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NEXT MONTH INCLUDES

THAT PART OF a computer system that most users wish to replace first, is the monitor. Whether you want to move to a colour monitor for your PC or Mac, or upgrade to VGA or just higher resolution, our survey of monitors will help bring your choice into focus – and to make things even clearer, we've included feature pieces on how monitors work, terminal emulations and what all the jargon means. Since communications are becoming an increasingly important part of computing, Stewart Fist will present the first in a series of articles covering electronic mail, faxes, X400 and X500 standards and electronic data interchange (EDI). Then for light relief – who says you can't have fun with random numbers?

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LANtastic

THE LOW-COST LAN

In just 18 months, LANtastic has become a major force in the low-cost LAN market. Superb design and ease of use are the hallmarks of this product.

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At a R.R.P. of \$793 (inc. tax) for a 2 Node Starter Kit, LANtastic has set the standard in the Low-Cost LAN marketplace for others to follow.

The Experts are talking about LANtastic . . . and the Network Eye



"Our clear choice for a favourite low cost (but highly effective) LAN is LANtastic from Artisoft. The code is fast, the implementation of NetBIOS is excellent, the services are great, and it uses only a tiny amount of RAM. As a final testimonial, the LANtastic software, installed over NetBIOS on Western Digital Ethernet cards has been installed in several machines in the PC LAN labs."

Editor's Choice, PC magazine, March 1989.



"a lot of LAN bang for the buck. It also lets you access a CD-ROM drive over the network without DOS extensions in the remote machine. Columnist Jerry Pournelle uses LANtastic ... every day at Chaos Manor."

BYTE Award of Distinction, BYTE Magazine, January 1989.

"... LAN of the Year."

Jerry Pournelle, BYTE Magazine, March 1989.



"The Network Eye's uses seem endless. If you have a big job to process, send part to an idle PC and watch it through The Network Eye. Or take information from a spreadsheet on someone else's PC and put it in the report you're writing on your PC. The Network Manager could use it to troubleshoot remote PCs or help confused users. Broadcast information to remote computers for demonstrations, such as in schools."

LAN Magazine, January 1989.

"The Network Eye is a neat piece of software with nearly endless uses ..."

LAN Control Product of the Year, LAN Magazine, February 1989.

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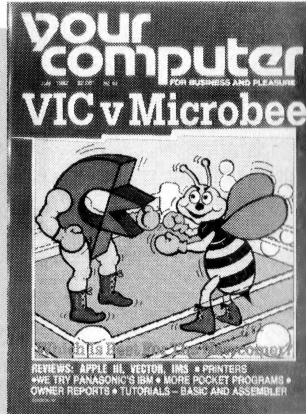


Slow the rush!

OUR LEAD feature this month covers 32-bit computers – for the most part that means 80386-based machines (the 68030's are the more interesting – even Matt Whelan is a semi-convert, now – but the '386s have got the market numbers for the time being). That feature includes mention of Intel's post-'386 chips – the '486, '586 and i860. Now, about a year ago I commented that it was a shame that the 80286-based machines hadn't fulfilled their potential and were already being shunted aside in favour of their faster siblings and descendants.

Not that I've got anything against 'progress' or power – there's certainly good use for 33MHz. It's the cost to users that always concerns me. Developing microprocessor chips is an expensive business – in the feature we quote a cost of some \$250 million dollars to see the 80486 to market – and that needs to be paid for by someone. I'm enough of a realist to accept that we can't expect the likes of Intel and Motorola to fund that themselves, so, ultimately, those who chose to buy computers find themselves funding their own investment's obsolescence.

That type of paradox seems to be rife in the computer world – the classic is having to pay for bug fixes – sorry, *upgrades*. Of the course the other side of the coin is that if the developer held the product back from the market until it was perfect, we'd be seeing one more broke developer. But – again it's the user who suffers the cost and inconvenience of working with a product that he's been misinformed on – any



July 1982

Bootstrap: To use one short program to load a longer program which then loads the operating system.

Bug: An error in a program. Makes programmers itch.

FORTRAN: Formula translation. One of the first computer languages and beginning to show it.

Patch: A temporary (*ha, ha*) fix on a bug.

System: A collection of hardware and software, possessed of the property that the whole is greater than the sum of the parts.

User: One of the people connected to the computer.

– from the *Your Computer* Glossary.

product with bugs in it is mis-represented when it's dropped on the market: when's the last time anyone told you before you handed over the cash, about patches that were needed to make the product what you thought it was?

Maybe it's time for the industry to catch its breath and let current developments mature. For example, there's a helluva investment in software and hardware that users will never recoup because it's been left in a technological dead-end during the rush to the future. Already, some manufacturer's are offering a 16MHz AT-class machine as their basic model and it probably won't be long before 25MHz is as slow as you can go. We see something similar in software: to get a good word processor now, it's necessary to pay for desktop publishing features (or support for 500 printers) – and there's no choice. Take it or leave it.

The simple fact is that most users are unlikely to use the speed, power, printer drivers, whatever, that they have had to pay for. And, they are paying for the developer to add even more bells and whistles.

I can see no simple way out of the dilemma. Except, wouldn't be nice to be offered a package or computer that was exactly what you wanted, that had no features you weren't going to use, and cost almost nothing. That might mean the rush to power would slow down a bit, but in the long term, it could only encourage the growth of computing – and isn't that what we all want? □

Future Features

IN ADDITION to our application stories and other informative pieces, each month we present a features designed to keep you informed about the world of personal computing –

September 1989

Entry-level PCs: As the price of power drops, these work horses become more powerful – our survey will show the best value for money machines and help you match one to your needs. In addition, a special feature in this issue will advise on choosing and implementing a network.

October 1989

Communications: Our indepth coverage of electronic communications covers recent developments in 'connectivity' and

presents an overview of the hardware and software that's bringing it all together – from the new generation of modems and fax cards to the latest in online services.

November 1989

Graphics: With the power now available to personal computer users, computer graphics have now come of age in almost every application environment. With particular emphasis on small business applications, we'll shows the exciting developments now taking place – including a special feature covering transputers and Risc-based machines.

December 1989

Integrated packages: Our survey of the latest full-featured offerings highlights the strengths and weaknesses of this growing range of flexible products. In addition, we present a detailed report on

project management software and feature the latest in hand-held computers.


January 1990

Yearbook: Featuring our Annual Software Roundup of products reviewed in the previous 12 months, this issue will be packed with buying tips, reference material, application stories – and a look at the future.

February 1990

Portables: Our survey of the newest portables and the technology behind them reveals that these machines have now come of age.

Application stories – particularly those with the same theme as our features – are always welcome. Please address editorial enquiries on our features to Geoff Wade, (02) 693 6143, and advertising enquiries to Mark Wilde, (02) 693 6646.



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What is Shareware ...and why does it cost so much less?

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How it works

Shareware relies upon the honesty of software users to pay for the software that they use.

Shareware bypasses the costs associated with conventional marketing and promotion of software by inviting users of software to give copies of the software to their friends. If the user of the software likes the product and wants to continue to use it in any way then the user should register that software.

When a user registers the software the author gets a return for his effort in creating the software and is encouraged to improve the product and to develop new products.

Rather than implementing cumbersome copy protection schemes shareware authors do exactly the opposite — they actually encourage their users to make copies of the software for their friends.

Word would spread slowly if the author solely relied upon users just sharing copies with their friends. User groups are encouraged to share the software with their members on a non profit basis.

Many user groups set up Bulletin Boards so that members can "down load" software which they would like to evaluate for use. This is another accepted way of distributing shareware.

Some commercial operations also distribute shareware and charge for the disks. Again this is an accepted way of distributing shareware providing the disk distributor meets certain criteria set down by the authors.

What is the difference between Shareware and Public Domain Software?

Public Domain software is created by authors who chose not to seek formal rights or royalties. There is no restriction of any kind on distribution of this kind of software. Most public domain software is games or utilities. There are very few complete products in the public domain.

Shareware software on the other hand is distributed so the user can evaluate the software to decide whether he will register with the author and continue to use the software. Shareware is an alternate method of marketing software, not really a different kind of software. In fact the more successful Shareware products hold their own against their commercially distributed competitors. The greatest difference is that the Shareware product's packaging is not as fancy and the price is much lower.

Where can I obtain Shareware trial disks?

A collection of Shareware disks is usually referred to as a Library. A Library may be kept by a user group, a bulletin board operator or by a commercial diskette distributor.

A lot has been said and written about viruses. There is no doubt that a virus could be distributed hidden in a public domain or shareware disk.

Care needs to be taken that the library you use for disks takes every reasonable step to eliminate the possibility of a virus. Careful checking is not sufficient as it is simply impossible to check every single disk to the degree which would be required.

The safest way for your library to obtain Shareware disks is to source them directly from the authors. This of course means that the source of every disk is known and the insidious perpetrator of a virus cannot hide behind a cloak of anonymity.

The Shareware authors are always releasing new versions of their software and you should ensure that the library is kept up to date with the latest available versions.

Before you purchase any disks you should ask if the software and the latest versions are sourced directly from the authors. If the answer is "yes" you can be reasonably sure that you are getting the latest versions and that they should be quite safe to use.

Do I need to join a Library?

Some commercial libraries and most user groups insist that you join before you can purchase disks. If you intend to purchase disks a properly prepared catalogue will make your selections easier and repay your membership costs many times over.

Other libraries allow purchases without any membership fees and some offer a free catalogue. The free catalogue is usually a very short description of available disks and is often given away as an insert in magazines. Often you'll end up buying more disks than you really need because the descriptions are so short you really are taking a lucky dip!

What is PC SIG?

PC SIG is the world's largest Shareware library and contains around 1400 disks. PC SIG not only produce a comprehensive 660 page directory to their library but publish a bi-monthly magazine.

This magazine, appropriately named "Shareware" lists new additions, upgrades to existing disks and compares products from different authors.

Members of the PC SIG Library receive the two volumes of the directory and a subscription to Shareware magazine. Not only do members have access to the most comprehensive directory but they are kept right up to date with the hundreds of upgrades made each year.

To ensure that the library contains the best quality products no disk is added to the PC SIG Library unless it is obtained directly from the author. There can be no anonymous interference with PC SIG disks!

PC SIG also offer a money back guarantee and support to get any disk started.

You do not need to be a member of the Library to purchase PC SIG disks. Five disks are just \$50 and then additional disks are only \$5 each.

Libraries often represent that they offer PC SIG disks BUT unless the disks are grey and carry PC SIG's logo they are not genuine PC SIG disks. PC SIG cannot take any responsibility or offer support nor the money back guarantee on such disks. Invariably such libraries do not bother updating to the latest version at all, or at best they will update from time to time so they can claim that they do update.

Are registered Shareware copies available in Australia?

PC SIG's distributor in Australia, Manacomm, offers the full PC SIG library and also has arrangements with many Shareware authors to represent them in Australia.

If you return the PC SIG Shareware disk when investing in a registered copy you will be refunded \$5 per disk. This means that the trial could be at no cost if you decide to continue to use the product.

We know that the PC SIG Library is the best Shareware value available, and we would like to prove it to you.

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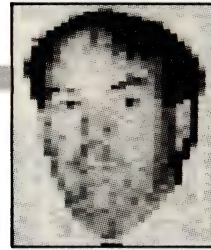
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Networking: now or never?

AUSTRALIA WILL BE a large emerging market for enterprise networking according to visiting US network specialist Ralph Ungermann. Speaking at a seminar in Parliament House recently, Ungermann said networking would be the wave of computing for the '90s. 'The fourth wave, networking, will tie the three previous waves - mainframes, minis and PCs, together,' Ungermann said. 'Growth is now moving from personal computers to networks.'

Ungermann warned that although the new network technology was still developing fast, the rewards for any organisation implementing it immediately were decreasing costs through better information management. 'For example, Citicorp in the US has just announced the 15-minute real estate loan. They can complete a loan in 15 minutes by putting a workstation in front of a loan officer networked to all Citicorp databases. Other banks are going to have to respond to that Citicorp pressure and networking is how they will do it.'

Ungermann said the Industrial Bank of Japan recently completed a world-wide network giving them 24-hour trading. 'And General Motors recently announced it was spending two billion dollars to reduce new car development time from four years to two. They will do it with the help of computer networks.' He said a large enterprise network connected more than 2000 workstations. 'Pacific-Bell in California have a network with 40,000 nodes on it. All Pacific-Bell work stations are on their network and that's how they run their business.'

Despite their experience with many computer companies, Microsoft went for a single vendor on its network project. According to Ungermann 'open' is a much misused term in computer networking because it implies adhering to one standard. 'However to me open means choice, because standards are exploding with new ones being announced almost weekly. We can't give clients the choice of all standards - we can only select the most important.'

Desines on Unix

DESPITE RECENT rumours to the contrary Unix is still on the table for Defence De-

partment Desine contracts. The Desine (Defence EDP System Integrated Network Environment) contract was recently awarded to IBM and 21 subcontractors. Geoff Walker, assistant secretary of the defence information systems policy division said this week there had been some misunderstanding of how the Desine contract worked.

'The idea that Unix would now be off



Network specialist Ralph Ungermann indicated noted at a Canberra seminar recently that there has been a big shift in the last six months to telephone cable as the standard for high-performance LANs. 'The advantage of telephone wiring is that you can put together a single wiring system and live with it for the next ten years.'

the order list is mistaken,' Walker said. 'We have options within the Desine contract to consider Unix as well as other operating systems if necessary.' He thought it was important to understand that any contract had to go with the technology available at that time. 'You must freeze the requirements at the point when a tender is issued.'

Walker and Mark Haughey, the director of information for the policy systems division, both said it was important to look at the background to Desine. 'Desine began in 1981 as an idea to decentralise computing within the Defence Department. To give computing power to the users,' Walker noted. 'In 1986 a decision was made to proceed with a decentralised system with built-in compatibility. The result was a request for tenders in March '87.'

Walker stressed that Desine compatibility was only for new equipment - existing defence systems were never intended to

conform with Desine. A team of defence user representatives including one from each of the services worked out the Desine requirements. 'The response to the Desine tender was enormous, we had a wall full of tender documents including 12 full solutions' according to Walker. By mid-1988 Desine short-listed three full tenders, IBM, Unisys and Digital. IBM became the prime contractor on 29th February this year with an eventual 21 subcontractors listed.

French DP research

ONE OF FRANCE'S largest insurance companies, UAP recently co-hosted a technological change conference with the Australian Science and Technology Council (ASTEC) in Canberra. Jean Marie Levaux, UAP's DP manager spoke about changing technology in France. Levaux said UAP had 130 mips of computer capacity connected to over 14,000 terminals around the country. 'On average we carry out 1,800,000 operations a day managing over 11 million insurance policies,' Levaux said. 'The data processing division has 450 employees and an operating budget of 550 million francs.'

Levaux said there were some basic principles UAP had always considered with DP operations. 'We wish to remain independent of manufacturers and have created our own specialised equipment. This includes a program operating system interface, a common programming language and a single connection method for all terminals. We have chosen a multifunction terminal which enables us to keep developing our network at relatively low cost while maintaining operational continuity.' UAP expects to have 4200 PCs networked by next year.

The company is evaluating future standards. These included Unix as a possible software base plus 80386 PCs. Levaux said UAP were unable to find any commercial software with a high enough performance for their requirements, so developed their own. This now allows remote control start-up and automatic operations management. 'In future with expert systems we will integrate automatic monitoring of air conditioning, humidity control and power supplies at our computer sites.'

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CANBERRA COMMENT

Unisys PCs



ALTHOUGH MAINFRAME builder Unisys does make a PC series they are not usually thought of as a PC company. SCT computers in Canberra have developed a nice little earner from marketing Unisys PCs. SCT began as an informal backyard group with plenty of computer talent. However, like many young people with good ideas they needed a backer. Theo Smarsz, a Canberra businessman came to their aid with finance and management skills. Smarsz found them an office in Canberra and they set to work. Smarsz keeps a friendly financial eye on the operation making sure they are pointed in the right direction.

As part of a community project SCT is installing six work stations in the local Belconnen Skill Share Centre free of charge. Skill Share is a non-profit community-based organisation. Unisys is the second biggest computer company in the world. Their PCs are assembled in the US from components sourced out of Asia. SCT say Unisys and suppliers Clear Technology give them great support.

UAP will install monitoring screens in some employees' homes so they can check on equipment without needing to be at work outside normal hours. UAP has been using electronic mail since 1986. 'Each employee receives on screen every day the image of mail needing processing. All administration can be done without any paper which has improved productivity 30 per cent.'

Levaux also mentioned Minitel — a terminal linked via standard phone lines to information serving computers. The French Post Office distributed Minitel free to anyone with a phone so they could access an electronic phone directory. More than five million Minitels are now operating in France with access to 3000 databases. UAP has decided to offer Minitel subscribers access to its insurance programs on line.

INTRO-FACES

Each month we introduce you to the names and faces behind the computer industry.

John Chandler



CURRENTLY THE manager of sales and marketing for information systems at Samsung Electronics, John Chandler has had what must be one of the most stable careers in the computer industry. After matriculation, Chandler's career began with AWA as an apprentice radio technician, and from there he moved up through the company rising to the level of product manager for Amstrad.

Chandler attributes his longevity at AWA to the wide range of responsibilities and tasks he undertook with the company which helped to maintain his interest. 'It was not a static role,' he said. His final role with the company led to him, and others, establishing the local office for Amstrad in January of 1988. Early in 1989, Chandler moved on to his present position which, he says, involves, putting into place a marketing infrastructure and setting-up a dealer network.

Personal interests include, genealogy, which has revealed his family's history right back to the 1600s. Chandler is married and lives in Kings Langley. Like Shephard, Chandler would also be a professional golfer if he 'had the ability.' Mostly because of the 'moving around, the lifestyle and, in particular, the rewards.'

Nigel Shephard



NIGEL SHEPHARD has had fairly diverse careers covering professional sports, marketing and senior management. They began after an education in Scotland and his qualifying as a mining surveyor. Shephard quickly realised however, that: 'the mining industry in Scotland was in strife' and it was fortunate that his interest and proficiency in soccer led to an invitation to join a Melbourne team. He moved to Australia on a two-year working permit. This move would eventually lead to his playing for Australia in the World Cup in 1966.

Shephard then pursued a career with Bell & Howell as marketing manager and this led to his becoming a consultant in the marketing area, and, in particular, for Hanimex. Shephard started the

company's Business Equipment Division which grew to include the Commodore range of computers. Not long after this move, however, Commodore Business Machines began to explore the possibility of establishing an Australian operation and approached Shephard.

Shephard subsequently founded Commodore Business Machines (Australia) in 1979 and remained the company's managing director until late 1985, when he was re-located to the US as the general manager for North America. But after parting company with CBM, he returned to Australia in 1987 and established a local office for Atari, re-establishing his relationship with the founder of Commodore, Jack Tramiel.

Shephard remains the managing director of Atari Computers, based in North Ryde, the high-tech heart of Sydney. His work includes management responsibility for the Australasia/Pacific region and ensuring the company efficiently markets and distributes Atari products.

Shephard is married and lives in Wahroonga, Sydney and when asked if he had any hobbies, Shephard replied: 'My wife would say my number one hobby is work' but he also enjoys a game of squash and likes a good novel as well. If he could have been anything else, he would have been a professional golfer. 'It's not as strenuous as tennis or soccer and you can do it for a lot longer. And you only need to play four or five games a year. I can think of nothing better,' Shephard said.

Kim Watts



EDUCATED IN England until fourth grade, and then at Cronulla High, Kim Watts is a man with an interesting past. After leaving school, he became a bank teller with what is now the State Bank (then the Rural Bank). After that, he joined a company called Instalrite, manufacturers of plastic products and one of the projects Watts was involved in was

the re-plumbing of the Opera House.

Next stop was Olivetti. Watts joined the company in 1976 as an assembler programmer for accounting systems, but two years later moved on to join one of the company's distributors in Wollongong. After gathering sales experience in this position, Watts moved on to a company called Primmers. Primmers is a computer bureau specialising in data processing for clubs and it was here that Watts gained a valuable insight into the workings of poker machines. His role with the company was to assist with the analysis of poker machines used by the clubs.

Watts returned to Olivetti in 1982 as product manager for personal computers. Since then he has also held positions in distributor sales and PC marketing and at present, Watts is Olivetti's national sales and marketing manager for personal computers.

He is married and lives in Bundeena ('near the Royal National Park') just outside Sydney. If given the opportunity to start all over again, Watts said he would: 'run a caravan park. In Jindabyne, near the snow.'

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Thoughts on scanners

WHEN AFFORDABLE scanners for PCs first appeared, they seemed to offer great potential for all kinds of users. Although I'm something less than an expert on scanners, it appears to me thus far that the promise of scanners has not been fully realised. They do not seem to have generated as much excitement as, say, desktop publishing. Perhaps scanners have not yet been around long enough for innovative personal applications to have emerged. I suspect it's largely a question of finding the right application. However, it's certainly not too late – scanners still offer enormous potential.

I've been thinking about a few scanner applications and scanners I have known, and it was particularly instructive to me to think back a few years ago to my first experience with scanners – in this case, a device that read ordinary numbers. On the advice of counsel, I'll say only that it was at a time when my 'personal computer' was about the size of a small house and was only truly 'personal' from around midnight Sunday to 6 AM Monday.

At that time, just about the only paper documents that were scanned were cheques, which required those funny-looking MICR numbers (still used today) at the bottom. MICR stands for Magnetic Ink Character Recognition, and the printing supposedly contained iron particles which enabled the check sorters to read the checks. The modest-sized commercial establishment at which I then toiled, thoughtfully maintained a number of Augean stables for employees to clean. The firm acquired this wondrous machine which would read ordinary numbers printed on documents.

A new age?

IT WAS A neat machine, and it then appeared to me to herald a new age in the information business. After all, it seemed but a short and obvious leap from that to reading letters. In retrospect, I was a bit overoptimistic, and readers of various sorts – to read bar code, type fonts, badges, and the like – arrived sooner, and even then, only following a long, tortuous acceptance. I was disabused of my notion of inevitable, rapid progress when it was

discovered, some months and many gallons of coffee later, that a bug in the machine's programming caused it to collect too much information.

Not only have readers of all sorts had a long struggle for acceptance, but the pattern of places where they are used – and not used – is surprising. Scanners are now found in all kinds of places that once would probably have been thought of as highly unlikely: checking out books in libraries, checking passports in customs stations, even in supermarkets! But although these are important applications, they are not really sexy or full of pizzazz.

Not only have readers of all sorts had a long struggle for acceptance, but the pattern of places where they are used – and not used – is surprising.

However, we should not let this deter us. Clearly, there are ways in which scanner makers could inject some pizzazz into their business and their product. One way, obviously, would be to find an application that would allow scanners to have more of an impact in our daily lives. Take, for example, folks like me, who are forever trying to get better organised. There is an army of us, whose lives are cluttered with paper.

To the everlasting dismay of those around me, I am a clipper and a collector. I read a fair number of periodicals, and as I read, I'm constantly cutting 'interesting-looking' things out of them. The result is The Karten Collection: a carefully selected set of clippings, selected with very high standards, removed from the pages of *The Wall Street Journal*, *Financial Times*, *Australian Business Review* and the odd supermarket tabloid ('Scanner causes Man's

Head to Explode').

Sometimes, I've clipped an article as a reminder to write to someone mentioned in an article; other times, it's to file the article for some reason. (What reason? To be candid, who knows? I've thought about it a lot, and I suppose there's some deep-seated psychological trauma or something – isn't there always?) In any case, filing anything in hardcopy form is near-useless, since once an item is safely out of sight, it's hard to recall or retrieve, and certainly too much trouble to index!

Thus, when Ye Kindly Olde Editor suggested that I direct my thoughts to scanners this month, I immediately began thinking about the vast wealth of information contained in The Karten Collection. I was stopped cold after only two minutes in the archives by the realization that it would take several hours to go through all the material, and started thinking about more practical matters.

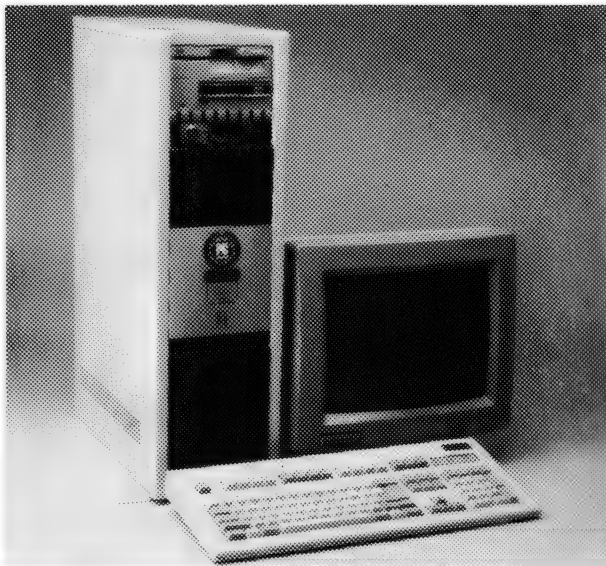
This also made me think briefly about the hidden danger to scanner proliferation. In my case, if I had a scanner that enabled me to easily input my collection of clippings-to-be-read into my computer, I'd probably waste a lot of time indexing it, cross-filing it, and so on. And *that* certainly wouldn't help me create more time; I already have all I can do to keep track of my to-do lists.

As I thought about this, it came to me a scanner application so simple, so obvious, that it was clear why no one had previously thought about it. It was clear, too, that the application I had in mind could revolutionise lives. With it, you'd never again have to wonder where you left your keys, or why your spouse misunderstood your perfectly clear intentions (even if sometimes accompanied by less-than-clear language), or why we do those silly things like collect newspaper clippings.

All this took place last week, actually, and hoping to capitalize on my previous experience with the aforementioned multinational computer manufacturer, I immediately persuaded it that the device could eventually make a fortune for all of us. We expect to announce in a month or so the world's first scanner that can read your mind. □

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8086, '286, '386, '486 and now we hear of the '586 – where Intel we going? Already, PCs have outgrown the name 'personal computers' and the current generation of 32-bit computers are just starting to have their potential realised. Whether or not that will happen before the next generation of chips comes on-line, is yet to be seen. But – today these machines are the pace setters. If you have a 'power use', then these are the one's you need to consider. . .



32-BITS

WITH THE 386DX personal computer offering five million instructions per second (MIPS) or more, some manufacturers (Compaq, in particular) have chosen to refer to them as workstations. When you consider the performance, features and relatively low cost of these machines, you may have to agree that the term PC as introduced with the original IBM machine, is no longer relevant.

Having broken the 640K, single-user barriers, the microcomputer is coming in to its own – Intel's 80386 CPU and its Motorola counterpart, the 68030 are the first tiny black boxes to offer the raw power, processor speed and address capabilities to seriously compete with mini-computers.

Speed is everything, and both the 80386 and the 68030 can blitz along at 33MHz. If there could be any doubts that this matters to the microcomputer market, a quick scan of the 80386 listing will reveal that there are more than 50 different 386DX systems available (and only a handful of those shown here are clones of clones).

There can also be no doubt that 33MHz is fast (some might say that 16MHz is fast). But, despite the fact that at the time of writing many manufacturers had only recently released their 33MHz sys-

tems and some had yet to do so, the question now being asked is: Is it fast enough? Rest assured, the industry already has an answer and rumours of 40MHz machines being just around the corner grow by the week. And then, of course, there's the 486, but that's another story. . .

R.I.P. 16MHz

THIS IS all very well, after all, speed will always sell. But for those users wishing to trade-up from their original PC (or clone) the first and foremost question must be how fast should my next machine be? Do I *really* need a 25MHz or 33MHz 'workstation'? If the answer is no (and in a great many cases it will be) it seems unfortunate that within the space of a few months, there may not be much choice. When compiling our survey, we found that many manufacturers have already discontinued the 16MHz models, and it seems only a matter of time before 20MHz machines suffer the same fate. The ubiquitous 25MHz may well end up being the low cost, 386DX entry-level machine.

This may make the reader wonder (amongst other things) if the previously revered 80286 processor will soon be relegated to the role of entry-level PC – well, this is what appears to be happening.



AND PCs

Of course, there is still the 80386SX, of which there are ten brands listed in the feature. But again, it seems that the SX has fallen out of favour. It was only during the year of our bicentenary celebrations that the 80386SX was the light in the midst of the darkness of 4.77MHz clock speeds, single-user processing and non-graphic intensive front ends. These days, it makes a great CPU for portables. Still, the SX has at least until 1991 to gain a credible market share (based on Intel's projection of an '80586' in 1991).

Much of this is according to Intel's plans for the 80386SX processor, which the company intended to supplant the 80286. What does not appear to have happened is the expected glut of 16MHz, 386SX machines. It appears the computer industry does not agree with Intel on the role of the 386SX.

However, much of this '386 fad will pay off as far as the consumer is concerned. One obvious benefit is cost. While the features and power of microcomputers continue to escalate, prices are (bytes for bucks) dropping rapidly and competition can only help these prices to come down further (as evidenced by IBM's recent price cuts, which some observers say was a response to falling market share).

Another benefit, although less direct, is the architectural design of most 80386 machines. These computers are far more adaptable than their forerunners and can be suitably configured for just about any task, no matter how demanding. For instance, most of the machines listed are available with a multitude of floppy and hard disk drive configurations ranging from 360K to up to more than 2Gb. Optical storage is now an optional extra for a number of machines, and many have networking hardware and software built-in. Displays systems range from monochrome MDA standard right through to Genoa and SuperVGA (1024 x 768 pixels). Expansion capabilities are also impressive with these machines, with some offering up to 34 serial ports and 9 expansion slots, many of which will accept cards from the XT, AT and MCA environments.

The configuration of a machine has a direct impact on its price, of course (for that reason we have created our own base configuration of 1 to 2Mb of RAM, single floppy disk drive and 40 to 80Mb of hard disk, VGA graphics and MS-DOS, and so there is some relief from high prices here).

Adaptability also allows the user to select a quality, brand-name PC and use existing cards or peripherals without chalking out much more than just a few dollars. Downwards compatibility

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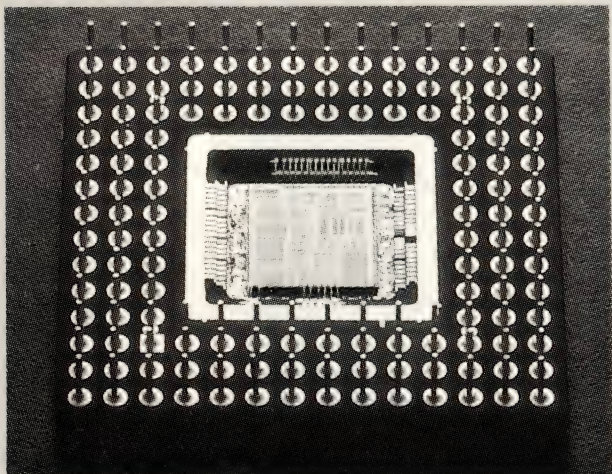
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32-BIT COMPUTERS

(albeit prone to the occasional hiccup) with software also means the user may not need to invest heavily in a new range of packages to just use the machine.

16.3 trillion words!



THE FOLLOWING facts and comments were extracted from an Intel poster of the 80386 chip –

- The Intel 80386 – squeezed onto it are 275,000 transistors, pushing the absolute limit of microprocessor technology. Ten years ago, a computer that powerful would have filled a room large enough to hold 2,000 people. Today, all the work that computer did can be done, in less time, on the 80386.
- The 80386 is the first 32-bit microprocessor with on-chip memory management. It can address 64 terabytes of virtual memory, no matter what the memory capacity of your computer. Put another way, the chip can manage an 8-page personal history of every living person on earth. Put still another way, 32,000,000,000 pages or 16.3 trillion words.
- The 80386 has full 32-bit data and memory paths. Data and memory paths are like country roads. All the information you work with passes down these roads. The larger the roads, the more information you can drive down them, faster. With the 80386, those country roads become 32-lane superhighways. And the amount of complex work your computer can do increases exponentially.
- There are areas of the chip reserved for the future. In these, the 80386's memory addressability and speed allow the creation of Artificial Intelligence functions that will revolutionize the future. Because of the 80386, computers will remember how you work, and adapt accordingly. They will recognize your voice, and understand what you are saying. They will ask you questions and answer yours. They will think. And because of this chip, you are here, at the beginning of this revolution.
- Imagine today's 16-bit microprocessors as having the speed of a bullet. You fire that bullet at a target 100 yards away. After giving it a 95-yard head start, you fire a second bullet with the 5,000,000 instructions per second speed of the 80386. The 80386 bullet will hit the target first.
- The control unit of the the chip is worth over \$10 billion, and it lets you run literally all industry standard software. And all of it on one machine. Including DOS, UNIX, OS/2, XENIX, and CP/M. That's \$10 billion worth of software available to you this instant. Not to mention the billions more to come.

However, for those users wishing to make the most of the '386's power and features, a wide range of hardware and a slowly increasing number of software packages are available to take advantage of it. The 80386 offers a great deal and at first glance delivers as much as promised. What remains to be seen is how the market will respond to computing in the fast lane.

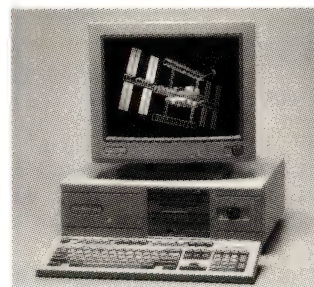
Bear in mind that the prices shown in the list are subject to fluctuation as a result of IBM's recent price cuts; they incorporate sales tax (unless noted) and include all the hardware needed to use the machine immediately (also unless noted).

MPE 386/25 \$23,487

The MPE (Multi-Purpose Engine) 386/25 is built by Intel and marketed by a division of the Lionel Singer Group. Features of the standard system include: 80387 co-processor support; 4Mb of RAM (expandable to 16Mb); disk controller capable of driving two floppy and two hard disk drives with one 1.2Mb 5¹/₄ inch floppy disk drive and one 130Mb hard disk included; 101-key AT-style keyboard; EGA graphics; two serial and one parallel port; six 16-bit AT-type expansion slots and a choice of operating environments. Optional extras include: up to 760Mb of hard disk storage; 60Mb of tape backup; up to 34 serial ports and 16MHz or 20MHz models. Warranty period is 12 months. Unimarket (02) 957 4226.

Compaq Deskpro 386/33 Model 84 \$19,000

Available in three configurations, the 386/33 is the latest machine from Compaq and features of the Model 84 include: 80387 co-processor support; 2Mb of RAM (expandable to 16Mb); one 5¹/₄ inch, 1.2Mb disk drive; one 84Mb hard disk; 101-key enhanced keyboard; 16-bit VGA



graphics board; one each of serial, parallel and mouse ports; six empty full-size expansion slots (one 8-bit, five 8/16-bit) and a range of Compaq software. Other features include: 82835 cache

controller supporting 64K of cache RAM; socket for Weitek co-processor; five mass storage device positions and security features. Other models include: Model 320 (320Mb hard disk with 15MHz ESDI controller) and the Model 650 (650Mb hard disk also with 15MHz ESDI controller). Warranty period is 12 months. CCA Systems (02) 417 7999.

Vectra RS/25C \$19,000

The newest members of the HP Vectra range, this machine is available in two clock speeds (20MHz or 25MHz) and in a variety of configurations. Standard features of the RS/25C Model 100 include: support for 80387 or Weitek 3167 co-processors; 1Mb of RAM (expandable to 16Mb on-board) configurable for application, extended or expanded memory; one 5¹/₄ inch, 1.2Mb floppy disk drive; one 103Mb 17ms hard disk (up to 620Mb of hard disk storage is available); 101-key AT-style keyboard; VGA graphics card (a selection of monitors is available); one parallel, serial and HP-HIL port; eight expansion slots (six 16-bit, two 8-bit); HP Vectra DOS 3.3, Windows/286, OS/2 version 1 and a selection of HP utility software (including PAM). Other features include: 32K of cache controlled by 82385 cache controller and 64K of ROM (and two additional ROM sockets). Options include: 4Mb of RAM; 5¹/₄ inch, 360K and 3¹/₂ inch, 1.44Mb disk drives and 155Mb or 310Mb hard disks. Warranty period is 12 months. Hewlett-Packard (008) 033 821.

Model 70 \$18540

The 25MHz version of Big Blue's 80386 PS/2 range, the Model 70-A21's features include: 80387 support; 2Mb of RAM (expandable to 16Mb); 1.44Mb 3¹/₂ inch disk drive and 120Mb hard disk; IBM Enhanced PC keyboard; VGA graphics with 256K of video RAM; serial, parallel and 'point-

32-BIT COMPUTERS

ing device' ports; three expansion slots (one 16-bit) and OS/2. Other features: 64K of cache and 128K of 'permanent memory' housing Advanced BIOS and security data. Also available are 16MHz (Model 70-E61, \$8199) and 20MHz (Model 70-121, \$11,931) models as well as the Model 80 range (16MHz and 20MHz). Warranty period is 12 months. IBM (02) 6349111.

Flexcache 25386 from \$15,249

A tower unit, the Advanced Logic Research FlexCache 25Mhz Model 150 system includes: support for the 80387 (25MHz) co-processor; 2Mb of RAM (expandable to 14Mb); one 1.2Mb, 5 1/4 inch disk drive and one 150Mb ESDI fixed disk (controlled by a 1:1 inter-leave, full track data buffering disc controller); 101-key enhanced keyboard; VGA graphics (with a selection of monitors available); one serial and parallel port; eight full length and height expansion slots (one 8-bit, six 16-bit and one 32-bit memory expansion slot). Other features include: 64K cache system controlled by the Intel 82385; 800 by 600 pixel graphics; support for an additional 5 1/4 inch or 3 1/2 inch, 1.44Mb disk drive and 150Mb streaming tape. Other models in the range include a 20MHz version of the FlexCache (from \$8577) and the base 20MHz, 80386/220 model (from \$6313). Warranty period is 12 months. Pericom (03) 699 2988.

Z-386/33 \$14,999

A new range of machines from Zenith, available in three models, all with a clock speed of 33MHz. The base model (Model 1) includes support for optional co-processors (numeric and floating point); 2Mb of RAM (expandable up to 16Mb); one 3 1/2 inch 1.4Mb floppy disk drive controlled by a multi-purpose Enhanced Small Device Interface (ESDI) floppy/hard disk card; a 101-key enhanced keyboard; 16-bit VGA card; 32-bit input/output card providing two nine-pin serial ports and one parallel port; three open 32-bit expansion slots and two 16-bit slots and MS-DOS 3.3. Other standard features include: real-time clock/calendar; resident password system and a 16K cache memory with 16 layer write queue. Options include varying configurations of 3 1/2 or 5 1/4 inch

disk drives. Model 150 includes a 18ms 150Mb hard disk, with the Model 320 providing 320Mb of storage. Both the 150 and the 320 are supplied with Windows 386 as standard. Warranty period is 12 months. Zenith Data Systems (02) 417 7999.

PW2 800/25 \$13,803

Also available in 16MHz and 20MHz models, the Unisys PW2 800/25 PC is a SCSI based machine employing a 64K cache system. Features include: 80387 co-processor support; 2Mb of RAM (expandable to 16Mb);



1.44Mb, 3 1/2 inch floppy disk drive with support for 1.2Mb 5 1/4 inch drives (or both); support for 80Mb, 140Mb or 320Mb hard disks (up to a maximum of 640Mb); 101-key AT-type keyboard; VGA graphics card and screen; one parallel port and two serial ports; eight expansion slots (one 8-bit, five 8/16-bit and two 8/16/32-bit) and MS-DOS 3.3 and Windows 386. Options include: OS/2 and SCO Xenix and 135Mb of (SCSI) tape backup. Other models in the range (1Mb of RAM and no cache) are priced from \$9077 (16MHz) and \$10,179 (20MHz). Unisys (02) 963 6000.

Powermate 386/20 from \$13,740

A 20MHz machine, the Powermate 386/20 supports (as standard): 80387 co-processor; 2Mb of RAM (expandable to 16Mb); a 5 1/4 inch, 1.2Mb disk drive; 140Mb hard disk drive running at less than 18ms and controlled by a 1:1 sector inter-leave controller card; 101-key inverted 'T' cursor control type keyboard; Multisync II monitor and VGB (VGA) graphics card; one parallel and two serial ports; eight expansion slots (five 8 or 16-bit full length and two 8-bit full length) and MS-DOS 3.3. Options include: up

to 10Mb of high-speed memory; 300Mb hard disk system; Multi-sync EGA Plus card and Color Graphics card. Warranty period is 90 days. NEC (02) 438 3544.

386-33 from \$12,938

Based on a 33MHz machine, this system includes a 32K cache and: support for Intel or Weitek co-processors; 1Mb of RAM (expandable to 16Mb); one 5 1/4 inch, 1.2Mb disk drive; one 40Mb hard disk; 101-key enhanced keyboard; Hercules/MDA graphics and monitor; two serial and parallel ports (32 serial ports maximum); eight expansion slots (one 32-bit RAM expansion, five 16-bit and two 8-bit slots) and MS-DOS 3.3, QA Plus. Options include: 64K cache system and hard disks up to 383Mb. Other machines in the range include: 16MHz (\$5710), 20MHz (\$6314) and 25MHz (\$10,333) models (differing in clock speeds only). Minicom (02) 957 6800.

Model P70 386 \$12,633

Available in two configurations, with 120Mb or 60Mb of fixed disk storage, the Model P386 is a gas plasma screen portable. Standard features of the P70-061 (weighing in at 46kgs) include: 20MHz 386 with 0-2 wait states; support for 80387 (20MHz) co-processor; 4Mb of RAM (expandable to 8Mb); one 3 1/2 inch, 1.44Mb disk drive; 60Mb, 27ms,



hard disk with 1:1 inter-leaving and ESDI controller (no slot required); 101-key enhanced IBM PC keyboard; VGA graphics supported by 256K of RAM and requiring external monitor; ten-inch gas plasma screen capable of displaying 16 shades of grey; one each of serial, parallel, mouse, external disk drive and VGA monitor port; two MCA slots (one full, one half size) and MS.DOS. Other features include: 128K of ROM incorporating Advanced BIOS (ABIOS), Basic interpreter, self-test features and security software. The other model, P70-121, is priced from

\$13,616. Warranty period is 12 months. IBM (02) 634 9111.

Deskpro 386/25 Model 60 \$12,292

The 25MHz of the 386 Deskpro range, the 386/25 Model 60 offers support for: concurrent use of the (optional) Intel or Weitek co-processors; 1Mb of RAM (expandable to 16Mb); one 5 1/4 inch, 1.2Mb disk drive; one 60Mb, 1:1 inter-leave, hard disk drive; enhanced keyboard; VGA/EGA/ CGA compatible graphics and colour monitor; one each of serial and parallel port; six expansion slots (four 8/16-bit and two 8-bit) and a selection of operating systems. Other features include cache memory controller (32Kb) and a selection of Compaq utilities. Options include: 360Kb, 5 1/4 inch and 3 1/2 inch, 1.44Mb disk drives; 110Mb or 300Mb hard disks; 40Mb and 135Mb tape cartridge. Warranty period is 12 months. CCA Systems (02) 660 0077.

Portable 386 Model 40 \$12,209

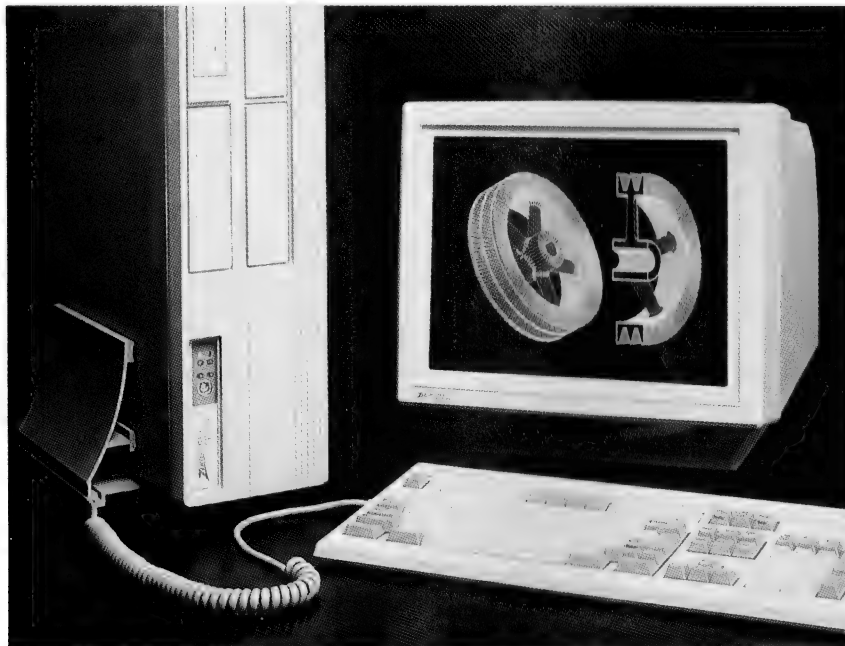
One of the two models in the Compaq 386 (20MHz) portable line, which differ only in hard disk size, the Model 40's features include: support for an 80387 co-processor; 1Mb of 32-bit, 80ns RAM (expandable to 10Mb); one 5 1/4 inch, 1.2Mb disk drive; one 40Mb, 30ms hard disk; Compaq enhanced portable keyboard (with 12 programmable function keys); 10-inch gas plasma display supporting high-resolution (640 by 400) monochrome graphics; serial, parallel and RGBI ports; two 8-bit or 16-bit expansion slots (through the optional expansion chassis) and MS-DOS 3.30 and a selection of utilities. Options include: 5 1/4 inch, 360K disk drive; Compaq 1200 baud or 2400 baud modems; additional I/O ports and colour monitor. The Model 100 (\$15,261) offers a 100Mb, 25ms hard disk. Warranty period is 12 months. CCA Systems (02) 660 0077.

T5200/40 \$11,999

Toshiba's top of the range 20MHz portable, the 5200 will run only from mains power and weighs in at 8.6Kg. Features include: support for the 80387 co-processor; 2Mb of RAM (640K user memory, 1.4Mb LIM-EMS or extended RAM expandable to 8Mb); 3 1/2 inch, 1.44Mb disk drive and 40Mb hard disk running at

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ZE156

64-bits and 33 MIPS

TO CALL Intel's latest processor a microprocessor is, perhaps, a slight understatement. While a number of semi-conductor manufacturers have designed and produced RISC processors and others have produced parallel processors, Intel has incorporated both technologies (amongst others) onto the one chip to create a microprocessor that it refers to as a 'Cray on a chip'.

Small wonder that Intel claim the i860 to have 'the highest overall performance of any microprocessor in the world today'. If you're sceptical, consider this: the 64-bit i860 offers 33 MIPS processing speed (clocking at 40MHz), 80MFLOPS (peak) single precision and 60MFLOPS (peak) double precision, a 128-bit on-chip data bus capable of transferring 640Mb per second, 64-bit on-chip instruction bus and a 64-bit external data bus.

It was also the world's first integrated circuit to contain more than 1,000,000 transistors, a feat Intel carried out again with its other recently released microprocessor, the i486. The i860 is a break from tradition for Intel, as it is the first attempt by the company to expand its computer processor horizons beyond that of the PC market. And the processor is a significant first step towards making an impression on the lower end of the supercomputer field.

It was designed primarily for complex, computing-intensive applications requiring real-time 3D graphics displays. To achieve this, Intel has designed a new architecture for the i860 and incorporated what is essentially a supercomputer on a single chip. This consists of nine modules: core execution unit (RISC), floating point control, floating point addition, floating point multiplication, 3D graphics unit, paging unit with translation lookaside buffer, instruction cache (4K), data cache (8K) and bus and cache control unit.

Or, put more succinctly, the architecture can be divided into thirds: one third floating point instructions (control, add and multiply) and the 3D graphics module; one third integer instructions (32-bit integer core, paging unit and bus module) and one third instruction and data caches.

For the technophiles, here is a brief outline of the major components of the i860:

- The core execution unit is the engine of the i860 and handles systems and application software. It's able to address 32, 32-bit general purpose registers, and execute load, store, integer,

bit and control-transfer operations (as well as fetch instructions for the floating point processor also).

- The floating point processor has access to a separate set of floating point registers which can be addressed as 16, 64-bit registers or 32, 32-bit registers. Special instructions also allow these registers to be used as 128, 8-bit registers.

- The graphics unit supports three-dimensional drawing in a graphics frame buffer with colour intensity shading and hidden surface elimination. This processor can compute individual red, blue and green colour intensities within a pixel (which can be an 8-bit, 16-bit or 32-bit data type).

- The paging unit implements protected, paged, virtual memory through a 64-entry, 4-way set-associative memory called the Translation Lookaside Buffer (TLB). The paging unit uses the TLB to perform the translation of logical addresses to physical addresses and to check for address violations.

- The bus and cache control unit performs data and instruction accesses for the core unit. It receives requests and specifications from the core unit, performs the data-cache or instruction cache miss processing, controls TLB translation, and provides the interface to the external bus. Its pipelined structure supports up to three outstanding bus cycles.

What all of this means is that the days of a supercomputer on a board are here. According to Intel, the release of a such a card, based on the i860, is likely to occur by the end of the year.

As the i860 is data-compatible with the 386SX, 386DX and 486 range of processors, users will be able to purchase the supercomputer board, plug it in their PC and access a computer with more power than most mini-computers through a 386 system. The implications of this are enormous. A chemist could, for instance, rotate the image of a molecule and view the results instantly. An aircraft designer could interactively alter a model and view the results in real-time. Simulations could become vastly more effective and realistic, multi-user systems more powerful and users can now have immediate access to a personal computer which delivers similar performance to a supercomputer which they once would only have been able to use on a shared basis.

27ms; 92-key keyboard with separate cursor control and numeric keypad; VGA, EGA and CGA compatible detachable gas plasma display with 16 grey scales; two serial ports, one parallel/floppy disk drive and 101-key keyboard port; one proprietary, one 8-bit and one 16-bit expansion slot and MS-DOS 3.3. Other features include: auto-sensing 110/240 volts power supply; external 5 1/4 inch disk drive; two-slot expansion slot and EGA/VGA monitor. Also available is the T5200/100 with 100Mb hard disk (\$15,999). Warranty period is 12 months. Toshiba (02) 887 3322.

T5100 \$11920
A 16MHz portable, the 5100 (mains power only) weighs in at 6.8Kg and includes: support for

the 80387 (16MHz) co-processor; 2Mb of RAM (640K user memory, 1.4Mb LIM-EMS or extended RAM expandable to 4Mb); 3 1/2 inch, 1.44Mb disk drive and 40Mb hard disk running at 29ms; 82-key keyboard with cursor control and integrated numeric keypad; EGA and CGA compatible gas plasma display with four grey scales; one each of parallel, serial, floppy disk drive and 101-key keyboard ports; one proprietary expansion slot and MS-DOS 3.3. Other features include: keyboard selectable operating speeds of 8MHz or 16MHz; auto-sensing 90-250 volts power supply; OS/2 and Windows 386; external 5 1/4 inch disk drive; two-slot expansion chassis; built-in modem and EGA/VGA monitor. Toshiba (02) 887 3322.

Z-386/25 \$11,799
Similar to the 33MHz range, the Z-386/25 operates at 25MHz. The base model (Model 1) includes support for optional co-processors (numeric and floating point); 2Mb of RAM (expandable up to 16Mb); one 3 1/2 inch 1.44Mb floppy disk drive controlled by a multi-purpose Enhanced Small Device Interface (ESDI) floppy/hard disk card; a 101-key enhanced keyboard; 16-bit VGA card; 32-bit input/output card providing two nine-pin serial ports and one parallel port; three 32-bit and two 16-bit expansion slots. MS-DOS 3.3 is supplied as standard. Other standard features include: real-time clock/calendar and a 16K cache memory with 16 layer write queue. Options include a variety

of configurations of 3 1/2 inch and 5 1/4 inch disk drives. Three additional models are available with 70Mb, 150Mb and 320Mb 8ms hard disk drives. Warranty period is 12 months. Zenith Data Systems (02) 417 7999.

Vectra QS/20 \$11,440
A 20MHz, desktop PC, the QS/20 is similar in specifications to the

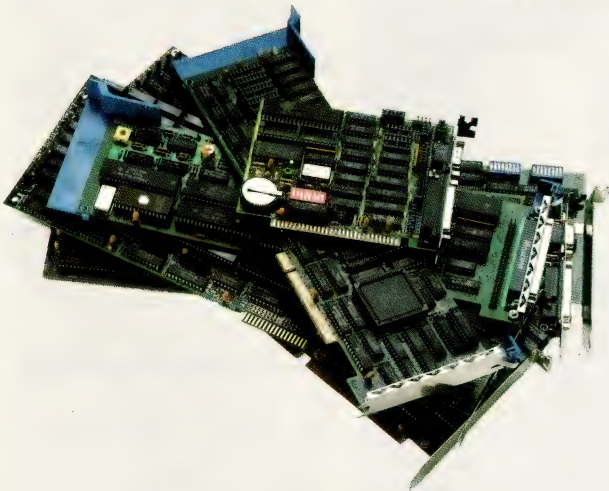


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RS/20C range and includes: support for the 80387; 1Mb of RAM (expandable to 16Mb); one 5 1/4 inch, 1.2Mb floppy disk drive and 40Mb hard disk; 101-key keyboard; VGA graphics card (monitor available separately); one serial and parallel port; seven expansion slots (one 8-bit and six 16-bit) and a selection of HP Utility software. Hewlett-Packard (008) 033 821.

Abacus 386 Model 60 \$11,150

The Abacus system is a 25MHz tower offering: support for the 80387 or Weitek WTL 3167 co-processors; 1Mb of RAM (expandable to 16Mb); one 5 1/4 inch, 1.2Mb disk drive; one 28ms, 60Mb hard disk with 1:1 inter-leaving and full-track caching; 101-key AT-style keyboard; two serial ports and one parallel; eight expansion slots (five 16-bit and three 8-bit) as well as one 32-bit memory expansion slot and MS-DOS 3.30. Other features include: VGA graphics and monitor; 5 1/4 inch, 360K and 3 1/2 inch, 1.44Mb disk drives and 130Mb or 320Mb hard disks. Warranty period is 90 days. TCG (02) 699 8300.

PC 916 from \$10448

A 16MHz machine, the PC916 is available in two models, differing in hard disk capacity only. The 916 is software switchable from 4.77MHz to 6MHz, 8MHz or 16MHz and other standard features include: support for the 80387 co-processor; 2Mb of RAM (with a maximum of 268Mb of 'physical addressable memory' claimed); one 5.25, 1.2Mb disk drive; 70Mb hard disk; 101-key enhanced keyboard; EGA graphics and monitor; one serial and parallel port; five PC/AT compatible expansion slots and NCR-DOS and utilities. Other features include: multi-lingual keyboards and real-time clock/calendar. Options include: 115Mb hard disk and VGA graphics. Warranty period is 90 days. NCR (02) 964 8111.

Step 386/25 \$9680

With the exception of the clock speeds (16MHz - \$6180, 20MHz - \$7312 or 25MHz) the Everex Step 386 machines are identical in features and architecture. The Step machines use a write-back cache system which, Everex claims, ensures effective zero-wait state operation. Standard features include: support for



Weitek WTL 3167 and 80837 co-processors; 1Mb of RAM (expandable to 16Mb); 1.2Mb high-density, 5 1/4 inch floppy disk drive (360K disk compatible) along with a 1:1 sector interleave hard disk controller; enhanced AT style keyboard with 101 keys; VGA graphics and Multi-sync monitor; one parallel and one serial port (second serial port available); eight expansion slots (six 16-bit and two 8-bit) one of which can be used as 32-bit memory expansion slot. Each machine in the range can run at one of three speeds, depending on software requirements. Warranty period is 12 months. Australia Everex Systems (02) 427 6111.



Osborne 386 \$9590

The Osborne 386 machine is a 25MHz model offering: support for Intel and Weitek co-processors; 4Mb of RAM (expandable to 16Mb); one 5 1/4 inch drive; one 96Mb hard disk drive; 101-key enhanced keyboard; EGA graphics and monitor and eight expansion slots (two 8-bit, five 16-bit and one 32-bit RAM) and LIM EMS 4.0 emulation software. Other features include: switch selectable bus speeds of 8.3MHz or 12.5MHz; three processor speeds, 6MHz, 8MHz or 25MHz; shadow RAM; direct map or two way associative cache option and real time clock. Peak Pacific (02) 901 0000.

Acer 1100/25 from \$9500 (approx)

Remington's 80386 machine runs at 25MHz and features include: 80385, 25MHz cache controller supporting 32K of static RAM; 2Mb of RAM (expandable to 24Mb); one 5 1/4 inch, 1.2Mb disk drive and hard disk controller capable of supporting up to 100Mb of hard disk storage; enhanced keyboard; VGA graphics (optional); two serial and one parallel ports; eight expansion slots (two 32-bit, six 16-bit and one 8-bit) and DOS 3.3 and Windows/386. Other features include: LIMSIM 4.0 (emulation of EMS 4.0) and disk cache software. Warranty period is 90 days. Remington (02) 418 6011.

CBM 386.40 \$9500

A 16MHz one wait state machine, the Commodore 386 has alternate bank refresh architecture, which CBM claims, speeds memory access. Standard features include support for the 80387 co-processor; 2.5Mb of RAM as standard (expandable to 15Mb); one each of 1.44Mb 3 1/2 inch drive, 5 1/4 inch 1.2Mb drive and 40Mb, 20.8ms hard disk; standard AT-style 101-key keyboard; EGA colour or monochrome TTL monitor; one parallel and serial port; eight full-length expansion slots (four AT, two XT and two 32-bit Intel standard bus) of which four are occupied, and MS-DOS, Windows and Phoenix Control 386 software. Other features include: clock/calendar, security lock and LIM emulation. Warranty period is 12 months. Commodore Business Machines (02) 427 4888.

Deskpro 386/20e Model 40 \$9497

The 20MHz of the 386 Deskpro range, the 386/20e Model 40 offers support for: concurrent use of the (optional) Intel or Weitek co-processors; 1Mb of RAM (expandable to 16Mb); one 5 1/4 inch, 1.2Mb disk drive; one 40Mb, 29ms, hard disk drive; enhanced keyboard; VGA/EGA/CGA compatible graphics and colour monitor; one each of auxiliary, serial and parallel port; five expansion slots (four 8/16-bit and one 32-bit) and a selection of operating systems. Other features include cache memory controller (32Kb) and a selection of Compaq utilities. Options include: 360Kb, 5 1/4 inch and 3 1/2 inch, 1.44Mb disk drives; 20Mb and

The i486

WHEN INTEL released the 80386DX, the company followed the convention of inserting a number in the middle of the name to denote the generation of the microprocessor. With the release of the i486, however, the company broke this convention: the i486 is, in fact, a member of the i386DX family.

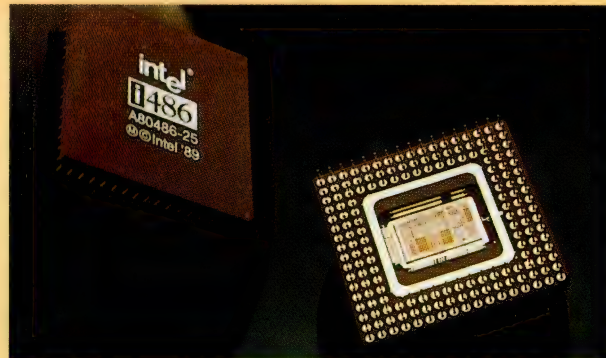
Running at 25MHz, the i486 is claimed to offer 15 Vax MIPS (up to 20 Vax MIPS at 33MHz) and incorporates on the one chip an: 80386DX processor, 80387DX mathematics co-processor, a paging and memory management unit and an 8K data and instruction cache. As Intel's second microprocessor to feature one million transistors (how do they count them all?), the i486 makes use of several advanced technologies to offer performance which rates with mainframes. Yet the i486 is still 100 per cent binary compatible with what Intel reckons is a software base worth about \$15 billion (comprising products in the DOS, Windows/386, OS/2, Unix System V/386 and iRMX and iRMK environments).

According to Claude Leglise, marketing manager for Intel's Santa Clara Microprocessor Division: 'The 386SX, 386DX and i486 microprocessors are completely compatible, giving manufacturers and buyers a 32-bit solution for all price/performance needs - from 386SX processor-based PCs to multi-processor mini-computers based on the i486 processor.

'The i486 processor gives our customers the power to compete directly with SPARC, 88000 and R3000-based systems while protecting their customer's investments in software,' he said. Intel has achieved this by including many of the functions usually located externally to the CPU on the microprocessor chip itself and through the use of RISC technology. By using these techniques, Intel has created a processor offering two to four times the performance of the 386DX. For instance, by performing memory management on-chip, the i486 eliminates access delays normally associated with communication with an external MMU, the speed of which is limited by printed circuit boards.

The i486's paging and memory management unit is identical to that used by the 386DX and although this device is capable of paging (thereby allowing it to recognise more than its physical address space), it can access up to 4Gb of RAM and 64Tb (tera or trillion bytes) of external storage. As well as that, the i486 processor also has an 8K, software transparent cache to provide data and instructions from high-speed, on-chip resources. The on-chip cache avoids time-consuming, external memory cycles and reduces traffic on the system bus, which is particularly important where the bus is shared on a multi-processor system.

The cache is particularly intelligent offering: a pre-fetch queue which can fetch 16 bytes of code in one clock cycle, support for self-modifying code in existing programs, a four-way set-associative configuration optimising the selection of storage areas for newly loaded data and other features. And by using RISC design techniques, many of the instructions which require a number of clock cycles on other CPUs (including the 386DX) can be performed by the i486 in one. For instance, the machine code instructions to LOAD and STORE to and from a register takes four and two cycles respectively on a 386DX.



Both require only one on the i486. Similarly, a successful JUMP instruction requires nine cycles on a 386DX but only three on the i486.

The i486 is also more compatible than most processors. In fact, it can get along quite nicely with any 386DX compatible system or mainframes system which use a different format for arranging bytes of information. This means that the i486 can quite happily converse with mainframe databases, offering unmatched compatibility at the processor hardware level.

Although the i486 has not been around for very long (it was released in mid-1989) a number of PC manufacturers have already revealed plans to develop systems based on the MPU. More than 20 companies, including Compaq, IBM and Sun Microsystems, have announced plans ranging from EISA-based architectures to MCA and straight AT-bus type machines. According to the manufacturers concerned, typical configurations may include: two to three times the present speed and performance of existing 386DX systems, 8Mb of RAM, super VGA graphics, 150Mb to 200Mb of hard disk, and a price close to the \$20,000 mark for a standalone workstation.

Prototypes have already been developed by IBM, and production units of the i486 machines are expected early in 1990. In the Unix environment, Intel is also at present working with AT&T's Unix Software Operation, Convergent Technologies (now a division of Unisys) and Prime Computer to develop a multi-processor version of Unix System V Release 4.0 that will run on the i486, along with the 386DX and i860 CPUs and this is expected to be available late 1989.

Unix users are expected to benefit most from the i486 with performance and power expected to increase dramatically over existing 386DX based Unix systems. Typically, a 386 Unix multi-user system can cater for between 4 and 24 users, and the i486 is likely to push this up to more than 40 users. Recently, Intel predicted that the next generation in the x86 series, the 80586, will contain two million transistors and will be released in 1991. This follows a convention within Intel known as Moore's law (after one of the founders of the company, Gordon Moore) who predicted that the number of transistors on a chip could be doubled every two years - a projection which, so far, has proven to be accurate.

110Mb hard disks; 40Mb and 135Mb tape cartridge. Warranty period is 12 months. CCA Systems (02) 660 0077.

PC Labs 386i/33 **\$9006**
The 33MHz model in the 386i

range, this machine is made in the US and is a tower system. Features include: support for the 80387 co-processor; 2Mb of RAM (expandable to 32Mb); one 5 1/4 inch, 1.2Mb disk drive; 101-key enhanced keyboard; one

serial and parallel port (expandable to a maximum of 16 and two respectively); eight expansion slots (one 8-bit, four 16-bit, two 32-bit and one 32-bit RAM slot) and MS-DOS 4.01. Options include: 20Mb, 41Mb, 44Mb,

150Mb (ESDI) and 300Mb (ESDI) hard disks; EGA and VGA graphics and monitors; Unix, Xenix, concurrent DOS, PC Mos and Novell. Other machines in the range include: 16Mhz (\$3475), 20Mhz (\$4117) and 25Mhz (\$6406) ma-

Was it worth it?

HILDITCH VINE had been looking for an answer to its particular data processing requirements since 1981. An international company, Hilditch Vine (HV) trades in crude oils, petroleum and various associated products and many of its employees (traders) spend a great deal of time on the road. As a consequence, and also because of the nature of HV's business, communication proved to be the company's single most important application.

Some eight years ago when the quest began, the company began to examine the potential of small computer systems to assist with this task, and its investigations led to the purchase of a system comprising three DEC PCs and the use of the US-based electronic mail system, Comet. This system linked HV's offices in Sydney, Melbourne, Houston and London; while this proved to be quite successful, there were some shortcomings.

Although the services provided by the set-up benefited the traders (consultants) most, staff telex operators were trained in the use of the system instead and consequently its full potential was never realised. This, and the company's general inexperience in computing led to the pursuit of alternative systems some years later.

In the meantime (in 1984), the corporation also purchased three Chendai XT's to network the Sydney, Melbourne and Adelaide offices and was part of an effort to provide access to Adelaide-based corporate financial records to all staff and offices. Unfortunately, this also caused the company some headaches as the network never got off the ground. Two of the Chendai XT's remained unpacked in their original condition until January 1989, and the other was used as a Viatel terminal. At this point, Hilditch Vine may well have been wondering why they had bothered.

In 1988, the company instigated an alternative communications system, running on two Sharp laptops. Originally, the concept was to use an interface between the laptops and the company's primary mode of local and international communications, telexes. Unfortunately, this was unsuccessful, it never worked, and the quest for effective computerised communications began again.

However, in September of 1988, things started to pick up. One of the company's Chemical Traders, Richard Havard was assigned the task of devising a system based on Telecom's Keylink electronic mail software using Telecom's own front end, Desklink. Unfortunately (again), the existing computers at Hilditch could not be used: the Sharp laptops were not sufficiently compatible and the Chendais were too slow. Alternative machines were then investigated.

Drawn by the promise of power and speed of 16 and 32-bit processors, Havard eventually settled on a short list of two, the Compaq SLT and the Toshiba T5100 laptops. Deciding the Compaq was too heavy, Havard purchased a T5100 on behalf of the company in January 1989 and the journey to successful data and personal communications began. Although there were many pitfalls, and errors were easy to make, the company has now made a successful transition to electronic communications.

'We now have nine T5100s, configured with 4Mb of RAM, 40Mb hard disk drives and soon we will be adding the NetComm 1234 internal modems,' said Havard. 'We use portables because the traders are continually traveling and need a computer with them constantly. As well as that, access to facsimile and telex services (provided by Keylink) are needed at all times, due to the time differences around the world,' he continued. Although the system does not allow a trader to receive a facsimile (although this may change soon, of course), the system offers all the features needed by Hilditch Vine in a portable package.

Asked why the company used 386 machines, Havard said Hilditch Vine replied: 'High-speed processing and multi-tasking capabilities and the '386 machines provide these. The Toshiba's have been a terrific success and we plan to move to them on an international basis.'

However, multi-tasking proved to be a significant problem for Havard. After wrestling with Windows/386 (and the special version needed for the T5100) Havard settled on Desqview, a product he now believes to be superior to Toshiba's own version of Windows. As is often the case with successful computer implementation, the use of the PCs has grown from the original application, communications, to include spreadsheeting, word processing and database applications. Hilditch Vine has even found a use for the PCs purchased before the T5100s. 'Everyone in the company now uses computers,' Havard noted.

Software used by the company includes: Cybersoft's Gateway V3, Desklink and Desqview. For spreadsheeting, word processing and databasing the company uses Excel, dBase IV and Multimate Advantage II. The company is also working closely with Telecom to ensure that the Keylink and Desklink packages are as effective and user-friendly as possible.

Asked if it had all been worth it, Havard said: 'Yes, it has. It's a superb system. The only thing I can't do is receive a fax which, in our line of work, doesn't matter all that much anyway. Yes, I think it has been worth it.'

serial ports and one parallel; eight expansion slots and MS-DOS 3.3. The 386SL (\$7750) includes: 2Mb of RAM; two serial ports and a keyboard lock. Warranty period is 24 months. President Computers (02) 476 2700.

Datamini 386 Tower \$7290

This machine has the unusual feature of switch selectable 20MHz or 24MHz clock speeds. Standard configuration include: support for 80387 co-processor support; 2Mb of RAM (expandable to 16Mb); one 5 1/4 inch, 1.2Mb and one 3 1/2 inch, 1.44Mb disk drive; one hard disk (71Mb,

voice coil); 101-key enhanced keyboard; EGA video card and 14-inch colour monitor to suit; one serial and parallel port, eight expansion slots (two 8-bit, five 16-bit and one 32-bit) and MS-DOS 3.3. Warranty period is 24 months. Australian Computer Distributors (03) 528 1988.

Synax 386-25 \$6995

A 25MHz, US manufactured machine the Synax system is LIM EMS 4.0 compatible. Other features include: 1Mb of RAM (expandable to 16Mb); one 5 1/4 inch, 1.2Mb disk drive and

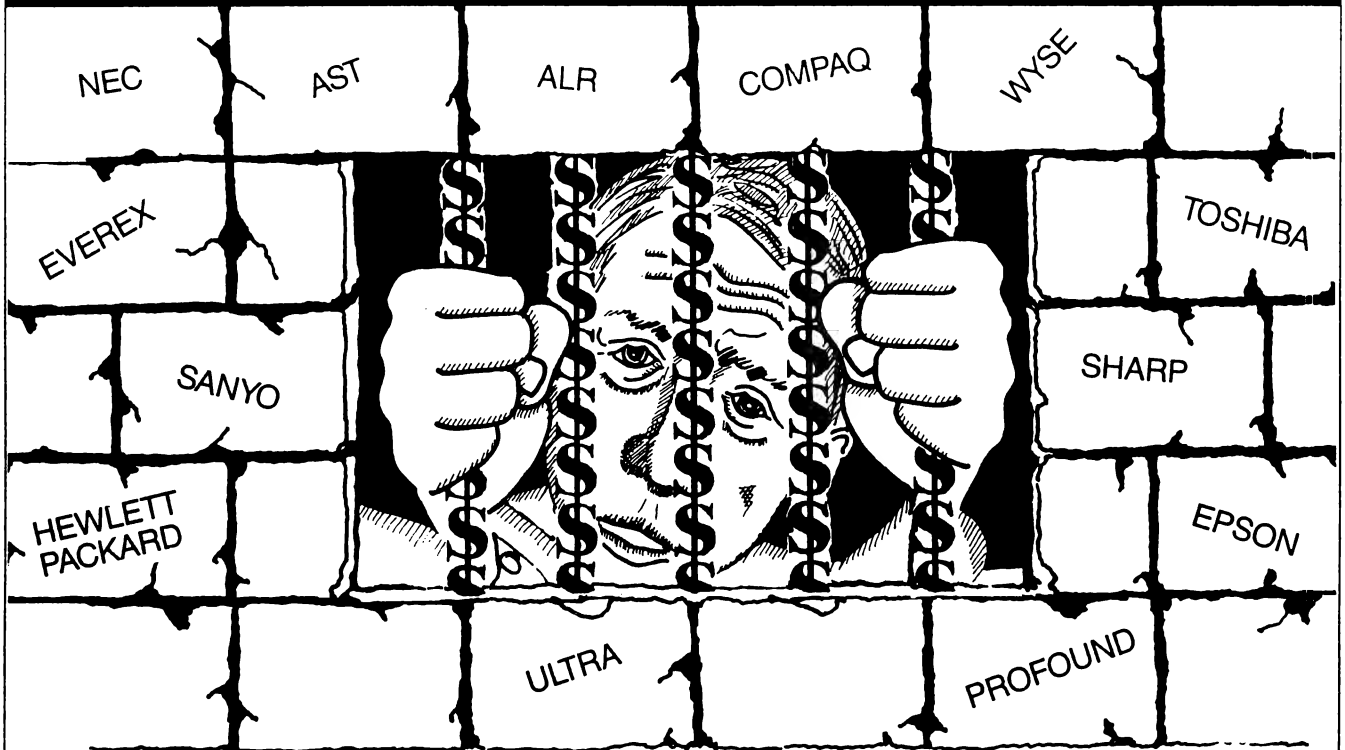
one 40Mb hard disk controlled by a 1:1 inter-leave controller (claimed to operate at 490Kb/-second); 101-key AT-style keyboard; VGA graphics card and monitor; two serial and parallel ports; eight expansion slots (two 8-bit, five 16-bit and one 32-bit RAM) and MS-DOS. Options include: 360Kb, 3 1/2 inch disk drives; 20Mb and 32Mb stepper motor, 44Mb, 72Mb, 120Mb and 158Mb voice coil drives and 91Mb, 155Mb, 307Mb and 638Mb SCSI hard disk drives; Hercules, CGA, EGA, Genoa, VGA and SuperVGA graphics cards. Warranty period is 12 months. Synax Sys-

tems (02) 949 2711.

LB386-20 \$6995

A 20MHz portable, the LB386-20 uses a gas plasma display and features include: support for Intel or Weitek co-processors; 1Mb of RAM (expandable to 16Mb); one 5 1/4 inch, 1.2Mb disk drive; one 40Mb hard disk; 101-key enhanced keyboard; gas plasma monitor; two serial and parallel ports (32 serial ports maximum); eight expansion slots (one 32-bit RAM expansion, five 16-bit and two 8-bit slots) and MS-DOS 3.3, QA Plus. Options include: 64K cache system and hard disks up to 383Mb.

YET ANOTHER BRICK IN THE WALL?



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advanced PC's mean a hefty advance on your bank balance. Whilst some questionable clones do offer hi-tech but with little standing or support.

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32-BIT COMPUTERS

chines differing in: RAM (1Mb expandable to 16Mb) and expansion slots (two 8-bit, six 16-bit and one 32-bit). Warranty period is 24 months (parts), 12 months (labor). ICT (02) 387 8033.

Neostar 386 \$8290

The Neostar machine is a 25MHz tower system offering a 64K memory caching system, EMS support, and 32K disk cache system. Other features include: 80387 co-processor support; 4Mb of RAM; one 5¹/₄ inch, 1.2Mb and one 3¹/₂ inch, 1.44Mb disk drive; 71Mb voice coil hard disk; 101-key enhanced keyboard (with calculator function); VGA graphics; two serial and one parallel ports; eight expansion slots (two 8-bit, five 16-bit and one 32-bit RAM) and MS-DOS 3.30 or 4.01. Other features include: three button serial mouse; shadow RAM capability; 150Mb, 350Mb or 800Mb hard disks; advanced disk caching (512Kb); 1.2Gb optical disk and VGA card (16 colour, 1024 by 768) with 512K of video RAM. Also available is the 20MHz model (\$4590) which differs in: 1Mb of RAM (expandable to 4Mb); monochrome graphics card and 45Mb hard disk. Warranty period is 12/24 months. KCM Computers (03) 429 2733.

Compwell 386/33 from \$10,000

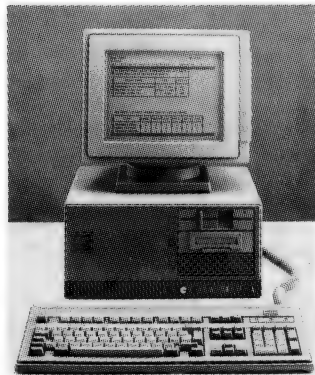
Available in three speeds: 20MHz, 25MHz and 33MHz the Compwell 386 has an unusual design in that all of the major components of the system: the CPU; RAM; floppy and hard disk controller; VGA graphics; serial, parallel and mouse ports are all on the motherboard. This technique, Compwell claims, speeds processing substantially. Features supported as standard include: 1Mb of RAM (expandable to 16Mb on the motherboard); any combination of 3¹/₂ or 5¹/₄ inch disk drives; 40Mb hard disk with 1:1 sector inter-leave



controller card (supporting up to 1.2Gb or 2.4Gb of hard disk storage depending on model); four-way 32K static RAM cache; AT-style 101-key keyboard; VGA graphics and one parallel and mouse port, two serial ports and eight expansion slots. All 386 systems have a two year warranty and 300Mb or 600Mb drives are warranted for three years. Options include: 16Mb hard disk cache for multi-user systems hard disk drive mirror feature for additional data security and five different operating systems. Other prices start at \$7355 for the 20MHz machine and \$9000 for the 25MHz. Warranty period is 24 months. Compwell (02) 569 3700.

M380C \$9951 (ex tax)

A 16MHz machine, the M380C is the entry-level system of the Olivetti 386 range. Standard features include: 80387 support; 1Mb of RAM (expandable to 36Mb); support for a wide variety of storage devices (up to a maximum of 198Mb); 101 enhanced



keyboard; VGA graphics; one serial and parallel port; seven expansion slots (three 32-bit, two 16-bit, and two 8-bit); support for a range of operating systems and a 128K ROM-based BIOS. Other models in the range include the XPI (\$11,824 ex tax) and the XP3 (\$13,961 ex tax) both of which operate at 20MHz. These models both incorporate mouse ports, CD-ROM options, ESDI hard disk controllers and support for the Weitek WTL 1167 co-processor. Warranty period is 12 months. Olivetti (02) 358 2655.

Mitac 386E \$9801

A 20MHz machine, the Mitac 386E is one of two in the range, the other being a 16MHz entry-level system (\$8185). Features of

both include: support for the 80387 co-processor; 2Mb of RAM (expandable to 8Mb) supporting LIM EMS 4.0; one 5¹/₄ inch, 1.2Mb disk drive; one 100Mb hard disk drive; 101-key enhanced keyboard; 16-bit VGA graphics card and 14-inch colour monitor; two serial and one parallel ports; five expansion slots (four 16-bit, one 8-bit) and MS-DOS 3.30A, LIM EMS 4.0 emulator and utilities. Options include: 5¹/₄ inch, 1.2Mb and 3¹/₂ inch, 1.44Mb disk drives; 40Mb hard disk; EGA and enhanced EGA graphics card and monitor. Warranty period is 12 months. Multi-tech (03) 338 3911.

DRS Model 80 \$8250 (ex tax)

ICL's 3986 machine is a 20MHz based system offering: 4Mb of RAM (expandable to 16Mb); 80387 co-processor support; one 5¹/₄ inch, 1.2Mb floppy disk drive; 45Mb, 80Mb or 300Mb hard disks (optional); 101-key enhanced keyboard; VGA graphics and monitor; one serial and parallel port; eight expansion slots (two 8-bit and six 16-bit) and MS-DOS 3.3. Other features include: Windows and multi-tasking comms facility. Mouse available as option. Warranty period is 12 months. ICL (02) 452 9900

Amstrad 2000 series from \$7999

Available in four configurations (all running at 20MHz) the Amstrad 2000 series is the latest in a large range of PCs. The basic system includes: socket for the Intel 80387 co-processor; 4Mb of RAM (expandable to 16Mb onboard); 1.4Mb 3¹/₂ inch disk drive and 65Mb hard disk with 1:1 inter-leave; 101-key AT-style keyboard; VGA graphics and 14-inch colour monitor with 0.29 dot pitch; external storage device, parallel and serial ports; five 16-bit expansion slots and MS-DOS version 4.0 and Windows 386. Other features include: LIM 4.0 Extended Memory, 64Kb, 35ns RAM



cache, mouse, battery backed clock and configuration RAM and security lock. Warranty period is 12 months. Amstrad (02) 360 3144.

Tandy Model 4000 \$7995

The 16MHz model, the 4000 is, along with its counterpart, manufactured in the USA and is marketed in Australia by Intertan Australia (aka Tandy Electronics). Features of the standard system are: support for the 80387 or the Weitek WTL 3167 co-processors; 1Mb of RAM (expandable to 16Mb); one 1.44Mb, 5¹/₄ inch floppy disk drive; one 52Mb hard disk with voice coil; enhanced keyboard with 101 keys; EGA graphics and monitor; one serial and parallel port; one slot for external drive and one for 32-bit RAM expansion; eight additional slots (seven 16-bit and one 8-bit) and MS-DOS 3.3. Optional features include: 80Mb SCSI hard disk; VGA graphics and OS/2 or SCO Xenix. Warranty period is 12 months. Tandy (02) 675 1222.

PC AX3 \$7868

Clocking in at 20MHz, the Epson 386 machine can, if necessary, also operate at a speed of 8MHz. Other features of the base model include: support for 80387 co-processor; 1Mb RAM expandable to 16Mb; one 5¹/₄ inch disk drive or a variety of configurations up to 90Mb of ESDI hard disk storage; new AT-style keyboard with 101 keys including 12 function keys and LED indicators;



monochrome/Hercules compatible graphics card (EGA and VGA also available); Centronics compatible parallel and RS232C serial ports; three 8-bit and six 16-bit expansion ports five of which can be used as mass storage device ports and MS-DOS version 3.30. Also included is shadow RAM which makes use of RAM above the 640K barrier to speed BIOS and video execution. Warranty period is 12 months. Epson (02) 436 0333.

Poor man's '386



OF THE MORE than 50 PCs presented in this feature, many are based on the poor man's 386DX, the 386SX. These machines are less expensive, have slower clock speeds (16MHz) and are more cost-efficient when it comes to expansion. The reason for this is the SX's bus is only 16-bits wide.

This means that RAM and other processor peripherals also need to be only 16-bit, which translates into lower cost for the user. Nonetheless, in a similar fashion to the 16-bit 8086 which had an 8-bit bus, the SX processor offers full upward software compatibility with the DX.

The 386SX chip processes data at the same 32-bits per CPU cycle as the 386DX, but has been priced by Intel at a lower rate than the DX. This, when teamed with its 16-bit bus width makes for a cost-effective entry-level 80386 PC. Even the least expensive SX machine in our survey, the Premium 386/SX Model 45 offers substantial power, particularly when compared to a typical 8086 or 80286 configuration: 1Mb of RAM, a 40Mb hard disk and a 12-month warranty period (which not even all 386DX machines offer). All this and 32-bit processing too. In short, the user is getting a bargain.

When Intel released the 386SX, this is exactly what the company had in mind. And, while the forerunner to the '386, the 80286, played a significant role in the evolution of personal computers, Intel considered that it had served its purpose and it was time to edge it out of the marketplace. The 386SX was an ideal tool for this purpose, but it appears the strategy is not working all that well.

According to Tom Cooper, managing director of Sydney-based President Computers, the 386SX machines have not been a success. 'They're too expensive,' he said. Cooper does believe the SX makes an excellent processor for laptop machines, but, he points out, the '286 market continues to thrive. This financial year has seen a growth of 25 per cent in the 80286 market, and these machines were now taking over from the PC and XT as the entry level PC. 'This year is the first year we have seen a decline in the XT market,' Cooper said, referring to the 15 per cent decline in XT sales. The 386DX sales, however, had increased by some 200 per cent in Cooper's estimation.

Pericomp, the Brisbane-based Australian distributor for Advanced Logic Research's Flexcache 386 systems, agrees with Cooper that the SX market appears to be slow. 'We've only had moderate reaction to the 386SX, probably because it is priced too high,' commented Robert Lee, the company's NSW manager. He does feel, however, that the '286 is losing market share. Last year's figures showed the it as having a 70 per cent stake in the market, which, this year has dropped to 50 per cent. The SX was running at about 15 per cent, Lee noted.

However, Craig Van Zeyl, sales manager for Solutions Plus of Crows Nest, NSW, is a firm believer in the 386SX. According to Van Zeyl, Solutions Plus is: 'definitely moving away from the '286. The 286 is taking over from the PC and XT, but the SX is taking over from the 286.' Van Zeyl considers the SX to be the next step up from the '286 machine and noted that this financial year had seen sales of the '286 and 386SX at similar percentages (20 per cent) but expects 386SX sales to outgrow the 286.

At Alliance Computers, of Ashfield, NSW (a firm IBM house), '386 sales are increasing month by month at a rate of about 15 per cent. Sales of the '286 were running at about 75 per cent, a significant drop on last year's results which showed the '286 accounted for 90 per cent of Alliance's trade. According to Joe Varady, managing director of Alliance, sales of IBM's SX machine are expected to grow at a rate of about 15 to 20 per cent per month.

The '386 market is essentially split into two camps. On the one hand there are the power users, requiring the full processing power of a 32-bit processor or the processor's multi-user/tasking capabilities. On the other hand, there are the price-sensitive purchasers who still require the price/performance of 386 machines but at a lower cost. And as competition increases, the cost of 386SX seems likely to go down further.

MBC 19 Plus \$7800

The MBC 19 Plus is a 20MHz tower system offering: an optional 80387 co-processor; 1Mb of RAM (expandable to 15Mb); one 5 1/4 inch, 1.2Mb disk drive; an optional hard disk drive; 101-key AT-style keyboard; CGA

graphics and a selection of monitors; one parallel and serial port; 12 expansion slots (three reserved) and MS-DOS 3.3. The MBC 18 Plus (\$4500) is a similar system with the exception of: clock speed (16MHz); one 5 1/4 inch, 360K disk drive; 1Mb of

RAM and five expansion slots (two reserved). Warranty period is 90 days. Sanyo Office Machines (02) 929 4644.

386VS \$7600

Both of these President machines are rated at 20MHz, although the 386S is claimed to

operate at up to 26MHz and the 386VS at up to 23Mhz. Features of the 386VS system include: 4Mb of RAM (expandable to 16Mb); 5 1/4 inch, 360Kb/1.2Mb and one 3 1/2 inch, 720Kb/1.44Mb disk drive; optional hard disk; VGA graphics and monitor; four



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32-BIT COMPUTERS

Warranty period is 12 months. Minicom (02) 957 6800.

PC 5 **\$6995**

Capable of running at 6MHz or 20MHz, the PC5 is the latest machine to be released by Atari and is expected to be available in Australia in August 1989. Features include: support for the 80387 co-processor; 4Mb of RAM (expandable to 8Mb); one 5 1/4 inch, 1.2Mb floppy disk drive; one 63Mb, 28ms hard disk (or a removable 44Mb); 101-key AT-style enhanced keyboard; VGA/EGA/CGA/MDA/MGC compatible graphics card; two RS-232C serial ports and one parallel port; five expansion slots (four AT, one XT) and MS-DOS 3.3 and Windows/386. Other features include: a 64K cache system and AMI BIOS. Warranty period is 12 months. Atari Computers (02) 805 0344.

AST Premium 386/11 Model 45 **\$6603**

Operating at 16MHz, this machine employs a 32-bit, 64K cache system which, AST Research claims, provides performance comparable to that of a 20MHz system. Standard features include: co-processor support; 1Mb of RAM (expandable to 16Mb); a 1.2Mb 5 1/4 inch disk drive and a 40Mb hard disk; enhanced keyboard with 101 keys; VGA graphics card; one each of 25 pin serial and 25 pin parallel port; seven expansion slots, one 32-bit (occupied), five 16-bit and one 8-bit; MS-DOS, and utility software. Also available is the Model 5, which excludes the hard disk and the Model 386/20 and the 386/25. Warranty period is 12 months. AST (02) 906 2200.

386 Turbo/XL **\$6300**

Designed around a four-layer PCB and a tower case, this machine is switchable from 8MHz to 20MHz. Features include: support for Intel 80387 co-processor; 2Mb, 100ns, RAM (expandable to 8Mb); one 5 1/4 inch, 1.2Mb disk drive (with 360K read/write capability); one 71Mb, voice coil hard disk (25ms); 102-key AT-style enhanced keyboard; EGA (800 by 600) compatible graphics card; one each of serial, parallel and joystick port; six expansion slots (one 8-bit, four 16-bit and one 32-bit) and MS-DOS 4.1. Options include: VGA graphics (800 by 600) and (1024 by 768). Warranty period is 12 months. Alfa Computers (02) 281 2755.

Z-386/16 **\$5385**

The 16MHz version of the Z-386/16 range. The base model (Model 1) includes support for optional co-processors (numeric and floating point); up to 1Mb of RAM (up to 16Mb); one 3 1/2 inch 1.4Mb floppy disk drive controlled by a ST-506 multi-purpose floppy/hard disk card; a 101-key enhanced keyboard; 16-bit VGA card; 32-bit input/output card providing one serial ports and one parallel port and three 32-bit expansion slots and one 16-bit and 8-bit slots. MS-DOS 3.3+ is supplied as standard. Other standard features include: real-time clock/calendar and a 16K cache memory with 16 layer write queue. Three additional models are available with 40Mb, 80Mb, 28ms, hard disk drives. Warranty period is 12 months. Zenith Data Systems (02) 417 7999.

DSS ET25 **from \$5306**

Available in 20MHz or 25MHz systems, standard features of the ET machines include: support for the 80387 or Weitek co-processors; 2Mb of RAM (expandable to 16Mb); one 5 1/4 inch, 1.2Mb disk drive; Western Digital floppy/hard disk controller card (with a range of hard disks available); enhanced 102-key keyboard; one serial and parallel port; eight expansion slots (six 16-bit, two 8-bit) and a range of operating systems. Other features include: programmable DMA speed, I/O bus, I/O wait states and memory wait states; page inter-leaved RAM; real time clock/calendar; and AMI BIOS. Also available is the 20MHz model (from \$3884). Warranty period is 12 months. Computer Control (02) 568 3145.

AST Premium 386/33 **POA**

The Premium is the powerhouse of the AST 386 range and like most of the machines listed here is fully configurable. Features offered include: 80387 and Weitek 3167 co-processor support (at 33MHz); 2Mb of RAM (expandable to 36Mb); one 5 1/4 inch 1.2Mb floppy disk drive with controller; enhanced keyboard with inverted 'T' cursor control; two serial and one parallel ports; seven expansion slots and MS-DOS. Also included is a 32K cache controller using 25ns RAM. Options include: a selection of graphics boards and hard disks. Warranty period is 12 months. AST Research (02) 906 2200.

Qi range

Apricot has an extensive range of 386 (and 386SX) machines and the Qi range includes four 386 machines. Features of the base model, the Qi 650 include: 20MHz clock speed; support for 80387 co-processor; 1Mb of RAM (expandable to 16Mb); one 5 1/4 inch, 1.44Mb disk drive; 47Mb, 28ms, hard disk; Apricot enhanced keyboard; VGA graphics card with 256K of graphics RAM (VGA monitors available separately); one each of serial, parallel, mouse, video, keyboard, network and sync comms ports; three expansion slots (MCA 16/32-bit) and MS-DOS 3.3. Other features include: hardware based security system; resident Ethernet support; 64K of cache RAM and expandable communication port. Other models in the range include: 25MHz machines with 65Mb (35ms), 118Mb (15ms), 147Mb (18ms), 247Mb (18ms) or 647Mb (18ms) hard disk. Warranty period is 12 months. Apricot Systems Australia (02) 888 9444.

EETO 386C

Manufactured by the famous Hyundai (pronounced Hunday) corporation and assembled in Australia, this machine offers: a 20MHz (switch selectable to 8MHz) CPU with co-processor option; 2Mb of RAM (expandable to 8Mb); one 5 1/4 inch, 1.2Mb disk drive; one 40Mb, 24ms hard disk drive; 101-key enhanced keyboard; VGA graphics card and monitor; one serial and parallel port; seven expansion slots (two 8-bit, four 16-bit and one 32-bit) and MS-DOS 3.3. Warranty period is 12 months. Y-Micro (09) 244 2888.

Model 5000

The 20MHz model in the Tandy 386 range includes a removable processor board providing for upgrades to the Microchannel technology. Features of the standard system are: support for the 80387 or the Weitek WTL 3167 co-processors; 2Mb of RAM (expandable to 16Mb); one 80Mb hard disk with voice coil; enhanced keyboard with 101 keys; VGA graphics; one serial, parallel and mouse port; two dedicated slots 32-bit RAM expansion; five Microchannel expansion slots and MS-DOS 3.3. Expected availability is the latter half of 1989. Warranty period is 12 months. Tandy (02) 675 1222.

POA

PC382

Running at 20MHz, the PC382 is switchable to 8MHz for clock speed sensitive applications. Other features include: support for the 80387 or Weitek WTL 3167 co-processors; up to 4Mb of base memory (expandable to 16Mb); 360Kb, 1.2Mb or 1.44Mb floppy disk drives; ST506 (20Mb, 42Mb or 68Mb) or ESDI (143Mb or 321Mb) hard disk controller card; a choice of enhanced keyboards with 10 or 12 function keys); a variety of graphics cards and monitors to suit (including a full-page screen); one serial, parallel and mouse port; two 8-bit, six 16-bit and one 32-bit (occupied) expansion slots and software for Expanded Memory Management, system diagnostics and preparation. Warranty period is 90 days. Wang (02) 925 5692.

80386SX-based machines

Apricot XEN-s range **POA**

The XEN-s range comprises five models offering varying features. Standard configuration of the XEN-s 240X includes: 16MHz



processor; 80387SX co-processor support; 1Mb of RAM (expandable to 5Mb onboard); one 3 1/2 inch, 1.44Mb disk drive; one 44Mb, 28ms, hard disk; VGA graphics card; one serial and one parallel port and three expansion slots (MCA). Apricot Systems Australia (02) 888 9444.

Powermate Portable SX **\$10,090**

As is the case with all of the SX machines, the NEC Portable is a 16MHz machine. Features include: 80387SX co-processor support; 2Mb of RAM (expandable to 16Mb); one 3 1/2 inch,

1.44Mb disk drive; one 42Mb, 28ms, hard disk; 93-key keyboard with numeric and cursor control keypads; VGA (640 by 480) graphics card (capable of driving external Multisync II colour monitor at 800 by 600); one each of serial, parallel and external monitor ports; three expansion slots (8/16-bit) and MS-DOS 3.3. Warranty period is 90 days. NEC (02) 438 3544.

Powermate SX \$8963

The Powermate SX supports (as standard): 80387SX co-processor; 2Mb of RAM (expandable to 16Mb); a 5 1/4 inch, 1.2Mb disk drive; 42Mb hard disk drive running at 28ms and controlled by a ST506 controller card; 101-key inverted 'T' cursor control type keyboard; Multisync II monitor and VGB (VGA) graphics card; one parallel and serial port; seven expansion slots (five 8 or 16-bit full length, one 8-bit full length and one 16-bit RAM) and MS-DOS 3.3. Options include: up to 16Mb of high-speed memory; 140Mb hard disk system (\$10,673); Multisync EGA Plus card and Color Graphics card. Warranty period is 90 days. NEC (02) 438 3544.

P500 \$8310

Clocking in at 16MHz, the P500 is Olivetti's SX machine and offers: 80387SX co-processor support; 1Mb of RAM (expandable to 16Mb); one 3 1/2 inch, 1.44Mb disk



drive; one 40Mb, ST506 based hard disk (28ms); 101-key enhanced keyboard; VGA graphics and monochrome monitor; one each of serial, parallel and mouse ports and five MCA expansion slots. Options include: colour monitor for an additional \$830. Warranty period is 12 months. Olivetti (02) 358 2655.

Compaq Deskpro 386s \$7820

One of the many in the Compaq

range, the 386s is Compaq's desktop 386SX model and was claimed to be the first to use the 80386SX processor. Features include: 16MHz clock speed;



80387SX co-processor support; 1Mb of RAM (expandable to 13Mb); one 5 1/4 inch, 1.2Mb disk drive; support for 40Mb, 110Mb or 145Mb hard disks; Compaq enhanced keyboard; VGA standard (EGA/CGA compatible) graphics card and one serial, parallel and mouse port. Options include: 12 inch monochrome monitor or 14 inch colour monitor; asynchronous comms/parallel printer board; MS-DOS 3.3; OS/2 and 40Mb or 135Mb tape cartridge. Warranty period is 12 months. CCA Systems (02) 660 0077.

T20 \$7600

Features of this machine include: 16MHz clock speed; 80387SX co-processor support; 1Mb of RAM (expandable to 8Mb); one 3 1/2 inch, 1.44Mb disk drive; 40Mb, 28ms, hard disk; 101-key enhanced keyboard; VGA graphics and monitor; two serial and one parallel port; three expansion slots (one 8-bit and two 16-bit) and MS-DOS. Other features include: mouse; keyboard password; EMS and disk caching software. Warranty period is 12 months. Terran Computers (03) 439 4100.

Model 55SX-031 \$6605

Features of Big Blue's 386SX machine include: 16MHz clock speed; 80387SX co-processor support; 2Mb of RAM (expandable to 16Mb); one 3 1/2 inch, 1.44Mb disk drive; one 30Mb hard disk; 101-key enhanced keyboard; VGA graphics supported by 256K of RAM; one serial, parallel and mouse port; three expansion slots (16-bit full size) and MS-DOS 3.3. Also available is the 55SX-061 (60Mb hard disk, \$7283). IBM (02) 943 9111.

ALR SX386 \$6405

Running at 16MHz, the Flexcache SX machine includes a 16K cache. Other features include: 16MHz, 80387SX co-processor support; 1Mb of RAM (expandable to 8Mb onboard, 16Mb total); one 5 1/4 inch, 1.2Mb disk drive; one 40Mb, 28ms, hard disk with 1:1 MFM controller card; 101-key enhanced keyboard; VGA graphics card; one serial and parallel port; five expansion slots



(one 8-bit, four 16-bit). Other features include: two-way associative cache system. Options include: mouse. Warranty period is 12 months. Pericomp (03) 699 2988.

Step 386is \$5622

Features include: 16MHz clock speed; 80387SX co-processor support; 1Mb of RAM (expandable to 16Mb); one 5 1/4 inch, 1.2Mb disk drive; 1:1 inter-leave controller supporting two hard disks; enhanced 101-key keyboard; one serial and parallel port (additional serial port available) and eight expansion slots (two 8-bit and six 16-bit). Other features include: CMOS RAM for setup and configuration; front panel keylock; front panel reset switch. Warranty period is 12 months. Australia Everex Systems (02) 427 6111.

Premium Workstation 386/SX Model 45 \$5495

Standard features of this machine include: 16MHz clock speed; 80387SX co-processor support; 1Mb of RAM (expandable to 6Mb onboard); one 5 1/4 inch, 1.2Mb disk drive; one 40Mb hard disk; 101-key enhanced keyboard; two serial, one parallel ports; two expansion slots (8/16-bit full length and height) and MS-DOS 3.3 and AST utility software. Other features include: security lock; front panel, cold-boot reset switch. Warranty period is 12 months. AST Research (02) 906 2200.

68030-based machines

DN4500 from \$32,500

One of two SCSI based systems from Apollo, the DN4500 differs from its counterpart (the DN3500) in clock speed and memory size. Features supported include: 33MHz (25MHz for the DN3500) clock speed; 68882 co-processor; 8Mb of RAM expandable to 32Mb (4Mb to 32Mb); 155Mb to 2.8Gb of hard disk storage; keyboard with function keys and mouse; optional 19-inch monochrome or 15 to 19-inch colour monitors; three serial ports; optional SCSI expansion bus; Unix V3 operating system. Options include: LAN. Warranty period is 90 days. Apollo Domain (02) 957 3382.

Macintosh IIcx \$9045

One of six models from Apple using the 68030 processor, the IIcx is Apple's most recent release. Features include: 15.567MHz clock speed; 2Mb of RAM (expandable to 8Mb); 1.4Mb, 3 1/2 inch drive; one 40Mb SCSI hard disk; a choice of 81-key standard keyboard or 105 extended keyboard, mouse (standard); two serial ports (RS-232/422 mini 8-pin din); three NuBus expansion slots and proprietary Macintosh operating system (includes MultiFinder and Apple utilities). Other models in the range include: floppy-based IIcx system with 1Mb of RAM (\$7745); IIcx with 4Mb of RAM and 160Mb of hard disk storage (\$13,995). Also available is the IIx range with: 4Mb of RAM (expandable to 8Mb); built-in 800Kb, 3 1/2 inch drive; 80Mb or 160Mb hard disk drive. Prices range from \$11,295 to \$13,995. All prices exclude keyboard. Warranty period is 12 months. Apple Computer (02) 452 8000.

Atari TT POA

Atari's newest desktop machine, the TT offers: 25MHz 68030 and 68882 processors; 4Mb of RAM; 3 1/2 inch, 720K disk drive; one 40Mb removable Winchester hard disk; keyboard with function keys and numeric keypad; two serial ports; and four VMEbus expansion slots. Warranty period is 12 months. Atari Computers (02) 805 0344.

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CACHE-IN!

The ALR Flexcache is a mean-looking, fast-moving and well-made '386 machine that stands tall with the big-boys at the top of the market, according to Ewart Stronach.

IMUST PREFACE this review by admitting a bias toward Applied Logic Research (ALR). The first AT-style machine I owned was an early 80286 ALR which has stood more abuse in the last three years than most computers could expect in a lifetime. Every conceivable peripheral has been tried in it, obscure modifications made to its motherboard and unmentionable outrages perpetrated to its nether regions. It has never let me down.

This new addition to the ALR stable makes my System 286 look like a Model T Ford parked beside a Seven Series BMW. It is a true tower configuration as distinct

from many clones which are simply AT cases with feet on the narrow side. There is room under a removable front panel for the easy insertion of up to five half-height devices and only the floppy drive doors and a keylock disrupt the clean front lines.

As with my ALR, there is no reset switch and even the power switch is hidden behind a small door in the rear of the system. This needs re-thinking in my opinion although the counter argument is that in a file server application, accidental resets or power interruptions could be a disaster, is valid. The entire unit is built with an obvious regard to strength and quality. The case is of heavier gauge metal than most,

and solidly built with thought to easy access without compromising the integrity of the structure when partly disassembled.

How fast?

THE 25MHz clock speed is just for openers – *PC-TECH Journal's* ATPERF program reports a clock speed of 25.3MHz and when the whole design has been fine tuned to make maximum use of this solid clock speed, the results are excellent. The standard disk drive is a 150Mb ESDI hard disk. ESDI stands for Enhanced Small Device Driver and by doubling the number of sectors on your hard disk effectively doubles its capacity. Built in caching techniques in the disk controller further enhance its speed. This disk is as fast as any I've seen and my tests indicate that the track to track seek time is a mere 4.3ms. Another test which creates, writes, reads and deletes ten 20,000 byte files took only 6.2 seconds to complete. The interleave factor of 1:1 assures you of rapid access and the built in track data buffering all adds to the performance.

The next area of attention to speed is the BIOS. The Phoenix BIOS and CHIPS set of VLSIs offer a system of ROM shadowing. Effectively this moves the contents of the ROMs into a more accessible and faster area of RAM and affords a significant improvement in throughput. The Phoenix BIOS is well respected and affords maximum compatibility for all DOS programs as well as trouble-free support for multi user applications such as Novell, Netware and file server applications.

All this attention to optimal speed is not unusual with '386 machines, after all, speed is what the '386 is all about. However, ALR have taken a further step with the design of their own cache system. For those of you who are unfamiliar with the technique (as I was a mere month ago) let me explain a few mysteries.

Information can only be fed to, or recovered from a RAM chip at a certain speed, dependent on the rating of the chip. The ALR has RAM chips rated at 60 nanoseconds (ns) and typically, with a clock speed of 25MHz, the CPU would be able to handle an access time of about 40ns. If the CPU is hanging about waiting for the RAM, it must generate 'Wait States', marking time so to speak. To prevent this a Cache of memory is set aside and the most used data stored there for faster access by the CPU. The CPU must first fetch the instruction, carry it out, then write the result to the RAM. By controlling the Cache area of RAM, the most used in-

structions are always in the same area and much faster access is available, so much faster in fact that on most occasions, no wait state need be generated. ALR have written their own cache software called Extended Emulation 82386 Cache Design to search its unique 64K of 25ns static RAM well inside the time restraints of the normal 60ns main RAM. In theory, this eliminates the one wait state generated each time there is a cache 'miss' or the information is not found in the cache area. With 2Mb of main memory, ALR suggest that this offers twice the memory configuration of most other systems. The control program is optionally loaded at boot-up.

I ran a series of tests with the cache active then de-activated. Frankly, I was disappointed with the speed-up afforded by the cache. Perhaps the type of test I ran did not need caching, but they were real-world tests, run with the type of program most potential customers would run. Don't get me wrong, I was not disappointed with the overall results, they were faster than any I have run before.

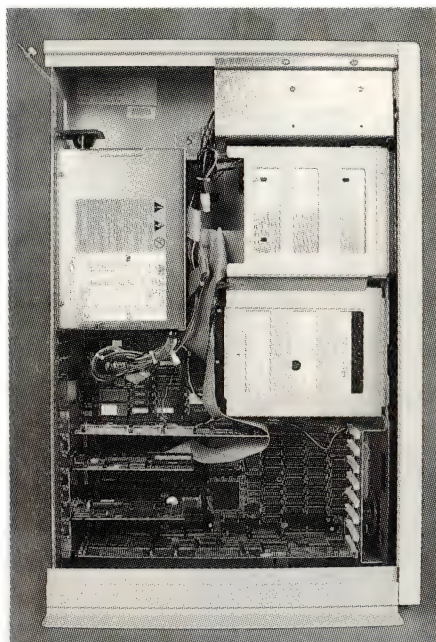
Test one consisted of loading a large, 360K file into good old WordStar. I then instructed WordStar to search for every occurrence of the word 'the' and change it to 'tbe'. With the cache on, this exercise took 1 min 22 sec and 3308 occurrences were found and replaced. With the cache off the time dropped by only 2 seconds. Whilst I thought a greater increase would have taken place, I suggest the problem might be as much with WordStar as with the hardware. Just for fun I fed the same instructions for the same file to a text editor called QEDIT which took only 3.9 seconds to carry out the same task, albeit without displaying the text as it searched.

A database test followed with a program which creates a database with 750 records of 256 bytes, sequentially reads them forwards then backwards then carries out a random read. The results were -

CREATE 750 RECORDS THEN:	WITHOUT	WITH CACHE
SEQUENTIAL FORWARD READ	1.48	1.32
SEQUENTIAL BACKWARD READ	6.37	1.54
RANDON READ	10.05	1.81.

Obviously this test was small enough to take place entirely inside the cache and was one area in which it shone.

A Lotus test followed in which a 360K spreadsheet was loaded, recalculated and written out to disk. The loading time was unchanged and the recalculation dropped



The Flexcache features strongly built supports for all possible drives and devices, beautifully manufactured circuit boards, a mammoth power supply and lots of room. There are eight expansion slots consisting of one 8-bit, six 16-bit and one 32-bit - there is no defined standard for 32-bit slots, so ALR have set theirs up by putting strapping two 16-bit slots together; in practice, the only use for this slot is additional memory boards from ALR. The system will support up to 14Mb of memory.

from 2.5 seconds to 1.78 with the cache enabled.

From ALR's own advertising sheet I offer the following comparison which I did not have the opportunity of verifying. A program from Database Group, called Power Meter, calculates the number of instructions per minute the CPU is capable of handling. This is reported as mips (Million Instructions Per Second). The ALR Flexcache 386 clocked in at 6.06 mips, the latest IBM model 70-A21 managed 5.81 and the Compaq DeskPro scratched its head a mere 5.51 million times.

Other published results which I did not have the equipment or software to verify suggest that the cache system offered by ALR produces significant operating advantages when run in the UNIX mode or in multi-tasking environments, both of which are natural applications for '386 machines.

The goodies continue

INSIDE THE CASE, the goodies continue. Strongly built supports for all possible drives and devices, beautifully manufactured circuit boards, a mammoth power supply and lots of room. There are eight expansion slots consisting of one 8-bit, six 16-bit and one 32-bit. As there is no defined standard for the 32-bit slots, ALR have effectively set theirs up by simply strapping two 16-bit slots together. Any card for this slot must therefore come from ALR and in practice, the only use for this slot is additional memory boards. The system will support up to a whopping 14Mb of memory.

The standard video board is a VGA, multi frequency controller. When coupled to my NEC Multisync, the graphics were brilliant, crisp, clear and flicker free. With a natural use of such a fast machine in CAD type applications the provision of such a high-grade video board makes excellent sense. I found very few programs which did not like the VGA board and all of those were my son's games which ran too fast to play anyway. Spreadsheets become far more readable in 132-column mode and graphics editors such as DR HALO enter a totally new dimension. A light pen port is standard on the video card and software drivers are included for most popular software capable of using the Video Graphics Array card.

The documents are well indexed and written at a level that almost any user with sufficient exposure to PCs in general, and particularly those with sufficient exposure to warrant the purchase of a '386, will be able to follow with ease. ALR have clearly aimed the Flexcache 25386 at the top of the market with prices below the perceived niche market leaders, IBM and Compaq. □

Product Details

Product: ALR Flexcache 25386 AT Tower
 From: Applied Logic Research
 Distributor: Pericom Computers, 66 Allison St, Mayne 4006 Qld (07) 252 4731
 Price: \$21,495

'It's a mean looking monolith with a minimum of superfluous excrescences and stands securely on its heavy metal base, ready for some fast action.'

POWER FOR THE PENURIOUS

Big on power and low on price; the IBM compatible '386 from Digital Designs made Rose Vines seriously contemplate reaching for her Bankcard!

REVIEWING AN IBM compatible 80386 computer, with EGA graphics card, multiscan monitor, 28-millisecond 42Mb hard disk, and a Landmark Speed Benchmark rating of 33MHz, is an awful job. While the testing itself is in no way unpleasant, all the while looming in my mind is the thought that I'm going to have to give this back. And oh, does my 8MHz AT with mono monitor look dreary in comparison!

Well, I may have to give it back, but Digital Designs' DSS ET's pricing makes it just feasible that I could sell my old workhorse, use my Bankcard to the hilt, and afford to keep it. For this is what we all want – a cheap powerhouse. Alright, I know I'm using cheap in a very loose sense, but if you've read our survey on 80386 machines and have lust in your heart, and then you've looked at the general price range, anything under \$7000 becomes bargain basement material.

For about that amount, you can get the top of the DSS range: the DSS ET with an AMD 80386-25 32-bit microprocessor, two megabytes of 80-nanosecond RAM, a fast 42-megabyte hard disk drive, a 1.2-megabyte floppy disk drive, a Teco multiscan



monitor, DSS's own EGA card providing 800 by 600 pixel resolution, and serial, parallel and games ports plus a mouse with its own garage. What? You can't stretch to \$7000. Then how does a little under \$4500 sound? For that you can get the bottom of the range: an 80386-20 processor, two megs of RAM, a slower 20-meg hard disk and a 1.2-meg floppy, plain old mono graphics card and screen, plus the various ports. That's a lot of computer for the price.

So is it worth going the cheap route? Well, when I bought my AT a couple of years ago I looked around at the Compaqs and the NECs, the TIs and the NCRs (for some reason I didn't bother with IBM).

They were all attractive except for their price tags. So I checked out the sort of computer shops my mother warned me against. In amongst some pretty shonky looking deals, I came across a couple of machines that looked as solid as the heavyweights in the field. Digital Designs' DSS AT was one of them (reviewed in the April '87 issue of *Your Computer*).

Since then, I've given my AT a thorough working over and it's performed beautifully. My only problem has been a hard disk that fell

over and refused to get up. If I'd forked out the extra and bought one of the top brand names, I might have slept better the first week or two instead of worrying over my decision, but two years down the track the only difference would have been an even slimmer wallet. For me, penny pinching has paid off and, because of this, Digital Designs now rates as a 'known brand' for me.

ET internals

SO, WHAT'S IT like inside? There are eight expansion slots, three half-length and five full-length. On the machine I tested, the EGA card took one slot and the communications card another, leaving six

vacant. Beside the slots is the 200-watt power supply. The RAM is expandable to 16 megabytes on the motherboard. In the model I tested, the 80386-25 processor (rated for 25MHz operation by Intel) was being driven to its limits. The various benchmarks I used gave CPU speeds of between 30 and 33MHz, or about 18 to 20 times the speed of the prehistoric PC. You can forget the figures and simply accept that this computer is currently one of the fastest around.

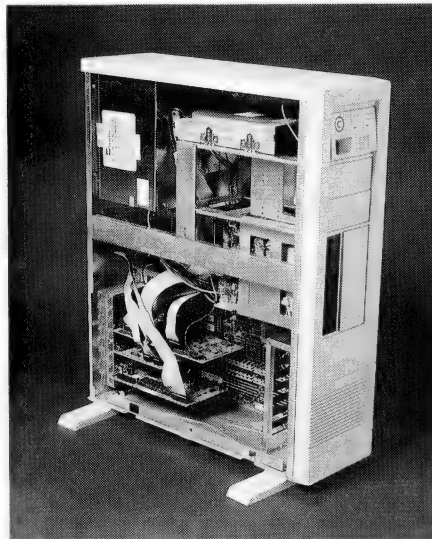
To get this sort of performance, the engineers at Digital Designs have used a technique called Interleaved Page Mode Dynamic RAM. The internal organisation of a RAM is a matrix of rows and columns – rather like a spreadsheet. A memory cell is normally accessed by first strobing in the row address and then in the column address. If the row address hasn't changed since the last access, you need only strobe the column address, almost halving access time. By divvying up the RAM into two blocks – one for the odd words and one for the even – you can effectively double the row size, and thus further increase the speed. This is called interleaving.

They've also used a variety of other techniques to squeeze the most from the hardware, including BIOS calls direct to RAM instead of the slower EPROMS (called shadow RAM).

All this dynamism is wrapped inside a plain exterior – you can choose between a very ordinary looking (but certainly not flimsy) desktop case with the traditional five screws securing the case in place at the back, or a somewhat more flashy tower case costing an additional couple of hundred dollars. The manuals are heaps better than those that used to be supplied with DSS computers, but only because they used to be supplied with no manuals at all! On the whole, you may well find it necessary to have an engineer friend beside you if you want to delve into the documentation, because that's who it's designed for. Unless you're very cluey, my advice is to let Computer Control (the distributor).

ET in action

IHAD A CHANCE to give the DSS ET a thorough going over and it performed very well with just one hiccup. This was a problem with running an expansion card that I was testing. The board needed to use COM 2; the ET had a communications card with two serial ports. Even though I disabled the jumper for COM 2 on the DSS card, I couldn't get the two cards to work



The DSS ET has eight expansion slots, three half-length and five full-length (six are free). The RAM is expandable to 16 megabytes on the motherboard. In the model tested, the 80386-25 processor was being driven to its limits – various benchmarks gave CPU speeds of between 30 and 33MHz.

Product Details

Product: DSS ET
 Distributor: Computer Control
 487 Parramatta Rd,
 Leichhardt 2040 NSW
 (02) 568 3500
 Price: \$7264
 (The 20MHz, monochrome graphics machine mentioned in the text is priced at \$4529.)

'The DSS ET lets you opt for the open-ended power of a '386 without having to justify massive outlays.'

together, so I had to remove the DSS communications card. As the expansion board was at beta test stage, I can't be sure that it wasn't at fault and not the ET (although I'd tested it on a variety of other computers with no hassles), but when you disable a COM port's jumper, you expect there to be no conflict.

The only other thing I found annoying was the startup routine which automatically turns the NumLock key on. The ET comes with the standard 'improved' AT keyboard, with the function keys along the top, and a separate second set of cursor keys between the alphabetic keyboard and the number pad. While it may be logical to

use the number pad for numbers and the separate cursor keys for cursor control, I prefer the more spacious layout of the cursor keys in the number pad and always use them for cursor control. As I rarely use the number pad for numbers (not being a spreadsheet fiend), I felt like I was being forced to work someone else's way. I know it's a simple thing to switch the NumLock key off each time the computer is reset, but it's these simple things that can drive you bats.

Apart from those two hitches, everything else worked well. I used the ET on my normal daily work and found no problems. The speed of the machine was most noticeable when using graphics animation and archiving programs, which are processor-intensive. At the time I was testing the ET, I was also writing a story on bulletin board software, so I spent a lot of time using programs such as ARC to compress and decompress files to transfer over the phone lines. The speed improvement over my own AT was a joy to behold – a normally tedious task became a breeze.

While processor-intensive tasks were transformed, other tasks such as normal DOS operations, word processing and database manipulation all benefited from the increased power. You can buy a computer like this with a slothful hard disk drive, but you really do need a 28-millisecond (or faster) drive to avoid frittering away the speed advantage gained with the processor. By the way, the BIOS is a legal version from AMI, something that's always worth checking when you buy a cheap clone.

Conclusion

USUALLY, THE expense of 80386 machines means you have to have a very good reason to justify buying one. If you do a lot of processor-intensive work, there's your justification. If you're interested in the very latest software, the 80386 offers you a path into the future. While the 80286 is far from dead, very gradually more and more software specifically designed to exploit the power and architecture of the 80386 is coming on to the market. It's becoming more common to read reviews that say 'I wouldn't try to use this on anything other than an 80386-based machine.'

The DSS ET lets you opt for the open-ended power of a '386 without having to justify massive outlays. While the three initials on the case may not fill you with a feeling of security, it's a solid machine that'll do the job and do it quickly. □

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SIGNATURE (If under 18 parent must sign) _____

YC/7/89

COLOUR PHASER!

TEKTRONIX RECENTLY released two new products into its existing range of colour printers: the Phaser colour printing system using thermal wax transfer technology, and the ColourQuick ink-jet printer.

The new Phaser system can be configured as a Phaser CP for IBM compatibles, or as a Phaser PrintStation for use with Macintosh computers. The system consists of an Phaser add-on controller card (which can emulate either parallel or serial ports) with a 300 dpi colour thermal wax transfer printer and includes the PostScript and the HPGL plotter language; the controller card has a Motorola 68020 microprocessor and 8Mb of RAM. Owners of

Tektronix have established a name for themselves in the quality colour market. Here are two of their latest releases – and it's good news for Mac users!

existing Tek 4693D or DX Colour Image Printer can upgrade to Phaser functionality with one of these cards.

The price for the printer and card with 8Mb memory is \$23,082.

The Phaser CPS Colour PrintStation is the version for Macintosh, with Appletalk networking, print spooling software, a 40Mb hard disk, a printer controller with 8Mb expandable to 11Mb, and a Phaser printer. Suggested retail price is \$28,410.

The Phaser CPS system offers thermal wax A4-sized output with a virtually unlimited colour range. Print speed is less

than 50 seconds per copy. The built-in print controller has a port designed to support a monochrome laser printer in addition to the colour CP engine. The Phaser CPS also has a serial port to support print spooling for an Apple LaserWriter printer.

Tektronix chose to implement its own PostScript-compatible interpreter, rather than license the PostScript interpreter from Adobe, according to Tektronix' National Sales Manager, David Gradwell, because it wanted to capitalise on its knowledge base as a manufacturer of colour printers and print controllers. It also wanted to be able to offer a modular architecture that would offer a convenient upgrade path and ease of future expansion.

ColourQuick

THE COLOURQUICK, another new product from Tektronix, is a 216 dpi resolution Ink-jet printer, designed for the a standalone Macintosh. It has a QuickDraw driver, and a high speed SCSI interface for rapid data transfer. It prints at two minutes per page, in four sizes up to 12 by 18 inches. Output can be on coated inkjet paper, transparency film and plain paper. It is 100 percent compatible with the Tek 4696 ink-jet printer, and is priced around \$4200.

The ColourQuick has 35 available fonts and 4096 colours. Software suitable for use with this printer includes Microsoft PowerPoint, Aldus Persuasion and Freehand, Cricket Presents, Symantec More II,

Letraset Standout!, and SuperMac PixelPaint. Amiga software can also make use of these printers. For further information, phone Tektronix (02) 888 7066. □



Tektronix' new ColourQuick printer is claimed to be the first ink-jet designed specifically for the Macintosh range. The printer is also Tek 4696 compatible and can be driven by Amiga software.



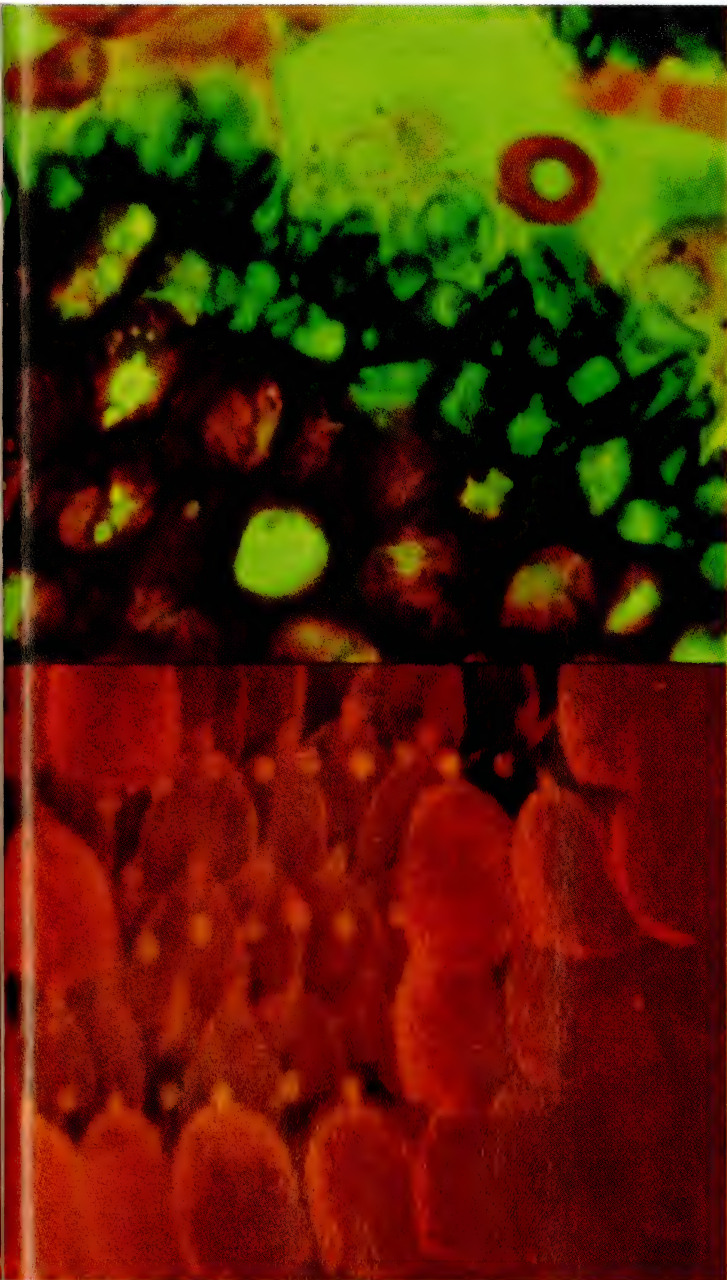
SINCE THE HALCYON days of early microcomputing, the PC industry has been fascinated with the role that graphical images play in everyday life. Indeed, one of the first analogue instruments to be connected to one of the first PCs was a video camera, and in the past attendants at PC exhibitions were frequently shown at least one set-up of a video camera hooked up to a PC, more recently as a real-time video system.

These days, however, images play a far more significant role in personal computing, particularly in the field of desktop and electronic publishing. The technology behind this revolution is, of course, scanning – the conversion of an analogue image to a digital format.

Scanners owe their popularity to desktop publishing, and without this technology there would not have been such an immediate need for the capabilities these machines offer. This is not to

Graphics are playing an increasingly significant role in personal computing – and the key to blending graphics and computing, is the rapidly developing technology of digital scanning and optical character recognition.

say that it is a new technology, far from it. The ability to digitise and manipulate images has been around for some 20 years, but many of the limitations of the past are still in place today.



BARNEY SCAN SLIDE SCANNER/MITSUI COMPUTERS LTD

As is also the case with laser printing, the resolution of such devices is an obstacle that seriously impedes the use of scanners in commercial, medium or high-output environments. While 35mm film scanners have a significantly higher scanning resolution than plain paper or positive image scanners, the cost differences are more than noticeable.

Furthermore, the cost of investing in a competent, conventional scanner remains prohibitive and it is ironic that the expensive nature of these machines is largely due to the advances being made in the technology. For instance, colour scanning is now no longer just a possibility, it is readily available, but the cost of these machines is (necessarily) high, as the manufacturers attempt to recover some of the costs of research and development.

Besides this, colour input and manipulation is nothing new to personal computing. There have been colour PCs since the Apple

II in the late 1970s, but colour output has always been (and remains) a major problem. It will be some time before PCs can produce better colour output than they can display at similar cost-efficiency and convenience. And, for desktop publishing, printing in colour remains the final frontier. Film separations are still necessary for colour reproductions, and printing in colour remains a costly exercise.

Of course, there are applications for scanners outside of DTP. Slide presentations, architectural drawings, colour proofing, promotional leaflets and, no doubt, more. Many of these will be satisfied through the use of a Mac II or '386 VGA PC, a colour scanner and either an ink-jet printer and colour photocopier (if accessible) or conventional printing processes.

Optical Character Recognition

ON THE OTHER side of the scanning coin is optical character recognition or OCR. This technology is in its infancy, and will not come of age until the millions of permutations and combinations created by the thousands of fonts and individual hand-writing styles (for signatures) are overcome.

For this to be achieved, the use of so-called 'artificial intelligence' is necessary, but this, too, is in its infancy. It is true to say that OCRs have come a long way since the technology was conceived, with even a new acronym being invented (ICR or Intelligent Character Recognition) to denote the advances being made, but the limitations are still there. Anyone who has had to train an OCR system to learn a new font will be aware of these limitations.

However, there are significant improvements being made all the time. One of the latest OCR packages for the Macintosh, the Accutext system from Xerox, which, priced at \$1950, promises a great deal of power and flexibility. This software package uses a number of techniques which set it apart from other OCR systems. The first is the use of a 50,000-word dictionary (extendable by 10,000 words) with which Accutext can examine individual words in context, and the second is AI software which allows Accutext to 'learn' about the page it is scanning, as it scans it.

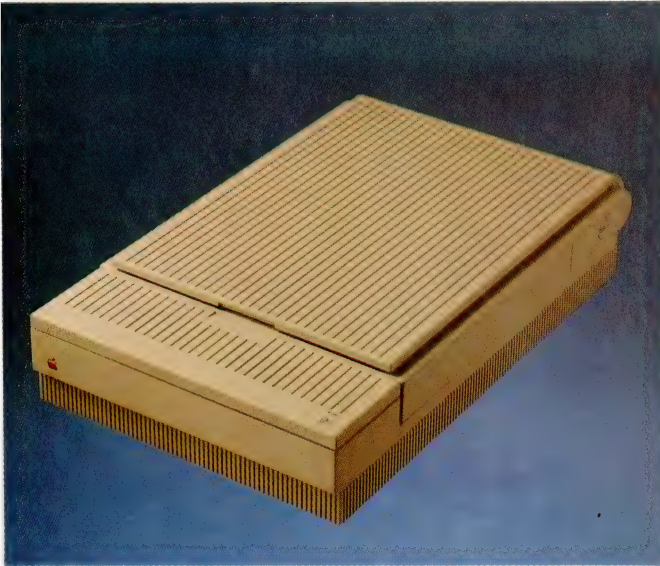
By using these techniques, it is claimed possible for the system to recognise any typed or typeset character, regardless of font (within sizes ranging from 6 to 24-point). Accutext can also handle varying text styles such as italics or subscripts. It also claims to be able to discern the difference between the characters 'l' and '1' and 'b' and an ornate, italicised, 'h'.

Further, the system also takes notes of the format of text, the font and styles used and then incorporates these parameters into the file, producing a readily formatted word processor document. And if, while scanning a page, Accutext comes a graphic image such as a signature, it automatically switches mode to image scanning and places the image in a bitmap file. But, like all other OCR software, it cannot recognise hand-written text (such as signatures) as characters, only as a bitmap.

This technology has a great future, in particular image processing, but the future of both image scanning and optical character recognition promises much: sufficient quality and low-cost of colour scanners to allow anyone to produce small quantities of colour brochures and perhaps publications, computer recognition of signatures, automatic conversion of facsimile messages to word processing or graphic files, and perhaps even the replacement of the camera with a digital image recording system which can be plugged straight into a PC.

No doubt, as has been the case with almost all technologies in the personal computer industry, it is all probably just around the corner.

SCANNERS



lution of 200 dpi with 5 levels of dithering, priced at \$1200 ex. tax. The DS3000 offers a maximum resolution of 300 dpi with 16 levels of dithering, supplied with ReadRight OCR software (see below) for \$2870 ex. tax. Both models feature RS-232C serial port and bidirectional/unidirectional parallel port (with optional interface card). Options include PC Paintbrush software (\$234), DTP Publish It! software (\$390) and Scan Fax card (\$995 ex. tax). Suitable for IBM PCs and compatibles. J.I.T. (Australia) Pty Ltd (03) 720 1333.

Hawk CP14 \$2915 ex. tax

200 dpi flatbed scanner with a personality problem – believes it's a thermal printer, thinks it's a photocopier, knows it's a scan-

ner and suspects it could be a fax machine! The Hawk is primarily a high-quality scanner with a built-in thermal printer allowing it to double as a thermal photocopier and printer. Future plans include the addition of a custom modem, enabling it to be used as a fax machine. Scans A4 sheets. The price includes HJB Paint software, allowing images to be bent, sine waved, broken, stretched, etc. Optional Augur OCR package (see below). Interfaces with the Atari ST range of computers. Creative Impulse Publishing (02) 686 1987.

SkySCAN \$450 ex. tax

Hand-held image scanner for IBM PC and compatibles. Features include 200 dpi resolution; 16 levels of grey scale (half-tone)

Mono Scanners

AppleScan \$3066 ex. tax

Flatbed A4 scanner with user-adjustable resolution from 75 to 300 dpi, for use with Apple Macintosh computers. Comes supplied with AppleScan and HyperScan software (requires Hypercard 1.2), allowing images to be used in virtually all applications, including Hypercard. File formats include PICT, TIFF and MacPaint, and can be used by numerous OCR packages (see below). Interfaces via SCSI port. Apple Computer (02) 452 8000.

AVR Megascan \$7690 ex. tax

Flatbed A4 scanner with 300 dpi resolution, suitable for use with IBM PCs and ATs. Supplied with software, MegaBuffer (2.3Mb storage for complete A4 image), Multiple Device Adaptor and comprehensive user manual with tutorials and general information. File formats include TIFF, MSI, IMG (GEM), and PCX. Options include MegaRead user-trainable OCR software (see below). President Computers (02) 476 2700.

DeskScan DS2000, DS3000

Camera-type flatbed overhead scanners (capable of scanning 3D objects) manufactured by Chinon. Maximum scanning area of 196mm x 281mm. The DS2000 offers a maximum reso-

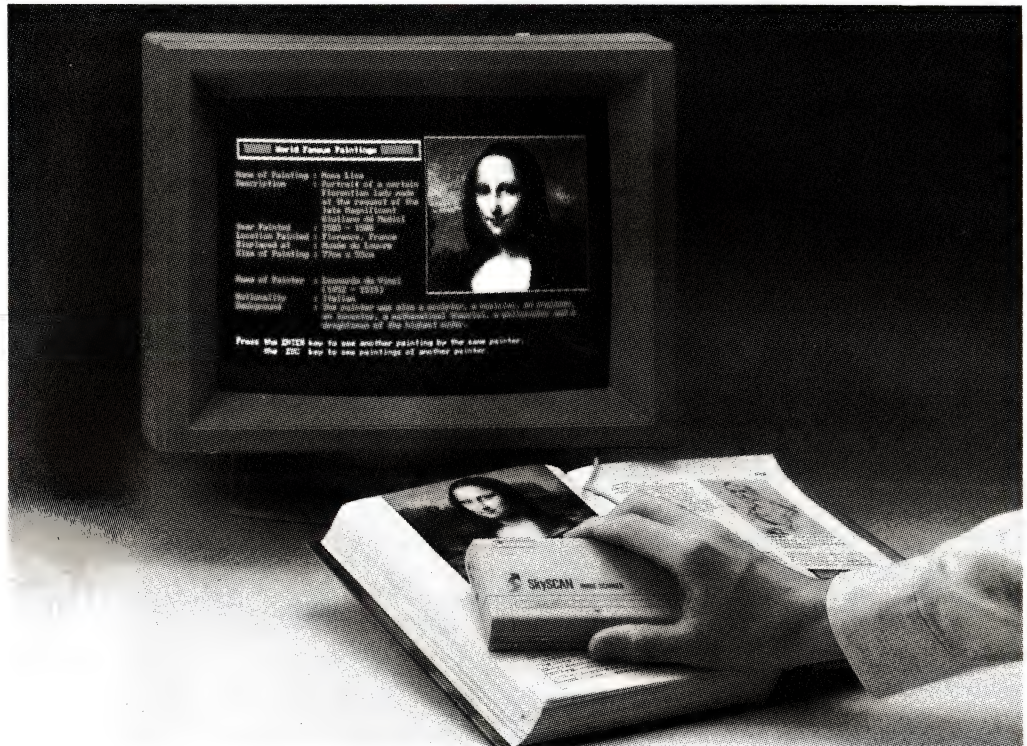


SCANNERS

mode) or black and white; scans images up to 105mm x 305mm. File formats include PCX, TIFF, CUT, MH, SSC and OCR. Utility software allows scanned images to be used in PageMaker, Ventura Publisher, PC Paintbrush, Paintbrush Plus, Dr HALO, Windows and many other software packages. Language Interface Modules allow scanning, display, storage, retrieval and printing functions to be called up from BASIC, C, Pascal, Assembly Language and even dBase III programs – ideal for building image databases for applications such as personnel and security systems, signature verification, real estate agencies and parts cataloging. C C Data Computers (02) 281 5122.

Logitech ScanMan-Mac \$840 ex. tax

Hand-held scanner offering adjustable resolution from 100 to 400 dpi. Images are displayed in 32 shades of grey, with three dithering settings. Desk Accessory software allows resizing, rotating, cropping, flipping and



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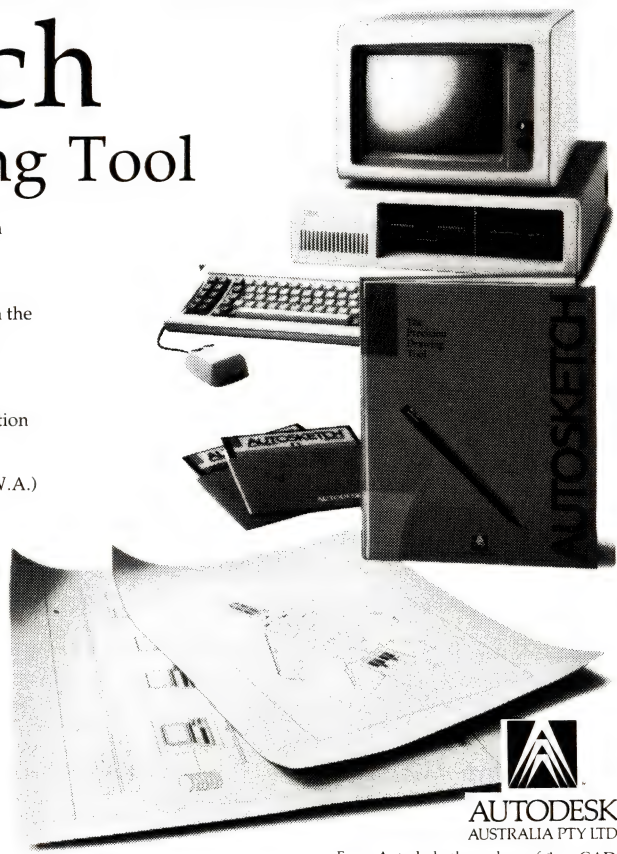
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Scanners: the inside story

WHEN IT COMES to importing images into desktop publishing documents, there is no substitute for a good scanner. No, not the type which lets you record politicians' car telephone conversations, but a device which effectively becomes the 'eyes' of your computer.

The principle of image scanning involves converting a two-dimensional image into a sequence of quantised values for processing by an associated piece of software; be it a desktop publishing package, a paint-type graphics program, or an optical character recognition (OCR) system. The image is analysed (in principle) the same as the method used by its radio-based namesake in monitoring a series of communications channels. The whole idea of scanning is to reduce the cost of the equipment by trading off speed of operation. Instead of grabbing the whole picture in an instant, the picture is built up from a series of adjoining lines, which are digitised one at a time.

Taking a typical A4 page with (say) an image area of eight inches by ten, at a resolution of 300 dpi (dots per inch), a bit of maths tells us that 7.2 million sensing elements would be required to instantly capture the entire image in one step. That's a lot in anybody's book. Instead of using this enormous number of sensors, a single strip of sensors is used (enough to digitise one line at a time at the desired horizontal resolution), and these are swept over the image (or the image is moved under them), and the sensors are repeatedly sampled, at a rate which achieves the desired vertical resolution. In most applications, the vertical and horizontal resolutions are the same.

This is similar to the way in which a television camera captures images, except that a camera does not 'see' a whole line at a time, rather it performs this scanning function in two dimensions simultaneously. The overall resolution of a TV image is much lower than that which can be achieved with a scanner, since the camera has to generate 25 complete frames per second. However, a scanner does not have to work as fast as this, so it is easy to achieve a higher resolution. Still, video cameras can be used as cheap grey scale or colour scanners in applications which don't demand very high resolution, and a number of frame-grabber cards are available to capture ordinary video images from cameras or from off-air transmissions.

The earliest form of image scanners were probably in facsimile machines (they've been around for a lot longer than you might think, transmitting weather maps and newspaper pictures around the world). The original was wrapped around a rotating drum, which moved it past a single optical sensor, which was often a simple photo-sensitive resistor. This converted the amount of light reflected by the original into an electrical signal, which was then modulated to be sent along a phone line or radio link. The image sensor also moved slowly, parallel to the axis of rotation of the drum, so that a complete model of the original could be built up at the receiving end out of a series of such lines.

Nowadays, computer scanners almost universally make use of a Charge-Coupled Device (or CCD) as the optical sensor. These solid-state devices are also used in many newer domestic video cameras and camcorders, and are largely responsible

Ever wondered how and why scanners work? Mark Cheeseman has the inside story. . .

for the dramatic reduction in the size, weight and power consumption of these devices of late.

CCDs are also used extensively in modern office facsimile machines. Indeed, a fax machine is really only a scanner, V.29 auto-dial/auto-answer modem and thermal dot-matrix printer all in the same box, with a bit of 'intelligence' thrown in to keep things in order. A typical Group 3 fax machine has a horizontal resolution of 200 dpi, and selectable vertical resolutions approaching double that figure. Hand-held and desktop scanners generally have selectable resolutions up to 300 or 400 dpi (although one scanner made by Agfa scans at up to 800 dpi with 64 grey scale levels), with some of the more advanced desktop models having the resolution adjustable in 1-dpi steps.

A light is shone onto the image during scanning, and the CCDs measure the amount of light reflected from the surface of the original. A threshold device decides whether each particular pixel should be black or white, depending on whether the reflected light is above or below a set threshold. This threshold is usually adjustable, to compensate for different paper colours and ink densities.

The price difference between desktop scanners and the less expensive hand-held variety can be accounted for by two main design differences. The first is that the width of images which can be scanned by a hand-held scanner is only about half that of a desktop model, although some full-width hand-held models do exist. But, an even more obvious difference between the two is related to the way in which they physically scan the image. In desktop machines, the optical sensor is moved under the control of the scanner's logic circuitry, as the data is read from the array of CCD sensors. This means that the controller of the scanner can ensure that the image is scanned at a constant rate, and at a rate which the rest of the device can handle.

In hand-held scanners, the operator controls the rate at which the device is passed over the image. The maximum rate that can be handled depends on the resolution which the image is being scanned at, and it is easy to exceed this rate, especially at high resolutions. This is because the scanner does not contain its own memory, and the scanner must deliver the data to the computer at a rate which the latter can handle. However, the use of DMA (direct memory access to the host computer's memory) has resulted in quite usable scanning speeds.

Furthermore, it takes a fair bit of practice to keep the scanner moving at a constant rate over the scanned image, although an

editing. File formats include TIFF, compressed TIFF, MacPaint and PICT. B.J.E. Enterprises Pty Ltd (02) 858 5611.

Logitech ScanMan-PC

Range of hand-held scanners for IBM and compatible computers. The PC200 ScanMan (\$511 ex.

tax) scans up to 4.1 x 11 inches in one pass with a maximum resolution of 200 dpi, and is suitable for IBM PCs. The PC400 ScanMan (\$573 ex. tax) offers resolution from 100 to 400 dpi and expanded grey scale capabilities. For PS/2 users, the PS/2 ScanMan (\$635 ex. tax) has all

the features of the PC400 with MicroChannel bus interface. All models supplied with PaintShow Plus software, and utilities are provided for scanning directly to a file or to the MS Windows clipboard. File formats include TIFF and compressed TIFF. Optional OCR software (see below). B.J.E.

Enterprises Pty Ltd (02) 858 5611.

Colour Scanners

Barneyscan Slide Scanner

\$13,995 ex. tax

The Barneyscan allows images from 35mm transparencies to be used with Macintosh II comput-

optical 'chopper' wheel in the unit provides feedback to the computer regarding speed, so that, provided the speed does not change suddenly, the scanner can compensate for the changes in velocity and still produce good images. One interesting point is that the movement sensor is not direction sensitive, unlike those which are used in, say, mice. If you scan the image from bottom to top, the scanner will still work, except that the image will be read into the computer vertically inverted, which may be useful in some circumstances for reversing a picture (a common enough occurrence in publishing). Also, unless the scanner is moved in a straight line, the image scanned into the computer will appear 'bent'.

Grey scales

WHILE LINE drawings and text can be digitised using only two intensity levels (black and white), photographs need to be converted into a number of intermediate grey levels in order to faithfully reproduce the stored image at a later date. There are two ways in which grey scales can be achieved in scanners. One is to use dithering, where patterns of dots are used to represent various shades of grey. An area with a dense array of dots appears darker than a sparsely populated area of the same size. However, dithering trades off resolution for grey scale capability, and to retain a useful resolution, the number of greys which can be achieved is quite limited. This technique of achieving grey scales is commonly used in hand-held scanners, and is also the method used by fax machines. And, it is how many pieces of software display shades of grey on a black and white monitor.

True grey scaling, however, does not result in a reduction of resolution in the scanned image. In scanners with this capability, each element in the CCD can resolve more shades than just black and white. The actual number of greys achieved depends upon the resolution of the analog-to-digital converter which converts the signal representing reflected light intensity into a digital value, with typical resolutions ranging from 4 bits (16 grey levels), as offered by the Apple scanner, to 8 bits (256 levels).

Images scanned with a 16-level grey scale have an obvious 'digital' look to them, and tend to lack fine detail, especially if the original picture is lacking in contrast. A 6-bit scanner (64 grey levels) is a definite improvement, while an 8-bit grey scale offers about as many grey levels as the human eye is capable of discerning. Because these grey scale values are stored as numbers in the computer (isn't everything?), the brightness and contrast of the image can be adjusted (within reason) by simply scaling them using a simple linear mathematical function. Other functions, such as exponential curves, allow even more flexibility in adjusting the image for best appearance.

Most printing devices which can be used as output devices for a computer are only capable of printing two intensity levels. This includes both plain-paper devices, such as laser printers and also photographic devices such as typesetters. At first this may appear to make the scanning of grey scale images rather pointless, since they cannot be easily printed out. However,

strictly speaking, the litho printing presses used to print this magazine can't do it either.

So, to achieve grey scale reproduction, the same principle used in commercial printing is applied to the printed output. This basically consists of breaking the image up into a fine grid of dots, a process known as screening, since the first way in which this way achieved was to photograph the image through a special screen. This broke the image up into dots - larger ones for dark areas, and smaller ones for lighter regions of the original. However, in this case the larger dots are built up from a number of adjacent smaller ones, since computer output devices can only produce one size of dot.

Therefore, in order to achieve a useful number of grey levels, the resolution of the output device must be significantly greater than the resolution at which the image is originally scanned. The resolution of the image is measured in lines per inch, or lpi, which is the number of screen rulings per inch. So it is obvious that you cannot scan in a photograph at 300 dpi, and expect a faithful grey scale reproduction on a 300 dpi laser printer. Even a Linotronic 300 typesetter, running at 2450 dpi, cannot reproduce the desirable 256 grey levels at a screen resolution of 200 lpi. At the other end of the scale, a typical 300 dpi laser printer printing an image screened at 75 lpi, can only achieve 17 grey levels. This grey scale/resolution trade-off is similar to the one discussed earlier for the case of dithering scanners.

Colour Scanning

THE NEXT obvious step beyond grey scale scanning is of course full-colour scanning. Instead of simply analysing the amount of light reflected from each pixel of the object, a colour scanner analyses the amount of each primary colour reflected from the original. In Sharp's range of colour scanners, this is achieved by shining three lights onto the original, one at a time - one blue, one green and one red. The CCD will produce three different values for each point on the currently scanned line, representing the amount of each of the primary colours present at that point on the image.

The single CCD sensor is moved over the image in the same way as in a monochrome scanner, and the sensor reads one line of information from the image while each of the light sources is illuminating it. Once all three colours have been collected for one line, the scan head moves to the next position to be scanned, and the process is repeated for each successive line. This is necessary because the CCD sensors are not sensitive to colour information on their own.

With six bits of resolution for each primary colour (effectively, a 6-bit grey scale for each colour), 262,144 different colours can be resolved, which is the same number as the IBM VGA can display (although the VGA cannot display this many colours simultaneously). If you are wondering how good this is, try to get a look at a VGA card and monitor in operation. With 8 bits per colour, the image quality is virtually indistinguishable from a photograph. All we need now is a four-colour printer capable of printing these images out with the same quality as they can be scanned.

ers. Slides are digitised at a resolution of 1500 x 1024 pixels, creating 24-bit colour or 8-bit monochrome or colour image files in numerous formats including PICT, TIFF, TIFF (IBM), Barneyscan and BarneyscanPC. Price includes desktop scanner, NuBus interface card, cables and Bar-

neyscan XP extended processing software (allows user to create effects that are usually produced in professional photo processing environments). Mitsui Computer Limited (02) 452 0452.

Epson GT-4000
\$2900 ex. tax

Flatbed colour image scanner of-

fering user-selectable resolution from 50 to 400 dpi, with colour data up to 8 bits/pixel. Resolution can be increased to 800 dpi using EpScan software (available for IBM and Macintosh). Scans A4 and US letter size documents. Features include RS-232C serial port and optional bidirectional

parallel port; optional SCSI port; connects directly to Epson ESC/P-24C colour printer; interfaces available for IBM PC/XT, PC/AT and compatibles, IBM PS/2 series and Apple Macintosh; accommodates many full-colour software packages including Designer, Publisher's Paintbrush

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SCANNERS



(IBM), Pixel Paint and Illustrator 88 (Mac). Epson Australia Pty Ltd (02) 436 0333.

Howtek Scanmaster series From \$14,800

Series of flatbed scanners allowing full colour or black and white images to be digitised using single CCD sensor and electronic RGB colour separation. Scanners offer fixed resolutions of 75, 100, 150, 200 and 300 dpi, or continuous rates from 30 to 300 dpi. Standard GPIB interface, making it possible to use the scanners with IBM and Macs supporting GPIB; accepts flat art up to 11 x 17 inches, transparencies from 2.25 x 2.25 to 8 x 10 inches. TCG Group (02) 699 8300.

Howtek Scanmaster/35 series

From \$15,900

Series of high-resolution scanners for 35mm film originals. Accepts 35mm positives or negatives, colour or black and white, mounted or unmounted film. Scanmaster/35 offers 2000 x 2000 dpi resolution and allows full 180 degree rotation, for publishing and other applications where it is essential that the image is presented in the appropriate orientation. Scanmaster/35 II offers 2000 x 3000 dpi resolution and is particularly suited for applications such as medical imaging and high-quality retouching. TCG Group Pty Ltd (02) 699 8300.

Sharp JX450, JX300

The JX450 is a colour flatbed scanner capable of scanning A3 pages, with optional mirror unit for scanning 35mm film, trans-

parencies and OHP film up to A4 size. Features include adjustable resolution from 30 to 300 dpi w/ 8-bit colour; colour output data can be fine-tuned (via host computer) to match the colour characteristics of a particular display monitor or printer; digitizes 256 grey levels for newspaper quality images; GPIB (IEEE 488) interface for high speed, bidirectional, 8-bit parallel transmission between scanner and host computer; supports a large range of host computers and software including Sharp PC700, IBM PC and compatibles, IBM PS/2, Apple Macintosh II, Amiga, Sun Micro and Silicon Graphics. File formats include PICT, PICT II, TIFF, EPSF, TGA and PCX. \$12600 ex. tax with software and interface cable.

The JX300 has similar features to the JX450, with a maximum scanning area of 8.5 x 11 inches (A4). \$7620 ex. tax with software and interface cable. Sharp Corporation (02) 831 9111; Mitsui Computer Limited (02) 452 0452

RasterOps TrueCapture 324

\$7695 ex tax

Colour video capture system for use with Macintosh II computers, allowing images from video camera to be stored and manipulated by computer. The digitized image can be placed in the Scrapbook using the PICT 2, 8 or 32-bit colour format, making it accessible to virtually any application. Accepts input from either separate RGB or composite NTSC/PAL video source, interfacing via NuBus TrueCapture board. Can be used with any dis-



play monitor. Mitsui Computer Limited (02) 452 0452.

OCR Software

S.P.O.T Syntactic Pattern Optical Translator

\$949
User-trainable OCR software from Flagstaff Engineering. Features high accuracy; easy training; up to four font files per page; reads typewritten and typeset text; on-line spelling and context checking; compatible with PCX and DCX files. Requires IBM PC/XT/AT with minimum 512K total system memory, CGA, EGA or Hercules graphic card, running DOS 3.0 or later. Price includes SkySCAN hand-held scanner. C C Data Computers (02) 281 5122.

ReadRight

OCR software from OCR Systems, available as a package with Chinon DeskScan DS3000 scanner. Reads font sizes from 8 to 14 points, pitch from 10 to 15 char/inch, with a maximum vertical line spacing of 8 lines/inch. Text format is compatible with most popular word processors. Suitable for IBM PCs, ATs and compatibles. J.I.T. (Australia) Pty Ltd (03) 720 1333.

Augur

\$2500
Optional Augur OCR cartridge and software reads text at sizes from 6pt to 23pt. OCR can be trained to read different fonts, (even reads Old English). Runs on the Atari ST range of computers. Creative Impulse Publishing (02) 686 1987.

OmniPage 2.0

Second generation page recogni-

tion software, with versions for IBM PCs and Macintoshes. Operates in either tall or landscape page configurations. Recognizes text from virtually any scanned documents, regardless of number of columns, font, bold and/or italic text, and a mix of headlines, graphics and captions. The text can be saved in many popular word processing, spreadsheet and database file formats. MS-DOS version \$4295 (includes 68020 co-processor board); IBM 386 version, \$2195; Apple Macintosh version, \$1695. Performance Sales (02) 959 3644.

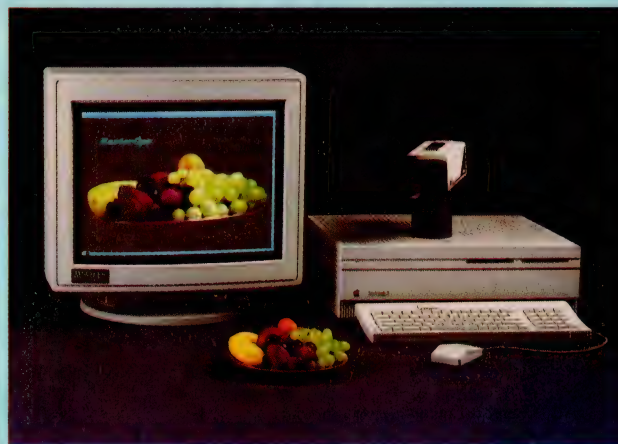
AVR MegaRead

\$1190
User-trainable OCR software, allowing the user to create new fonts or add special symbols and international characters to existing fonts for accurate optical character recognition. Character definitions are stored in font database files on disk, the user simply selects the correct font database to read a document. Font database files can be created to read pages with multiple fonts. Operates on IBM PCs, ATs and compatibles, with MegaScan scanner and Mega-Buffer. President Computers (02) 476 2700.

Logitech ICR

Intelligent Character Recognition for use with Logitech ScanMan-PC Scanner. Specifically designed for hand-held scanners, text may be scanned horizontally or vertically, as columns or as a page. Text outside columns and graphics within columns are automatically ignored. B.J.E. Enterprises Pty Ltd (02) 858 5611.

RasterOps ColourBoards



MITSUI COMPUTERS are the distributors of the RasterOps 24-bit ColourBoards, which offer Macintosh II users the choice of 786,432 colours out of 16.7 million to play with. If you haven't seen 24-bit colour you are in for a bit of a surprise, since a 19-inch RasterOps monitor connected to a Mac II with a RasterOps 104 board can display 3000 times more colour than you can find in an average photograph. The RasterOps monitor is based on Sony's Trinitron technology, and is more than two and a half times the size of a standard Macintosh II display.

Mitsui is marketing four ColourBoards: the ColourBoard 104 displays a TrueColour photographic quality (or better) image of 1024 x 768 pixels, with over 786,000 colours on screen (from 16.7 million) simultaneously. It is a high-resolution video controller specially developed for the Macintosh II, and represents the state of the art for microcomputer image processing.

The 108 is a multiple resolution, 8-bit colour graphics board which can switch to a faster 1-bit monochrome mode. It operates using high-resolution monitors to display 256 colours simultaneously, from a palette of 16.7 million. Mitsui's Gold Medallion upgrade path allows users to purchase an 8-bit 108 board today, then at a later stage upgrade to a RasterOps 24-bit or a 32-bit board.

The ColourBoard 100 includes a broadcast quality NTSC/PAL frame grabber and buffer options. This device takes a video image from a video camera and freezes it as a 24-bit image.

The ColourBoard 64 is a 640 x 480 pixel resolution version of the 24-bit ColourBoard 104. These are the only two 24-bit QuickDraw compatible boards currently available.

Mitsui Computer has teamed the RasterOps boards with Sharp's colour scanner, Mirius' FilmPrinter and PLI's range of removable winchester drives. Applications include CAD/CAE, electronic and desktop publishing, page layout, digital imaging, cartography, graphics design, desktop video and desktop presentation.

Mitsui also announced recently the release of the RasterOps ColourBoard 108+SE/30 (with a Gold Medallion upgrade path), and 19-inch colour monitor for the Mac SE/30. Phone Mitsui (02) 452 0452.

CAT Reader

\$395
Trainable, accurate OCR software for hand-held scanners at an affordable price. Features include auto text integration; graphics

rotation; up to 10 per cent skew handling; reads monospaced, typeset and proportional text. Suitable for IBM PCs and compatibles. BJE Enterprises Pty Ltd (02) 858 5611.

MOTHERBOARD

10 MHz XT* TURBO MOTHERBOARD

Increase the performance of your sluggish XT* approximately four times with this super fast motherboard.

- 8088-2 running at 10 MHz, no wait state
- Turbo/ Normal selectable
- 640K fitted
- 8 Expansion slots
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- Keyboard port

Excluding RAM
X18032.....\$199
Including RAM
X18033.....\$570

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- Phoenix BIOS
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Excluding Ram
X18200.....\$689
Including 2M/Byte Ram
X18201.....\$1,649

386 MAIN BOARD

- Intel 80386 CPU (20 MHz)
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Without RAM
X18103.....\$2,390
Including 2 M/Byte RAM
X18107.....\$3,500

386 CACHE 25MHz MOTHERBOARD

X18105.....\$4,395

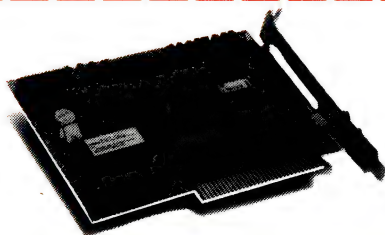
VIDEO CARDS

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KEYBOARD & ACCESSORIES

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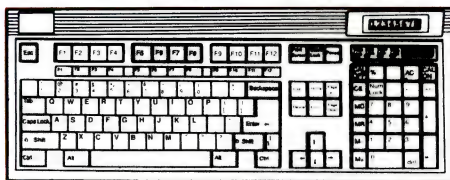
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- Computer keyboards
 - Printers
 - Video recorders
 - Computer circuit boards
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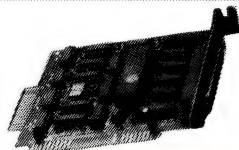


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- European version

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DISK DRIVE CARDS



FLOPPY DISK DRIVE CONTROLLER CARD

These cards will control up to 2 or 4 double sided 360K IBM* compatible disk drives.

With 2 Drives
X18005.....\$52

HARD DISK CONTROLLER CARDS

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X18140 (AT*).....\$290

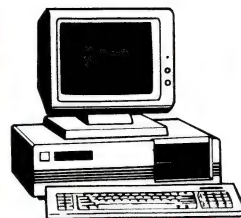
FLOPPY DISK DRIVE CONTROLLER CARD

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 - 5 1/4" and 3 1/2" drives
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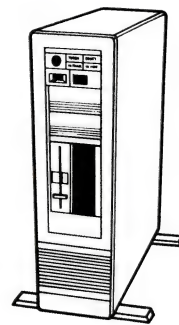
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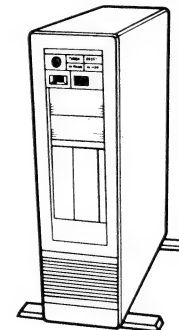
COMPUTERS & ACCESSORIES



386 TOWER PC

The 386 Tower PC is a high performance system that's IBM* AT* compatible. However, the 386 Tower PC gives you 2-5 times the performance.

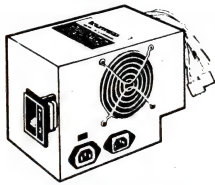
- FEATURES:**
- Intel 80386-16MHz microprocessor
 - Switchable 16/20 MHz
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 - Option for 80287 & 80387 co-processor socket
 - Operates in page mode with interleave memory subsystem
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 - Chips and Technology chip set
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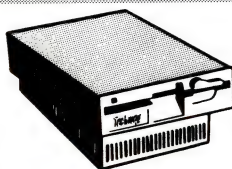
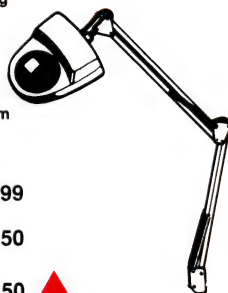
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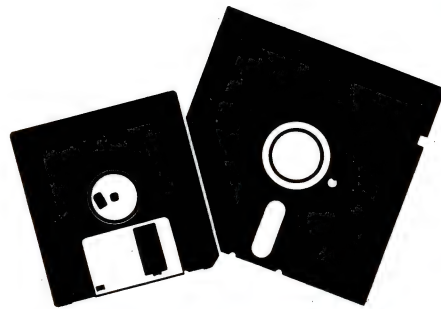
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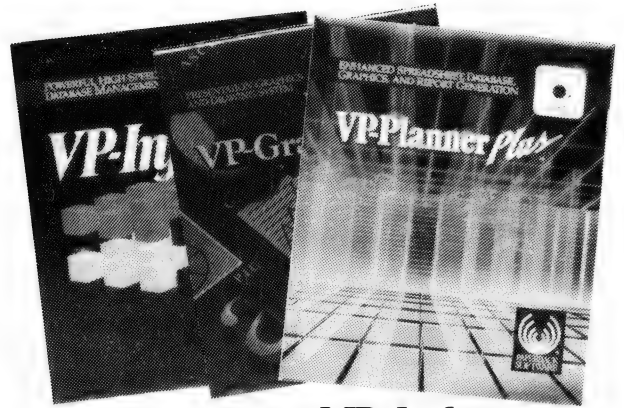
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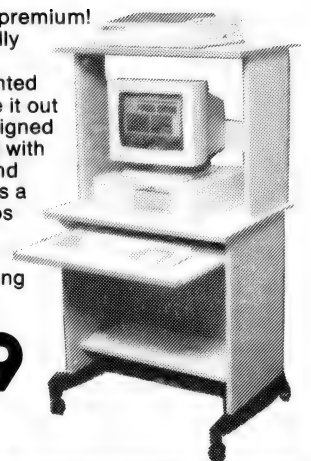


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COMPUTERS**

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What's more, the Creative Music System allows you to fully utilize the incredible 'Sierra' range of software! Cat X-2020

\$299

"The Speech Thing"

Digital Sound Synthesizer

Here's great news for the serious experimenter! The Speech Thing is a complete hardware and software package which adds sound capability to your PC. It gives you a full featured 8-bit D/A (digital to analogue) converter, audio amplifier and software system which is capable of creating almost any sound. Converts text, either from keyboard or ASCII files, to high quality speech - just imagine, you can have a conversation with your computer! Installation is as simple as plugging Speech Thing into the parallel port and keyboard (comes with adaptors) and it does not interfere with their operation. Plus, it can be used in conjunction with the 'Voicemaster' (X-2038) to sample and edit digital sounds.

Cat X-2036

View And Edit Sounds With... Voice Master Sound Input Card

The perfect match for "Speech Thing"! This analogue to digital (A/D) card lets you sample any sound, then view the waveform and edit it. Combine it with 'Speech Thing' and the recorded sound can then be played back. Voice Master comes complete with headset and software which allows you to experiment with voice recognition. With it you can set up to 256 different voice activated keyboard macros. For installation it requires an 8-bit expansion slot (XT & AT compatible). It's an amazing idea that's just perfect for the serious experimenter who wants a lot more from his computer system. Cat X-2038



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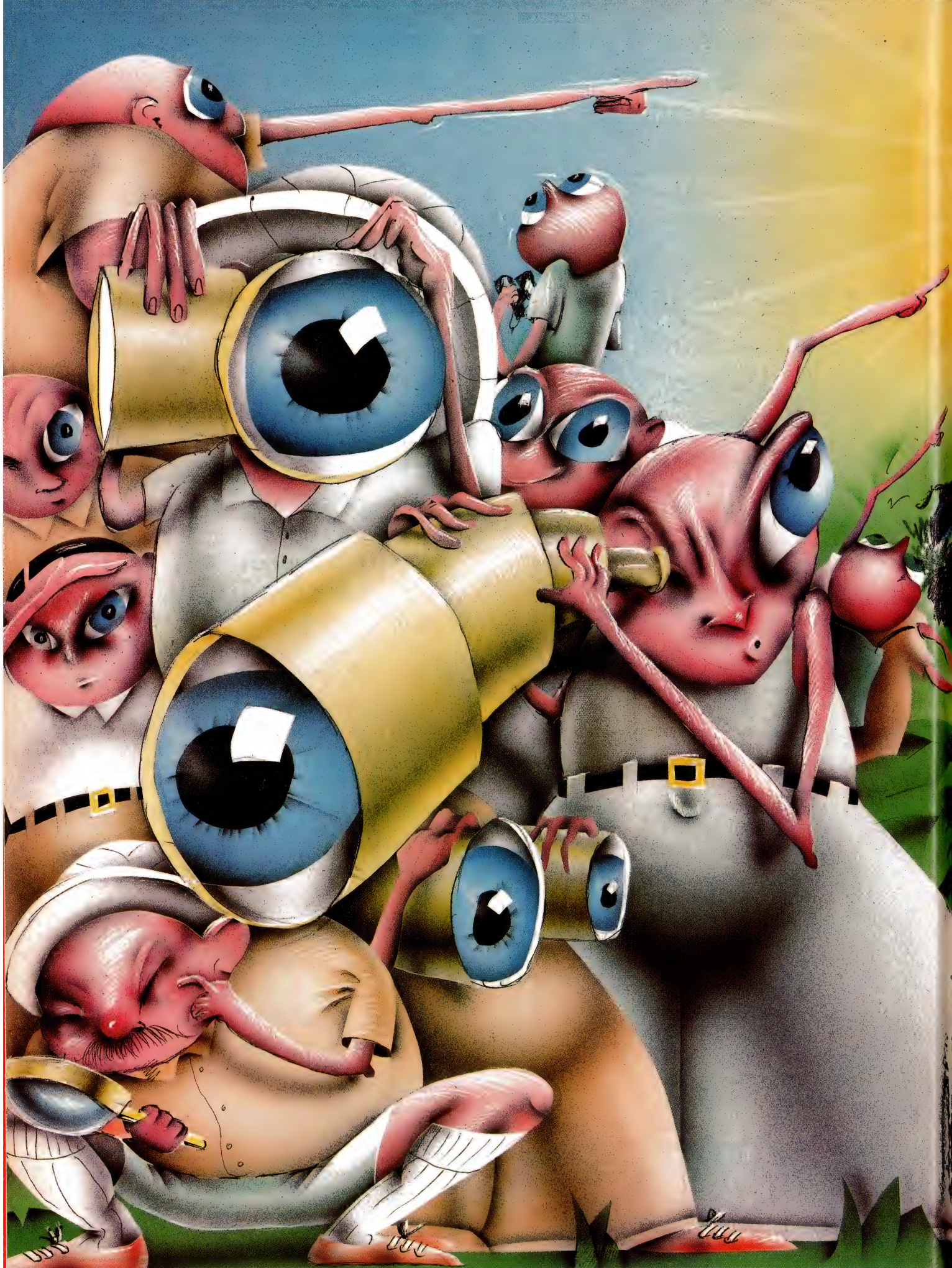


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The ideal memory chip is fast, cheap, non-volatile – and still a dream. As Ian Allen found, realising that dream is going to take more than money.

IF THE MICROCHIP industry has a Holy Grail it would have to be a memory chip that is fast and cheap, and yet retains its memory when the power is turned off. It is a quest which offers a fabulous fortune as its prize, because any non-volatile memory that also matches the price and speed of existing random access memories is certain to sweep the multi-billion dollar market for computer memory. Even beyond that, it holds the promise of replacing magnetic disks as the preferred media for data storage.

At present computer memory comes in three basic forms, each employing a different technology. The most common is the DRAM, or Dynamic Random Access Memory. Its main advantage is that it is the cheapest to manufacture and is also the densest, meaning you can pack more memory cells onto each chip. Its drawback is that its read/write cycle of 150 nanoseconds (ns) is too slow to keep up with the latest generation of processor chips so the processor is forced to wait while the chip is read or written to.

To get around that problem, high-end computers and manufacturers of cache circuitry use another technology, static random access memory (SRAM). The fastest of these have read/write times on the order of 20ns. This is achieved by a more complicated arrangement of transistors within each memory cell. Unfortunately this added complexity means that the bit density of SRAMs is only about one-third that of DRAMs and their general complexity means they also cost more. The cost per bit of SRAM memory is typically six times that of DRAMs. Even so, both SRAMs and

DRAMs have a common weakness in that their memory is volatile – they need constant electricity to refresh their cells; lose the power and you lose your data.

At present the only really workable technology to provide writeable non-volatile memory is that of the EEPROM, Electrically Erasable Programmable Read Only Memory (sometimes called E-squared PROM). This memory retains its data for 10 to 100 years, but it has its own drawbacks. While the read cycles are almost respectable, ranging from 50 to 200ns, the write cycle is not; typically it's about 10 million nanoseconds. EEPROMs also require more than the standard five volts to activate them and can handle being written to only a limited number of times – somewhere in the range 100 to 100,000 cycles. They have half the bit density of DRAMs and are even more expensive than SRAMs.

The ideal chip

WHAT WOULD be ideal is a chip which had the cheapness and memory density of a DRAM, the speed of an SRAM and the non-volatility of an EEPROM. It's quite a difficult brief, and the solution is likely to rely on new materials and possibly some conceptual leaps as well. For this reason, it's not the sort of problem that can be solved simply by throwing money at it. While heavyweight chip makers like Intel and Toshiba are pursuing intensive research programs, it remains very much an open field. No one really knows what approach is likely to crack the problem, and a number of start-up companies are exploring fresh ideas.

As it turns out, one of the most promis-

Consumer FRAMs

RAMTRON IS still a very small player in the huge computer electronics industry, but, like the FRAM chip which represented a conceptual breakthrough, their approach to company and market development is different, too. Rather than jealously guard their secrets and try to fund very expensive research internally or by borrowing, the company has formed a number of strategic alliances. Each alliance the company has made, has had a very specific purpose.

For example, the latest, with Seiko Epson, is intended to give Ramtron an entry into the consumer product field, as well as computing and industrial electronics. Epson will pay Ramtron a royalty for the use of FRAM technology in their own products while providing Ramtron with manufacturing facilities. The two are jointly developing mass production techniques for sub-micron CMOS ferroelectric products, but they will each design, manufacture and market their own products.

Ramtron is also allied with General Motors, ITT, Japanese company NMB Semiconductors and the American aerospace giant, TRW. Brian Harcourt, managing director of Ramtron Australia, recently commented that each alliance is targeted at specific markets and each was an additional step in the plan to have FRAM technology widely used and rapidly accepted. The company's goal is to reach annual sales of over US\$500 million dollars early in the 1990s.

ing lines of research is coming from one of the start-ups, the small Ramtron Corporation of Colorado Springs, Colorado. Unusual as it may seem, a large slice of Ramtron is Australian owned, by the Australian-listed company of the same name.

Ramtron's approach has been to explore an unusual phenomenon called the ferroelectric effect. This is the property of certain crystalline materials to polarise under the influence of an external electric field and remain polarised after the field is removed, in much the same way a magnetic field can magnetise a piece of iron. When the effect was first discovered in 1921, it was thought that there must be iron in the crystal, hence the name 'ferro-

electric'. In actual fact there is no iron at all. The ceramics that Ramtron are using are compounds of Lead Zirconate Titanate (PZT) – they work because the applied electric field jogs a titanium atom from one stable position to another within the crystal. It's because of this property that the crystal can be modelled as a bistable capacitor with two distinct polarisation voltages. In other words it can be used to store a digital 0 or a digital 1.

PZT has a lot of very favourable physical and electrical properties – among them are high resistance, since its tight crystal structure makes it an insulator; thermal and chemical stability, because it is almost unreactive chemically; and it has the hardness typical of ceramics. As a storage device, its read/write cycles are 25 to 100ns, it can operate within the standard five-volt environment of a circuit board, its bit density is equal to that of DRAMs and at this stage of research it can hold the data without power for a minimum of ten years. This figure is expected to increase to the 100-year mark after more trials provide a better statistical base.

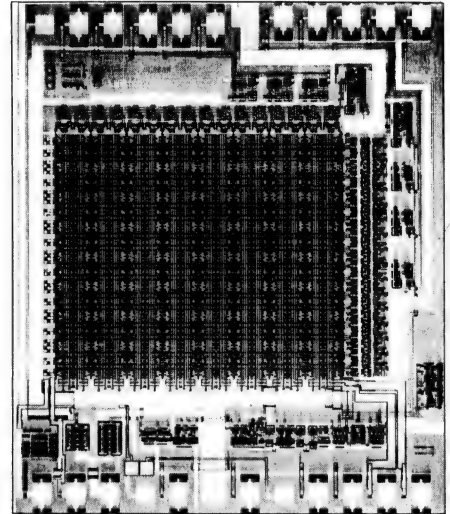
There is one major technical drawback with PZT in that the endurance (number of read/write operations) is limited to 10^{10} cycles. Even though a ten with ten zeroes after it seems like a big number, it's not considered satisfactory for computer memory when already it's quite common to have processor chips operating at 10 and 25MHz. Even 10MHz represents a ten with six zeroes after it per second, which is only four orders of magnitude less than the PZT's current endurance. At that rate a single read or write per cycle would wear out a PZT memory cell in 10,000 seconds or in roughly 2 hours 45 minutes – clearly that's not good enough in anybody's language.

But, that's what happens in research. You develop a great idea that seems perfect in every way except for one fatal, not immediately apparent flaw. After all the initial excitement and a few million dollars down the track you hit a dead end – but not in this case. Someone at Ramtron had a conceptual leap: why not marry the ferroelectric memory to a conventional one? Use conventional memory when the power is on and only use the non-volatile memory when power is disconnected?

A new approach

ALMOST ALL silicon chip architecture is two dimensional: length and breadth. Most approaches to packing more circuits onto a chip revolve around making the thin electronic channels even

thinner. In theory, we should be able to make them even 100 times thinner than they are at present, but we don't yet have the technology to etch circuits so finely. Ramtron came up with the elegant idea of building up – adding layers of ceramic ferroelectric PZT over the top of the chip circuitry.



Ramtron have released only one experimental ferroelectric chip which can hold 256 bits (32 bytes), the FMx 801. The company has formed alliances with General Motors (who are interested in non-volatile memory because flat motor car batteries are a major obstacle in introducing computers to cars), and the telephone and electronics giant ITT (who are somewhat coy about their exact intentions) which has given the company access to cash for research and manufacturing facilities.

One of the added layers functions as a kind of electronic gate. While the power is on, the ferroelectrics are separated from the memory cells below, but when power is interrupted, the transmission gates are opened, connecting the ferroelectric capacitors to the memory cells and polarising them to the RAM state before power loss. Sufficient polarisation for non-volatile recovery occurs within 10 to 20ns, well before the RAM loses its state or the power supply collapses. Once charged, the capacitors retain their state almost indefinitely.

Recovery from power loss and return to active RAM mode are also direct. As power is applied, the capacitors strongly bias the

FERROELECTRIC CHIPS

inputs to the RAM cell to reflect the stored condition. Once fully-powered, the transmission gates are closed and the ferroelectrics are removed from the circuit leaving the RAM in the same data state as it was before power loss.

This 3-D approach to design effectively overcomes the fatigue problem. If you turned your computer on and off once an hour, it would take 13,000 years before the ferroelectric cells had exceeded their endurance.

Ramtron have so far released only one experimental chip. It's more a proof of concept exercise than anything else, storing a mere 256 bits or just 32 bytes. The design is based on conservative 3-micron CMOS process design rules. The first commercial products will use a 1.5 micron processes. Ramtron calls these ferroelectric chips FRAMs, and their immediate target is to challenge the EEPROM market. The company has formed a number of alliances with heavyweight companies, including General Motors who are interested in non-volatile memory because flat motor car batteries are a major obstacle in introducing computers to cars, and the telephone and electronics giant ITT who are somewhat coy about their exact intentions.

Ramtron are still hopeful that further development and testing will prove FRAM endurance of 10^{15} cycles, in which case the technology would be viable as active computer memory. In the meantime, the first commercially available FRAMs will be based on the six transistor SRAM topology and will have 8 Kbyte of memory. The generation planned after that will have 32K chips based on a DRAM-like single transistor design. With the technology optimised, Ramtron hopes to be able to compete with DRAMs in terms of price.

On paper it all looks very exciting, and by having a working prototype Ramtron are ahead of the field. The alliances they've formed with cashed-up organisations are a positive indication that they are onto something that's going to work, but there is still a way to go before they can make a true claim to having found the Holy Grail. In the final analysis much of the promise of ferroelectrics is going to depend upon price and performance. The non-volatility is a very big plus, and in a worst case scenario, FRAMs must be seen as a serious challenge to the EEPROM market. But – if FRAMs are going to corner the entire market on random access memory, they are going to have to beat each of the current champions on its own turf. Faster than SRAM and cheaper than



Most approaches to packing more circuits (and memory) onto a chip revolve around making the thin electronic channels even thinner. In theory, we should be able to make them even 100 times thinner than they are at present but we don't yet have the technology to etch circuits so finely. Ramtron's elegant solution is to build the chip up, adding layers of ceramic ferroelectric material over the top of the chip circuitry. The technique also has the advantage that is compatible with existing semiconductor technology.

DRAM – that's a tall order, but not an impossible one. It's all going to depend upon whether the technology matures without encountering unforeseen bottlenecks.

If (and at this stage it is still 'if'), FRAMs do live up to their current promise, it is quite conceivable that they will challenge magnetic media as well. Despite all of the progress in reducing the cost of magnetic storage technology, the pace of price reduction in chip memory cost per bit is

even faster. At the moment, on a cost basis magnetic media has a decided edge, but if present trends continue, in the not so distant future there will be a point where chip memory matches magnetic memory in cost. If that chip memory happens to be non-volatile as well, it will all be over for disk drive manufacturers.

If you would like to know more about FRAM technology, contact Ramtron, 30 Carrington St, Sydney 2000 NSW; (02) 262 1933. □

THE LIGHT FANTASTIC

- PART 5

IT MIGHT APPEAR that CD-ROM (the Read-Only form of CD) has been overtaken by writeable systems (CD-E and CD-R) before it has become firmly established. We are just beginning to see an upswell of electronic publishing on CD-ROM, while coming over the horizon behind we see a wave of WORM (Write Once, Read Many times) and eraseable-recordable optical disks. Many experts have criticised CD-ROM (and therefore CD-I also) and have said that it would not last simply because it wasn't a recordable medium.

I think this judgment is wrong. Writeable systems have raised the level of consciousness of optical disk systems, but in my opinion the CD-ROM industry (including the publishing business it supports), could, in a few years, be hundreds of times larger than the writeable disks industry. Recordability is important in its own right, but it has also had the effect of finally making the CD-ROM read-only system respectable. It has confirmed the importance (and the viability) of the CD-ROM standard.

Is CD-ROM going to become obsolete even before it's established? No (and yes) answers Stewart Fist.

Consumers and businesspeople have every reason to be wary of these new technologies. What had been a very gullible consumer-public in the 1970s, has now begun to get wise to the hype of the techno-marketeers of the mid-80s. Once bitten, twice shy! People now don't get sold so easily by the hype of new technologies; now they only buy when systems are proved and standards are established.

The marketing people increasingly find that they can't conjure up new markets out of thin air for expensive high-tech

DOMINIQUE SARRAJTE/THE IMAGE BANK

equipment – not matter how space-age and futuristic the technologies.

The numerous forms of videodisc didn't make much impact because they couldn't record television off-air, and this was the principle reason why people wanted a home video machine – not to replay old movies. CD-Audio, however, made an enormous impact (using virtually the same laser-disc technology) because it replaced an existing system. CD-Audio appeared to overcome all the problems associated with the old technology – scratched disks, bad needles, fragile cartridges, limited playing time. And, at the same time, it greatly improved the sound quality for only a reasonable increase in capital outlay. It wasn't long before a CD-Audio player was cheaper than a good LP turntable.

CD-ROM however is breaking new ground entirely – it needs to establish its own market. At present it fits into the same home market niche, probably, as that of the encyclopedia salesman and those that promote 'better education for your kids' products. In business it has a general application in providing encyclopedias, general-reference and writing-assistance tools – but none of these are crucial business functions except in publishing. In some more specific business and industrial 'customised' areas it has application for parts-manuals, technical references, and training. This is where it appears to be slowly succeeding. We keep talking about CD-ROM as a computer peripheral – which it is from the manufacturer's point of view. But from the vantage of the computer user, CD-ROM doesn't replace any of existing peripherals: it seeks to expand the range of computerised applications into new areas. This is where the problems lie.

In effect it substitutes for bookshelves full of encyclopedias, or work-shop manuals, or reference books – but very few people have bookshelves full of books. Only five per cent of people read a significant amount. Those of us working in the information technology areas are info-philers ourselves, and we often fondly imagine that the rest of the universe is populated by other info-philers; but it isn't.

So CD-ROM faces the classic chicken-and-egg problem. Disk publishers will only produce a great range of general reference materials when a million or two CD-ROM drives have been sold. And the price of these disk will only become 'reasonable' when disk titles are manufac-

Disk publishers will only produce a great range of general reference materials when a million or two CD-ROM drives have been sold.

ured and retailed to a mass market. But people won't buy CD-ROM disk drives until there are plenty of cheap disks with the range of reference material that they want.

According to a couple of research projects, most computer-users expect to buy a CD-ROM drive 'at some time in the future' – but not right now! Fortunately there seems now to be enough specialised applications for short-run customised CD-ROM disks to provide some sort of a market base – and thus break the chicken-and-egg nexus.

We can't be too far from the take-off point now – even allowing for the infinite greed of the manufacturers. And when that point is reached CD-ROM drives will drop to half of their present excessive price, while CD-ROM disks will drop to match the cost of CD-Audio. There's no logical reason why informational disks or machines should be substantially more costly than the audio versions.

The advent of record-once and record-able-erasable disks should give CD-ROM a



CD-R (recordable, write-once) can provide a large capacity storage system with a built-in audit trail, but this consumes disk space at an alarming rate if you constantly make changes and write each file-change to disk. The disk will soon be filled with obsolete data which the current directory structure won't recognise, because WORM systems like CD-R 'erase' their data by destroying the directory pointer to the old file, and create a new one for the latest version. This characteristic is of great importance in banking and financial administration circles; almost anyone supervising important information – legal-documentation, warehousing-databases, or financial records – would feel a lot happier knowing that all past changes could be traced if an audit is ever required. The Taxation Department might well insist on all company financial records being held only on certified WORM or CD-R disks in a few years.



WEINBERG-CLARK/THE IMAGE BANK

The 'rainbow disk' currently being researched at a number of establishments, including the Australian National University in Canberra, can theoretically store up to one million bits of information at each location on a CD disk – and there are over two billion locations on even the current disks – by encoding the data in colours. Materials that can record the full visible spectrum exist, so the work is currently focused on but finding one that will work on a disk surface.

boost also – although there aren't any drives out yet that can record a disk that is playable on a standard CD-Audio or CD-ROM drive. This is what is being proposed, however, by the development of standards in Japan for CD-R (recordable, WORM, write-once) and CD-E (recordable/erasable, rewriteable).

The problem is in getting the right amount of contrast between the reflective area (land) and the non-reflective area (pit) without actually cutting holes through a metalised surface. If you do cut holes then you've axiomatically got a WORM (CD-R) system, not a reversible CD-E.

Write-once technologies don't always physically burn holes, but this is the best way to create the necessary contrast. Reversible 'erasable' technologies generally only have contrast differences of 20 per cent at the most – and a lot of the standard CD drives sold at the present time wouldn't be able to detect this change. So, while interchangeability is what everyone is hoping for, it might not necessarily be achievable for quite some time – and then only on new machines.

Personally, I don't think recordable CD systems are half as important as the re-

play-only CD-ROM. It makes sense to have 650 megabytes of Read-Only Memory on a disk as a mass-consumer computer product, but it hardly makes sense to have the same amount of recordable space: not for text-based computers anyway.

Overkill

IN PURE text terms 650 megabytes is about three times the total amount of words that any one person could write in a lifetime – and since 95 per cent of computer use is for the storage of text, these future CD-R and CD-E drives are a slight case of overkill. They'll also be too expensive for you to use to pirate music, so this leaves graphic applications as possibly their major advantage in the foreseeable future.

The WORM technologies – those that can be written-once but not erased and reused – actually make more sense in business computer systems than the fully erasable-rewriteable types.

CD-E is predicated as a substitute for large magnetic hard-disk, and yet conventional hard-disks are already getting into the half-gigabyte range. So CD-E doesn't really provide us with anything new – except, perhaps, a disk that is easily remov-

able and which may have good archiving qualities.

However CD-R which can be recorded once only, would provide us with a large capacity storage system with a built-in audit trail. Of course this means that disk space is consumed at an alarming rate if you constantly make changes and write each file-change to disk. Your disk will soon be filled with unusable obsolete data which the current directory structure doesn't recognise.

This is the way WORM systems 'erase' their data, they simply destroy the directory pointer to the old file, and create a new one for the latest version. This characteristic is of great importance in banking and financial administration circles; almost anyone supervising important information – legal-documentation, warehousing-databases, or financial records – would feel a lot happier knowing that all past changes could be traced if an audit is ever required.

This non-erasability overcomes, to a degree, one of the main problems with holding business records on magnetic disk (as many companies are beginning to discover): Once a magnetic file is overwritten, the old information (I almost said 'evidence'!) is gone forever. It is impossible to retrace paths to see where mistakes were made or fraud committed, unless regular archival backups have been preserved – and who does that?

It wouldn't surprise me in the slightest if the Taxation Department didn't insist on all company financial records being held only on certified WORM or CD-R disks in a few years. Of course you could fiddle the system to 'erase' the old information on a disk by over-burning it, but this leaves irrefutable evidence that the books have been cooked, in the literal sense of the term!

Provided that the standards can be made compatible, CD-R disks will also fill the need for short-run CD-ROM disks, where the number of copies needed is too small to warrant the \$6000-odd cost of pre-mastering before the first disk can be produced.

Most WORM technologies use a disk coated in a thin-film with the rare-earth metallic substances tellurium or terbium. There are a couple of variations in recording technique – The Toshiba approach is to use a high-powered laser to burn holes in the material during recording, while the read cycle uses the standard low-power laser which reflects (or not) from the tellurium surface.

Panasonic use a phase-change system (discussed later) which varies the reflectance of the crystalline surface of the disk, and Sony has a strange technology that relies on two layers of different metals. The heat of the recording laser causes the metals to melt and form an alloy with different reflectance characteristics.

Usually both sides of the disk are used to get a total storage capacity of around 600 megabytes, and a large part of the disk space is devoted to ECC error-checking. There's another problem with all writeable disks in maintaining accurate tracking while recording. Most use specially pre-grooved disks which guide the laser head.

DRAW (Direct Read After Write) is still a term you'll hear bandied about in optical disk circles – often in association with WORM. Originally DRAW referred to WORM systems that didn't have to be developed or processed before they could be read. A few years ago the WORM category included some non-DRAW photo-lithography techniques which needed to be processed in a photographic laboratory then etched to provide the pits.

More recently DRAW has taken on a new meaning. It is now applied to systems which record, then read, almost instantly thus enabling the computer to check that the disk has faithfully reproduced the information fed to it. This is the best form of error-checking. Sometimes DRAW machines switch between high and low power using the same laser, and so check the information a block at a time; sometimes they use two different lasers and check constantly with a half-rotational delay.

Photo-lithography processes for the direct manufacture of one-off or short-run disks certainly have a place also. A couple of years ago McDonnell Douglas invented a low-cost photographic process for making one-off optical videodisks using, what looked like X-ray film, but it doesn't seem to have caught on. I now hear that they have sold the system to some European company and that it will be reappearing shortly as a CD system.

There are also a number of new laboratories in the US which advertise low-cost, one-off production of CD-ROMs, and I guess that these companies are using a photographic process. It is almost the obvious approach for short-runs. When we get down to the fully erasable-rewriteable disks – the technologies that will eventually be used in the CD-E standards – we find three quite different approaches:

Like to know more?

THIS IS THE last in Stewart Fist's series on optical storage technology. Part 1 in our January 1989 issue covered Philips' LaserVision system, the history of optical storage and a variety of current applications. Part 2 (February) discussed the integration of CD-ROM and CD-Audio, and the problems encountered in developing applications; a separate item with the article described compact disk manufacture. Part 3 (March) focused on error-handling and the Philips/Sony standards. Part 4 (May) covered CD-ROM file and directory structures and data retrieval. If you missed any of these issues, back copies are available – refer to the Services page.

Phase-change. The first relies on the different reflectance of some exotic materials which can exist in either an amorphous (non-structured) or a crystalline (structured) state – a change of the material's 'phase'. Philips has recently made a breakthrough here using semiconductor materials such as gallium antimonide and indium antimonide (known as chalcogenide alloys) doped with rare-earth elements like tellurium, selenium and antimony.

If you heat an area of these disks quickly with a laser to just above melting point it cools to an amorphous (high reflectance) state. Reheat the area to just below melting point and it returns to its more stable (and lower reflectance) crystalline state. You can swap states on these disks up to 1000 times and, with care, the disks have a reasonable shelf life at room temperatures.

The laser needed to swap the crystalline layer to its amorphous state is about five milliwatts in strength, and it must heat the surface for about 100 nanoseconds – which doesn't present any problems at CD-ROM speeds.

The difference in reflectivity between the two phases is only about 30 per cent, with the amorphous 'pit' being higher than the crystalline 'land'. But this reversal of 'expectations' doesn't matter since CD systems work on the change between one and the other, not which is what. A change equals binary 1, and the stable state is binary 0s.

To reverse the amorphous process, a half-power laser hits the area for about the same 100 nanosecond time, and the

reflectivity drops by about 20 to 25 per cent – not back to zero, but enough for a detectable contrast – as long as the reading machine has been constructed to expect this.

It is fundamental to phase-change systems that they are 'thermally activated' and therefore changes occur, albeit at a slow rate, even at room temperature. Tellurium, which is the most important material used in these phase-change systems (and in many WORM technologies) is notoriously sensitive to oxidation from moisture, giving rise to concerns about shelf and data-life.

The concerns about these materials extend to include problems of film deformation over time, incomplete erasure (ghosting) and accidental erasures. Fortunately selenium, indium and antimony are all reasonably resistant to corrosion or oxidation.

Magneto-Optica. The second technique depends on the laser heating an area of disk to which a strong magnetic field has been applied. The area under the laser (and only the area under the laser) re-orientates magnetically to create a magnetic 'pit'.

The thin recording layers used for magneto-optical systems are usually of the rare-earth 'transition' metals, terbium and gadolinium, alloyed with iron and/or cobalt. Unfortunately, terbium oxidises very easily, although this may not be such a problem under some of the new protective layers.

The difference in magnetic orientation doesn't mean that you need a magnetic head to read these disks, they can still be read by laser. Lasers work because of the Kerr and Faraday effects which deal with changes in the polarisation of light reflected by, or passed through, magnetised materials. As you would expect, contrast is very low, but to erase, you simply bias the magnetic field and run the laser over the track again.

Sony and Canon have been showing magneto-optical machines which conform to the ISO's 5¼ inch standard (not CD-E) since November 1987, and Sharp, Hitachi, Maxell and 3M have all experimented with this approach. Canon are making magneto-optical disk units for Steve Job's Next computer and there are now eight other manufacturers who actually claim to have magneto-optical reversible products – but the only one showing at the recent PC-89 show was a Sharp. Sharp's disk 'Minder' wouldn't make it record or replay anything, and he refused to take out the

Non-disk technology

SEVERAL non-disk technologies are liable to influence the development of CD-ROM and CD erasable and recordable systems in the near future.

Drexler. The Drexler Technology Corp. of Mountain View, California, is certainly the world leader in applying optical technologies to card-storage systems. Their Drexon Laser Card has been around for many years as a general information storage system. It is about the size of a standard credit card and it is specifically aimed at medical and military use. Toshiba and Nippon-conico make card readers for the system.

The original Drexler cards had a two-layer plastic film coating, with the top layer saturated by microscopic particles of silver. A medium-power laser melted pits in the top layer to expose the unsilvered/unreflective bottom layer during the recording process.

These cards could store 1.2 megabytes, or about 30,000 words of information which is about a thousand times the capacity of a standard magnetic-stripe card. Drexler has since raised the capacity of their card to four megabytes (a Canadian inventor has supposedly demonstrated a 200-megabyte version called the Hi-Lite).

Drexler cards are now being used by the Sumitomo Bank and British Telecom. Trials are underway to distribute software via the cards, and to hold medical information. Telecom are also experimenting with the inclusion of fingerprints, photos and signatures as a secure means of paperless financial transactions and as security provisions for access to sensitive defence areas.

DAT. Magnetic Digital Audio Tape (DAT) machines are already on sale in Japan, but due to copyright problems they have been pretty well quarantined from the rest of the world. They are just too good, and potentially too cheap, to let loose in a piratical world.

Every effort has been made by the Japanese electronic manufacturers to create incompatible standards for digi-

tal sampling between CD-Audio and DAT systems, and now they have introduced a mandatory Copycode 'spoiler' chip to destroy the quality of DAT recordings made from CD-Audio disks.

There are two forms of DAT. R-DAT (Rotating DAT) uses a rotating head and helical scan, much like the standard videocassette recorder. As such, it is very similar to the analogue/PCM Super-8 video recorders being promoted by Sony. This system also has potential as a computer peripheral. S-DAT (Stationary DAT) has 22 parallel tracks along the tape and is now used exclusively in professional sound recording machines.

R-DAT stores digital data on a small cassette which is capable of winding from beginning to end in only 14 seconds, so it even has the capacity for speedy access as a computer peripheral – especially for mass delivery of textual information, and for backups. It is not likely to be a direct competitor to recordable CD systems, but it certainly could intrude into some areas of the same market. At present there are no Data-DAT standards, but a number of Japanese companies are building recorders for this purpose. Sony and HP have devised the DDS (Digital Data Storage) format and Hitachi, Scientific Micro Systems, and Gigatape of Germany are all offering rival systems. Generally they can hold more than one gigabyte of data on a two-hour audio cassette at about a tenth the previous cost of tape backup.

Gigatape GmbH is already selling a Giga 1200 (megabyte) drive for \$US5000 using JVC mechanisms. They are making and selling 3000 a month.

Sony's system uses extra heads for recording and playing on the rotating helical scan drum. The extra heads allow the data to be read and checked immediately after being recorded (DRAW technique). Sony also include another layer of error correction over and above the two layers normally found in a DAT audio recorder.

for its 3½ inch-release under the Kodak label.

Dye-polymer. The third technology is the dye-polymer approach which the Japanese developed to the prototype stage first in 1985. It has a much lower potential cost than the other disk systems because it uses inert materials rather than rare-earth elements. For this reason also, it could prove to be more stable for archiving – but until recently the companies trying to produce dye-polymer equipment have needed special (expensive and bulky) gas lasers to get the necessary visible-light frequencies and this has complicated matters.

Most dye-polymer systems work by creating physical bubbles at the surface between two bonded polymer layers, and the curvature of the bubble changes the reflection during the read cycle. Two quite different lasers are needed for the recording process since the two polymer layers must be dyed to respond to different wavelengths.

The dye in the bottom layer absorbs light, heats and expands to create a bubble at the boundary. This bump intrudes only when the thermoplastic of the top layer is simultaneously heated by its own laser during the writing process. If only one laser is active, the disk can only be read; if both are active it can be read and/or erased. The bumps are locked in by cooling and since the polymers are elastomer (rubber-like) they can be reheated and the process reversed.

The optical future

THERE ARE problems at present with the sheer bulk of the two visible-light lasers and also with material fatigue (which might limit the number of erasures to between 100 and 1000) but obviously there is potential in this idea for the future.

This is the technology that Tandy announced (about ten years premature) as their CD-Thor 'breakthrough' – they've gone awfully quiet since. It is also closely related to the ICI Digital Paper announcement – although from what I read the image on the surface of the digital paper is not erasable, and is visible to the eye (with a microscope) as a black dot – so obviously this is some variation.

It is fairly obvious that the crystalline-amorphous approach is the most likely technology for the immediate future if we are to have a single CD-based standard which covers the whole range from erasable, through write-once, back to CD-ROM.

cartridge to show me. This was definitely a 'showing' not a demonstration. I suspect Sharp's model was little more than the box – but there will be real machines (at around \$10,000) by the time you read this.

The main advantage with the magneto-optical approach is that there doesn't seem to be any limit to the number of erasures that can be made – unlike the

phase-change approach. The disadvantages of magneto-optical are in shelf-life and in the problems experienced in detecting the polarisation of the light.

You get more contrast if the light passes through the disk rather than reflects off the surface, and this is the technique Verbatim took in some of its disks. Lately it retreated to a reflection system

Digital paper

ICI ELECTRONICS announced last year a new optical storage medium they called 'digital paper'. It is a flexible plastic film that can store optical information in etched paper pits with a very high packing density. The film is a Melinex polyester and is coated with a dye sensitive to infrared frequencies. It can be cut into lengths as tapes, or stamped into disks, or even wound into cassettes.

ICI say that a single 800m reel of half-inch digital paper tape will store 600 Gigabytes of data – the equivalent of a thousand compact disks. They claim that it has a 15-year shelf-life and will retail for 0.5 cents per megabyte of storage.

New WORM drives are under development now to handle the paper. Bernoulli Optical Systems have undertaken development of a unit for PC use with a one-Gigabyte capacity, and a Canadian optical drive company, Creo, is working on a terabyte (1000 gigabytes) storage system for satellite weather and remote-sensing information.

Magneto-optical systems are the types currently on sale, but they are all 5¼ inch ISO standards which are an off-shoot of an earlier WORM standard.

Phase-change systems use pure optical techniques and they can be made to comply with the current CD standards – so a disk recorded on one machine should eventually be replayed on a CD-ROM, CD-I or CD-Audio player. There are theoretical reasons for supposing that phase-change will also provide greater bit-densities than magneto-optical systems, and their disks are certainly cheaper to manufacture.

Recently, Matsushita Electrics developed a solid-state laser which can emit visible light – in particular light in the blue part of the visible spectrum – and this could mean much better performance for CD systems in general and for dye-polymer recordable systems in particular. These wavelengths would allow a modified-standard CD-ROM disk to store roughly four times the present 660 megabytes. It is the wavelength of the current infra-red lasers that decided how close the tracks could be spaced, and how many pits there could be to each millimetre of track.

The Russians have also developed a dye-laser which could lead to the produc-

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The Light Future

THERE ARE a number of different draft standards around for both WORM and re-writeable disks, but recently most manufacturers seem to have settled on 5¼ inch magneto-optical disks based on two ISO draft standards – the Continuous/Composite format and the Sampled format which refers (I think) to the way in which tracking occurs on the preformatted disk.

Canon. When Steve Jobs announced his NEXt Computer, the most interesting innovation was the built-in Canon recordable-erasable drive. I hoped to be able to give you full details about this drive but Canon in Australia hadn't heard of the drive, or of the Next computer, or of Steve Jobs! However, from more informed sources, I can tell you that it uses the magento-optical principle, and holds 256 megabytes of storage on each side.

Sony. Sony are producing 'engines' for magneto-optical recorders which are sold to be inserted into third-party boxes. The SMO-S501 5¼ inch engine gives 650Mb (unformatted) on a cartridge, with the costs somewhere in the region of \$US6000 (retail) for the drive and \$US250 for the cartridge. It uses the Continuous/Composite format.

The recording capacity of the disks is actually 325 megabytes each side, and the disks are Constant Angular Velocity (2400rpm) with a spiral track having 18,751 tracks to each side.

Sony claim a cumulative life for erase/write/read cycles greater than one million times, and a shelf life of ten years (I'll believe that in 1999)!

Sony also make a WORM engine called Century Media using the alloy process – the name comes from the claimed life of 100 years. It uses a large polycarbonate disk with a capacity of 3.2 gigabytes (in CLV mode), although one third of the capacity is used for error-checking.

Ricoh. Ricoh make an essentially similar drive to the Sony erasable – the RO-5030E – with an ISO standard cartridge of 600Mb.

Computer Drive in Melbourne, (03) 690 1689, are selling an erasable/recordable WORM drive for the Macintosh based on this engine. The MACSetra is a 600 megabyte drive also with a claimed disk life of one million erasures, or ten years – which ever comes first. Costs are about \$8000 for the drive and \$500 each for the cartridges – and I don't know whether that is US or American, because they don't answer their phone.

Sharp. Sharp have a brochure out on their drive, but they wouldn't demonstrate it at the PC-89 show. They claim that it is an engine of their own manufacture which provides 652 megabytes (both sides, formatted) in a standard ISO cartridge. The disk rotates at 2400rpm, CAV – but it is a glass substrate disk (the others use polycarbonate). They (wisely) don't specify archive life.

tion of tuneable lasers, customisable to create visible light of any colour. This could mean that any required dye used in a polymer disk can be matched exactly to a laser.

Obviously these discoveries have potential in the optical disk field – if we assume that more capacity is necessarily an advantage in CD. Don't forget that most disk publishers are only using about one-third of the CD-ROM disk space at present.

We also shouldn't lose sight of the fact that magnetic storage systems have been advancing at a similar rate to optical, so it is by no means certain that optical will replace magnetic disks in all areas of computing. IBM recently announced an experimental 3½ inch disks which holds over 1 gigabyte (10 gigabits) of information. However, making this in a laboratory, and achieving the same 0.5 micron track

separations with the necessary reliability in factory production runs, is different matter.

Nonetheless, optical disk systems, specifically those using dye-polymer technology, have potential far beyond the theoretical limits of magnetic. The present dye-polymer disks only use two layers, each coloured to absorb a specific wavelength of laser light, but there's no reason why three or more layers couldn't eventually be used, with each handling its own distinctive part of the spectrum. This is the way colour film works.

In other words, each discrete area of the disk might eventually be capable of storing more than one bit. In the laboratory, they've already managed to record 8-bits or one full byte of information in one location, but this is a laboratory curiosity at present. However, it could give us eight times the present disk capacity –

and coupled with the use of visible-light lasers, this could boost capacity to 32 times the current 650 megabytes – if we need this much space.

Along the same lines, but using an entirely different technology, is the 'rainbow disk' which is only in the very early research stages. Six research establishments around the world (one being the Australian University in Canberra) are looking at materials which are able to store and reproduce a full visible spectrum. These materials exist, but finding one that will work on a disk surface is the problem.

If you shone a blue light onto these materials, they would reproduce a blue light on play-back; if the recording light was red, then they would reproduce red; if it was both red and blue, you'd get the exact match back on replay. Theoretically, if the recording light was from a sodium vapour lamp with the two dominant very narrow spectral yellow lines, the materials would reproduce only these lines on playback. This doesn't sound possible, but I am assured it is so.

It might eventually be possible to find materials that would reproduce the complete visible spectrum, including the Fraunhofer (absorption) lines often found in spectra, say, from the sun. If this is so, then theoretically (and this is entirely theoretical) it might be possible to store up to one million bits of information, encoded as lines in each spectrum. And so a million bits could be recorded at each location on a CD disk – and there are over two billion locations on even the current disks.

No one pretends that this is even remotely possible or desirable, of course, but if we were only able to store one hundredth or a thousandth these figures, we would increase the capacity of CD-sized optical disks to astronomical proportions. We already have practical demonstrations of 2.5 gigabytes on a 12cm disk, but this research takes the possibilities up into blue-sky ranges like 2500 or 25,000 gigabytes – in text terms, about 16 million average books per disk.

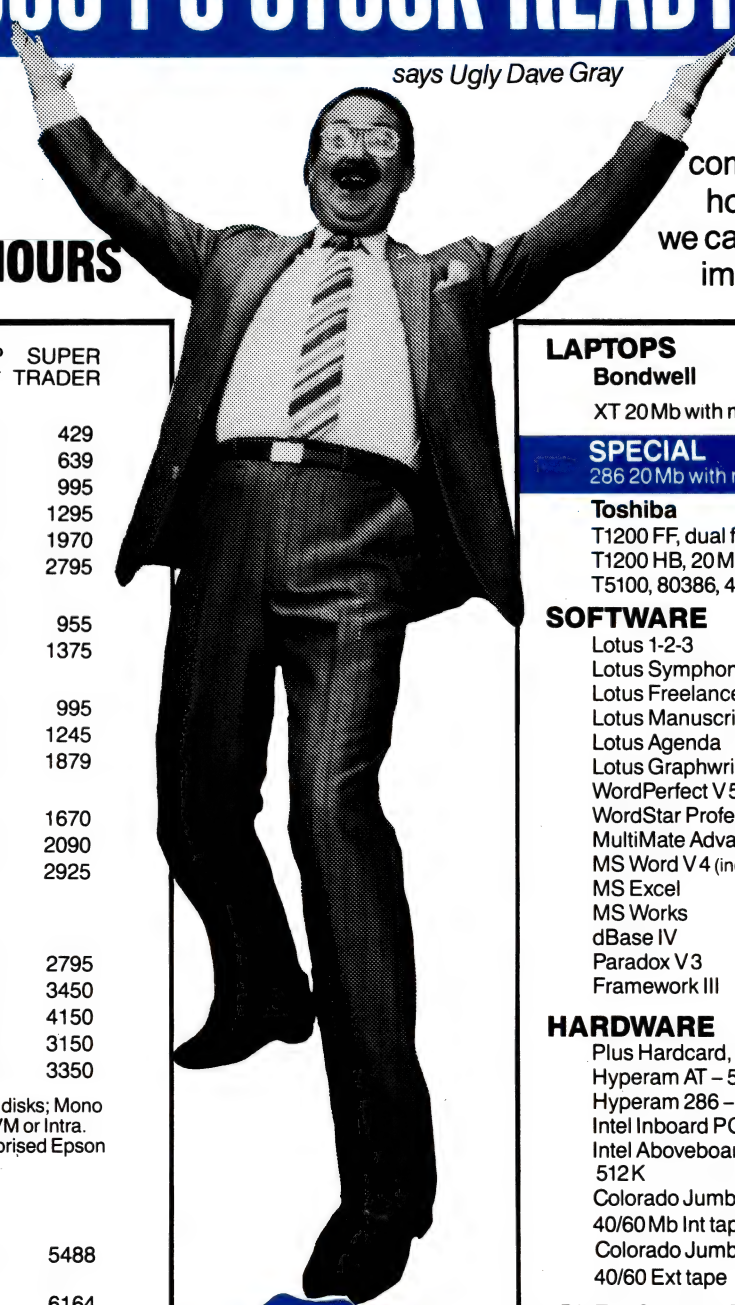
Of course this is crazy for text, but you can see potential with motion video and anthology disks like a 'single' with the 'Complete Works of Bach, Mozart, Beethoven and 300 minor European composers' or the 'Complete Recordings of Federal Parliament Proceedings since 1901'. Storage shelving isn't going to be a problem in future homes – and you'll never need to buy a frizby again. □

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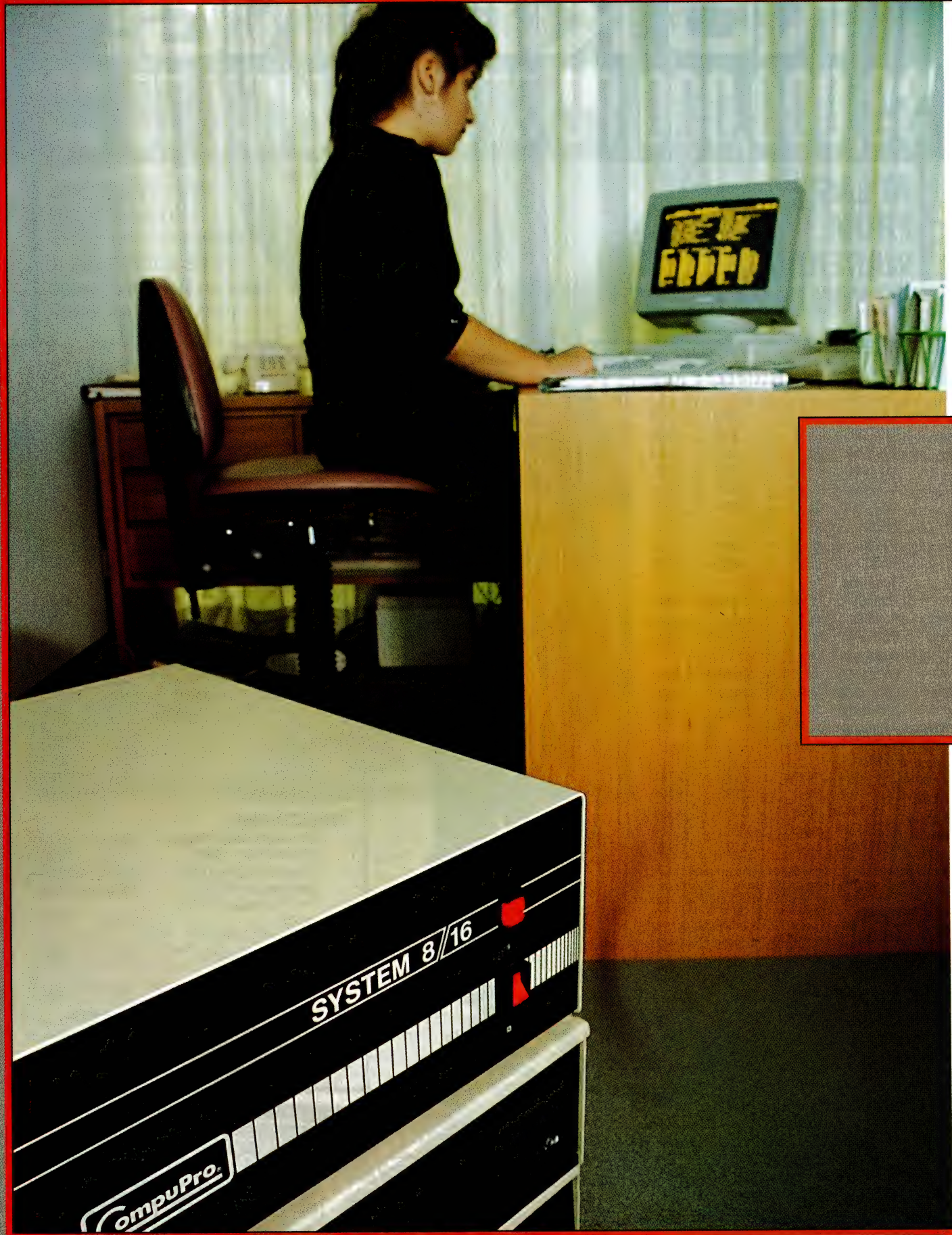
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The Computer Trader



The heaven of
computerisation can soon
turn to hell, as
Jim Prosser-Fenn found
when upgrading a country
legal practice.

back and passing disks between them, we had ourselves a primitive multiuser system.

This word processing solution could not last long (in fact it stayed that way for two years), but it firmly convinced me that everything on the system must be capable of being shared with everyone else. It set me on the search for a good local area network.

At that time we had an Olivetti BCS 2030 doing an acceptable job of the accounts and as my motto is 'if it works, don't change it until absolutely necessary', we left it as it was until the last possible minute. We briefly flirted with the option of writing our own accounts system, but we came to our senses (or so we thought at the time) and looked for someone else who had already invented the wheel.

worked quite well, but accounts was another story. The new package was written in Dataflex and ran like a dog – a dead one. It took nearly 90 seconds to load the program for the third user. I could just see my partners waiting for this stuff to load – no chance!

After much legal letter writing, the DMS hardware was to be removed, but a replacement had to be found first. Word processing had been taken across, but accounts was still on our faithful Olivetti. We persisted with the word processing as it was usable in the short term, but Daro wanted their machines back. In the course of my search for a replacement I happened to attend a technology seminar which indirectly addressed our problem and there met Les Bell. He pointed out to me that heavy data flow would kill a local area network that was not configured to meet its demands.

He also told me of a system in place at Eastern Suburbs Newspapers that could eat mine. This I had to see and I arranged to inspect it and run a test of Dataflex. Eastern Suburbs Newspapers were at that time, like us, using WordStar and Dataflex and were running CompuPro super micros. I agreed to have a look.

The first copy of Dataflex loaded in four seconds and the second and third took seven seconds each. The machine was very quick and the newspaper was already doing what I thought we needed to do, so we bought a CompuPro. (*Eastern Suburbs Newspapers is a sister company to Federal, the publishers of Your Computer; the system described here was also used to produce the magazine for a number of years.*)

The first system

WE CAME across Daro Office Systems who, with their Digital Micro Systems local area network, appeared to be the answer to our prayers. It was quite good at word processing and we looked seriously at their proposition of six computers in a token ring with a 40Mb dedicated file server.

Their 8-bit accounting package was in the process of being rewritten for 16-bit hardware and we could continue with WordStar (which we then used) as an editor. They even offered to transport our data from the Apple format diskettes – it was heaven. Unfortunately, heaven quickly turned to hell.

Our office was wired and ready for the DMS hardware to be installed. The accounts were made ready to be transferred from the Olivetti to the new system. Then we waited, and waited and waited. Eventually word processing was converted and

The second system

THE COMPUPRO 8/16 we bought initially ran an implementation of M/PM that had been doctored by Gifford Computer Systems in the States and which they called Multiuser Concurrent Dos or MC-DOS.

It was a dream, and the documentation was excellent. They gave away a good editor, a diary, electronic mail, internal communications, and all sorts of other goodies as a standard package. Unfortunately Gifford disappeared in the shake-up that took place in 1986 – the computer itself had a megabyte of RAM a high-speed RAM disk used as cache memory and ran six terminals happily. With 40Mb of hard disk and three printers dedicated to letters and documents, and all hardware buffered (64K), the WP output was centralised to one room and this improved paper flow enormously.

We got the CompuPro in 1982 and it is still chugging away merrily today having

**IF IT AIN'T
BUSTED, DON'T
FIX IT!**

IT WAS 1978 and back then it was simple: we needed a tax write-off and everyone said we should have a word processor. We opted for a standalone Olivetti system which was useful, but a legal office of our size quickly saw the limitations of the machine.

We needed a system, that much was apparent. Not a standalone, but a coherent unit with accounts, word processing, database and capable of expansion, easily and efficiently. Not just the software or the hardware, but the method and means to bring it all together. Being the junior partner of what is now a seven partner firm, I started reading – books, the writings of other lawyers, magazines (including this one), all sorts of publications.

While we were looking we bought a secondhand Apple II with dual drives and printer, and replaced the Olivetti. This proved quite successful and we bought a second Apple and printer to help carry the load. With the operators placed back-to-

ever only lost one day in downtime. It now runs as a node on our network. It cost us about \$19,000 back then.

Accounts revisited

DARO HAD in the meantime fallen over and been picked-up in name only by Intelligence (Aust) Pty Ltd. They proposed continuing with the writing of the accounts programs and gave the suite the name ILAS (Intelligence Legal Accounting System). We agreed to go with them in this and once again started waiting. This time, however, it was different since I had started to learn a bit about computers and salespeople. We already had a very good WP system and wanted their accounts

programs to run on the CompuPro. We knew that Dataflex would run well on it because that was already happening at Eastern Suburbs Newspapers. Intelligence said they would have it up and running for us in no time.

Now the man who markets CompuPro in Australia, Rod Whitworth at Automation Statham, frowns on maintenance agreements. He encourages his clients to learn more about their systems, and I was a willing student. With the first CompuPro we had achieved our goal of distributing word processing to six and, at times, eight of our secretaries through the 8/16. It worked night and day, and even now is never turned off.

Each time the operating system was updated we jumped in early. From MC-DOS to CCP/M to Concurrent DOS 8/16 right up to CDOS Version 5.2e which we now run (soon to be Concurrent DOS Version 6). When the 8/16 was first purchased it had an 8088 CPU which we quickly upgraded to a 8086 at minimal cost (just switch the board). It now has an 80286 and three dual-task 80186 slave processors – it's very quick for a seven-year-old. Accounts were still running on the Olivetti, but we had three or more people in the Department and it was very inefficient.

When ILAS was finally said to be ready in 1984 we purchased another computer, a CompuPro 286 with a 40Mb hard disk,

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1Mb of RAM, three 80186 slaves, RAM cache, the whole thing, and networked it to the 8/16 with DRnet using Arcnet hardware. It was to run seven terminals. The bugs were there but we quickly worked them out of the hardware. The software was another story: Dataflex was not running properly; the accounts programs kept hanging and Intelligence could not work out why.

Eventually, in desperation, Rod came to Orange and met the Intelligence programmer in front of one of our screens. Rod diagnosed the programming error causing that particular hang-up in about ten minutes and it was fixed on the spot. But this was not the end of the story, not by a long shot: the accounts programs ran, but unreliably; whole batches of data were being duplicated and the programs had to be carefully mothered. Fortunately, we had a mother on our staff and through the dedication of our accounts staff, we were able to continue while Intelligence supposedly battled with the programming.

The CompuPro is a true multiuser machine. Running Concurrent CP/M these machines can run Dataflex applications with 14 users on the one machine with little or no speed degradation. So why wouldn't our accounts run? Poor programming that's why – the Intelligence programmers had written Lock commands (which lock the Multiuser Exclusion Queues) and had then tried to twice Unlock them! The first time it worked, the next time the program tried to write to the queue it was already writing. Presto, hang-up the terminal (not the system, thank goodness).

Then Intelligence (Australia) Pty Ltd departed the scene too. The partners' confidence in the system reached an all time low – the dream was starting to pall. Fortunately, the ILAS system continued to limp along, and still does so today while we look for a replacement, or write one ourselves.

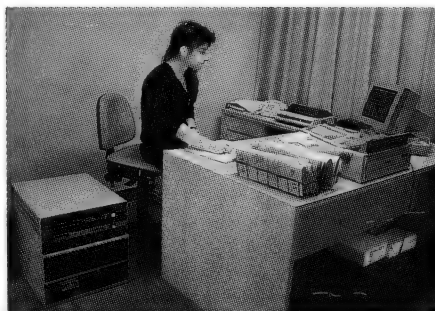
The system grows

BY 1986 WE had two CompuPros running fifteen terminals and eight printers. The operating system was Concurrent CP/M and our software was NewWord, SuperCalc, Amcall, a communications program (all bundled with the machine) and Dataflex. Each of my partners had a terminal on his desk for access to the system, principally accounts. Our database was growing, and all our secretaries were becoming very familiar with the system.

The snake in our Garden of Eden was the ILAS package. It was unruly and per-

sisted in hanging terminals, duplicating batches of data and other unpardonable sins. We had to change it or throw it out of the Garden. Its only saving grace was that it could be run by one person with part-time assistance, instead of three people. If only it had worked properly, it would have been marvelous.

To try to stop the duplication of records we proposed to run accounts as a standalone. We bought another CompuPro 286 with 80Mb of hard disk (our accounts database was now 46Mb and growing fast) and networked it to the other two. Word processing was still humming, and at this



After a lot of trial and error, good advice and bad, competent and incompetent programmers, Jim Prosser-Fenn was able to put together an almost ideal system for a seven-partner law practice.

time we started to flirt with communications.

We purchased a communications program called Voyager from the States and obtained access to the CLIRS (Computerised Legal Information Retrieval Service) through our own modem, a Dataplex automatic which runs at up to 2400 baud. Through this we now also access Lawpoint and the Land Titles Office, even doing our own title searches, credit searches and occasional enquiries and E-mail drops to and from the CompuPro Users Group in the States. Our Precedent database was over 20Mb and the partners could search and view the precedents on their own terminals. I regularly produce my own documents, having found it easier to do the complicated ones myself rather than plague a secretary.

Except for the ILAS package, the system is running very efficiently and well, and is very inexpensive. The printers are two 24-pin dot matrix for documents, both quite fast, and a C. Itoh F-10 40 for letters. The Itohs are remarkable printers – we got

them with the Apples in 1980 or thereabouts, both parallel, and we got parallel to serial converters from a guy in Surfers Paradise (who seemed to only work when the surf wasn't up). One gave up last year but the other is still going strong after all these years and tens of millions of characters.

The printers are shared by the whole system and have 200K buffers. They will shortly be spooled as well, although there is little or no conflict as the terminals run at 38,400 baud and have intelligent I/O boards with onboard memory. We have no maintenance agreements on computers or printers. We oil the printers when we remember to and clean the platens once a quarter. We are onto the third print head on one of them and it has been running for six years. The print heads are about \$900 each and the maintenance agreement for it was about that in 1986. We bought it for about \$3000 in 1983.

The ideal system

WITH OUR network we are, I believe, approaching the ideal system. Three supermicros, very fast, with high-speed cache, available to everyone through a local area network. Multiple slave processors in each machine, allocated as required by the Concurrent DOS operating system allowed us to run seven or eight copies of NewWord or Dataflex with little speed degradation.

The three machines give redundancy, so that WP is never completely down, particularly as we have only ever had three occasions when it was necessary to send a machine to Sydney for repair in a combined total of about twelve years uptime – and they are never turned off except at Christmas. Accounts used to be fail-safe but has now grown too large, even for itself.

Why proliferate resources throughout the building when most of the time the lawyers are too busy to use them, the staff are happy to share the printers, and because of the low cost per user, have their own terminals? When the lawyers want the resources they are there, cheaply and very quickly because they share a very fast machine.

Data is kept close to those who use it most, but is available throughout the system on request via the local area network. It is the combination of the best of multi-user speed and power with the ease and flexibility of the local area network.

We all have our own opinions, but this arrangement is currently working for us and as I said earlier: 'If it ain't busted, don't fix it.' □

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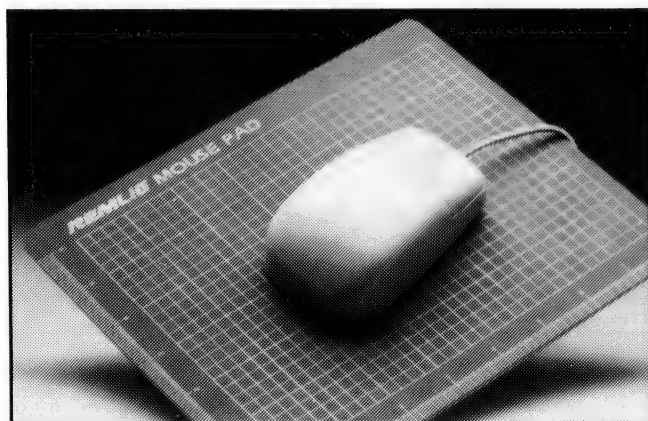
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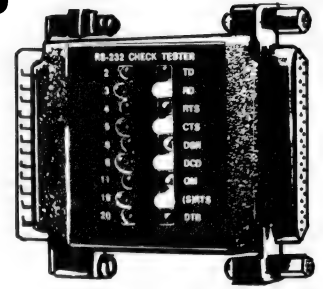
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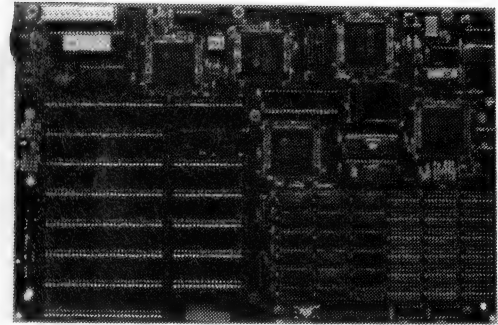
IBM AT Compatible 80286 Motherboard

Building your own computer or upgrading the old one? Our new 12MHz motherboard is the way to go for the ultimate computing power. DRAM not included.

Just take a look...

- Expandable to 1Mb using 256K chips
- Expandable to 4Mb using 1Mb DRAM chips
- Keyboard or hardware selectable 8/12MHz operation
- Six 16-Bit and Two 8-Bit expansion slots.
- Selectable for RAM speed - 80 or 100 nanosecond
- Selectable from 0 wait states on read operations (with 80 nanosecond RAM)
- Socketed for 80287 Co-processor
- Performance - 13.7 using Norton S.I.
- Battery backed real time clock on board
- AMI Bios ROM's included
- OK RAM supplied Cat X-1002

\$499



Multifunction XT/AT I/O Cards

The complete expansion for your XT/AT computer on a single card. Complete with parallel printer port, RS-232C serial port (second port optional), games (joystick) port, real time clock (calendar), 3.5"/5.25" floppy disk controller, cables and manual. Supports up to two 360K, 720K, 1.2Mb or 1.44Mb drives.

XT Version. Cat X-2026 **\$149**
AT Version. Cat X-2028 **\$149**

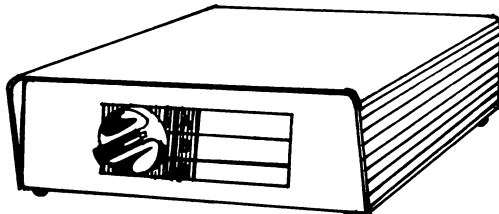
(NOTE: AT version does not include real time clock)

3-Way Switch Boxes

A great idea! The switch box allows the switching of a common input or output to any one of three other devices. All lines are switched. Ideal for sharing a printer or modem with more than one computer or connecting several printers to one Centronics port.

25 Pin With DB25 Connectors. Cat X-3575
36 Pin With Centronics Connectors. Cat X-3576

\$49⁹⁵ ea



RS-232 Quick Tester

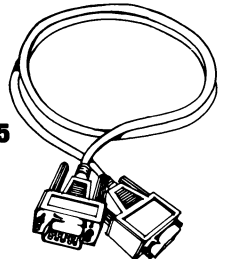
An in-line tester which has both 25 male and 25 pin female connectors. Three switches and 6 LED's allow quick selection for the most popular RS-232 configurations. You simply set the switch to select the connection you need. Cat X-2652

\$39⁹⁵

Monitor Extension Cable

Another great way to clear the clutter. This 2 metre extension cable is fitted with 9 pin 'D' connectors which allow you to move your monitor away from the CPU so you can save space and find the best viewing position. Cat X-2602

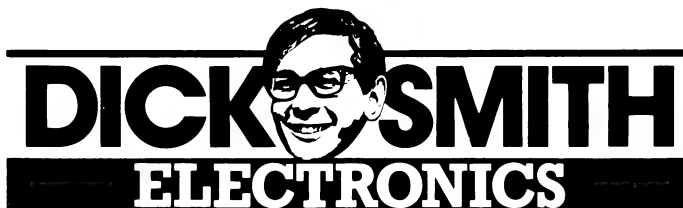
\$12⁹⁵



Keyboard Extension Cable

A great way to save desk space! This two metre coiled extension cable with 5 pin DIN connectors allows you to move your keyboard away from the CPU. So you can put the CPU on the floor (or where ever) and make use of your work desk. Cat X-2600

\$9⁹⁵



• MW • Albury 21 8399 • Bankstown Squares 707 4888 • Blacktown 671 7722 • Campbelltown (046) 27 2109
• Chateau Chase 411 1955 • Chifley 642 8922 • Gore Hill 439 5311 • Gosford 25 0235 • Hornsby 477 6633
• Hurstville 590 8622 • Liverpool 600 9888 • Maitland 33 7866 • Miranda 525 2722 • Newcastle 01 1890 • North Ryde 88 3855 • Parramatta 899 2188 • Penrith (047) 32 3400 • Railway Square 211 3777 • Sydney City 267 9111
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COMPUTER PENSIONERS

WHEN PERTH chartered accounting firm, Hendry Rae & Court's Information Technology Services manager first suggested installing computers to simplify the increasingly cumbersome record system of the Pensioner League of WA, mass walkouts of the voluntary staff were mooted. It was assumed that computer systems were the province of the young and older people would show less aptitude and enthusiasm for the technology.

But a more sophisticated system than the old card files that had been used for the past twenty years was certainly needed. As Bloomel pointed out: 'When you consider the League has 22,000 members and 83 branches between Carnarvon and Esperance, owns rental flats, a retirement home and a frail-aged hostel, it is easy to appreciate that the card system had outlived its usefulness.'

With the guidance of consultants, David Paine and Associates, an analysis was made if the League's special requirements and of those who would be using the system, all volunteers aged between 65 and 86. With their help, Multisoft Accounting software was chosen and a Dataflex application was written especially to cope with the membership files, simply and efficiently. Since a multiuser system was needed, Xenix was chosen as the operating system. For hardware, the League decided on an 20MHz NEC 80386-based system with 6Mb of RAM and an 18

Who says computers are only for the young-timers?

millisecond hard disk with seven terminals attached plus two high speed printers, one with Epsoms's new automatic paper aligning system. The computer was built by NEC to Bloomell's specifications. He also specified printer output trays that were raised off the floor to minimise bending over by the users.

Expecting a degree of difficulty with ac-

ceptance of the new system and training, particular attention was paid to installation to ensure everything would work as it should, the first time, and to training. Within three days, staff at the League were at ease with the new computer system and using it with some considerable skill.

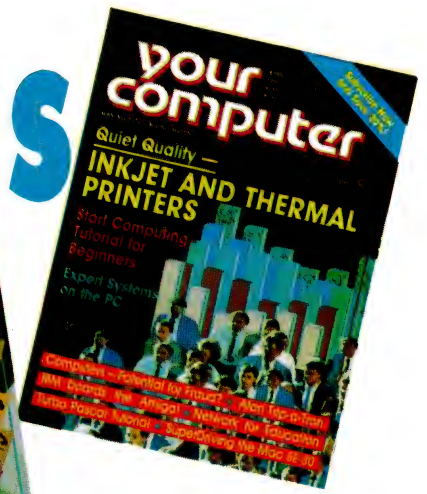
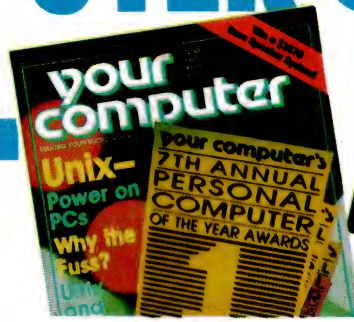
'In fact,' Bloomell said, 'the staff were far more receptive to the highly sophisticated technology and the transition went far more smoothly than at many other business houses I've worked with.'

If you'd like to know more about the system, contact Hendry Rae & Court, 254 St Georges Tce, Perth 6000 WA; (09) 481 1448. □



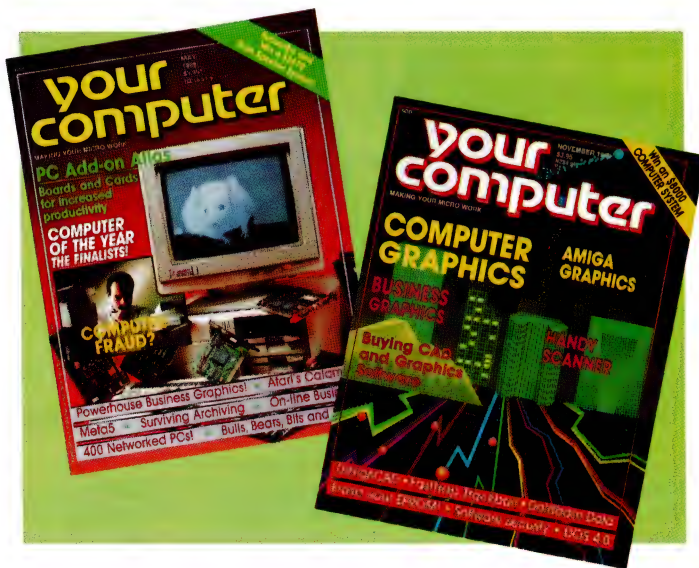
Modern technology is usually considered the province of the young, but volunteer staff at Pensioner League of WA took to their new computer system 'like ducks to water.'

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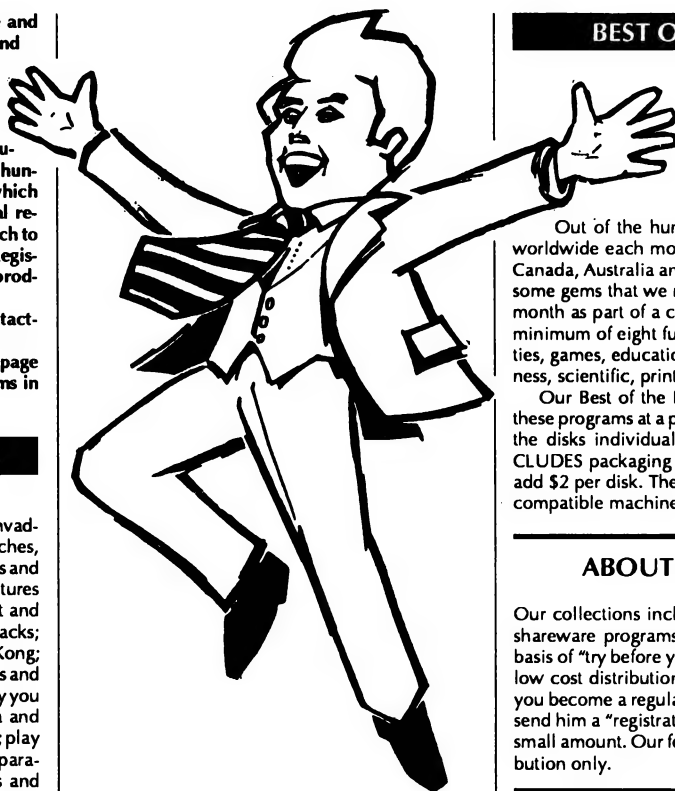
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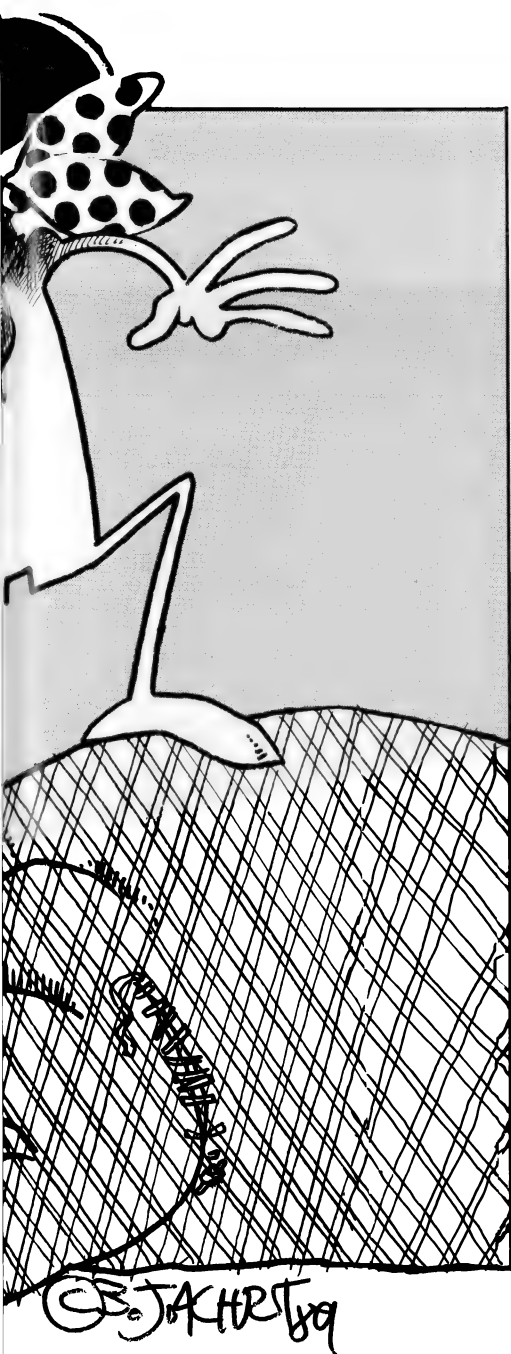
WHO HASN'T succumbed to a friend's offer of an exciting but illegally copied new program? I have, and even now, weeks afterwards, it's killing me softly. Perhaps this cautionary tale may alert other tempted PC owners to the cataclysmic consequences of accepting such generosity from 'friends' and 'mates'.

It all started with an American magazine's review of the new hard disk utility, SpinRite, which has apparently taken US PC owners by storm. I mentioned SpinRite to a Singapore friend with whom I've corresponded for several years. I sent her a copy of the highly favourable US review, asking if she'd heard about the new program.

A week or two later I received a floppy

A CAUTIONARY TALE

When you install unknown and pirated software in your PC you can sometimes end up with a lot more than you bargained for, as Rasjad Moore found out—the hard way.



disk in the post with a note saying that SpinRite was not yet available in Singapore, but that the attached program 'might do what you want'. In her spindly handwriting, my friend had written the innocuous word 'Software' on the identifying label and an ID number, presumably needed to access the disk.

Eagerly, I fired up my AT clone and spun out the directory of the new program. A READ.ME file identified the program as SoftSafe, by SDI (Software Directions Inc) of Randolph, New Jersey USA, however nothing in READ.ME shed light on the purpose or capabilities of SoftSafe except that it had certain virus detection features.

Always intrigued by new utilities, I saw SoftSafe as challenging new territory to explore. In hindsight, I suppose I should

have been more cautious. But after all, this mysterious program – at the time unknown to me – did come recommended by a friend. So with SoftSafe in my high-density drive, I called up its INSTALL.EXE but was told to first remove the write-protection tab from the program disk. Leery of such messages, I quickly made a copy of the disk (just in case), using this back-up to proceed with installation of the program. I was later to rue this precaution.

During installation everything seemed to go smoothly, with messages flying past on the screen, including one mentioning virus detection. As I watched all the subdirectories on my already packed 32Mb hard disk renamed at 10MHz speed I relished in the thought that my friend had apparently laid on me a valuable virus detection and vaccine utility. Having heard about such programs, I could hardly wait to use it. Regrettably, I never had that opportunity.

Rebooting my AT after installation, I was confronted with an entirely different opening screen and an unexpected challenge. The familiar cavalcade of programs that normally march from my AUTOEXEC.BAT file had now been replaced by the picture of a large safe complete with a stylised combination lock and a handle, obviously in the locked position.

This was the first inkling I had that SoftSafe might be more than a virus detection program. There on the screen was the SoftSafe Log-on panel and these simple instructions: Enter Your UserID, Enter Your Password. I quickly typed in the ID number my friend had penned on the disk label. But the password?

Fortunately, I noticed a little box in the lower left-hand corner of the Log-on panel with information I assumed would help me with the password. First, there was a name of a person, whom I took to be the registered owner, followed by the words, 'Sea Horse'. Obviously, that would be the password. But hold on, 'Sea Horse' would not work. Nor would any other combination of letters from the owner's name or his company. SoftSafe permitted three attempts, then presented me with a SYSTEM LOCKED message. My hard drive was now completely hung up; nothing I could do.

Oh well, I mused as I fished out my DOS disk to boot-up in Drive A, looks like I won't be able to use SoftSafe without the password. Win some, lose some; nothing ventured, nothing gained. Back to my old familiar system, without SoftSafe. Who needs security in Kilkivan, Queensland (population 303) anyway?

But I didn't figure on the program's unique locking mechanism that is automatically applied to the hard disk whenever it's used, thus preventing anyone from booting from an A drive diskette and then accessing the C drive. Incredibly, I discovered that I was now irretrievably locked out of my C drive. When I asked for drive C from the A prompt, I was confronted with the message that terrifies seasoned hard disk users: 'Drive not ready.' Had a virus invaded my system?

Enter Your Password

ALARMED, I tried de-installing SoftSafe, only to get this message from INSTALL: 'SoftSafe already installed. Do you wish to de-install?' When I replied, 'yes', I was again presented with 'Enter Your Password'. Back to square one.

And so, like thunder from China across the sea, it dawned upon me that without a valid password those 32 megabytes of mine – with their wonderful word processing and desktop publishing programs; with all their text files (many, unfortunately, yet to be backed-up) – were as inaccessible to me as a Raffles Singapore Sling. Two frantic telephone calls and several telex messages to Singapore failed to yield the elusive password; the original owner was the only person who knew the key word that would open the sesame of my AT's hard disk. But he or she was unavailable – or more than likely, unapproachable.

However, there seemed to be some hope in the owner's manual, which my Singapore friend photocopied for me as my gloom deepened. When it arrived I learned that SoftSafe comes with generic password and ID to get the user started. Once the program is installed, SoftSafe's User Control Panel can be called up by the owner from SOFTSAFE.EXE to add a UserID; change the password; list encrypted files; and remove the UserID. But, in order to use the Control Panel you must enter the current, valid owner's password. The same password is required to de-install SoftSafe, remove it from the system permanently.

I learned, too, that no amount of manipulating SoftSafe – changing or renaming the system programs on the distribution disk – will do anything except destroy the hard disk files. Even copying the SOFTSAFE.SYS unique device driver – as I had innocently done in making my back-up copy before installation – is fraught with dangers.

Prevention is worth. . .

NOWHERE IS THE adage 'Prevention is worth a pound of cure' truer than in the field of computer data security. Because of their insidious and long-term destructive nature, self-replicating viruses and other programs of that ilk are potentially the most dangerous in the long term. But, that's only one part of computer security that needs to be addressed.

Physical security of the hardware aside, the 'system manager' needs to be able to control user access at various levels starting with who is even allowed to use the system, which directories and files they can access (with defined levels of access - read, write, execute, delete, copy and so on), and which applications can be run by which users; and, an essential part of any security system is an audit trail to tell who did what when. Bear in mind that every 'system' has a 'manager' - the system may be your own PC at home or a hundred PCs spread around the country-side, but the concepts of system management remain the same.

Almost all of us can use protection against viruses, a convenient method of backing up, and an audit trail of the work we've done. An audit trail might seem like overkill on a single-user system, but it can be used for a variety of functions, from billing clients for work done to tracing a bug in software under development.

While there are any number of security systems on the market, one of the most full-featured and easiest to use is Protec, a system designed not only for security at almost every level, but one that also includes a powerful file management facility, a menuing system and a built-in electronic mail system. Note that Protec is meant for use on a standalone PC: it's intended for use where a number of users are sharing the same system and devices - whether it be your work machine at home which the kids use, too, or a shared PC in an office. To state the obvious, protection of data from unauthorised access or corruption becomes greater as more

Screen: Configure PROTEC			
PROTEC version	3.30	1/15/89	Serial #P3
<F1> Color MODE	on/off	<F7> Encryption	on/off
<F2> Screen Save	on/off	<F8> eXecute	on/off
<F3> Audit Mode	on/off	<F9> 3270	on/off
<F4> Kbd Lock Out	on/off	<F10> Lockout	on/off
<F5> Logon ID	on/off	<Alt-F1> Flcs	on/off
<F6> Menu Spacing	on/off	<Alt-F2> Menu FileIO	on/off
Boot protection is off			
Press <Enter> to save changes, or <Esc> to abort.			

Protec's Configuration Screen - The Screen Save feature not only saves the phosphor on your monitor but is a security feature in that it blanks the screen, preventing the data's being read; Kbd Lock Out (Keyboard Lock Out) allows a user to lock the keyboard and blank the screen while working in an application (handy during coffee breaks!); 3270 configures the screen for an PC-XT and compatibles; FICS (File Integrity Control system) monitors boot files, sounding an alert if they are altered; and Menu File IO stops TSR programs from circumventing Protec's access security.

users share a system.

The installation of Protec is straightforward (and clearly explained in the 246pp-manual); of course the time it takes and the complexity of the installation are both proportional to the number of features implemented.

The most basic of the security features included with the program is Boot Protection which prevents unauthorised users accessing the hard disk by booting the machine from the floppy drive with a DOS disk. While disk optimisation and file sorting programs (such as the Norton Commander Speed Disk or PC-Tool's

With SoftSafe, SDI has certainly given us a truly, rock-solid security program, although based on my own limited experience, its motto - 'Effortless Data Security for your PC' - is somewhat ironic.

But my cautionary tale is no place for a review of this remarkable new product, nor am I the person to write it. According to SDI, 'SoftSafe(TM) is the easiest to use computer data security program available

for PCs. It protects your computer from use by unauthorised persons and prevents them from viewing, copying, modifying or accessing your valuable files. SoftSafe also gives you powerful protection from computer 'viruses'. Access to your hard disk is granted only if a valid password is entered. If a valid password is not entered, or if you boot from a diskette, all data on your hard disk will be inaccessible.'

I'm terribly impressed with SoftSafe. However, for all the hours I have spent trying to access my hard disk after its 'unauthorised' installation on my AT, I have yet to benefit from its awesome features, much less the virus detection option which was recently discussed on ABC television. In the end, like a boundary rider putting down his faithful horse, I bit the bullet and reformatted my trusty hard

The virus Brain

Roger Thompson describes a virus that cost 400 floppies and two years' work.

IN NOVEMBER 1988, the computer studies subject master at Bremer State High School in Brisbane started noticing strange happenings in some of his PCs. In his words, 'Sometimes you could TYPE a file, but couldn't direct it to the printer, but then later, you could. Sometimes you could do a DIR of a floppy, and then you could not'. One of his students started probing the disk, and to his horror, found the following -

```
FAE94A01 34120102 06000100 00000000 57656C63 6F6D6520 zIJ.4.....Welcome
746F2074 68652020 44756E67 656F6E20 20202020 20202020 to the Dungeon
28632920 31393836 20427261 696E1726 20416D6A 61647320 (c) 1986 Brain.& Amjads
28707674 29204C74 64202020 56495255 535F5348 4F452020 (pvt) Ltd VIRUS_SHOE
5245434F 52442020 2076392E 30202020 44656469 63617465 RECORD v9.0 Dedicate
6420746F 20746865 2064796E 616D6963 206D656D 6F726965 d to the dynamic memorie
73206F66 206D696C 6C696F6E 73206F66 20766972 75732077 s of millions of virus w
686F2061 7265206E 6F206C6F 6E676572 20776974 68207573 ho are no longer with us
20746F64 61792020 20546861 6E687320 474F4F44 4E455353 today - Thanks GOODNESS
21212020 20202020 20424557 41524520 4F462054 48452065 !! BEWARE OF THE e
722E2E56 49525553 20203A20 5C746869 73207072 6F677261 r..VIRUS : \this progra
60206973 20636174 6368696E 67202020 20202070 726F6772 n is catching progr
616D2066 6F6C6C6F 77732061 66746572 20746865 7365206D am follows after these n
65737365 6765732E 2E2E2E2E 20242340 25244021 21208C8C essegas..... $$$!$!! .H
```

(Note: some of the ASCII control characters on the right hand side of dump have been replaced by '.' to allow printing.)

The teachers and students at Bremer began a systematic check of their floppy library, and ended up having to reformat approximately 400 floppies. The data lost included an education program they had been building for two years. They are hoping they have cured the problem.

This virus is highly sophisticated but not particularly nasty because it showed itself fairly early. A far more dangerous virus would be one that replicates itself for, say, three months to allow reasonable spread, and then decides to become nasty by simply flipping a few bits at random in each .exe or .com. The programs would not necessarily crash, but they could become unreliable. Imagine an engineer's modeling program that used to multiply by a factor of six suddenly using a factor of sixteen. You mightn't find out until a bridge falls down.

Brain is a virus that enters a PC when the unsuspecting victim boots from an infected floppy. Once in the PC, it apparently replicates itself by copying itself onto a floppy each time a DIR is issued against a new floppy.

It appears to work this way: it grabs some sectors, marks them as 'bad', copies the original boot record into those sectors, and modifies the original boot record so that it loads at the same time as DOS. Once loaded, Version 9 allegedly bypasses the BIOS for its disk accessing, and instead addresses the disk controller directly. This would allow it to reside, unseen, in the machine at the same time as any protection scheme that relies on monitoring BIOS interrupts to detect viral activity.

Compress) cannot be run with boot protection installed, de- and re-installing is a built-in menu feature and only takes seconds. Another feature, Access Protection, can be used to control access to a partitions on the hard disk.

Virus protection is essential for anyone who ever puts a floppy with an unknown history into their system or who downloads files from a remote system. Protec's VDM (Virus Protection Module) comprises seven files: Syringe.exe which injects a 'symbiotic and protective virus' into .EXE files, Canary.exe for quarantining suspect floppies or downloaded files, and Infect.exe which verifies that Canary and Syringe are working properly.

Whereis.com is used to verify files be checking their creation date, size, attributes (it can also be used as a simple file finder), Chmod (Change mode) is used to check and change file attributes - it's basic intention is to change the Hidden attribute that is almost always associated with virus programs, Combine.com is used to create a batch file for mass vaccination of a hard disk (it can also be used for 'mass action' on any specified group of files), and Compare.com, a powerful file comparator that shows matches of files and directories by name, time, size and date.

Other features of Protec are discussed with the figure.

If you have any time or money invested in your computer system, if more than one user has access (even if that access is remote), if you use foreign discs or files, then your system needs a form of protection and Protec is certainly one of the easiest to use and powerful security systems available. And, it also includes a range of management features that can be used for a variety of applications other than security.

Protec is available for \$299 from Logo Distribution Services, 303 Henry Lawson Business Centre, Birkenhead Pt 2047 NSW.

disk, mindful that any further recovery or rebuilding of my now encrypted subdirectories would be impossible.

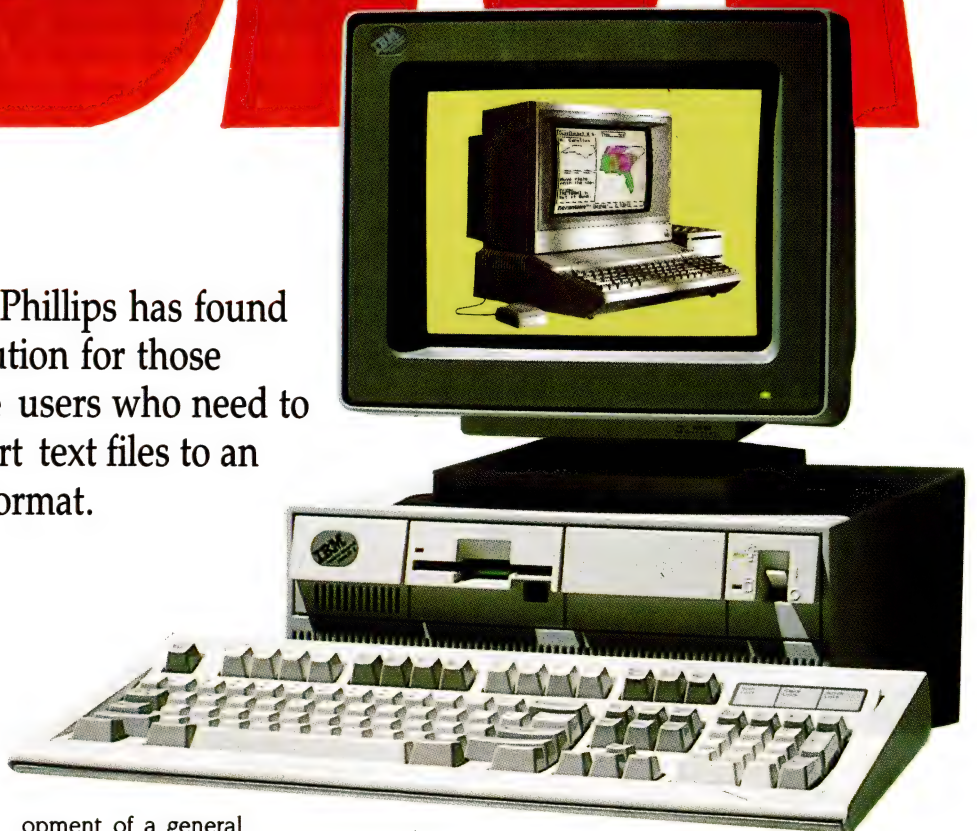
As the cylinders and heads whirled down my screen during formatting, I could visualise all those millions of treasured bytes vanishing into thin air; the lost hours of work that went into their making; and of my great adventure with SoftSafe - killing me softly. □

APPLE TO IBM

Peter Phillips has found a solution for those Apple users who need to convert text files to an IBM format.

ONCE UPON a time the Apple computer was king of the roost, and the IBM PC only a gleam in its developers eyes. These days, the IBM PC (and all its derivatives, clones and so on) is the standard, begging the question; what happened to all those Apples? My guess is that many IBM PC owners have an Apple lying fallow in the cupboard, along with lots of Apple software and data disks.

Being in this situation myself, I have often needed to take an Apple word processor data disk, and transfer the files to my IBM AT. I have even done this for others, including *Your Computer*, who often receive contributor's articles on Apple disks. This has required the devel-



opment of a general technique that will allow me take any Apple word processor file and send it to the IBM. And some of the early word processors for the Apple use some pretty weird formats. Because readers may be faced with this need, here is a description of how I transfer any type of Apple text file to WordStar 4 on the IBM.

The serial link

THE ESSENTIAL components for computer to computer interchange are a communications software package for both, with a suitable serial link-up between them – see Figure 1. The communications package for the Apple can be ei-

ther DOS 3.3 or ProDOS based, as it is easy to convert between these formats. If you have an Apple II plus, then ProDOS is not even an option. The IBM communications software can be any one of many, although I use Supercom as it has always worked well for me. The Apple program I use is the communications module of AppleWorks GS, as it supports the serial port of the IIGS. It also allows the serial port to be driven without presuming that a modem is connected. However, prior to getting this program, I used ASCII Express with a communications card. This set-up wouldn't work in my IIGS, so I had to resort to an Apple II plus, which handled the job admirably.

Test the link-up by setting both computers into Terminal mode, and observe that either computer can receive the other. Once the link-up is ready, it remains to figure out the disk format for the Apple disk.

Disk file formats

THERE ARE quite a few possibilities for Apple disk file storage formats. By this, I mean how the data is stored on the disk, not the actual sectoring and track layout. Even so, there are three possibilities for track/sector arrangements; DOS 13- or 16-sector, and ProDOS. I have never encountered 13-sector disks, and conversions between DOS 3.3 and ProDOS 8 are easy if you have the ProDOS utilities file called 'convert files'.

The real problem is how the files are stored on the disk. I don't know the arrangements used by all the word processors, but I do know that AppleWorks, Zardax (1 or 2) and Sandys data disks are no problem. All these programs either use ProDOS or DOS 3.3, and store the files according to the standard rules.

If you have a ProDOS comms package, then you need to convert the files from Sandys or Zardax 1 data disks to the ProDOS format. Alternatively, if the comms package is DOS 3.3 based, conversion to DOS from ProDOS is required if the files are from AppleWorks or Zardax 2. However, if the data disks have the files stored in a non-standard way, things are more difficult. For example, I recently transferred a file across to the IBM from an Apple disk without realising the Apple word processor used was actually the CP/M version of WordStar. This took a lot of doing, even though I had previously done the same thing with an Apple word processor file that used a storage pattern peculiar to itself. So how did I do it? With great difficulty and lots of patience.

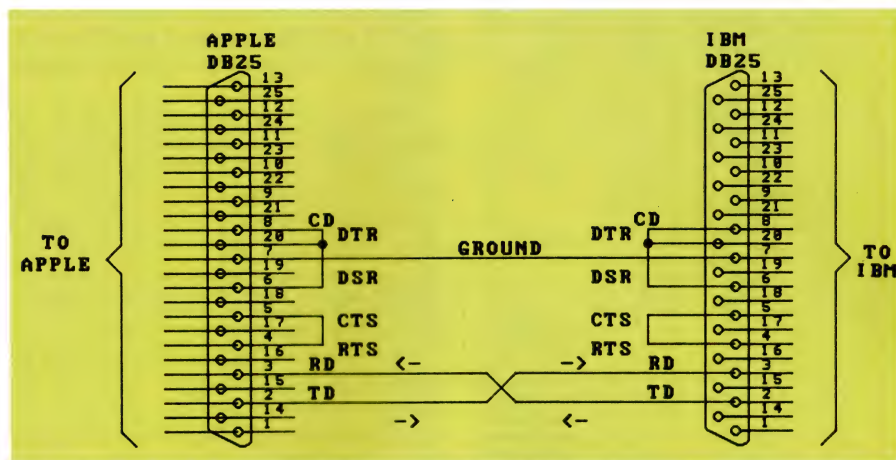


Figure 1. For transferring files to the IBM from the Apple, a suitable serial link-up is needed. Usually all that's needed is a three-wire null modem connection – connect the receive data and transmit data terminals of the IBM to the transmit data and receive data terminals respectively of the Apple, add an earth wire and away you go. The pin connections for a DB25 connector are: pin 2 for transmit data, and pin 3 for receive data; pin 7 is the signal ground.

Some comms packages like to see the CTS (pin 5) and RTS (pin 4) terminals joined, and also the DSR (pin 6), CD (pin 8) and DTR (pin 20) terminals joined. These connections are local to each connector, and not between each computer.

Make sure you don't delete the line feed characters during transfer, as this can make reformatting a tedious process.

You can soon find out if a disk is non-standard – simply boot either DOS or ProDOS and catalog the disk. If it can't be read by either, it's non-standard. If this is the case, you will then need to get technical. The required items now are a sector editor and a copy of *Beneath Apple DOS* by Worth and Lechner. The easiest sector editor is that contained with most versions of Copy II plus. There are other similar programs, usually found in copy programs. So, now it's time to boot-up the sector editor and go looking.

A standard DOS 3.3 disk uses track 17 (11 in hex) as its reference track, and stores the VTOC (volume table of contents) in sector 0 of this track. Usually, the VTOC will direct DOS to sector F of this track, where the first seven filenames will be stored. This is not essential, as the VTOC can direct DOS to anywhere on the

disk, but it is standard practice. However, a non-standard disk will have its own rules, so your main interest is to first find the files you want to transfer.

Start by making a copy of the disk you need to work with, and put the original out of harm's way. Don't touch it again, except to make further copies. Then proceed to examine the copy. I usually start at track 0, and work through each sector until I find data. If the file is a text file, the sector editor will show text, assuming 8-bit ASCII is used. Unfortunately, this is not always the case, and 7-bit ASCII will give hieroglyphics that can make decoding what you are looking at very difficult. WordStar sets the last character of each word to 8-bit ASCII, giving some clues.

If you use the sector editor from Copy II plus, the screen will show hex values for each data byte, and, on the right, display the ASCII equivalent of each data byte. To convert a 7-bit hex value to 8-bit, you need to add \$80 (\$ means hex) to the current value. For example, if the hex character is \$41 (standard ASCII code for A), the Apple screen will give a flashing A. To convert this code, add \$80 to \$41 giving \$C1. However, don't despair, it is not necessary to do this for each character, only enough so you can determine what the file contains.

Work through the disk, reading each sector in turn to get an idea of what is

```

SECTOR EDITOR                                DISK A
00- 00 11 0E 00 00 00 00 00  @QN*****
08- 00 00 00 12 0F 02 C8 C5  @ROBHHE
10-  CC CC CF A0 A0 A0 A0 A0  LLO
18- A0 A0 A0 A0 A0 A0 A0 A0
20- A0 A0 A0 A0 A0 A0 A0 A0
28- A0 A0 A0 A0 02 00 03 0F  B@CO
30- 00 D2 C1 CE C4 CF CD AE  @RANDOM.
38- CE A0 C2 C5 D2 D3 D9 C3  N BERSYC
40- A0 A0 A0 A0 A0 A0 A0 A0
48- A0 A0 A0 A0 A0 A0 A0 A0  @
50- 00 07 0F 00 C1 D0 D0 C2  @GO@APPL
58- C9 C2 CD A0 A0 A0 A0 A0  IBM
60- A0 A0 A0 A0 A0 A0 A0 A0
68- A0 A0 A0 A0 A0 A0 A0 A0
70- A0 A0 36 00 00 00 00 00  6*****
78- 00 00 00 00 00 00 00 00  @*****
80- 00 00 00 00 00 00 00 00  @*****
88- 00 00 00 00 00 00 00 00  @*****
90- 00 00 00 00 00 00 00 00  @*****
98- 00 00 00 00 00 00 00 00  @*****
A0- 00 00 00 00 00 00 00 00  @*****
A8- 00 00 00 00 00 00 00 00  @*****
B0- 00 00 00 00 00 00 00 00  @*****
B8- 00 00 00 00 00 00 00 00  @*****
C0- 00 00 00 00 00 00 00 00  @*****
C8- 00 00 00 00 00 00 00 00  @*****
D0- 00 00 00 00 00 00 00 00  @*****
D8- 00 00 00 00 00 00 00 00  @*****
E0- 00 00 00 00 00 00 00 00  @*****
E8- 00 00 00 00 00 00 00 00  @*****
F0- 00 00 00 00 00 00 00 00  @*****
F8- 00 00 00 00 00 00 00 00  @*****

TRACK $11, SECTOR $F  DOS 3.3
    
```

Figure 2. An example of the first catalog sector, track \$11, sector \$0F, as it appears with Carbon Copy II's sector editor. The three files on the disk, ROBHELLO, RANDOM.N BERSYC and APPLIBM, have their track/sector lists respectively at 12 0F, 03 0F and 07 0F (marked with a rectangle on the diagram). The file lengths are, respectively, 2 sectors, \$40 sectors (equals 4 tracks) and \$36 sectors (3 tracks, 6 sectors); these are marked with a parallelogram.

there. Hopefully, there will only be one item, as two or more files will make things much more difficult – perhaps even impossible. Once you have an idea of the content, document the used track/sectors on a sheet of paper. Be very careful doing this, to ensure all sectors that contain data are accounted for.

Disk reconstruction

NOW THE TASK is to reconstruct the disk to make it compatible with a DOS 3.3 word processor. This is where you really need *Beneath Apple DOS*, as there are quite a few rules to follow. First of all, read track \$11, sector 0 of a standard word processor data disk, using the sector editor. Then copy this sector to the same track/sector of the disk being examined. This establishes the VTOC sector (Volume Table of Contents), and usually doesn't

need further alterations. Just check that it has \$11 and \$0F in bytes 01 and 02 respectively, as the pointer to the first catalog sector.

Now copy track \$11, sector \$0F of the known data disk to the disk under scrutiny to establish the first catalog sector for DOS. If you now tried to catalog this disk, it would show the first seven files as being those from your known disk. Using the sector editor (for Copy II, press ? for help), change the first title to a name that identifies the file you are trying to find.

The important information that must be present in the catalog sector is the file length (relative bytes \$21 and \$22 – in lo/hi format) and the address of the track/sector list (relative bytes \$00 and \$01, hi/lo format). By relative byte, I am referring to the bytes relative to the start of the file description. File 1 starts at byte \$0B and ends at byte \$2D, file 2 occupies \$2E to \$50, file 3 occupies \$51 to \$73 and so on. Each file is therefore \$22 bytes long, (equals 34 bytes in decimal). Thus, for the 1st file, a track/sector list present at track \$12 sector \$0F would require 12 in byte \$0B, and 0F in byte \$0C of the catalog sector.

The length of a file is identified by the number of sectors it uses, including the track/sector list for that file. This value is in hex (as usual), and is calculated by adding up the total sectors and converting this to hex. This can be done fairly easily, as the MSD (most significant digit) of the byte is the number of tracks, and the least significant digit (LSD) is the number of sectors. Thus, if the first file is 4 tracks and \$0C (12) sectors long, the value 4C must be entered in byte \$2C, and 00 in byte \$2D. Alright, that's set-up the catalog sector and it now remains to write the track/sector list.

The track/sector (T/S) list tells DOS where to find each sector for that file. The order of the list determines the order the sectors are read, and different programs often use their own order. The easiest way is to simply enter the track/sector information in numerical order, then re-arrange the list once you have seen the file in your word processor.

Pick a sector that is not being used, preferably on a track that is not being used either, in case you need more than one T/S list. Make sure the selected location of the T/S list is recorded in the catalog sector. Then, using the sector editor, write 00 into all bytes from 00 to \$0B, then, from byte \$0C, enter the location of each track sector containing data. The information is in hi/lo format, that is track/

```

SECTOR EDITOR                                DISK A
00- 00 00 00 00 00 00 00 00  @*****
08- 00 00 00 00 03 0E 03 0D  @CNCNCM
10- 03 0C 03 0B 03 0A 03 09  CLCKCJCI
18- 03 08 03 07 03 06 03 05  CHGCFCE
20- 03 04 03 03 03 02 03 01  CDCCBCBA
28- 03 00 04 0F 04 0E 04 0D  C@DODNDM
30- 04 0C 04 0B 04 0A 04 09  DLDKDJDI
38- 04 08 04 07 04 06 04 05  DHGDFDE
40- 04 04 04 03 04 02 04 01  DDCCDBDA
48- 04 00 05 0F 05 0E 05 0D  D@EOENEM
50- 05 0C 05 0B 05 0A 05 09  ELEKEJEI
58- 05 08 05 07 05 06 05 05  EHGFEFEE
60- 05 04 05 03 05 02 05 01  EDECEBEA
68- 05 00 06 0F 06 0E 06 0D  B@FOFNFM
70- 06 0C 06 0B 06 0A 06 09  FLFKFJFI
78- 06 08 06 07 06 06 06 05  FHGFFFE
80- 06 04 06 03 06 02 06 01  FDFCFBFA
88- 06 00 00 00 00 00 00 00  F@*****
90- 00 00 00 00 00 00 00 00  @*****
98- 00 00 00 00 00 00 00 00  @*****
A0- 00 00 00 00 00 00 00 00  @*****
A8- 00 00 00 00 00 00 00 00  @*****
B0- 00 00 00 00 00 00 00 00  @*****
B8- 00 00 00 00 00 00 00 00  @*****
C0- 00 00 00 00 00 00 00 00  @*****
C8- 00 00 00 00 00 00 00 00  @*****
D0- 00 00 00 00 00 00 00 00  @*****
D8- 00 00 00 00 00 00 00 00  @*****
E0- 00 00 00 00 00 00 00 00  @*****
E8- 00 00 00 00 00 00 00 00  @*****
F0- 00 00 00 00 00 00 00 00  @*****
F8- 00 00 00 00 00 00 00 00  @*****

TRACK $03, SECTOR $F  DOS 3.3
    
```

Figure 3. The track/sector list of the file RANDOM.N BERSYC (see Figure 2). The file runs from track 3, sector E, to track 6, sector 0, giving a length of \$3F. When the list is included, the total file length is \$40 sectors.

sector, so each sector requires two data bytes to identify its location. You will have already recorded all sectors containing information on a sheet of paper, but be very careful not to miss one as you copy them into the T/S list. Once this information has been entered, count up the number of tracks/sectors comprising the file and enter this information in the catalog sector in bytes \$2C and \$2D as already described.

Reading the file

NOW YOU SHOULD be able to load the file into a word processor. Boot-up a DOS based word processor capable of reading standard DOS 3.3 disks (of course), and see how you go. If there are problems, look for sectors that contain bytes of 00, and change them to either 80 or A0 (space). Also, recheck your T/S list for reversed entry, missing information and so on. It may take one or two goes before you can load the file, but eventually it will appear.

The word processor I use for this process is Zardax I, as it has the ability to get

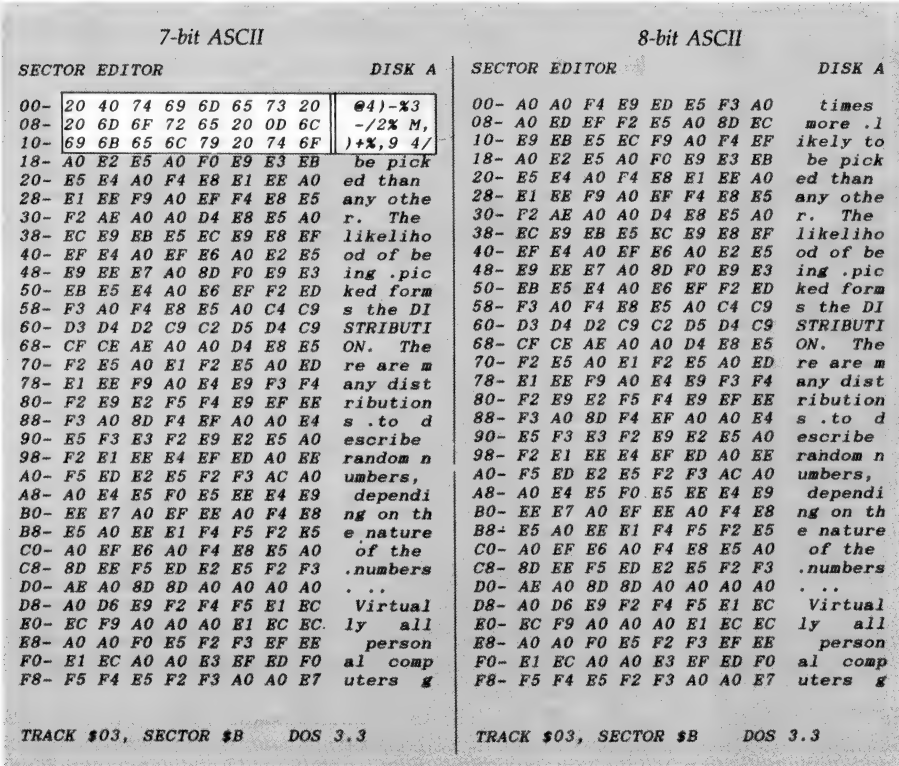


Figure 4. As can be seen here, 7-bit ASCII looks strange to the Apple - it's converted to 8-bit by adding \$80 to each byte so that 6x becomes Ex and 7x becomes Fx. It's only necessary to convert enough of the text to identify a few words at the beginning and end of each sector.

the text into 8-bit ASCII form. Once the file has been loaded, 7-bit ASCII will be in inverse, and using Open Apple-Y (for Zardax 1) it will remove the underline it thinks is intended. If the file is a long one, place a weight on the required keys and sit back and watch. By this time, you will note that the text is not sequential, and it now remains to rearrange the T/S list on the disk to get the file in order. This can take some doing, and requires detective work of the best kind.

I identify the text from each sector by looking for words that are incomplete, or by referring back to the sector editor. Once you have each block of text separated, write track/sector it occupies next to it. Then, print it out and try and find the algorithm that fits. For example, the order of how each sector within a track is used by CP/M WordStar is: Start at 0, thence 6,C,3,9,F,E,5,B,2,8,7,D,4,A,1, to 0 of the next track.

Finally, re-arrange the T/S to the correct order, then get the file into the word processor, this time in the correct sequence.

Save it to a new disk, ready for transfer to the IBM. If your communications program uses ProDOS, run the convert program from the ProDOS utilities disk.

Performing the actual transfer is usually the easiest bit. Set both computers to the same baud, data bit and stop bit values, with no parity. I use 1200 baud to speed things up, but 300 is fine - it just takes a lot longer. Make sure you don't delete the line feed characters during transfer, as this can make reformatting a tedious process.

Once you have the file in the IBM in ASCII format, read it into your IBM word processor and revel in your cleverness. You may need to reformat the layout, but generally things go smoothly. I use WordStar 4, in either document or non-document mode, although other programs should be much the same. When you have a routine established, the next time won't be as tedious. By the way, it helps to have three computers, one for the sector editor, one for the Apple word processor and, naturally, the cause of all this trouble, an IBM. □

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MS

For more information about multiple sclerosis contact the MS Society.

CALSTAT

- a study in conversion

Mike Allison found converting an Apple II teaching program to run on an IBM was a study in human behavior as well as programming techniques.

WE ALL KNOW the bad news about Australia's competitive position in the world economy. But, not all is bleak – in common with many countries reeling under the Japanese onslaught, Australia is embracing the philosophies and techniques of Total Quality Management (TQM), to reduce costs, increase market share and improve productivity.

A major difficulty organisations have with TQM, is training people in statistical quality control. In teaching statistics, students often do not grasp a concept and are afraid to ask in a group situation. There is the old fear of appearing foolish. Yet, if the best among us were to confess, hardly anybody found learning statistics easy.

There exists a method for learning statistics which overcomes most of the difficulties students experience. It does not substitute for diligent application, but it does address the vital considerations of the differences in individual student's learning pace; the need for immediate feedback when a concept is not understood; and a one-to-one learning situation, with graduated and varied practice examples.

The method is Computer Assisted Learning (CAL). The concept is that the services of a human lecturer are indispensable, but reinforcement and practice is enhanced by using the computer, with its endless patience and 24-hour availability, to take over the repetitive tasks. This makes good sense.

Computer assisted learning for statistics

A COMPUTER assisted learning package for statistics, Calstat, has been developed by Graham Hopper, a lecturer in statistics at Curtin University. After teaching statistics for more than twenty years, he developed a suite of eight programs to assist students in learning the basics of statistics, such as the concept of probability and distributions, through to more advanced techniques, including hypothesis testing, determination of confidence intervals for estimation, and sampling simulation.

The suite was originally developed for use on the Apple II microcomputer using ProDOS 3.3 and required up to 48K of RAM (it's still available in that form). The suite first became known to the quality profession, through the Australian Organisation for Quality (AOQ), a national, voluntary organisation dedicated to teaching quality techniques throughout Australian manufacturing and service industries.

The computer committee of AOQ was impressed by the Calstat suite. The programs are easy to use; exercises and illustrative examples are generated randomly by putting a vast variety of 'flesh' on a number of stored 'skeletons', to ensure the user's interest is maintained; error traps prevent the user from inadvertently crashing the programs; and, through the use of graphics, concepts are clearly shown.

Where the student is required to input a response, the program checks for validity. In the event of an incorrect answer, the student is given a gentle hint and invited to try again. If the answer is still wrong, the correct answer is provided, together with a further explanation.

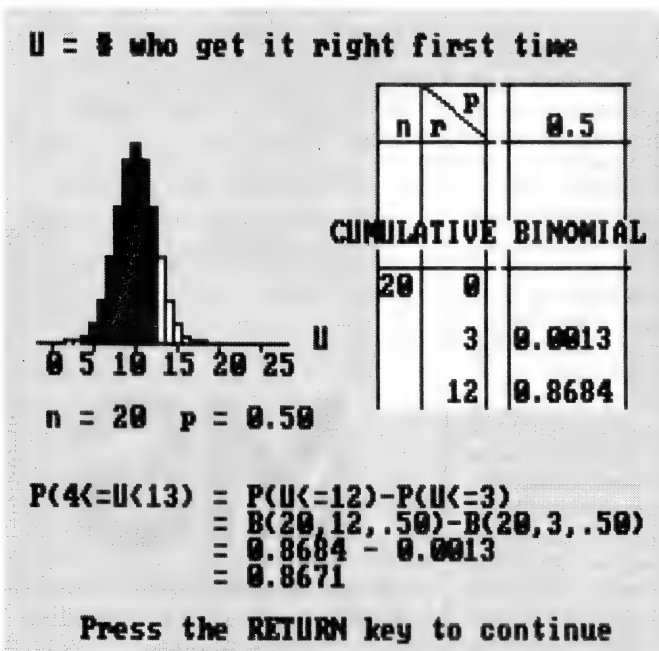


Figure 1. After Calstat, a computer assisted learning package for statistics, was developed under ProDOS 3.3, it became apparent it would have to be converted to run on IBM machines to be widely used. But the experts said it couldn't be done!

Converting from Apple to IBM

WITH THE IBM PC now the de facto industry standard, the demand for this material was in the IBM format, so AOO's Victoria Division undertook to convert the package. The Victorian State Government, through the agency of DITR, provided funds to support this considerable undertaking. The first thing to be discovered was the dearth of expertise. There were experts in the Apple II, experts in the IBM, but hardly any to be found with expertise in *both*.

This experience showed us an interesting comparison between the values of enthusiasm and integrity on the one hand, and the commercial profit motive, on the other.

However, the conversion is now complete. The story of how that conversion took place is an interesting study in human behaviour, as well as programming techniques.

The first step in the long journey to completion, was to find a vendor to do the conversion. This experience showed us an interesting comparison between the values of enthusiasm and integrity on the one hand, and the commercial profit motive, on the other. A quotation was obtained from a major software company, which met the price and delivery requirements. The company claimed to have expertise in both Apple and IBM – this was the first bitter lesson from the project. After an initial good start, work began to slow down. Excuses were offered and the telephone ran hot with constant chasing.

The project manager for AOO (the author), was not familiar with the IBM at the time and naively accepted the vendor's claim that a major stumbling block was the inability of the IBM to reproduce the mathematical symbols used on the Apple, via shape tables. Then, when the vendor claimed that the speed function of the Apple could not be copied, suspicions set in. Graham Hopper had used the speed function to slow down presentation of text at key points. The Apple can be made to present text to the screen at varying speeds by setting SPEED=NN, where NN is an integer between 1 and 255; the default speed is 255 (maximum). Since there was no equivalent function on the IBM, a simple timing loop could be used to slow down text presentation and achieve the same effect as on the Apple –

```
600 A$="THE TAIL AREA IS: "
610 FOR I=1 TO LEN(A$):PRINT MID$(A$,I,1);
620 FOR J=1 TO 500:NEXT:NEXT
```

If a self-taught programmer could figure out the solution to what was, after all, a relatively simple problem, perhaps these 'experts' were not what they claimed to be? The literature was consulted in an attempt to find the answer to the problem of mathematical symbols. There was in fact a similar facility to the Apple

Here's how to write Math Symbols:

Sigma - Σ
 Nu - ν
 Xbar - \bar{x}
 Chi-Square - χ^2
 p-hat - \hat{p}
 Rho - ρ
 etc. - \sum_1^2 H_1 $\sqrt{\frac{\sum(x-\bar{x})^2}{\nu}}$

Figure 2. All one needs to know to draw mathematical symbols is found in the Basic manual – contrary to a 'major software house's' advice that an IBM was unable to reproduce the mathematical symbols used on the Apple. This figure (and Listing 1) were produced in an attempt to shame the vendor into doing the job right (these are for demonstration only and should not be taken as meaningful in a mathematical sense).

shape tables, by means of which special characters could be created in binary form. This was ultimately the method used in the conversion. However, for a novice, there is an even simpler method given in the Basic manual – see Figure 2.

All one has to do is to make the desired symbol as a series of squares, representing pixels, on a sheet of squared paper. Then, from an arbitrary starting point, count the number of pixels in the appropriate direction. Make these counts into a string, using the IBM convention –

```
Un move up n pixels
Dn move down n pixels
Ln move left n pixels
Rn move right n pixels
En move diagonally
    up and right n pixels
Fn move diagonally
    down and right n pixels
Gn move diagonally
    down and left n pixels
Hn move diagonally
    up and left n pixels
```

So, the following will produce the Greek letter MU (lower case), which looks like a 'u' with a long tail:

```
700 U$="D6R5U6D14":DRAW U$
```

```

100 SCREEN 1
110 CLS
120 PRINT "Here's how to write Math Symbols:"
130 N$="f2d2g1br1e3u2h2"
140 C$="r2f6r1bu6b12g6bu12br8"
150 T$="r2d2g2d1r2"
160 P$="h2g2bd5r4u314d7"
170 R$="e7r2f2d2g212h2u2"
180 X$="r5bd2g5br5h5"
190 PRINT:PRINT
200 A$="U1L5D1F3G3D1R5U1"
210 PRINT "Sigma - "
220 PSET (70,24)
230 DRAW A$
240 B$="r2d1g2r2bg3bg1h113d1f4d114h1bd1br2d3"
250 PSET (50,40)
260 PRINT:PRINT "Nu - ":DRAW N$
270 D$="d4l4u4d8br5ou1d4"
280 PRINT:PRINT "xbar - ":PSET(55,56):DRAW X$
290 PRINT:PRINT "Chi-Square - ":PSET(105,72):DRAW C$:DRAW T$
300 PRINT:PRINT "p-hat - ":PSET(70,38):DRAW P$
310 PRINT:PRINT "Rho - ":PSET (60,110):DRAW R$
320 PRINT:PRINT "etc. - ":PSET (65,115):DRAW B$:PSET (114,121):DRAW D$
330 PSET(180,106):DRAW "14d24r4":PSET(188,111):DRAW A$
340 BL$="g3d3f3":PSET(195,110):DRAW BL$:EX$="g5br5h5":PSET(204,112)
:DRAW EX$:PSET(210,113):DRAW "r4"
350 PSET(220,110):DRAW X$:RB$="f3d3g3":PSET(230,110):DRAW RB$:S$="
:r2d2g2d1r2":PSET(236,106):DRAW S$
360 PSET(242,106):DRAW "r4d2414":PSET(183,120):DRAW "r48":PSET(208,
125):DRAW N$
370 PSET(155,130):DRAW "e2f4":FOR I=1 TO 10:DRAW "e1u2":NEXT:
DRAW "r80"
380 V$=INKEY$:IF V$="" THEN 380
390 LOCATE 23,1
400 END

```

Listing 1. A simple Basic program used to produce the symbols in Figure 2.

There are other commands associated with the draw function, but you can see how easy it is to use with just the directional commands.

At this stage, the contractor threw in the towel. A meeting was held to resolve how the project could be salvaged and as a result, the work done to date was offered at no charge. The contractor claimed to have grossly underestimated the cost of the job.

After much searching, we located a programmer known to be skilled in both the Apple and IBM and asked him to quote for the conversion. The quotation was about double our budget and the project appeared doomed. Then Juergen Ude, a member of the computer committee and an extraordinarily hard worker, offered to take on the job at a fee within the budget.

As Ude examined the work done, it became apparent that the contractor had made some really crazy assumptions, resulting in

work that would have to be undone. The worst example was the use of PEEKs and POKEs. Because the Apple programs made heavy use of calls to the monitor, PEEKs and POKEs were to be found in just about every module. In the hands of a competent programmer, these can improve the speed and efficiency of a program greatly.

The contractor had seen some of these PEEKs and POKEs and, not knowing what they did on the Apple, simply ignored them! Worse, because they require knowledge of the memory map, using them at all on the IBM would require translation of the function and the location. With great perseverance and guided by the freely available tables of Apple PEEKs and POKEs, Ude was able to bring this situation under control.

The next obstacle was the difference in the number of pixels in the Apple and IBM screens. The Apple's high-resolution screens consist of either 280 pixels width by 160 pixels high or 280 pixels wide by 192 pixels high. The IBM's medium-resolution graphics screen is 320 pixels wide by 200 pixels high. To get text and graphics to line up properly, every screen had to be checked and if necessary, changed.

It worked!

As each disk was completed, the IBM version had to be checked against the original Apple version so two computers were set-up, side-by-side. Each frame had to be checked for equivalence and all calculations had to be checked. This was tedious, but helped to resolve differences due to the respective screen pixel layouts.

The test work allowed some interesting observations to be made about the two machines. The Apple, despite its smaller processor and lower clock speed, was much faster than the IBM in presenting text to the screen. The IBM, on the other hand, was faster at disk access and more complex calculations.

The hardest thing to overcome in testing, was making sure that all the possible paths through the program had been tested. There were so many different ways to set-up the learning process, that it was simply not possible. Instead, all the modules were invoked through using at least one combination of lessons that would require the modules to do something. Additionally, all the lesson combinations were tested, but not all the randomly selected examples.

Finally, after about two years of effort, the disks have been fully converted and we now have a valuable resource for helping industry on its road to recovery.

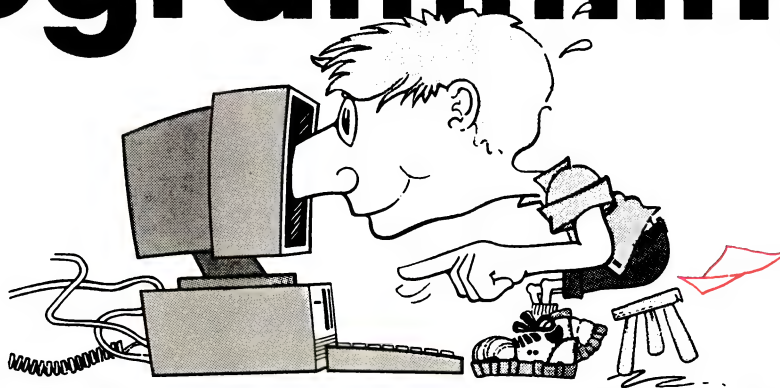
If a project such as this should come our way again, we would see the selection of a contractor of high personal integrity as being the first requirement. Integrity and skill are hard to find – personal contact is the best way to locate the necessary resource.

Be prepared for a long task. Any software of moderate complexity has the potential to bog developers down in layer after layer of detail. Conversion may have been a frustrating task, but starting from scratch would have involved even more complexity, due to the interaction with mathematical, as well as programming, skills. Fortunately for us, our developer had good measure of both.

Finally, the exercise showed how the personal computer has potential to be involved in a huge range of applications. Hopefully, this application will benefit individuals as well as the community.

The Apple version of Calstat is available from OMDS, 10 Bundarra Ct, Vermont South, Vic 3133. Phone (03) 801 4259. The eight modules can be bought separately (\$100 each) or as a suite (\$690). The IBM version is to be released shortly. □

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ADA MAKES A MARK!

Ada is a powerful third generation language written to overcome the limitations of earlier 3GLs – in fact, it was probably the world's first 'designer' language. Katherine Harrington reports. . .

EVER SINCE THE invention of electronic computing in the 1940s, the size and importance of computer application programs has been growing. By the early 1960s the problem of developing and maintaining computer software had become so acute that it led to the development of such third generation programming languages (3GLs) as COBOL and FORTRAN. These languages offered several important advantages over first and second generation languages (machine code and assembler). The two most important were that the source code of a program written in a 3GL was more readily readable by a programmer than that of a 1GL or 2GL, and that programs written in 3GL offer some degree of machine independence.

These early 3GLs had, as you would expect, many shortcomings, being first attempts at solving a problem that had not been fully defined. Other problems became evident in the early '70s as the size of software systems grew still further. One of the main ones being that the programs of the day were written in an unstructured way, making it difficult to read and maintain large blocks of source code. This was seen as a problem with both the programming languages and the programmers of the day.

In 1971, Professor Niklaus Wirth published his definition of the Pascal language, so named in honour of Blaise Pascal the famous 17th century philosopher and mathematician. Pascal, the language, was defined as a teaching tool to train programmers to write structured programs. Initially there were no Pascal compilers, only the language definition existed. Compilers soon followed, and so successful was Wirth's teaching tool that before long Pascal was in use in practically every area of software development. But Pascal itself has shortcomings, as it was not intended to be a complete language for commercial use. Thus many variations of the language were developed such as Euclid, Lis, Mesa, Modula and Sue. And so the population of 3GLs grew, but the older 3GLs didn't die out just because new ones were developed. Indeed, even the earliest 3GLs, such as COBOL and FORTRAN still refuse to go away.

Thus the very evolution of programming languages itself introduces a problem. This becomes most evident in the construction of big software systems where large proportions of the systems are normally taken directly from old systems and reused. The development of these old systems was generally not done in a coordinated manner. The choices for the programming language and development environment were usually made independently for each project, resulting in modules written in a variety of programming languages. This introduces maintenance problems of its own.

A standard language

THE PROBLEMS of large software systems are felt no more acutely than by the user of the largest software systems of all, namely the US Department of Defence (DoD). In 1974 the DoD initiated a project to attempt to standardise their approach to software development – the major step they took was the decision to select a single preferred 3GL for all new software development. In 1975 they released specifications of features required in a preferred 3GL in a set of documents called Strawman, followed by Woodman and, in 1976, Tinman. This last document was a review of the existing 3GLs and it concluded that none satisfactorily met the DoD requirements.

In 1977 the DoD took the major step of releasing contracts for the development of a new programming language. The language specification, codenamed Ironman, was given to four independent software houses. The four contracts were colour-coded: Red, Yellow, Green and Blue. The Steelman group selected the Red and Green software houses for further refinement in 1978, and in 1979 the Green contract was selected and renamed Ada. The name Ada was selected in honour of Augusta Ada, Countess of Lovelace who collaborated with Charles Babbage on his Analytical Engine and is credited with inventing computer programming.

So what is Ada like and why was it necessary for the DoD to develop a new language? To the casual observer Ada source code is almost identical to that of Pascal. In fact all four of the original contractors working on the Ironman specification started with Pascal as their point of departure. Ada is, however, significantly different to Pascal. It retains the structured programming feature of Pascal and adds several important ones: the separation of program block specification from its implementation; the implementation of program packages, which clearly define a program module boundaries; generics, the ability to write a program segment without defining the type of variable to be manipulated; and tasks, the ability to define the asynchronous running of program modules. This is useful for writing real-time programs.

Let's look at a few Ada programs to explain these features. The specification is the part of a program module which is visible to the outside world, in other words, other modules and users. The specification defines what will happen in a program and what variables will be involved without necessarily showing the mechanics (algorithm). As shown in this example, called 'transpose', a program may consist of a specification and no body –

```
with swap;  
with text_io; use text_io;
```

Mini-Ada

AS MENTIONED in the main story, the name Ada is owned by the US Department of Defence so no sub-set of the language can carry that name. For that reason, when Edward Mitchell devised a public domain subset of the language to run on PCs, he named it Augusta (the Countess Lovelace's first name). As originally published in *Dr Dobb's Journal*, it consisted of four files: AUGUSTA.BAS is the compiler, written in generic Microsoft Basic which reads in keywords and predefined constants from the file KEYWORDS.TXT when it is run; the remaining two files are demonstration programs published with the compiler – SIEVE.AUG is the popular Eratosthenes Sieve benchmark, while DEMO.AUG is a simple number guessing game.

Jim Castleberry translated AUGUSTA.BAS into Turbo Pascal as AUGUSTA.PAS. He also wrote ADIS.PAS, a disassembler for compiled Augusta programs and ATERP.PAS, an interpreter for compiled programs.

Augusta is based on an interpreter which implements a stack-orientated virtual machine that executes special pseudo-code, in which each byte represents a simple operation, say 'Add 2 Integers', or 'Print A String'. The interpreter goes through the compiled p-code, decoding the bytes and carrying out the appropriate operation. This system has advantages and disadvantages. On the good side, the compiled programs can be moved to another computer without any changes, and will run just the same.

The same could be said of the original source program, but p-code can be interpreted much faster than the source could be. On the bad side, p-code interpretation is much slower than a normal program – the extra layer of software between the program and the microprocessor has a high cost in speed. Furthermore, even though the compiled program can be moved unmodified, the interpreter can not. Each computer has to have its own interpreter. Fortunately, the interpreter can be written in a high-level language and moved over with little trouble.

Augusta was introduced in a series of articles in *Dr Dobb's* that ran from January to July, 1983 – they explain the operation of the compiler, the language syntax, and the details of the p-code system. For more detailed information, there is a 160-page book about Augusta mentioned in the article – it's available from Laboratory Microsystems, 4147 Beethoven Street, Los Angeles, CA, 90066 (they also offer a complete Z80 CP/M interpreter written in assembly language).

To give a feel for implementation, this is Mitchell's SIEVE.AUG –

```
-- Eratosthenes Sieve Prime Number Program
-- in Augusta

Procedure Prime is
  prime,K,count : integer;
  flags : array(8190) of boolean;
Begin
  putline("10 iterations");
  for iter in 1..10
  loop
    count := 0;
    flags(0) := true; -- initialize the array
    moveleft ( @flags(0), @flags(1), 16378);
    for I in 0..8190
    loop
      if flags(I) then
        prime := I + I + 3;
        K := I + prime;
        while K (<= 8190)
        loop
          flags(K) := false;
          K := K + prime;
        end loop;
        count := count + 1;
        -- putstr("Prime #=");
        -- putint(prime);
        -- newline;
      end if;
    end loop;
  end loop;
  putint(count); putline(" primes");
End;
```

Note that you will need Borland's Turbo Pascal if you want to take full advantage of Augusta. Our copy of Augusta was supplied by Select Software (their disk M5034), PO Box C343, Clarence St PO, Sydney 2000 NSW; (02) 29 2866.

```
procedure transpose is      -- Specification

package int_swap is new swap (integer);
use int_swap;

package int_io is new integer_io (integer);
use int_io;

  x, y : integer;

begin
  put ('Enter x and y :');
  get (x);
  get (y);
```

```
new_line (1);
rev (x,y);
put (x);
put (y);
end transpose;
```

The following shows a program/package, called 'swap' with a separate body and specification –

```
generic

type component is private;
```

```

package swap is          -- start specification

  procedure rev (x,y) : in out component);

end swap;                -- end specification
package body swap is    -- start body

  intermediate : component;

  procedure rev (x,y : in out component) is
  begin
    intermediate := x;
    x := y;
    y := intermediate
  end rev;

begin                    -- initialisation (if any)
  null;
end swap;                -- end body

```

In this example swap is called by the first program. Transpose is a simple procedure which accepts two variables x and y, and uses a procedure called 'rev' from the swap package to exchange the values x and y with each other. All that transpose needs to know about swap is contained in the swap specification. The body of swap can be altered and recompiled, or may even not exist, with no need for any change in transpose.

The 'package' is a program module containing one or more procedures. A package is, as its name implies, like a wrapper, a convenient way of treating a program module. Packages are treated in the same way as data objects in programs that make use of them. Swap is an example of a package containing a procedure called rev. Once the package has been nominated in the declarative part of the procedure transpose, then the procedure(s) defined in swap are available to transpose. Thus the transpose procedure is able to use the procedure rev as if it were an intrinsic function of Ada. In fact, this is how many features which are normally regarded as an intrinsic part of other programming languages are implemented in Ada. Transpose shows the use of 'get' and 'put' which are used to read the input stream from a terminal and send data to the output stream (the terminal screen). 'Get' and 'put' are actually part of a package called 'integer-io'. Similar features in other 3GLs are normally implemented as part of the language.

The package 'swap' is a special type known as a 'generic'. This is one in which the data types for the data to be manipulated by the package are not defined within the package. The swap package defines a data type, called 'component' which is defined within the package as 'private' which means the data type will be defined later. The procedure within swap, called rev takes two components, x and y, and transposes their contents; x and y can later be defined to be any data type such as integer, real, character, and so on. When the package swap is declared in transpose, in the command line commencing with the word 'package', the data type for component is declared to be 'integer' – thus transpose uses rev to transpose the values of two integers, x and y.

This is a very powerful feature in that it allows programmers to write packages with a much more general application than previously allowed in most other languages. Thus program reusability

is enhanced. The following shows a simple example of a program which makes use of 'tasks' –

```

with text_io use text_io;

procedure cnt is

  task count_task is
  entry count (start : integer; stp : integer);
  end count_task;

  task body count_task is
  local_start : integer;
  local_stp : integer;
  package int_io is new integer_io (integer); use int_io;
  begin
    loop
    accept count (start : integer; stp : integer) do
      local_start := start;
      local_stp := stp;
    end count;
    for i in local_start .. local_stp loop
      put (i);
    end loop;
    new_line;
  end loop;
  end count_task;

begin -- main program
  count_task.count (21, 30);
  count_task.count (1, 10);
end cnt;

```

With the concept of tasks, Ada allows the programmer to break with the traditional sequential operation of a program. Tasks define program segments which can be executed asynchronously. The task facility is aimed at real-time computing. Tasks can be prioritised and made to run in a time deterministic manner. The task feature of Ada was conceived for use on single processor computers, however, its application to multi-processor machines should be most interesting.

The simple program example above shows a task called 'count-task' which accepts two integers and then counts from one to the other. The main program calls the task twice, once to count from 21 to 30 and once to count from 1 to 10. The MIL-STD specification for Ada does not define how tasks are to be implemented. A compiler could implement tasks using a time-sharing approach, or it might execute a task to completion once it has commenced, so long as it is not interrupted by a higher priority task. The example shown does not assign any priorities for the execution of the tasks, so the output of the program will be dependent on the compiler used. The result could be:

```
21 22 23 24 25 26 27 28 29 30 1 2 3 4 5 6 7 8 9 10
```

or

```
21 1 22 2 23 3 24 4 25 5 26 6 27 7 28 8 29 9 30 10
```

or

21 22 23 1 2 3 24 25 26 4 5 6 27 28 29 7 8 9 30 10

and there are many other possibilities.

Acceptance

ADA, AS A programming language, has gained considerable acceptance, not only because it is required for most US DoD projects, but because it is a surprisingly good language – 'surprisingly' because, unlike almost all other successful programming languages, it was defined by a committee. Apart from the combining of many useful features in the one language, Ada offers a strict adherence to the MIL standard. The name Ada is owned by the DoD and it can only be used by products that exactly meet the ANSI/MIL-STD-1815A. No super-sets or sub-sets may bear the that name. Ada is available for a broad range of computers from PCs to mainframes.

The Australian Defence community has welcomed Ada and tend to require it for the development of any new software they specify. This rapid acceptance of Ada introduces problems of its own, not the least of which is a lack of programmers experienced in the use of it.

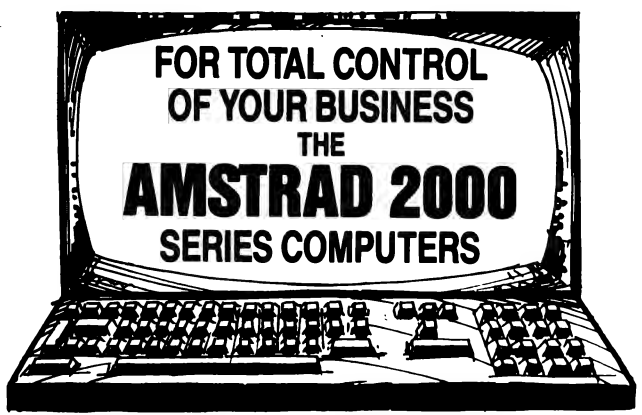
Writing code which conforms to the syntax of the Ada language is quite a simple ability to learn, especially for a programmer conversant with Pascal. The writing of code which embraces the philosophy of Ada and utilises its special features is a skill that is acquired from experience with the language. There is a worldwide shortage of experienced Ada programmers so any shortfall in Australia is not likely to be satisfied from overseas.

For the development of any large software system, it is necessary to have a good development environment consisting of programming tools, compilers, editors and so on. Just as with a programming language, extracting the best from a programming environment requires a degree of familiarity. This, of course, takes time to acquire. The US DoD, being aware of this, developed a series of specifications for an Ada Programming Support Environment (APSE). The specifications were developed in parallel with Ada and had names ranging from Pebbleman to Stoneman, which covers three levels of APSE: Kernel APSE (KAPSE), the basic interface between the computer operating system and everything else; Minimal APSE (MAPSE), including compiler, linker, loader, debugger, editor and so on; and full APSE.

The full APSE should contain tools for Software Configuration Management (SCM). This is very important for large software systems with many interrelated modules.

Conclusion

WITH THE weight of the DoD behind it, Ada is certainly here to stay. Ada on its own will not have a major effect on the success of large software systems for some time. This is due to two factors. Firstly, the advantages of having one standard programming language will only bear fruit when there is a large base of reusable software written in Ada. Secondly the acceptance of a common APSE is yet to occur. It will be at least several years before we can measure the success of Ada, but given the degree of dependance that many companies have on the military complex and the degrees of freedom it offers in programming, the language will probably dominate the 3GL market by then. □

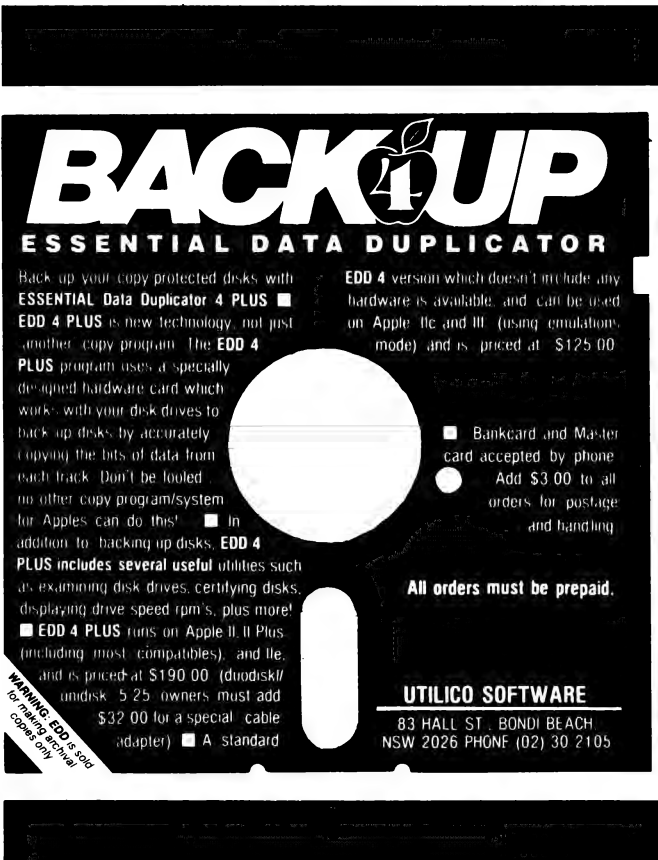


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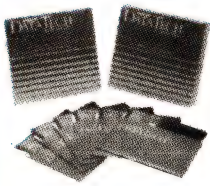
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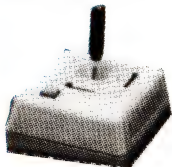
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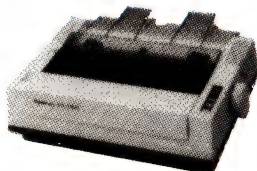
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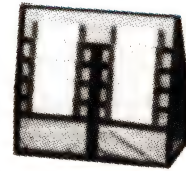
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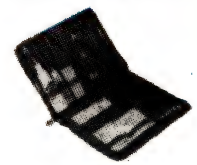
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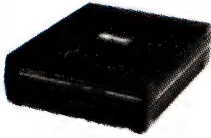


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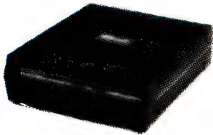
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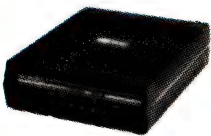
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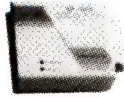
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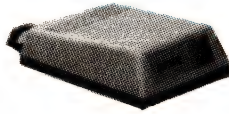
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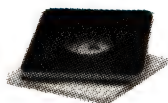
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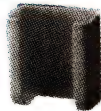
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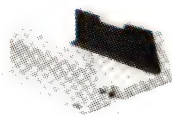
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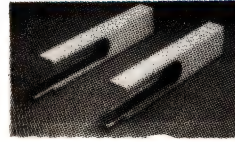
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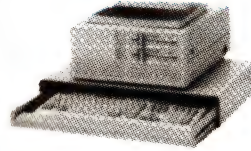
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Assembling QuickBasic

- Part 4

Although the assembly language routines for QuickBasic presented so far have all used integer variables, there is no reason that these routines should not make use of other variable types, or use arrays instead of simple variables. String variables will be considered later, but this month Jeff Richards discusses using arrays of integers.

ARRAYS ARE ONE area in which Revision 4 of QuickBasic differs significantly from previous revisions. The major difference as far as assembly routines are concerned is that the address of an array element must be specified as a full segment/offset address (4 bytes) to ensure compatibility with both static and dynamic arrays, and environment and stand-alone programs.

This requirement should only be a problem when attempting to pass whole arrays to a procedure. If single elements are passed they can be forced into temporaries, which are treated as simple variables. There are two ways of forcing array elements into temporaries. One is to enclose the variable name in parentheses, such as $A(1)$ or $N(B * 2)$. Another is to make it an expression, for instance by adding zero – $A(1) + 0$. Of course, any problems in using arrays can be avoided simply by assigning the value of the array element to a simple variable and using the simple variable as the argument to the routine.

The biggest problem in using array elements arises from SUB procedures that return results in their arguments. Forcing array elements into temporaries for these routines will not work, as the returned result which is loaded into the temporary is lost when the temporary is discarded as the routine returns. The only solution for this situation is to transfer the array element into a simple variable, use the simple variable in the routine, and copy the result back into the array.

But when you want to write a function or subprogram that refers to a number of sequential elements from an array, the best solution is to pass to the procedure the full, double-word, array address. This address is found using the VARPTR and VARSEG

functions on the first array element. VARPTR provides the offset address of the array element, while VARSEG provides the segment address.

Listing 1 is the MAX function rewritten to return the maximum value of a sequence of array elements. The arguments to the function are the address of the first array element (offset and segment) and the number of elements to consider. Although the process of calculating the addresses of the data is more complex, the whole difficulty of cleaning up the stack on exit is eliminated because of the fixed number of arguments.

Lines 4 and 5 get the number of list elements into CX, as in the previous example. Then the first and second arguments are loaded into the ES:DI register pair. ES is a segment register, while register DI, when used as an address, is assumed to refer to an offset in the ES segment. Therefore, loading ES and DI with the segment and offset address of the first array element neatly solves the problem of passing a full double-word address for arrays.

The routine executes the actual comparison in a similar manner to the MAX routine presented in Part 3. Each array element is accessed using ES:DI at the start of the loop (line 11) before being compared to AX. Register DI is incremented by 2 each time so that ES:DI points to successive elements of the array. When the loop terminates, the largest value in the array is left in AX, and returned to the calling program.

Note that register DI is saved on the stack at the start of the program, and retrieved at the end. Although this is not strictly necessary, it is recommended. Also note that it is saved on the stack after loading BP from SP. This enables us to maintain consistent offsets from BP (6, 8, 10 and so on) for the arguments.

Such a function would be declared with a line like –

```
DECLARE FUNCTION AMAX% (I%, J%, K%)
```

and used in a line such as –

```
A% = AMAX% (VARPTR(A%(0)), VARSEG(A%(0)), 10)
```

Note that the actual value of VARSEG(A%(0)) and VARPTR(A%(0)) can change while the program is running, so they must be assigned immediately before the function is called. The easiest way to ensure this happens is to embed the functions within the argument list, as in the example above.

Gaps in Parts?

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```

TITLE AMAX.ASM - QuickBasic Library Routine

.MODEL MEDIUM
DOSSEG
.CODE
PUBLIC AMax
;*****
; FUNCTION AMAX(Ptr%, Seg%, N%)          *
; RETURN THE VALUE OF THE LARGEST OF N% *
; IN THE ARRAY STARTING AT OFFSET P% IN *
; SEGMENT S%.                          *
;*****

AMax PROC                                ;Procedure starts here.
    push bp                               ;1 Save BP register.
    mov bp,sp                             ;2 Make BP into frame pointer.
    push di                               ;3 Save DI Register
    mov bx,[bp+6]                         ;4 Use frame pointer to get the
    mov cx,[bx]                           ;5 list count into CX.
    mov bx,[bp+8]                         ;6 Get Segment of array
    mov es,[bx]                           ;7 into ES.
    mov bx,[bp+10]                        ;8 Get Offset of array
    mov di,[bx]                           ;9 into DI
    mov ax,8000h                          ;10 Clear AX to MIN.
AXLoop: mov dx,es:[di]                   ;11 Get next list item into DX
    add di,2                               ;12 Increment DI pointer by 2.
    cmp ax,dx                             ;13 Is AX (= than DX?
    jnl XSkip                             ;14 No - skip.
    mov ax,dx                             ;15 Yes - load DX into AX.
XSkip: loop AXLoop                       ;16 Repeat until CX = 0.
    pop di                                 ;17 Retrieve DI
    pop bp                                 ;18 Retrieve BP
    ret 6                                  ;19 Return past 3 arguments.
AMax ENDP                                ;Procedure ends here.
END                                       ;Module ends here.

```

Listing 1. The MAX function from Part 3 (May 1989) rewritten to return the maximum value of a sequence of array elements. The arguments to the function are the address of the first array element (offset and segment) and the number of elements to consider.

Of course, it is not necessary that the address used is that of the first array element – it is quite possible to find the maximum value of a subset of the array by passing the address of the first element of the subset, and the number of elements in the subset. For instance, a line such as –

```
A% = AMAX% (VARPTR(A%(5)), VARSEG(A%(5)), 5)
```

will find the maximum value in the range of items A(5) through to A(9). The Microsoft documentation doesn't say so, but it can be assumed that the segment address of every element in the array will be the same, so it wouldn't matter whether VARSEG(A%(0)) or VARSEG(A%(5)) was used in the above example. □

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NEW PRODUCTS



Sprint
\$1500 Sprint

The Sprint is a high-performance 20Mb internal hard drive for the Amstrad PPC portables. When fitted in place of the second floppy drive, the Sprint adds less than 70 grams to the weight of the machine and allows the internal modem to stay in place. The drive has a rated average seek time of 25ms and 375K/sec sustained data transfer rate (coupled with a special BIOS, the drive is claimed to give the PPC about four times the power of an XT). The Sprint drive is available separately for \$1500, plus \$60 fitting.

Mac SE/30 ColorBoard

Mitsui Computer
Phone: (02) 452 0452
Price: \$3395

The RasterOps ColorBoard 108+/SE30 facilitates displaying up to 256 colours or shades of gray on 19, 16 and 13-inch monitors in Apple standard 72dpi. The board includes a hardware pan and zoom feature (2X and 4X). Colour (and gray scale) can be selected as 1, 2, 4 or 8-bits; if less than 8-bits is used, an Extended Virtual Desktop can be created up to 8192 x 768 pixels. Other features include pop-up menus and automatic cursor relocation on the standard 9-inch screen when

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Phone: (03) 521 1249
Price: \$230

Designed to fit any 5 1/4 inch slot,

this hard drive frame will take any standard 3 1/2 inch hard drive, turning it into a portable unit for security and convenience in transporting data. The key-lockable unit is supplied with its own carry bag.

Amstrad Sprint hard disk

Babets Information Technology
Phone: (02) 922 6511

Price: \$2499 Amstrad PPC and



NEW PRODUCTS

the large monitor is disconnected.

FastLynx

Micro Support Systems

Phone: (02) 439 7773

Price: \$249

FastLynx enables the drives of a remote computer to be treated as virtual drives by the host using a serial connection between the two; it can also be used to redirect output to a printer. The package includes an integrated communication diagnostic utility for comprehensive tests of ports and cables, and monitors the speed and accuracy of data transfers.

The Green Book

Greencomp Pty Ltd

Phone: (065) 69 1292

Price: \$295

Written in Lotus 1-2-3 version

pre-defined reports supplied (including transaction reconciliations and six-month p&l statements) and up to 99 different reports can be user-defined, both in content and layout. Facilities include account maintenance, ledger aging, debtors statements, forecasts and bank reconciliations. The program includes automated back-up and a two-level password and security code facility. The Lotus Macros used to write the system are available from Greencomp if customisation is required. While not all of the features of Lotus are available from within The Green Book, the program offers some enhancements to 1-2-3, primarily in speed and memory handling. The manual is arranged by topic and each topic is organised into What, When

```
A1: [W11] 'REPORT
      A          B          C          D
1  REPORT      "THE GREEN BOOK" - REPORT GENERATOR
2
3  CREATE      CREATE USER REPORT FORMAT
4
5  EDIT        EDIT USER REPORT FORMAT
6
7  DELETE      DELETE USER REPORT FORMAT
8
9  PROCESS     PROCESS & PRINT USER REPORT
10
11 AGED        AGED LEDGER REPORTS
12
13 SUMMARY     ACCOUNT SUMMARY
14
15 LIST        ACCOUNT LISTINGS
16
17 QUIT        QUIT
18
19
20
```

2.01 (and requiring Lotus to run), The Green Book offers a modular accounting system with a powerful report generator. Using the features of 1-2-3, Actual, Budget, Constants and Formula reports can be set-up from the menus; there are eight

and How sections, making it very easy for new users to follow.

Bentley Bear educational software

Atari Computers

Phone: (02) 805 0344

Price: \$19.95

Rabbit Portables



Teco Australia

Phone: (02) 725 1233

Price: \$6595 PC-286G

not supplied PC-286GN

Manufactured by Taiwan-based Chicony, the PC-286 has a 12MHz 80286 CPU and the PC-286GN, a NEAT (New Enhanced AT) 80286 running at 16MHz with zero wait state and 21.5 in turbo mode. Both portables feature a gas plasma screen with a resolution of 640 x 400 pixels (can be increased to Hercules 720 x 400) and Multisync EGA/MGA compatibility, 5 expansion slots (2 16-bit slots are free), 2 serial ports, a parallel port and a port for an external CGA/EGA monitor. The 101-key ALP keyboard on both models includes 12 function keys. The two units are each configured with an external 5 1/4 inch and internal 3 1/2 inch floppy drives; the PC-286 has a 20Mb hard drive and the PC-286GN, 40Mb.

The Bentley Bear range of educational software is designed for children under the age of 10. Difficulty and time parameters can be set with all of the packages – correct answers let Bentley collect honey and rubies. The Scholastic Series includes three Magical Maths packages that provide a mix of problems that introduce addition, subtraction, division and



Crossword Reference

Genesis Software
 Phone: (08) 297 2833
 Price: \$45
 \$6 demo disk

CROSSWORD REFERENCE DEMONSTRATION

SUN 28-MAY-1989 09:46:11 Word length: 10

Known Letters: _ A _ S _ _ _ _ _

Match Words

bassethorn	bassoonist	caespitose	cassollette	causticity	daisychain
farsighted	hamshackle	Hansardise	hanselling	haustellum	haustorium
hawserlaid	kaisership	lansquenet	maisonette	manservant	mansuetude
marshalled	marshaller	marshalsea	marshiness	Massoretic	nauseating
nauseously	pansophist	parsonbird	parsonical	passageway	passionary
passionate	Passionist	ramshackle	Sanskritic	tasselling	waistcloth
wassailing					

Matching words found: 37 - (RETURN) to continue: Completed: 100 %

Based on a library of over 74,000 words, Crossword Reference was originally designed as an aid to crossword puzzle buffs. The user specifies the length of the word to be filled in and places the known letters in position, the program then supplies matches. Not all of the regular plurals, past and present participles and third person singular regular verb forms are included in the dictionary - this makes the searches quite fast without hobbling the program to any great degree. Crossword Reference can also supply matches if a sequence of letters and their relative positions are known, but not their actual position in the word. The program also includes an anagram generator. Crossword Reference requires a PC with one floppy drive; it's available on either 5 1/4 or 3 1/2 inch disk.

multiplication. Equation Builder introduces the four mathematical functions in equations and promotes problem solving skills. The Memory Master Module is designed to strengthen memory skills and the Alphabet Tutor introduces the world of words. Other modules available are Magical Anagrams, Spelling Bee and typing Tutor.

Logo Tec

Printer Innovations
 Phone: (09) 321 6000
 Price: \$149 each 3 users

\$99 each 5 users
 \$199 set-up fee

Logo Tec is a memory resident program that enables users to integrate a graphic image with a document as it is being printed out. The image to be used needs to be supplied to Printer Innovations who digitise it and set it up for incorporation into documents using a 3-character 'trigger'. Logo Tec is designed to eliminate the need for specially printed continuous stationery - for example, a company logo/letterhead would only be printed on the first page of a



document and the others could be left as plain paper or incorporate a cut-down version of the letterhead; phone numbers and other information can be changed without having new stationery printed. The software requires at least DOS 2.1, 640K and a single floppy drive. Two printers can be supported concurrently. Dot matrix printers that emulate Epson's Esc/P commands and Canon-engined laser printers can be used with the package. Up to nine images can be incorporated for each laser printer port and up to four per port for dot matrix printers.

Keyboard Plus

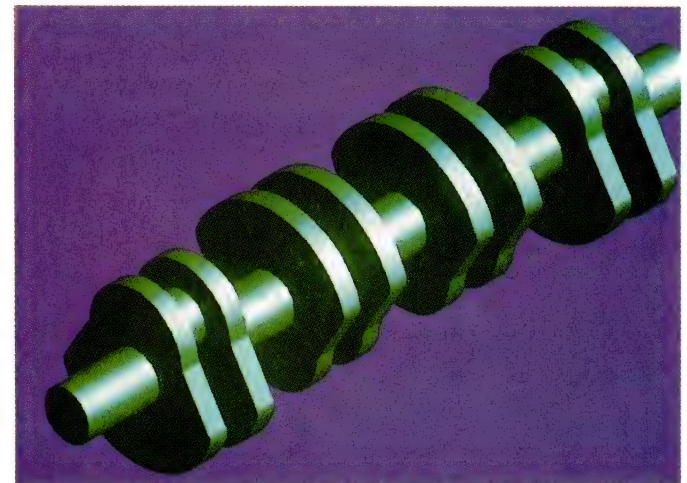
Xtratek Corp Pty Ltd
 Phone: (03) 521 1249
 Price: \$220

switched on) and has its own display, located above the keypad.

Eicon 400 Laser Printer

Imprint Computer
 Publishing Systems
 Phone: (02) 818 3577
 Price: \$7725 300dpi printer
 \$9225 400dpi printer
 Adapters from \$4375

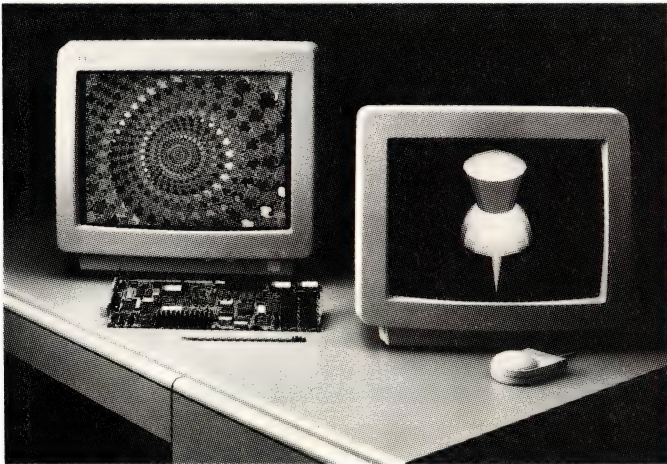
The Eicon 400 is an eight-page per minute laser printer with a 400dpi version of the Canon laser engine; the system is PostScript compatible and comes with three megabytes (expandable) of RAM and 35 resident fonts. Versions are available for both the PC/AT and MCA busses. Existing 300dpi Canon and Hewlett-Packard laser printers can be upgraded to 400dpi with an adapter.



Graphics controller and high-resolution displays

Hewlett-Packard
 Phone: (03) 895 2895
 Price: \$2298 83328A graphics controller

Both XT and AT compatible, this 101-key unit features a calculator built into the keypad. The calculator can be used independently of the computer (which doesn't need to be



\$4420 D1187A display
\$5863 D1188A display

Supporting a resolution up to 1024 by 768 pixels, Hewlett-Packard's new intelligent graphics controller can display 16 colours simultaneously from a palette of 4096. The controller is designed for us with 'all PCs based on industry-standard architecture' and is supplied with 896K of on-board memory (expandable to 2.4Mb). The non-interlaced controller has a screen refresh rate of 60 times per second (the IBM 8514A's refresh rate is 43.5 times per second). Drivers are included for a large range of popular software and applications such as AutoCad 9 and 10, GEM, Windows/286, WordPerfect and Ventura Publisher. HP is also offering an enhanced graphics emulation

module that snaps on to the controller to allow EGA applications to use 90 per cent of a high-resolution display (1024 x 268); the module also enables PC-CAD users to configure dual or single-monitor systems.

To complement the graphics controller, HP have also released two new high-resolution graphics displays. Both the 16-inch D1187A and the D1188A displays intelligently support any resolution from 640 x 480 to 1280 x 1024 pixels. Both units feature 'dynamic focus-control' which ensures that characters at the corners of the screen are as sharp as those in the centre and an improved cathode ray tube for uniform screen brightness.

MacinStor hard disks

Ski Peripherals
Phone: (03) 429 2611
Price: see below

The MacinStor family of SCSI hard disk sub-systems for the Macintosh feature an average access time of 14 to 16.5ms and data transfer rates of 15 megabits/sec. Two capacities are available: 345Mb (\$4840 internal; \$5049 external, Mac II/x only) and 630Mb (\$8300 internal; \$8510 external, Mac II/x only - prices untaxed). All versions of the drives are supplied with a suite of installation and drive management software, including a formatter, disk diagnostics and A/UX compatible partitioning. PCTools is also supplied to provide back-up, restore, file recovery, disk recovery, data encryption and disk optimisation facilities.



Cadkey enhancements

Minicom Pty Ltd
Phone: (02) 957 6800
Price: \$295 Cadkey I
\$1599 Cadkey Solids

Cadkey I adds three-dimensional capabilities to Cadkey using a menu and prompt system. A universal Position Menu offers almost unlimited scope for defining a position in 3D space and other features facilitate geometric modelling, manipulating the display and detailed dimensioning. Cadkey I supports 256 levels of colour (16 at once) and complies to the ANSI and ISO standards, allowing straightforward import and export of drawings.

Cadkey Solids is a solids modelling tool that features calculation of mass properties, Boolean operations (union, difference, intersection and cross sections) and smooth shading. The program uses a combination of two solids modelling systems - Boundary Representation (B-rep) defines a solid by its boundaries and Constructive Solids Geometry (CSG) which uses primitives like cubes, cones and cylinders to define the shape (primitives can be combined to form new primitives).

Logimouses

Logimouse Australia
Phone: (02) 954 0248
Price: see below

Logitech have released a new 3-button mouse with a default resolution of 320dpi in both serial and bus versions. Resolution is adjustable from 50 to 19,200dpi and a ballistic driver allows the cursor sensitivity to be set for accelerated motion or precision control. The mouse, priced at \$180, is supplied with over 30 mouse menus and a menu-maker for keyboard-based software; a Lotus 1-2-3 menu shell and pop-up DOS shell are

also included. Logimouse have also announced new prices for the C7 Plus pack: \$145 in serial form and \$150 for the bus version; and the 2-button, 200dpi DEXXA mouse, now priced at \$85. All prices taxed.

Dataproducts LaserJet emulation

Dataproducts Corporation
Phone: (02) 451 3533
Price: \$25,950

Dataproducts have released a Hewlett-Packard LaserJet emulation for their 300dpi LZR 2655 laser printer. Designated the LZR2655/LJ, the 26 page/minute machine features



NEW PRODUCTS

750-sheet input tray, 3Mb RAM and a rated duty cycle of 80,000 pages/month. Other features include a high-speed parallel interface, support for downloaded HP fonts and an optional 1500-sheet input tray, a 250-sheet output tray and 2000-sheet stacker.

MacTree Plus

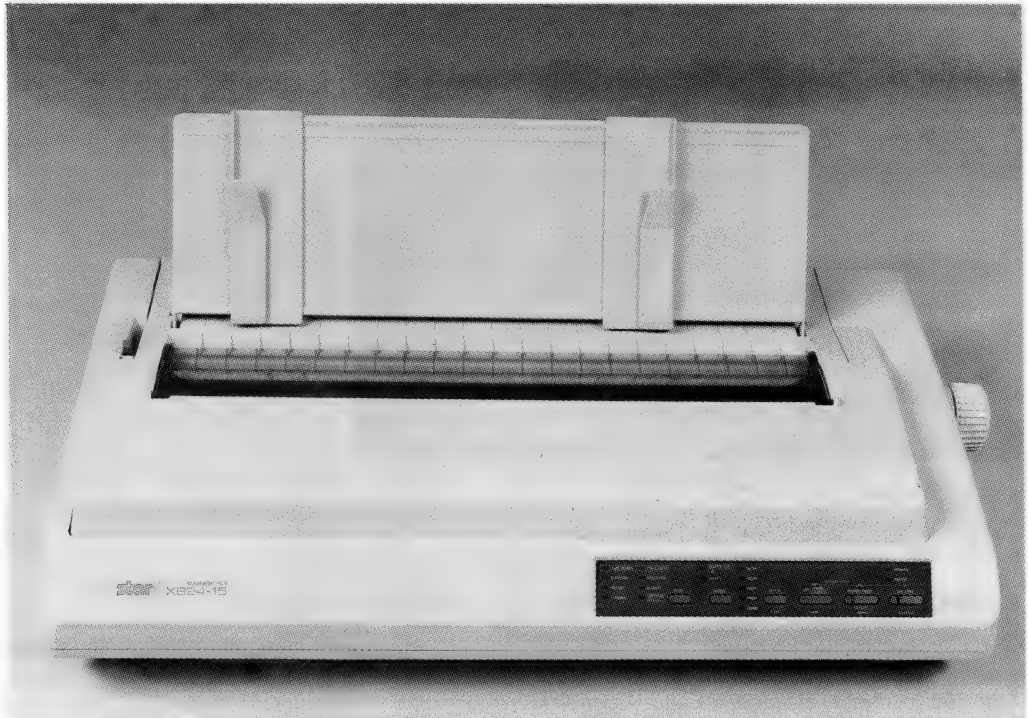
Programs Plus
Phone: (08) 326 1644
Price: not supplied

MacTree Plus is a file management utility for the Macintosh which enables selection and viewing files in either a vertical or horizontal tree display. It can also be used to find, copy, rename, erase, and move files and folders. Other features include TOPS support, the MacTREEView window which allows background printing, custom menus, a Pop-up Info window to display files statistics, and a Search and Filter feature to enable files searches by name, date, creator and file type and to hide files that meet specified criteria. Programs Plus are currently offering a 'combo pack' of MacTree with DS Backup.

Dot-matrix printers

Star Micronics
Phone: (02) 748 4300
Price: not supplied

Star Micronics has released four new dot-matrix printers featuring



paper parking, 'quiet printing' and optional colour printing. The FR-10 and FR-15 models (with 10 and 15-inch carriages respectively) are 9-pin machines with a rated draft output of 300cps and NLQ output of 76cps (Elite) and 63cps (Pica). Four different pitches are available and eight fonts are supplied as standard. The XB-2410 and -2415

(10 and 15-inch models respectively) are 24-pin machines with a rated draft speed of 240cps and true letter quality speed of 80cps (Elite) and 67cps (Pica). Sixteen fonts are supplied as standard and printing can be either uni- or bi-directional. The 2415 has a printer buffer of 41K, while the 2410 has 27K.

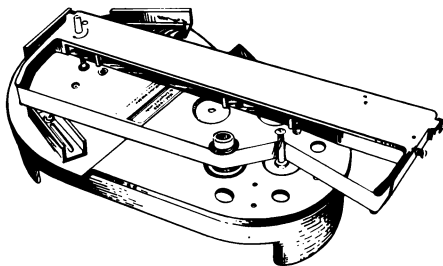
InstaPlan upgrade

Programs Plus
Phone: (08) 326 1313
Price: \$99 upgrade
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\$145 Pert module

Version 2 of Instaplan has added a number of user-suggested features. These include multiproject outlining for

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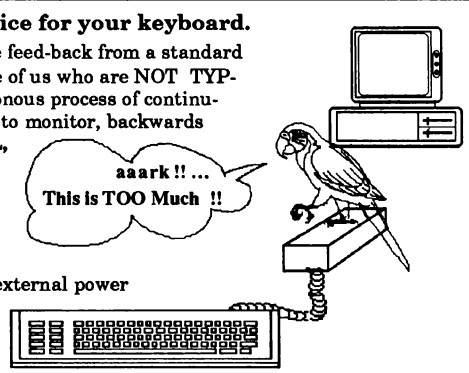
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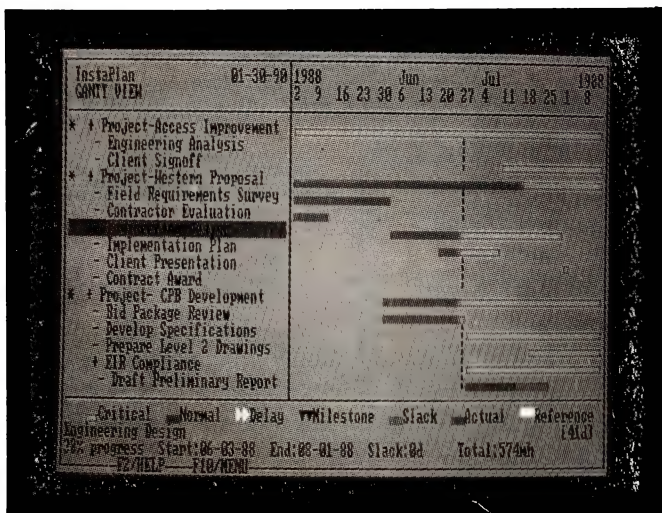
TCG Information Systems Pty. Ltd.		SERVICE REQUEST	
Customer:		Job No:	
Address:		Date:	
Contact:		Time:	
Bill: Internal <input type="checkbox"/> Customer <input type="checkbox"/>		Complete By:	
Details:		Customer Order No:	
Requested By:		Approval:	
Work Done:			
Labour		Materials	
DATE	ESTIMATED HOURS	QTY	PRICE
Job Completed: YES <input type="checkbox"/> NO <input type="checkbox"/>		Originator Advised: YES <input type="checkbox"/> NO <input type="checkbox"/>	
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Price: \$599

FLIPS (Form-Label Integrated Printing System) produces business forms or labels on demand using a PC-based system (512K minimum; 2Mb necessary for some applications) and an HP Laserlet Plus, or compatible. Obviating the need to have specially printed stationery, the package allows forms, labels and bar codes to be designed on screen. Forms can be printed out one at a time for use, or filled in on screen. A merge feature can be used to incorporate data directly into the printout. The package includes the OCR-B font in eight sizes, a compressed Swiss-style font that conforms to the Australian Retail Code of Practice, support for the printer's resident fonts and integration of a choice of third-party fonts, including soft fonts.

efficient utilisation of resources, individual calendars for everyone involved with a project, deadline scheduling and automatic detailed history and progress

reports. Another new feature is the Project History Database which records actual progress, work and spending at each stage of the project.



Sharp IQ-7000

Sharp Australia
Phone: (02) 831 9111
Price: \$389 IQ-7000
\$129 application cards

A range of IC application cards are available to add a thesaurus/dictionary, an eight-language translator, a time expense manager and a variety of other functions. Using an

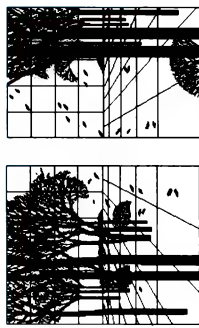


The Sharp Electronic Organizer IQ-7000 has a full-featured, 199-year calendar, a schedule mode that can take about 440 32-character entries, a telephone directory, a memo pad that can store up to 512 characters per item, a built-in clock preprogrammed for the time in 212 different cities and a calculator with a 'what-if' facility.

optional interface, the IQ-7000 can connect to a PC or a second IQ-7000 to transfer data.

Omnis 5 DBMS for the Mac

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ARRIBA \$295
 Above Disc Version 2.0B \$150
 Athena BIOS (Runs CGA on Hercules) \$80
 Copy II PC Ver. 5.0 \$ 51
 Copy II Deluxe Operation Board \$199
 DESQview 2.2 (NEW VERSION) \$165
 DESQview 386 (INCLUDES QEMM) \$215
 DESQview Companion \$99
 Disk Technician Advanced \$250
 DS Backup Plus \$95
 Fastback Plus 2.01 (NEW VERSION) \$189
 Form Tool with Free Greatest Hits \$180
 Form Filler for Form Tool \$220
 FormWorx with Fill & File \$170
 MACE Utilities 5.0 \$150
 MACE Utilities Gold Edition \$195
 MenuWorks (Incredible Value) only \$79
 MemoryMate \$110

MONTHLY SPECIALS

XTree Pro™ PC Tools Deluxe
Version 5.131
\$142.00 **\$77.00**

Mace Utilities FASTBACKPLUS
Gold Edition
\$195.00 **\$189.00**

MICROSOFT SPECIALS

QuickC 2.0 \$99 Windows 286 \$149
 QuickBasic 4.5 \$105 Mouse & Windows 286 \$275
 Quick Pascal \$120 Windows 386 \$289
 MacroAssembler 5.1 \$190 WORD 5.0 \$489
 C Compiler V5.1 \$589 EXCEL Spreadsheet \$580
 MOUSE (Bus or Serial) \$180 Works \$250

COMPUTER BOOKS

WordPerfect 5: The Complete Reference \$46.50
 Turbo Pascal: The Complete Reference \$49.50
 DOS: The Complete Reference \$47.50
 dBASE III+: The Complete Reference (Hard Cover) \$44.50
 PARADOX: The Complete Reference \$41.50
 1-2-3: The Complete Reference \$41.50
 1-2-3: Made Easy or DOS 4: Made Easy ea \$34.50
 Using Quick C 2.0 or Using QuickBasic ea \$36.50
 Using Turbo C 2.0 or Using Turbo Pascal 5 ea \$39.50
 Advanced QuickC or Advanced Turbo C ea \$39.50
 Word 4: Made Easy or WordPerfect 5: Made Easy ea \$33.50
 Using EXCEL or Advanced EXCEL for the PC ea \$39.50
 Using QUATTRO: The Professional Spreadsheet \$38.50
 Advanced dBASE III+: Programming & Techniques \$39.50
 Microsoft Works for the PC \$37.50
 The ABC's of AUTOCAD (Release 10) \$40.50
 Mastering AUTOCAD (Release 10) \$54.50
 Mastering Turbo Pascal 5 (SYBEX) \$40.50
 The Official Book of King's Quest \$20.50
 dBXL and QuickSilver Programming \$45.50
 Programming in Clipper (2nd ed) \$52.50
 Mastering VENTURA 2.0 \$42.50
 The Paul Mace Guide to Data Recovery \$42.50

Ph (02) 681 2722 Fax (02) 632 5298

ENTERTAINMENT

EPYX Winter Games \$55
 Leisure Suit Larry II \$65
 Police Quest II or ManHunter ea \$69
 Space Quest III \$75
 Kings Quest 4 \$75
 Microsoft Flight Simulator 3.0 \$72
 FALCON AT \$79
 PT 109 (Patrol Boat Simulation) \$72

SPREADSHEET

LOTUS 1-2-3 Release 3 or Release 2.2 \$CALL
 MICROSOFT EXCEL \$580
 QUATTRO \$249
 VP-Planner Plus (SPECIAL PRICE) \$225
 1 to C Spreadsheet Compiler \$450

SPREADSHEET ADD-ONS

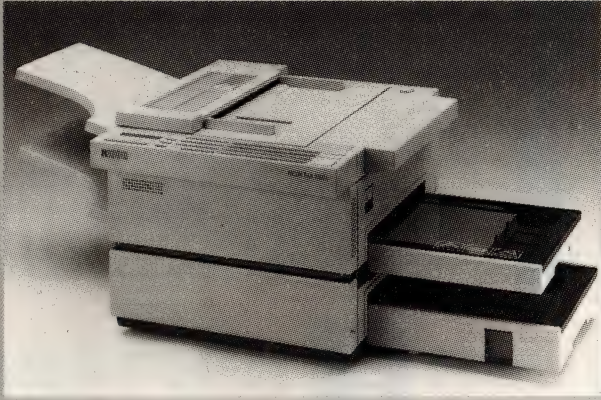
101 Macros for Excel, 1-2-3, Symphony, SuperCalc, WordPerfect & more ea \$89
 3-2-1 Blastoff (Accelerator & Security) \$220

Norton Editor \$ 95
 Norton Commander 2.0 \$108
 Norton Utilities Advanced Ver 4.5 \$175
 PC Tools Deluxe 5.131 \$77
 Print Q (NEW VERSION 4.0) \$169
 PrintMaster Plus (With free Fonts & Borders) \$88
 Q.E.M.M. 386 (Expanded Memory Manager) \$90
 QDOS II \$94
 SoftSafe (PC Data Security) \$169
 Sidekick Plus \$229
 X-Tree Professional \$142
 X-Tree NET \$CALL

3-2-1 Gosub (Write your own @Functions) \$220
 Always (New from FUNK Software) \$179
 IMPRESS (Spreadsheet Publisher) \$199
 Individual Training for Lotus 1-2-3 \$95
 InWord \$109
 Look & Link \$139
 ProjectCalc/Project Manager Lotus Add-in \$269
 Sideways \$89
 Spreadsheet Toolbox \$139
 SQZ! Plus (NEW Version) \$139
 Worksheet Utilities (5 Lotus Add-ins) \$129

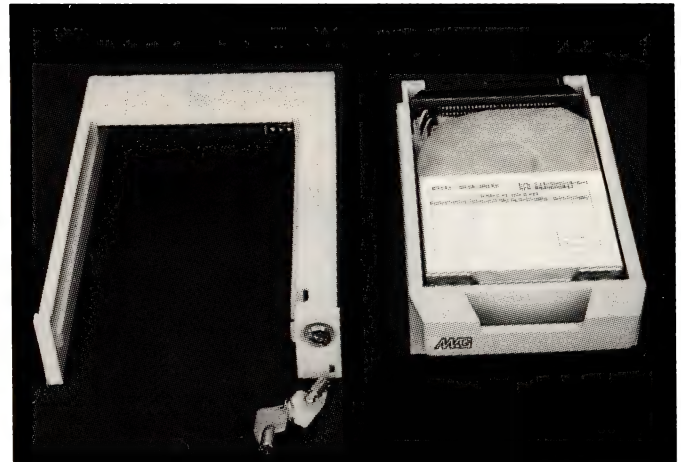
NEW PRODUCTS

Ricoh FAX1000L



DBE Australia
Phone: (02) 406 9444
Price: \$11,190

Claimed to be the world's smallest laser fax, the FAX1000L is a plain paper machine that features Ricoh's Image Smoothing System 'to produce images eight times clearer than those produced by thermal facsimile machines.' Twin paper cassettes can hold up to 740 A4 or B4 sheets and the document feeder is designed to cope with sheets up to A2 size. A quick dial facility can hold 144 numbers and a single document can be sent to 99 different numbers from a single scan. A 7-day timer can be programmed to switch the machine off after hours and on weekends (documents can still be received but are held in memory). If the paper supply runs out, the FAX1000L stores incoming documents until the paper is replenished.



data files in both single- and multi-user installations. Application files can be up to 32Mb in size and data files can be as large as 2560Mb; other specifications include: a maximum of 60 open files, 255 fields per file, 16 user-defined colours, 32,000 characters per field and a numeric accuracy of 16 significant figures.

Porta-Disk

Electronic Solutions
Phone: (02) 427 4422
Price: \$1090 taxed

The Porta-Disk is a 42-megabyte removable hard disk and chassis that fits into a standard 5 1/4 inch slot on any PC, XT, AT or '386-type computer. Using an

NEC drive, the unit is supplied with all necessary connectors, cabling and a built-in keylock.

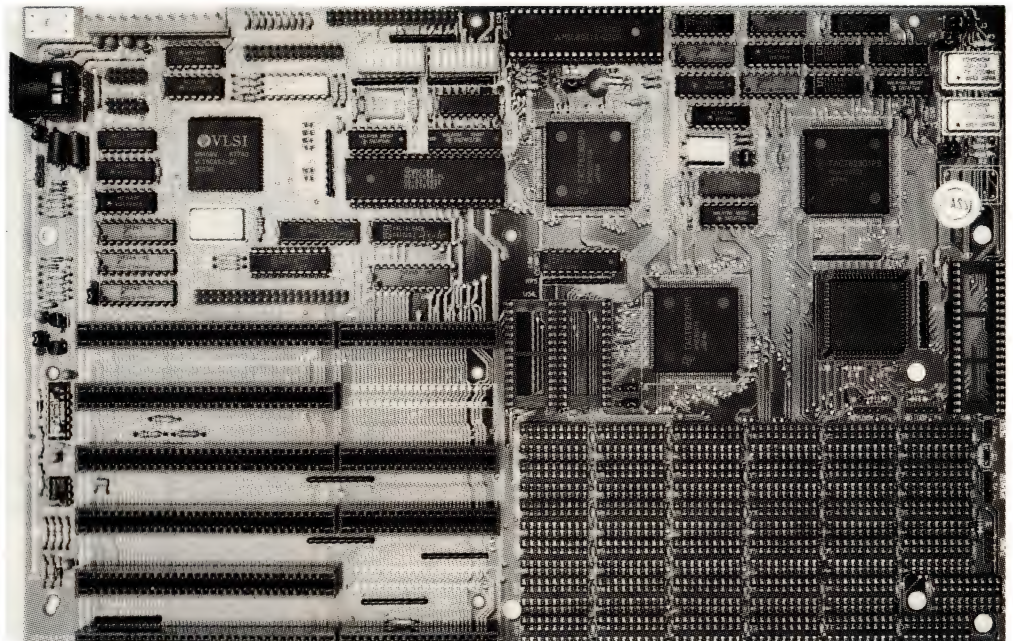
AT motherboard

Electronic Solutions
Phone: (02) 427 4422
Price: \$495 taxed

This 12MHz, zero wait state AT is built into a motherboard measuring only 8.5 x 13 inches (video card not included). The board features dynamic I/O speed control which provides compatibility to a wide range of add-on cards, two serial and one parallel port, controller for both 5 1/4 and 3 1/2 inch drives, a real time clock (with off-board battery) and an Award BIOS.

Phone: (03) 820 0022
Price: \$1350
\$325 Add-on packs

A relational or heirarchical database management system, Omnis 5, has been designed to fully-utilise the graphical interface, enhanced memory, and colour capabilities of the Macintosh. This new release of Omnis includes 'hot-areas' for HyperCard-type buttons, user-defined menus, variable-length records, text can be displayed in a variety of fonts and colours, and fields can be push button, radio box or check box. Included with the program is the Express module, designed to help beginners with first applications; it can also be used by more advanced users to set-up simple databases and for prototyping complex systems. Also included are a set of programs, XCMDS, that enable HyperCard stacks to read Omnis 5



The only data management software to deliver real Local Area Network support is



If you don't believe us, ask Novell or Apple.

When you want a powerful, easy to use data management system with full network support, there is only one program that's got it all: the new Q&A Version 3.

Q&A Version 3 comes with over 100 improvements. But its uniquely comprehensive yet affordable network support is the big bonus for the business user. And you don't have to take our word for it. To quote Novell, "Q&A Version 3 fully utilises the record locking capabilities that LANs offer today's business".

Comprehensive LAN facilities built into Q&A 3.0 include:

- record locking support to allow multiple users to simultaneously access the same database
- five levels of password protection to preclude unauthorised entry into databases
- levels of protection can be set so that a user may read or read/write records, change form designs or change report designs

Q&A Version 3, first with Appleshare support

Q&A Version 3 supports the Appleshare network including record locking of databases. Apple are delighted - "It is very exciting to see PC users sharing

a Q&A database from a Macintosh II file server using the AppleTalk network with our AppleShare PC software" says Peter Friedman, Manager of Business Systems Marketing at Apple Computer. "Q&A Version 3 is the first MS-DOS file manager to offer such impressive record-locking support on an AppleShare network."

Inexpensive network growth

A Q&A Network Pack allows additional users to simultaneously operate a single copy of Q&A from a LAN. This offers an inexpensive way of extending Q&A throughout an organisation. Diskless workstations are fully supported. Installation takes a only a few minutes.

Other powerful enhancements that come with the new Q&A Version 3 include:

- multiple file lookup capabilities
- improved file searching
- summary functions
- increased formatting flexibility
- font, laser printer and Postscript support
- advanced document search and replace, simplified mail merge and mailing label abilities.

For up to the minute information and pricing on Q&A Version 3, fill in the coupon below, phone or fax us today. Include a cheque for \$10 and we will include a comprehensive demonstration disk.

Name _____

Company/position _____

Address _____

Postcode _____

Phone _____

PC EXTRAS

Send to:

PC Extras, PO Box 136, Redfern, NSW 2016
Phone (02) 319 2155, Fax (02) 698 9926
Melbourne: Phone: (03) 486 1999
Brisbane: Phone: (07) 281 8231

YCS/ULY

TULDIN

NO MICKEY, THIS MOUSE

The new BMC cordless mouse is a good idea that Roy Hill found really works!

I HAVE LONG been used to using a mouse as part of the usual array of peripherals attached to my computer. For some applications it has proved to be far more useful than the old cursor pad and its associated motion keys. Up to now, I have been using a Z-NIX mouse, which quite successfully emulates the Mouse Systems mouse and claims to (but doesn't) emulate the Microsoft Mouse, especially with MS-Word, which I use quite often.

At a recent microcomputer exhibition, I was asked by a long-time associate to 'have a look at' his new cordless mouse from BMC that emulates both the above mouse drivers. My reply was very simple – if does what it's claimed to do, it'll get a rave review. It does, and here's a rave review.

The mouse and its associated goodies are packaged in a fairly small, well-designed box which at least is atypical of the usual Taiwanese presentation (this is understandable, as the mouse is made in Hong Kong). The mouse comes as two major components – the mouse itself (which contains an infrared LED transmitter) and a receiving device with 1.5m cord, which plugs into a standard DB25 connector. There is no card required to be fitted inside the computer. The receiver operates at standard TTL levels from the COM1 or COM2 port and the mouse itself is driven by two AAA alkaline batteries.

Installation of this mouse was perhaps



the most enjoyable experience of its kind I have ever had with any computer peripheral: it all worked first time! Here is a step-by-step description: unpack the contents of the box; uncoil the receiver cord and plug it into the DB25 connector; place the receiver on the back of the desk; take the mouse out of the box, open the battery compartment, and insert two AAA batteries; place the mouse on the desk and press the button on the left-hand side of the mouse (this activates the power circuit); place the software disk in the drive, log on to the drive and type BMCMOUSE.

The mouse is now operating as a Microsoft Mouse, using the COM1 port. Naturally, I tried it out on one of my MS-Word documents and it worked like a charm. To use it as a Mouse Systems mouse, requires the use of an optional parameter as listed below –

```
BMCMOUSE ==> COM1 (Microsoft mode).
BMCMOUSE 1 ==> COM1 (Microsoft mode).
BMCMOUSE 2 ==> COM2 (Microsoft mode).
BMCMOUSE /3 ==> COM1 (Mouse systems mode).
BMCMOUSE /31 ==> COM1 (Mouse systems mode).
BMCMOUSE /32 ==> COM2 (Mouse systems mode).
BMCMOUSE ? ==> Help.
```

There are several menus available on the supplied disk, which pop-up an application-specific list of choices (in other words DOS Lotus, WordStar, dBase and Turbo Pascal). These are invoked by first loading the BMCMOUSE driver program and then typing 'MENU choice' where 'choice' is one of the five listed above. An additional program, called MENUMAKE.-COM allows the user to customise existing menus, or to make their own.

Of course the greatest advantage to this

mouse is that there is no cord, no running to the end of your rope, no pad, and it works faultlessly as either a three-button Mouse Systems Mouse or a Microsoft Mouse (the centre button is not used). A fourth button on the left hand side of the mouse acts as a 'fine-tuning' device for ultra-fine cursor control. I found this excellent when used with AutoCad, as it gave me very fine control of lines and their placement.

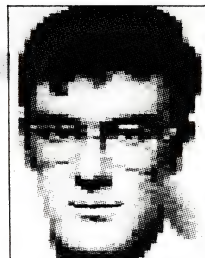
There is also a power-down circuit which operates if the mouse has not been used for twenty minutes (that's the time given in the manual, but the actual cut-off time is much shorter than that: not much more than a minute). This helps extend battery life, which is pretty close to shelf life anyway, considering the very low current drain of the mouse. To kick the mouse off again after it has powered down, just click the button on the left-hand side of the mouse. A red LED on the receiver provides a visual indication that the mouse is alive and well. The mouse/receiver combination work over an angle of about 100 degrees at distances up to five feet (1.7m).

For ease of use, cost and efficiency, it can't be beaten. I want two of them (one for home and one for work). □

Product Details

Product: BMC Mouse
Distributor: Microgram Computers
17 Barry St,
Bateau Bay 2261 NSW
(043) 34 1544
Price: \$160

'For ease of use, cost and efficiency, it can't be beaten. I want two of them.'



BBS Registry News

THE NAME OF the Registry that maintains the Bulletin Board listings is now the Australian Bulletin Board System Registry, or BBS Registry for short. The reason for the change is that the old name with PAMS in it was causing confusion.

Nothing in real terms changes – it is still the place that has the most up to date BBS listing possible. There are some minor changes: System Operators can now add to their system's listing a short description of what specialities are supported by them. This has been done at the request of a number of operators and users.

Seeing as the name has been changed it might be time to remind everyone about the aims of the Registry and some other important considerations that dictate how things are done. The Registry can in no way be thought of as an association or similar body, but as it provides an important service to the Bulletin Boards of Australia, an official document is considered necessary. That is the purpose of this Policy and Procedure Guide (referred to as the PPG from now on).

The Registry is formed specifically with the intent of providing to any interested person access to the most accurate listing of BBS (Bulletin Board Systems) possible, the regular production of up-to-date listings of systems accessible for use by the public, and the distribution of the listings as widely as possible. The Registry is specifically forbidden from affiliation with other or-

ganisations and the Registry must at all times be independent and act solely as the point of registration for bulletin boards within Australia.

The Registry is concerned with publication of listings of the Bulletin Boards in Australia, and at all times the business of the Registry will revolve around this fact. Except as otherwise provided, no information collected for use by the registry is to be released for any purpose without the express permission of the National Coordinator.

The National Coordinator will produce on the first weekend of each month a list of the systems currently held on the Registry files. The list will be distributed as directed by the National Coordinator. Each Regional Coordinator is responsible for the distribution of Registry files as widely as possible within their region, a distribution plan should be coordinated with the National Coordinator.

Except for genuine offline situations, no system is to be removed from the listings without the authority of the National Coordinator. The registry must not become involved in issues relating to the conduct of a system by its operator.

I thought I would give you all of this to help people understand what the registry is, and more importantly, isn't. It is definitely not a standards body, club, or other organisation in those sort of terms – it is simply a Registry of information about Bulletin Boards. Enjoy. □

Primary electronic collection points

ACT – PC Exchange RIBM
(062) 58-1406

NSW – Prophet TBBS
(02) 628-5222

Vic. – Custom Programming
Opus (03) 848-3331

Qld. – AMPAK Opus/PRBBS
(07) 263-7070

SA – Oracle PC-Network
(08) 260-6222

WA – Nemo Multiple BBS
RAPL (09) 370-1855

Tas. – Hobart Users Bulletin
Board (002) 43-5041

BBS Listing 8905

New systems: 21
Online: 3
Unknown: 8

Offline: 11
Name Change: 2
Amended: 41
TOTAL Systems: 314

AUSTRALIAN

CAPITAL

TERRITORY

MICSIG Fido
Phone: (066) 85-1026
Baud: V21 V22 V22bis V23
Access: Public
BBSoftware: Fido

PC Exchange Opus
Sysop: Phil Harding
Phone: (062) 58-1406
OZnet: 7:801/220
Baud: V21 V22 V22bis V23
Access: Mem LVA

PCUG Bulletin Board
Sysop: Alan Salmon
Phone: (062) 59-1244
Baud: V21 V22 V22bis V23
Access: Mem LVA

Computer: IBM AT
DOS: PC DOS
BBSoftware: Opus

NEW SOUTH WALES

2000 and Beyond BBS

Sysop: Greg Kuhnert
Phone: (02) 522-6514
Baud: V21 V22 V22bis V23 B212
Access: Mem Reg LVA
Computer: System One
DOS: CP/M
BBSoftware: TBBS

3M Australia Pty Ltd

Sysop: Graham Stair
Phone: (02) 498-9184
FIDOnet: 3:711/409
Baud: V21 V22 V22bis B103 B212
Access: Public
Hours: Weekdays: 1900 – 0700
Weekends: 24 Hours
Computer: IBM PS/2 Model 70
DOS: PC DOS
BBSoftware: Opus
A Southern Rendezvous
Sysop: Kevin Withnall

Phone: (042) 26-3382
FIDOnet: 3:712/206
Baud: V22 V22bis B103
Access: Reg LVA
Computer: Leading Edge
DOS: PC DOS
BBSoftware: Opus

ABCOM-dataLINK
Sysop: Ben Sharif
Phone: (047) 36-4165
FIDOnet: 3:713/304
Baud: V21 V22 V22bis V23
Access: Mem Reg VA
Computer: IBM AT Clone
DOS: PC DOS
BBSoftware: QuickBBS

ACE (NSW) BBS
Sysop: Larry O'Keefe
Phone: (02) 529-2059
Baud: V21
Access: Mem Reg LVA
Computer: Atari
DOS: Atari
BBSoftware: Michtron

Aftermath BBS
Sysop: Ron & Andrew Clark
Phone: (02) 872-5520

NATIONAL BBS LIST

FIDOnet: 3:711/804
Baud: V21 V22 V22bis V23
Access: Reg VA
Computer: Amstrad 1640
DOS: MS DOS
BBSSoftware: GTPower

AmigaMan

Sysop: Ron Carruthers
Phone: (047) 58-8006
Baud: V21 V22 V22bis V23
Access: Mem Reg LVA
Computer: Amiga 1000
DOS: AmigaDOS
BBSSoftware: BBS-PC!

Amstrad ABBS

Sysop: Riccay Schmahl
Phone: (02) 981-2966
FIDOnet: 3:714/904
Baud: V21 V22 V22bis V23
Access: Reg VA
Computer: Supercom 386
DOS: MS DOS
BBSSoftware: Opus

Apolloine BBS

Sysop: Richard Heppell
Phone: (02) 869-8349
Baud: V21 V22 V22bis V23
Access: Mem Reg VA
Computer: Macintosh
DOS: HFS
BBSSoftware: Red Ryder Host

Apple Users Group - Apple // BBS

Sysop: Cameron Brawn
Phone: (02) 449-7798
Baud: V21 V22 V22bis V23
Access: Mem LVA
Computer: Apple //e
DOS: ProDOS
BBSSoftware: Proboard //

Apple Users Group - MAC BBS

Sysop: Bruce Stanley
Phone: (02) 498-7084
Baud: V21 V22 V22bis V23
Access: Mem LVA
Computer: Macintosh
DOS: HFS
BBSSoftware: Red Ryder Host

AUGUR TBBS

Sysop: Mark James
Phone: (02) 311-3052
FIDOnet: 3:712/302
Baud: V22 V22bis V23
Access: Reg VA
Computer: IBM XT Clone
DOS: PC DOS
BBSSoftware: TBBS

Australian Pick User's BBS

Sysop: Kurt Johannessen
Phone: (02) 631-8603
FIDOnet: 3:713/610
Baud: V21 V22 V22bis HST
Access: Reg VA
DOS: MS DOS
BBSSoftware: PCBoard

BAD NEWS travels fast

Sysop: James Stevenson
Phone: (02) 540-1879

Baud: V21 V22 V22bis V23
Access: Reg VA
Computer: IBM XT
DOS: MS DOS
BBSSoftware: Opus

Beauford BBS

Sysop: Roger Cooper
Phone: (047) 58-6542
Baud: V21 V22 V22bis V23
Access: Public
Computer: IBM XT Clone
BBSSoftware: QuickBBS

Bill's BBS

Sysop: Bill Mastro
Phone: (049) 62-2044
Baud: V21 V22 V23
Access: Reg

DOS: MS DOS
BBSSoftware: QuickBBS

Club-80 RTRS

Sysop: Michael Cooper
Phone: (02) 332-2494
Baud: V21 V22 V22bis V23 B103 B212
Access: Mem VA
Computer: TRS80 Model 4
DOS: LDOS

Coastal Communications

Sysop: Chris Patten
Phone: (02) 977-6869
FIDOnet: 3:714/906
Baud: V21 V22 V22bis V23
BBSSoftware: QuickBBS

Complete BBS Registry listing

Starting this month, we will be publishing the complete listing for the ACT and New South Wales in July, October, January and April; the listing for Victoria, Tasmania and the Northern Territory will be published in August, November, February and May; South Australia, Western Australia and Queensland in September, December, June and March.

Computer: Apple //E Clone
DOS: ProDOS
BBSSoftware: GBBS Pro

Blackboard BBS
Sysop: Will Black & Shane Anderson
Phone: (02) 525-6970
Baud: V21 V22 V22bis V23 B103 B212

Access: Reg VA
Computer: Amiga 500
DOS: AmigaDOS
BBSSoftware: BBS-PC!

Books BBS

Sysop: Ion Ruwolt & Chris Ruwoldt
Phone: (02) 281-4791
Baud: V21 V22 V22bis V23
Computer: IBM XT Clone
DOS: MS DOS
BBSSoftware: Opus

Cavity

Sysop: Don Cunningham
Phone: (02) 606-9687
FIDOnet: 3:713/611
Baud: V21 V22 V22bis
Access: Mem Reg VA
Computer: Profound XT Turbo
DOS: MS DOS
BBSSoftware: QuickBBS

Club Amiga BBS

Sysop: Ross Kellaway
Phone: (02) 521-6338
FIDOnet: 3:712/511
Baud: V21 V22 V22bis V23
Access: Mem VA
Computer: IBM XT Clone

Coastal Opus BBS

Sysop: Kevin Mann
Phone: (043) 23-2275
FIDOnet: 3:711/430
Baud: V22 V22bis V23 PEP
Access: Reg VA
Computer: IBM AT Clone
DOS: MS DOS
BBSSoftware: Opus

Comet C-64 BBS
Sysop: Eric Davis
Phone: (02) 599-7342
Baud: V21 V23
Access: Mem VA
Computer: C-64
BBSSoftware: Comet
Note: Requires UltraTerm or Palette on C-64

Commodore 64 and Amiga BBS

Sysop: Paul Bourke and Graham Lee
Phone: (02) 664-2334
FIDOnet: 3:712/629
Baud: V21 V22 V23
Access: Mem VA
Computer: IBM XT Clone
DOS: MS DOS
BBSSoftware: QuickBBS

Commodore Pursuit TBBS

Sysop: Warren Hillsdon
Phone: (02) 522-9507
FIDOnet: 3:712/512
Baud: V21 V22 V22bis V23
Access: Mem VA
Computer: IBM AT Clone
DOS: MS DOS
BBSSoftware: TBBS

Computrol

Sysop: Robert Spence
Phone: (02) 489-6848
GTnet: 036/004
Baud: V21 V22 V22bis V23 B103 B212
Access: Reg
Computer: IBM XT Clone
DOS: MS DOS
BBSSoftware: GTPower

Contact BBS
Sysop: Peter Hall
Phone: (02) 798-6368
FIDOnet: 3:712/709
Baud: V21 V22 V22bis V23
Access: Mem LVA
Computer: IBM XT
DOS: MS DOS
BBSSoftware: QuickBBS

CSACE BBS

Sysop: Larry O'Keefe
Phone: (02) 529-8249
Baud: V21
Access: Mem LVA
Computer: Atari 800
DOS: Atari
BBSSoftware: AMIS V 36
Note: Atari protocol only, logon delayed by answering machine for 30 sec then BBS

Cursor Contact Amiga BBS

Sysop: Greg Minahan
Phone: (02) 637-8131
Baud: V21 V22 V23
Access: Reg LVA
Hours: Daily: 2100 - 0800
Computer: Amiga 500
DOS: AmigaDOS
BBSSoftware: BBS-PC!

Cybersoft Opus

Sysop: Heath Rogers
Phone: (02) 212-2261
FIDOnet: 3:712/202
Baud: V21 V22 V22bis V23
Access: Reg LVA
Computer: IBM XT
DOS: PC DOS
BBSSoftware: Opus

Delta Net

Sysop: Geoff Arthur
Phone: (02) 457-8281
FIDOnet: 3:711/415
Baud: V21 V22 V22bis V23
Access: Reg
BBSSoftware: QuickBBS

Dick Smith Electronics BBS

Phone: (02) 887-2276
Baud: V21 V22
Access: Reg
Computer: Multitech PC-500
DOS: MS DOS
BBSSoftware: Opus

Down Under KBBS

Sysop: Glen Myles
Phone: (02) 674-6647
Baud: V21
Access: Mem VA

NATIONAL BBS LIST

- Computer:** C-64
BBSSoftware: KBBS
Eagle One BBS
Sysop: Terry Harvey
Phone: (02) 745-3190
FIDOnet: 3:712/704
Baud: V21 V22 V22bis V23
Access: Reg LVA
Computer: IBM AT Clone
DOS: MS DOS
BBSSoftware: Opus
Edlink BBS
Sysop: Craig Sinclair
Phone: (02) 232-5584
Baud: V21 V22 V22bis V23
Access: Reg LVA
Computer: IBM XT Clone
DOS: MS DOS
BBSSoftware: Opus
Excalibur
Sysop: Kevin Scott
Phone: (02) 896-1063
Baud: V21 V22 V22bis V23 B103 B212
Access: Mem VA
Computer: C-64
BBSSoftware: Punter
Food For Thought
Sysop: Steve Thompson
Phone: (02) 683-6093
GTnet: 036/006
Baud: V21 V22 V22bis V23
Access: Public
Computer: IBM AT Clone
DOS: MS DOS
BBSSoftware: GTPower
Helping Hand
Sysop: Dave Hatch
Phone: (02) 872-3571
FIDOnet: 3:711/807
Baud: V22 V22bis PEP
Access: Reg VA
Computer: AT Clone
DOS: PC DOS
BBSSoftware: Opus
HighTech
Sysop: Ross Wheeler
Phone: (060) 25-1813
FIDOnet: 3:712/201
Baud: V21 V22 V22bis V23 B103 B212 PEP
Access: Reg LVA
Computer: IBM AT Clone
DOS: PC DOS
BBSSoftware: Opus
Illawarra C-64 BBS
Sysop: John Simon
Phone: (042) 61-8230
Baud: V21
Access: Reg VA
Computer: C-64
BBSSoftware: KBBS
Imagineering BBS
Sysop: Mark Livingstone
Phone: (02) 697-8599
FIDOnet: 3:712/626
Baud: V21 V22 V22bis V23
Access: Reg LVA
Computer: Ultra AT
DOS: MS DOS
BBSSoftware: Opus
Infocom Computer Systems BBS
Sysop: Lance Lyon
Phone: (02) 261-3004
Baud: V21 V22 V23
Access: Public
Hours: Daily: 1800 - 0900
Computer: Amstrad PPC512
DOS: MS DOS
BBSSoftware: BBS-PC!
Integra TEX
Sysop: Kevin Leong
Phone: (02) 746-1109
FIDOnet: 3:712/703
Baud: V21 V22 V22bis V23
Access: Public
Computer: IBM AT Clone
DOS: PC DOS
BBSSoftware: QuickBBS
Intersoft BBS
Sysop: Craig Heading
Phone: (02) 476-2391
FIDOnet: 3:711/411
Baud: V22 V22bis
Access: Mem Reg LVA
Computer: Tandy 2000
DOS: MS DOS
BBSSoftware: Opus
J & M's TBBS
Sysop: John Kelly
Phone: (02) 646-5573
FIDOnet: 3:712/625
Baud: V21 V22 V22bis
Access: Reg LVA
Computer: IBM XT Clone
DOS: MS DOS
BBSSoftware: TBBS
K.K.K BBS
Sysop: Jim Lynch
Phone: (02) 418-6005
FIDOnet: 3:711/416
Baud: V21 V22 V22bis V23
Access: Reg
BBSSoftware: TBBS
Konektion Business Link
Sysop: Robert Earle
Phone: (02) 906-1354
FIDOnet: 3:711/410
Baud: V22 V22bis
Access: Reg VA
Computer: IBM XT Clone
DOS: PC DOS
BBSSoftware: Opus
Lodestone BBS
Sysop: Ian McWhirter
Phone: (02) 456-3264
FIDOnet: 3:711/407
Baud: V22 V22bis B103
Access: Reg
Computer: IBM XT Clone
DOS: MS DOS
BBSSoftware: Opus
Macarthur BBS
Sysop: Peter Degotardi
Phone: (046) 28-1499
Baud: V21 V22 V22bis V23
Access: Public
Computer: Osborne XT
DOS: MS DOS
BBSSoftware: Opus
Mail Dispatch
Sysop: Matthew Wood & Andrew Avery
Phone: (02) 969-5861
FIDOnet: 3:711/905
Baud: V21 V22 V22bis V23
Access: Mem Reg
Hours: Daily: 1600 - 0700
Computer: IBM XT Clone
DOS: MS DOS
BBSSoftware: QuickBBS
Manly BBS
Sysop: Chris Patten
Phone: (02) 977-6820
Baud: V21 V22 V23
Access: Reg VA
Note: Requires Ultraterm or Pal-ette on C-64
Micro Design Lab
Sysop: Kevin Lowton & Lindsay Gorrie
Phone: (02) 663-0151
Baud: V21
Access: Reg VA
MicroBASE BBS
Sysop: Dave Whiteman
Phone: (047) 35-2415
FIDOnet: 3:713/305
Baud: V21 V22 V22bis V23
Access: Mem VA
Computer: IBM XT Clone
DOS: MS DOS
BBSSoftware: QuickBBS
Milliway's
Sysop: David Coucke
Phone: (02) 357-7027
FIDOnet: 3:712/306
Baud: V21 V22 V22bis V23 B103 B212
Access: Mem Reg VA
Computer: Amiga 1000
DOS: AmigaDOS
BBSSoftware: QuickBBS
Moebius Trip
Sysop: David Butler
Phone: (02) 439-7072
FIDOnet: 3:711/408
Access: Mem VA
Multicomm Amiga BBS
Sysop: Richard Duffy
Phone: (02) 771-6351
Baud: V22 V22bis B103 B212
Access: Mem LVA
Computer: Amiga 1000
DOS: Amiga
BBSSoftware: BBS-PC!
New Frontiers CBBS
Sysop: Howard Pew
Phone: (046) 25-6954
FIDOnet: 3:713/613
Baud: V22 V22bis B103 B212 PEP
Access: Reg VA
Computer: IBM XT Clone
DOS: PC DOS
BBSSoftware: Opus
Newcastle Amiga TBBS
Sysop: Stan White
Phone: (049) 58-7350
FIDOnet: 3:711/490
Baud: V21 V22 V22bis V23
Access: Mem VA
Computer: IBM AT Clone
DOS: MS DOS
BBSSoftware: TBBS
Newcastle Micro Club RCPM
Sysop: Tony Nicholson
Phone: (049) 68-5289
Baud: V21 V22 V23
Access: Mem VA
Hours: Weekdays: 1700 - 0830
Weekends: 24 Hours
Computer: Ferguson Big Board
DOS: CP/M80+
BBSSoftware: ROS
Nightmare BBS
Sysop: Todd Wright
Phone: (02) 545-1132
FIDOnet: 3:712/503
Baud: V21 V22 V22bis V23
Access: Mem
Computer: FTC 1600XT
DOS: PC DOS
BBSSoftware: Opus
Omega Board BBS
Sysop: Paul Speirs
Phone: (02) 792-1526
Baud: V21 V22 V22bis V23 B103 B212
Access: Reg
Computer: IBM AT
DOS: PC DOS
BBSSoftware: QuickBBS
Opus Info Under
Sysop: Bill Bolton
Phone: (02) 449-2618
FIDOnet: 3:3/113
Baud: V22 V22bis PEP
Access: File Server
Note: Software support system for FidoNet
SysOps - File Request ONLY
Outdoors Education
Sysop: Mel Lee
Phone: (046) 66-9881
Baud: V21 V22 V22bis
Access: Reg VA
Computer: IBM AT Clone
DOS: MS DOS
BBSSoftware: GTPower
Palantir C-64 BBS
Sysop: Steve Sharp
Phone: (060) 40-1284
Baud: V21 V22 V22bis V23 B103 B212
Access: Reg VA
BBSSoftware: Punter
Pandemonium Programmers BBS
Sysop: Mark Farnan
Phone: (02) 411-7642
FIDOnet: 3:711/414

NATIONAL BBS LIST

Baud: V21 V22 V22bis V23 B103 B212
Access: Mem Reg VA
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: Opus

Paragon Bulletin Board

Sysop: Jennifer Allen
Phone: (02) 597-7477
FIDOnet: 3:712/502
Baud: V21 V22 V22bis V23
Access: Reg VA
BBSoftware: TBBS

PC Users Group – IBM Board

Sysop: John Clarke
Phone: (02) 724-6813
Baud: V21 V22 V22bis V23
Access: Reg LVA
Computer: IBM AT
DOS: PC DOS
BBSoftware: Opus

PC Users Group – Microcomp Board

Sysop: Bruce Edney
Phone: (02) 540-1842
FIDOnet: 3:712/505
Baud: V21 V22 V22bis V23
Access: Mem Reg VA
Computer: IBM PC
DOS: PC DOS
BBSoftware: Opus

Phantomland Connection BBS

Sysop: Bob James
Phone: (02) 399-7716
FIDOnet: 3:712/311
Baud: V21 V22 V22bis V23
Access: Reg VA
Computer: Atari PC3
DOS: MS DOS
BBSoftware: QuickBBS

Playground BBS

Sysop: Brett Selwood
Phone: (02) 534-6944
FIDOnet: 3:712/504
Baud: V21 V22 V22bis V23 PEP
Access: Mem Reg LVA
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: Opus

Poet's Dilemma

Sysop: John Della-Torre
Phone: (02) 804-6412
GTnet: 036/000
Baud: V22 V22bis HST
Access: Public
Computer: IBM AT
DOS: PC DOS
BBSoftware: GTPower

Prophet TBBS

Sysop: Larry Lewis
Phone: (02) 628-5222
FIDOnet: 3:713/600
Baud: V21 V22 V22bis V23
Access: Mem Reg VA
Computer: IBM AT Clone
DOS: PC DOS
BBSoftware: TBBS

RCOM C-64 BBS

Sysop: Simon Finch
Phone: (02) 667-1930
Baud: V21 V22 V23 V23ORG B103 B212
Access: Reg VA
Computer: C-64
BBSoftware: RCOM
Note: Requires UlatraTerm or Palette on C-64

Riverina BBS

Sysop: Craig Sinclair

BBSoftware: Opus

Shortwave Possums

Sysop: Patrick McDonald
Phone: (02) 651-3055
FIDOnet: 3:713/605
Baud: V21 V22 V22bis
Access: Public
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: Opus
Silicon City
Sysop: Ted Harrison

Computer: Sharp 7501 AT

DOS: PC DOS
BBSoftware: Opus
Sorcerer Users Group
Sysop: John Cepak
Phone: (02) 626-8020
FIDOnet: 3:713/607
Baud: V22 V22bis B103
Access: Mem VA
BBSoftware: Opus

Sorcim microS

Sysop: John Caine
Phone: (065) 59-4537
FIDOnet: 3:711/405
Baud: V21 V22 V22bis V23 PEP
Access: Reg
Hours: Daily: 2100 – 0800
BBSoftware: Lynx

Statesman

Sysop: Michael Gayford
Phone: (047) 33-1010
FIDOnet: 3:713/307
Baud: V22 V22bis B103 PEP
Access: Public
Computer: IBM XT Clone
DOS: PC DOS
BBSoftware: QuickBBS

Sydney CAE BBS

Sysop: Geoff Shearsby
Phone: (02) 660-8272
FIDOnet: 3:712/628
Baud: V21 V22 V22bis
Access: Reg LVA
Computer: IBM XT
DOS: PC DOS
BBSoftware: Opus

Sydney Information Xchange

Sysop: Lawrence Gould
Phone: (02) 519-6681
Baud: V22 V22bis
Access: Reg VA
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: GTPower

Tachyonics

Sysop: Richard Lenz
Phone: (02) 438-2682
Baud: V21 V22
Access: Reg VA
BBSoftware: Fido

Tech Exchange

Sysop: Chris Moran
Phone: (02) 712-2282
FIDOnet: 3:712/708
Baud: V21 V22 V22bis V23
Access: Reg LVA
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: Opus

TeleInfo Australia

Sysop: Ross Delaforce
Phone: (02) 975-1099
FIDOnet: 3:714/407
Baud: V21 V22 V22bis V23 B103 B212
Access: Mem VA
Computer: AMI 386
BBSoftware: TBBS

*The name of the Registry that
maintains the Bulletin Board listings
is now the Australian Bulletin
Board System Registry, or BBS
Registry for short.*

Phone: (069) 67-2277
FIDOnet: 3:712/420
Baud: V21 V22 V22bis V23
Access: Reg LVA
Hours: Daily: 2000 – 0800
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: Opus

rti's Pinkboard

Sysop: Laurence Singer
Phone: (02) 810-7196
Baud: V21 V22 V22bis V23
Access: Mem VA
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: Opus

RUNIX

Sysop: Mark Webster
Phone: (02) 487-2533
Baud: V21 V22 V22bis V23
Access: Mem LVA
Computer: PDP11/73
DOS: Xenix

SBA BBS

Sysop: Bob Wilson
Phone: (02) 411-1850
FIDOnet: 3:711/406
Baud: V22 V22bis PEP
Access: Reg LVA
Computer: IBM AT
DOS: PC DOS
BBSoftware: Opus
Note: Business Users Only
between 0600 – 1800.

Sentry

Sysop: Trev Roydhouse
Phone: (02) 428-4687
FIDOnet: 3:711/401
Baud: V21 V22 V22bis V23
Access: Mem VA
Computer: IBM AT Clone

Phone: (02) 713-7891
FIDOnet: 3:712/705
Baud: V21 V22 V22bis V23
Access: Public
Computer: Ultra AT
DOS: MS DOS
BBSoftware: Opus

Small Business

Sysop: Geoff Bilborough
Phone: (049) 50-4211
FIDOnet: 3:711/491
Baud: V21 V22 V22bis V23
Access: Public
Computer: IBM AT Clone
DOS: MS DOS
BBSoftware: QuickBBS

SMUG Opus

Sysop: Stephen Thompson
Phone: (02) 476-6396
FIDOnet: 3:711/417
Baud: V21 V22 V22bis V23
Access: Mem Reg VA
Computer: IBM XT Clone
DOS: MS DOS
BBSoftware: Opus

Software Connection

Sysop: Graeme Nichols
Phone: (02) 975-1006
FIDOnet: 3:714/404
Baud: V21 V22 V22bis V23 B103 B212
Access: Reg VA
Computer: IBM XT Clone
DOS: PC DOS
BBSoftware: Opus

Software Tools

Sysop: Bill Bolton
Phone: (02) 449-9477
FIDOnet: 3:711/403
Baud: V22bis PEP
Access: Reg VA

NATIONAL BBS LIST

Tesseract RCPM+
 Sysop: Scott MacDonald
 Phone: (02) 681-5716
 Baud: V21 V22 V22bis V23
 Access: Mem VA
 Computer: Collex
 DOS: CP/M+
 BBSSoftware: RBBS
Texpac Electronic Magazine
 Phone: (02) 319-1009
 Access: Mem

The Black Hole
 Sysop: Ken Thompson
 Phone: (02) 819-6971
 GTnet: 036/003
 Baud: V21 V22 V22bis V23 B103 B212
 Access: Mem Reg LVA
 Computer: IBM AT Clone
 DOS: MS DOS
 BBSSoftware: GTPower

The Commodore Spot
 Sysop: Chalk
 Phone: (02) 759-4879
 Baud: V21

Access: Reg VA
 Computer: C-64
 BBSSoftware: KBBS
The Ivory Tower
 Sysop: Colin Leslie
 Phone: (02) 668-8021
 FIDOnet: 3:712/624
 Baud: V21 V22 V22bis V23 B103 B212
 Access: Public
 Computer: IBM XT Clone
 DOS: MS DOS
 BBSSoftware: Opus

The Lost Tavern
 Sysop: Sean Murphy
 Phone: (02) 938-6836
 FIDOnet: 3:714/902
 Baud: V21 V22 V22bis V23
 Computer: Blue Chip PC/XT
 DOS: PC DOS
 BBSSoftware: Opus

The Runway
 Sysop: Colin Lean
 Phone: (02) 569-5130
 FIDOnet: 3:712/506
 Baud: V22bis B103 B212 PEP
 Access: Public
 Computer: IBM XT
 DOS: PC DOS
 BBSSoftware: Opus

The Twilight Zone
 Sysop: The Mystic Machine
 Phone: (065) 72-3970
 Baud: V21 V22 V23
 Access: Reg LVA
 Hours: Weekdays: 2100 - 0600
 Weekends: 24 Hours
 Computer: Apple //e
 DOS: ProDOS
 BBSSoftware: GBBS Pro
TNT Shuttle
 Sysop: Chris Gallaher

Phone: (02) 319-3112
 Baud: V21 V22 V22bis V23 B103 B212
 Access: Reg LVA
 Computer: IBM System/2
 DOS: OS2 (???)
 BBSSoftware: RBBS V151a

Trantor
 Sysop: Matthew Geier
 Phone: (02) 543-6899
 Baud: V21 V22 V22bis B103 B212
 Computer: MicroBee
 DOS: CP/M
 BBSSoftware: ROS
 Note: RINGBACK

Triops BBS
 Sysop: Pdisk
 Phone: (063) 62-9715
 Baud: V21 V22 V23
 Access: Public
 Hours: Daily: 2100 - 1800
 Computer: C-128
 BBSSoftware: KBBS

Ultimate-10 : The Ultimate BBS

Sysop: Ben Woo
 Phone: (02) 484-4004
 FIDOnet: 3:711/802
 Baud: V21 V22 V22bis B103 B212
 Access: Reg LVA
 Computer: Super-10 XT
 DOS: MS DOS
 BBSSoftware: Opus

Ventura Publisher BBS
 Phone: (02) 449-0463
 Baud: V21 V22 V22bis
 Access: Reg
 Note: Access for registered Ventura users ONLY

Wollongong Amiga BBS
 Sysop: Peter Nicholson
 Phone: (042) 27-3927
 Baud: V21 V22 V22bis
 Access: Reg VA
 Hours: Weekdays: 1730 - 0800
 Weekends: 24 Hours
 Computer: Amiga 2000
 DOS: AmigaDOS
 BBSSoftware: BBS-PC!

YABB
 Sysop: Jonathan Chin
 Phone: (02) 804-6837
 FIDOnet: 3:711/803
 Baud: V21 V22 V22bis V23 B103 B212
 Access: Reg VA
 Computer: IBM XT Clone
 DOS: MS DOS
 BBSSoftware: TBBS

Zeta
 Sysop: Nick Andrew
 Phone: (02) 627-4177
 FIDOnet: 3:713/602
 Baud: V21 V22 V22bis V23 B103 B212
 Access: Mem VA
 Computer: TRS-80
 DOS: NEWDOS 80



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Why buy a IIGS?

I WAS RECENTLY asked the question: 'Why should I buy a IIGS, instead of a ***?' While I have no shares in Apple, it occurred to me that maybe it is timely to look at reasons for buying a IIGS in the first place, rather than pushing ahead with the latest on the new product front. Feedback from readers has indicated that this column is also read by those researching the possibility of buying a IIGS, so perhaps this month's offering will be useful to these readers.

The IIGS history

WHEN APPLE designed the IIGS, they decided to follow the path that has always worked – upwards compatibility from previous models. To this end, the IIGS can emulate any of the two series Apples, and even retains the slots that made its ancestors so popular with hackers and experimenters. But to compete with the sophistication of the Amiga, the Atari and other such computers, Apple took many of the features of the Mac and incorporated these into the IIGS. Unlike the Mac, colour was implemented from the start, and for the musically inclined, a fully blown synthesiser IC was also incorporated, alas without a MIDI port.

Today, some two years or so after its introduction, the IIGS has still not really established an identity. It is still regarded by many as a super Ile, but with Mac characteristics. Having owned a IIGS for nearly two years, I can assure you I run very little Ile software, as the IIGS software is just so much better. However, all my old data disks are still accessible, and the kids can enjoy the many games they have collected over the years, but now enhanced with colour.

But, for many home users an IBM (or compatible) is often seen as having the greatest crunch per dollar, and the availability of hardware and software at quite low prices for this machine makes it hard to beat. Still, one aspect of the IBM genre that is often overlooked is its user unfriendliness. In fact, the whole IBM story is one filled with enough variations to confuse the most literate of computer liter-

ates. Here's a summary of some of these to illustrate my point.

The IBM saga

THERE ARE various models of IBMs (you know I also mean compatibles as well), including the PC, XT, JX, AT and the PS/2. There is some compatibility between all the models, but it's not absolute. And not all compatibles are 100 per cent compatible with the IBM standard as well, including how fast the computer can run. Turbo models abound, although some software and hardware devices get confused if the speed is too high.

Apple have clearly aimed the IIGS at those who want a computer that is friendly and non-technical in use.

Then there are the disk drive variations. You can have a 360K, 5¼ inch drive (with different numbers of sectors per track as per the software), or a dual 1.2Mb/360K 5¼ inch drive. It is not always possible to use such a drive to read a 360K disk, and a standard 360K drive certainly can't read a 1.2Mb disk. If you like 3½ inch disks, you can fit either a 720K drive, or a dual 720K/1.4Mb unit. Decisions, decisions!

Then there are various screen displays, ranging from Hercules (not a standard, though very popular) to CGA, EGA, VGA and so on. This introduces dual and even triple function drive cards and monitors. Then there are various types of mouse, many of which have three buttons, and all of which need their own driver routine that has to be installed at boot-up. And of course, there are the variations available for the keyboard, mostly comprising third-party equivalents of the XT or AT-style keyboards.

Putting this all together, the IBM is an experimenter's dream, and a beginner's nightmare. Unless you know someone who understands the system, an IBM as a home computer can be a major hassle. And the final cost if you go for EGA and a 20Mb hard disk is probably around the \$3000 mark as well, not far short of a IIGS.

Software for the IBM is very plentiful, and a lot of it is excellent, if sometimes a bit difficult to get going in the first place. But much of the software is for commercial applications, and usually is an overkill for the domestic situation. Peripherals such as printers and monitors are equally as plentiful, providing you know how to install them into your software, but it is all very complex, believe me!

The Apple story

APPLE HAS often been criticised for keeping its products to itself. For example, a IIGS is designed to run only with its own colour monitor, its own mouse and can only use Apple type disk drives. These devices are usually more expensive than their equivalents for the IBM, but you can always be sure they are absolutely compatible. And that's the reason for Apple's thinking. This philosophy was cemented with the Mac, and has been retained with the IIGS.

However, unlike the Mac, the IIGS has expansion slots, and already a range of cards for the IIGS are filtering through. These third-party cards often contest the Apple product, or even break new ground. Although there may be differences in standards between the products, they are unlikely to be significant. And another reason Apple have kept their products to themselves is to keep the quality up. The IIGS colour monitor is excellent quality, and allows the full capability of the computer to be displayed. Similarly, the Apple disk drives are well made, with as much user-friendliness built in as possible. The mouse has one button, and the driver software is integral with the firmware supplied with the computer.

The end result, however, is a computer that experimenters can play with, (with

some difficulty, I must admit), but that is essentially a friendly machine intended for the home user.

IIGS software`

THE SUCCESS of a computer is with its software, and it is still early days as far as the IIGS is concerned. In general, though, IIGS software is much more sophisticated than it first appears, but usually easy to learn. The common characteristic of most IIGS software is its use of the preferred Apple format. The idea is to make each package operate in a similar manner, meaning users can quickly learn a new program. For example, a music program will not be vastly different to a word processor, except one deals with notes, the other with text. This concept comes directly from the Mac stable, and is a feature found on no other brand of computer.

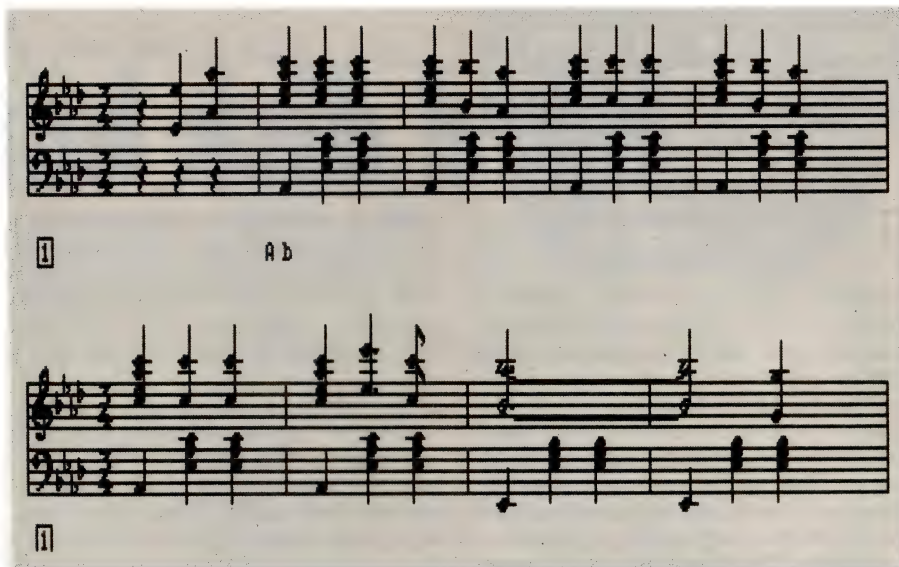
So far, software for the IIGS includes a range of word processing programs, all of which are fairly similar, a number of paint-type programs, again similar in features, music applications, games and graphic-based software. The most sophisticated package so far produced is undoubtedly AppleWorks GS, which contains six applications in the one package. Unfortunately, we are all waiting anxiously for version 2.

There are also 'learn to type' programs, databases, communications software, copy programs, utilities and other miscellaneous applications. In short, there is no lack of software, all of which is reasonably priced. For example, a typical word processor will cost around \$150 or so, while games usually only run to the \$60 mark.

Apple have clearly aimed the IIGS at those who want a computer that is friendly and non-technical in use. Experimenters are not entirely left out, but the kids will be able to sit down with a IIGS and not feel overwhelmed by its operating system. The IIGS is a home computer and the software currently available is intended for home, small business or education use.

Apple have a dealer network all over the country, thereby providing a support service that caters for breakdowns, hassles with software, advice and, of course, sales. The concept is simple; produce a computer that is user friendly and provide support for it if needed. Admittedly, the up front cost is higher than other similar computers, but it's nice to know you aren't left to your own devices if things go wrong.

The IIGS is therefore a likely choice by those either needing upwards compatibility with existing Apple software, or for



This printout is from Music Studio version 2 – it's interesting for two reasons: first, it was printed out on my Epson printer via the LQ interface described last month, and, second, is that I put the music into the computer by way of a MIDI keyboard via an Apple MIDI interface; the program then wrote the score and added the bar lines automatically. Note: make sure you select 'Your Card' for slot 2 when you use the MIDI interface, and have everything connected and powered up (keyboard and MIDI interface) before you boot the program.

those wanting a Mac, but at a lesser price. To get colour with a Mac will cost far more than domestic users can justify, and even a monochrome version is dearer.

The bad points

ALL COMPUTERS have their deficiencies, and the IIGS has its share of these. The most obvious thing against a IIGS is its price. However, I firmly believe that when the whole thing is taken into context, and the unremitting support of Apple is considered as well, the cost is not so bad.

The speed of the IIGS is often cited as being slow, although an IBM XT is probably no faster. One reason for the slower speed is the high use of graphics, which always slows things down. However, text-based software, such as AppleWorks, runs like greased lightning, and most programs are fast enough anyway.

The need to stick with Apple peripherals, with their usual high price tag has always been a bone of contention with me. For example, the only printer type supported by the IIGS is the ImageWriter series, and these are not cheap. However, regular readers will know that third party extras for the IIGS are becoming available, and I now run my system with an Epson printer fitted with an ImageWriter LQ

adapter (costs around \$125), and a CMS hard disk rather than an Apple type. Memory expansion kits, modems, MIDI interfaces and the like are now becoming available, as many of these will also work with a Mac. So Apple won't always have it to themselves.

My reasons for a IIGS

APART FROM the compatibility with existing Apple software, I purchased a IIGS for its musical capabilities. But I also use the IIGS for all sorts of other things as well, despite owning an IBM AT into the bargain. The IBM takes care of all my professional needs, for which it is admirably suited.

However, the IIGS belongs to the family, and is used when the kids need support for school projects or when a letter must be written, on our own letterhead of course – courtesy of Print Shop. The educational packages, games, learn-to-type programs, the database and word processor all get a good work out, and I know that the family can all use the computer without any problems. So, for me, the IIGS was an obvious choice, and one I've never regretted, and I can assure you the Apple 'magic' hasn't died, it has just grown up a bit. □



Hard disk horrors

THIS MONTH WOULD seem to be a good time to tell you a story. The story is about how I narrowly escaped a total nervous collapse and possible suicide due to the trauma of trying to install an auto-booting hard disk drive into an Amiga 2000. It begins with the victim, me, surveying the available hard disk drives and controllers. Looking through American magazines like *Amiga World*, *Amazing Computing* and *Byte* can be really depressing; the range of goodies is enormous and the prices are all within reach.

However, the first rude shock comes when you approach a local distributor and ask for the Australian price. For example, product X, with an American list price of \$1199 is advertised in America at \$999, the exchange rate is AU\$1 to US\$0.80, but the Australian advertised price is \$1999. Something just doesn't add up there. Much groveling to bank managers and credit purveyors follows. I bravely set off and purchase a 45-megabyte Rodime hard drive and a Commodore 2090A controller card. Sales staff, while casually picking bark out from under their fingernails, assure me that all will be well and installation is a breeze. Big mistake number one – never believe anything sales staff tell you!

My Amiga 2000 was safely out of warranty so I bravely undid the appropriate screws and remove the top cover. I take great precautions to work in a static-free environment. Carefully, I remove the tray carrying the floppy drives, remove the hard drive from its padded box and protective bag, and insert it into the mounting frame. Needless to say it doesn't fit correctly. If the mounting holes are lined up with those on the frame, the drive sits two centimetres too low.

Hours later I have constructed adapters from some sheet metal to support the drive securely in the correct place. The instructions say: 'Replace tray with floppies and secure. Remove 2090A controller card from its protective bag and mount it into the first expansion slot in the 2000.' It fits beautifully. Big mistake number two – I forgot Murphy's law which says 'If it fits perfectly, you've done it wrong.'

The 'wrong' in this case was the connecting cable between the drive and the controller card. What cable? There is no

cable supplied with the controller, nor is one supplied with the drive. Remember those simian sales staff? They knew! Nice one, guys. An important lesson learned – whenever sales staff assure you that something will be easy, ask them what is missing.

Several hours later, following a phone call to the supplier and a long drive there and back to collect a 50-way SCSI cable, I have the devices installed and connected. Big test time – a final check of all connections, and power on. Bravo! No smoke. My

They must be the only books I know of which work in reverse. After you've finished reading them you know less than when you started.

grandfather used to tell me that if there's no smoke, you're half way there. Power off again. Now is the time to take a break from the hardware and study the software installation instructions. More hours pass.

Documentation

HAVE YOU ever read a Commodore manual? Interesting isn't it. They must be the only books I know of which work in reverse. After you've finished reading them you know less than when you started. The 2090 Controller manual is no exception. Note that I said 2090 manual. There is no reference in the manual to the autoboot capability of the 2090A controller.

Being a cunning sort of guy I decided to include a thorough read of the Workbench 1.3 documentation, especially appendix A which refers to the 2090A in particular. Unfortunately, the text in this area does not spell out any special actions necessary to get auto-boot to work. Much later I was informed by a very helpful chap from

Commodore technical support in Sydney that no special actions are needed. The manual doesn't say that. If it did say so I could have saved hours and hours of frustration.

Now for the software installation. I fire up the computer and load a known and tested Workbench 1.3 disk. Into the second floppy drive I load the 2090 controller software disk. I select the INSTALL icon from the controller software window. The INSTALL process automatically copies the PREP file into my Workbench's C directory and adds items to the DEVS/MOUNTLIST file. At this point I interrupt the process to check the mountlist items.

The two-cylinder reserved space – RES2: in the case of a SCSI drive – and any partitions you wish to add in excess of the standard one, must be included in the mountlist. There are problems with such details as number of sectors per track, number of surfaces and total number of cylinders on the device as the drive had no documentation included with it.

A phone call to the banana munchers at the dealership established that the drive has 872 cylinders, 6 surfaces and 17 sectors per track. That was easy, wasn't it. Too easy? Warning signals start ringing in the brain and paranoia sets in. Just to be on the safe side I'll phone the importer/distributor of the drive, in Melbourne who tell me it has 860 cylinders, 6 surfaces, 17 sectors. Well, not too far off, my arboreal friends.

I now follow the installation instructions intently. After making the necessary changes to the mountlist, and re-booting the machine for good measure, I run the Prep RES2: process. A few minutes later the software asks for the number of cylinders, I enter 860. Next the number of surfaces, 6. Sectors per track, 17. Fantastic! Now it asks whether I want to specify any bad sectors on the device. Oh no! I have no error sheet and a hard drive inevitably has some bad sectors. I recall seeing some obscure numerical hieroglyphics on a paper label on top of the drive casing.

With practice it only takes about half an hour to remove the case from an Amiga 2000, remove the tray with floppy drives and get at the hard drive. Sure enough, there on the label are the specs for five

YOUR AMIGA

bad sectors. Mind you, it's just as well that I've installed hard drives before, as the strings of numbers are not marked in any way to indicate their purpose. Everything is back together and I'm ready to go again. 'Prep RES2:' I bravely type and once again enter the drive specs. This time I'm ready and I can also type in the details of the bad sectors. Now we're flying! The process ends, with the message that I must now reboot the machine before formatting DH2:. I slap the Ctrl-A-A keys with tears of joy streaming down my cheeks.

I key in 'Format drive DH2: name SLOWHD' and press Enter. The format process is working. It even knows the number of cylinders I selected for the first partition. Marvelous! Next I copy the contents of the Workbench disk across to the DH2: partition of the hard drive.

An important lesson learned – whenever sales staff assure you that something will be easy, ask them what is missing.

I Remove the floppies from drives DF0: and DF1: and hit the C-A-A keys for a reboot. Nothing happens. The familiar disk symbol appears on screen asking me to insert a Workbench disk. Yes, the message does ask for Workbench 1.3, so the version 1.3 ROM is working. Inspiration strikes – maybe it needs to be cold-booted. I turn off the 2000 and the monitor. After a decent wait of thirty seconds or so I power on the monitor then the 2000. I get the same rotten result; it wants a Workbench disk.

I give in and let the beast boot from the floppy. Let me check the software I copied across to the DH2: partition. There is no icon visible for SLOWHD so I open the CLI window from my floppy and type DIR DH2:. The directory listing starts, and stops. A requester window opens to inform me that device DH2: has read/write errors.

The disk icon for DH2: has appeared so I double-click on it. The window opens but only a few of the expected icons appear, and along comes the read/write error message again.

Obscure tricks

MANY DAYS pass. Every now and then I put in a couple of hours trying progressively more obscure tricks to get it to run. Finally a breakthrough – while running the Prep routine for the umpteenth time, the hard drive emits a painful screeching noise and expires totally. I calmly remove it from the 2000, pack it up, and return it to the dealer with a polite request for one that works.

Five days later the replacement drive is ready to pick up. To cut a long story to only medium length, I install the drive into the 2000 and try the Prep routine again, unsuccessfully.

I know it's a long shot but I call the drive's distributor again. I want to confirm the numbers I've been typing in so often that they're permanently engraved on my subconscious. A friendly and helpful voice on the other end is pleased to check them for me. The number of cylinders is 680. Five surfaces, and 26 sectors per track. I stay calm. The Serepax are doing a great job. 'Is it just remotely possible that you are mistaken?' I ask in a voice that doesn't sound very much like mine. I explain about the other numbers. He laughs. If only he knew what I was going through, surely he wouldn't laugh. He tells me that the figures I was previously given were for an ST-506 drive, but mine is a SCSI. Anyway, he tells me, you really don't need the numbers because a SCSI interface is smart enough to read it all from the drive's ROM.

Telecom charges heaps to replace a smashed phone, so I put it down gently. I go through the process again with the new numbers. No error messages. It seems to work. I copy the Workbench software across to DH2: from the floppy. No read/write errors. I open the drive's icon and all the usual icons appear in the window. I even mount and format two Fast File System partitions and they work. With some confidence I remove the floppies and hit C-A-A.

When I dropped the 2000 off at the dealer's premises I didn't swear or behave in any way violently. I just asked him, if it wouldn't be too much trouble, to make my 2000 auto-boot as it is supposed to. I didn't even make any threats about what I would do if he failed. I don't really care how long it takes to be repaired. In fact, I don't think I really mind if I never get it back. You see, I've decided to take up trout fly tying. □



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CP/M file transfers

TREVOR MYERS, from Thornbury in Victoria, is an experienced CP/M user, and has passed onto me some very useful advice based on his experience with CP/M 2.2, which often involved file transfers between different types of hardware. For file transfers, Trevor says a null modem cable, with serial connectors is needed, with pin 2 linked to 3 and 3 to 2 from one end to the other; pins 1 and 7 straight through, and on each end, and the following pins

connected, 4, 5, 6, 8 and 20.

There are many transfer problems which can occur, Trevor points out. Many .com and overlay files do not transfer properly using PIP due to various embedded characters. Often this can be overcome by transmitting files in HEX format. There is a public domain program, Unload.com, which does the job. On a disk, which has plenty of free space, 'UNLOAD filename.ext' creates 'filename.hex'. Then, having

connected the two machines via the serial ports which are set-up the same for speed, parity, data bits and so on, 'PIP PRN: A:filename.hex' on the transmitting machine, and PIP A: (or B:) filename.hex PRN: on the second machine. Note that the serial port might be addressed as PRN:, PLN:, RDR: or something else, so check the machine's manual to make sure.

Once you've done all this, and the file has transferred in HEX, on the receiving

```

10 REM One-and-Twenty
20 REM ONE&TWEEN.TY
30 HS = 0:CS = 0
40 H = 0:C = 0:N = 0
50 CLS
60 PRINT "Press 'R' to roll, 'S' to stand"
70 A$ = INKEY$
80 N = N + 1
90 IF A$ (<) "s" AND A$ (>) "S" AND A$ (<) "r" AND A$ (>) "R" THEN 70
100 IF A$ = "s" OR A$ = "S" THEN CLS:PRINT "Your total is":H:GOTO 180
110 RANDOMIZE (N + H)
120 GOSUB 430
130 R = INT(RND*6) + 1
140 PRINT:PRINT "You rolled a"R
150 H = H + R
160 PRINT "so your total is" H
170 GOSUB 430:PRINT:GOTO 60
180 IF C\H AND C(22 OR C)21 OR H\21 OR H=21 AND C=21 THEN 260
190 R = INT(RND*6) + 1
200 GOSUB 430
210 PRINT:PRINT "I rolled a"R
220 C = C + R
230 PRINT "so my total is" C
240 GOSUB 430
250 GOTO 180
260 IF H=C OR H\21 AND C)21 THEN 320
270 GOSUB 510
280 IF (C\H OR H)21 AND C(22 THEN PRINT "I";:CS = CS + 1
290 IF (C\H OR C)21 AND H(22 THEN PRINT "You";:HS = HS + 1
300 PRINT " win!"
310 GOTO 330
320 PRINT "That round is a dead heat...no score"
330 GOSUB 430
340 GOSUB 510
350 PRINT "After that round, the game score is"
360 GOSUB 430
370 PRINT "You:"HS", and me"CS
380 GOSUB 510
390 IF CS + HS = 5 THEN GOTO 450
400 PRINT:PRINT "Stand by for the next round..."
410 GOSUB 430:GOSUB 430
420 CLS:GOTO 40
430 FOR O = 1 TO 900:NEXT O
440 RETURN
450 PRINT:PRINT "That's the end of the game"
460 PRINT:PRINT "Final scores:"
470 PRINT "You:"HS
480 PRINT " Me:"CS:PRINT
490 IF CS>HS THEN PRINT "And I defeated you, humanoid!":END
500 PRINT "And remarkably, a mere human beat the machine!":END
510 PRINT:PRINT "*****":PRINT
520 RETURN

```

Listing 1. A computerised version of Blackjack – if you look at line 180, and decipher what it is doing, you will understand the strategy the computer uses (and which allows it to win most of the time). By all means modify this line, if you can, to get the computer to win even more often.

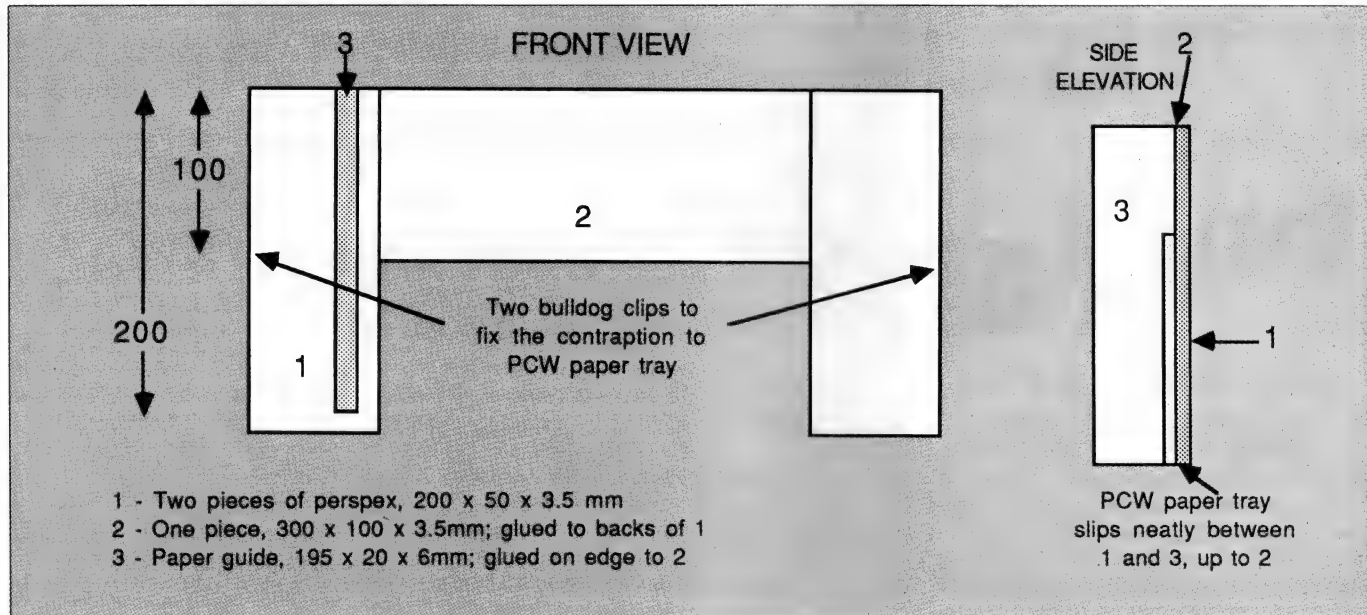


Figure 1. David Aron's 'contraption' to keep individual sheets of paper straight in the PCW's printer.

computer you re-assemble the file using LOAD, and so on. Don't forget to rename the file if it was not a .com file originally. From time to time, you'll find that the error of file marker has not been transferred by PIP, so you'll need to append a Ctrl-Z at the finish to close the transfer and finalise writing the entry on the second machine.

Amstrad supplies

IN RESPONSE to my request for details of suppliers in Australia, I've had a note from Reckon Software Pty Ltd, 706 New South Head Road, Rose Bay 2029 NSW; (02) 371 9222. Reckon supply products such as Ability on the PCs and audio-visual introductions to the PCW range directly to Amstrad for bundling with their machines.

In addition, they supply the Amstrad dealer base with Amstrad-specific products such as printer ribbons and daisy wheels, 3-inch disks (I get lots of enquiries regarding supply of those) and cleaners, plus lots of other goodies. Get your dealer to contact them for their full list, so you can have access to Amstrad-specific products.

One-and-Twenty

THE PROGRAM One-and-twenty is a computerised dice version of Blackjack. The same program listing will run on both machines. In this simple version, which you may well want to elaborate once you have

it up and running, you are always given the first go. You roll the die as many times as you like, aiming to get a total as close as possible to, but not exceeding, 21. You can stop adding to the total whenever you like. If you exceed 21, that is you 'bust', the computer wins that round automatically. A game consists of five rounds, and the winner of the most rounds, naturally enough, wins the game.

The computer's intelligence is held in one simple line. If you look at line 180, and decipher what it is doing, you will understand the strategy the computer uses (and which allows it to win most of the time). By all means modify this line, if you can, to get the computer to win even more often.

Keeping a straight face

DAVID ARON, from Collaroy Plateau, is one of those people who would be described in advertisements as a 'satisfied user'. He wrote to me recently as follows: 'While waiting at an airport recently I purchased my first copy of *Your Computer* and was delighted to see that it contained a column for Amstrad users.

'I have two Amstrads, a PCW 8256 and a PC1640 with mono screen. I bought the latter in order to gain access to the vastly wider range of software that is available for it, even taking into account all that is available for the PCW in England. I originally planned to give my PCW to my

daughter for her to write her university essays and theses on. However, when I found that word processor programs for the PC - even though much more sophisticated and expensive - were not as user-friendly and versatile as Locoscript 2, I decided to buy her a second PCW. I simply couldn't bear to part with my old faithful.

'I have knocked up a device for my PCW printer which might be of interest to other PCW users. We all know how maddeningly difficult it is to set the individual sheets of paper straight, and in the same lateral position every time in the PCW printer. There are gadgets available from England to help overcome this problem, but they didn't look too crash hot to me, and I didn't fancy buying one in order to find out if they were indeed effective.

'My solution was to buy a few small pieces of clear Perspex and glue together the device shown in the illustration. It slips over the paper tray, with the two tray extensions removed, clips into position by means of two bulldog clips, and provides the perfect guide. All I have to do is push the sheet of paper hard up against the paper guide to the left hand side, and it registers correctly and feeds in straight, every time.'

Thanks for that idea, David. I now imagine that there will be fewer angry single sheet paper users in the future, as a result of your 'invention'. □



Farm finances

THE BEST software for one person is not always best for another, but with accounting, bookkeeping and budgeting software there is a certain general direction in which it must head for it to be useful. It must keep track of money, possibly some physical resources such as sheep or cattle numbers or other production statistics, and certainly allow one to plan ahead. There are many packages on the market and many more devised by individuals for their own use. This article deals with a small sample of the range.

'Our clients want to be able to just press one button and the machine looks at them and works,' says Tom Cyster, the principal of Gateway Computers. Gateway are the producers of Money Menu, a comprehensive financial handling tool created for farm and general business use.

Money Menu comes up with a spreadsheet look, and window menus to lead the user through the many options available. The package contains procedures to compile exhaustive reports on all the data entered and the manner in which these reports are presented can be altered easily by the operator. The user doesn't have to know a thing about printers, computers and very little about file handling.

The review version of Money Menu just fitted inside a 640K machine running on MS/DOS 2.11 or PC-DOS 2.0. This isn't surprising as there were some 70,000 lines of Turbo Pascal code written to bring the thing to this stage and the software needs all the RAM it can get. Despite the amount of assistance provided and the flexibility of its presentation, for \$500 I would rather have less assistance and be able to use a later version of DOS. Naturally there was no room for SideKick, Automenu or other memory-resident software which meant I had to prepare a plain vanilla boot disk to start the machine and then run Money Menu. This worked happily enough under my MS.DOS 3.2, there was just a little less

room for accounts in memory and more disk access.

Tom Cyster's interest in computers and cattle-farming led him to Perth after he was elected as President of the Western Australian Farmer's Federation's meat section. The software has been written by Dr. David Wynne to an outline derived from Tom's practical experience of farm and general business needs. Gateway are

*The little basic programs
or pop-up calculators
that balance cheque
books, and the simple
spreadsheets that
calculate and print out
wool-sale results. . . and
proportions in a
boom-spray are the real
moppers-up of little
calculating chores.*

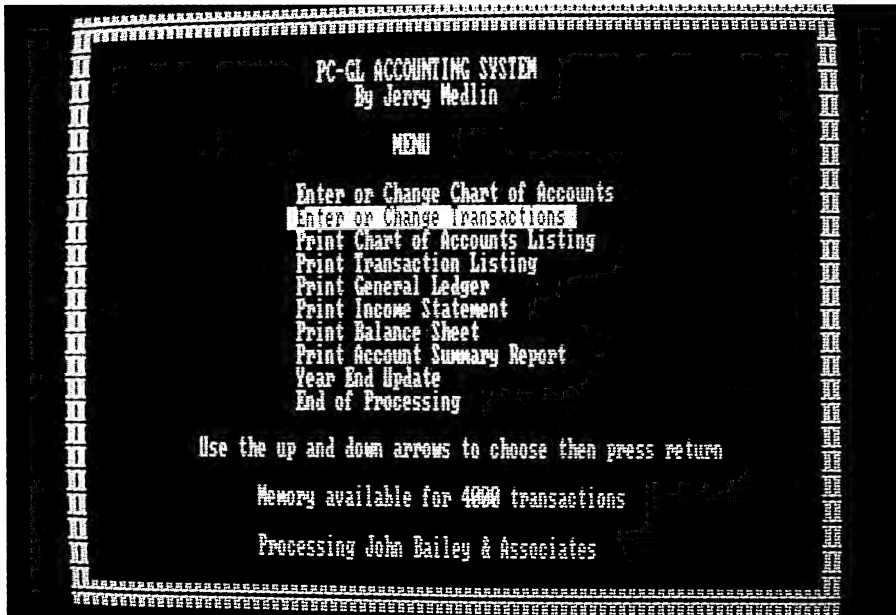
producing a new manual, a full on-line tutorial/help routine and the new version occupies less RAM than earlier versions. This new version will be covered in detail in the December issue; in the meantime, Gateway can be contacted at 239 Adelaide Tce, Perth 6000 WA; (09) 325 3766. The buyers of Money Menu get a good program and silken service including upgrades and help.

PC-Accounting

IHAVE USED the PC-Accounting package from Jerry Medlin Accounting Services of PO Box 357, Napa CA 94559, USA, for quite a while and find it simple to operate. The software is also written in Turbo Pascal and one can buy the source code. The package is Shareware and consists of three sections on the disk costing \$US35 each. The companion programs to the total package are PC-AR (for Accounts Receivable), PC-AP (for Accounts Payable) and PC-GL (General Ledger). Accounts Receivable does not automatically read into the General Ledger program but Accounts Payable does.

The item most used by farmers is the PC-GL or General Ledger package. The system is designed as a full double-entry accounting package but can be used by simple single-entry types like me. The reporting facilities available from the PC-GL package cover a transaction listing, listing by account, profit and loss statement, general ledger and itemised listing of different account entries. These can be output to screen, printer or ASCII file so it is possible to suck the data into some kind of budgeting spreadsheet or data-base. This is helped by an option that allows the omission of headings which might tend to confuse things.

The Accounts Receivable program is a gem, the reporting side of it has recently been amended to correct a minor flaw in the manner in which late payments were identified and the output to file option has been adjusted. This refinement allows us to use a spreadsheet to sort, classify and report on client activity in extra ways that suit the business using the package. Accounts Payable is also easy to operate and has adequate reporting facilities. The PC-Accounting package has some things to which we must adapt, for instance we must use the American date format. I am told this simplifies sorting of monthly re-



Money Menu comes up with a spreadsheet look – the package contains procedures to compile exhaustive reports on all the data entered and the manner in which these reports are presented can be altered easily by the operator. The user doesn't have to know a thing about printers, computers and very little about file handling.

ports. The report date headings come out as May 30, 1989 and it also spells 'cheque' as 'check' which irritates me, but then I still wear a tie occasionally (no Victoria, not spats and button-up boots).

The staff and students at Muresk Agricultural College (now a part of Curtin University) developed a spreadsheet-based budgeting and bookkeeping package called Muresk Cash-book. By the standards of Medlin and Cyster it is a bit slow and if your printer is a bit different it needs some adjusting, but it works. The bookkeeping side of it requires a bit of knowledge of the spreadsheet and a few too many key-strokes for the average soul, but it is hackable to suit your needs. The budget side of it is quick to fill and covers most things that need consideration when drawing up a farm budget. The menu system allows one to enter different styles of farm business and has plenty of help to keep the user going in the right direction. There was talk that the package would be refined and distributed but it seems to have lapsed a little. It should be available in shareware or public domain libraries.

A much more rigidly structured package along similar lines is the Western Australian Department of Agriculture's comprehensive budgeting spreadsheet called

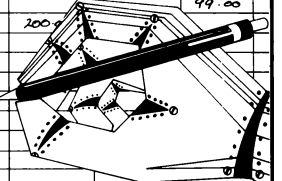
Zack. This spreadsheet takes the average XT about two or three minutes to load from floppy and nearly 45 seconds to recalculate. The layout and design of the sheet is very slick and great credit is due to the developers for the comprehensive nature of this budgeting tool. There is no cash-book facility included with Zack. The whole thing is devoted to an exhaustive analysis of the farm business along Rural Reconstruction-type guidelines. This depth of analysis is more than is required by the ordinary farmer doing a routine budget. For the Farm Advisor or Agricultural Extension worker the package is probably the best available and worth its \$150 price tag including manual. One still must own a copy of Lotus, VP-Planner, Quattro or similar program to run it.

The little basic programs or pop-up calculators that balance cheque-books and the simple spreadsheets that calculate and print out wool-sale results, weedicide application rates and proportions in a boom-spray are the real moppers-up of little calculating chores. These items are usually of the throw-away type and there are as many different ones as there are computer users. Perhaps I should run a competition to try and collect a few together. □

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Art for art's sake

ONE OF THE more interesting ways of using your Atari ST is as a tool to investigate and explore your own creativity, regardless of whether that creativity is latent or recognised by yourself. When looking at computer usage in this way two areas immediately come to mind – music and art.

The music area is rather straightforward, especially for those people who already have some understanding of the fundamentals of music. Even for those without this knowledge, the ability to input tunes using one of the many software packages available is an easy introduction to computers as well as music. With more knowledge (and money) this can be extended to synthesising utilising the MIDI port. From there you can explore arranging, orchestration and even composing. Once having started on this line of musical improvisation there is no telling where you will eventually end up.

Starting on the art (graphics) side is even easier by using one of the traditional drawing packages or any of the drafting, CAD or animation packages available, or a combination of these. Even if you 'can't draw', that is no excuse, as there are libraries of line drawings available (print shop types) which may be manipulated to your own requirements. There are also low-cost and not-so-low-cost digitisers and scanners available to help with picture importation from either photographs or normal drawings. After the picture is on the screen, start putting your own stamp of individuality onto it to make it a personal work of art.

If your goal is to produce animation sequences, these can be shown off by making a video. The easiest and cheapest way of doing this is to use the RF outlet, or if you have a movie camera, by filming directly from the screen. For those times when a higher quality of output is required there are Genlock devices on the market which will give you that quality of output, plus the ability to merge your computer art work with straight film.

The above are only a few of the things that can be done with your Atari ST. All you need to start with is the idea, and then be prepared to follow it up with some learning of the techniques involved in



Just because you haven't developed your artistic skill is no reason to think you can't be creative – this image was created by scanning, combining and manipulating images from two different art packages.

your chosen area of endeavour. Even if you don't produce the best thing ever seen or heard, the knowledge gained to accomplish your end product will not have been wasted. This knowledge may be used again in a repeat performance, or in an entirely different way. All knowledge acts as a stepping stone to a better understanding of ourselves, our abilities and in a broader sense the world around us.

One thing that never ceases to amaze me are comments like: 'well, I have an ST and the right art package, how do I create some art work?', or 'I've got all the right stuff, but I haven't any talent, so I can't do a picture.' I hear these types of remarks continuously about the graphical side of computer usage, but rarely concerning music. Both are creative areas that require some learning and work before you can expect to produce something acceptable.

People understand and accept that to be able to work with music you have to be prepared to do some learning, and they are prepared to put the time and effort

into understanding the basics of either physical playing or the language of music. This then allows them to read the musical notes and copy them into a music program to reproduce the sounds written by someone else. Even this seemingly simple operation is not the easiest of tasks for those who start off musically illiterate.

In the art/graphic/painting area no such conceptual understanding exists. People think that you either have talent or you don't. Nothing could be further from the truth. Like music, there is a conceptual understanding that needs to take place to be able to produce a pleasing picture. What generally happens is, people load in their favourite art package and start drawing lines and using the default shapes, then add a bit of colour and wonder why they haven't come up with a great picture. The art package is then put away, rarely to see the light of day again, and they consider themselves to be artistic failures because they have no talent. What they fail to realise is that there is more to creating

a picture than meets the eye, if you will pardon the pun.

Understanding the rules of drawing, composition, perspective and colour usage, as well as the emotional responses to any given mark, go a long way in helping you to produce something that will give you a great amount of satisfaction when showing your artwork to your friends. These things can be learned overtime by reading, experimentation and the willingness to try new concepts. And this is where a computer is a godsend, in as much as it allows you to do a whole variety of things very quickly.

Not everyone has had the time nor the opportunity to develop their artistic skills, but this need not stop you from being creative. Using a digitiser or a scanner it is possible to import a picture and then use your favourite art package to manipulate it. There are also many pictures in the public domain that could be used as a basis to express your own creativity. Find two or three pictures that stimulate you, and in which you can see some type of relationship. Bring them all to the same file format using one of the utilities available for this (Picswitch or Tiny) and then load them into your art package on to different screens. Having done that, modify each of the pictures and start merging them on to one screen. Try different combinations of placement, experimenting freely, and whenever you come up with a combination you like, save the picture just in case you ruin it with further work. This ability to go back a step or two is wonderful, try doing that on a canvas or drawing

Not everyone has had the time nor the opportunity to develop their artistic skills, but this need not stop you from being creative.

board – it's not that easy, and that is why most people do not persevere with art work using the traditional methods and tools.

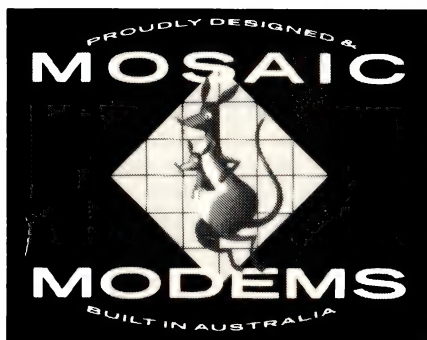
Creativity is more than being able to draw or paint, it is being able to see. When you look at a picture and think to yourself 'I like that, but why didn't they do this instead, or why didn't they incorporate this idea within the picture to enhance the whole picture?', you are being creative. With your Atari ST you can go one step further and give form to this inner creativity and start changing the picture and allowing it to come to fruition. This is done in the music area all the time, it's called arranging and/or orchestration. And when you take more than one piece to work with, you are not changing an existing piece, but combining the threads of a number of different pictures to express a new idea or concept that is totally yours.

One of the more interesting things that I tackled as a new computer user in the art area was to take two existing pictures

available in the public domain, change both of them and then bring them together to create a third and distinctive picture. Both were digitised monochrome pictures, the Macintosh (I think) apple and Applegirl. I saw these pictures some weeks apart, but having seen them, I made a connection between the two to come up with a new concept.

I started the transformation by changing the pictures from monochrome to medium resolution (using Degas Elite) and then thought about how to make the other changes I wanted. The first thing was to rework the apple and make it into a delicious apple. Then I manipulated the second picture (using various distort and skew functions plus some redrawing) so that it would give the final picture a feeling of evolution or transformation. I then spent time putting both pictures together on the one screen in such a way that they seemed to belong together as a whole unit rather than being obviously two separate pictures on the one screen. The title of the third and final picture, by the way, is Eve-olution (I thought that said it all).

The whole concept of Eve and the apple was a fascinating one for me after having seen Applegirl, and I wondered why the girl was in the apple rather than emerging from it. It just takes a little spark or a simple question for the creative side of your mind to start working. When this happens to you, don't ignore it, try using the computer to put some type of concrete expression to your own form of creativity. No talent as such is required, and in some cases it could even be a hindrance. □

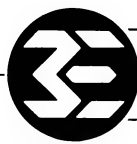


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THERE ARE A couple of important announcements this month, mainly for users of Mac IIs and the SEs. First of all, Apple have modified QuickDraw for 32-bit colour. This new extension is actually an important announcement for high-level Mac users, because it now supports up to 32 bits per pixel which you need for photographic-quality images. The old QuickDraw only ran in an 8-bit mode, but this new version (for 68020 and '030 computers) has been extended to 16- and 32-bit modes. You will have to look to third-party developers for 16-, 24-, or 32-bit video-cards, although Apple say that the new QuickDraw 'makes it possible to manipulate high-quality color images without a video card.' I'll have to think more about this!

The new QuickDraw will mean that the Mac can now begin to deal successfully with full-resolution photographic quality images. It will open up new fields for desktop computing, although possibly these will only be specialist fields for a few years. You will need at least two megabytes of RAM before you play around with images of this quality, and probably four megabytes would be better. Since it can effect the grey-scale shading as well as colour, the result will be smoother shading, and lifelike images and textures.

LaserWriter 6.0

PART OF THE same parcel as QuickDraw is LaserWriter 6.0 which is Apple's new PostScript print driver. This lets applications using the old 8-bit colour standard, print that colour on colour PostScript printers; your applications can produce 'a colour output of even higher quality because the colour transitions are smoother and rendering is even more realistic' according to Apple.

The new driver is optional – version 5.2 will continue to be shipped – but 6.0 is said to speed-up the printing process, especially with multiple font documents when the fonts are stored on hard-disk. It

also improves the output quality of B&W laser printers when colour images are fed to them; the grey-scale rendition of these QuickDraw images will be handled in pseudo-half-tone.

Databases

OMNIS, WHO until recently only programmed in the Macintosh environment, have now ported their database management program to the MS-DOS and OS/2 environments. Omnis 3 Plus is the current model for Mac users, but there is a DOS

One primary area of development to look forward to is in artificial intelligence and expert systems; SQL and Prolog have already been integrated.

version which is published under the name of Quartz, but which isn't file-compatible with Omnis 3 Plus. A new version, soon to be released, called Omnis 5 is supposed to be compatible across the Mac, DOS and OS/2 range. On the Mac side, they've added colour, calls to Multi-Finder, button functions and a better HyperCard interface, so the reports go.

While we are talking about databases, have you noticed that Oracle for the Macintosh has just been released by Oracle Systems – the world's largest database company. They are charging \$599 for the stand-alone version and \$1999 for the full networking version. I haven't received a review copy yet, but I would guess this is the program that is going to give Fourth

Dimension a run for its money. Oracle is the Macintosh's first SQL database, and the use of this industry-standard query language will give the Mac direct links into Oracle on IBM mainframes, DEC VAX, IBM PS/2 machines, and quite a few others. The program has 'transparent access' through HyperCard and C programs, and it will run on anything from the Mac Plus (up) with two megabytes of RAM.

SQL (Structured Query Language) appears to be the way to go with micro-to-mini-to-mainframe connections for database access. IBM invented it and Oracle introduced it in 1979, so Oracle for the Mac could well be the product that leads the way for full Mac integration into major business systems. It allows you to ask questions of mainframe databases, if you want. It is a powerful, but very terse database language which is very stable, predictable and usable. SQL is generally held to be far superior to other co-operative management languages: you have to memorise less syntax rules, you don't need the tedious menus and prompts, and SQL can take advantage of big-system's automatic optimisation and multiple records-at-a-time processing.

Even more important is that it is now a widely recognised standard – both IBM and ANSI are involved – although like all other standards there's a lot of fiddling going on at the periphery with everyone adding their own little proprietary bit. In their PC, mini and mainframe versions of SQL, Oracle have stayed much closer to the ANSI standards than most. It is a constantly growing language with new tools that enhance its capability. One primary area of development to look forward to, is in artificial intelligence and expert systems; SQL and Prolog have already been integrated into one system.

Token Ring network

LAST NOVEMBER at the Comdex Trade Show, IBM announced its second generation Token Ring network. IBM is stepping

System 7.0

THERE HAVE BEEN numerous rumours that Apple were about to move to a dual operating system, retaining the basic form for the low-end Macs and introducing a new version for the 68020 and '030 machines. Apple have always denied this was about to happen – and on the basis of information given simultaneously last month to Australian technical journalists and at the Worldwide Developers Conference in the USA, I can only concur. Although, it's hard to credit that this new version will preserve the upward compatibility with applications that Apple claims.

The new 7.0 version will be available for developers (in beta form) 'within six months.' It maintains an evolutionary path, but with numerous (and major) enhancements, some of which will profoundly alter the way applications are written in the future –

Virtual memory. The new system will have true 'demand paging' which will allow you to use hard-disk space as an extension of RAM, but only on 687030 machines and 68020 Macs with a Page-Memory Management Unit (PMMU) chip. Large applications will be able to spool on and off the hard disk so that a 2-mega-byte machine can act as if it had 8 megabytes of RAM.

Inter-Applications Communications Architecture. Lotus' Jazz first introduced the idea of 'hot' links between applications, and a number of other programs have extended the idea – especially those from the Microsoft stable. Inter-Applications Communications (IAC) protocols and communications modules will now be built into the operating systems so that data and instructions can be automatically exchanged between any two programs on a single Mac and over networks.

This means, for example, that you can cut and paste an Excel spreadsheet module into a report being written under MacWrite II, and the links will remain between the two document files. If, at a later date, you modify the spreadsheet, the changed will also be communicated to the word processed document – under command control.

Outline fonts. These are similar to those used in Adobe PostScript and are now available from Apple and other type publishers for the new QuickDraw. The fonts are mathematically based rather than bit-mapped, which means that one font can provide all type sizes within a specific typestyle. The jagged edges of enlarged fonts will be no more.

Most current software will be able to take advantage of these fonts (some will require minor modifications), and both the ImageWriter and the LaserWriter will benefit in quality and speed. Adobe will provide a utility to convert Apple fonts to the PostScript format.

New Print Architecture. Layout management will provide current and future Mac applications with automatic kerning (letter spacing), ligatures and contextual forms – functions that were previously available only on desktop publishing programs. It will provide you with flexible positional control over your text characters to the point where you will be able to mix Roman and non-Roman print characters and perform other weird and wonderful stunts with text-like printing right to left.

The new print framework will give your applications more control over printing and make it easy for the Mac to support new output devices. It will now be easy to write print drivers, and background printing will be available for all devices. Fur-

thermore, Apple say that you'll get 'enhanced colour and grey-scale support'.

Database Access Manager. This becomes part of the operating system to provide a standard interface to remote databases supporting Apple's own CL/I server software. CL/I supports both SQL and non-SQL databases, and since SQL is certainly the coming query-language standard of the computing world, this is an important innovation.

Finder. Changes to the Finder appear to be extensive – they range from the provision of a Communications Toolbox (extensible so that e-mail and system backup can be incorporated into the desktop) to the removal of the need to load DAs and fonts into the System using the Font/DA Mover. These will now be installed just by dragging them into the system Folder. From now on the system will handle these as does Suitcase: if they have been copied from the system Folder, they can be used directly. The Control Panel and Chooser will also come out as icons on the desktop and will be treated like any other application.

Both System 7.0 and the new Finder will run on any Mac from the Plus up, but the system will not provide all functions to your Mac unless it has the 68030 or '020 with the PMMU (for virtual memory) chip, and generally you'll need at least 2Mb of RAM. The new system size is about 200K bigger than before.

There will also be a one-button installer for the new System. This program will have enough intelligence to identify the hardware and make all the changes necessary to the system – one click, and that's it!

Both Mac OS 6.0 and 7.0 will be round for some time, and you can mix both versions on the one network, Apple say.

4-megabit per second (mb/s) data rate to a new speed of 16mb/s, which puts it into ascendancy over the 10mb/s Ethernet – and way above the rather sluggish rate of Apple's LocalTalk at 230 kilobit/sec.

This doesn't mean that IBM have abandoned the 4mb/s rate. This slower speed will still be retained for work group or departmental LANs, while the 16mb/s version will be used as a ring-backbone to link a number of work-group into an internet. This version is therefore being introduced by IBM as a direct challenge to the strength of Ethernet as the major network backbone technology.

AppleTalk puts the 'local' in Local Area Networks into real perspective! They average only 10 users.

up its technology from the current There seems to be an ever-increasing

spread of internets and the provision of 'backbones' has become a major part of the business. This year should also see DEC's Ethernet finally overtaken by IBM's Token Ring as the favourite large-scale LANs technology around the world. Apple, with its two million AppleTalk nodes, would still outrate token ring in sheer numbers.

One in every three PCs which are linked to networks in the USA are Macintoshes, which on a per capita basis makes Apple easily the most interconnected personal computer company. But AppleTalk puts the 'local' in Local Area Networks into

real perspective! They average only 10 users – which places them down at the bottom end of the scale.

A couple of weeks ago at the Chicago Macintosh Connectivity Conference, Apple staked a claim in IBM's major LAN game by privately showing their new Macintosh TokenTalk interface. This didn't turn out to be a plug-in, direct-access card as many people had predicted, but rather a gateway capable of linking an AppleTalk environment to the token ring networks.

Firstly you link your local Macs together using AppleTalk, then you join this LAN to the token ring LAN through the TokenTalk gateway – which is a NuBus card. It's not a bad approach, but it has its limitations (and naturally its critics). For starters, the cost of the gateway is going to be well over a thousand dollars US, so you could guess at about \$2500 when it arrives in Australia. At these prices you don't want one in every Mac – it makes sense to share one between, say, six or seven or more. The chips that make the beast work are the same 4mb/s chips that Texas Instruments developed for IBM – which at least means compatibility, if not speed. Al-

The cost of the gateway is going to be well over a thousand dollars US, so you could guess at about \$2500 when it arrives in Australia.

though with the LocalTalk net only supplying data at 230-kilobits/sec, there's not really much point in being faster.

The cost of the gateway card is partly explained by the presence of a half-meg of RAM (which can be expanded to two megabytes) which is needed to buffer the amount of data flowing through the port. If this were a one-user-only Mac card, you wouldn't need much memory at all, but since it may be called upon to handle the data of up to 30 workstations, and the data could be feeding into the gateway at 4mb/s, you will certainly need buffer

space. The major component of the gateway price, however, is the cost of a Motorola 68000 microprocessor – the same one used in the early Macs – which is responsible here for the speed translation.

Apple first pledged token-ring support back in early 1987, and since then they have been remarkably open about their involvement in the technology. Over the last couple of years they've made a number of 'real soon now' semi-announcements, but they seem now to have settled on a realistic September '89 delivery date. They aren't the only company to see the value of inserting Macs into IBM rings. Asante Technologies of Southern California are working on a one-user NuBus card for direct connection, and Excelan/Kinetics (now a part of Novell) could well be out with their own gateway card before the official Apple gateway release.

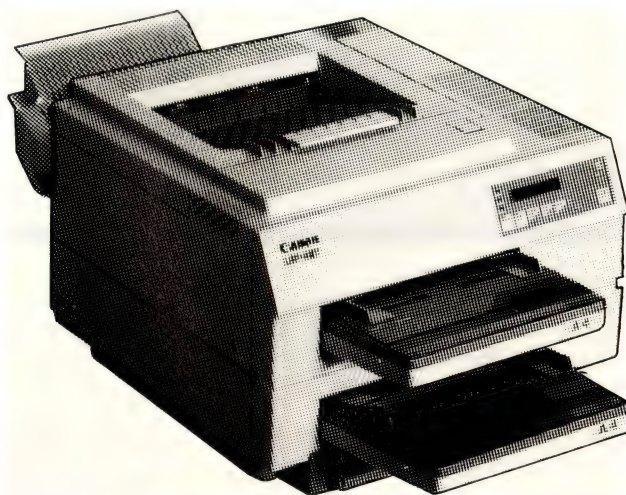
This isn't the first time Macintoshes have had access to Token Ring networks, of course. You've always been able to link to them through 3Com Ethernet card, providing an Ethernet/Token Ring bridge is available. Novell's Netware has also provided a bridge in the past. □

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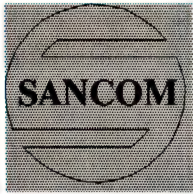
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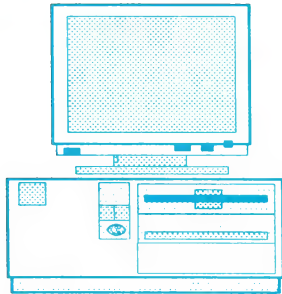
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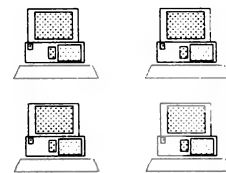
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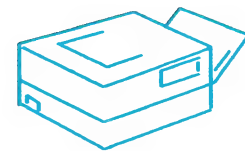
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The ultimate laptop

JUST WHEN I thought it might be safe to go to a restaurant and not be surrounded by pretentious yuppies taking business and romantic calls on their cellular phones, comes an advertisement in an American computer magazine for the ultimate laptop computer.

The ITC286CAT, from the Intelligence Technology Corporation in Dallas, Texas, is more than just a laptop. The processor is a 12MHz 80286, it has a 28ms 40Mb

jokes aside, I'm sure there will be a niche market that genuinely needs such a device. However, a laptop that needs to be tied to a power point is not very portable, and a modem that needs a wall socket to make a call is just about useless in some situations.

Logitech mouse

FOR YEARS I scoffed at using a mouse. Most were inconvenient, the utility soft-

ness for a long time. I have just taken a look at their latest offering, the CA-93-6MD. It is a three-button mouse, with a curved top that comfortably fits any size hand from small child to adult male. Two versions are available. The bus mouse has its own adapter card for installation in a PC. I looked at the serial-PS/2 version, for use with 25 or 9-pin serial ports, or the mouse port on an IBM PS/2 computer.

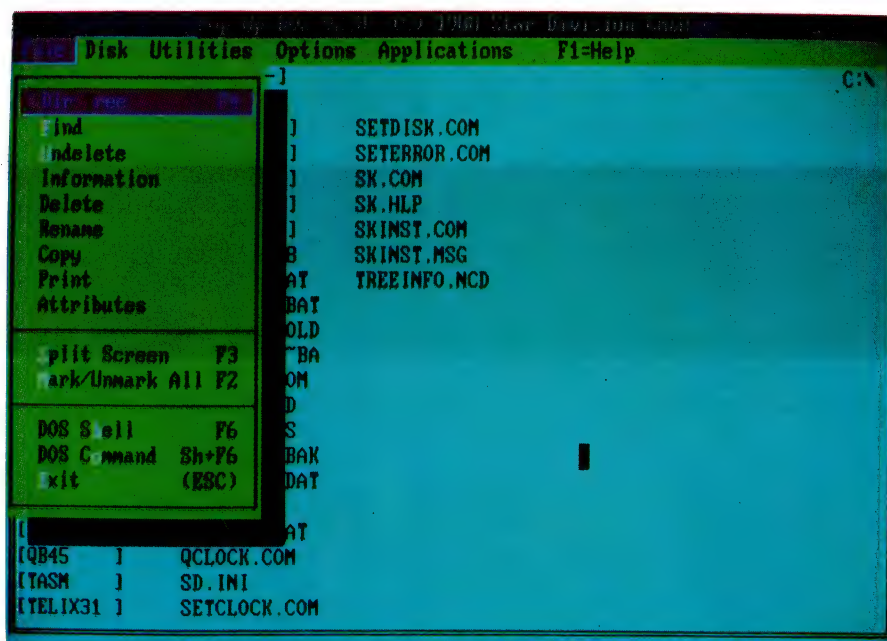
The Serial-PS/2 mouse is 100mm long and 60mm wide. The top surface is curved. At its highest point it is 30mm high, about half that at the button end, and coming almost down to the desktop at the other end. It is a mechanical mouse, with a soft ball on the underside which rotates as the mouse is slid across the desktop. The ball is easily removed for cleaning.

The mouse is connected by a flexible cable over 2.5 metres long to a plug for the PS/2 mouse port. An adapter is included which adapts it to a 25-pin serial post and another for a 9-pin serial port. Rather nicely, the mouse sensitivity can be increased or decreased by pressing Ctrl and Alt, and either the left or right button at the same time. In addition, it has optional 'ballistic action'. Here, moving the mouse the same distance at fast or slow speed gives a greater movement on the pointer on screen the faster the mouse travels. This makes it easy to jump the pointer fast across the screen, and then delicately home in on the desired object.

The big news with a mouse is the bundled software, not the hardware, though that must be ergonomically sound and mechanically robust. With many Asian-made clone mice, the software that comes with them is often very inferior almost to the point of being useless.

The Logitech software comes on two 360K 5 1/4 inch disks and one 720K 3 1/2 inch disk. It includes drivers for the mouse, an excellent install program for the software, ready-to-run menus for some applications like XTree and Lotus that don't have internal mouse support, 'compilers' to allow users to write their own menus, and Pop-Up DOS, one of the better DOS shells.

Pop-Up DOS has a screen somewhat reminiscent of the MS-DOS Executive screen in Microsoft Windows and the



There are five menus in Pop-up DOS: File, Disk, Utilities, Options, Applications and Help. The File Menu displays the directory tree of the drive, finds a file, deletes and undeletes files, gives information on a file, renames or copies files, print files or changes file attributes. It can also split the screen, mark or unmark groups of files, shell out to DOS or run DOS commands.

hard disk, backlit EGA screen, and has a full-size keyboard with separate numeric keypad.

The features that set it apart are the built in modem and built in cellular telephone! Now you can call your paramour from anywhere, and bore your fellow diners to death by getting stock prices from Viatel at the restaurant table. All

ware that came with them was marginal, and the major applications for a PC usually did not offer good mouse support, if they used a mouse at all. A couple of years ago I was converted and found that, for many tasks, using a mouse smoothed the way. For graphics applications, drawing programs and CAD they became essential.

Logitech has been in the mouse busi-

DOSSHELL menu system of PC-DOS 4. A title bar across the top has the names of several menus. Below the title bar are letters for the available drives, in an icon that looks a little like the front of a drive. Clicking on a drive letter changes to that drive. In the main window are the names of files in the current directory.

Clicking on a menu name in the title bar pops down a menu with multiple options. Clicking on an option either activates it or displays a dialog box in which various choices can be made. There are five menus, called File, Disk, Utilities, Options, Applications and Help. The File menu can display the directory tree of the drive, find a file, delete and undelete files, give information on a file, rename or copy files, print files or change file attributes. It can also split the screen, mark or unmark groups of files, shell out to DOS or run DOS commands.

The Disk menu can give information on the disk, do a CHKDSK, set the volume name, format, erase or copy disks, and put DOS on a disk. It can also do backup or restore of a disk. The Utilities menu has a file editor, calculator, ASCII table, Card File, Calendar, a system information function similar to that in Norton Utilities, and a date/time setting function.

The Options menu allows resetting of mouse and colour options, setting the hot keys used to pop-up some functions, the format of the directory display, editor, printing, cardfile and calendar options, and the toggles to confirm or not confirm copying, deleting and overwriting files.

All of the previously mentioned menus are predefined in Pop-Up DOS, and are used to run internal Pop-Up DOS functions or some external DOS commands. What if you want to run another application from a menu in Pop-Up DOS, your favourite word processor or database for example? The Applications menu is the answer. It starts with just one item which allows the user to define the other entries in the menu. The information which can be entered is the title for the menu, the name of the program, and the directory in which it is to be found. Up to five parameters can be defined for each application.

Mouse manuals

DOCUMENTATION IS another area where clone mice fall down. Logitech, by way of contrast, has no less than four manuals. Getting Started, a 60-page manual, clearly and accurately shows how to install the hardware and software, and make the first use of the mouse. The 120-page Pop-Up

DOS manual give good information on that program, while Getting The Most From Your Mouse (90 pages) shows how to create your own menus and drivers for particular applications. Last is the 18-page manual for Mouse-2-3, which covers using the mouse with Lotus. All of the manuals are accurate, clear and complete.

Lock down mouse

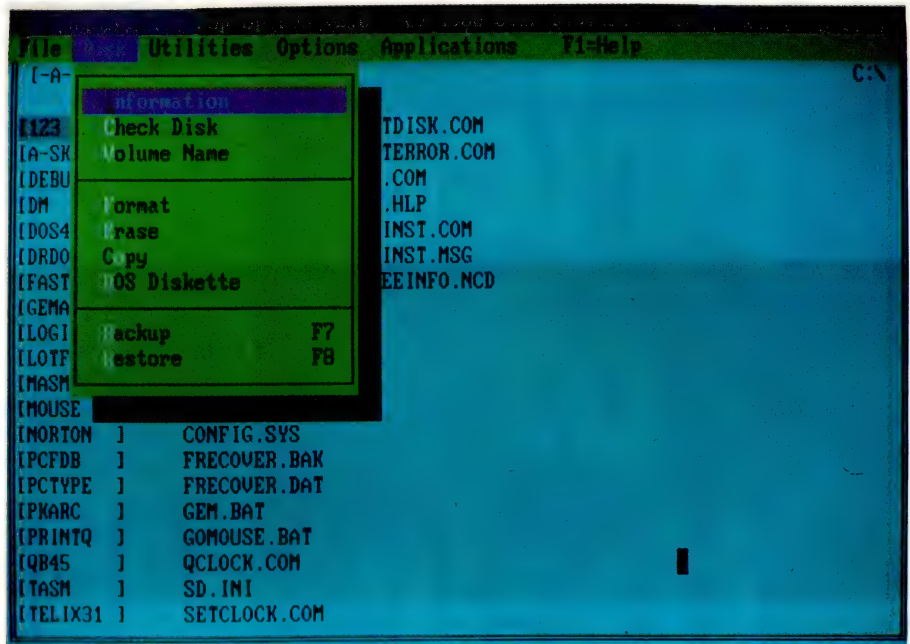
SOME MONTHS ago I had a strange problem. As often happens, I had just changed the board/software combination in my PC. I was correcting a document, and had the marked-up proofs next to me on the desk. Several times, I got into the document, worked through to a certain point, and the system suddenly locked up. It had to be turned off and on again to reset.

ber of sheets to do it.

I kicked myself for many reasons. For not keeping the mouse out of the way. For not having my desk tidy. For not remembering tales that others had told me of software going berserk when a mouse button was held down accidentally. For taking so long to figure out the problem. Nothing major – just a little thing to remember when all seems to have fallen apart.

Australian made

A PERENNIAL subject on the news is talk of balance of payments and trade deficits. We must all try to do our bit to encourage exports and minimise non-essential imports. On this basis, Australian products, and Australian content in products must be considered when buying anything, in-



Pop-up DOS's Disk Menu can give information on the disk, do a CHKDSK, set the volume name, format, erase or copy disks, and put DOS on a disk; it can also do backup or restore of a disk. The Utilities menu has a file editor, calculator, ASCII table, Card File, Calendar, a system information function similar to that in Norton Utilities, and a date/time setting function.

Was it that TSR I had been playing with? Was it that new board? Did I have a corrupted word processor program? I looked high and low, changed all sorts of things, and then realised that under the proof was my mouse. As I turned the pages, the number of sheets of paper on the button slowly increased until the button clicked down, and it always took the same num-

cluding computer hardware and software. Traditionally, we have been an inventive country and there must be a host of good products out there which many people need, and have yet to hear about. Users need to hear about good Australian-made products. If you have something in this area make sure you let me know via the YC office. □

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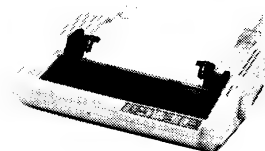
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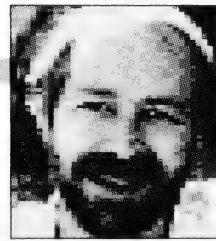
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Performance!

EVER TRIED dBase IV on a fast-drive, '386-processor hot-rod and then gone back to an XT, or even a standard-speed AT? It's frightening, I can tell you. Well, how would you like to make dBase faster on your slow-coach than it is on your co-worker's '386? Thought you might be interested...

In a recent test I made dBase IV load the Control Center nine times faster, start itself eight times faster, and run a test program three times faster, simply by typing three words. Odds are you can do the same relatively easily, and soon have your AT out-performing your neighbour's '386! The most dramatic speed-up available for dBase is not a compiler, and it's not hours of painstaking code-tuning: it's as simple as having some extra memory available, and putting it to good use.

dBase IV is a disk-bound monster with its more than two megabytes of executables, overlays and help files, and unless you have the fastest hard disk in town, it's probably thrashing itself to death every time you load Ashton-Tate's latest marvel.

Cache me if you can

ALL OF THE speed-ups (see the graphs) came from taking advantage of extra memory – either by installing disk cache software or by using the extended memory as a RAM disk. Everyone looking forward to using their extra memory for dBase itself was somewhat disappointed when it turned out that version 1.0 couldn't handle it; few have put the memory to the other good uses available.

Creating a large enough RAM disk for dBase and its overlays (or even just the overlays if space is tight) has a dramatic, immediate result: dBase flashes through what used to be lengthy, lumbering delays. It loads itself from the DOS prompt (using the /t parameter to avoid the copyright screen) in just three seconds, compared to a massive 23 on the same machine in standard no-cache, no-ramdrive trim.

I'm not talking about a slow machine here, either – the testing was done on a Toshiba 5100, which has a 27ms drive and a 16MHz 80386. Machines with slower drives will see an even more dramatic im-

provement. I tested a number of approaches to improving dBase IV's speed: disk optimisation, loading dBase from a RAM drive, and using a disk cache.

While the RAM disk provides some spectacular figures – like cutting the time taken to invoke the Control Center from the dot prompt from nine seconds to 0.6 seconds – I consider the disk cache a clear winner.

The RAM disk completely eliminates dBase's overlay thrashing, which is why it shows up so well on the straight load-and-

How would you like to make dBase faster on your slow-coach than it is on your co-worker's '386?

go tests. But it does nothing further to help things once dBase starts working with your disk-based data files, as you can see from its performance on the test program (a dummy routine which simply opened a file, copied ten records to a temporary file, USED the new file, indexed it, listed its contents, replaced the key fields, printed each name to the screen, and so on). The cache software – which keeps several complete disk tracks in memory after a disk read for faster access when next required – provides by far the best overall improvement. It helps both the overlay loading and the data-file reading, which gives it the best all-round results for typical dBase applications usage.

The cache approach is also the cheapest, because you can get measurable improvements from as little as 256K of extra memory. My recommendation is clear: use your extra memory (or get hold of some if you don't have any) for disk caching, preferably devoting a megabyte to it. Of course, if you have plenty available, a 2Mb RAM drive plus 1Mb a cache would be neat!

The other thing is to make sure you get

cache software which doesn't take up too much of your sub-640 memory for its device driver, or you won't have room left for dBase. I use Microsoft's SmartDrv.Sys, which comes with MS Windows – it's one of the most economical and effective pieces of cache software I've seen. Remember, also, that you need to match the driver to the type of memory you have.

The tests

I'VE BEEN running a disk cache for quite a while, so it wasn't until I tried dBase IV on someone else's machine that I realised just how slow it can feel. That prompted me to measure the performance difference a cache provides. I was knocked out by the figures. Yes, I knew the cache helped, I just didn't realise how much. Even the simple act of running the tests told me a lot – after using the cache for so long, I couldn't believe the apparent sluggishness of the Toshiba with the cache disabled.

Disk optimisation provided a substantial subjective performance improvement – the machine felt faster – but it did little for the stopwatch. It showed an improvement, but not one big enough to get excited about. It came down to a showdown between cache and RAM-drive. The 'silicon disk' provided the spectacular results, while the cache gave the most useful overall improvement.

That settled, I decided to measure the relative benefits of different-size cache buffers, from 256K to 3Mb. Even 256K made a substantial difference, but the best 'value for money' figure came from a 1Mb cache. Anything bigger seemed a waste: the performance of a 2Mb cache was only marginally better, while the 3Mb cache turned in figures so close to the 2Mb that I didn't even bother including it in the graphs.

If you have three megabytes to spare, go for a 1Mb cache and a 2Mb RAM drive. Then light the blue touch paper, and stand well back. That's performance!

Track-testing dBase IV

I MUST admit to having been a little worried about how dBase IV would perform

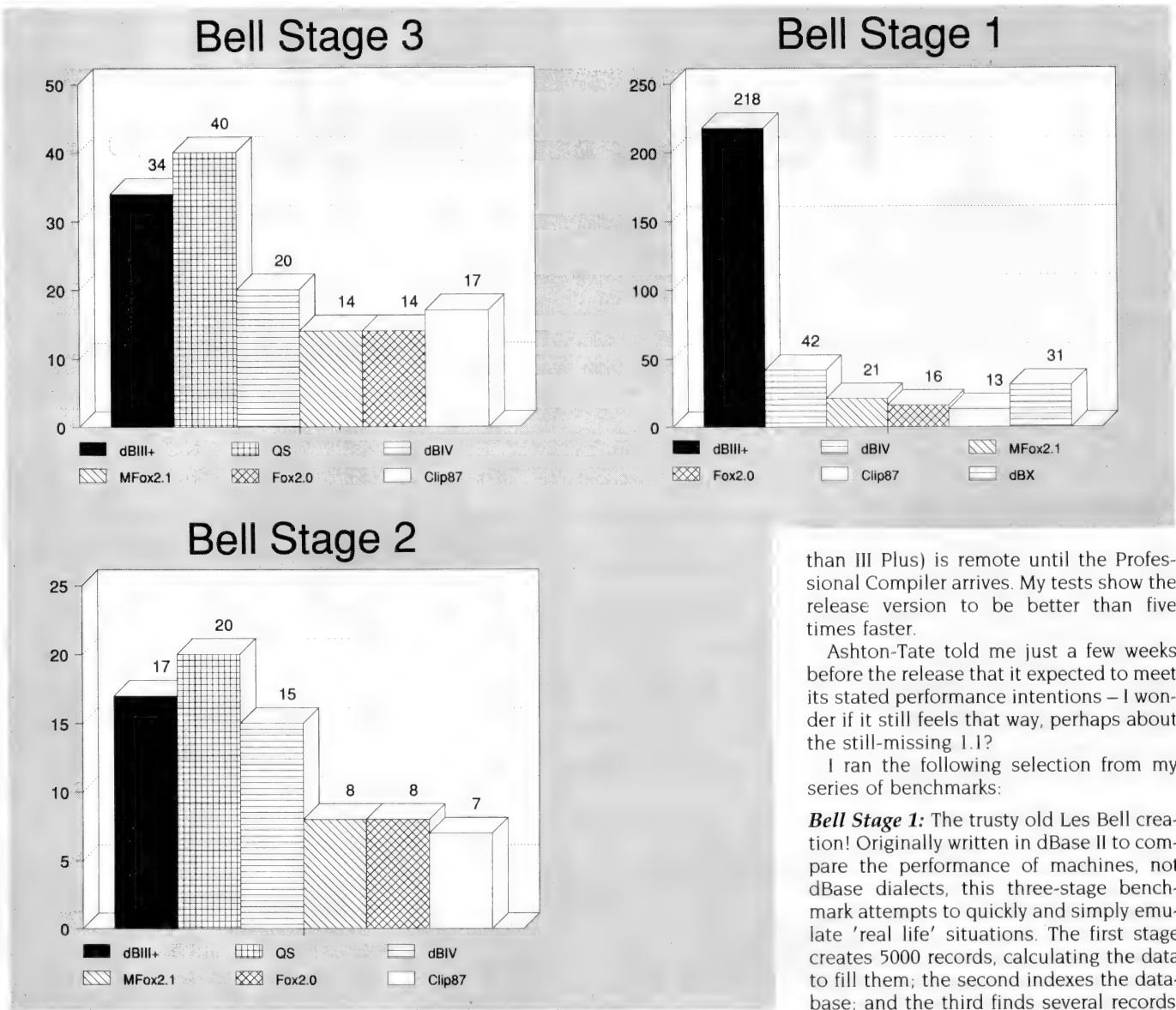


Figure 2. The three-stage benchmark used to test the performance of dBase IV was originally written by Les Bell in dBase II to compare the performance of machines, not dBase dialects – it attempts to quickly and simply emulate 'real life' situations: the first stage creates 5000 records, calculating the data to fill them; the second indexes the database; and the third finds several records, deletes them, and PACKs the database.

before I took the stopwatch to it. It gives the impression of being a 'lumbering giant' when you're playing with the Control Center and the applications development system. While I wouldn't call it slow (on a '386, at least!), the feeling it gives is not that of a nimble, code-gobbling athlete. Of course, it carries 'induced' performance losses like the fancy Ashton-Tate signon screen – this version takes

four times longer to get to the dot prompt than does dBase III Plus if you don't use the /t option to bypass the sign-on.

So my expectations were low, yet the monster surprised me with its brisk attack on my benchmarks. While not quite a Fox-Base-beater (Ashton-Tate's real target) it certainly makes dBase III Plus look sad. Still, the possibility of Ashton-Tate meeting its performance spec (ten times faster

than III Plus) is remote until the Professional Compiler arrives. My tests show the release version to be better than five times faster.

Ashton-Tate told me just a few weeks before the release that it expected to meet its stated performance intentions – I wonder if it still feels that way, perhaps about the still-missing I.I?

I ran the following selection from my series of benchmarks:

Bell Stage 1: The trusty old Les Bell creation! Originally written in dBase II to compare the performance of machines, not dBase dialects, this three-stage benchmark attempts to quickly and simply emulate 'real life' situations. The first stage creates 5000 records, calculating the data to fill them; the second indexes the database; and the third finds several records, deletes them, and PACKs the database.

The result is an interesting commentary on how times have really changed for database users. In the early days of floppy disks and CP/M machines, this benchmark used to take considerably longer – and that's before we upped it from 1000 records to 5000. Consider also the fact that dBase II (written in Assembler, and with lower numeric precision) was more than twice as fast on this compute-bound stage than dBase III when it was released. Yet now we have this routine down to 40 seconds for dBase, and around 20 for Fox-Base: it'll soon have to be changed to 10,000 records!

Random Create: Another oldie-but-goodie, this has also been around since

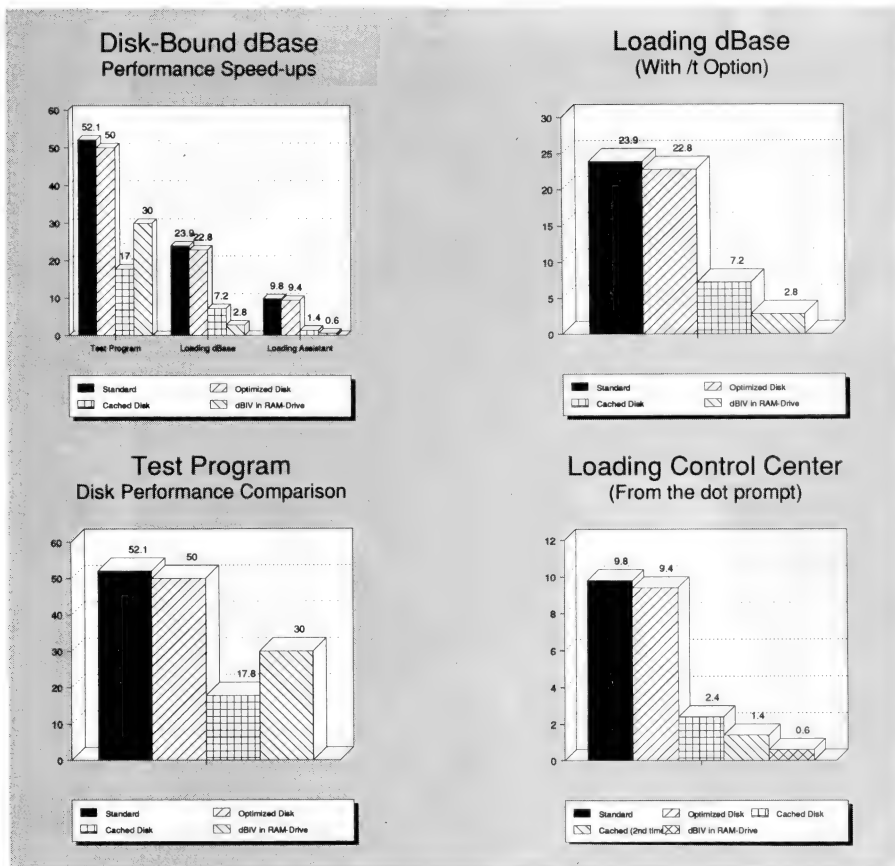


Figure 1. As these tests show, creating a large enough RAM disk for dBase and its overlays has a dramatic, immediate result: dBase loads itself from the DOS prompt (using the /t parameter to avoid the copyright screen) in just three seconds, compared to a massive 23 on the same machine in standard no-cache, no-ramdrive trim.

the dBase II days. It is similar in style to the first stage of Les Bell's routine, but is much more heavily compute-bound. It really drags under dBase III Plus, taking more than 17 minutes to create 500 records (on a Toshiba T5100, a 16MHz 80386-based machine with fast drive and disk caching). dBase IV whips through it (comparatively speaking) in just over three minutes, and is within striking distance of FoxBase's 2m24s.

Global Calculation: I spend a lot of time telling people at seminars how much faster a dBase verb will do a given job than will a 'traditional' programmed loop. These two benchmarks illustrate the point, and highlight the dramatic improvements found in dBase IV's 'interpretation' speeds. They also show that a 'compiler' will still benefit from the technique of using file-wide verbs wherever appropriate.

Screen Handling: These two very simple benchmarks (they display 200 records to the screen, the first using '?' print statements, the second using direct-screen addressing (@...SAYs) look at a problem area of dBase III Plus, and show it has been corrected in IV. Handling of the '?' print statement used to be awfully slow, now it's much improved. And in the direct screen addressing mode (including a box-drawing statement) dBase IV scored a victory over FoxBase!

Help! Help!

A MEMORY-resident dBase, Clipper or Foxbase, available at the touch of a key, which comes up on exactly the page you need at the time sounds just like what you've always wanted, doesn't it? Well, now you can get it, in a choice of colours. Clipper fans may want to stick with the Nantucket-produced Norton Guides for

Clipper, or they can join dBase and Fox-Base users in buying Tom Rettig's Help.

Either way, they'll be ecstatic.

I can't make up my mind which of these I prefer, as both have their advantages. Rettig's help is perhaps better for some because of its 'multi-dialect' approach (you can get separate help databases for each product, and can switch between them on the fly). For Clipper users, the Norton Guides database may be slightly more comprehensive - at more than 700K, it appears to have the entire manual included, right down to the glossary.

Rettig's user interface is more complex, but also allows better cross-referenced searching, and has the ability to dump command syntax and selected detail or examples directly into your text editor as you program, or to the printer for reference.

Nantucket and its distributors handle Norton Guides. For Tom Rettig's Help talk to Graham McKechnie at Tom Rettig Associates/RCM Software, 51 Through Road, Burwood, Victoria 3125, phone (03) 299-2041. □

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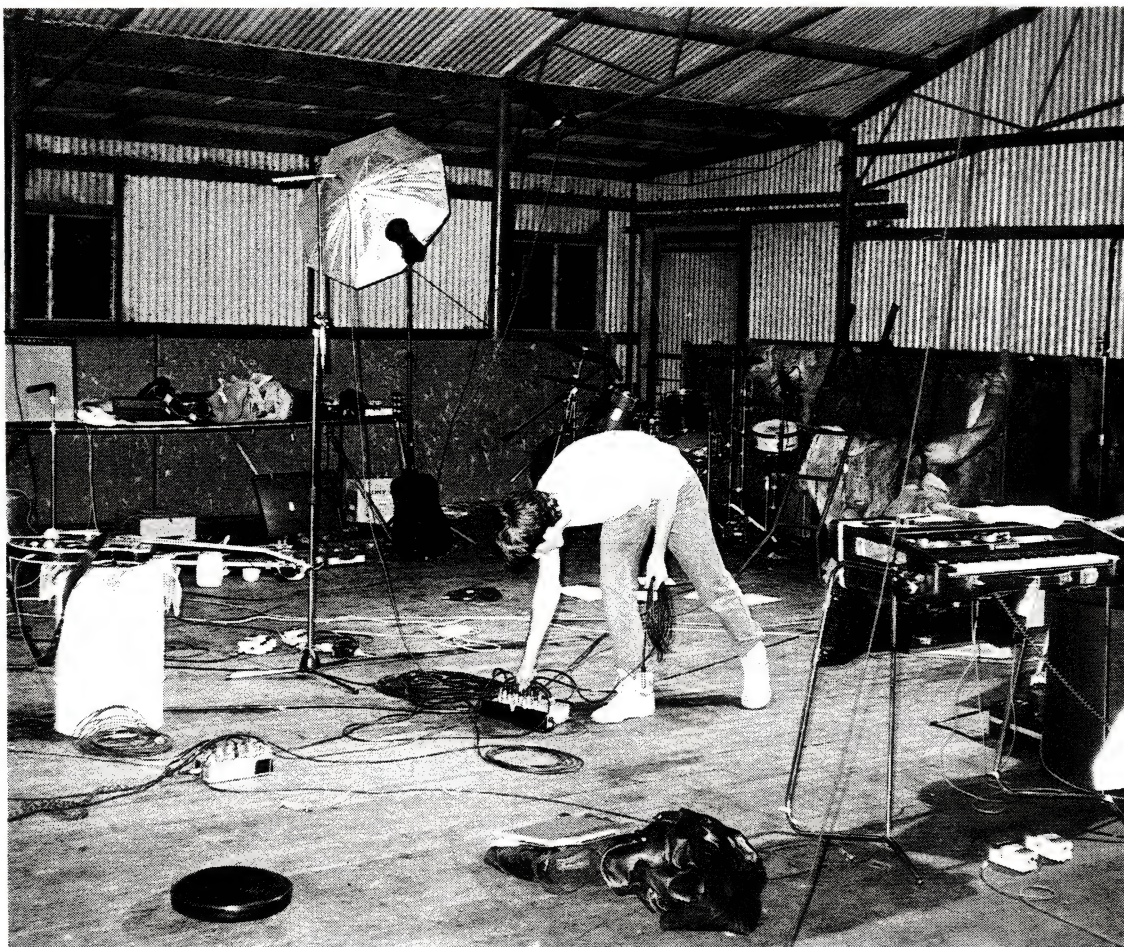
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Images from Chaos

WHEN I WALK into a bookshop I always find it dangerous to have a credit card in my pocket. There's just too much temptation on the shelves, especially for an ideas junkie like myself. My latest little slip-up resulted in the discovery of a book called 'Chaos: Making a New Science' by James Gleick, and ever since I read it my poor computer has been working practically 24 hours a day calculating Mandelbrot images.

Chaos is one the biggest new things in the world of science. Some people even go so far as to say it's one of the three things the Twentieth century will be remembered for. The other two being the theory of relativity and quantum mechanics. I wouldn't necessarily go along with that, but from a physicist's point of view it's probably a fair claim. In a nutshell, Chaos is about recognising order within disorder, about how even complex phenomena like weather patterns or stock market prices have a predictability within their unpredictability.

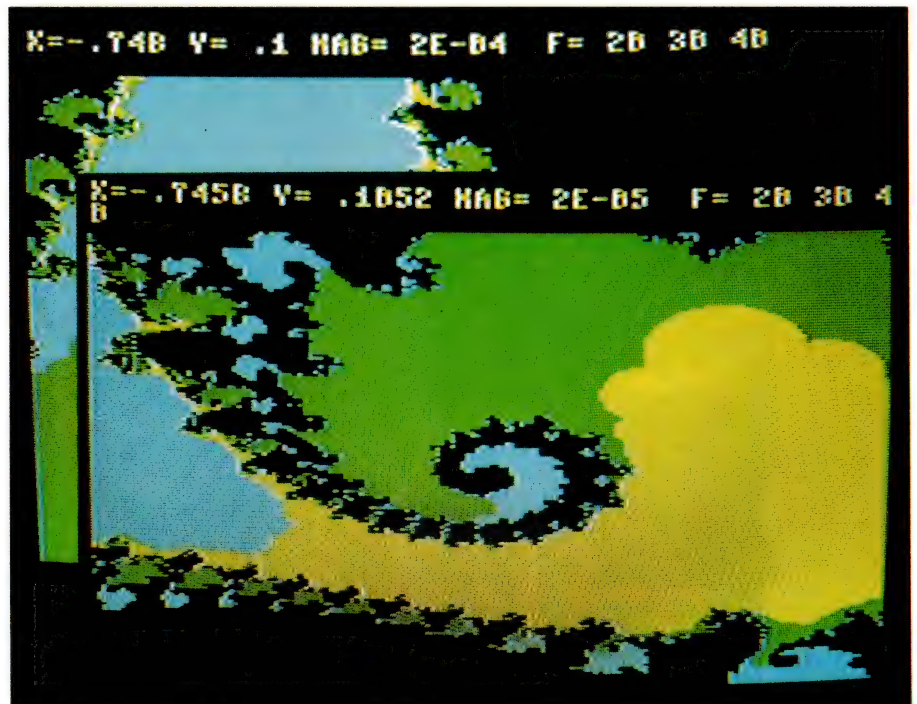
The interesting thing is that the whole notion of Chaos really only took off in the 60s and 70s with the arrival of the computational power of computers. People began building computer models of unstable things like the weather and discovering that while the models output never repeated itself exactly, there was a sort of envelope of stability from which the model never strayed. This echoed the way the weather seemed to vary within certain bounds. These early models also displayed another characteristic – an extreme sensitivity to the initial conditions. Change even one decimal digit and the model would veer off to produce entirely new behaviour.

That was just the beginning. In a very short space of time we had a whole new branch of science: 'Non-Linear Dynamics' and new terms like 'fractals' and 'Mandelbrot set'. As I progressed through the book I began to wonder whether I might be able to use my 64 or 128 to model something for myself. After all, both of these 8-bit computers are more powerful than the tools available to research scientists in the 60s. The idea that caught my imagination was the Mandelbrot set. The

book has some colour plates of it, brilliant coloured swirls and shapes like sea-horse tails. The amazing thing about these images is that they are usually presented as a series of zooms. At each level of magnification the patterns display the same beautiful complexity, no matter how many orders of magnification you go down to.

bers which when multiplied by themselves always give a negative result. They are called imaginary numbers because the first one thought of was the square root of -2. It sounds impossible, but it turns out that they are a valid mathematical entity and apparently quite an important one.

Anyway, I wanted to see some pretty



Mandelbrot images are a contour map of a complex mathematical plane where the X-axis represents all the real numbers from minus infinity to plus infinity, while the Y-axis represents the universe of imaginary numbers, numbers which when multiplied by themselves always give a negative result.

The ones in the book show the Mandelbrot set magnified over a million times, and not even supercomputers have found an end to the detail.

These Mandelbrot images are in fact a sort of contour map of a complex mathematical plane where the X-axis represents all the real numbers from minus infinity to plus infinity, while the Y-axis represents the universe of imaginary numbers, num-

bers and since the Mandelbrot set program has just a few essential pieces I thought I'd give it a try. The main engine is a loop which takes a given complex number and applies an arithmetical rule to it. The rule is $Z=Z^2+C$, where Z is initially 0, and C is a complex number corresponding to the point being tested. The program loops until Z is greater than plus or minus 2 (in which case it's mathemati-

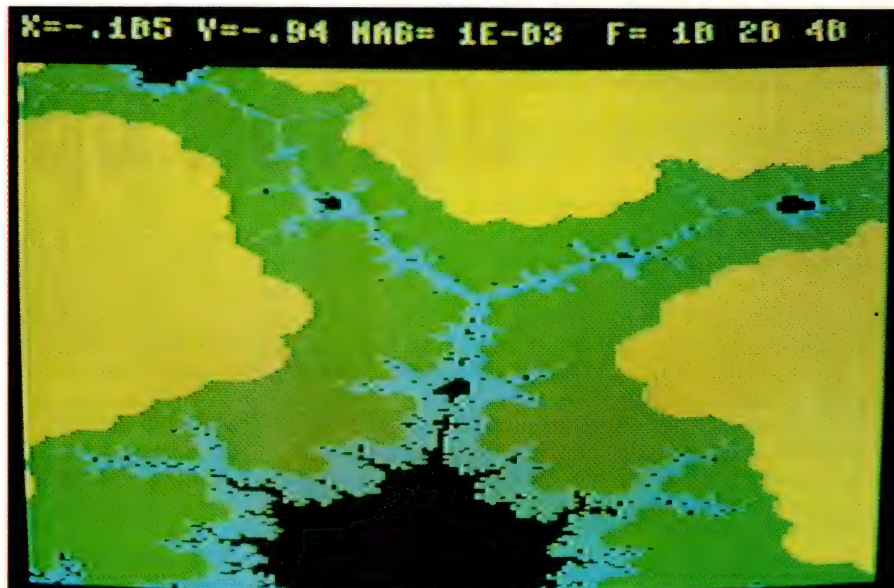
cally proven that further looping will see Z reach infinity). If the loop is broken in this way it means that the point being tested is not a member of the Mandelbrot set.

Finding the points that are members of the set is a little more difficult, because even after a million iterations you can never be sure if just one more might make a difference. Instead, you approach the problem as a mapping exercise, performing the test on a range of points and drawing a graph of the results. If you assign different colours to the number of iterations before the value breaks out, you can produce those quite striking images.

I set about thinking of how one would go about writing a 64 or 128 program to do the job. The Mandelbrot engine part of the code is the relatively easy part and can be done within a few lines. Then it's a matter of a couple of nested FOR..NEXT loops to supply a range of X and Y values to feed the Mandelbrot engine. This exercise involves quite a deal of number crunching, even before you draw the graphics.

The C-64 and C-128 both offer two bit-mapped modes. Standard mode has a pixel resolution of 320 by 200 in effectively two colours. Multicolour mode offers a lower horizontal resolution (160 by 200), but you have four colours to play with. For this exercise the more colours you have the better. I had to make a choice about which machine to write it for, and much as I love the C-64, this is one task it's not really suitable for. It's Basic offers no commands other than POKE for writing to the bit mapped screen. This Mandelbrot program has enough number crunching to do without the additional calculations for the screen display. This can be speeded up by writing special machine language drivers to do the job, but that's a prospect guaranteed to dampen anybody's curiosity. Instead I thought I'd have a play with the 128 and see just what it's advanced BASIC 7.0 graphic commands could do.

It took me just an afternoon to get it happening, and I didn't need to use a single line of machine language. The 128's Basic 7.0 is so good that I ended up writing a much more sophisticated program than I originally intended. One with a proper menu with Load and Save options, ways to change the colours or iteration filters, and a way of cursoring about over an image and selecting the next bit I wanted to zoom in on. (The 128's SPRDEF command makes sprite design a snap). But the best bit was the 128's FAST mode, exactly twice that of the 64. This does have the effect of blanking the 40-column screen, but because the 128 has the ability to support



Originally I thought we would print the Mbrot128 program here, but with the Load and Save features and other bits of sophistication, it's gotten too big. However it can be downloaded from Coastal BBS, (02) 977 6869, and Phantom BBS, (02) 399 7716; these are both part of Fidonet, so you can ask your local sysop to do a File Request.

two monitors at once I was able to plug my 80-column monochrome monitor into the RGB port while the colour monitor was driven from the standard video jack. The 80-column monitor is not affected by blanking so I could use it to display the progress of the program as it ran. If I became curious to see what wonder it was creating I made it so a single press of the space bar will put the machine in SLOW mode where the graphics can be seen on the colour monitor.

Originally I thought I might print the program in the magazine, but it's a little too big for that now. Instead I've put it on two bulletin boards, Coastal BBS (02) 977 6869 and Phantom BBS (02) 399 7716. The program is called 'Mbrot128'. Both of these boards are on Fidonet so if you are not in Sydney your local node can get a copy if you ask them nicely.

If you do get a hold of a copy I suggest you start off by setting the initial X and Y values to 0,0 and the increment value to 0.05. This will give you an overview of the Mandelbrot shape. You can then choose points within for further blow-ups. The way you change the scale is by changing the increment value and by changing the number of iterations you will count to. I'm not yet sure how small the increment value can be shrunk to before the 128's internal rounding errors affect the plot.

If you are interested in exploring how far the 128 hardware can be pushed, *Scientific American* has published a formula for measuring magnification. $Magn = 1/s$ where s equals the length of the shortest axis you have calculated. If you have graphed a region where the difference between the smallest X value and the largest X value is 0.02, then you'll have a magnification factor of 1 divided by 0.02 which is 50. In the program I've written, X is the smaller dimension with 160 two pixel increments, so to achieve a 50X factor of magnification you would have to make each increment equal 0.000125. That is why rounding errors will rapidly become important.

The speed at which the program runs is very much determined by how many iterations you want to do before branching. It's also affected by which point on the plane you choose. The further away you are from the centre of the set, the fewer iterations before a point breaks out. Run times can range from 15 minutes to forever, depending how deep you want to go. Some of my plots are taking over six hours and that's why my 128 has been working overtime – while I'm asleep in bed, while I'm at work and while I'm watching the evening TV. Sounds a little excessive I know, but I'm starting to have quite a nice collection of these intriguing images. □



Button up!

THIS MONTH, we'll have a quick review of some packages from the underground that I'm sure you'll find invaluable. First is Altdots, a simple program to browse through files created with dBase III. Second is Setdisk, which allows a PC to recognize a 720K 3 1/2 inch drive. Third comes Shez, a shell for Pkpak/Pkunpak, Pkzip/Pkunzip and List, which allows easy manipulation of .arc and .zip files. And finally a look at one of the most successful shareware programs in the US, PC-File, and its author Jim Button.

Altdots

ALTDOTS IS one of those deceptively simple but very useful programs. All it does is read and edit dBase III files. If you just want to take a quick look at a record, it is far more convenient than firing up a copy of dBase, loading the data file and looking for the desired information. It also allows a dBase III file to be read without having to have a copy of dBase available – a big cash saving, and a big saving on disk space particularly on a laptop.

Altdots is distributed in two versions. The evaluation version is available from most bulletin boards in the tiny file (around 22K) called Altdots.zip. A registered version is supplied to users who register and pay a very nominal fee. Both versions can read dBase III data files, and can edit the data in a field. The differences come two ways. The evaluation version ignores index files, while the registered version can use them. In addition, the evaluation version can only be run as a conventional transient program, while the registered version can be either a transient program or a TSR (Terminate and Stay Resident) program which can sit in the background behind other programs and be popped up over them on de-

mand. For this column I took a look at the evaluation version.

The first screen has several windows. One shows a list of the dBase III files in the directory, with one of the filenames highlighted with a reverse video cursor bar. A second window shows the field names, field type and field size for the highlighted file. If the number of files, or fields is too great to fit in the relevant window, the information in each window can be scrolled to see the hidden parts. Also on the first screen is the name of the current directory, and some rudimentary help. The cursor bar can be moved up and down with the cursor keys, and the file to be browsed is then selected by pressing the Enter key.

It is not possible to change the datafile definition, define a new data file or create new records, just manipulate those that already exist. Still, the ability to quickly, cheaply and easily inspect a dBase file could often be a godsend.

Setdisk

SETDISK SOLVES another problem. Imagine a typical scenario. A 3 1/2 inch floppy disk drive is installed in an original PC with an original PC controller. Physically

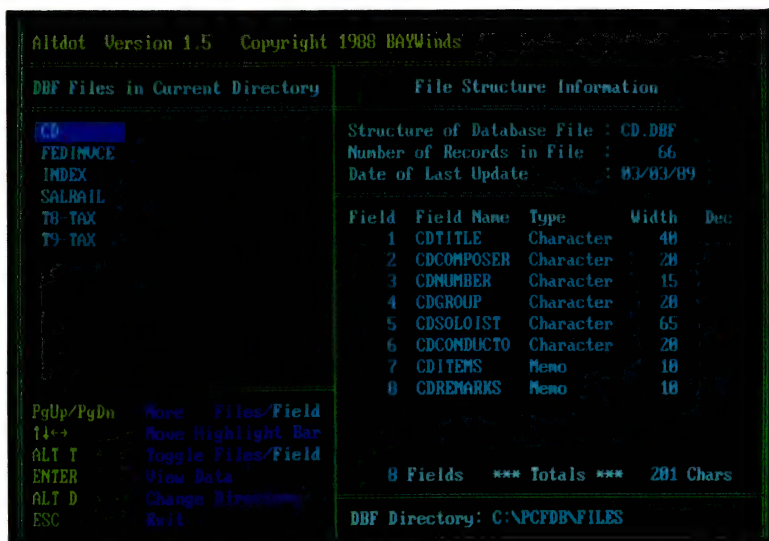
the installation is a snap, as the kit includes a cage that adapts the smaller drive to the larger drive bay, and also adapts the pin connections on the 3 1/2 inch drive to the edge connector on the cable. It even reads and writes 720K disks alright, but when an attempt is made to format a disk it only formats it as a 360K disk, and Diskcopy refuses to work. The reason is that the original PC made no provision in its hardware and firmware for 720K drives. A patch must be installed so that DOS can recognise the 720K for Format and Diskcopy. The standard way is to use the device driver Driver.sys, and invoke it from the Config.sys file. This has just one problem. If the 3 1/2 inch drive is the second floppy on a hard disk system, as far as DOS is concerned it will be both a 360K 'B' drive and a 720K 'D' drive.

The solution is to use Setdisk.com. This re-configures the table in memory that DOS uses for drive parameters. The 3 1/2 inch drive becomes a 720K 'B' drive, not two logical drives in a single mechanical unit. At any time the drive can be reconfigured to 360K using Setdisk. I now call Setdisk from my Autoexec.bat file to automatically configure my 3 1/2 inch drive every time I start my PC.

Shez 3.4

I TOLD MYSELF that I had referred to .arc files and .zip files and utilities often enough, and that I wouldn't need to make mention of them again. As always, as soon as I decided not to look at a particular topic again, a program comes out of the woodwork that is so important and convenient that it can't be ignored. This program is Shez, currently in version 3.4.

Pkpac can be used to create .arc files, and Pkunpak to extract the component files from them, while Pkzip and Pkunzip do the same for



The opening screen for Altdots shows a list of the dBase III files in the directory, with a second window showing the structure of the file.

Inside ButtonWare

IF YOU EVER use a PC, you will use Shareware at some time. Have you ever wondered how it came about? Well, in the early days of microcomputers there was no commercial software available for the beasts, most users had to roll their own, swapping it with each other as the need arose. Thus was born public domain software. In the early 80s, a couple of authors of public domain software more or less independently hit upon an idea. They allowed their products to be freely copied, but sought a contribution from users. Two of the better known of these pioneers were Andrew Flugelman who wrote PC-Talk, and Jim Button, who started with PC-File and has since expanded his range dramatically.

Since then, many other authors have created shareware products, but Jim Button and his company ButtonWare are the stand-out success story. In 1981, Jim Button was working at IBM. He needed a program to print mailing labels for his local church. Rather than write just a mailing label program, he wrote a general purpose database for his Apple II, in Apple-soft Basic. Its initial title was Easy File.

About this time the IBM PC was announced. Jim, and many other local IBM people, bought IBM PCs. Jim ported his database program over to it. With a captive audience within IBM, and few commercial programs available, he was soon sharing copies of his database program with his colleagues. Quickly, his primary use for his own product was maintenance of a database of names and addresses of his users.

Jim's list of users was growing rapidly. The cost of telling them about enhancements became expensive and time consuming. He looked for a way to weed out the serious users from the tyre-kickers. He decided to put a message in the program asking for a voluntary \$10 donation to assist in meeting costs. Quickly he found out that Andrew Flugelman was moving in a similar direction, and they got in touch with each other. By the middle of 1982, Andrew and Jim had agreed to ask for the same amount (\$25) for registration, and Jim had renamed his



I don't believe that a powerful program has to be confusing and overwhelming. With a simple keystroke you should be able to accomplish mountains of work – Jim Button, 'father' of user supported software.

program PC-File, to complement Andrew's PC-Talk.

The timing was perfect. There were a rapidly growing number of PCs in the hands of users. Commercial software was expensive and often was burdened with copy protection. Usually users had to buy this expensive software before they could even try it, so shareware fell on fertile ground.

Encouraged by the libraries in user groups that were also springing up at the same time, shareware took off. In May 1983 came the breakthrough. A review in one of the major US PC magazines gave PC-File a rave report. Jim and his family were in Hawaii at the time on holiday, and arrived back to find their basement full of sacks of mail, carted home from the post office each day by a friend in their absence. Business grew steadily, and by the end of 1984 Jim left IBM. The workload of a day job, plus running ButtonWare at night and weekends was just too much. Since then business has boomed, from revenues of \$430,000 in 1984 to \$2,800,00 in 1988. ButtonWare

now has a user base approaching 750,000 and 22 employees.

ButtonWare products

BUTTONWARE HAS a range of shareware products to meet almost every need. The cornerstone remains PC-File, with its latest incarnation being entitled PC-File dB. Other products include the word processor PC-Type, newest version being PC-Type II released at the end of March. Their spreadsheet is PC-Calc+ 2.0, due for release in the US as I write this. A communications program PC-Dial, style checker PC-Stylist, follow-up system PC-Tickle and a batch of essential utilities called Baker's Dozen round out the range.

PC-File dB, now in version 1.1, can read dBase III data and index files, but not run programs written in dBase. It should be on everyone's 'must have' list. If you need an interpreter to run programs written in dBase syntax, an answer is on the way in the form of jBASE, also from ButtonWare.

Users can share copies of all ButtonWare products with friends, workmates and others, and copies can be obtained from most user group libraries for evaluation. If usage continues, then the copy must be registered and the appropriate fee paid. Excellent printed manuals plus the latest version of the software on disk come when registration is made.

Registration can be made direct to ButtonWare in Seattle, or via their Australian agents Manacomm Pty Ltd, at PO Box 509, Kenmore 4069 Qld. Registered versions, complete with excellent manuals, can be obtained from ButtonWare or from Manacomm.

I have been using various ButtonWare products for years. They have proven themselves to be reliable, high-performance software products at very realistic prices. The ultimate bonus is that users can try each product, via their local user group, PC-SIG outlet or from friends, before paying for registration. It's always worth looking at a ButtonWare product before buying software!

zip files. None of these have what could remotely be called a user-friendly interface. All commands have to be remembered and entered manually from the keyboard.

It would be nice to have a program that looked at the names of files in a directory, listed the component files of .arc and .zip

files, and then took care of file creation, extraction and manipulation. It would also be nice to be able to browse through documentation files within those archives.

Shez to the rescue. It does not replace any of the PK programs, but creates a shell with directory displays, pull-down menus and speed keys. It automates any task in-

volving .arc or .zip files. It does this by getting user input, and then calling one of the PK programs with appropriate parameters. It even makes it easy to convert .arc files to .zip files, and also uses List to browse text files within archives.

When Shez starts, a window at the bottom of the screen lists the directory the

CD		Record No. 1 of 66	
Field Name	Field Data	Field Name	Field Data
CDTITLE	Delicate Sound of Thund		
CDCOMPOSER			
CDNUMBER	463161 2		
CDGROUP	Pink Floyd		
CDSOLOIST			
CDCONDUCTO			
CDITEMS	none		
CDREMARKS	none		
PgUp-Prev PgDn-Next F4-GoTo F5-Find F6-Find Next F9-Edit ESC-Exit			

When a data file is selected from the opening screen of Altdots, a second screen appears showing the name of the data file, the total number of records in the file, and the number of the record being displayed. While F9 allows the record to be edited, this should be done with great caution as the file may have been created with a dBase program that relies on an index file and Altdots will ignore the index.

[FILE LIST] →B:*.*

PCS-839	ARC
YC-019	ARC
YC-029	ARC
YC-039	ARC
YC-049	ARC
YC-059	ARC
YC-069	ARC
YC-079	ARC

SHEZ 3.4
Compression Companion
Copyright (c)1989 by
JIM DERR
CSERVE ID 76266,2634

[CURRENT SHEZ ENVIRONMENT]

Files found matching filespec:
B:*.*

Current Disk and Directory is:
B:\

Extracted files will be put in:
B:\

Setup for 200 files per COMPR file and 200 per file window

[ESC-EXIT] /-MENU F2-CDIR F3-VIEW F4-DEL F5-STAT F6-SORT F7-CREATE F10-DOS

Shez creates a shell with directory displays, pull-down menus and speed keys and automates any task involving .arc or .zip files by taking user input, and then calling one of the PK programs with appropriate parameters.

user was in before starting Shez. It also shows the drive, path and file mask for the archive files to be examined. Typical of this would be *.arc if only .arc files in the default directory are to be examined, or B:?*.* if all files in the root directory of the B drive are to be inspected.

At the left of the screen are listed in a column all the files in the desired directory that match the file mask. At the bottom of the screen are listed the functions of some of the most essential function keys. Pressing F1 at any time gives help screens, and pressing the '/' key pops down menus for the top of the screen. Selecting a file in the archive file list by moving a cursor bar over its name, and then pressing Enter takes us to the next screen. Between the first and second screen, Shez invokes Pkpak or Pkzip to read from the selected archive file the names, size, creation date and time of each of the component files. These are then displayed on the second screen.

Highlighting a textfile name and pressing Enter extracts the text file to a temporary directory, and invokes the program List to allow the user to read the file. When the user exits from List and returns to the Shez shell, the temporary directory and temporary text file are erased.

Likewise, it is possible to extract permanently any file or files from one or more archives, to convert .arc files to .zip files and do a host of other things. Using Shez to manage PK programs and List is painless and elegant. I don't just recommend Shez; it is absolutely vital, and must not be missed under any circumstances.

Availability

ALTDOTS VERSION 1.5 is distributed in Altdots.zip. It is a product of BayWinds Software Inc, PO Box 31804, St Petersburg, Florida, 33732. Registration is \$US19.95 plus postage which is \$US5.00 in the USA, probably around \$US10 in Australia.

Shez version 3.4 is found in Shez34.zip. It is a product of Jim Derr, 2425 Santa Cruz Ct, Santa Rosa, CA 95401. Registration is a mere \$US10.00.

As far as I can determine, Setdisk is public domain. My copy came from a trusted bulletin board, where it is in the file Setdisk.com, without any documentation.

All three are available from the Sydney PC User group bulletin board on (02) 724 6813, and from many other bulletin boards. Altdots and Shez should also be available direct from the authors. □

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dbase 2 - CP/M Wanted

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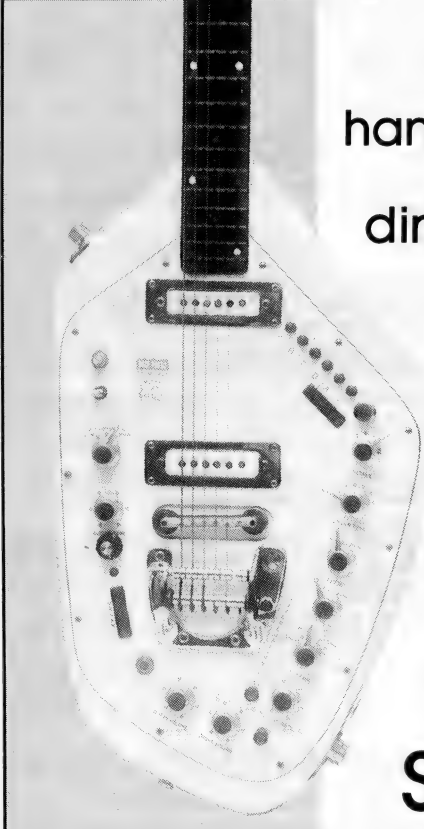
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All Contributions: should include your name, address, and home and office phone numbers (in case we need to check details). Each page of your submission, and any material sent with it, should also carry your name.

Contributions by telephone: contributors who have modems and suitable software (in the MODEM7/YAM mould – see our stories on Christensen Protocols in the May and June 1983 issues) can arrange direct transfer

to our computers through our Bulletin Board system, which is on-line 24 hours a day, seven days a week. Contact our office by phone for details on transferring material in this way.

Contribution on Disk: Contributions can be accepted in most disk formats, although some have to be converted outside our offices, which will add to the (often lengthy) delay between receipt and acknowledgment. The preferred medium is IBM standard format single-sided, single-density, 20cm CP/M disks or IBM PC-DOS minifloppies. We can also handle, in-office, most soft-sectored 13cm disks, thanks to PC-Alien – so unless you have a particularly strange format, send it on disk straight from your machine. Please pack them extremely carefully if posting and label all disks with your name, address and phone number.

Listings: Unless it is absolutely impossible, we want listings produced on the computer. This reduces the risk of error – if the computer typed it, the computer probably accepted it. Print listings with a dark – preferably new – ribbon on white paper, and try to format the output to a narrow (40 characters) width. If they can't be produced on a printer, borrow a good typewriter – handwritten material is likely to sit around the office for a year before someone can find time to type it all out for you. Please provide an account of what the program does, how it works and so on. Any comments of the program should refer to the address, line number or label rather than to a page number. Any comments on modifying the program to work on other machines will be appreciated. Try to include a printout of at least part of a sample run if possible.

Style: All items should be typed (or printed) and double-spaced on plain white paper. We will only accept original copies – no photostats. Include your name, address, telephone number and the date on the first page of your manuscript (all manuscript pages should have your surname and page number in the top right hand corner). Be clear and concise, and keep jargon and adjectives to a minimum. □

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Cursory Glance



■ These new Wang desktop imitations (Freestyle is one, there will no doubt be more) look like getting computers into the hands of people who are keyboard-shy. Freestyle has an electronic pencil, a writing tablet (shades of Moses and the ten commandments) and a telephone-like handset. All these entry devices allow you to put handwritten notes, voice messages and pages of info from the computer into a document and store them or send them to other users.

Each Freestyle document can be displayed on a screen representation of your physical desk as an icon the size of a postage stamp. You can move the documents, staple them together, unstaple them, mail them or open them up to visible size and work on them – all by using your pencil. I guess you could say this is one way to get more lead in your pencil. Some computer widows would say it will get less in. Now, if someone will just combine this technology with the French Macintosh system which is able to read your handwriting into typed text, we will have something which is usable by many more people, and much more personal. Roll on the electronic rolltop desk.

■ Rent a car from Hertz in some cities and you can get their computer to tell you where to go. No doubt that's better than being told where to go by one of their staff. You can use a touch screen on the computer in the rental office to choose likely places and it will give you directions including highlighting relevant aspects such as 'Right at the lights' in capitals. The directions are fairly primitive and limited, but for some people they are a big improvement on struggling with the street directory. How long before the top-of-the-line rental vehicles have touch screens in the cars?

■ The PrinTron process will allow circuit boards and the like to be printed rather than acid-etched. This will cut pollution from the waste caused by the acid and cyanide process used at present. It will also allow boards to get smaller. The ink is printed onto the 'board' then zapped with energy which cures the ink and makes it conductive and permanent. The promotions floating around the industry talk about a portable telephone no thicker than a credit card and a TV which fits on a bracelet. Because the process can theoretically be applied to fabrics, there could be

a computer in the legs of your jeans, making the first washable, fading laptop. What do you do when they fade to the extent that your data disappears?

■ After seven years without using her phone, evangelist Aimee Semple McPherson's service was disconnected. Few people were surprised that she didn't use it. After all, the phone was in her coffin and she had been dead and buried for seven years.

Who says electronic technology improves communication? A ouija board would have been much more useful, at least to her devotees. The ouija board is one of the few examples of a unary system. Most modern computers have operated on binary with some using octal, hexadecimal and so on as well. The name ouija comes from the French 'oui' meaning 'yes' and the German 'ja' also meaning 'yes'. Binary computers run on yes and no, off and on, making them binary. So presumably yes and yes would be unary. Yes? Well you certainly can't say no to that.

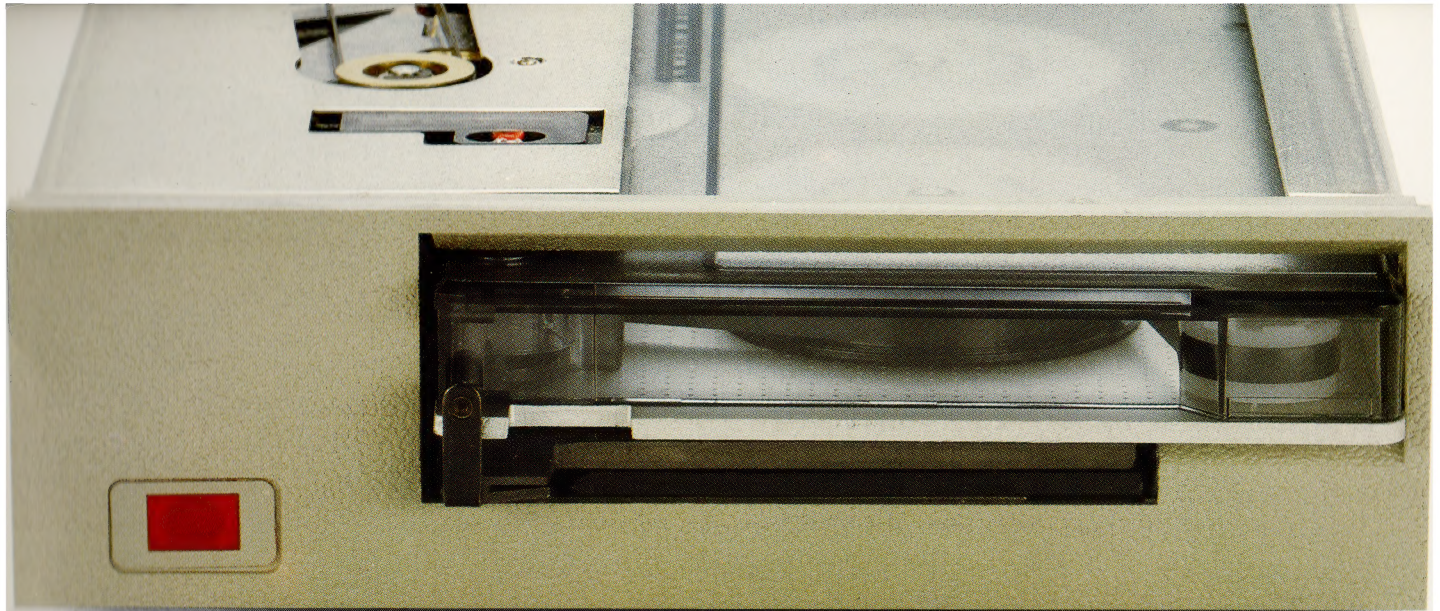
BOOTSTRAP: Software piracy nightmares continue to plague the marketers of some programs. So badly do some of these people suffer that they sit up watch late night movies and reruns on TV rather than face another night of screaming. As far as I'm concerned, there's not a lot of difference.

But, one of those who can pick the difference watched one too many episodes of Mission Impossible (just one show perhaps?) and came up with the perfect solution – well, as far as this media moron was concerned.

Now he distributes his software on a disk which self-destructs under certain specified conditions. Of course it is already an expensive program so they can afford the extra costs involved. Naturally, it is the sort of disk that you need to have in the floppy drive at all times while the program is running. And no, the disk doesn't actually disintegrate before your eyes. Their lawyers figured that was a bit over the top and likely to lead to too many problems. Pity, it might have brought a little joy to a dreary old program.

Instead, the program just warns of data corruption pending unless you ring the company and confess to the message on your screen and agree to pay the extension fee. Of course, if you just happen to be a little late with the payment of your protection money the program pops up again and makes other threats of a blackmail-like nature. Very successful at getting money from customers who have by now become totally dependent on the software. How appropriate that the people who use it refer to it as Draco. □





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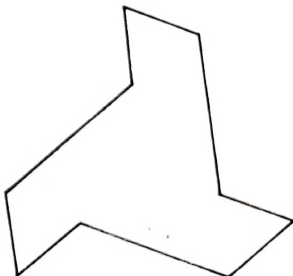
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