRINT" >>@<<"\ EL
SE PRINT\:FOR J=0 TO 4:F0$(E,J)="":NEXT J
00770 FOR J=0 TO 4
00780   IF F1$(J)="" THEN NEXT J:GOTO 850
00790   F2$=F1$(J):A=SEARCH(F2$,":"):IF A=0 : PRINT F2$:NEXT J:GOTO 850
00800   IF SEARCH(F2$,"@")<>0 THEN 3160
00810   PRINT F2$(;1,A);" ";:B=LEN(F2$)-A:GOSUB (FLT(B),0] 2870
00820   IF A0$="ESC" THEN NEXT*J 3020
00830   F0$(E,J)=A0$:PRINT
00840 NEXT J
00850 Z(E)=-1:E5=-1:E=E+1:IF E>F THEN 2990
00860 GOTO 760
00870 IF E5=0 THEN 3010
00880 C0=0:FOR J=0 TO 4:Y(J)=0:NEXT J
00890 FOR J=0 TO 4
00900   IF F1$(J)="" THEN NEXT J:GOTO 1020
00910   F2$=F1$(J):A=SEARCH(F2$,":"):IF A=0 : PRINT F2$:NEXT J:GOTO 1020
00920   PRINT F2$(;1,A);" ";:B=LEN(F2$)-A:GOSUB (FLT(B)+1,0] 2870
00930   IF A0$="ESC" THEN NEXT*J 3020
00940   Y(J)=0:IF A0$(;1,1)="?" : Y(J)=1
00950   IF A0$(;1,1)="#" : Y(J)=2
00960   IF A0$(;1,1)="=" : Y(J)=3
00970   IF A0$(;1,1)="<" : Y(J)=4
00980   IF A0$(;1,1)=">" : Y(J)=5
00990   IF Y(J)<>0 : Y0$(J)=A0$(;2):GOTO 1010
01000   IF A0$<>"" : Y(J)=3:Y0$(J)=A0$
01010 PRINT:NEXT J
01020 IF C7=0 : PRINT\"Searching....."\ ELSE PRINT\"Counting....'\
01030 FOR J=1 TO F
01040   IF Z(J)=0 THEN NEXT J:GOTO 1320
01050   FOR K=0 TO 4
01060     T0=0:ON Y(K)+1 GOTO 1170,1070,1090,1110,1130,1150
01070     IF SEARCH(F0$(J,K),Y0$(K))<>0 : T0=-1
01080     GOTO 1160
01090     IF F0$(J,K)<>Y0$(K) : T0=-1
01100     GOTO 1160
01110     IF F0$(J,K)=Y0$(K) : T0=-1
01120     GOTO 1160
01130     IF VAL(F0$(J,K))<VAL(Y0$(K)) : T0=-1
01140     GOTO 1160
01150     IF VAL(F0$(J,K))>VAL(Y0$(K)) : T0=-1
01160     IF T0=0 THEN NEXT*K 1310
01170   NEXT K:C0=C0+1
01180   IF C7=-1 THEN 1210
01190   CLS:UNDERLINE:PRINT CHR(26);"File #";J;" "\:NORMAL
01200   FOR K=0 TO 4
01210     IF F1$(K)="" THEN NEXT K:GOTO 1250
01220     F2$=F1$(K):A=SEARCH(F2$,":"):IF A=0 : PRINT F2$:NEXT K:GOTO 1250
01230     PRINT F2$(;1,A);" ";F0$(J,K)
01240   NEXT K
01250   IF P0=-1 THEN 1280
01260   IF W=0 : CURS 960:PRINT"Press ''P'' to print, any other key to continue.
...";ELSE PRINT [A22 11];[A22 10];"Press ''P'' to print, any other key to conti
nue....";
01270   A1$=KEY:IF A1$="" THEN 1270
01280   IF A1$="P" OR A1$="p" OR P0=-1 THEN GOSUB 3070
01290   CLS:PRINT CHR(26);
01300   IF A1$=CHR(27) THEN NEXT*J 1320
01310 NEXT J
01320 IF C7=-1 : PRINT"Count:";INT(C0)
01330 GOTO 150
01340 IN#3:OUT#W OFF:OUTL#W:POKE 63487,W
01350 INPUT A1$:IF A1$(;1,2)<>"**" THEN 1350
01360 LPRINT"Loading ";A1$(;3);":    ";
01370 CLEAR:INPUT F:STRS(100)
01380 DIM F0(F,4),F1(4),Z(F),Y(4),Y0(4)
01390 STRS(INT(FRE(0))-2000)
01400 FOR J=0 TO 4:Y0$(J)="":Y(J)=0:F1$(J)="":NEXT J
01410 INPUT N0$,E6,E7,E,E5,S7,W
01420 IF W=0 : L6=60 ELSE LET L6=76
01430 IF W=PEEK(63487) THEN 1440 ELSE IF W=0 : L6=60:OUT#0:PRINT" ";:INVERSE:UND
ERLINE:CLS:NORMAL:PRINT"  ";:OUT#0 OFF ELSE LET L6=76:NETLR:OUT#6:PRINT" ";:PRIN
T"  ";:OUT#6 OFF
01440 FOR J=0 TO 4:INPUT F1$(J):NEXT J
01450 INPUT X,A1$,A2$,A3$,A4$,A5$:IF X=-1 THEN 1490
01460 F0$(X,0)=A1$:F0$(X,1)=A2$:F0$(X,2)=A3$:F0$(X,3)=A4$
01470 F0$(X,4)=A5$:Z(X)=-1
01480 GOTO 1450
01490 OUT#W:IN#0:PRINT CHR(7):GOTO 150
01500 OUTL#3:OUT#W:PRINT"  ";
01510 LPRINT"**";N0$
01520 LPRINT F:PLAY 0,2
01530 LPRINT N0$;",";E6;",";E7;",";E;",";E5;",";S7;",";W
01540 FOR J=0 TO 4:LPRINT F1$(J):NEXT J
01550 FOR J=1 TO F
```

```
01560   IF Z(J)=0 THEN 1590
01570   LPRINT J;",";F0$(J,0);",";F0$(J,1);",";F0$(J,2);",";F0$(J,3);",";F0$(J,4
)
01580   Q=1-Q:IF Q=0 : PRINT"*";CHR(8); ELSE PRINT" ";CHR(8);
01590 NEXT J:LPRINT " 1,,,,,,":OUT#W:PRINT CHR(7):GOTO 150
01600 A0$=A0$(1 6):IF VAL(A0$)=64 AND W=6 : OUT#0:PRINT" ";:INVERSE:UNDERLINE:CLS
:W=0:L6=60:GOTO 140
01610 IF VAL(A0$)=64 THEN 150
01620 IF VAL(A0$)<>80 THEN 2960
01630 IF PEEK(57344)<>195 THEN 3040
01640 IF W=6 THEN 150
01650 NETLR:OUT#6:L6=76:W=6:PRINT CHR(26);SPC(36);"DataBee"\:NORMAL:GOTO 150
01660 IF A0$(;4,4)=" " : A0$=A0$(;1,3)+A0$(;5)
01670 IF A0$(;4,4)="P" : P=1
01680 IF A0$(;4,5)="S1" : P=4
01690 IF A0$(;4,5)="S2" OR A0$(;4,4)="S" : P=5
01700 IF P=0 THEN 2960
01710 GOTO 150
01720 IF A0$(;6,6)="P" : P0=-1
01730 FOR J=0 TO 4:Y(J)=0:NEXT J
01740 GOTO 1030
01750 OUTL#P:A7=VAL(A0$(;6)):IF A7<1 OR A7>5 THEN 2960 ELSE LET A=INT(A7)
01760 B=SEARCH(A0$,","):IF B=0 THEN 3120
01770 B0=VAL(A0$(;B+1)):IF B0<1 OR B0>5 THEN 2960 ELSE LET B=INT(B0)
01780 LPRINT TAB(40-LEN(N0$)/2);N0$\\\
01790 LPRINT CHR(27);"3";CHR(30)
01800 H0=0:L7=0
01810 FOR J=1 TO F
01820   IF Z(J)=0 THEN 1850
01830   IF VAL(F0$(J,A-1))>H0 : H0=VAL(F0$(J,A-1))
01840   IF LEN(F0$(J,B-1))>INT(L7) : L7=FLT(LEN(F0$(J,B-1)))
01850 NEXT J
01860 IF H0=0 THEN 3130
01870 L1=78-L7:L2=L1/H0
01880 FOR J=1 TO F
01890   IF Z(J)=0 THEN NEXT J:LPRINT CHR(27);"@":GOTO 150
01900   LPRINT F0$(J,B-1);TAB(INT(L7+1));":";
01910   L3=VAL(F0$(J,A-1)):IF L3=0 THEN LPRINT:NEXT J:LPRINT CHR(27);"@":GOTO 15
0
01920   L=INT(L3*L2)+1
01930   FOR K=1 TO L:LPRINT CHR(17);:NEXT K
01940   LPRINT
01950 NEXT J:LPRINT CHR(27);"@":GOTO 150
01960 A0$=A0$(;5):IF A0$(;1,1)=" " : A0$=A0$(;2)
01970 IF A0$="" OR A0$(;1,4)="COMM" THEN 2010
01980 A=SEARCH("F       INIT    SOFF    SON     PR FD   DEL     ENT     SP
SC      LOAD    SAVE    STAT    WIDTH   OUT     PRINT   GRAPH   HELP    KILL
SORT    ",A0$+" ")
01990 A=A-1:IF A/8*8<>A OR A=-1 THEN 380
02000 UNDERLINE:PRINT"Format: ";:ON A/8+1 GOTO 2140,2040,2060,2070,2080,2090,212
0,2170,2240,2260,2270,2280,2290,2300,2320,2330,2010,2360,2370
02010 UNDERLINE:PRINT"Commands:":NORMAL:PRINT"INIT    SOFF    SON     PR FD   DE
L     ENT     SP      SC      LOAD    SAVE    STAT    WIDTH   OUT     PRINT   GR
APH   F       HELP    ";
02020 PRINT"KILL    SORT    "\"Use the format ''HELP (help)'' where (help) is a
command above"
02030 GOTO 150
02040 PRINT"INIT (''f/name'') xx"\:NORMAL
 02050 PRINT"    Initialise DataBee to xx files, with an optional filename":GOTO
150
02060 PRINT"SOFF"\:NORMAL:PRINT"    Set sound off":GOTO 150
02070 PRINT"SON"\:NORMAL:PRINT"    Set sound on":GOTO 150
02080 PRINT"PR FD"\:NORMAL:PRINT"    Print out fields":GOTO 150
02090 PRINT"DEL zz xx (-yy)"\:NORMAL
02100 PRINT"    Delete fields (zz=''FD'') or files (zz=''FL''). Deletes field/"
02110 PRINT"file number xx (through to yy optionally)":GOTO 150
02120 PRINT"ENT"\:NORMAL
02130 PRINT"    Enter files according to fields designed beforehand. See"\"also:
 HELP F":GOTO 150
02140 PRINT"F xx= (text/field)"\:NORMAL
02150 PRINT"    Set field xx to the text after the ''='', Use a '':'' to"\"separ
ate the field name from the input, and ''.'' to represent"\"the field of input,
or a ''@'' for ";
02160 PRINT"calculations"\"See also: HELP ENT":GOTO 150
02170 PRINT"SP"\:NORMAL
02180 PRINT"    Search and Print. Enter search conditions in the fields as"\"wit
h the ''ENT'' command, using the following symbols:"
02190 PRINT"  = (string) : Search for an exact match with ''string''"
  02200 PRINT"  # (string) : Search for anything that does not match ''string''"
02210 PRINT"  < (value) : Search for anything less than (value)"
02220 PRINT"  > (value) : Search for anything greater than (value)"
02230 PRINT"  ? (string) : Search for anything ";:UNDERLINE:PRINT"containing";:N
ORMAL:PRINT" (string)"\"Any files fitting the conditions will be printed"\"See a
lso: SC, ENT":GOTO 150
02240 PRINT"SC"\:NORMAL:PRINT"    Search and Count. Enter search condtions in th
e fields as"\"with the ''ENT'' command. After a brief pause, the number of"
02250 PRINT"files conforming to the search conditions will be returned."\"See al
so: SP (for sesrch symbols), ENT":GOTO 150
02260 PRINT"LOAD"\:NORMAL:PRINT"    Loads a DataBee file from cassette"\"See als
o: SAVE":GOTO 150
02270 PRINT"SAVE"\:NORMAL:PRINT"    Saves the DataBee files in memory to cassett
e, along with"\"field designations and system swttings"\"See also: LOAD":GOTO 15
0
02280 PRINT"STAT"\:NORMAL:PRINT"    Displays STATistics on the current memory si
tuation":GOTO 150
02290 PRINT"WIDTH xx"\:NORMAL:PRINT"    Set the screen width to xx columns. xx m
ust either equal 64"\"or 80. WIDTH 80 may only be used on those with the network
 ROM":GOTO 150
02300 PRINT"OUT (dev)"\:NORMAL:PRINT"Directs printer output to one of three devi
```

```
ces:"\" OUT P - sends to a parallel printer"\" OUT S1 - Sends to a serial prin
ter at 300bd"
02310 PRINT" OUT S2 or OUT S - sends to a serial printer at 1200bd"\:GOTO 150
02320 PRINT"PRINT (P)"\:NORMAL:PRINT" Prints out all files on the screen, and
 to the printer if"\"the ''P'' is added at the end":GOTO 150
 02330 PRINT"GRAPH xx,yy"\:NORMAL:PRINT" Graph a set of values to the printer
in a simple bar-graph"\"format. xx is the field with the value to be graphed, an
d yy is"
02340 PRINT"the field with the title of each entry."
02350 PRINT"Eg. If field 1 contained the names of 50 students, and field 2"\"con
tained their score, you would type ''GRAPH 2,1'' to graph the scores.":GOTO 150
02360 PRINT"KILL"\:NORMAL:PRINT" This function clears out the help files to a
llow more space"\"for files.":GOTO 150
02370 PRINT"SORT xx yy zz"\:NORMAL:PRINT" This function sorts files into a pr
edetermined order,"\"and prints out the files as it sorts. The order depends on
the"
02380 PRINT"parameters given in xx,yy and zz. xx must either be ''A'' or ''D'',
"\"for an ascending or descending order. yy is the field # to sort"
02390 PRINT"by, and zz must either be ''A'' or ''N'', depending on whether"\"the
 field contains alphanumeric or numeric data.":GOTO 150
02400 PRINT"The help function has been deleted":GOTO 150
02410 PRINT"Free memory:";INT(FRE($));TAB25;"# of files:";F;TAB48;'Maximum: ';INT
(F6)
02420 PRINT"Approximate number of files that will fit in memory:";
02430 L=0:FOR J=0 TO 4:IF SEARCH(F1$(J),".")<>0 : L=L+LEN(F1$(J)):NEXT J ELSE NE
XT J
02440 IF L=0 THEN PRINT F:GOTO 2470
02450 F7=FRE($)/FLT(L):IF F7>FLT(F) : PRINT F:GOTO 2470
02460 PRINT INT(F7/10)*10
02470 GOTO 150
02480 PRINT"Type ''RUN'' to restart the program. The ''help'' function has been
deleted from the program."
02490 PRINT"Press [ESC] to abort, or any other key to continue.....";
02500 A1$=KEY:IF A1$="" THEN 2500
02510 IF A1$=CHR(27) THEN PRINT:GOTO 150
02520 DELETE 1960,2390
02530 END
02540 A0$=A0$(;5):IF A0$(;1,1)=" " : A0$=A0$(;2)
02550 IF A0$(;1,1)="D" : O7=1:H0=0:H1$=""
02560 IF A0$(;1,1)="A" : O7=-1:H0=99999999:H1$="~~~~"
02570 IF A0$(;1,1)<>"A" AND A0$(;1,1)<>"D" THEN 2960
02580 A0$=A0$(;2):F7=VAL(A0$):IF F7<1 OR F7>5 THEN 2960
02590 Q=INT(F7)-1:A=SEARCH(A0$,"N"):O6=1:IF A=0 : A=SEARCH(A0$,"A"):O6=2:IF A=0
THEN 3050
02600 OUTL#P:FOR J=1 TO F-1:IF O7=-1 : H0=99999999:H1$="~~~~" ELSE LET H0=0:H1$="
"
02610   IF Z(J)=0 THEN NEXT J:GOTO 150
02620   FOR K=J TO F
02630     IF Z(K)=0 THEN 2680
02640     IF O6=2 THEN 2670
02650     V1=VAL(F0$(K,Q)):IF (O7=-1 AND V1<H0) OR (O7=1 AND V1>H0) : H0=V1:H=K
02660   GOTO 2680
02670     V2$=F0$(K,Q):IF (O7=-1 AND V2$<H1$) OR (O7=1 AND V2$>H1$) : H1$=V2$:H=
K
02680   NEXT K
02690   FOR K=0 TO 4
02700     F2$=F0$(J,K):F0$(J,K)=F0$(H,K):F0$(H,K)=F2$
02710   NEXT K
02720   FOR K=0 TO 4
02730     IF F1$(K)="" THEN 2760
02740     F2$=F1$(K):A=SEARCH(F2$,":"):IF A=0 : LPRINT F2$:GOTO 2760
02750     LPRINT F2$(;1,A);" ";F0$(J,K)
02760   NEXT K
02770   LPRINT
02780 NEXT J
02790 GOTO 150
02800 STOP
02810 IF ERRORC=18 OR ERRORC=23 : ON ERROR GOTO 2840:STRS(200):GOSUB ['Out of me
mory. Press any key to save files....."] 3140:U=USR(32774):GOTO 1500
02820 IF ERRORC=12 : ON ERROR GOTO 2310:GOSUB ["The kill function has already be
en used!"] 3140:GOTO 150
02830 PRINT"Error#";ERRORC;"in line";ERRORL;CHR(7):END
02840 PRINT"Out of memory. Press any key to restart. Load the file that you have
 just saved.";
02850 U=USR(32774):RUN
02860 GOTO 150
02870 VAR(L7,U7):A0$=""
02880 A1$=KEY:IF A1$="" THEN 2880
02890 IF (A1$=CHR(8) OR A1$=CHR(127)) AND A0$<>"" : A0$=A0$(;1,LEN(A0$)-1):PRINT
 CHR(127);
02900 IF A1$=CHR(27) : A0$="ESC":RETURN
02910 IF A1$=CHR(13) THEN RETURN
02920 A=ASC(A1$):IF A>96 AND U7=-1 : A1$=CHR(A-32)
02930 IF A1$<" " OR A1$>"z" OR A1$="_" OR LEN(A0$)=INT(L7) THEN 2880
02940 PRINT A1$;:A0$=A0$+A1$:GOTO 2880
02950 GOSUB ['Missing quote"] 3140:GOTO 150
02960 GOSUB ["Illegal parameter"] 3140:GOTO 150
02970 GOSUB ['Missing "="'] 3140:GOTO 150
02980 GOSUB ['Illegal identifier: Use ''FD'' (field) or ''FL'' (file)'] 3140:GOT
O 150
02990 GOSUB ["Maximum number of files reached"] 3140:GOTO 150
03000 GOSUB ['No fields entered"] 3140:GOTO 150
03010 GOSUB ["No files entered"] 3140:GOTO 150
03020 PRINT:GOTO 180
03030 GOSUB ["The field cannot be altered once a file has been entered"] 3140:GO
TO 150
03040 GOSUB ["Option not fitted"] 3140:GOTO 150
03050 GOSUB ["Sort type unspecified"] 3140:GOTO 150
03060 GOSUB ['Divide by zero"] 3140:GOTO 150
```

```
03070 OUTL#P:FOR K=0 TO 4
03080   IF F1$(K)="" THEN NEXT K:LPRINT:RETURN
   03090   F2$=F1$(K):A=SEARCH(F2$,":"):IF A=0 : LPRINT F2$:NEXT K:LPRINT:RETURN
03100   LPRINT F2$(;1,A);" ";F0$(J,K)
03110 NEXT K:LPRINT:RETURN
03120 GOSUB ["Missing '',''"] 3140:GOTO 150
03130 GOSUB ["Field"+STR(A)+" has no numerical inputs"] 3140:GOTO 150
03140 VAR(P0$):UNDERLINE:PRINT P0$;:IF S7=-1 : PRINT CHR(7);
03150 NORMAL:PRINT:RETURN
03160 A=SEARCH(F2$,"@"):B=SEARCH(F2$,":"):PRINT F2$(;I,B);" ";:F2$=F2$(;A+1)
03170 A=SEARCH(F2$,"*"):B=SEARCH(F2$,"/")
03180 IF (B<A AND B<>0) OR (A=0 AND B<>0) : A=B
03190 IF A<>0 THEN 3230
03200 A=SEARCH(F2$,"+"):B=SEARCH(F2$,"-")
03210 IF (B<A AND B<>0) OR (A=0 AND B<>0) : A=B
03220 IF A=0 : A0$=F2$:PRINT A0$:GOTO 820
03230 O0$=F2$(;A,A):IF PEEK(262)=27 : A0$="ESC":GOTO 820
03240 O1$=""+O2$=""
03250 K=A:O4$=F2$(;A,A)
03260 A=A-1:O3$=F2$(;A,A)
03270 IF (O3$="-" AND (F2$(;A-1,A-1)<"0" OR F2$(;A-1,A-1)>"9")) OR O3$="." OR O3
$="F" OR O3$=" " OR (O3$>="0" AND O3$<="9") : O1$=O3$+O1$:GOTO 3260
03280 K=K+1:O3$=F2$(;K,K)
03290 IF (O3$="-" AND (F2$(;K-1,K-1)<"0" OR F2$(;K-1,K-1)>"9")) OR O3$="." OR O3
$="F" OR O3$=" " OR (O3$>="0" AND O3$<="9") : O2$=O2$+O3$:GOTO 3280
03300 IF O1$(;1,1)="F" : F5=VAL(O1$(;2))-1:IF F5<0 OR F5>4 THEN 2960
03310 IF O1$(;1,1)="F" : O1$=STR(VAL(F0$(E,INT(F5))))
03320 IF O2$(;1,1)="F" : F5=VAL(O2$(;2))-1:IF F5<0 OR F5>4 THEN 2960
03330 IF O2$(;1,1)="F" : O2$=STR(VAL(F0$(E,INT(F5))))
03340 O5=VAL(O1$):O6=VAL(O2$)
03350 IF O4$="*" : O7=O5*O6
03360 IF O4$="/" AND O6=0 THEN 3060
03370 IF O4$="/" : O7=O5/O6
03380 IF O4$="+" : O7=O5+O6
03390 IF O4$="-" : O7=O5-O6
03400 F2$=F2$(;1,A)+STR(O7)+F2$(;K)
03410 GOTO 3170
```



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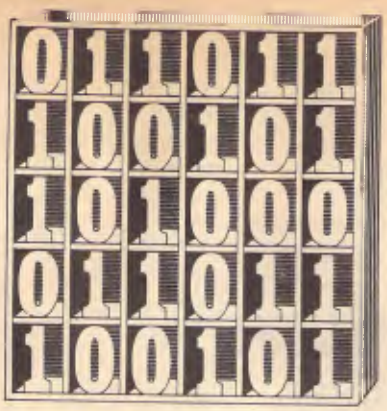

David Barrow presents more documented machine code routines and useful information for the assembly language programmer. If you have a good routine, an improvement or conversion of one already printed, or just a helpful programming hint, then send it in and share it with other programmers. Subroutines 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 SubSet, APC, 2nd Floor, 215 Clarence Street, Sydney 2000.

Untrappable division

In *APC*, January, I issued a challenge for a Subset Class 1 signed 32-bit division routine for the 68000. The need for this is obvious in the 68000, the 68008 and the 68010, which are limited to 32/16-bit division, with a built-in error trap to catch out those zero divisors.

The 68020, which designs planets in its spare time, does have several forms of full 32-bit division, but it suffers from the (structurally sound) fact that attempts to divide by zero will be trapped and exception processing in Supervisor mode initiated. However, Supervisor mode is unlikely to be available to you, the user, hence the need for a division routine that cannot be trapped.

Terry Browning's DIV32S and DIV32U attempted to solve the problem in *APC*, June 1985, but got it wrong on a couple of counts. Firstly, his code to set the overflow flag V to show division by zero actually missed its target by a full eight bits — but without causing any havoc. Secondly, there is one possible overflow condition in signed division for which his DIV32S did not test. Terry has, however, sent improvements which correct these mistakes.

Alasdair Macdonald and A Perkins also sent corrected improvements and some very pertinent comments about the 68000 series processors. As no one version solved all the problems of implementing a Class 1 routine on all processors in the 68000 family, code and ideas from all three readers, along with some of my own concepts, are combined in this month's Datasheet, DIV32.

Signed overflow

Quotient overflow can occur in a signed division only if the dividend is the lowest negative value, that is −2,147,483,648 ($8000 0000 or −2^31), and the divisor is −1. The quotient takes the magnitude of the dividend with a sign change forced by the negative divisor, but the highest positive value expressible in 32 bits using two's complement notation is 2 31 − 1. $8000 0000 negated is still $8000 0000, a negative value.

Terry Browning thinks the output flags for the signed division should distinguish between magnitude overflow and division by zero.

He suggests that the overflow flag V be set to indicate error with the carry flag C set or reset to show which type.

Mr Perkins, however, points out that the C flag is always cleared by the division instructions of the 68000 series, whereas both N (negative, sign) and Z are left in an undefined state if overflow occurs (more on this later).

It seems sensible, therefore, to use N or Z to flag the error type instead of C. DIV32S and DIV32U use the zero flag Z and all three routines clear C.

Speed and length

Alasdair Macdonald notes that the business of stacking the SR is unnecessary in the June versions of DIV32S and DIV32U as the flags can be manipulated by the "MOVE #data, SR" instruction.

This produces quicker shorter code, and Alasdair's routines at 38 bytes each were indeed the shortest submitted. Terry's improved versions logged in at 86 bytes (signed) and 64 bytes (unsigned), and those of AJ Perkins were 54 bytes and 44 bytes respectively.

Other ways suggested by Alasdair of speeding up the routines' execution times are to use equivalent but faster instructions. ADD Dn,Dn and ADDX Dn,Dn shift and rotate data registers two or four clocks quicker than ASL #1,Dn and ROXL #1,DN and MOVEQ #0,Dn will clear them two clocks faster than CLR.L Dn. (These figures are for the 68000, 68008 and 68010 — the use of equivalent instructions has a complex effect on 68020 timing.)

Equivalent instructions can build confusion into your programs, and unless speed really is of the essence, clarity is more important. However, the quicker ADDX.L Dn,Dn is used in the main division loop of DIV32Z.

One method of speeding up execution which Alisdair missed is to take as much out of a loop as possible. I have done this in DIV32's division loop, which actually calculates the logical complement of the quotient. The terminating NOT instruction both corrects the result and sets the right exit flags. For comparison, Fig 1 shows Alasdair's main loop which still requires a TST D0 to set exit flags and thus will execute on the 68000 in 12 + 32 * (42-52) clocks. The loop in DIV32Z takes 18 + 32 * (44-50) clocks — best case timing has been traded for a quicker worse case to produce a more even timing.

```
;
;...Main division loop, giving correct quotient.
DIVLP   ADD.L   D0,D0       ;Shift dividend, clear bit 0,     D080
        ADDX.L  D1,D1       ;shift remainder, get next bit.   D381
        CMP.L   D2,D1       ;Will subtraction go?             B282
        BCS     DIVLPT      ;Skip if not, leave result = 0,   6504
        ADDQ.B  #1,D0       ;else set result bit and          5200
        SUB.L   D2,D1       ;subtract divisor.                9282
DIVLPT DBF      D3,DIVLP    ;Repeat for 32 dividend bits,     51CB
                            ;end with correct quotient.       FFF2
;
```

Fig 1

Upward compatibility

The main bugbear of the June routines for Mr Perkins is the simple fact that neither will run on the 68010 or 68020 in User mode.

As both 68010 and 68020 are designed as virtual machines where both non-existent memory and peripherals may be addressed, the user cannot be allowed access to the system byte of the status register to determine which mode is currently in operation. Consequently, Motorola has made the instruction MOVE SR, <EA> privileged on these two machines. To restore condition code access to the user, it has provided the new instruction MOVE CCR,<EA>, not available on either the 68000 or 68008.

So, in a series of very sophisticated processors, declared to be upwardly compatible, there is no way to program a move of condition codes to either data register or memory that is portable across all processors in User mode. Any half-decent system software should, of course, deal with the problem and make the resulting illegal instruction or privilege violation processing transparent to the user program.

But system software writers are not noted for their love of low-level programmers, and exception processing could have drastic effects on time-critical user routines.

The best fully-portable method of putting the CCR on stack below a subroutine return address, ready for RTR exit, is awaited.

DIV32 flags

Mr Perkins ventured that any Class 1 division should be portable and should return flag information of the same order as that returned by the 68xxx DIVS and DIVU instructions. This is basically the same reason why Terry Browning originally saved the Status Register to stack.

Essentially, N and Z should return the sign and zero status of the quotient, V should signal overflow when set, C should be clear and the extend flag X should be totally unaffected.

Overflow can be dealt with by preliminary tests, and N, Z, V and C are correctly set or cleared by a terminal TST of the quotient. X is more difficult as many instructions do affect it, but two methods of preserving it are given in DIV32.

The first, in DIV32S, is to rotate it into the top byte of stack. Restoration to the condition codes is achieved by a sequence of rotations into and out of the quotient, which also flag the quotient's status.

The second method, in DIV32Z, was originally used in Z80 code. By moving the result bits into the quotient one shift in arrears, the carry or extend flag can safely be rotated through the quotient register and back to the C or X bit of the CCR. END

DATASHEET 1

```
;
;= DIV32     32-bit trap-proof division suite.
;> DIV32S    32-bit signed trap-proof division.
;> DIV32U    32-bit unsigned trap-proof division.
;> DIV32Z    32-bit unsigned division with zero divide.
;
;JOB        DIV32S - To divide one signed (two's complement)
;             32-bit number by another, returning 32-bit signed
;             quotient and remainder, or unchanged operands with
;             division by zero or quotient overflow information.
;           DIV32U - To divide one unsigned (absolute) 32-bit
;             number by another, returning 32-bit unsigned
;             quotient and remainder, or unchanged operands with
;             division by zero information.
;           DIV32Z - To divide one unsigned (absolute) 32-bit
;             number by another, returning 32-bit unsigned
;             quotient and remainder, or "high-values" quotient
;             on division by zero.
;ACTION     DIV32S:-
;             IF divisor = 0:
;             THEN:
;             [ Set division by zero error flags. ]
;             ELSE:
;             [ IF dividend = -2^31 AND divisor = -1:
;               THEN:
;               [ Set quotient overflow error flags. ]
;               ELSE:
;               [ Compute quotient & remainder signs.
;                 Compute absolute dividend & divisor.
;                 Call absolute value division, DIV32Z.
;                 IF quotient sign negative THEN:
;                 [ Negate quotient. ]
;                 IF remainder sign negative THEN:
;                 [ Negate remainder. ]
;                 Flag quotient status. ] ]
;           DIV32U:-
;             IF divisor = 0:
;             THEN:
;             [ Set division by zero error flags. ]
;             ELSE:
;             [ Call absolute value division, DIV32Z. ]
;           DIV32Z:-
;             Clear remainder register.
;             FOR 32-bit count:
;             [ Shift last result bit to dividend\quotient,
;               shifting next dividend bit into remainder.
;               Subtract divisor from remainder.
;               IF subtraction went (C = 0):
;               THEN:
;               [ Skip, result = 0. ]
;               ELSE:
;               [ Add divisor to remainder, result = 1.] ]
;             Shift final result bit into quotient.
;             Complement quotient, flagging quotient status.
;-------------------------------------------------------------------
;CPU        68000, 68008, 68010, 68020
;HARDWARE   None.
;SOFTWARE   DIV32Z is a subroutine of both DIV32S and DIV32U.
;-------------------------------------------------------------------
;INPUT      DIV32S: D0 = 32-bit 2's complement signed dividend,
;                   D1 = 32-bit 2's complement signed divisor.
;
;           DIV32U: D0 = 32-bit unsigned (absolute) dividend,
;           DIV32Z: D1 = 32-bit unsigned (absolute) divisor.
;OUTPUT     DIV32S:
;             X  unchanged     X  unchanged     X  unchanged
;             N  quot. sign    N  0             N  0
;             Z  quot. state   Z  1             Z  0
;             V  0             V  1             V  1
;             C  0             C  0             C  0
;             D0 quotient      D0 dividend      D0 dividend (-2^31)
;             D1 remainder     D1 divisor (0)   D1 divisor (-1)
;           DIV32U:
;             X  unchanged     X  unchanged
;             N  quot. sign    N  0
;             Z  quot. state   Z  1
;             V  0             V  1
;             C  0             C  0
;             D0 quotient      D0 dividend
;             D1 remainder     D1 divisor (0)
;           DIV32Z:
;             X  unchanged
;             N  quot. sign
;             Z  quot. state
;             V  0
;             C  0
;             D0 quotient  (= $FFFFFFFF if divisor was zero.)
;             D1 remainder (= dividend if divisor was zero.)
;ERRORS     None.
;REG USE    A7 (USP), D0, D1, CCR
;STACK USE  DIV32S: 14. DIV32U: 12. DIV32Z: 8.
;RAM USE    None.
;LENGTH     128 (DIV32S: 82. DIV32U: 12. DIV32Z: 34).
;CYCLES     Not given.
;-------------------------------------------------------------------
;CLASS 1     *discreet      *interruptable      *promable
;******      *reentrant     *relocatable        *robust
;-------------------------------------------------------------------
;
DIV32  ;Suite of three trap-proof division routines.
;
;...Signed division returning overflow information.
DIV32S TST.L   D1              ;Test for a zero divisor,        4A81
       ORI     #$02,CCR        ;set V flag without affecting    003C
                               ;any other flags and exit        0002
       BEQ     D32SX           ;Z = 1 if division by zero.      6748
;
       CMPI.L  #2^31,D0        ;Test for other possible         0C80
                               ;overflow, when dividend is      0000
                               ;$80000000                       0000
       BNE     D32SOK          ;(okay if it isn't)              660C
       CMPI.L  #-1,D1          ;and divisor is $FFFFFFFF        0C81
                               ;giving invalid +$80000000       FFFF
                               ;quotient.                       FFFF
       EORI    #$06,CCR        ;Set V always and clear Z        0A3C
                               ;only if D1 = -1 then exit       0006
       BNE     D32SX           ;Z = 0 if overflow error.        6634
;
D32SOK CLR.W   -(A7)           ;Clear stack word for flags.     4267
       ROXR    (A7)            ;Save entry X flag state.        E4D7
;
       TST.L   D0              ;Test for negative dividend,     4A80
       BPL     DRTST           ;skip, okay, if positive,        6A04
```

```
        NEG.L   D0              ;else make absolute and set     4480
        ORI.B   #%11,(A7)       ;sign flags, quotient (bit 0)   0017
                                ;and remainder (bit 1).         0003
;
DRTST   TST.L   D1              ;Test for negative divisor,     4A81
        BPL     ABSDIV          ;skip, okay, if positive,       6A06
        NEG.L   D1              ;else make absolute and         4481
        EORI.B  #%0i,(A7)       ;correct quotient sign flag     0A17
                                ;for changed sign result.       0001
;
ABSDIV  BSR     DIV32Z          ;Do absolute value division.    6128
;
        BTST    #0,(A7)         ;Test quotient sign flag        0817
                                ;and skip, okay, if result      0000
        BEQ     REMSGN          ;should be positive, else       6702
        NEG.L   D0              ;change to negative.            4480
;
REMSGN  BTST    #1,(A7)         ;Test remainder sign flag       0817
                                ;and skip, okay, if result      0001
        BEQ     RESTX           ;should be positive, else       6702
        NEG.L   D1              ;change to negative.            4481
;
RESTX   ROXL    (A7)+           ;Restore stored X flag and      E5D7
        ROXL.L  #1,D0           ;rotate in and out of quotient  E390
        ROXR.L  #1,D0           ;to flag quotient status but    E290
        ANDI    #$FE,CCR        ;preserving X, then clear C     023C
                                ;leaving X N Z & V unchanged.   00FE
;
D32SX   RTS                     ;Exit information correct.      4E75
;
;...Unsigned division with division by zero error information.
DIV32U  TST.L   D1              ;Test for a zero divisor,       4A81
        ORI     #$02,CCR        ;set V flag without affecting   003C
                                ;any other flags and exit       0002
        BEQ     D32UX           ;Z = 1 if division by zero.     6702
        BSR     DIV32Z          ;Do absolute value division.    6102
D32UX   RTS                     ;Exit information correct.      4E75
;
;...Unsigned division returning $FFFFFFFF for zero division.
DIV32Z  MOVEM.L D2/D3,-(A7)     ;Save working registers,        48E7
                                ;D2 and D3 to user stack.       3000
        MOVE.L  D1,D2           ;Put divisor in D2 and          2401
        MOVEQ   #0,D1           ;clear D1 for remainder.        7200
        MOVEQ   #31,D3          ;Set 32-bit counter.            761F
;
;...Division loop - the complement of the last result bit is
;...looped round in the X flag to be shifted into the quotient,
;...(initially the input X flag is shifted into the quotient).
```

```
DIVLP   ADDX.L  D0,D0           ;Shift in last result, shift    D180
        ADDX.L  D1,D1           ;next d'dend bit to remainder.  D381
        SUB.L   D2,D1           ;Subtract divisor and skip,     9282
        BCC     DIVLPT          ;C = X = 0 = result if gone,    6402
        ADD.L   D2,D1           ;else add it back, C = X = 1.   D282
DIVLPT  DBF     D3,DIVLP        ;Repeat for 32 bits, sending    51CB
                                ;result bit to loop start.      FFF4
;
;...One more shift moves final complemented result bit in to
;...quotient bit 0, and input X back to X flag. NOT complements
;...quotient to correct it, clears V and C, puts sign and zero
;...status of quotient in N and Z, leaving X unaffected.
        ADDX.L  D0,D0           ;Get last result, restore X.    D180
        NOT.L   D0              ;Correct quotient, set flags.   4680
        MOVEM.L (A7)+,D2/D3     ;Restore working registers,     4CDF
                                ;D2 and D3, from user stack.    000C
;
        RTS                     ;Exit information correct.      4E75
;
```

'I came downstairs this morning and there he was!'

An apology.

We would like to apologise to anybody who has already bought a communications package for their Commodore 64.

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Fido links

Peter Tootill and Steve Withers look at the inner workings of FidoNet, and round up the new bulletin boards at home and abroad.

Fido is not only a bulletin board, but also part of a network of Fido BBSs called FidoNet. One of the drawbacks of the standard BBS is that it is a single system, and you can only use it to exchange messages with people who call that particular system. Fido is different: you can ask it to forward a message to another Fido system used by the person you want to contact.

A Fido system consists of two parts. Firstly, there is the BBS software (which is quite a sophisticated BBS program in its own right), and secondly, there is the FidoNet software which handles the networking side. The BBS uses the directory structure of MS-DOS to provide a convenient way of keeping related material together. The operator sets up a separate directory for each topic and Fido's commands make it easy for users to move from one area to another. For example, one of us (Steve) is setting up a private Fido for an organisation with separate areas catering for Macintosh, Rainbow, and IBM PC users. Fido also provides file transfer facilities, and downloadable files can be grouped in the same way as messages.

There are a number of security features built into Fido that provide the operator with convenient ways of controlling the use of the system. Fido can be told to refuse access by unregistered users, they can be asked to fill in a questionnaire, or they may be logged on with full or limited privileges. It will also limit the time per call, time per 24 hours, and the number of kilobytes downloaded in a day.

The FidoNet software takes control for a short period each day, called 'network time' (at night when call rates are low), and shuts down the BBS. Each system organises messages to be forwarded into packets and automatically dials other FidoNet members. It sends the packets to the relevant systems, and packets can even be routed via other Fido boards to their destination. If the FidoNet software receives an engaged tone when it calls another system, it simply waits for a random period (in case other Fidos are trying to talk to it) and goes on to the next on the list. It repeats this process until network time is over, or all the packets have been sent. If a call is received during network time, a message is displayed to warn users that the system is only taking calls from other FidoNet nodes. If a successful connection is established, the two nodes exchange packets, marking the ones that have been successfully transmitted so that senders know that their message has been despatched.

The author of the software, Tom Jennings, who works for Phoenix Software in San Francisco, reckons that the network system works well and that, after a few 'collisions' (engaged tones), the system settles down and the majority of calls will get through.

Obviously, sending messages in this way costs the operator of the BBS money for phone charges, so each person using the facility has an account. He pays a sum into his account, and it is debited each time he sends out a message. The costs are not high as all the calls are made at off-peak times: for example, sending a 2k file to the US would cost around a dollar. FidoNet uses text compression to reduce the size of the messages and hence to keep costs down.

Jennings hopes to extend the FidoNet concept to include non-Fido systems as well. The FidoNet software would take over the micro at certain times of the day, and interface with the host BBSs message-handling system. Fido is written in C, but Jennings firmly refuses to release the source code. The compiled programs, however, are in the public domain.

To run FidoNet a Hayes-compatible modem is essential (Hayes is a US manufacturer that has set a de facto standard for auto-dial modems — even IBM is conforming!). The use of the V23 (1200/75) standard also causes problems: the high speed standard in North America is 1200 full duplex (equivalent to V22). If using V23, FidoNet needs to be able to control the modem, so that when it is sending messages it works at 1200 transmit, 75 receive and the opposite way round when it is receiving. No doubt it is only a matter of time before these problems are sorted out.

If anyone is interested in running a Fido system they will need an auto-answer modem (preferably with Hayes-compatible auto-dialling) and either an Otrona Attache 8:16, a DEC Rainbow, or an IBM PC/XT/AT (or close compatible).

Being public domain, the software should be available from sources such as users' groups, although we have not been able to determine local sources. If anyone wants a copy of the Rainbow version of Fido they may send a formatted diskette (with return postage) to Steve at the address at the end of the article. A list of FidoNet nodes (dated 29th February, 1985) will be sent on receipt of a large, stamped addressed envelope. This list details approximately 200 systems, but we have heard that the current total is around 500.

System News

A study of the listings will reveal new systems in Perth, Melbourne, and Canberra. Members of the deep pocket brigade should note that Eskimo North Minibin now operates from a different number and that the Manchester Open BBS will accept no new users. There are several new overseas systems to make up for it, including five in Brazil.

The MICOM CBBS recently celebrated its third birthday. Over 35,000 calls have been logged in that time and the current rate is around 100 per day. System operator Peter Jetson believes that the 31 megabytes of disk space exceed the total of all other systems in Melbourne.

Some bad news is that the Gippsland RCPM has closed permanently. We are told that this is due to the ill-health of Bob Sherlock. Although neither of us were users of this system, we would like to express our thanks to Bob for running it, as well as our best wishes.

If you heard on the grapevine about the Secret Service BBS, you should know that it is now off-line due to a large number of calls outside the designated hours. The operator hopes to install a dedicated phone line, so we will pass on any news.

Bulletin Boards

Each entry shows the available information in this order: name, phone number, access control ("P" for public access and "M" for member, possibly with a "V" for visitor access), operator's name, operating times, and any special notes (including modem type if not V21 300 baud).

Systems outside Australasia are only listed if we have been informed that they are available to the public 24 hours per day.

Australian Systems

Micro Design Lab RCPM. (02) 663 0150. P. Stephen Jolly. 5pm-7am weekdays, 24 hours weekends.

MI Computer Club BBS. (02) 662 1686. MV Evan McHugh. 24 hours daily. Program downloading.

Sydney Public Access RCPM. (02) 808 3536. MV. Barrie Hall and David Simpson. 24 hours daily.

Prophet RBBS. (02) 628 7030. P. Larry Lewis. 24 hours daily.

TISHUG BBS. (02) 560 0926. MV. Shane Anderson. 7pm-7am weekdays, 24 hours weekends.

AUGABBS. (02) 451 6575. MV. Mathew Barnes and Andrew Riley. 24 hours daily.

AUSBOARD. (02) 95 5377. P. Daniel Moran. 24 hours daily.

Club-80 RTRS. (02) 332 2494. MV. Michael Cooper. 24 hours daily.

Omen I. (02) 498 2495. P. Ted Romer. 4.30pm-9am weekdays, 24 hours weekends.

Oracle. Has temporarily closed down. Previous number printed in Network News should be ignored.

Infocentre. (02) 344 9511. MV. 24 hours daily.

Dick Smith Electronics RIBM. (02) 887 2276. P. Ian Lindquist. 24 hours daily. Program downloading.

Sorcerer Users Group RCPM. (02) 387 4439. MV. John Woolner. 6prn-8am weekdays, 24 hours weekends. Ring-back system.

Date BBS (02) 550 1004. MV. Steven Williams. 9am-11pm weekdays, 24 hours weekends. Computer dating.

Keeboard TBBS. (02) 631 3282. P. Philip Keegan. 6pm-8.30am daily.

RUNX Unix System (02) 487 2533. MV. Mark Webster. 24 hours daily. Call (02) 48 3831 for system status. Also on (02) 48 3831 (V22) and (02) 487 1860 (V23).

Tesseract RCPM. (02) 651 1404. MV. John Hastwell-Batten. 24 hours daily.

Tomorrowland's DIRECT. (02) 411 2053. NV. Mike Kidson. 24 hours daily. Helpline: (02) 412 3909.

RCOM BBS. (02) 667 1930. MV. Simon Finch. 24 hours daily. For Commodore 64 users, software downloading to registered users only $20/year to Box 1542, GPO, Sydney 2001. Half duplex.

BERT. (02) 211 0855. P. Resource Data. 24 hours daily. V23 videotex.

Commboard. (02) 664 2334. MV. Graham Lee. 24 hours daily. For Commodore 64 users, membership $25/year to 199 Coogee Bay Road, Coogee 2034.

Newcastle Microcomputer Club RCPM RBBS. (049) 68 5383. MV. Tony Nicholson. 5pm-8.30am weekdays, 24 hours weekends. RBBS free to all, RCPM for members only — $4/year to PO Box 293, Hamilton, NSW 2303.

Canberra RBBS. (062) 88 8318. 24 hours daily.

Canberra IBBS (062) 58 1406. MV. 24 hours daily.

DSA-80 RTRS. (062) 41 4395. MV. Anonymous. 24 hours daily. Full access granted only to Canberra Micro 80 Users Group Inc and non-residents of Canberra.

MICOM CBMS. (03) 762 5088. MV. Peter Jetson. 24 hours daily.

Melbourne PIE. (03) 878 6847. P. Len Gould. 24 hours daily.

Sorcerer Computer Users Association CBBS. (03) 434 3529. MV. David Woodberry. 24 hours daily. Program downloading for members.

PC Connection IBBS. (03) 528 3750. Lloyd Borrett. 24 hours daily. IBM PC program downloading.

Omen IV. (03) 846 4034. Philip Westh. 24 hours daily.

Hisoft IBBS. (03) 799 2001. Richard Tolhurst. 24 hours daily. IBM PC program downloading.

Computers Galore IBBM. (03) 561 8497. Bob Cooban and Martin Scerri. 24 hours daily. IBM PC program downloading.

East Ringwood RCPM. (03) 870 4623. Mick Stock. 4pm-midnight. Monday-Friday ONLY.

C64-BBS. (03) 489 4557. MV. Alan Miles. 24 hours daily. Commodore 64 software up/downloading.

Microbee RBBS. (03) 873 5734. G. Forrest. 24 hours daily.

MicroPro BBS. (03) 568 8180. MV.

AM-NET. (03) 366 7055. MV. Peter Hallgarten. 24 hours daily. Membership $5/year.

National IBBS. (03) 818 1934. P. John Blackett-Smith. 5pm-9am. 24 hours weekends.

BUGM RCPM. (03) 500 0562. P. Sol Green. Midnight-6pm Monday-Saturday, Midnight-Midday Sunday.

Victorian Apple Bulletin Board. (03) 877 1990. Graham Willis. 24 hours daily.

Gippsland RCPM. Permanently off-line.

Mail-Bus. (051) 27 7245. M. Max Moore. 24 hours. Membership virtually essential. Write to PO Box 234, Newborough, Vic 3825.

MIN-NET. (054) 41 3013. MV. Mal Fields. 24 hours daily. Enquiries to (054) 43 2589 during business hours ONLY.

Software Tools RCPM. (07) 378 9530. Bill Bolton. 24 hours daily. CP/M, MS-DOS, Unix program downloading. V22 (1200 baud) only.

BEX II RCPM. (07) 395 1809. 24 hours daily.

Tomorrowland. (07) 286 2438. 24 hours daily.

BCUG. (07) 808 2125. 24 hours daily. Commodore users' group.

ACEA. (07) 341 0285. 24 hours daily. Commodore.

Brisbane Microbee RCPM. (07) 51 3582. 6pm-8am weekdays, 24 hours weekends.

Competron IBBS. (07) 52 9294. 24 hours daily.

HiTech C BBS. (07) 38 6872. 24 hours daily.

TI-BBS. (07) 263 6161. 7pm-6am weekdays only.

CAD-IBBS. (070) 51 3582. 6pm-8am weekdays, 24 hours weekends.

COCO-LINE. (075) 32 6340. 24 hours daily. Tandy Color Computer.

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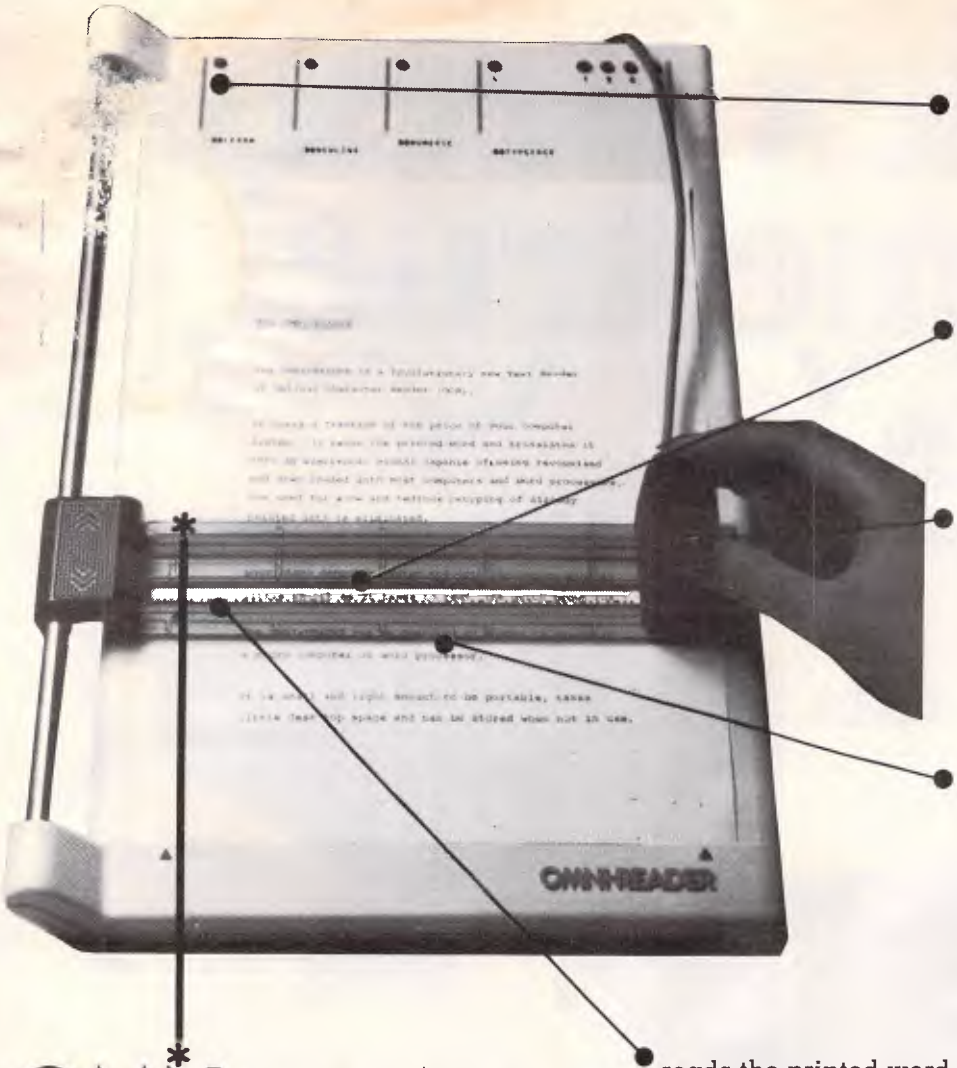

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Adelaide Micro Users Group BBS. (08) 271 2043. MV. 9am-9pm weekdays, 10am-10pm weekends and public holidays.

Computer Ventures CBBX. (08) 255 9146. Daniel Schumacher. 24 hours daily. NB: This number has been misprinted in recent issues — please ensure your own records are correct.

The Electronic Oracle. (08) 260 6686. MV. Don Crago and Grayham Smith. 24 hours daily. Program downloading. Membership $35/year to 12 Brentwood Road, Flinders Park, SA 5025.

Multiple BBS. (08) 255 5116. 24 hours daily.

Nexus. (08) 243 2477. 24 hours daily.

SAC64. (08) 382 4631. 24 hours daily. Commodore users' group.

Red Centre RCPM. (089) 52 8852. 24 hours daily.

Omen II. (089) 27 4454. Terry O'Brien. 24 hours daily.

Outback RCPM. (089) 27 7111. Phil Sampson. 24 hours daily.

Omen III. (09) 279 8555. Greg Watkins. 24 hours daily.

The Mouse. (09) 370 1855. Graeme Platt. 24 hours daily.

Computex. (09) 447 0522. Russell Stocks.

New Zealand systems

NZ Micro Club RBBS. 0011 64 9 762 309. Chris Cotton. 24 hours daily.

Software up/downloading. Type "help" to log in.

Attache RBBS. 0011 64 9 78 9084. 24 hours daily.

These listings are believed to be correct, but we welcome new information. Please mention whether you have first-hand knowledge of the systems you tell us about, or are simply passing on the information. Viatel users can send messages to Mailbox 063000030, users of RUNX and other systems on ACSnet can mail to stephenw@murdu, and letters may be sent to Steve Withers, C/- *Computer Publications*, 77 Glenhuntly Road, Elwood, Victoria 3184.

Overseas systems

SYSTEM	NUMBER	NOTES
North America		
SPACE Citadel	0011 1 206 839 4759	
Ckcms Citadel	0011 1 206 329 0436	
Eskimo North Minibin	0011 1 06 367 3837	
Conn-80	0011 1 212 441 3755	TRS-80 Color Computer
CLEO	0011 1 213 618 8800	Job vacancies
Mindstorm Network	0011 1 812 235 0908	Networked BBSs
South America		
CBBS Do Prado, Brazil	0011 55 11 813 2016	
CBBS Do Pinto, Brazil	0011 55 21 247 8440	
CBBS Do Otto, Brazil	0011 55 41 262 4743	
Forum 80, Brazil	0011 55 21 287 8844	
Sistema Samoa, Brazil	0011 55 11 853 6273	
Europe		
ELFA A8C-MONITOR, Sweden	0011 468 730 0706	Half Duplex
ABC-Banken, Sweden	0011 463 511 0771	
A8C-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
	0011 47 2 431 840	22Mb of public domain files
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		
BABBS Felixtowe	0011 44 394 276306	Apple Users' Group
BABBS TWO Basildon	0011 44 268 778956	Apple Users' Group
Blandford Board	0011 44 258 54494	
CABB	0011 44 631 3076	300/300 and 1200/75 baud
CBBS South West	0011 44 392 53116	
CBBS Surrey	0011 44 4862 25174	
Clinical Notes Online	0011 44 524 60399	
Computers Incorporated Newcastle	0011 44 207 543555	
Gnome At Home	0011 44 1 888 8894	V23,7 bits, even parity
Gosport Apricot BBS	0011 44 705 524 805	
Liverpool Mailbox	0011 44 51 428 8924	
Microweb TBBS	0011 44 61 456 4157	BBC Micro
NBBS Birmingham	0011 44 827 288810	
Africa		
Connection 80, Cape Town	0011 27 21 457 750	
TRShop, Cape Town	0011 27 21 5367	
Peters Computers, Johannesburg	0011 27 11 834 5134	

* 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.

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• 384k multifunction card standard	YES	NO	YES	NO
• 2 parallel/serial/calendar/clock/jstick ports standard	YES	NO	YES	NO
• Choice of 2 styles of keyboards	YES	NO	YES	NO
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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', 2nd floor, 215 Clarence Street Sydney 2000. Please keep your contributions as concise as possible. We will pay $10-$25 for any tips we publish. APC can accept no responsibility for damage caused by using these tips, and readers should be advised that any hardware modifications may render the maker's guarantee invalid.

OLD APPLES

Here is an idea that can make your Apple IIe or Apple IIc programs more applicable to earlier Apples. PEEK (64435) returns the ROM version number which is 6 only on Apple IIes and Apple IIcs. This can be sensed by an output routine which only converts lower-case to upper-case on Apple IIs and APPLE II+s (which do not have lower-case displays).

The following program connects a lower-to-upper-case machine code routine to the output vector only if it is running on an upper-case-only Apple. The machine code is stored in the REM at line 100 (type this line EXACTLY as shown with no space between the REM and the 'A') and this line must be the first line of the program. Line 110 senses the ROM version number and connects the routine if appropriate. Line 110 as listed only works in ProDOS; for DOS 3.3 replace line 110 with the following:

```
110 A2E = PEEK (64435) = 6:
IF NOT A2E THEN POKE 54,6: POKE
55,3: CALL 1002
```

Note that the machine code routine is disconnected at line 980, just before END. Enter the following, save it, and use it as a starting point for your programs.

K Lau

```
NEW
100 REMABCDEFGHIJKLMNOPQR
110 A2E = PEEK (64435) = 6: IF
    NOT A2E THEN PRINT CHR$(4)
    "PR#A$806"
120 REM
 --- PUT YOUR PROGRAM HERE ---
980 IF NOT A2E THEN PRINT CHR$(4)
    "PR#0"
990 END

CALL -151

0806: D8 08
0808: 48 29 7F C9 60 90 04 68
0810: E9 20 48 68 28 4C F0 FD

<Ctrl-C><Return>
```

SPLIT BAUD RATES

The new Telecom Viatel system and some other bulletin boards require split-baud rate operation. This means that the terminal transmits at 75 baud while the host transmits at 1200 baud. However, most computers do not support this type of operation, especially those in which the baud rate is not software controllable.

There does exist a solution however for those computers which have a Motorola 6850 based communications port. This chip has an internal register which can be used to divide the clock rate by 1, 16 and 64. If you set the hardware to transmit at 1200 baud while this register is set at divide by 1, you may change it under software to divide by 16, giving the desired transmit rate of 75 baud. The counter ratio register is located in bits 0 and 1 of the ACIA control register. If both bits are zero the clock is divided by 1, if bit 0 is set the clock is divided by 16, and if bit 1 is set the clock is divided by 64. Setting both bits resets all the registers in the chip. The registers should only be set for 75 baud at the moment of transmitting, otherwise the receive loop will not work and no interrupts will be generated. If you own a computer like the Apple in which the register is normally set to divide by 16, you will have to set it to divide by 1 and set the switches on the card for what would normally be 75 baud. It can easily be seen that setting it back to divide by 16 will achieve a rate of 75 baud while setting it to divide by 1 will increase the rate 16 times providing a speed of 1200 baud.

When changing these registers care should be taken not to disturb any other of the bits in the byte, as this will change the communication parameters. The simplest way to avoid this is to use logical AND and OR operations. It should also be noted that the use of these registers on your system may also enable you to use baud rates not normally supported. For further information on the 6850 ACIA refer to the Motorola M6800 programming reference manual, pages 2-6 to 2-8.

P Johnson

SPECTRUM PRINT USING COMMAND

This routine allows output to be formatted by specifying a number of character positions for an entire number, as well as a number of character positions for the decimal part. The function bears some resemblance to the Fortran F descriptor in the FORMAT command.

The formatting is performed recursively, and is performed up to eight times to allow for the magnitude of most numbers.

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The listing gives a small demonstration of an 8.4 format with eight character positions in total, four after the decimal point. The function has three arguments: T — the total number of characters to be printed (including the decimal point); A — the number of digits to come after the decimal point; and N — the number to be printed.

In the listing, the function comes after line 1000 and is called by a line of the form PRINT FN F$(T,A,N) where T, A and N are as previously described. The lines before 1000 give a simple demonstration of the routine.

K Finlay

```
10 REM FORMAT DEMONSTRATION
20 PRINT "1234567890"
30 FOR I = 1 TO 18
40     LET N = RND
50     PRINT FN FS(8,4,N)
60 NEXT I
70 STOP : REM END OF DUMMY PROGRAM

1000 REM           FORMAT FUNCTION.
1010 REM         COPYRIGHT K.A.FINLAY
1020 REM             APRIL 1985
1030 REM
1040 REM ROUND THE NUMBER TO A SPECIFIED NUMBER OF PLACES
1050 REM
1060 DEF FN R(X,A) = (INT ((X*10^A) + 0.5))/ (10^A)
1070 REM
1080 REM PUT A ZERO BEFORE THE DECIMAL POINT IF THERE ISN'T ONE.
1090 REM FOR INTEGER NUMBERS ADD A DECIMAL POINT.
1100 REM
1110 DEF FN IS(XS) = ("0" AND XS(1)=".") + XS + ("." AND VAL XS=
                     INT VAL XS)
1120 REM
1130 REM MOVE LEFT UNTIL DECIMAL POINT IS IN CORRECT PLACE. THE
     THREE LOGICAL EXPRESSIONS ARE MUTUALLY EXCLUSIVE.
1140 REM
1150 DEF FN AS(XS,T,A,N) = (XS AND (XS(T-A)="."1                    +
     (XS(2 TO)+ " " AND (XS(T-A)<> "." AND XS(1)= " ") )            +
     ("**********"( TO T) AND (XS(T-A)<> "." AND XS(1)<>" ") )
1160 REM
1170 REM MOVE RIGHT UNTIL ALL SPACES FILLED UP.
1180 REM
1190 DEF FN BS(XS,T,A,N) = (" " AND LEN XS<T) + XS
1200 REM
1210 REM RECURSIVE FORMATTER.
1220 REM
1230 DEF FN FS(T,A,N) =
      FN AS(FN AS( FN AS( FN AS( FN AS( FN AS( FN AS( FN AS(
      FN BS(FN BS( FN BS( FN BS( FN BS( FN BS( FN BS( FN BS(
      FN IS( STR$ ( FN R(N,A))),T,A,N),T,A,N),T,A,N),T,A,N),T,A,N)
      ,T,A,N),T,A,N),T,A,N),T,A,N),T,A,N),T,A,N),T,A,N),1,A,N)
      ,T,A,N),T,A,N),T,A,N)
1240 REM
1250 REM END OF FUNCTIONS.
```

PASCAL GREP UTILITY

This is the Unix GREP function written as a Pascal program in Turbo Pascal for the IBM PC. It should be easy to convert to Pascals for other machines. The GREP function allows you to search for the occurrence of a specific string in one or more programs and to display all occurrences of the string and where they appear on the screen.

Use is made of the windowing facility in Turbo Pascal but this can be avoided or omitted for other machines.

F Murphy

```
{=============================================================================}
{     GREP.PAS        WRITTEN BY F.P.MURPHY, CORK, IRELAND      30/01/1985      }
{                                                                             }
{  Searches  one  or more files for each occurance of a  specific  pattern,   }
{  distinguishing between uppercase & lowercase if necessary, and outputing   }
{  the complete line together with its line number to either the console or    }
{  printer.                                                                   }
{                                                                             }
{          Written for use on an IBM PC using TurboPascal and PCDOS 2.0.      }
{                                                                             }
{=============================================================================}

PROGRAM GREP;

TYPE
     string80        =    string[80];
     filestring      =    string[14];

VAR
     In_File         :    text;
     Out_File        :    text;
     NameArray       :    array[1..10] of filestring;
     OutFileName     :    filestring;
     Pattern         :    string80;
     InLine1         :    string80;
     InLine2         :    string80;
     Line_No         :    integer;
     Max_No_Files    :    byte;
     cvt2lc          :    boolean;
     No_Files        :    byte;
```

```
{=============================================================================}

FUNCTION LC(x : char): char;

BEGIN
     lc:=x;
     if(x<'Z') and (x>'A') then lc:= chr(ord(x)+32)
END;

{-----------------------------------------------------------------------------}

PROCEDURE LCASE(var x : string80);

VAR   i: byte;

BEGIN
     for i:= 1 to length(x) do x[i]:= lc(x[i]);
END;

{-----------------------------------------------------------------------------}

FUNCTION EXIST (filename : filestring) : boolean;

VAR   fil : file;

BEGIN
     Assign(Fil, Filename);
     {$I-} Reset(Fil); {$I+};
     EXIST := (IORESULT = 0);
END;

{-----------------------------------------------------------------------------}

PROCEDURE BEEP;
BEGIN
     Sound(900); Delay(200); NoSound; Sound(600); Delay(300); NoSound;
END;

{-----------------------------------------------------------------------------}

PROCEDURE INIT;

LABEL   B1;

VAR     ch   : char;
        y,i : byte;

BEGIN
     ClrScr; WriteLn('     GREP ===== Version 1A, 27/01/1985'); WriteLn;
     Max_no_files := 0;
     Repeat
B1:     max_no_files := max_no_files + 1; namearray[max_no_files]:= '';
        Write('Search file name (CR - Exit) ----------> ');
        y:= WhereY; ReadLn(namearray[max_no_files]);
        if (not EXIST(namearray[max_no_files]) and
           (namearray[max_no_files] <> '')) then begin
           GoToXY(60,Y); Write('UNKNOWN/INVALID FILE '); Beep; GoToXY(1,Y+1);
           max_no_files:= max_no_files - 1; GoTo B1;
        end;
        for i:= 1 to 14 do begin
        namearray[max_no_files][i]:= UpCase(namearray[max_no_files][i]);
        end;
      until (namearray[max_no_files] = '') or (max_no_files = 4);
      WriteLn;
      Write('Output file name ----------------------> '); ReadLn(OutFilename);
      Write('Pattern to search for -----------------> '); ReadLn(Pattern);
      Write('Case sensitive search (Y/N ?) ---------> '); ReadLn(ch);
      CVT2LC:= not(ch in ['Y','y']); If CVT2LC then LCase(Pattern);
      Assign(Out_file, OutFilename); Rewrite(Out_file);

END;

{=============================================================================}

BEGIN {MAIN}
      init;
      for no_files := 1 to (max_no_files - 1) do begin
        Assign(in_file, namearray[no_files]);  Reset(in_file);
        GoToXY(1,12); ClrEOL; Write('File : ',namearray[no_files]);
        Window(1,14,80,25); ClrScr; Beep; Line_No:= 0;
        While not EOF(in_file) do begin
            Line_No := line_No + 1; readLn(in_file, inline1);
            inline2:= inline1; if cvt2lc then lcase(inline2);
            If Pos(pattern,inline2) <> 0 then WriteLn(Line_No:5,    ,[80]);
        End;
        Window(1,1,80,25);
        End;
      Window(1,1,80,25); GoToXY(1,24);
END.

{=============================================================================}
```

BBC DIRECTORY CHANGER

This program is for those who need to frequently copy files between disks when all the files are in different directories. As the Acorn DFS does not allow the wild card symbols * and # to be used with the *RENAME command, changing all the files on a disk would mean typing a separate command for each file to be changed.

This program solves the problem by individually listing each file and its directory and then allowing the user to alter the directory of the file, even if the file is locked.

How it works:

Lines 100-190 are the heart of the program.

B?0 sets up the drive

B!1 points to a location in memory

B?5 number of parameters (track, sector, and so on)

B?6 specifies read (&53) or write (&48)

B?7 is the track

B?8 is the sector

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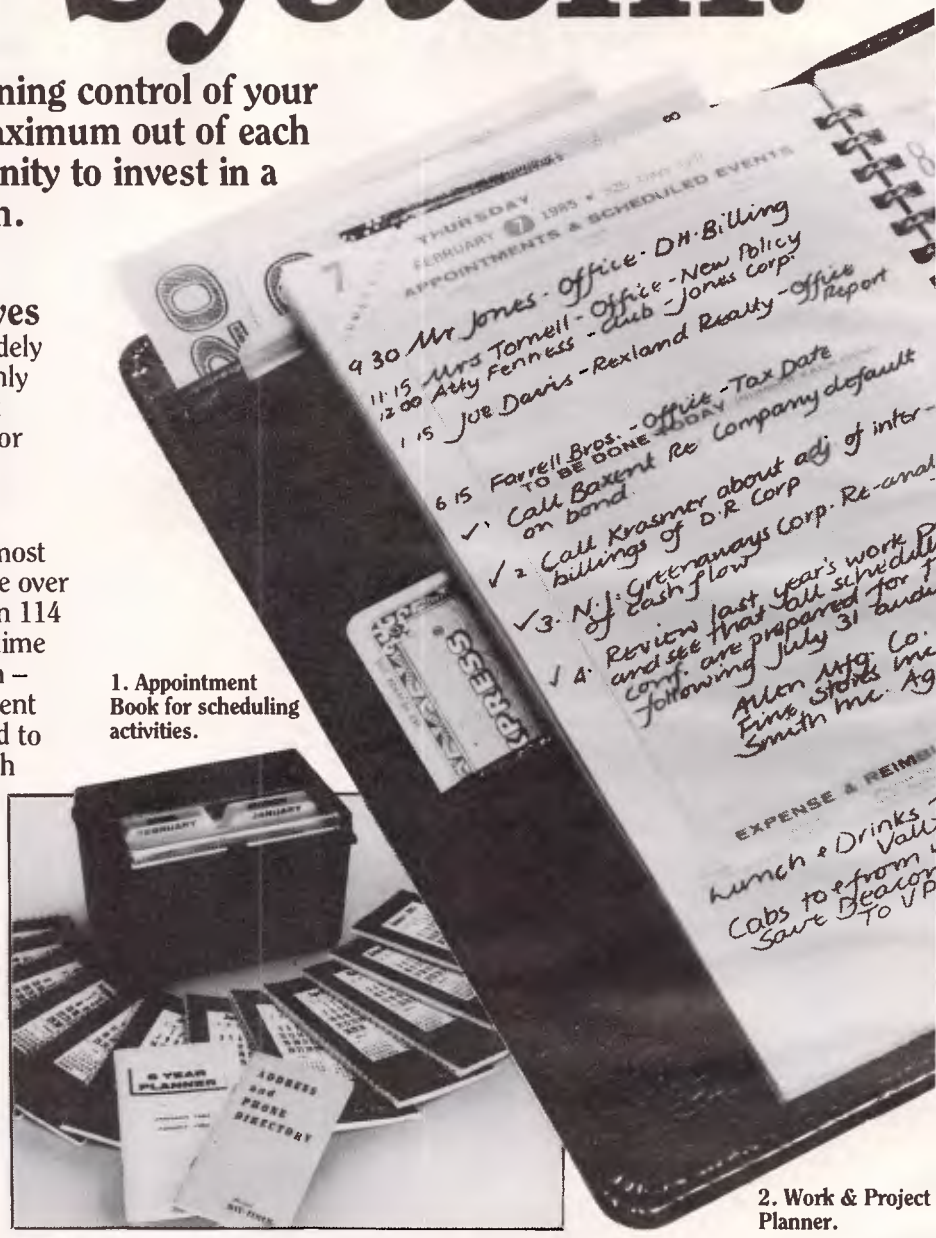

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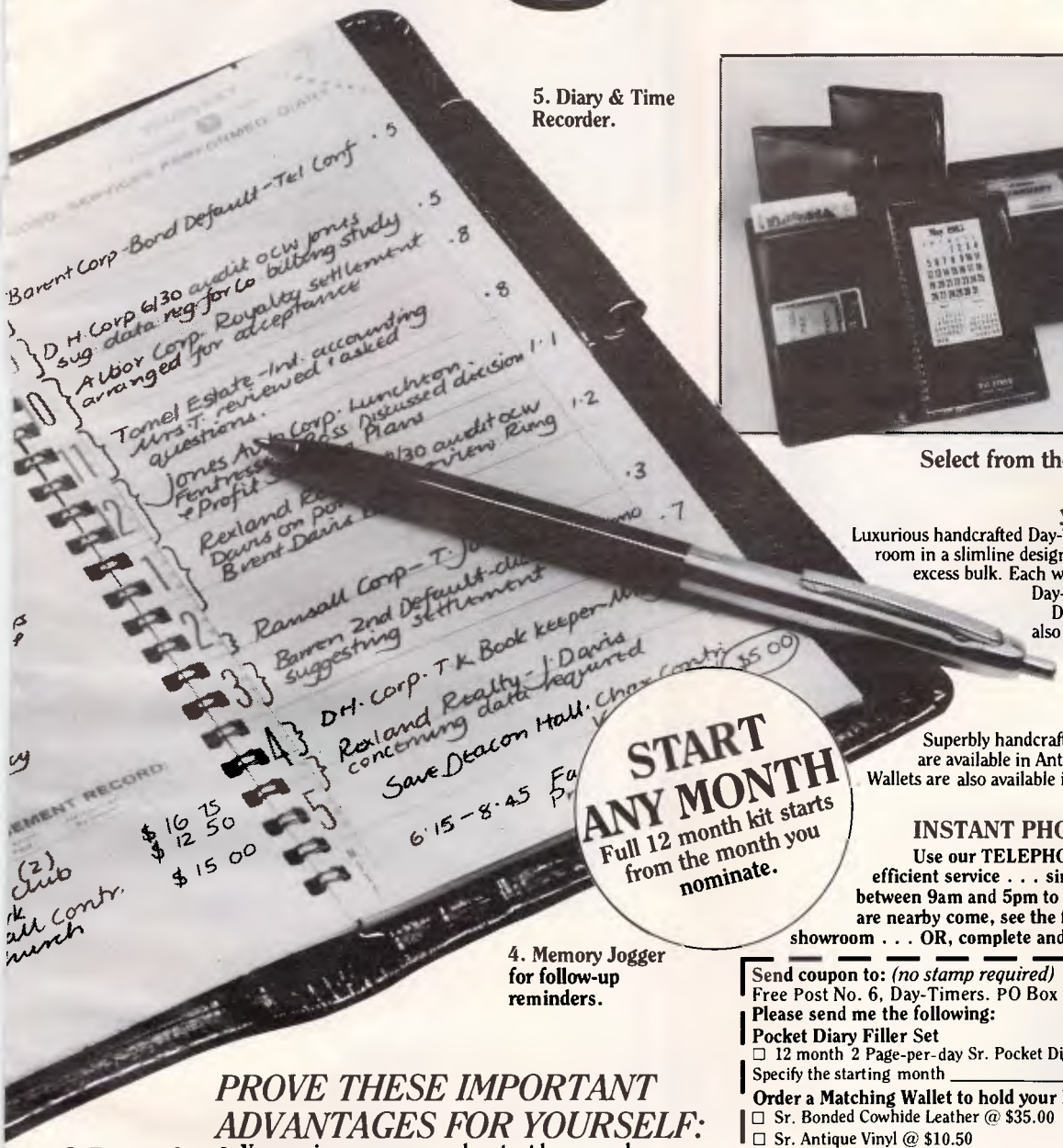

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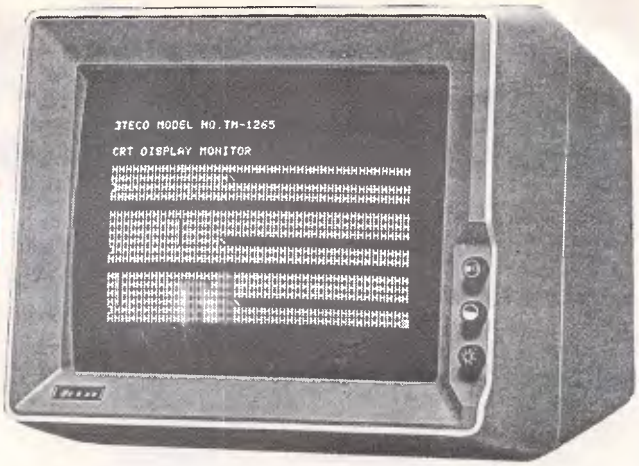

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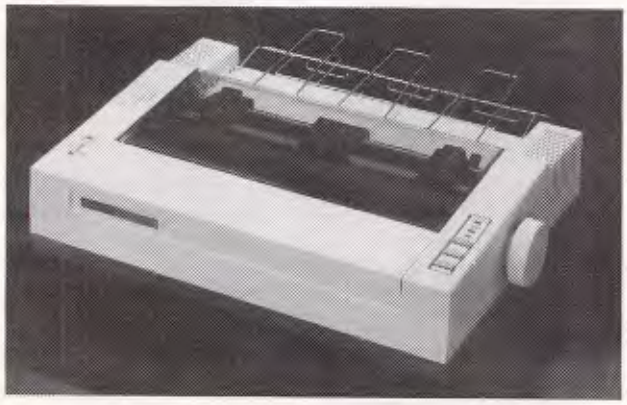

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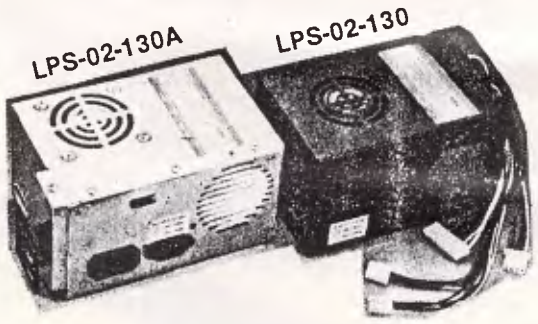

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B?9 specifies one sector to be read

Lines 210 to 320 print each file and its directory, and allow the user to alter the directory via the subroutine at 370. If the directory number is greater than &7E, the file is locked. To obtain the directory, subtract ?BO.

M Morgan

```
   10 REM ** DIRectory changer **
   20 REM ** by Meirion Morgan **
   30 MODE 3
   40 PRINT 'STRING$(79,"*")
   50 PRINT '"   DIRECTORY CHANGER FOR BBC MICRO (
 USED ON 8271 ) - BY MEIRION MORGAN "
   60 PRINT 'STRING$(79,"*")
   70 INPUT TAB(0,8)"Which drive ",drive
   80 IF drive<0 OR drive>3 OR INT(drive)<>drive G
OTO 70
   90
  100 DIM B 12:DIM H 255
  110 A%=&7F:X%=B MOD 256:Y%=B DIV 256
  120 B?0=drive
  130 B!1=H
  140 B?5=3
  150 B?6=&53
  160 B?7=0
  170 B?8=0
  180 B?9=&21
  190 CALL&FFF1
  200
  210 CLS:yes=0:B?6=&4B:name$=""
  220 FOR files=14 TO 254 STEP 8:IF (H?files)>&7E
OR (H?files)<&20 GOTO 330
  230 FOR peek=files-6 TO files
  240 name$=name$+CHR$(H?peek)
  250 NEXT peek:dir=H?(files+1)
  260 IF dir>&7E dir=dir-&80:yes=1 ELSE yes=0
  270 dir$=CHR$(dir)
  280 PRINT dir$;" . ";name$;
  290 IF yes=1 PRINT ;" Locked . Change ? "; ELSE
PRINT ;" Change ? ";
  300 c$=GET$:IF INSTR("YyNn",c$)=0 GOTO 300 ELSE
PRINT ;c$;
  310 IF INSTR("Yy",c$) GOSUB 370 ELSE PRINT
  320 name$="":NEXT files
  330 PRINT '"********** END OF PROGRAM ********
**"
  340 CALL&FFF1
  350 REPEAT UNTIL FALSE
  360
  370 PRINT ;' To directory ? ";:d$=GET$
  380 PRINT ;d$;:byte=ASC(d$)
  390 PRINT ;" Lock ? ";:lock$=GET$
  400 IF INSTR("YyNn",lock$)=0 GOTO 390 ELSE PRINT
 ;lock$
  410 IF INSTR("Yy",lock$) byte=byte+&80
  420 H?(files+1)=byte
  430 RETURN
>
```

TI SOUNDS

The noises −4 and −8 vary the tone of the third tone specified (pg II−85 Users Reference Guide) in a CALL SOUND statement.

I have noticed that by using −4 and −8 any noise can be created. Where −4 can create noises −1, −2 & −3 and where −8 can create noises −5, −6 & −7.

The following program demonstrates this by using 129 different noises created by −4 to form the sound of an aeroplane taking off.

```
100 FOR T = 110 TO
    4000 STEP 30 :: CALL
    SOUND (−100,110,30,
    110,30,T,30,−4,0) ::
    NEXT T
110 CALL SOUND
    (−100,110,30,110,30,T,
    30,−4,0) :: GOTO 110
```

Hence 89246 noises (not tones) are available on the TI, and you can hear all of them, none are out of the range of hearing. 44623 of those noises are generated by −4 and another 44623 noises are generated by −8.

The following program will let you hear every noise the TI is capable of: (if you have the willpower to listen to them all).

```
100 FOR T = 110 TO
    44733 :: CALL SOUND
    (−100, 110,30,110,30,
    T,30,−4,0) ::
    NEXT T
110 FOR T = 110 TO
    44733 :: CALL SOUND
    (−100,110,30,110,30,T,
    30,−8,0) :: NEXT T
```

The first couple of sounds you won't be able to hear because −100 duration doesn't give enough time for it to be activated.

P Bruce

. . . /RAM . . .

If you have a copy of Prodos and an Apple IIc or Extended IIe, then you have a RAM disk.

The RAM disk uses up the auxiliary memory. This gives you a 64k (128 blocks), fast, silent, and convenient RAM disk.

If you know all about prefixes then you should have no trouble using it. You boot up a disk that is Prodos formatted and when you want to access the RAM disk, you do a PREFIX / RAM. Now if you do a CAT or CATALOG, you will be given the contents of your RAM disk. /RAM operates just like a normal disk and performs all the normal Prodos functions. To get out of /RAM you do a PREFIX /.

You might be able to use /RAM with a 64k machine, but I am not sure of this.

S De Silva

VZ EDITOR/ ASSEMBLER TIPS

To enter hi-res mode (mode (1)) in assembler set bit 3 of address 6800 H(26624) to 1. For example:

```
LD A,(6800H) ; Load A with
  content of 6800H
OR 8 ; Set Bit 3 of A to 1
LD (6800H),A ; Load new
  information back
LD (783BH),A ; into 6800H
  and 783BH
```

If you want to change the background colour to buff (normally it's green), instead of [OR 8], as above, change that to OR 24 (setting bit 4 to 1).

(783BH) is the copy of (6800H). It is important to load A into (783BH) if you want to use the sound driver routine in ROM, because the SDR does a Read (783BH) to see what mode you are in, and loads that into (6800H).

To Call the sound driver routine

```
LD HL, Frequency
LD BC, Duration
Call 345CH
```

Before returning back to the Editor/Assembler use the program below to clear bit 3 of (783BH). If you don't, the screen will change to mode (1) (hi-res) when you use [Tape Save] in the Editor/Assembler.

```
LD A,(783BH)
AND 247
LD (783BH),A
```

T Lam

CLEAN HEADS

Normally when cleaning the 1541 drive the user is forced to keep the drive read/write heads in constant movement by either loading/saving while the cleaning disk is inside the drive, consequently the user must keep typing load/save to move the heads — in order to clean them thoroughly.

This short program eliminates this repeated load/saving and makes drive cleaning a much easier task. It spins the disk while cleaning the drive and will

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move the read/write head back and forth from track 1 to track 35. Because of this the potential of your cleaning disk will be increased as the read/write head will be more thoroughly cleaned; it will also provide a back and forth cleaning motion as well as that of the motor spinning. If you have a drive with an address other than 8, change line 5 to your drive number. Also you can vary the length of the cleaning by altering the loop in line 20 (each pass through takes approximately 10 seconds).
J Soo

```
5 u=8
10 open 15,u,15
15open2,u,2,"#"
20for j=1to4
30 print#15,"u1:2 0 1 1"
40 print#15,"u1:2 0 35 1"
50 next j
60 input#15,a$,a$,a$,a$
70 close 2: close 15
```

'64 SPLIT BORDER

The following routine allows the border to be split into two colours. This is achieved by using a raster interrupt to change the colour of the border at a specified position down the screen. Simply type the Basic loader in and you will be prompted as to where to change the colour down the screen (from 0 to 255), 50 being the top of the text screen, and which colour you want on the top and bottom. If you wish to change the border in direct mode after you have already run the program, POKE 2 with where you want the border to change, POKE 3 with the colour you want at the top and POKE 4 with the colour you want at the bottom.
J Pucci

```
10 REM  MULTI-COLOUR BORDER
20 INPUT"[CLR][ROW NUMBER FOR
   CHANGE ?(0-255)";SP
30 INPUT"TOP COLOUR ?(0-15)";T
40 INPUT"BOTTOM COLOUR ?(0-15)";B
50 CHK=0:FORA=828TO893:READB:
   CHK=CHK+B
55 POKEA,B:NEXT
70 IFCHK<>7206THENPRINT"[CLR][DOW
   N][RGHT]DATA ERROR":END
90 SY5828:POKE2,SP:POKE3,T:POKE4,B
120 DATA120,169,88,141,20,3
130 DATA169,3,141,21,3,169
140 DATA129,141,26,208,169,27
150 DATA141,17,208,169,127,141
160 DATA13,220,88,96,169,1
170 DATA141,25,208,166,4,160
180 DATA0,173,18,208,197,2
190 DATA176,4,166,3,164,2
200 DATA142,32,208,140,18,208
210 DATA173,13,220,74,144,3
220 DATA76,49,234,76,188,254
```

MEMOTECH CHARACTER ROTATION

Using the Memotech's user-defined characters, any or all of the character set can be easily rotated through 90 degree steps. The principle involves reading each selected character's 8x8 bit pattern with the GR$ command and then using this pattern to re-define the character.

Character rotation requires the use of a graphics screen. However, once characters are rotated they can also be printed on a text screen.

Listing 1 illustrates the use of the four arrow keys to rotate each character of an operator-entered string. A new string can be entered at any time with the HOME key.

Listing 2 rotates all upper case characters in four 90 degree steps and shows the effect on the screen. Lower case and/or numeric characters can also be rotated by changing the range of ASCII values in Line 180. Lines 170 and 250-290 print the screen to a dot matrix printer capable of bit image printing.

Program listings with rotated characters are difficult to read. The normal —upright— character set can be restored at any time by pressing (in turn) ESC "B" "0".
R Potter

```
5 REM  Character Rotation Demonstration No 1

10 DIM A(8): VS 4

20 CLS : INPUT "  ENTER STRING  ";S$

30 LET L=LEN (S$)

40 CLS : PRINT "  ENTER DIRECTION"

50 LET K=ASC(INKEY$)

60 IF K=26 THEN  GOTO 20 ELSE  IF K=11 THEN  LET
   D=4 ELSE  IF K=25 THEN  LET D=1 ELSE  IF K=10
   THEN  LET D=2 ELSE  IF K=8 THEN  LET D=3 ELSE
   GOTO 50

70 FOR N=1 TO L: LET W=0

80 CSR 7,10: PRINT MID$(S$,N,1)

90 FOR M=1 TO 8

100 LET P$=GR$(64-M,111,8): LET A(M)=ASC(P$)

110 NEXT

120 GENPAT 1,129,A(1),A(2),A(3),A(4),A(5),A(6),
    A(7),A(8)

130 CSR 7,10: PRINT CHR$(129);

140 LET W=W+1: IF W<D THEN  GOTO 90

150 CSR N,23: PRINT CHR$(129);

160 CSR 30-N,15: PRINT CHR$(129);

170 CSR 22,N+3: PRINT CHR$(129);

180 CSR 4,20-N: PRINT CHR$(129);

190 NEXT

200 GOTO 50
```

Listing 1

TJ'S WORKSHOP

```
5 REM   Character Rotation Demonstration No 2
10 DIM A(8): VS 4: CLS
20 LINE 4,2,252,2: LINE 252,2,252,189
30 LINE 252,189,4,189: LINE 4,189,4,2
40 LINE 19,20,236,20: LINE 236,20,236,172
50 LINE 236,172,19,172: LINE 19,172,19,20
60 LET M$="MEMOTECH COMPUTERS": LET L=LEN (M$)
70 CSR 7,1: PRINT M$
80 GOSUB 180
90 FOR P=1 TO L: CSR 1,20-P: PRINT MID$(M$,P,1);:
   NEXT
100 GOSUB 180
110 FOR P=1 TO L: CSR 25-P,22: PRINT MID$(M$,P,1);:
   NEXT
120 CSR 2,20-P
130 GOSUB 180
140 FOR P=1 TO L: CSR 30,P+2: PRINT MID$(M$,P,1);:
   NEXT
150 GOSUB 180
160 CSR 7,10: PRINT M$;
170 IF INKEY$<>"P" THEN  GOTO 170 ELSE  GOTO 250
180 FOR N=65 TO 90: CSR 7,10: PRINT CHR$(N)
190 FOR M=1 TO 8
200 LET P$=GR$(64-M,111,8): LET A(M)=ASC(P$)
210 NEXT
220 GENPAT 0,N,A(1),A(2),A(3),A(4),A(5),A(6),A(7),A(8)
230 NEXT
240 RETURN
250 LPRINT CHR$(27);"3";CHR$(8)
260 FOR Y=191 TO 0 STEP -8
270 LPRINT CHR$(27);"K";CHR$(255);CHR$(0)
280 FOR X=0 TO 255: LET A$=GR$(X,Y,8)
290 LPRINT A$;: NEXT : LPRINT : NEXT
300 GOTO 300
```

Listing 2

Sample screen dump

SCREENTEST

Personal Consultant

Is Texas Instruments' Personal Consultant a useful tool for building an expert system? Mike Liardet evaluates this specialist package for the Professional Computer range.

In general, computers compete with humans on dull, unimaginative and repetitive tasks. But there has been a recent spate of activity, in the field of 'expert systems', which has led some industry observers to believe that this state of affairs will not last much longer.

An expert system is a computer program which can substitute for a human expert, especially in activities involving knowledge or reasoning ability. If the intensity of expert system press coverage is an indication, then there should be many human experts currently feeling very nervous about their jealously-guarded monopolies on skill and expertise.

A recent expert systems arrival is a Texas Instruments (TI) product called Personal Consultant. Expert systems products fall neatly into two categories: the expert systems themselves, and the systems to build them. The majority of products to date are in the latter category, as is Personal Consultant. It is a specialist tool for building expert systems on personal computers, currently restricted to the Texas Instruments Professional Computer range.

Personal Consultant is a commercialised version of an expert system builder called E-Mycin which was developed at Stanford University, California. Although expert systems have only recently become widely known, Stanford has been working in this field for 20 years. E-Mycin is only one of many developments at Stanford, all emanating from a pioneering project of the mid-Sixties — a system called Dendral, which was expert at deriving chemical structures.

Overview

Personal Consultant is supplied as a ring-bound manual with four disks. The programming language IQ-Lisp is required to run it, and the review system included this — another manual with a single diskette. It is not strictly necessary to be greatly familiar with Lisp, or IQ-Lisp in particular, in order to use the system. However, it does help to know something of Lisp, and in the long-run, to get the best out of Personal Consultant it will probably be necessary to revert to Lisp for some activities.

'Personal Consultant organises its knowledge in a "context tree" . . . a convenient way of dividing up the problem domain.'

The software runs on a Texas Instruments Professional Computer with a 10Mbyte Winchester disk and a minimum of half a megabyte of RAM. The Professional Computer is a rather quaint machine as it looks like an IBM PC, runs MS-DOS, works with PC format disks, but otherwise has a very low level of software compatibility. Conversely, some of the Professional Computer software, including Personal Consultant and IQ-Lisp, will not run on the IBM. The word from TI is that this state of affairs may change in the near future, and it is to be hoped that it does — there is little mileage for anyone; TI or otherwise, in trying to go it alone with software and hardware which is only superficially compatible.

Personal Consultant is intended to be used in the first instance by an expert who may spend some considerable time and effort in building up a knowledge base (database) containing a good deal of his skill, expertise and judgement. Following this, the knowledge base can then be available for advice sessions with non-expert end-users who would otherwise need to consult the human expert.

There are two very different classes of Personal Consultant user: the expert who builds the knowledge base; and the ordinary user who uses it. These two types of user each employ a different Personal Consultant module: the 'builder program' for the expert and the 'client program' (or 'knowledge engine') for the end-user. These two programs can be thought of as being quite distinct — the only thing they have in common is that they both access the knowledge base, but in each case for quite a different purpose.

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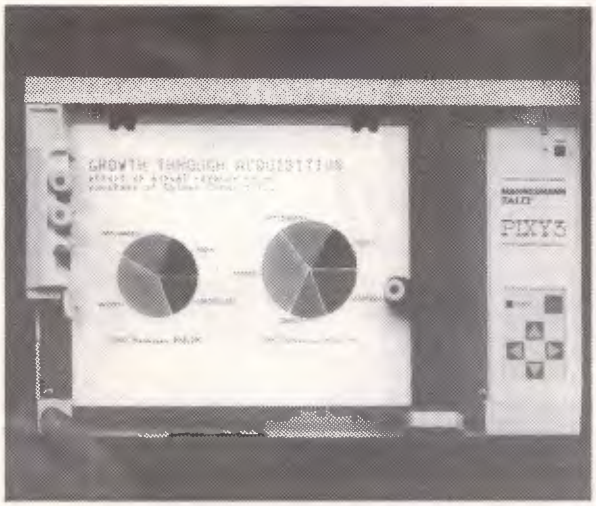

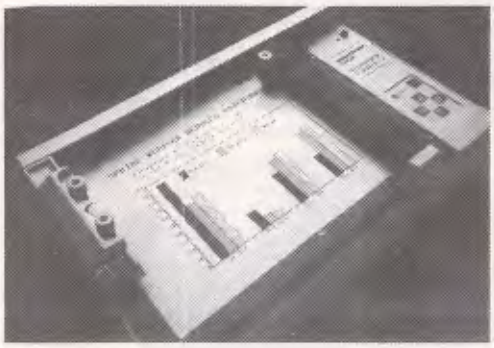

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nal workings of Personal Consultant. He arrives at the keyboard with a problem, answers the questions generated by the knowledge engine, and is then given the answer. He obviously needs to know the necessary keyboard procedures, and may wish to ask why the answer was given, or why certain questions were asked, but can otherwise remain completely ignorant of the knowledge base structure and the intricacies of the knowledge engine, and so on.

Clearly the expert needs a much deeper understanding of Personal Consultant. He needs to be able to encode his knowledge into the knowledge base, test it and correct it, and organise the format of advice sessions for the end-user. The key issue is that he should have sufficient understanding of the general structure of a Personal Consultant knowledge base and how the knowledge engine uses it, in order that he can phrase his knowledge so that it can be entered into Personal Consultant. If he is not a computer expert, he is likely to find it too difficult to work directly with the builder, and would instead use a specialist 'knowledge engineer' as an intermediary.

Personal Consultant organises its knowledge in a 'context tree', which is a convenient way of dividing up the problem domain. For example, part of a context tree for car fault diagnosis may look like Fig 1. In this example, the 'root context' of the tree is Car Fault Diagnosis (yes, the tree is upside down), and it has 'sub-contexts': engine, transmission and electrical. These in turn have their own sub-contexts, and so on. The advantage of using the context tree is that it is possible to divide the problem area into small, manageable 'chunks', which can be encoded in isolation. Somewhere at the 'tips' of the tree there will be contexts for Starter Motor and Fuel Pump, which are sufficiently simple to be dealt with without further breakdown.

There is nothing absolute about the context tree for a given problem, and different experts in the same domain may develop completely different context trees. For example, an alternative to Fig 1 might divide car fault diagnosis into Broken Down, Running Badly and Minor Ailments. (An RACV mechanic might see the domain this way, in contrast to a garage mechanic.) For simple problems the context tree need not really be used — the whole problem area can be dealt with in a single context (the root context), which has no sub-contexts.

The context tree provides the overall framework and structure for the knowledge base. Attached to each context there are a number of 'parameters' and 'rules', together with some control information.

The parameters are values that are associated with the particular context: for example, a Starter Motor context might have parameters concerning 'type of starter motor', 'status' (OK, repairable, replace), and so on. In some instances, these parameters may be set directly from values entered by the user. The type of starter motor would probably be directly determined by a visual inspection, and so would be asked for directly.

If a parameter cannot be determined by a direct entry from the user, then it is determined by using the rules. The 'status' of the starter motor might be determined by rules such as:

IF belching smoke and sparks
OR completely dead
THEN status is replace

IF it's a bit squeaky
THEN status is repairable

IF status is (otherwise) unknown
THEN status is OK

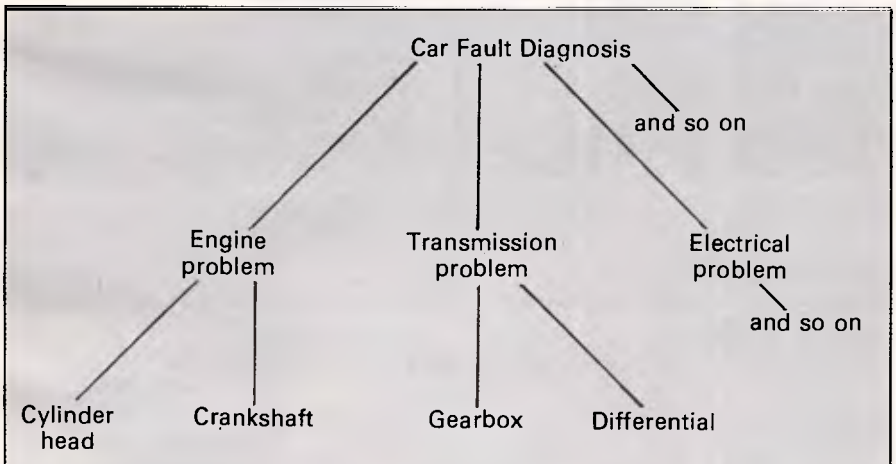

Fig 1 Part of a possible context tree for car fault diagnosis

Personal Consultant's knowledge engine uses a technique called 'backward chaining' when it needs to use rules to determine a parameter value. It looks for rules whose THEN part appears to match the parameter whose value is being sought; it then tries to find the value of the parameters in the IF part. This may involve looking at further rules or asking for values directly from the user, or a mixture of both.

For the rules, attempting to discover the status of the starter motor would generate questions to the user on smoke, sparks and squeaks until the status could be satisfactorily derived. Failing that, the third rule introduces a Personal Consultant trick of the trade — essentially it says that if nothing can be found to be wrong with the starter motor, then assume that it's OK. Notice that 'status' appears in both halves of the rule. This is 'self-referencing', and Personal Consultant will only use rules of this type if all else fails.

There are various ways in which a context's control information comes into play. A simple one occurs when the knowledge engine, in trying to derive the parameters for one context, has to drop down a level of detail to a sub-context. For example, when working in the Transmission Problem context (Fig 1) it may have derived that there is a transmission fault, but then have to consider the transmission components one by one in order to determine, say, the 'component to be fixed' parameter. Is it the gearbox or differential, and so on.

One type of context control information makes it possible to specify that a context can only be considered if the user says so. If the gearbox context were of this type then the user would first be asked: 'Do you want me to consider the gearbox?' in the middle of analysing his transmission problems, and if he said 'no', then the gearbox would be ignored. This could save him the bother of answering a lot of tedious questions about it, if for some reason he already knew there was nothing wrong with the gearbox.

In some instances, an expert's knowledge may not be completely precise. For example:

IF patient is sneezing
AND has a slight temperature
AND has a sore throat
THEN PROBABLY has a cold

Typically, experts form these 'rules of thumb' when their domain knowledge is imprecise or incomplete. This may happen either due to personal ignorance, or the need to save time (both theirs and the end-user's), or simply because their domain of expertise has not become sufficiently developed to provide a precise

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explanation. In the above example, who really knows all the mysteries of the common cold?

Personal Consultant can handle imprecise rules, formulated by an expert, by allowing 'certainty factors' to be attached to rules. A certainty factor can range between −100 and 100: 100 means that the conclusion of the rule (after the THEN) is definitely true when the hypotheses (after the IF) are: −100 means the conclusion is definitely false if the hypotheses are definitely true. Inbetween values indicate less decisiveness in the conclusion. Personal Consultant also substitutes words such as 'definitely', 'probably', and so on, for the numeric values, and these are usually simpler to understand.

The user can also attach a certainty factor to the answers he enters directly. He might record 100 for loud and regular sneezing, −100 for none at all, and 50 for irregular sneezing where he does not want to indicate complete certainty about the symptom. Although there is no compulsion to use the facility, it should be noted that this can be a bad technique for building an expert system, as in order to work properly, it relies on both expert and end-user attaching the same probabilities or meanings for the same situation, which is highly unlikely.

Personal Consultant uses complex mathematics to manipulate the probabilities, but I won't go into detail here. Generally, if the hypotheses of a rule have been deduced or entered with some uncertainty, then the conclusion will be even less certain. Following from this, Personal Consultant has built-in facilities for ignoring the very woolly conclusions that do not really say anything. Readers who are familiar with Bayesian statistics should note that Personal Consultant does not use Bayes Theorem, but an *ad hoc* system which is reported to be as effective in a consultation, but more simple for the builder.

In use

It is relatively easy to install Personal Consultant. A hard disk system is necessary, and it is simply a matter of using the MS-DOS COPY facility to transfer the contents of the supplied disks onto the hard disk. There are five disks containing IQ-Lisp, sample knowledge bases, facilities for converting standard E-Mycin knowledge bases into Personal Consultant format, and two copies of the Personal Consultant software. These latter disks incorporate a copy-protection scheme — the files are freely copiable, but the software will not run unless one of these disks is present in the computer.

It is possible to customise various features of Personal Consultant, but this is achieved by tinkering with IQ-Lisp so is not to be recommended for first-time users.

When the files have been copied across, a batch file can be executed to load IQ-Lisp and the Personal Consultant code, and then to start executing it. This takes several minutes and is accompanied by a number of cryptic messages, then the screen clears to a standard Personal Consultant menu display. This first menu offers the option to load whatever knowledge bases happen to be on the current disk drive, or to create a new knowledge base, or to quit.

A consultation

To gain some familiarity with Personal Consultant, it is best to start working with an existing knowledge base. Regrettably, the demonstration disk only offers three, one of which is the tutorial example used throughout the manual. This example is concerned with advising on whether to lease or buy an asset.

If the lease/buy knowledge base is selected, it is loaded from a disk and the master menu is then displayed. From this menu, the major Personal Consultant activities can be selected. The first option is Go, which starts the knowledge engine, resulting in a consultation with the user based on the knowledge base just loaded.

'Personal Consultant is intended to be used in the first instance by an expert who may spend some considerable time and effort in building up a knowledge base . . . containing a good deal of this skill, expertise and judgement.'

The lease/buy knowledge base uses just two contexts and approximately a dozen rules and parameters, but can result in quite an extensive consultation (see Fig 2). The consultation itself is not presented in the 'glass-teletype' fashion shown in Fig 2. Instead, Personal Consultant uses a windowed approach — the top area is used for titles and general prompts, the middle is used for data entry or menu selection, and the bottom identifies the currently active function keys. As each question is asked, the previous question and answer is cleared. If only a limited number of responses are necessary, a menu is presented. This is frequently the case when a yes/no response is needed, or when good/fair/poor responses are required as in the example presented here.

It can be seen that the dialogue is not completely smooth and natural. For example, in question one ASSET-1 is the internal name of the root context, but this fact does not hold a great deal of meaning for the ordinary user. Having stated that the asset being considered is a com-

The following is a demonstration system which reflects a part of a lease/buy/finance decision support system.
1) What is the asset that you are considering for ASSET-1?
COMPUTER
2) How do you describe your current credit rating (Good, Fair, Poor)?
FAIR
3) When you go to borrow money, does the lender check on outstanding leases you have?
YES
4) How would you describe your cash reserves (Good, Fair, Poor)?
FAIR
5) In your business, do you need to maintain larger-than-average cash reserves to maintain larger-than-average cash reserves in order to take advantage of unexpected opportunities?
NO
Conclusion: since experience shows that buying is almost always cheaper than leasing, and since the special cases in which leasing offers an advantage do not seem to apply in your case, buy the asset.
6) Would you care to analyse the financing for ASSET-1?
NO
Recommendation: my recommendation is: buy the asset
Payment on the asset for ASSET-1 is: None

Fig 2 Sample consultation with Personal Consultant's lease/buy demonstration advisor

```
1.  Premise of rule002:
($AND ($OR (SAME CNTXT CANNOT-BORROW)
     (SAME CNTXT PRESERVES-CREDIT)(SAME CNTXT PRESERVES-CASH)))
2. Action of rule002:
(TEXT NIL (TEXTAG TXTG1)) TALLY 1000) (CONCLUDE CNTXT BUY
     F TALLY 1000))
3. Type of TXTG1:
TEXTAG
4. Trans of TXTG1:
(lease the asset)
```

Fig 3 A small fragment of the dialogue to build the lease/buy knowledge base

puter, the word is never mentioned again. It would be preferable if subsequent references to ASSET-1 could be replaced by 'computer', but this does not appear to be easy to arrange in Personal Consultant.

Apart from simply answering the questions, there are a number of different actions available to the user during a consultation. At the touch of a function key it is possible to ask why a question is being asked, and how a particular conclusion was reached. This facility sounds better than it really is, as unless the user is well-versed in the ways of Personal Consultant, he will make little sense of the system's replies.

At any time in a consultation, it is possible to return to the previous question and change the answer given. Unfortunately the previous reply is overwritten by the next question, and in any case it is not possible to go back more than one question. Nonetheless, the facility can be useful for correcting slip-ups at the keyboard; without it, the only alternative would be to go back to the beginning and answer all the questions again. This is also necessary to correct a mistake made earlier than one question previously.

The final question in the consultation is asking whether Personal Consultant should enter the finance context, where repayments can be calculated. In this instance, many finance contexts can be arbitrarily created as sub-contexts of the root asset context, each considering different types of finance option. In the consultation given, zero finance contexts are created.

From the master menu there are other facilities which may be of use to the ordinary user. One of these is the ability to 'record' the dialogue. If this option is selected, the knowledge engine is run in the normal way but all questions, answers and prompts are remembered. At the end of the advice session they can be written to a file, from which they can be played back at any time using the master menu Playback option.

```
If      1) your credit is too low to get a loan, or
        2) this lease does preserve your credit rating, or
        3) this lease does preserve your cash reserves
Then    1) it is definite (100%) that my recommendation is lease the
           asset, and
        2) it is definite (100%) that determination to lease or buy the
           asset is F.
```

Fig 4 An example of the fragment of knowledge base created in Fig 3

It would be unfortunate if this dialogue dissuaded users who are really familiar with the domain. Clearly it contains a number of howlers, and it should be said that TI could have chosen a better knowledge base to demonstrate its product. For example, in question five, the system should ask the user for his cash reserve requirements, and so on, and then reach its own conclusion about whether this is larger than average. This type of thing could easily be put right by a real expert who knows what 'average requirements' mean — obviously the end-user does not.

The knowledge-builder

The master menu contains several options which are concerned with the tasks of entering, testing or modifying knowledge. As has already been pointed out in the overview, the knowledge base for Personal Consultant is based on a tree-structured framework of contexts which have parameters, rules and control information attached. The main menu has specific options for creating, deleting or changing each of these components. In addition to the end-user facilities, it also features options for debugging, and for creating Lisp code, plus other more complex facilities.

It is not possible to give a full run-down of Personal Consultant's powerful knowledge-building facilities here, but I'll show a randomly-chosen fragment of the dialogue involved in building the lease/buy demonstration advisor. This should dispel any illusion that a non-programming expert can easily set up the knowledge base himself (Fig 3).

One of the key features of Personal Consultant is that it uses short internal identifiers for the parameters, and so on, but can also expand them for printouts. Therefore, although Fig 3 looks very complex, when the knowledge base has been set up and expansions specified for all the identifiers, it can be neatly and clearly printed out (Fig 4).

Although Personal Consultant does offer some help with rule entry in the form of an abbreviated rule language, you should be warned that it can only print out, not understand the text of Fig 4. Bearing in mind the difference in the two figures, this is an important point which artificial intelligence researchers seem reluctant to emphasise in articles on expert systems (see *Byte*, April 1985, page 303 for a good example of this).

Conclusion

I have given an overview of Personal Consultant and attempted to show what it would be like to use, both from the viewpoint of the expert and the end-user. However, Personal Consultant is a very complex system, and inevitably some valuable features and facilities have been omitted. To summarise the omissions, it can safely be said that Personal Consultant is very powerful, and for flexibility and utility it is likely to compete very well with any other expert system currently available.

But to introduce a note of caution: in common with all other expert system builders, Personal Consultant particularly favours certain specific problem areas and not others. In Personal Consultant's case it is invaluable for building systems for diagnosis, guidance and decision-making, but it should be remembered that there are other tasks performed by experts, for example spatial reasoning and teaching, to name but two. For these other types of system, Personal Consultant is not especially well-equipped.

Anyone contemplating the purchase of Personal Consultant should be forewarned on two points: it is currently restricted in use to TI hardware; and it is unlikely that a non-computer expert will be able to build-in the knowledge directly. In fairness to TI, it should be pointed out that this latter criticism is a fault shared by surprisingly many expert system builders currently available.

Personal Consultant costs $1495 for the package used to build the expert system.

END

Speaking up

Your 64 can be made to speak volumes with this American gadget, The Voicemaster. Kenn Garroch linked it up to his machine for a test conversation.

One of the good things about the Commodore 64 is its sound synthesis chip (SID). Many games are beginning to use this for speech synthesis, to make the games a little more interesting. One thing that may be puzzling a few people is how the speech is coded and set up for use.

The Voicemaster from Covox can be used to input speech, via a microphone, store it in files, and modify it to a certain extent.

Presentation

The device itself consists of a small, flashy-looking, brushed aluminium box (10cm x 6cm), a disk or cassette, an electric condenser microphone, and a manual. This comes all wrapped up in a box about the size of a 'ten pack' of disks.

Setting up

The main box plugs into the user port on the back of the 64 (make sure the machine is switched off). The microphone goes into a 3.5mm jack socket on the left side, and the 64 can then be switched on.

The review model came with its software on disk and was loaded from Basic with the command LOAD "VOICEMASTER", 8 and then RUN. As well as loading the machine code and initialising it, it also asks you whether you want to turn off the SID filter. To the innocents among you, the SID chip contains a set of tone generators to produce the sound, some envelope generators to alter the volume with time, and some filters to alter the shapes of the waveform (effectively giving the different vowel sounds of 'ee' and 'ooo' but with shades in between). Also included are a few other features and FX to make the SID a bit more flexible.

Turning the filter on or off didn't seem to make a great deal of difference, although the 64 I was using was fairly new and the Covox manual vaguely mentions something about older machines not having the same SID as the newer versions. Anyhow, with an ordinary everyday television the speech was more or less intelligible.

After selecting the filter off option, another disk access is performed and the computer speaks.

In use

The whole idea of the Covox is that you can input speech, save it, and then be able to reproduce it without add-ons.

There are a number of programs on the disk — Demo, Calculator, and Clock.

Demo is a simple program that allows you to input speech and then play it back. It also allows some of the added effects to be demonstrated, such as altering the speed of the playback, which changes the pitch of the sound rather like speeding up, or slowing down a record player. The calculator turns your Commodore into a speaking adding machine and Clock is more or less the same as dialling the speaking clock.

After you have become fed up with the demo programs, you can try writing your own. This is very easily achieved from Basic, since the software gives you a whole new set of commands to use. These are:

SPEAK N, where N is the word number previously placed into memory, with LEARN N which analyses the voice input from the microphone and stores it in memory
PUT "filename", 8 stores the current vocabulary onto disk
FIND "filename", 8 loads a vocabulary from disk.
SCREEN N selects whether the screen is on (N +ve or true) or off during voice playback. When the screen is on, the speech is slowed down a little but this can be offset somewhat by using SPEED.
CLEAR deletes the current vocabulary, unlike the command NEW (normal Basic) which leaves it intact. It also resets all current settings such as speed and volume.
SPEED N changes the speed of playback where N is in the range 0 to 9, with 5 being the norm. The highest speed makes the voice playback sound like the Munchkins, while the slowest is like the belt slipping on a record deck.
VOLUME N sets the volume in the range 0 to 15 with 15 being the loudest.
RATE N changes the sampling rate at which the voice or sounds are recorded. So the sound quality improves the faster it is sampled.

The Covox can incorporate up to 64 (familiar number) sounds in memory. These can be brought back, at will, with the SPEAK command. Incorporating speech into your programs is simply a matter of executing a SPEAK at the appropriate time.

Conclusion

The Covox is a pretty good gadget. If you can think of a good use for it. I really could not think of a great deal of use for a computer that talks, unless you can talk to it and hold a conversation. Voicemaster is an American product being distributed by Pactronics in Sydney (02) 630 8555. Voicemaster will retail for $149.

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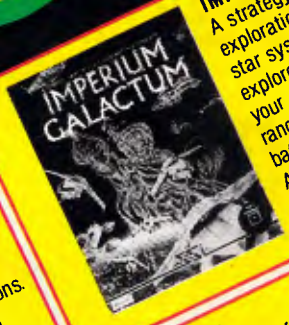

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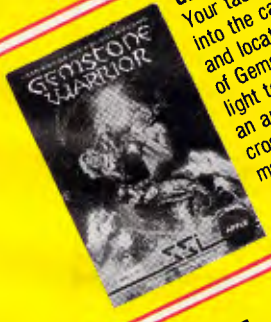

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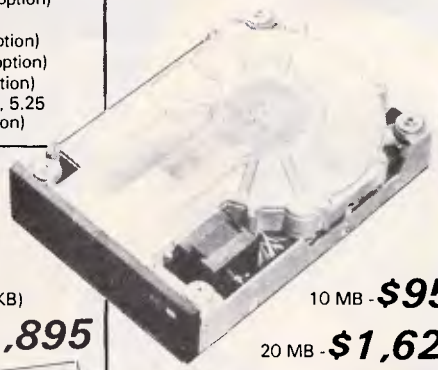

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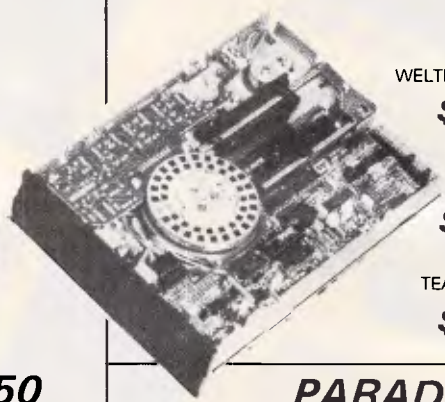

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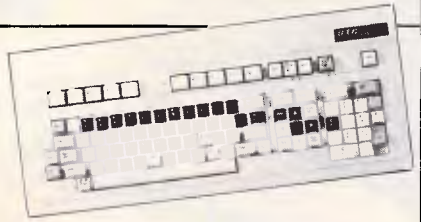

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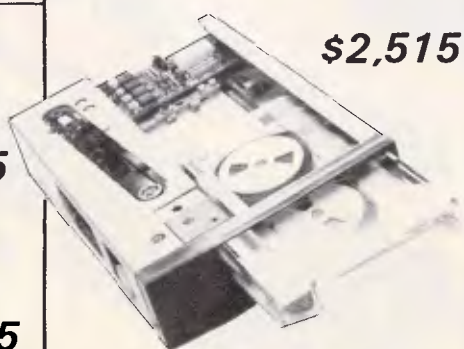

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Questions & answers

Harvey Mellar solves a hypothetical murder case with the help of Logo pattern matching.

This article demonstrates some powerful techniques that make use of lists. I won't be introducing many new Logo primitives, but I'll use those already known to develop procedures for 'pattern matching' and apply these to the task of interrogating a simple database. The techniques are similar to those which lie at the heart of many artificial intelligence (AI) programs.

The murder

Imagine the following scenario: a terrible murder has been committed in a small community in the Ozark Mountains. Zachariah has been viciously attacked with a sharp implement and killed. His close family seem the obvious suspects. We know that his brothers, Matthew and Joshua, both have axes, that his cousins, James and Ebenezer, have guns, and a cousin Jane has a knife. When questioned by the sherriff shortly after the murder, Matthew, James and Joshua all had traces of blood on their clothes. It is also known that Matthew and Ebenezer both hated Zachariah because of an old argument about a piece of land. Joshua is full of self-loathing and hates only himself!

It may not be difficult to work out a prime suspect for the murder, but how can we program a computer to use the same kind of logic?

We have to begin by representing the data in some way. Each fact can be represented as a list, and for simplicity we'll take each list as having three terms — a noun, a verb and another noun or an adjective. The procedures we will develop will work for facts of any length and structure, but it will be easier to remember their form with this simple grammar.

One fact in the database would be [JAMES OWNS GUN]. The database will be a list of such facts, a list of lists. Let's begin with an empty database:

```
MAKE "DATABASE []
```

and add facts to it one at a time, for example ADD [JAMES OWNS GUN]. ADD could be defined as follows:

```
TO ADD :FACT
  IF NOT THING? "DATABASE THEN
    MAKE "DATABASE []
  IF NOT MEMBER? :FACT :DATA-
    BASE THEN MAKE "DATABASE
  FPUT
:FACT :DATABASE
END
```

This procedure makes sure there is a variable called DATABASE; if there isn't already one, it creates one. It then checks to see if the fact is in the database; if it isn't, it adds it.

The database to represent the facts outlined previously might be:

```
[[MATTHEW OWNS AXE] [JOSHUA
  OWNS AXE] [JAMES OWNS GUN]
  [EBENEZER OWNS GUN] [JANE
  OWNS KNIFE] [KNIFE IS SHARP]
  [AXE IS SHARP] [JAMES IS BLOODY]
  [JOSHUA IS BLOODY] [MATTHEW IS
  BLOODY] [MATTHEW HATES
  ZACHARIAH] [EBENEZER HATES
  ZACHARIAH] [JOSHUA HATES
  JOSHUA]]
```

We can now interrogate the database to determine whether a particular fact is true. For example: DOES [JAMES OWN GUN], which should give the answer YES.

DOES is easily defined:

```
TO DOES :FACT
  IF MEMBER? :FACT :DATABASE
    THEN PRINT "YES ELSE PRINT
    "NO
END
```

Pattern matching

There is a more interesting form of questioning the database, where WHICH [?PERSON IS BLOODY] would receive the responses:

```
[?PERSON JAMES]
[?PERSON JOSHUA]
[?PERSON MATTHEW]
NO (MORE) ANSWERS
```

We use a question mark at the start of ?PERSON to show that this is not the name of an actual person but a variable. We want the computer to go through the database, looking for facts which are of the form ?PERSON IS BLOODY, and to answer that James, Joshua and Matthew are the possible values of ?PERSON.

This is a simple example of what we mean by pattern matching. The computer looks for facts of the pattern IS BLOODY, and lets us know what values could possibly fill the gap.

The procedures needed to carry out this more sophisticated way of interrogating the database are:

```
TO WHICH :QUERY
  LOCAL "ANSWER
  LOCAL "RESULTS
  MAKE "ANSWER []
  MAKE "RESULTS []
  COMPARE :QUERY :DATABASE
  PRINTOUT :RESULTS
END
```

WHICH sets things up and passes the main work over to COMPARE. LOCAL is a primitive which makes the named variable local to that procedure; when that procedure is finished, the variable will cease to exist. The value of the local variable is available to all the procedures that WHICH calls, and only disappears when WHICH itself finishes. Some versions of Logo do not have LOCAL, and it could be omitted here, but this would leave a couple of variables in the workspace that are no longer required.

Each individual answer will be stored in the variable ANSWER, and these will then be put together as a list of answers in the variable RESULT. The procedure PRINTOUT prints the answers one below the other and prints out NO (MORE) ANSWERS at the end.

```
TO PRINTOUT :MESSAGE
  IF EMPTY? :MESSAGE THEN PRINT
    [NO (MORE) ANSWERS] STOP
  PRINT FIRST :MESSAGE
  PRINTOUT BUTFIRST :MESSAGE
END
```

The real work begins with the procedure COMPARE. This takes each fact

in the database in turn and passes it over to MATCH? to determine if it is the same. If it is, MATCH? will also make sure that ANSWER is set to the corresponding value, and COMPARE will string this value of ANSWER onto the front of RESULTS.

```
TO COMPARE :QUERY :FACTLIST
  IF EMPTY :FACTLIST THEN STOP
  TEST MATCH? :QUERY FIRST
    :FACTLIST
  IFTRUE MAKE "RESULTS FPUT
    :ANSWER :RESULTS
  COMPARE :QUERY BUTFIRST
    :FACTLIST
END
```

MATCH? does the actual pattern matching. It must compare the input pattern with a single fact from the database and determine if it is a possible match: if so, it must record the possible value of the variable in ANSWER.

```
TO MATCH? :QUERY :FACT
  IF ALLOF EMPTY? :QUERY EMPTY?
    :FACT THEN OUTPUT "TRUE
  IF ANYOF EMPTY? :QUERY EMPTY?
    :FACT THEN OUTPUT "FALSE
  TEST FIRST :QUERY = FIRST :FACT
  IFFALSE IF NOT (VARIABLE? FIRST
    :QUERY) THEN OUTPUT
"FALSE
  IFFALSE (REMEMBERFIRST :QUERY
    FIRST :FACT)
  OUTPUT (MATCH? BUTFIRST
    :QUERY BUTFIRST :FACT
END
```

The first two lines check to see if we have come to the end of either or both lists. If we have come to the end of both lists at the same time, then there is a match. If one list is longer than the other there cannot be a match (with this definition of matching). In studying how this procedure works, remember that in Logo, a procedure stops when it outputs a value.

The next test is to see if the first element in the query is the same as the first element in the fact. If they are not the same, the only way we could have a match would be if the first element of the query is a variable. If it is not a variable, there is no match. If it is, we must make a note of its value. Then if everything is matching so far, we carry on checking the rest of the two lists.

REMEMBER can make a record of a value when it subsequently turns out that the rest of the patterns do not match. This is not a problem, as MATCH? will finally output FALSE so ANSWER will not be tagged onto RESULTS by COMPARE.

Notice the last line OUTPUT (MATCH? BUTFIRST :QUERY BUTFIRST :FACT). Novice Logo programmers often forget the OUTPUT. It is needed because the recursive call to MATCH? will return a value to MATCH?, but this value must itself then be passed back up to the procedure that called MATCH?.

The two helping procedures, VARIABLE? and RECORD, are both quite simple and they introduce a new element of Logo programming.

A 'word' in Logo is just a collection of characters or numbers — like a string in Basic. Many of the list processing primitives can be applied to words as well as to lists, so FIRST "JAMES outputs J, and BUTFIRST "JAMES outputs AMES. In order to discover if something is a variable in our query, all we need to do is establish whether its first character is a ?. VARIABLE? does this:

```
TO VARIABLE? :WORD
  IF FIRST :WORD="? THEN OUTPUT
    "TRUE
  OUTPUT "FALSE
END
```

FPUT is useful for adding an element to the front of a list, but it often happens that we want to create a list from a number of words rather than by extending an existing list. A useful primitive to do this is LIST. To put ?SUSPECT and JAMES together as a list, we can type LIST "?SUSPECT "JAMES giving the result [?SUSPECT JAMES]. REMEMBER uses this method in order to create the value of ANSWER as a list:

```
TO REMEMBER :VARIABLE :VALUE
  MAKE "ANSWER (LIST :VARIABLE
    :VALUE)
END
```

Variables

The procedures so far only look for a single variable. To make the query system more powerful it needs to be able to look for more than one variable, and so be able to ask queries of the form WHICH [?PERSON HATES ?SOMEONE] to

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which the reply would be:

```
[?PERSON MATTHEW] [?SOMEONE ZACHARIAH]
[?PERSON EBENEZER] [?SOMEONE ZACHARIAH]
[?PERSON JOSHUA] [?SOMEONE JOSHUA]
NO (MORE) ANSWERS
```

The new procedures will also have to be able to deal with the case where the same variable is used more than once, for example:

```
WHICH [?PERSON HATES ?PERSON]
```

Here, ?PERSON must have the same value in both places. The result should be:

```
[?PERSON JOSHUA]
NO (MORE) ANSWERS
```

The major change that needs to be made is to change MATCH? to take account of the possibility of inconsistent assignment of variables. This involves adding one line:

```
TO MATCH? :QUERY :FACT
  IF ALLOF EMPTY? :QUERY EMPTY? :FACT THEN OUTPUT "TRUE
  IF ANYOF EMPTY? :QUERY EMPTY? :FACT THEN OUTPUT "FALSE
  TEST FIRST :QUERY = FIRST :FACT
  IFFALSE IF NOT (VARIABLE? FIRST :QUERY) THEN OUTPUT "FALSE
  IFFALSE IF NOT (CONSISTENT? FIRST :QUERY FIRST :FACT :ANSWERS) THEN OUTPUT "FALSE
  IFFALSE (REMEMBER FIRST :QUERY FIRST :FACT)
  OUTPUT (MATCH? BUTFIRST :QUERY BUTFIRST :FACT)
END
```

Checking whether an assignment is consistent means going through the list ANSWERS to see if there is already a value for the variable, and checking to see if the values are the same. If not, there is an inconsistency:

```
TO CONSISTENT? :VARIABLE :FACT :ANS
  IF EMPTY? :ANS THEN OUTPUT "TRUE
  TEST :VARIABLE = FIRST FIRST :ANS
  IFTRUE IF NOT (:FACT = LAST FIRST :ANS) THEN OUTPUT "FALSE
  OUTPUT CONSISTENT? :VARIABLE :FACT BUTFIRST :ANS
END
```

REMEMBER must also be altered as there may be more than one set of answers. REMEMBER now makes a list of pairs, where each pair consists of a variable name and its value:

```
TO REMEMBER :VARIABLE :VALUE
  LOCAL "PAIR
  MAKE "PAIR (LIST :VARIABLE :VALUE)
  TEST MEMBER? :PAIR :ANSWER
  IFFALSE MAKE "ANSWERS LPUT :PAIR :ANSWERS
END
```

Questions

The questioning procedure is still not very clever, but we shall now extend it to be able to deal with more than one query pattern at a time. The queries will then be presented as a list of queries, and the search will be defined as looking for values of the variables that make all the facts true at the same time.

For example:

```
WHICH [[?SUSPECT OWNS ?IMPLEMENT] [?IMPLEMENT IS SHARP]]
```

asks for values of ?SUSPECT and ?IMPLEMENT which make both [?SUSPECT OWNS ?IMPLEMENT] and [?IMPLEMENT IS SHARP] true at the same time. In plain English, this translates as ?Which suspects own sharp implements?' The result would be:

```
[?SUSPECT MATTHEW][?IMPLEMENT AXE]
[?SUSPECT JOSHUA][?IMPLEMENT AXE]
[?SUSPECT JANE][?IMPLEMENT KNIFE]
NO (MORE) ANSWERS
```

We can have any number of queries, not just two, and the queries are now presented as a list of queries. If there were only one query, we would have to write it in this way?

```
WHICH [[?IMPLEMENT IS SHARP]]
```

The actual programming changes required to accommodate this new demand are not as great as might be expected, although it might take some doing to unravel how the system works. It is only COMPARE that needs changing this time, and the new version is:

```
TO COMPARE :QUERIES :FACTLIST
  IF EMPTY? :QUERIES THEN MAKE "RESULTS FPUT :ANSWERS :RESULTS STOP
  IF EMPTY? :FACTLIST THEN STOP
  KEEP :ANSWERS
  TEST MATCH? FIRST :QUERIES FIRST :FACTLIST
  IFTRUE COMPARE BUTFIRST :QUERIES :DATABASE
  RESTORE "ANSWERS
  COMPARE :QUERIES BUTFIRST :FACTLIST
END
```

The heart of the procedure is the two lines:

```
TEST MATCH? FIRST :QUERIES FIRST :FACTLIST
IFTRUE COMPARE BUTFIRST :QUERIES :DATABASE
```

If we find a match between the first query and the fact we are presently looking at, we need to go on and try to find consistent matches for the other queries — each attempt at finding a match has to be done starting again from the beginning of the database.

We won't know until we reach the end of the queries if we have been successful in finding values consistent with all of them, so the adding of ANSWERS into RESULTS can only occur when we have exhausted the list of queries. This is done in the line:

```
IF EMPTY? :QUERIES THEN MAKE "RESULTS FPUT :ANSWERS :RESULTS STOP
```

After we find an initial match for a query, we go on to look for consistent matches for the subsequent queries. When we have finished this quest (successfully or unsuccessfully) we need to return to see if the first query could have been satisfied in any other way, consistent with any variables already set by earlier queries. KEEP and RESTORE are used to keep a track of the assignment of variables.

KEEP and RESTORE are really push and pop operations on a stack, which we implement as a list.

```
TO KEEP :ITEM
  IF NOT THING? "STACK THEN MAKE "STACK []
  MAKE "STACK FPUT :ITEM :STACK
END

TO RESTORE :VAR
  MAKE :VAR FIRST :STACK
  MAKE "STACK BUTFIRST :STACK
END
```

It is not easy to follow how COMPARE works, but it is well worth the effort of trying to do so.

Conclusion — who did it?

After all that preparation, we can now ask the fairly complex question: 'Is there anyone who hates Zachariah, owns an implement which is sharp, and who has blood on their clothes?'

```
WHICH [[?MURDERER HATES ZACHARIAH] [?MURDERER OWNS ?IMPLEMENT] [?IMPLEMENT IS SHARP] [?MURDERER IS BLOODY]]
```

To which the reply is: 'Matthew did it with the axe'.

```
[?MURDERER MATTHEW] [?IMPLEMENT AXE]
NO (MORE) ANSWERS
```

END

This is part four of a six-part series.

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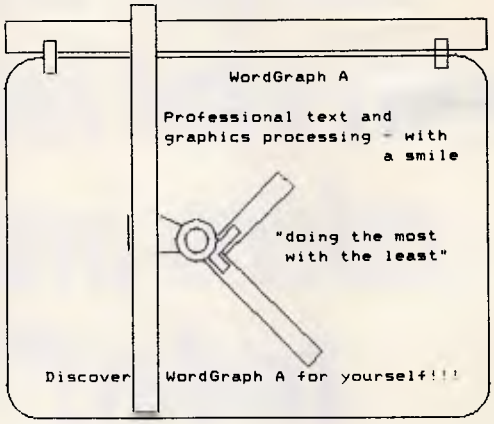

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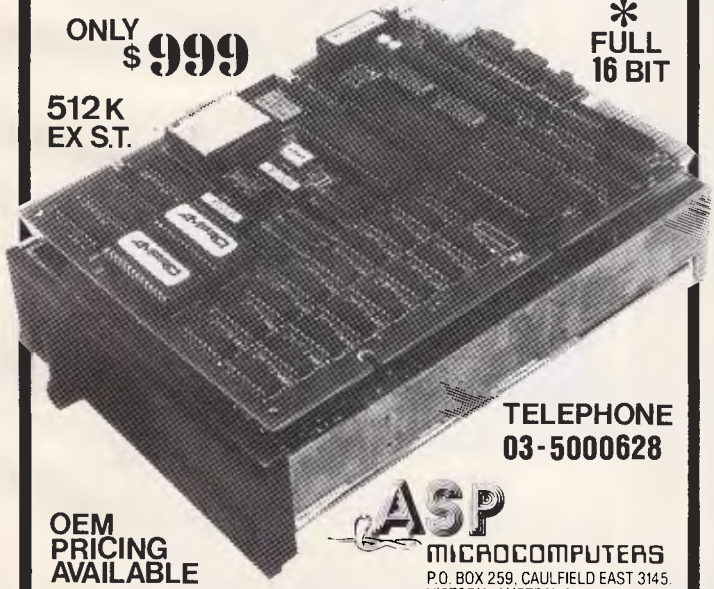

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If you require information on medicine, the law, science, technology, business, companies, finance and banking, or almost anything else, it's probably available on a database. If you know what you're doing it's faster and more thorough than spending hours in a library, but it can be very expensive.

The value of being able to find the right information in a short space of time should be self-evident, but few professionals or businessmen use this technology to help them with their work. Cost shouldn't put you off. Many databases cost a dollar for every minute spent online (and some are far more expensive), but there are ways of dramatically reducing the damage to your bank balance.

Online searching costs can be divided into four main categories: the cost of purchasing the hardware and software; the telecommunications charges; database subscriptions, manuals and training; and the searching costs. It's possible to make savings in all these areas, but the first question you should ask is whether you want to go to the time, trouble and expense of setting up an online searching facility.

We recommend that you start by talking to existing users. Find out how they have benefitted, and if the costs measure up against the benefits? If you find that the information is useful, but you don't think it's worth investing the time and the money in learning how to do it yourself, there is another option. Information brokers will do the searching for you; Triad Infoquest is one such organisation, but there are a number of others.

Hardware

If you think that online information would be invaluable and you have some money to spend, it's worthwhile investing in your own facilities. Don't skimp on hardware and software which might be difficult to use and limited in scope. You will need a personal computer, a modem, a communications software package and a telephone line. Most of your money will be spent on databases, and that's where the savings should be made.

Some hosts (remote computers storing a number of databases) such as Nexis advise that you use their equipment, but most don't mind you using your own. Personal computers are a better bet than dedicated terminals for several reasons. Firstly a micro can be used for many other business tasks. It also allows you to store the information on a disk; it can then either be printed out at your leisure or word processed. If you're writing a report, this facility is invaluable.

Unless you have a printer capable of speeds in excess of 160 characters a second (cps), a micro will also reduce online costs. If you have a terminal and a slow printer, you will waste money by having to stay online until printing has finished. The printer needs to be significantly faster than the data transmission rate of 120 cps to cope with carriage returns, and so on.

If you have a slow printer and don't want to buy a faster one, you can get round this problem by installing a print buffer to sit between the computer and the printer, and store the file to be printed. In this way, you don't have to wait for the printer to finish before logging off.

Telecommunications

Obviously you should check carefully that the modem and communications software you're interested in using will run on your micro. This is especially important with IBM lookalikes, as some software packages written for the IBM will not run on some 'compatibles'. As a rule of thumb, see it working before you hand over the cash.

Modems have a multitude of different facilities and specifications. I'll start with the simple distinction between the ones that plug directly into the telephone socket and acoustic couplers — the ones with two rubber cups for the telephone handset.

The plug-in ones have several advantages — they're faster and more reliable. Most acoustic couplers can only transmit and receive at a maximum of 30 characters a second (300 baud) but the plug-in ones can operate at four times this speed, 120 characters a second (1200 baud). Most databases charge on a connect hour basis, so a faster modem will soon justify the extra investment.

Acoustic couplers are also more likely to suffer from interference which, if it causes you to lose data or drop the line, is both irritating and expensive. They also have a reputation for wearing out much faster than plug-in modems. The plug-in variety also have the bonus of being able to support an autodialer. It often requires several attempts to log on to the host, and there is nothing more frustrating than dialling time after time, only to have the line drop after a few seconds. For the overworked, an autodialer is essential.

The best type to go for is the 1200/75 modem which receives data at 1200 baud (120 characters per second) but only transmits at 75 baud (7.5 characters a second). This slow speed is unlikely to affect search times as few of us type faster than 450 characters, or about 80 words, a minute.

Slow transmission speed is only likely to cause problems if you want to use the modem to transmit your own files down the telephone line, but as the latest generation of modems operate at 300, 1200/75 and at 1200/1200 baud, you shouldn't need to worry.

If you lose any vital data during a search you may have to start from the beginning again, so it's important to have a good telephone line,preferably direct rather than through a switchboard. This will minimise the chance of interruption or line noise.

There are several ways of accessing a database: you can either dial directly or use one of the public data transmission

networks. The cheapest option is a direct-dial local call, but this is rarely available to everyone. Long distance and international direct dial calls are expensive, so it's better to use Telecom's Austpac packet switched data service. With Austpac you pay for the volume of data transmitted plus a low hourly rate and the cost of a local call.

Many databases not available by direct dial include the Austpac telecommunications costs in their online charges. Before shelling out the $50 charge for a Network User Identifier (NUI), it's worth finding out if you will need to have your own, as many of the hosts provide a free one, absorbing telecommunications costs in their own charges. If you find you need to subscribe to Austpac, dial your local telephone business office which will give you the number of the appropriate Austpac sales office.

Software

There are a large number of communications software packages on the market, but only a limited number specifically designed for online searching. There are three types available: those dedicated to your micro; those dependent on the particular host; and general gateways to all hosts.

The general gateway is probably the best bet if you can find one that runs on your machine. It certainly gives you the freedom to diversify at a later date in whatever way you wish. The following is a list of the facilities you should look for when choosing communications software, and an indication of how the facility can prevent problems and reduce search costs.

Autodial This allows you to store telephone numbers on disk, and, by pressing a couple of keys, to make the computer dial the number. It saves you the bother of remembering the number and, as often happens, re-dialling half-a-dozen times.

Variable communications settings There are many different data transmission standards and parameters. The communications program should allow you to set up the parameters in advance and then store them, so rather than spending half an hour setting up the correct protocal, all you have to do is press a few keys and you're logged on. If you're accessing several remote computers all using different settings, this facility is essential.

Downloading Most printers cannot print as fast as the data comes down the telephone line, so to keep costs down, the program should allow you to store the contents of the search on a disk. Many databases forbid downloading and it is technically in breach of copyright, so check first. Avoid programs which limit the amount of information that you can download at any one time. Downloading has the added advantage in that the information can be edited later using a word processor.

Programmable function keys These allow you to set up your search strategy in advance, thereby saving online time, especially if you're a slow or inaccurate typist. This is important if you are searching different databases on the same host for the same subject.

Security If someone steals a password, you are responsible. At $90 an hour, it wouldn't take long to run up a debt of thousands. The program should allow you to store your passwords securely in order that no-one can see them on the screen. It should also allow you to set up your own passwords to stop unauthorised use of the disk.

The other facilities you should look for are: the printing and viewing of files while online; x/on x/off, a facility which tells the remote computer to temporarily stop sending data down the line; and the ability to be able to filter out unwanted control characters. Buying the right hardware and software will save both time and money in the long-run: you can save over 50 per cent on searching costs by using a faster modem and good searching software. At the end of this article there is a list of three such communications software packages.

Database

With 3000 databases available, it's likely that there's more than one which will suit you. When you require information in a particular area, it's essential to find the most relevant database. You could waste a fortune sifting through a dozen databases, picking up one or two records from each, when a search of one database may provide all the information you need. There are several directories available: the most comprehensive is published by the Cuadra Association (but costs around US$100 per year); others of lesser scope are cheaper, at least one is free.

One of the best ways to cut costs is to be well-informed about the cheapest sources of information and where to find them. The American newsletter Data Base Informer, produced by Information

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720K FLOPPY DRIVE	add	$388.00
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USA, exists especially to 'identify existing unique, free or low-cost computerised databases which can be accessed directly or indirectly'.

There are a large number of free databases, although the information contained on them may often seem somewhat obscure. Many of these are maintained by either non-profit making or government organisations.

One particularly interesting example is a foreign affairs database which contains transcripts of radio broadcasts from around the world. The BBC offers a similar monitoring service which is available on Nexis and World Reporter, but you have to pay through the nose whereas it's free from Clearpoint.

Similar things occur in other areas. As an extreme example, Cancerlit, a medical database about cancer, costs three or four times as much on the Swiss host Data Star as it does on the German host Dimdi. With this degree of variationin cost, it's worth doing your homework. Before signing, obtain as many brochures as possible and arrange for demonstrations — the hosts are only too pleased to show off their service.

Most databases do not require subscriptions, so the cost of being online is confined to the manuals. However, some systems offer heavy users reduced rates in exchange for a commitment to a particular level of use.

It has been estimated that for the average user, 80-90 per cent of the searching costs are database charges. As these are generally based on time spent online, the key to cheap searching has to be efficient, rapid accessing and retrieval of information.

With time being the central factor, the cost per minute online need not always be the prime consideration. A well-designed, easily accessible database or one that is powerful and fast-working has its advantages over the system that is cheap but slow. Dialog (for example) is expensive, but it is relatively simple to use and works quickly.

Although time zone differences make it difficult to telephone people in the US and Europe, this works to the advantage of overseas database users. Our business hours correspond to their off-peak periods, which results in quicker response times and (in some cases) reduced rates. An exception is that the "last minute rush" on US systems occurs around 9 or 10am Eastern Time.

To illustrate the kind of savings that can be made, academic institutions are able to use the Chemical Abstracts Online database between 8pm and 8am "host time" at just 10% of the usual rates.

When you have decided which hosts to subscribe to, it's a good idea to attend the basic training courses which are usually fairly inexpensive — some are even free. Even more important are the savings that a bit of experience can bring, and such courses are one of the best ways of getting it. World Reporter occasionally offers a free day from time to time; full advantage should be taken of such opportunities.

Searching

The hosts often provide a quick reference guide, so keep this by your

1) Use a 1200/75 modem
2) Use a fast printer, at least 160 cps or a print buffer, or make sure that your communications software can download to disk
3) Use a small number of hosts — different search languages can be confusing
4) Find the right database on the most convenient host
5) Find the cheapest way of accessing that host
6) Attend as many free courses and demonstrations as possible before paying for the databases
7) Take full advantage of the free time offered to new subscribers
8) Use the training, help line and search aids before you go online
9) Most database hosts have help lines. Phone them, and ask them to take you through the first search
10) Unless you want to waste a lot of mney, plan your search and be familiar with the database commands before going online. Do your thinking before yo go online
11) Remember that in some databases, you pay for both connect time and the number of records displayed. Make your search as fast and accurate as possible
12) Always log off if you get stuck

Fig 1 The Golden Rules of Online Searching (or, how not to go bankrupt while online)

computer and use it. You might just forget a particular command, especially if you regularly search different databases.

You will almost certainly waste money through lack of experience and/or inefficient and sloppy searching. There are certain ground rules that are worth bearing in mind which, although they appear to be obvious, are easy to forget.

Make sure you know how to get out of the system. Putting the phone down at your end does not always guarantee that yu will be immediately logged off the system: it might take the host a few minutes to realise that it has a dead line. This is an easy way to lose money on some systems.

To avoid this, make sure that you have a note of the relevant log-off command, and the minute you either get into trouble or feel that you need to reconsider your strategy — log off! Anyone with even a few weeks' experience online will tell you of the speed with which you can lose money the minute you become confused.

Become as well-acquainted as possible with the skills involved in searching. Get into the habit of disciplining yourself into thinking carefully about what exactly it is that you want. If you're trying to gain as much information as possible about a specific thing — a particular company, for example — this needn't be too difficult. Problems begin when search strategies become too general and wide-ranging, which itself is usually a product of being unsure of what you're doing.

Write down exactly what you want to know before going online. Think of all the different words which might be used to express a particular subject: for example: UK, United Kingdom, Great Britain, BG and England could all be used to describe Maggie's Farm. To get round this, you will either have to include all these terms or make use of the truncation facilities.

Some databases have special codes for particular subjects. These 'controlled terms' make searching much more thorough, so it's worth becoming acquanted with the system's 'thesaurus' facility. This way, it is possible to be sure that you are reaching every file covering the subject.

Conclusion

Ultimately, the key to cheaper searching is research and planning ahead, whether in terms of equipment purchase or the process of searching itself. It is unlikely that anyone using legitimate methods of searching is going to find it an inexpensive undertaking given the current state of the online information market, but, with a bit of effort, it's certainly possible to lessen the damage.

Information sources

Although no recommendation is implied, the address of Triad Infoquest is:
328 Flinders St
Melbourne
Tel: (03) 61 2044

Different hosts have different charges for databases. One useful source of information is:
Information USA Inc
12400 Beall Mt Road
Potomac
MD20851
USA

For the free foreign affairs database, contact:
Clearpoint
POB 31577
San Francisco
CA 94131
USA

There are a number of general-searching software packages. Although we are unaware of local suppliers, three of the most commonly-used searching software pckages are:

Connect Software
Learned Information Ltd
Besselsleigh Road
Abingdon
Oxon OX13 6LG UK

Userlink
Userlink Systems Ltd
Mansion House Chanbers
22a High St
Stockport
Cheshire UK

Headline
Oxted Mill
Spring Lane
Oxted
Surrey UK

The most comprehensive database directory is available from:
Cuadra Association Inc
2001 Wiltshire Blvd
Suite 305
Santa Monica
California 90403
USA

The directory of Australian Databases is available from:
Australian Database Development Association
PO Box 53
Hawthorn
Victoria 3122

A free listing of European databases is available from:
Euronet Diane
177 Route d'Esch
Luxembourg

END

Systems to give you wisdom

Expert systems can help your PC think for itself. Phil Manchester, Chris Naylor and Ashok Soni continue last month's look at individual packages.

In last month's issue we wrote about 'expert systems'. This is a relatively vague term covering new software packages that essentially allow you to build business models, depending on your business. Before you dive into the three package reviews here, you may want to go back to last month's introduction to expert systems or artificial intelligence, the description for programmers of the Prolog expert systems language, or the individual reviews of Reveal, Tess, Savoir, ExpertEase and Trigger.

Expertech's Xi

Expertech's low-cost expert system, Xi, is designed to introduce inexperienced computer users to the esoteric world of artificial intelligence.

On the early version of the package we received, a tiresome set-up process is required before you can get to grips with Xi. Expertech did say, however, that later versions will be easier to cope with.

Xi is copy-protected so you must have the main Xi disk in drive A at all times. This can be tedious and on a number of occasions the system would not work because it could not pick up the protection key.

This criticism aside, Xi is an attractive and straightforward approach to building simple expert systems. What Expertech has done is to devise what amounts to a programming language not unlike Prolog (see page 100 last issue) to construct expert systems. The system offers a simple way of setting up a 'knowledge base' or database.

The knowledge base comprises three basic items — rules, questions, and queries — and Xi provides a toolkit to set these three things up.

Xi: a straightforward approach.

Rules are entered in an English-like 'language' using the form: 'If so-and-so then so-and-so'. The example used in the tutorial program is a knowledge base about the weather so a typical rule is: If weather is sunny and outlook is good then picnic is possible.

The toolkit allows you to enter any number of these rules to build up a knowledge base about a specific subject. The knowledge base can be saved at any time and re-loaded if further rules need to be added, or changes to existing rules need to be made.

Questions are entered in the form: question identifier; question text; permitted responses. This enables you to build up a set of questions that can be used to examine the knowledge base and make use of the expertise embodied in the rules.

The final item — query — allows the questions to be formatted into menus for ease of use.

The package comes together with a comprehensive tutorial — actually constructed using Xi itself. In other words, Expertech is practising what it preaches by writing the training material for Xi using the Xi expert system.

There are some criticisms to be made of the tutorial. First of all it is slow. We reviewed the product on an Olivetti M24 with a 10-megabyte hard disk — a PC compatible noted for its speed. Xi could be expected to be even slower on a standard PC with the floppy disks only.

Secondly, the interface is inconsistent. Sometimes you continue the tutorial session by pressing the RETURN key, other times you can press any key. And the escape mechanism sometimes requires you to make a selection from a menu, but at other times it requires that you press the ESCAPE key.

If the ESCAPE key option is used Xi performs a garbage collection process, leading to a long delay before you can carry on with the session.

Obviously, it is a worthy thing to use the expert system for the teaching process and at the end of the tutorial it is relatively easy to set up your own knowledge base — albeit a simple one.

But the process can be frustrating and will put a lot of people off because it is not very forgiving. The slightest mistake invokes a condescending message. The system should allow for trivial input errors.

The Xi also offers to explain how it has come to a conclusion through selecting the 'Why?' option on each of the tutorial menus. The main criticism of the system stems from this.

It replies in needlessly anthropo-

morphic terms like: 'I am trying to work out so-and-so because you asked me about so-and-so.' Professional computer software should avoid this use of personal pronouns — it is a sign of immaturity.

Criticisms aside, Xi is a competently produced product and makes good use of colour screens. The testing conducted in this review did not lead to any system crashes and the instant help screen proved very useful when the system's behaviour appeared confused.

The low price tag (around $1,000) and the relatively small memory requirements (384k) will make Xi an attractive introduction to PC users wanting to learn more about expert systems.

Lightyear

The Lightyear package is a business decision modelling product. It does not actually generate new knowledge, but focuses your mind on the rules involved in decision making and presents you with a number of alternative tactics.

Its approach to decision modelling is one which is widely used. The decision model is defined by first specifying a list of alternative solutions to a given problem. Then the pros and cons of each alternative are assessed to determine its overall desirability.

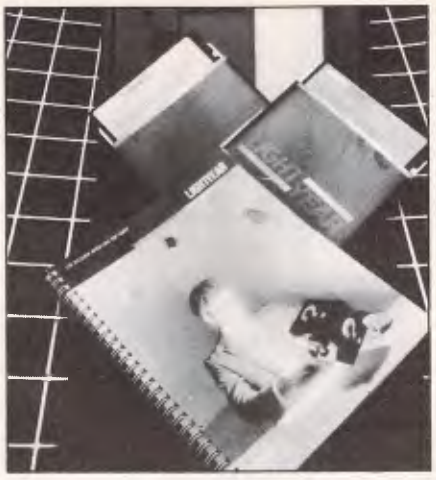
The obvious advantages of this automation are the ability to deal with large numbers of alternatives, rules and criteria in addition to the flexibility of changing the model easily.

Lightyear needs 192k of RAM and DOS 2.0. It is copy-protected like most PC products but unfortunately no back-ups or installations to the hard disk are possible. In addition, there is no support for sub-directories.

The product is entirely menu-driven with heavy use of pop-up menus. But the function keys are brought into play so much that even ESC and ENTER lose their standard definition. Their functions are unnecessarily and annoyingly assigned to function keys.

You build your model by listing alternative solutions to a situation and all criteria must be defined with optional rules for evaluating the overall desirability of each alternative. Also, each criterion is weighted to indicate its importance within the decision-making process.

So the desirability of any particular event is calculated by a simple addition of the 'values' allocated to an alternative for each criteria. If rules are used, then they may either eliminate an alternative or add bonus points to its score depending on whether the rules were satisfied or not. Rules can be conditionals. For example, if condition x is met then condition y must also be met.



Lightyear: a well designed package.

What you feed into Lightyear can go in numeric, graphic or verbal 'modes'. Values for criteria such as physical dimensions are best expressed in numeric mode; qualitative values such as assessment of management are best expressed in the graphic mode: here the value is represented by the position of a marker along a scale.

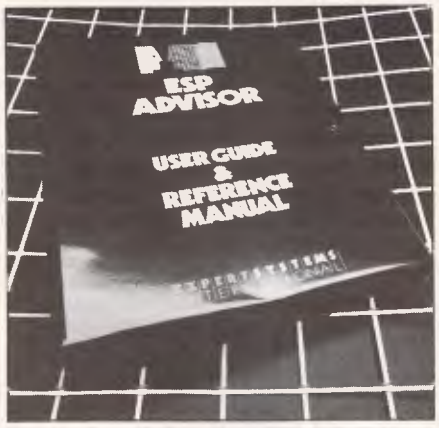
Evaluation criteria, such as reputation, are best expressed by words such as 'excellent', 'poor' and so on.

This is without doubt an attractive feature. It is also useful that Lightyear's built-in vocabulary can be amended and increased as each word has a value associated with it which can be easily changed.

Once the model is set up then the overall score for each alternative is calculated using the EVALUATE option from the main menu. The results of the evaluation are displayed graphically, using bar graphs, and results for any two alternatives may be compared in detail.

In conclusion, there is not much in Lightyear which cannot be done with a spreadsheet but the Lightyear package is also well designed for rather more specific applications.

It may appear to be a lightweight product but in a number-crunching situation, when a large number of variables is involved, it can be useful. It sells for just under $1,000.



ES/P Advisor: uses 'text animation'.

ES/P Advisor

The designer of ES/P Advisor has concentrated on providing an expert systems shell with the type of domain that will appeal to as many prospective users as possible.

By ignoring much conventional expert systems' wisdom, which argues that expert systems must be able to deal with the uncertain nature of human knowledge, Expert Systems International (ESI) has taken the line that while some human knowledge may be uncertain, an awful lot of it isn't. Regulations, manuals, instruction books — whole forests have been denuded to codify information and turn it into the printed word. So why not build an expert system shell which can automate this knowledge?

This is where ES/P Advisor's 'text animation' comes in. This is a new term coined by ESI to describe exactly what ES/P Advisor does. Text animation sim-

'It's exhausted, I've been playing squash on it all afternoon.'

ply automates text. You keep the text of some document in the machine which, when the program is run, displays the text. You might not think that this is particularly clever, but by means of a question and answer session, it always displays those items of text which you must read and never displays any irrelevant items.

ESI also describes the product as performing the 'conditional outputting of text — because the sole purpose of ES/P Advisor is to output text to the screen. Not the whole text, just the relevant items.

Looking more closely at the package, the knowledge base is the text which you are aiming to animate. Unfortunately, you can't just key in the text and let ES/P Advisor get on with it — but you can nearly do so. Essentially, the text is written in a fairly straightforward fashion but it has to conform to ESI's Knowledge Representation Language (KRL) which fortunately is quite easy to get the hang of.

During tests of ES/P Advisor there were no problems encountered in understanding how a knowledge base should be designed and written for any problem.

The knowledge base itself is created (in machine terms) by writing it to a text file using either a text editor or a word processing package. ESI recommends WordStar and, during review, the PC's line editor Edlin seemed to be as good a method as any. But beware of using any word processing package which embeds control characters into the text file — ES/P Advisor expects a 'clean' text file containing only the knolwedge base.

The command ESP will run ES/P Advisor proper, display a menu of all current knowledge bases on the disk to allow you to choose the required one and, once you've made your choice, you then have an expert in that field sitting on your desk, asking you questions, explaining its reasoning and why it's asking a particular question. This 'expert' will also continually display items of text on the screen to suit your answers.

Sessions can be interrupted and saved to disk for re-starting in the future (useful if you need to check something before replying to a question) and entire sessions can be saved to provide a permanent record of what transpired.

The whole system is written in ESI's Prolog-1 and it's possible, once you acquire some confidence to link ES/P Advisor to tailor-written Prolog code to extend its facilities.

The facilities ES/P Advisor contains will be more than adequate for many people and for quite some time. Again, it's good value, selling at $1,200 END

Mike Mudge investigates problems in the theory of continued fractions.

Definition An expression of the form:

$$a_0 + \cfrac{1}{a_1 + \cfrac{1}{a_2 + \cfrac{1}{a_3 + \cfrac{1}{\ddots}}}}$$

(where $a_0, a_1, a_2, a_3, \ldots$ are positive integers) is called a regular (or simple) continued fraction.

For ease of printing it is written $(a_0; a_1, a_2, a_3, \ldots)$, the a_i are called the partial quotients.

Theorem I Given any rational number greater than zero, that is a fraction p/q where p and q are positive integers with no common factor, the associated continued fraction is finite.

$131/17 = (7;1,2,2,2) =$

$$7 + \cfrac{1}{1 + \cfrac{1}{2 + \cfrac{1}{2 + \cfrac{1}{2}}}}$$

Theorem II (The converse of theorem I.) Any finite continued fraction represents a rational number. (Loosely we may say that any finite continued fraction can be 'wrapped up'!)

$(2;3,1,7,) = 70/31$

Theorem III (See for example *Continued Fractions* by A Ya Khinchin, translation from the Russian published by The University of Chicago Press in the Phoenix Science Series 1964, pp 47-50.)

Any positive real root of a quadratic equation has a periodic simple continued fraction.

$2½ = (1;2,2,2,..) = (1;\dot{2})$

$3½ = (1;1,2,1,2,1,2,...) = (1;\dot{1},\dot{2})$

$7½ = (2;1,1,1,4,1,1,1,4,1,1,1,4,...) = (2;\dot{1},1,1,\dot{4})$

The converse is also true, any periodic continued fraction represents the root of a quadratic equation.

$x = (1;7,7,7,...) = (1;7, \cfrac{1}{x-1})$

here $x = 1 + \cfrac{1}{7 + (x-1)}$

thus $x^2 + 5x - 7 = 0$ and $x = (53½ + 5)/2$ approximately 1.140054944

It should be noted that (1;7) is approximately 1.142857142 (1;7,7) = 57/50 = 1.14 while (1;7,7,7) = 407/357 is approximately 1.140056022.

Certain special continued fractions are to be found in the literature, for example, *Continued Fractions* by C D Olds Appendix II includes (Euler 1737)

$e = (2;1,2,1,1,4,1,1,6,1,...) = (2;\dot{1},2n,\dot{1})$

n = infinity

n = 1

also (Lambert 1770)

Pi = (3;7,15,1,292,1,1,1,2,1,3,1,14,2,1,1,2,2,2,2,1,84,2,...) with no apparent pattern.

However general results are somewhat sparse. In the summer of 1970 the Maniac computer at Los Alamos used 25000 decimal digit arithmetic to calculate the first 8000 partial quotients in the continued fraction expansion of the cube root of two; the theoretical interest centring around the statistical distribution of these a_i.

J Inst Maths Applic (1969) Vol 5 pp 318-328 R F Churchhouse and S T E Muir report that the real root of $x^3 - 8x - 10 = 0$ (approximately 3.3186217750185) was calculated to 200 decimal places and the first 200 partial quotients (beginning (3;3,7,4, 2,30,1,8,3,1,1,1,9,2,2,1,3,22986,2)) were also determined in a total of 10 seconds on Atlas at S R C Chilton!

Problems 1) Determine the period of the continued fraction expansion of a given quadratic irrational that is, $p + q\,(x)½$.. try $(4517½ - 61)/3$.

2) Determine the continued fraction expansion of a real number given to an arbitrary precision. Try 0.1234 56789101112131415116.

3) Compute exactly the rational number (fraction) corresponding to a given finite continued fraction. Try (1;2,3,4,5,6,7,8,9,..n)

4) Compute the positive real root(s) of a given cubic (or higher degree equation) equation to arbitrary precision and use the result of (2) to find the continued fraction expansion.

The statistical distribution arising in this theory will be discussed in a later Numbers Count article if the response warrants it.

Readers are invited to submit their program listings, together with hardware descriptions, run times, any comments and of course the output relating to the above problems. These submissions will be judged, using suitably vague criteria, and a prize will be awarded to the 'Best' entry received by 17 December 1985. Send entries to Mike Mudge, C/- *APC*, 2nd Floor, 215 Clarence St, Sydney 2000.

Please note that submissions can only be returned if a suitable stamped addressed envelope is provided.

```
MULGEN VER. 850621 TIME: 00:00:02

INPUT MULTIGRADE OF ORDER  6:
A:  39  38  28  27  16  10  5  1
B:  40  36  31  25  14  13  3  2
TRANSLATION =  150

-------------------------------------------------------------------------

NUMBER OF TERMS = 8
A:  151  155  160  166  177  178  188  189
B:  152  153  163  164  175  181  186  190
POWER SUMS:
A ^ 1 =  1364                    B ^ 1 =  1364                    EQUAL SUMS FOR EXP. =  1
A ^ 2 =  234060                  B ^ 2 =  234060                  EQUAL SUMS FOR EXP. =  2
A ^ 3 =  40418048                B ^ 3 =  40418048                EQUAL SUMS FOR EXP. =  3
A ^ 4 =  7022349636              B ^ 4 =  7022349636              EQUAL SUMS FOR EXP. =  4
A ^ 5 =  1227303597344           B ^ 5 =  1227303597344           EQUAL SUMS FOR EXP. =  5
A ^ 6 =  215710267243380         B ^ 6 =  215710267243380         EQUAL SUMS FOR EXP. =  6
A ^ 7 =  3.81164888351467170+16  B ^ 7 =  3.81164882413935700+16
A ^ 8 =  6.76929308317756400+18  B ^ 8 =  6.76929293303717300+18
TIME: 00:01:14
```

Fig 1

Prize winner April

The first response to Sums of Powers used a simple approach in Basic on a TI-99/4A, subsequent contributors ranged over the spectrum of combinations of theory and empirical programming and over the globe from Oxford to Cambridge to Saudi Arabia.

The winner this month is Henry Ibstedt of 4, rue Gramme; 75015 Paris, a regular contributor to the mail bag, with a very well presented combination of theorems with proofs, followed by detailed implementation in Basic for an IBM PC with 256 kbyte Ram. The detailed results would suffer badly from the condensation needed to fit the available space. Fig 1 gives a sample of Henry's style.

MULTI-FUNCTION –
MEMORY TO 512K
RS 232 INTERFACE
DMA CONTROLLER
BUS FOR CLOCK-MOUSE

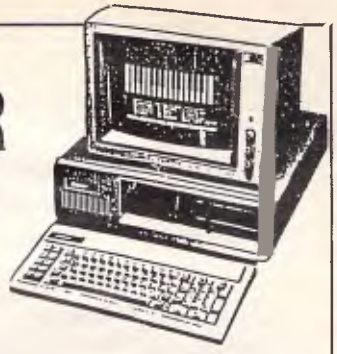
HARD DISK –
10 MEGABYTES
FITS INTERNALLY
SPECIAL LOW POWER

NEW

TANDY 1000 UPGRADES

ASP MICROCOMPUTERS
03-5000628
PO BOX 259
CAULFIELD EAST 3145

SUPER PC-XT



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BENCHMARKS

A list of Benchmarks used when evaluating micros is given below. An explanation can be found in the February '84 issue.

```
100 REM Benchmark 1
110 PRINT "S"
120 FOR K=1 TO 1000
130 NEXT K
140 PRINT "E"
150 END
```

```
100 REM Benchmark 2
110 PRINT "S"
120 K=0
130 K=K+1
140 IF K<1000 THEN 130
150 PRINT "E"
160 END
```

```
100 REM Benchmark 3
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/K*K+K-K
150 IF K <1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 4
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 5
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 GOSUB 190
160 IF K<1000 THEN 130
170 PRINT "E"
180 END
190 RETURN
```

```
100 REM Benchmark 6
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB220
170 FORL=1 TO 5
180 NEXTL
190 IF K<1000 THEN 140
200 PRINT "E"
210 END
220 RETURN
```

```
100 REM Benchmark 7
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 230
170 FOR L=1 TO 5
180 M(L)=A
190 NEXTL
200 If K<1000 THEN 140
210 PRINT "E"
220 END
230 RETURN
```

```
100 REM Benchmark 8
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K^2
150 B=LOG(K)
160 C=SIN(K)
170 IF K<1000 THEN 130
180 PRINT "E"
190 END
```

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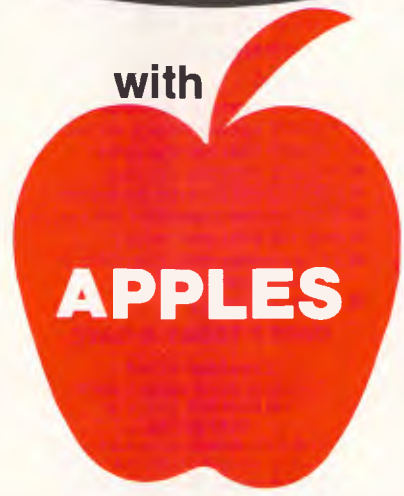

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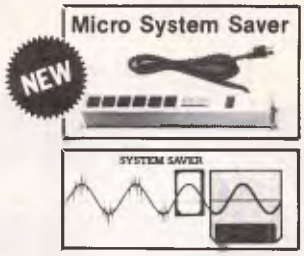

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USER GROUPS UPDATE

Below is a list of updates and additions to the full User Groups Index published in the August issue of APC. The next full listing will appear in the December issue of the magazine.

NEW SOUTH WALES

Macwest, a user group for the Macintosh computer, has been established in the Western Suburbs of Sydney. Services will include: newsletter, bulletin board and a Public Domain Library. For more details write to: Macwest, 11 Toohey Avenue, Westmead, NSW, 2145.

NEC Users Group of New South Wales has recently been formed. The group caters for the NEC APC and its related products. The first meeting will be a discussion on dBase II and will be held at the Middle Harbour Yacht Club, The Spit, Mosman at 7.30pm on November 21. Prospective members are welcome. For more details contact the Secretary, NEC Users Group, PO Box 568, Milsons Point, NSW, 2061.

Newcastle Microcomputer Club. The group caters for many machines and meets every second and fourth Monday of each month at 7.30pm in room G12, Ground Floor, Physics Building, University of Newcastle. More information may be obtained by contacting the President, Angus Bliss on (049) 67 2433 extn. 326 (BH), or the Secretary, Tony Nicholson on (049) 52 6017 (AH). The postal address is PO Box 293, Hamilton, NSW, 2303.

Southern Districts Commodore Users Group. Meetings are held on the first and third Wednesday of each month at the A.P.I. Hall, Kurrajong Road, Prestons commencing at 6pm. For more details write to 3 Lucille Crescent, Casula, NSW, 2170 or telephone (02) 602 8691.

VICTORIA

Color Computer Club. The group caters for TRS-80 Color Computers and meets on the first Friday of each month at Geelong College at 8pm. For more information contact the Secretary, David Collen on (052) 43 2128.

Geelong Atari Users Group. Meetings are held on the first Tuesday of each month at the Newtown Club, Skene Street, Newtown, commencing at 7.45pm. Contact the Secretary, Brian Oates, PO Box 293, Geelong, Vic, 3220.

Tandy Color Computers. An exhaustive list has been submitted for all the Tandy User Group contacts, however it is far too long to print so we have listed the contacts for major centres only. We suggest you call the contact in your state and they should be able to help you find a group that is in close proximity.

Adelaide
John Haines (08) 278 3560
Brisbane East
Rob Thompson (07) 848 5512
Canberra North
John Burger (062) 58 3924
Darwin
Brenton Prior (089) 81 7766
Gosford
Peter Seifert (043) 32 7874
Hobart
Bob Delbougo (002) 25 3896
Melbourne
Jeff Sheen (03) 528 3724
Newcastle
Lyn Dawson (049) 49 8144
Perth
Ian MacLeod (09) 448 2136
Sydney East
Jacky Cockmos (02) 344 9111

Victorian Wizzard Users Group — The group caters for Dick Smith's Wizzard and Funvision and the Hanimex Ramses. For more details contact Barry Klein, 24 Russell Street, Bulleen, Vic, 3105.

A.C.T.

Australian Adventure Club. For details contact Bernard Wiemers, 10 Tardent Street, Downer, ACT, 2602.

Australian ZX Users Association (AZUA). The group caters for all Sinclair computers and meets on the last Wednesday of each month at the Woden Valley High School Library. Ainsworth Street, Phillip, ACT. For more information contact David Vernon, AZUA, 50 Waller Crescent, Campbell, ACT, 2601.

QUEENSLAND

Brisbane PC1500/PC2 Club. We have been informed that the club is no longer operating.

Darling Downs Apple User Group. This group has recently been formed and caters for Apple computers. For further information contact Lloyd Ernst on (076) 38 3060 or write to PO Box 53, Darling Heights, Qld, 4350.

NEC User Group of Queensland. Meetings are held on the second Wednesday of each month at 165 Wellington Road, East Brisbane. More details may be obtained by writing to the President, Guy Coppens, PO Box 194, Corinda, Qld, 4075.

VZ-200/300 Computer Club. A new group catering for the VZ-200 and 300. For more information write to VZ-200/300 Club, 24 Albert Street, Goodna, Qld, 4300, or telephone (07) 288 3045.

SOUTH AUSTRALIA

Adelaide Atari Computer Club. The group meets at the Gillies Street Primary School, City, on the first Monday (second, if first is on a public holiday), and third Monday of each month at 7.30pm. For more details write to PO Box 333, Norwood, SA 5067.

Adelaide Micro Users Group Inc. Helen Ross is now Public Relations Officer for the group and has replaced Rod Stephenson. More details may be obtained by writing to Helen Ross, 36 Sturt Street, Adelaide, SA, 5000.

MicroBee Users Group of South Australia Incorporated. Meetings are held on the third Monday of each month (except January) at 18 Arthur Street, Unley, commencing at 7.30pm. For more details contact the Secretary, Richard Jackson, GPO Box 767, Adelaide, SA, 5001.

WESTERN AUSTRALIA

MicroBee Users Group of Western Australia. For details contact the Secretary, M.U.G.W.A., 4 Garnkirk Road, Greenwood. WA, 6024. Telephone (09) 447 5366.

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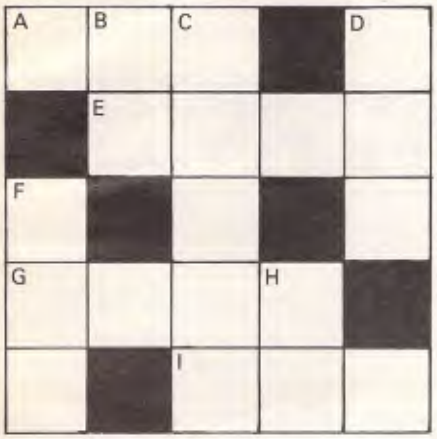
LAZING AROUND

Brain-teasers from J J Clessa

Prize Puzzle

The idea for this month's puzzle comes from Graham Gales. A man and his horse ran 10 times around a rectangular field. The horse ran almost twice as fast as the man. Can you complete the cross number puzzle in which all numbers are in Octal rotation. (By the way, one hand equals four inches)



Across

A Horse's running time in seconds (rounded).
E Perimeter of field in feet.
G Diagonal of field in hands.
I Man's running time in seconds (rounded).

Down

B Horse's speed in mph.
C Area of field in square feet.
D Distance to nearest foot that man has completed of his sixth lap, when the horse finishes.
F Width of field in feet.
H Man's speed in mph.

Answers on postcards please to *APC* Prize Puzzle, November, Lazing Around, *Australian Personal Computer*, 2nd floor, 215 Clarence Street, Sydney, 2000. Entries to arrive not later than 30 November 1985.

Quickie

A golden oldie this month, no prizes no answers. A water lily is growing in the centre of a circular pond. It doubles its size every day and on 16 June 1985 it exactly fills the pond. On what date did it half-fill the pond?

August Prize Puzzle

'Find three positive numbers in arithmetical progression whose produce is 11.'

This was described as 'short and sweet'. However I should have asked for rational solutions only, since there are an infinite number of irrational answers — the most obvious being that each number equals the cube root of 11.

The majority of answers was rational, but irrational solutions were allowed to qualify for the prize. Even with rational solutions, the wording of the question leaves ambiguity. I should have also said 'base 10' numbers only since: $1 \times 2 \times 3$ in base $5 = 11$.

This month's winner is Paul Gray of East St Kilda, Victoria — your prize should be with you shortly. The winning answer: 11/6, 9/4, 8/3.

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CHIP CHAT

Chip Chat recovers after yet another censuring attack from our lawyers . . .

When is a clone not a clone?: Guy Kewney mocked Digital Research recently for having the less than bright idea of releasing different versions of GEM for IBM's PC and each of various clones. Infuriatingly, we hear that only one three-character instruction needs changing on the PC version to make it run on the clones.

When the right hand knows not what the left hand . . . Now, we've made a pledge not to poke fun at opposition titles (no matter how horrendous their errors) but a computer trade newspaper doesn't strictly fall into the category of opposition title', so here goes:

A recent instalment of the said publication pontificated to the rest of the industry about journalistic and ethical standards etc. in its Editorial headed 'Finding a way through the computer publications maze'. To quote several choice examples: "Some of the new titles . . . have managed to place into question the ethical and professional standards of the computer press in Australia"; "Readers of Australia's computer publications have a right to expect news and information which is *competently and accurately reported*" (*APC's* italics); or "But who is informing the fathers of the information age? And who is informing those many thousands of users, the corporate executive who is still having some doubts about those new-fangled desktop computers, the small businessman who is not quite sure about the task his computer can perform, those sons (and daughters) of the information revolution? Who indeed".

Certainly not the trade paper which spewed forth this garbage, it would seem, because in the same issue an apology appeared regarding a recent story it concocted about IBM and Rolm. Imagine our shrieks of merriment upon reading the following, in the context of the above Editorial in the same instalment of the same paper: "A number of errors appeared in a story *Promising future for Australian PABX* . . . In one instance the word 'Rolm' . . . appeared as ROM . . . In the story, there is reference to IBM working on ROM. This should have read that IBM and Rolm had 'a working relationship'."

So much for 'competent and accurate' reporting! Or what about "The reference to 'headsets' in the story should have read 'handsets'" or "Mr Tregear was also quoted as saying: *Lots of companies would be interested in being involved in PABX projects, but the point is do they want to get into ROM development?* This comment was not made; Mr Tregear at the time was making references to Rolm Corporation".

With that sort of disastrously embarassing apology being made, you'd think the Editor would have the nouse to delay comments about journalistic standards, at least one instalment, if not forever. But perhaps there's an even *bigger* loo-loo coming up . . .

Redeployment: in Sweden, they're moving people suffering from mental illness out of institutions and back into society. So what happens to the mental institutions? We have the answer — or at least a press release has given us the answer. Its headline states baldly: 'Swedish Science Park to replace Mental Institution'. It doesn't say whether any job losses are involved.

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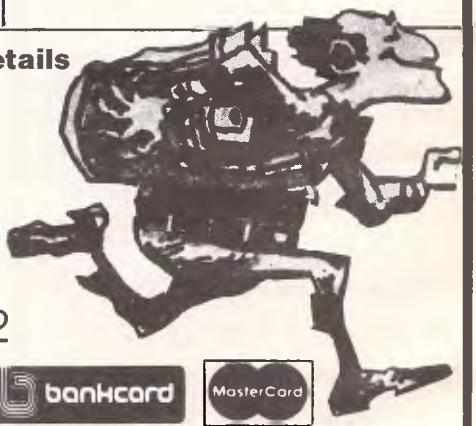

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