Australian Personal Computer

GIANT SPREADSHEET COMPARISON

ISSN—4115 NZ $5.80 INCL. GST
REGISTERED BY AUSTRALIA POST PUBICATIONS VBP 3691

November 1987 $3.95

AUSTRALIA'S TOP SELLING COMPUTER MAGAZINE

COMPAQ PORTABLE 386 versus TOSHIBA 5100

Exclusive test: The 386 war hots up

50.5 MBytes
5¼" Half-Height Disk Drive

3650

Responding to the demand for a higher capacity, cost-effective, 5¼-inch half-height disk drive with increased performance, MiniScribe has met the challenge with its new model 3650. Based on MiniScribe's rugged 3000 family of 5¼-inch half-height Winchester disk drives, the 3650 is an innovative three disk, six head, 50.5 MByte configuration with an average access time of 61 milliseconds.

The 3650 features a tri-colored LED which allows the operator to view various operational phases of the disk drive by displaying a green light during normal operation, a blinking red light for error codes and an amber light while the heads are parked at the landing zone.

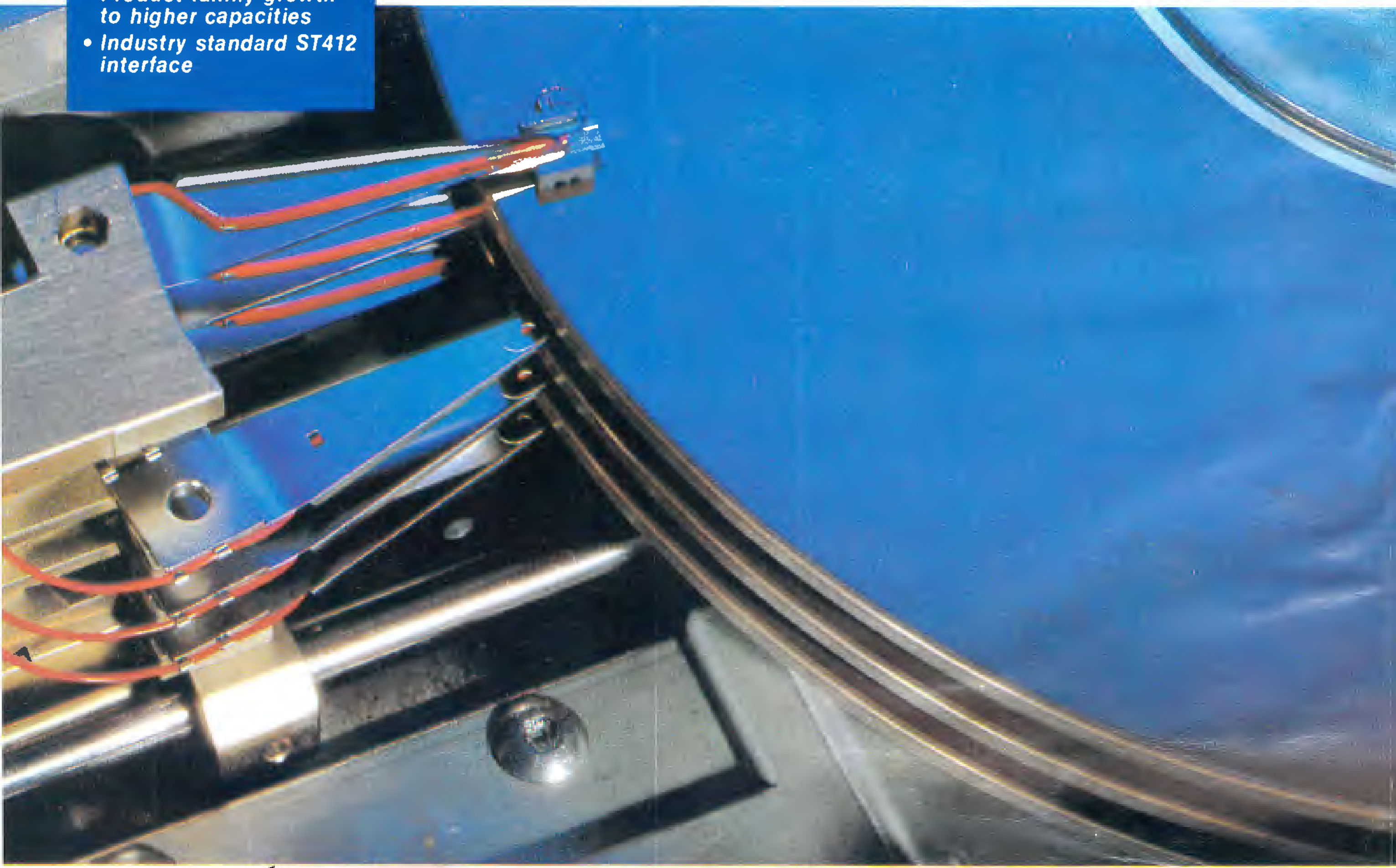
Another innovative feature of the 3650 is the self-regulated head parking feature which will automatically park the heads at the landing zone after 30 seconds of inactivity to insure the operator that the heads are parked in a nondata area.

Like other MiniScribe products, the 3650 incorporates the company's high standards of quality and innovation. The 3650 utilizes MiniScribe's field-proven rack and pinion linear actuator system which provides positioning accuracy throughout temperature extremes as well as rugged resistance to shock and vibration. In addition, the drive incorporates the industry standard ST412/506 interface.

With planned enhancements to higher storage capacities, the 3650 demonstrates MiniScribe's technical leadership by delivering one of the most favorable cost per megabyte solutions for your current and future storage requirements.

In addition to the 3650, MiniScribe produces a complete line of 3½-inch and 5¼-inch Winchester disk drives which begins at 12.75 MBytes, extends to high capacity, high performance models, and includes a variety of standard, intelligent and custom interfaces.

- ***Based on MiniScribe's 3000 family of 5¼-inch half-height disk drives.***
  - ***Field-proven rack and pinion actuator provides positioning accuracy throughout temperature extremes***
- ***50.5 MByte (unformatted)***
- ***61 msec. average access time***
- ***Self-regulated head parking feature***
- ***Tri-colored LED***
- ***Product family growth to higher capacities***
- ***Industry standard ST412 interface***



TOTAL PERIPHERALS PTY LTD

MiniScribe

UNIT 22, 1-7 SHORT ST, CHATSWOOD,SYDNEY, NSW 2067 TEL: (02) 417 7455 FAX: (02) 406 4772

One or Two Things to Know About Your Laser Printer.

1. Production speed can be significantly improved.

As delivered, your laser printer rarely attains its production capacity of eight pages per minute. Somebody is forever stopping it to change papers —or to reload its paper bin. Under the best of circumstances, its capacity, 100 sheets, is only enough for 12½ minutes' operation.

What your laser printer is actually producing is one or two sheets per average minute; about what you could expect of an impact printer.

By adding BDT's triple-bin LaserFeeder, you expand your system with up to four paper and envelope choices in a reservoir of 560 sheets plus 60-80 envelopes. You get 20 to 50 percent more print production in a day and free better than 50% of the operators' time.

In that case, consider our MultiFeeder. It adds up to six bins of paper and envelopes to your laser feeder. With extra paper cassettes, you can reload the MultiFeeder as the printer continues full speed operation so that *production never slows.*

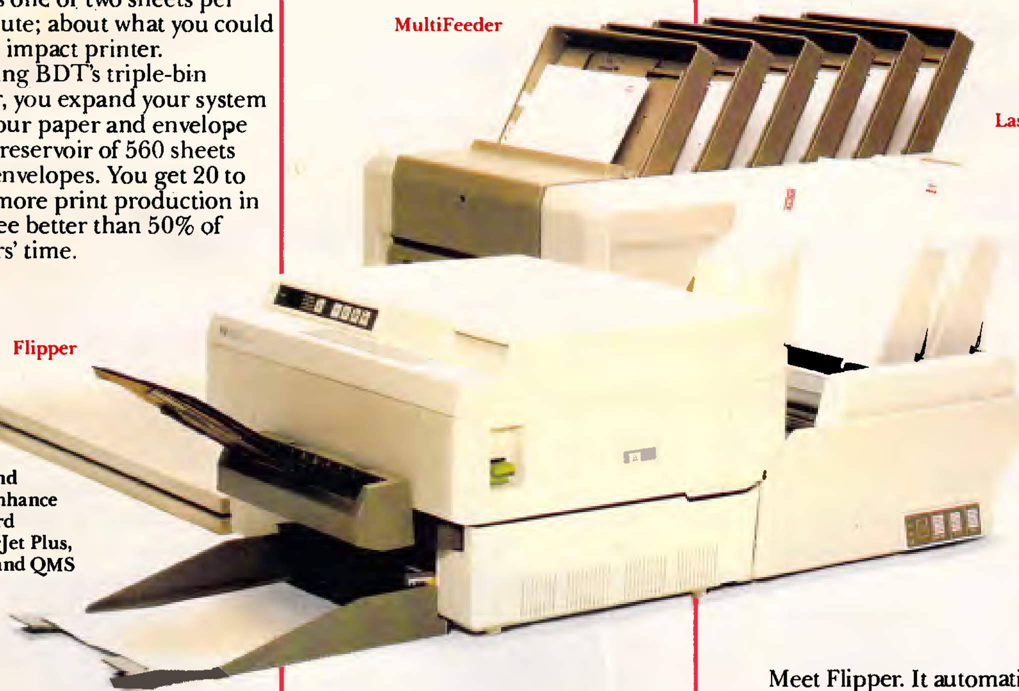
Both the LaserFeeder and the MultiFeeder are products of BDT, the world leader in sheet feeder engineering and manufacture.

2. Organized output.

Most laser printers stack finished work wrong side up. They also spew paper on the floor when the small paper catcher provided with your printer is full.

Both problems cause further production delay and irritation.

Both have been solved by BDT.



LaserFeeder and MultiFeeder enhance Hewlett Packard LaserJet, LaserJet Plus, Canon LBP-8 and QMS laser printers.

In some offices, four bins aren't enough. Letterhead, second sheets, memos, envelopes, purchase orders, invoices and other forms are in constant use. Or you may simply need 1,550-sheet capacity for volume production of automated letter and document runs.

Both are attractively priced. The LaserFeeder sells for about 20% less than any other sheet feeder you might consider. The MultiFeeder is absolutely unique in capabilities. It is the only means of adding six bin capacity to your laser printer on the market today.

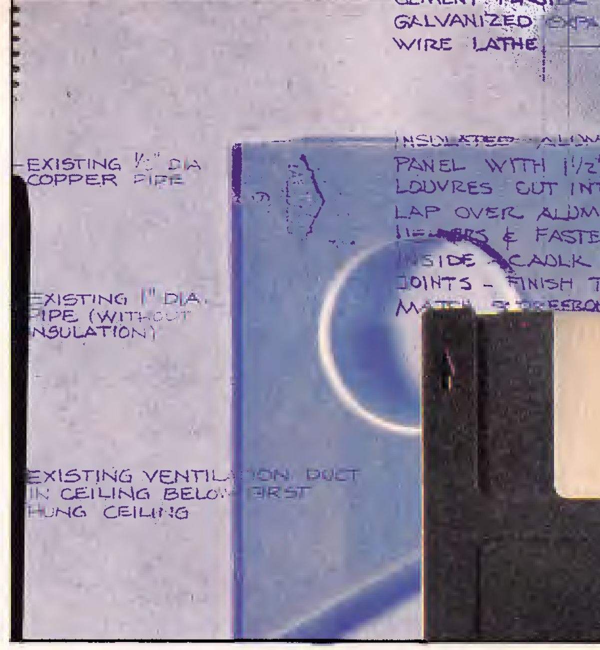
Meet Flipper. It automatically collates in correct order for you, with each sheet discretely placed face side down.

To enhance the benefit of greater paper capacity to your laser printer, Flipper comes with a paper basket holding up to 400 finished sheets.

For more information, contact:
Practical Peripherals Corp.
163A Brougham St., Woolloomooloo 2010
Tel: (02) 358 6244 Brisbane: (07) 846 2970
Melbourne: (03) 241 5799

BDT

PRACTICAL PERIPHERALS CORPORATION

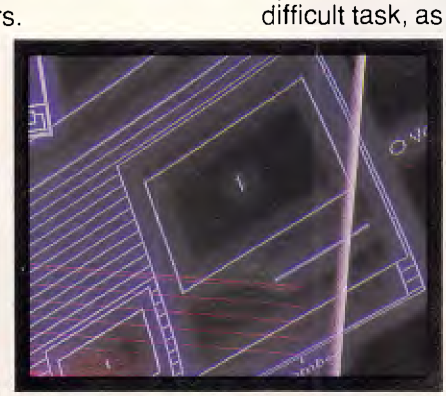


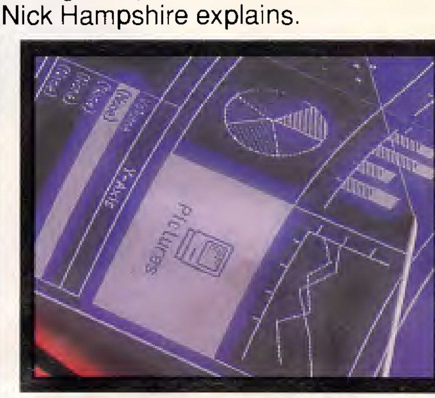
CONTENTS

Volume 8 Number 11 November 1987

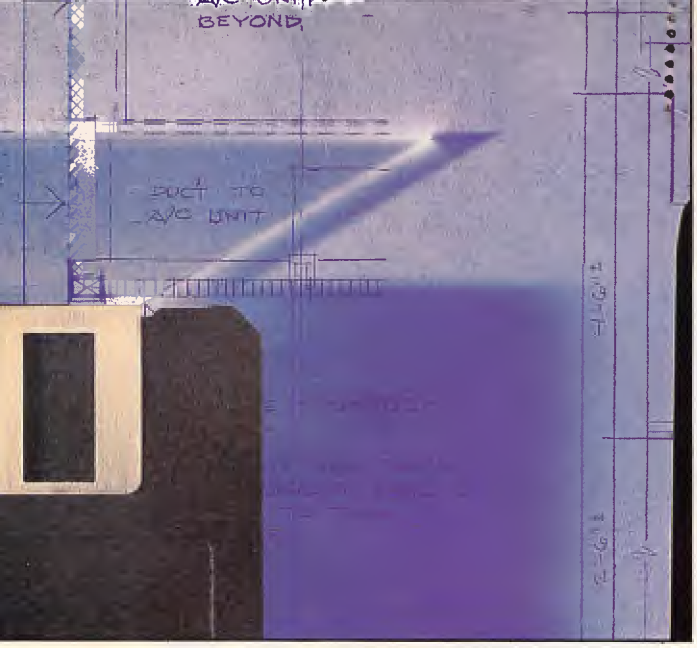
REGULARS

FEATURES





Managing Editor: Sean Howard; *Assistant Editor:* Maria Bokic; *Consultant Editors:* Steve Withers, Ian Davies. *Advertising Manager:* Gerard Kohne; NSW and Qld Sales Executive: Graeme Austin, (02) 264 1266; Vic, SA, WA and Tas Sales Executive: Joanne Owen-Campbell; (03) 531 8411. **Production:** Graphic Heart Pty Ltd. **Subscription Manager:** Roula Tsitos (02) 264 1266; Standard subscription rates: Australia $47 per annum, overseas A$80 (surface) A$194 (airmail). Newstand Sales: Network Distribution Co. 54 Park Street, Sydney 2000.
Publisher: Computer Publications Pty Ltd (a subsidiary of Consolidated Press (Holdings Ltd)). **Sydney Office:** 124 Castlereagh Street, Sydney 2000: telephone (02) 264 1266; telex AA 20514 CONPRES. **Melbourne Office:** 47 Glenhuntly Road, Elwood, 3184; telephone (03) 531 8411; telex AA 30333 'AMJ'.
Printed by Quadricolor International (Aust.) Pty Ltd.



BENCHTESTS

GRAPHICS

Aldus has been keeping quiet about its plans for a new version of PageMaker — a version it believes can clobber Ventura's growing market share. Also, there's news of increased friendliness between Apple and Digital Equipment and Intel's problems of bugs in its processors just won't go away . . .

Jumping the gun

Doubts about Microsoft's OS/2 operating system have been boosted by the discovery of a chip that makes it look obsolete before it is available.

This chip comes from Intel itself. Rumour in Silicon Valley points to a half-size 80386 chip for early next year. It would probably be called 80388, after the 8088 (which was the 8-bit version of the 8086.)

Microsoft is the company most likely to be affected by this news, and IBM could end up with egg on its face, too; the problem of the 80286 chip (the one used in the AT) is now becoming one you don't need to solve.

The problem is simple but virtually impossible to explain in less than three closely-typed pages. So, I'll summarise. The 80286 chip turned out to be incapable of running PC programs in protected segments, because: (a) IBM used illegal interrupts on the 8088 which trip up the 80286 in protected mode; and (b) Intel didn't get the protection system working properly.

But, unfortunately, the whizz-bang operating system from IBM and Microsoft is OS/2, and that *has* to work on 80286 machines. Therefore, it can't take advantage of the really nice software protection that is built into the 80386.

The 80286 does have one thing going for it. The advantage of using it is simple: it runs 8088 code fast, and can run at 12MHz — much quicker than any 8086 (standard PC-style family chip) ever could.

It operates at 12 times faster than a standard 8088-based system or four times the speed of a good 'turbo-pc'.

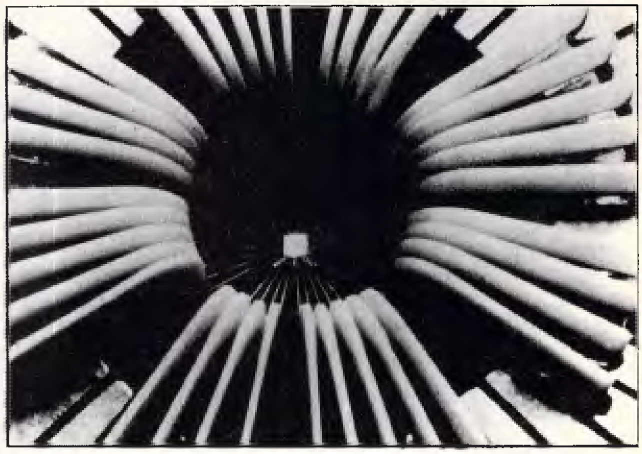
It has, therefore, an assured future for the next year or so as the engine in the standard MS-DOS 3.X machine.

But an 80388 would be a 16-bit chip, like the 80286, and should plug into a simpler board than the AT-type boards. It would be cheaper to make, much faster (capable of running at 25MHz, eventually) and, best of all, be able to run a more advanced operating system than OS/2.

Microsoft has already announced Windows 386 for Compaq and Zenith, and I expect Olivetti and one or two Asian clone makers to follow soon — if it hasn't already by the time this issue of *APC* is printed.

Hats should not be hung on the OS/2 hook. I think reports on its success are premature.

Guy Kewney



Frightening, the semiconductor builders of the world. IBM has released pictures of transistors, made with parts 'one thousand times thinner than a human hair' — something which theorists had doubted was possible. Just to remind you (if you had forgotten) that IBM is the world's largest and most advanced builder of silicon devices.

It also builds computers, of course.

QuickBasic's compile speed up tenfold

In its new version of QuickBasic, Microsoft has taken the familiar programming language a technological step forward, building QuickBasic 4.0 around a combined compiler/interpreter/debugger.

Microsoft officials claimed QuickBasic 4.0 can compile up to 150,000 lines of code a minute, and said that rate is 10 times faster than Borland International's Turbo Basic or version 3.0 of Microsoft's QuickBasic. (A Borland official said Turbo Basic compiles 12,000 lines of code a minute.)

"This is the largest quantum leap forward in anything we've done in the language area," said Steven Ballmer, Microsoft's vice president of systems software. Mr Ballmer said the core technology of the product may be used in a variety of future Microsoft products, including QuickC.

Microsoft officials explained that version 4.0 includes an incremental compiler, which combines the speed of compilers with the interaction of interpreters.

The compiler lets programmers interrupt a program that is running, edit a line and then continue running the program from that point, officials said.

An interpreter operates on source programs in the computer's memory, translating source-code instructions into pseudo-codes (called p-codes) and then executing them immediately. This allows programmers to see immediate results of their work. A compiler creates a machine-language program from a computer program written in a higher-level language, such as Basic. This machine-language program, or executable file, is then stored and executed separately.

An incremental compiler marries the two technologies, compiling quickly to p-code instead of an executable file. QuickBasic 4.0 can do both, allowing users to create both p-code and an executable file, said Mr Ballmer.

IBM begins shipping SAA; Apple reacts with DEC alliance

IBM is about to begin shipping the initial technical reference manuals for Systems Application Architecture (SAA), giving software developers their first chance to evaluate the programming specifications of IBM's long-term software strategy.

"Now customers can figure out whether or not this cross-systems compatibility is real and useful to them," said Mike McCandless of Micro Focus which makes the Cobol development tools designated by IBM for SAA.

"Everybody has been anxious to see the spec," he said.

The first volumes, which will be shipped shortly , will include the language reference manuals, said an IBM spokesman.

SAA is IBM's long-range plan for achieving a measure of software portability across its three primary hardware systems — its System/370 mainframes (running TSO/E and CMS communications monitors under the MVS/XA and VM operating systems, respectively); its System/3X mid-range offerings; and its micros running the upcoming OS/2 operating system.

SAA defines a set of common user interfaces, standardises programming interfaces and languages and specifies communications protocols between applications and systems.

"What IBM is publishing now is a technical description of the [programming] interfaces," said Eugene Buechele of Communications Solutions.

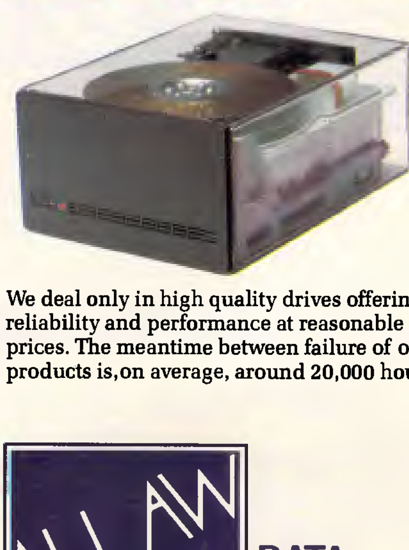
"They explain, for example, how you [access] the communications and database portions of OS/2 Extended Edition," he said.

"They are not publishing any of the functions — what they do and how they do it," Mr Buechele said. "The internal operational details of SAA will be embodied in future IBM Products, and it is not in their immediate interest to publish a full description for their competition," he added.

The release of the SAA technical documentation is "primarily oriented toward [large] IBM end users, so that they can design new interfaces into their applications," he added.

Though IBM's corporate customers seem highly interested in SAA, no one expects the SAA to have widespread impact for a long period of time.

"IBM announced APPC [Advanced Program-to-Program Communications] three and a half years ago; and today about 27 per cent of large [IBM accounts] have APPC applications under development' Mr Buechele said. "SAA will fol-



low roughly the same pattern," he predicted.

IBM's SAA Overview document specifically states that SAA "will be the framework for development consistent applications across the future offerings of the three major IBM computing environments."

There are still gaps in IBM's SAA strategy that inhibit users from making certain strategic decisions about implementing SAA, a seniour analyst, who asked not to be identified, said. "SAA doesn't talk about networking, only data communications — program-to-program and terminal emulation," Mr Buechele said.

Apple, DEC join forces

Apple Computer and Digital Equipment Corp plan to counter IBM's release of Systems Applications Architecture (SAA) early next year by demonstrating a wide range of applications and systems software running on both Macintoshes and VAX computers, according to Peter Hirshberg, Apple's manager of desktop communications for its Large System Group.
The applications will be shown at an Apple-DEC connectivity forum during the February 1988 DEXPO show in Boston, USA. They will allow corporate users to run the same program on Macs or DEC equipment and to interchange that hardware as workstations or servers in networks using either Apple or DEC's networking schemes, according to Mr Hirshberg.

"In many ways, you'll see implemented [by DEC and Apple] what IBM hopes to accomplish with SAA. We see what is coming in DEC-Mac applications as a perfect analog to SAA," he said.

Apple also plans to release combination Token-Ring/3270 emulation cards and software for the Mac SE and Mac II in 1988, and will also release Mac-Workstation, a software toolkit for mainframe programmers who need to deliver applications that run on Macs, according to Apple officials.

At DEXPO, where Apple Chief Executive Officer John Sculley will be keynote speaker, 25 per cent of the floor space will be devoted to Mac connectivity. "We have shown system software, both from Apple and third parties, for DEC and Apple environments before. Now we will be showing real applications, such as shared spreadsheets and word processors," Mr Hirshberg said.

"It's not secret that there is interest among several firms in producing products for the Apple-DEC environment," said Bill Houserman of Access Technology in the US, maker of the 20/20 spreadsheet for DEC computers. A spokeswoman for DEC, refused to comment on "anything to do with Apple-DEC connectivity."

At least three independent developers are working on hardware enabling Macs to serve as nodes on the DEC-Net, networking system, according to Apple's Christine Jordan.

Mac bounds with both Token-Ring and 3270 emulation capabilities will arrive early in 1989, according to Ms Jordan. At first we want to expand the ability of AppleTalk to run over Token-Ring hardware, and expect third parties to do similar products. Ultimately, we want to run both AppleTalk protocols as well as other protocols," such as those used by 3Com, Novell and other network-software vendors, Mr Hirshberg said.

Macworkstation, another upcoming Apple connectivity tool, is "a software toolkit that allows a mainframe programmer who is familiar with developing in host environments and writing in Cobol or Fortran to construct programs that appear very Mac-like to the Mac user," Mr Hirshberg said.

MacWorkstation is currently in beta test, Mr Hirshberg said, and "will probably, but not certainly", be a commercial product in 1988.

Networking, S/36 announcements on IBM's agenda

IBM is expected to kick off a series of product announcements with enhancements in NetView, its key network-management software, and new System/36 minicomputers.

The announcements will culminate later this month in a new version of IBM's PC LAN Program that offers added security features, said sources within and close to the company.

This month IBM is also expected to issue a statement of direction describing the relationship between the PC LAN Program and future OS/2-based LAN software packages, which sources said will make use of Microsoft's LAN Manager extensions to OS/2.

The new release of the PC LAN Program will add user-identification and password-security features, said one micro manager briefed by IBM.

IBM also plans to offer LAN operating software based on Microsoft's OS/2 LAN Manager. IBM's LAN Manager software is intended only to meet specific customer demand for the Microsoft product from IBM and will not necessarily be incorporated into IBM's own networking extensions of OS/2, called the Communications Manager. The new NetView release will offer improved use of colour displays, support for a broader range of telecommunications hardware and integrated functions for monitoring network performance.

The NetView introduction is expected to accompany IBM's announcement of a new version of its System/36-PC low-end mini, which incorporates a PS/2 Model 80 and new high-capacity disk drives, according to System/36 resellers.

"Because we're switching to a another form of piracy"

Elusive bug

A bug in Intel 80386 causes, under certain conditions, 80386-based computers with an 80387 math coprocessor to go into an endless loop when running Unix applications in protected mode, according to Intel officials.

The problem was discovered within the past month, said Claude Leglise, Intel's product marketing manager for its microprocessor and graphics division. The problem can be fixed by changes in applications software or in system hardware, he said. One company is offering a small add-in board that places additional logic chips between the '386 and the '387 to solve the problem.

Since discovering the bug last month, Intel has been notifying hardware and software manufacturers and looking at various software and hardware remedies to solve the problem, said Mr Leglise.

But because there are so few computers that are affected, Intel does not plan to fix the bug at the chip level until mid-1988, when a revision of the '386 is due, he said.

"It will be dependent on each computer manufacturer and software company to fix the machines, but the hardware fix is the easiest fix," he said.

The bug surfaces when an 80386-based machine, equipped with the 80387 coprocessor, runs a software program using protected mode, which includes the 80386's paging mode. Paging is the '386's virtual-memory capability, which swaps memory into and out of disk storage, depending on the requirements of software programs. Such programs have been designed with certain timing patterns and memory wait states. A memory wait state is the extra time the microprocessor spends waiting while data is retrieved from the PC's main memory.

Intel does not know which 80386 computers meet these hardware conditions.

"It is a case where the chip will work fine on one machine, and then run into problems on another," said Mr Leglise. The problem has been difficult to repeat and diagnose, but it has been narrowed down to a conflict between the 80386 and 80387 coprocessors, he added.

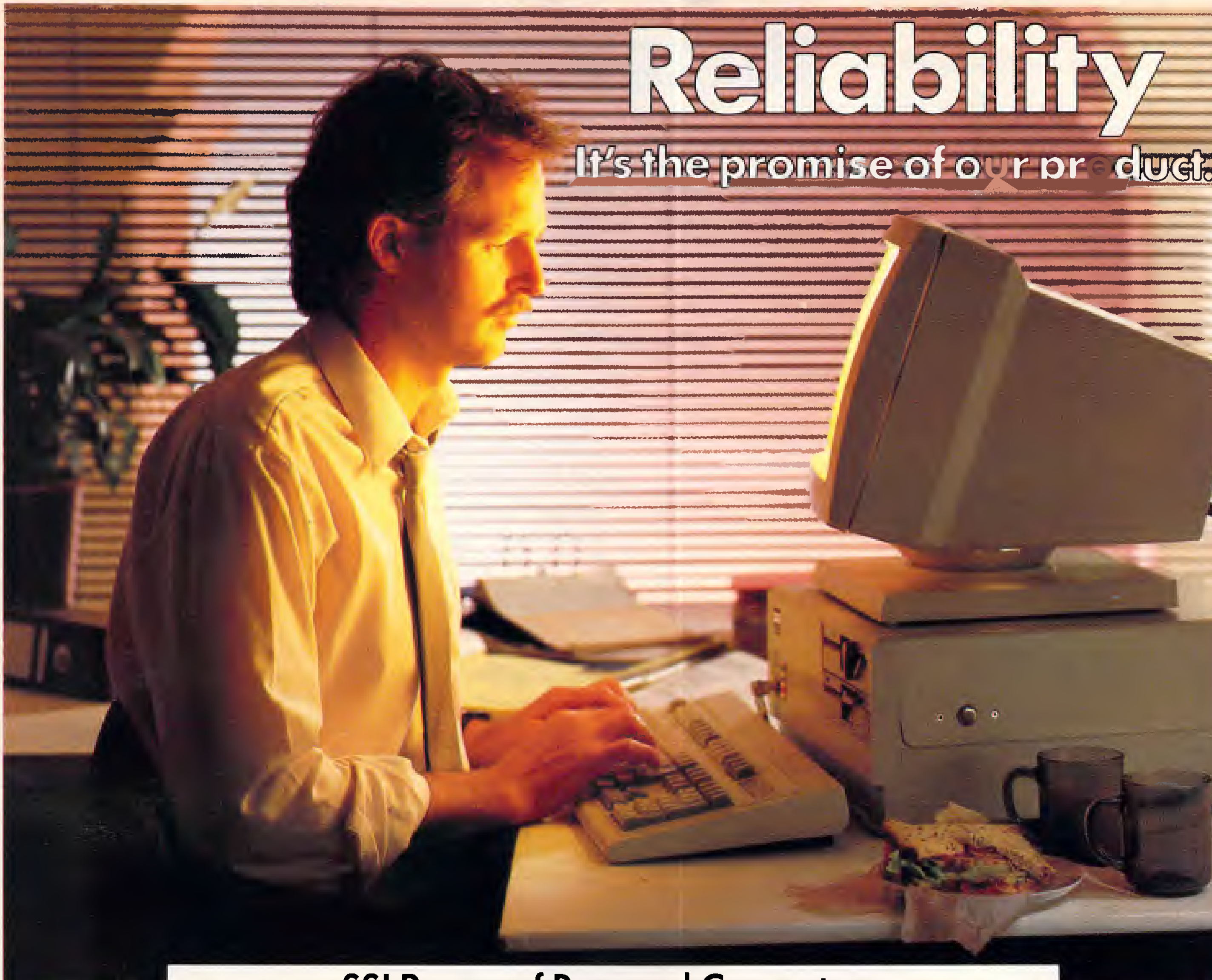
A maker of add-in boards, Bell Technologies of California, has designed a small board that fixes the '386 paging problem. Called 386 Math Adaptor, the board has a programmable logic chip that corrects the 80386's interface problem with the 80387 or 80287 math coprocessor, according to Bell Technologies President Dimitri Rotow.

The user simply removes the '386 chip, plugs the 386 Math Adaptor card into the 80386 socket on the motherboard, and installs the '386 chip on the 386 Math Adaptor card, said Mr Rotow. A new 80386 microprocessor is not required to fix the problem, he said.

Mr Rotow said the board is compatible with most 80386 computers and doesn't affect the computer's performance. Pricing for the 386 Math Adaptor, although not set, will be less than $US100. The board is currently only available in limited quantities but will be available in large quantities in November, he said. We don't know of an Australian distributor for the product yet, so purchases will have to be made direct from the States.

Network version of 1-2-3

The network version of Lotus 1-2-3 announced last year, but never shipped, will be available in December, according to Lotus. Called Networker, the product includes a counter scheme



SSI Range of Personal Computers


XT – 8MHz


386 – 20MHz


AT – 10MHZ


PORTABLE – XT/AT


AT – 10MHz

We know there are many personal computers out there that look the same and have similar functions.

That's why we felt it important to offer that little bit more.

Sure, our SSI personal computers can perform all the latest functions, and of course, they are compatible, but above all they're reliable.

So reliable that there are thousands of our machines being used around the world.

So when you need a PC you need The PC Pty. Ltd. to introduce you to the SSI reliable range of products

The PC Pty. Ltd.
NSW, QLD, ACT, SA, WA. Enquiries.
Telephone: (03) 859 5022 Fax: (03) 859 4152
Ring for our free brochure.

Victorian enquiries through
Silicon Valley Pty. Ltd.
17-19 Wangaratta St., Richmond, Vic. 3121.
Telephone: (03) 428 0756 Fax: (03) 427 0171

that allows multiple users to access 1-2-3 from the network and share worksheet files. Lotus officials declined to disclose pricing, but each Networker package will support five 1-2-3 users.

Program for 1-2-3 helps manage, analyse data

Merging the user interface and reporting features of a spreadsheet with a database's ability to handle large amounts of data is the idea behind Computer Associates new spreadsheet add-in package, Silverado.

The program, which first will be available as a Lotus 1-2-3 add-in and then will be offered for SuperCalc4, is designed for spreadsheet users who are looking for a tightly integrated tool for managing and analysing their personal data, explained Eric Michelman, the program's author. He said Silverado borrows concepts from an earlier program he wrote — Borland's Reflex database program.

As a 1-2-3 add-in, Silverado operates from a window within the worksheet and can be accessed by a function key without leaving 1-2-3, Mr Michelman said. Through the familiar spreadsheet interface, Silverado allows users to create databases such as mailing lists or personnel data, then employs the program's analytical and reporting functions to perform tasks such as tracking sales results.

One of Silverado's key features, said Mr Michelman, is its database-outlining function. This feature gives a broad overview of the data.

"The outlining feature is unique in that it allows users to slice and dice their data and [arrange it] in a way they can understand," said Adam Green, an independent consultant and lecturer on database products.

To create and edit reports with Silverado, users work with standard menu commands instead of having to learn a report-specification language, Mr Michelman explained. The program employs background processing to minimise the time it takes before users can view the results of the report on screen, he added.

Other features of the program include the ability to import and export dBase III files, relational capabilities for working on more than one file and hot-links, a feature for connecting information between the database and the spreadsheet.

The program will be available for 1-2-3 by the end of this year and will be offered for SuperCalc4 during the first quarter of 1988. No price has yet been set, but it's likely to be around the $200 mark.

Microsoft and Borland debunk rumoured rivalry

Since they both recently introduced new PC spreadsheet programs, Borland and Microsoft are apparently just as conscious that they are competing with each other as much as they are competing with Lotus.

Borland President Philippe Kahn has been quoted as saying that Microsoft's Excel spreadsheet is "full of tradeoffs" because it is an Apple Computer Macintosh spreadsheet that's been reconfigured for IBM PCs.

Mr Kahn reportedly hasn't been shy about making light of OS/2, the PC operating system being jointly developed by IBM and Microsoft. Mr Kahn reportedly referred to OS/2 as "BS/2" at a recent industry conference.

Borland officials deny that Mr Kahn made the remark or that there is any bad blood between the two companies. However, there have also been news reports that Microsoft is behind a T-shirt circulating in Europe that says "Delete Philippe".

A Microsoft spokesman denied that the company is involved in any promotion that uses such a T-shirt. The spokesman also noted that Mr Kahn is well known for making provocative statements that draw attention 'to his name and his company's name'.

Separating OS/2 fact, fiction in order to make LAN plans

A large portion of the Australian computer community, we suspect from the correspondence we receive, is confused about the imlications of OS/2 in a networking environment. So this issue we temporarily depart from our usual Newsprint format to answer some common qestions , and begin with an introduction:

A lot of practical networkers are finding it hard to plan for both the new PS/2 computers and OS/2 operating system. It's tough: the PS/2s are relative newcomers, and OS/2 is still not a commercial product. The connectivity aspects of both items are still surrounded by a cloud of confusion.

But let's try to separate OS/2 fact from fiction:

Will OS/2 run on non-IBM machines?

Yes, provided the clone maker licenses OS/2 from Microsoft and that the machine has either a '286 or '386 processor.

Will the Communications Manager of OS/2 Extended Edition (XE) only run on IBM PS/2s?

No. According to IBM announcements, all 80286-based and 80386-based IBM machines will be able to run all versions of OS/2. These include IBM ATs and XT/286s as well as PS/2 Models 50, 60 and 80. IBM will support its existing base of '286 machines.

Will OS/2 XE run on my non-IBM '286 clones?

This is a slightly different issue, but the answer is most likely yes. OS/2 XE is an IBM-only product. Unlike the standard edition, which is jointly developed by Microsoft and IBM, XE is written by IBM exclusively for IBM machines. However, IBM has to write the code to run its own ATs. Because of this, Microsoft sources claim that OS/2 XE will run on non-IBM '286 clones provided the user installs communications adaptors from IBM.

IBM has announced OS/2 XE support for the following adaptors: the Synchronous Data Link Control adaptor, the Token-Ring adaptor and its various asynchronous and 3270-emulation adaptors. Use these in your non-IBM machine, and you should do fine.

Does the OS/2 Communications Manager include any network operating system?

No. You will still need to purchase a LAN operating system (such as the LAN Manager) to get network functions such as file and print sharing.

IBM's Communications Manager is not a network operating system, but a set of terminal-emulation protocols. Basically, the Communications Manager combines the features of IBM's 3101 and 3270 emulation programs into the OS/2 package.

The OS/2 Communications Manager supports the IBM Token-Ring, but only as a means of attaching PCs to mainframes or minis. This is similar to the way IBM's 3270 Emulation Program (version 3) supported Token-Ring-attached PCs to mainframes.

Are IBM's OS/2 Communications Manager and Microsoft's OS/2 LAN Manager similar products with similar features?

No. The two products are very different. Microsoft's LAN Manager is a set of extensions of OS/2 that allow programs to communicate among PCs connected via local area networks. Essentially, LAN Manager is a net-

Which of these new words will give you the most zitboodle?

Remember the good old Anglo-Saxon days when *wig* meant *war?*

How about when *radio* was *wireless?*

Every year, new words creep into our language, giving us greater control of our ever-changing world.

In this list of recent arrivals you will find one new Word in particular that gives you power over all others.

anfo *[milit]* a type of home-made explosive used for terrorist bombs in Ulster.

bumblepuppy *[sport]* in bridge, a game played at random, with neither rhyme, reason nor sensible planning.

cocktail *[medic]* **1.** a barium enema. **2.** castor oil.

electronic smog *[audio]* non-ionising radiation – i.e.: radio or TV waves or radar – emitted into the air in such amounts as to threaten public health.

FIDO *[aerospace]* Fog Investigation Dispersal Operation: a method of dispersing fog above airports by using the heat from petrol burners.

fuff *[TV]* fake snow for wintertime effects.

googol *[science]* slang for 10 to the hundredth power.

humint *[espionage]* human intelligence: gathering of material by means of human beings – spies – rather than by electronic surveillance.

kludge *[computers]* **1.** an improvised do-it-yourself lash-up which may well work. **2.** a factory-made computer which still has some (endearingly) odd characteristics.

meg *[finance]* $1,000,000.

nodders *[TV]* the interviewer's reaction shots, often no more than nodding at the answers his questions receive, which are usually filmed after the actual interview and edited into the tape prior to transmission.

nuplex *[industry]* a complex of manufacturers all of whom use nuclear power within their factories or plants.

nybble *[computers]* half a byte or four bits.

operant conditioning *[business]* the persuading of one's workforce to do what you wish them to do – often by providing incentive schemes, productivity bonuses, etc.

psychic income *[econ]* **1.** aka: *psychic compensation*: the non-monetary and non-material satisfactions that ideally accompany an economic or work activity. **2.** the non-measurable mental and emotional satisfaction a consumer gleans from an item or a service that he/she purchases.

quasimodo *[sport]* in surfing, riding a surfboard in a crouched position; from the posture of the fictional 'Hunchback of Notre Dame' in Victor Hugo's *Notre Dame de Paris* (1831).

rep-tile *[maths]* aka: *reptile*: two-dimensional figures of which two or more can be grouped together to make larger scale models of themselves.

soup *[science]* the waste products of a chemical process.

space gun *[aerospace]* a hand-held instrument that propels the astronaut while he is working outside the capsule.

work operating system for OS/2.

LAN Manager extends the original NetBIOS and Server Message Block protocols used in DOS MS-NET products, including the IBM PC and Token-Ring Networks.

As mentioned previously, the Communications Manager provides terminal emulation.

Can I mix PCs running DOS with PCs running OS/2 on the same local area network?

Yes, provided the server is running the OS/2 LAN Manager. This lets workstation PCs running either OS/2 LAN Manager or DOS/NetBIOS access the shared resources on the server.

Can I run the IBM PC LAN program on a network made up of both PCs and PS/2s?

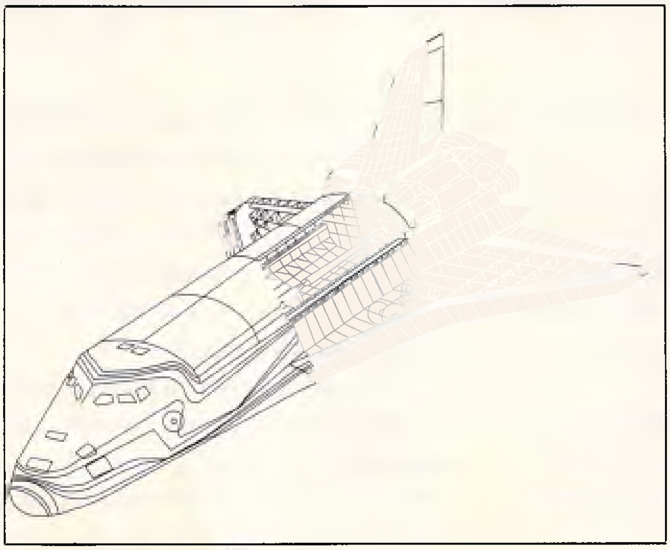
Yes, with some qualifications. If you are mixing both the old PC Network and new PC Network Broadband II and II/A adaptors, you must use the IBM PC Network Protocol Driver on machines with the newer adaptors to talk to machines running the original PC Net cards and NetBIOS.

Do the new PS/2s come with any built-in communications features on the motherboard?

Not really. The only built-in communications feature of the new PS/2s is the common serial port. You will have to buy a Token-Ring Adaptor (or other network cards) to network PS/2s. Similarly, you will need to buy your 3270 coax boards to communicate with mainframes, just as you do now with other PCs.

Do the OS/2 Presentation Manager and Windows 2.0 have the same applications programming interfaces (APIs)?

No. The two have the same user interfaces, but use different APIs. Programs must be converted.



Conographic's RIP board speeds up the printing of the PostScript file of the Space Shuttle Columbia from 3 minutes to 2.69 seconds

PostScript clones compete in PDL market

Steve Jobs declared Hewlett-Packard (HP) 'brain dead' for choosing a page description language (PDL) other than Adobe's PostScript for its printers. HP has now changed its mind and, with the help of QMS, now offers PostScript on its Laserjet printers.

The industry is watching the announcement of the new PostScript clones very carefully as they move into a market dominated by Adobe for three years.

There are other alternatives to PostScript, such as Imagen's DDL or Xerox's Interpress, but PostScript is clearly the industry standard of today — particularly after IBM announced its support. HP's HPGL, the limited page description language on the Laserjet, is actually the market leader since HP claims 80 per cent of the market for laser printers.

Apple's own QuickDraw routines will soon be a part of its PDL offerings. But, even in their best form, they cannot compete with PostScript for high-quality output, font rotation and true font smoothing.

New lasers are coming onto the market monthly, and the computing demand for high-quality typography raises the issue of PostScript clones' potential for adding users cost to PostScript printers, making these clones items to watch as we approach 1988.

The two leaders in this field — Phoenix Technologies and Conographic Corporation — recently announced a high-performance PDL interpreter for laser printers with PostScript compatibility.

It provides high-speed printing of text and graphics, and features an open architecture design to accommodate other page description language and device standards.

Now printer manufacturers who want PostScript compatibility and HPGL compatibility can go to Phoenix, obtain its board and have a printer that emulates Apple's LaserWriter and HP's Laserjet all in one.

Phoenix describes its 100 per cent compatible architecture as 'light table-compatible', which means that the output precisely matches. And its pre-processed outline technology allows for high-speed printing of PostScript fonts.

Phoenix claims that fonts from Bitstream, an electronic font supplier, are a key component to the technology and gives true PostScript compatibility.

The other major player, Conographic, also has a PostScript-compatible solution through its ConoScript software running on a Conodesk 6000 RIP board. Conographic actually licenses the same fonts as Adobe, and so also claims 100 per cent PostScript compatibility.

The RIP board is the fastest output enhancer I have seen, giving a standard Canon laser printer anywhere from 10 to 50 times faster performance than the Apple LaserWriter.

As an example, the PostScript file of the Space Shuttle takes around three minutes to process on the Apple LaserWriter. If you use the Conographic system, that same files takes 2.69 seconds to process.

Another key example comes from a complicated font-sheet PostScript file. A very basic 8pt full sheet on the LaserWriter takes 44.5 seconds to process; on the Conographic system it takes just 1.43 seconds.

The key issue for the new PostScript cones is not just compatibility but also new levels of processing speed and flexibility.

Although Adobe is working on a new generation of PostScript technology, as well as adding colour and its new PostScript Display product, it will have to do much more to the processing power if it wants to maintain its marketplace lead.

Many major manufacturers will produce PostScript clones in 1988. This competition may bring the price of these printers down, but the main ad-

"Build-it-yourself Uni-x XT comes in first on the performance index."

Australian Personal Computer
LOW COST IBM COMPATIBLE SURVEY — OCTOBER 1987

(Australian Personal Computer 'Low cost IBM Compatible' Survey — October 1987 issue.)

Australian Personal Computer have now proved what our customers have known for years . . . see for yourself in the full Report in the October '87 issue.

Processor.

NEC. The Uni-x contains a NEC V20, manufactured by Sony.

Thus a V20 running at 4.77MHz will outrun an 8088 running at the same clock speed.

machines examined provided a standard PC clock rate of 4.77MHz as a minimum, although the Uni-x delivered higher than standard performance even on this clock rate by virtue of the V20. The Altantis and machines

Performance.

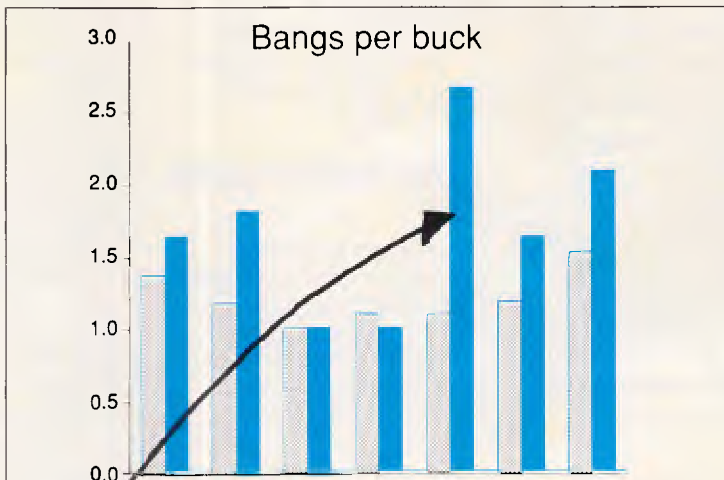
The Uni-x is fastest overall, providing a 50 per cent boost over the Technology Interface due to the V20.

Display.

and the Uni-x is delivered with a nice INTRA tilt/swivel amber screen.

Cost Effectiveness.

As you might expect, the do-it-yourself Uni-x comes up trumps with its low cost and relatively high performance.



'Bangs per buck' — just one way of comparing the relative merits of these seven ultra-cheap clones. The lighter shading denotes price (in thousands of dollars) and the darker shading a performance index. See Table 3 for more details. (Machines in order from left to right are from Altantis, Rod Irving, MicroDOS, Commodore, Uni-x, Atronics and Technology Interface)

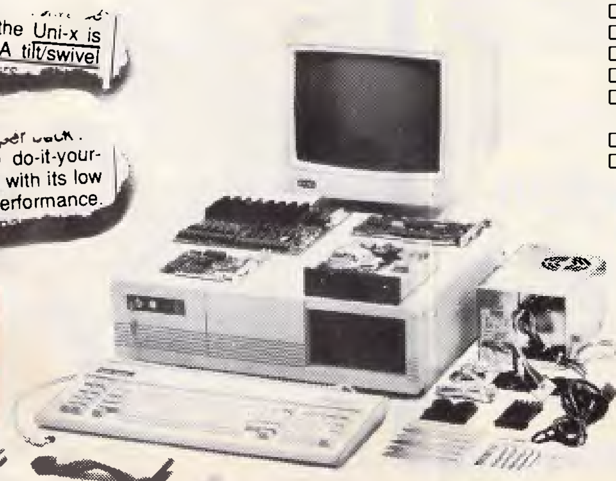
Specifics.

very sensible place

The Uni-x features a delightfully small motherboard. It has employed a VLSI component to replace the Intel 8253 timer, 8255 PPI, 8237 DMA controller and several other components. This reduced the component count and a simplified motherboard serves to reduce costs.

♫ Why try to keep up with the Commodore, when the Commodore can't keep up with us? ♫

- ☐ **Super-10 mother board** 640K installed, 4.77/10 MHz, plus V-20 chip (very fast!)
- ☐ **Colour graphics adaptor card.**
- ☐ **Multi I/O Card** — Serial/Parallel Ports, Games Port, Clock, Calendar, Floppy Controller.
- ☐ **Dual Frequency TTL Monitor** (Green or Amber) includes tilt & swivel base.
- ☐ **Top quality Japanese Disk Drive.**
- ☐ **150 watt switching power supply.**
- ☐ **High tech flip-top case.**
- ☐ **Complete set of accessories.**
- ☐ **AT style keyboard.**
- ☐ **Industry standard, runs all IBM software.**
- ☐ **Instruction manual.**
- ☐ **Utility Disk.**



$942*

* Including tax

Why not?

UNI-X Pty Ltd CompuPak Division

UNI-X CompuPak Division,
16-20 Edmondstone St,
Newmarket, Queensland 4051

Open Saturday morning.

Phone: (07) 356 7866
Dealer enquiries welcome

vantage will be the performance boost given to existing laser printing engines.
Tim Barjarin

More punch for hard disk back-up

Utility software lacks the glamour and appeal of packages such as Excel or PageMaker, and so tends to get lost in all of the application hype. This is especially true when it comes to disk back-up products. They're generally very bland, but if you have ever crashed your hard disk, you know how important these products are.

One company, United Software Security of Vienna, Virginia, has decided to give its disk back-up product, Take TWO, more punch.

Take TWO Manager is one of the most powerful tools for hard disk management I have seen, combining disk back-up with file management, file annotation and report generation features.

A fast OOPS feature allows you to undelete files and completely restore lost files; and, if you accidentally format your hard disk instead of a floppy, just type A:TT and you resurrect all your files.

Individual products offer some of these features, but this type of integrated solution on one disk is a utility that hard disk users will find very useful

The price is $US139.

United Software is in the US on (703) 556 0007.
Tim Bajarin

The search goes on

The quest for the ideal comms program continues, with Mirror and Transend being my two newsworthy developments, and there's still no outright winner.

Transend is a UK product which now has the ability to do sliding-window Kermit file transfers, something every serious bulletin board hacker will want for international work. It does Viatel videotex well, and has a noticeably improved user interface, editor and programming language.

Mirror remains the only program that will work in the background, leaving me to run programs while it stores incoming batches of data. But it still doesn't do videotex and won't do sliding window Kermit or Xmodem.

Then, in September, Softklone executives took me to a quiet corner of a hotel where they showed me work in progress on both these essentials.

The new Mirror should be out in a few months — possibly before the end of the year. That version will probably not have a sliding window facility, but it will have videotex — handled, cleverly, as a terminal emulation. However, it doesn't make the program any larger.
Guy Kewney

Thieves' resource

If you were a regular pilferer of the community's video recorders, and you'd rather like to improve your chances of scoring a machine in the lottery-like endeavour of breaking into houses and apartments on the off chance a video recorder was present (and a VHS at that — they sell for more on the black market), what would you do? According to Julie Nugent of PC Extras, you'd make your first port of call the local video store and make off with its computerised membership list.

Should the proprietor of the store leave the hard disk on the premises over-night, the thief would have a wonderful hit-list — unless, of course, the hard disk were encrypted. And this is where PC Extras would like to come in. The firm is selling Security Guardian, a software encryption system. It sells for $299 plus sales tax and is compatible with IBM PCs, ATs and the PS/2 range.

Details from PC Extras on (03) 529 8976.

Aussie indexer

Australian software developer, Software Source, has released a disk management utility. 'Disk-n-Dex' produces an index on your hard disk of every file you have on your hard and floppy disks. It records how many copies of each file you have, when you last updated them and its archiving facility backups only those files which have been created or added.

There's lots more of course. Details on (02) 389 6388.

Great product, bad timing

As a sequel to this month's test of the Transputer-based Monoputer board for the IBM PC, we should mention the bad timing, but good prospects, of the firm Integrated Arts Limited. It employs over forty scientists in Australia, largely involved in producing a Transputer-based video post-production machine. When it is released next year it will perform the total range of editing functions and extend to two and three-dimensional computer animation, graphics, titling and digital video effects.

The company's managing director, Kia Silverbrook, said "We believe we are one of the most advanced users of Transputers in parallel processing in the world today . . . It enables us to build in enormous computer power at very competitive prices".

That's the good product. The bad timing was its decision to list on the stock exchange early last month. Integrated's shares got a bit

Introducing the VGA card that'll knock your socks off.

It's VEGA VGA,™ just what you'd expect from the company that brought you the award-winning VEGA Deluxe.

This short card gives you VGA compatibility without having to buy a new IBM PS/2 machine.

And at the same time, it gives you capabilities that even IBM can't match.

To begin with, VEGA VGA provides a graphic resolution of 640 x 480. And gives you 16 spectacular on-screen colors from a palette of 64, with a variable frequency monitor.

Or if you're using an analog monitor, you can select 256 simultaneous colors with 320 x 200 resolution from a palette of 262, 144 or 16 colors with a resolution of 640 x 480.

But this isn't just a BIOS level VGA card. VEGA VGA offers complete software compatibility for all VGA programs. And that's not all.

VEGA VGA is backwards compatible, working with your favorite software programs for EGA, CGA, MDA and Hercules. Guaranteed.

And due to our innovative design, VEGA VGA supports both analog and digital monitors. Which means it will work with the monitor you're currently using.

And it works up to 400% faster than an EGA card.

VEGA VGA also incorporates surface mount technology with our custom IC chips—for less heat, more reliability and durability.

VEGA VGA provides drivers for an additional high resolution of 800 x 600.

And finally, VEGA VGA is the only card that comes with a full three year warranty.

All this for a fraction of the price of a new IBM PS/2. Plus a new pair of socks.

VIDEO SEVEN
We make a clear difference

Tech Pacific Pty Ltd: 119 Ferrars Street, South Melbourne, Vic 3205. Tel: (03) 690 9055, Fax. (03) 690 8283

Sydney, Tel: (02) 319 2622 • Wellington (NZ), Tel: (04) 736820

Dimension Graphics Pty Ltd: 201 Miller Street, North Sydney, NSW 2060, Telephone: (02) 929 5855, Telex: AA25693 • Melbourne, Telephone: (03) 51 3353

MAKING THE WYSE DECISION

The latest Wyse Computers with superior functions and ergonomic design are now available.

1. The WYSEpc 286 Model 2108
This AT-Compatible is designed to provide the best value in a PC AT-compatible system. A Wyse solution for the single user.

2. The WYSEpc 286 Model 2112
This elegantly designed High Performance AT Compatible is designed to provide a powerful solution for demanding single user computer applications. With this model you have a high performance desktop computing solution for the Wyse and proficient office user.

3. The WYSEpc 286 Model 2214
A very High Performance AT-Compatible. Designed to provide a superior platform for advanced workstations and multi-user systems applications where power and expandability are vital. Upgradable to a 386 this is a Wyse solution for your CAD or file server requirements.

4. The WYSEpc 386 Model 3216
The Desktop AT-Compatible Supermicrocomputer provides the computation power of a dedicated 32-bit supermicrocomputer for the price of a personal computer. This is the Wysest choice for applications that demand the highest level of performance.

Model	Processor	Speed MHz	Wait States	Standard Memory	Mass Storage Support	Footprints	Special Features
3216	80386	16	0	1Mb	4-½ height	53.7cmx 44.7 cm	Wyse windows 32 bit architecture
2214	80286	12.5	0	1Mb	4-½ height	53.7cmx 44.7 cm	Upgrade to 386 available
2112	80286	12.5	1	1Mb	3-½ height	38.1cmx 42.2cm	software security system small footprint
2108	80286	8.0	1	1Mb	3-½ height	38.1 cmx 42.2 cm	price, performance, ergonomics

The Computer House
161 Park Street,
South Melbourne, 3205.
Ph: (03) 699 2000 Fax: (03) 690 5810

Intown Computer Products
3rd Floor,
396 Kent Street, Sydney 2000
(02) 261 4411

The best pri

PC SHOPPER

Prices in this advert may be used to update your copy of PC Shopper

REMEMBER

The Computer House & Intown Computer Products are your computer suppliers — we have the very best industry standard equipment to meet your needs and all at the best prices in town.

HYPERFORMANCE HARDWARE & SOFTWARE

Make your PC's fly with Hypertec hardware and Microsoft software. This combination represents the very latest in super price performance products from Australia and the United States.

HYPERACE AND HYPERFORMANCE RATINGS

	IBM PC	IBM AT 8MHz	HYPERACE 286 PLUS 10MHz	HYPERACE 286 SUPER PLUS 12.5MHz	HYPERFORMANCE 12.5MHz	HYPERFORMANCE 16MHz
Norton SI(V3.0)	1.00	7.00	10.10	12.9	13.30	17.70
PC Bench	1.00	3.78	5.81	7.2	7.30	9.06
Symphony Recalc	1.00	2.78	2.96	3.55	5.82	7.76

SUPER SOFTWARE NEW FROM MICROSOFT

MS WORD - VERSION IV

This new wordprocessor really flies and you control the speed. Fantastic new features including document summary sheets, box and line drawing, red lining and a complete search facility.

MS EXCEL

The soul of the new machines designed to access the real power of 286 and 386 chips.
This is the first step towards OS-2.

SUPER PRODUCTS AT SUPER PRICES

HYPERTEC	Ex tax	Inc tax	MICROSOFT	Ex tax	Inc tax
Hyperace 286+	637	735	MS Word	589	664
Hyperformance 12 MHz	1761	1999	MS Excel	678	779
Hyperformance 16 MHz	1999	2300			

SOFTWARE

	Excl. tax	Incl. tax
Spreadsheets		
Lotus 123 Rel. 2	$499	$588
Supercalc 4	$469	$563
Lotus HAL	$195	$224
Silk	$249	$299
V.P. Planner	$158	$178
MS Multiplan	$295	$335
Javelin	$349	$395
Professional Plan	Call	Call
Database		
dBase lll plus	$714	$830
Foxbase	$495	$575
Q & A	$448	$519
Paradox V1.11	$735	$640
R Base Systems	$839	$978
Reflex	$195	$225
Clipper compiler	$730	$849
Dataflex	$1095	$1285
Professional File	Call	Call
Word Processing		
Multi Mate Adv ll	$600	$675
Wordstar	$269	$294
Wordperfect	$419	$475
Microsoft Word	$589	$664
Leading Edge	$199	$229
Professional Write	Call	Call
Integrated		
Framework ll	$875	$1045
The Smart Series	$870	$999
Symphony	$895	$959
Ability	$235	$285
First Choice	$165	$195
Open Access	$860	$999
Graphics		
MS Chart	$369	$429
Harvard Graphics	$413	$499
Freelance +	$574	$674
Magician	Call	Call
Utilities		
Sidekick (Unprotected)	$99	$118
Norton Utilities	$119	$134
Norton Utilities Advanced	$215	$249
Norton Guide	$119	$134
Mace + Utilities	$119	$134
X-Tree	$ 79	$ 94
Fastback	$154	$169
Sideways	$ 78	$ 99
Microsoft Windows	$129	$148
Copywrite	$ 85	$ 99
Languages		
Microsoft C Compiler	$560	$666
Microsoft Macro Assemb.	$199	$229
Microsoft Quick Basic	$108	$123
Microsoft Quick C	$108	$123
Turbo Pascal (V 3.0)	$139	$152
Turbo Prolog	$139	$152
Turbo Basic	$139	$152
Turbo C	$139	$152
Accounting		
Satchel	$620	$695
Dollars and Sense	$229	$259
Sybiz Book Worker	$799	$892
Accounting 1	$775	$845
T*A*O* Specialised accounting for accountants		Call
Also Sybiz, I.A.L., Integrity, etc.		Call

ces in town

	Excl. tax	Incl. tax
Communications		
Crosstalk	$174	$197
Reflection (H.P. Emulation)	Call	Call
Entertainment		
Silent Service		$69.95
Zork I, II or III		$89.00
Wizardry		$101.00
Gunship		$69.95
Flight simulator		$89.00
and many many more		
Project Management		
Harvard Project Management	$682	$789
Super Project plus	$559	$669
Microsoft Project	$496	$578
Timeline	$579	$659

HARDWARE

System Units		
Wyse 2108 At	$2399	$2699
Wyse 2112 12MHZ AT	$2999	$3499
Wyse 3216 80386	$6490	$7327
Ultra 2 F,Disk Mono	$1542	$1742
Ultra 20MB Mono	$1899	$2195
Ultra 20MB Color	$2223	$2595
Ultra 20MB EGA	$2522	$2950
AST Premium 20MB EGA	$4749	$5399

Call now for the configuration of your choice. Also Laptors at super price reductions.

Disk Drives		
Seagate 20MB	$575	$624
Hardcard 20Mb	$1122	$1275
Hardcard 40Mb	$1669	$1950
CDC High Performance Drives	Call	Call

	Excl. tax	Incl. tax
Tape Backups from	$789	$899
M'Function & Memory Boards		
Hypertec Hyper - 512 MF	$349	$398
Hypertec Hyper - 512	$245	$269
Hypertec Hyper - 256	$178	$185
Hypertec Hyper - 128 AT	$249	$299
Hyperam AT & XT	Call	Call
Intel Above Boards	Call	Call
AST Ram page	Call	Call
Display Cards		
Everex Autoswitch	$263	$299
Hercules Graphics Card plus	$408	$475
Vega deluxe	Call	Call
Turbo Cards		
Hyper Ace 286 (6Mhz)	$649	$699
Hyper Ace 286 Plus (10 Mhz)	$637	$735
and many others	Call	Call
Monitors		
E.G.A. from	$720	$832
Mono from	$140	$165
NEC Multisync	Call	Call
Laserview	Call	Call
Modems		
Netcomm Automodem 2123	$369	$435
Netcomm Automodem 12/12	$489	$550
Netcomm Automodem 24/24	$689	$795
Netcomm Automodem 123	$619	$729
Netcomm Automodem 1234	$739	$865
Data Bridge 1200 SA	$664	$774
Data Bridge 123 SA	$739	$849
Data Bridge 2400 SA	$784	$897
Data Bridge 1234 SA	$850	$976

	Excl. tax	Incl. tax
Printers		

Complete Epson range at heavily discounted prices — Call for a quote we will not be beaten.
Star Printers also heavily discounted — Call for price.
Fujitsu reliability — A printing bonanza.
Laserjets galore — All as special pre Xmas discounts.

Other Boards and Peripherals		
MS Mouse (Bus or Serial)	$216	$245
Power Supplies	$179	$199
Plotters (H.P. or Roland)	Call	Call
Cables	Call	Call
Acoustic Hoods	Call	Call
Printer Buffers	Call	Call
Power filters	Call	Call
Coprocessors	Call	Call
Summa graphics bit pads	Call	Call

REMEMBER

THIS IS ONLY A SAMPLE OF OUR PRODUCT RANGE – CALL NOW FOR THE PRODUCTS OF YOUR CHOICE.

PLUS

• Free Hotline Service • Immediate* replacement of any defective stock
• Training arranged • Expert advice
• Australia wide maintenance

DELIVERY

• Anywhere in Australia for $8.50 (under 3Kg.) • Overnight on request • Goods over 3Kg are charged at Post Office rates • Prices are subject to change without notice
• Terms: Payment on receipt of goods
• Bankcard, Mastercard, Visa accepted

"We rent PC's, call now for information"

*Subject to availability

The Computer House
Phone Now (03) 699 2000
161 Park Street, South Melbourne Vic. 3205. Fax (03)690 5810

Intown Computer Products
Phone Now (02) 261 4411
3rd Floor, 396 Kent Street, Sydney 2000.

Sextant/242

of a beating of course, but not as bad as the majority.

Backwards emulation

APC has published various bits of information on software emulation over the last couple of issues — the latest news being the possibility of Transputer-based PCs emulating IBM PCs and Macintoshes. But the latest product to hit the market actually takes the 'retrospective' step of getting an Amiga to emulate a Commodore 64. Why would anyone want a fast, advanced machine like the Amiga to pretend it's an 'old dog' like the Commodore 64? Because there are thousands of programs around for the '64 — the same reason people want a Transputer to emulate an IBM PC.

The product is the 'GO 64' Commodore 64 emulator and it should be available from Computermate by the time you read this. It will retail for $199; Computermate is on (02) 457 8118.

Shooting oneself in the foot

Last April IBM announced a whole new range of PCs and some vapourware. The PCs were PSs (personal systems) and the vapourware was (and still is) OS/2, or 'Operating System/2'.

When it is released next year, OS/2 will need at least an 80286 to run on. It will not run on 8086-based computers. So it was surprising to see an 8086-based PC in IBM's new line-up in the form of the Model 30. But it was even more surprising that anyone would buy one. And absolutely staggering that anybody would buy one thousand.

National Reservation Systems has placed this strange order. It is one of the largest in Australia for the PS/2 range and probably the largest for the Model 30 (at least all we'll hear about — who else would admit buying them?) National Reservation will not be able to run OS/2, or the presentation manager, or effectively multi-task or . . .

But there is something National Reservation will be able to do with their Model 30s, though.

It will be able to depreciate them for the next three to five years.

Never stuck for a new idea to tempt PC users with a fetish for computer stands, ergonomic seats, desks, foot rest . . . you name it . . . Sylex has come up with this. It's a 'Sylex Stacker Stand', which means it's a place to put your printer.

Optimistically, Sylex says that: "Because the paper feeds easily, the printer can be left unattended without concern — simply return to collect the finished product". If you're interested, Sylex is on (02) 647 2888.

Awards

APC's occasional award series recognises two firms this month.

Packet Press gets the 'Understatement of the month award' for its PR blurb accompanying its latest innovation — a credit sized plastic PC-DOS reference guide. The company explains that amongst other things, the DOSCARD is "not a replacement for the DOS manual . . .". Manual publishers breathe easy.

And to Tricom goes the 'Overstatement of the month award' for its conviction that the Pick operating system has "contributed largely to the PC market growth in recent months".

Windowing on the Commodore 64 is the province of GEOS (graphic environment operating system): this now has a desktop publishing system attached.

Geopublish is from Berkley Softworks, which wrote Geos. It will sell for $US70, and the company is (perhaps understandably) unforthcoming about exactly which versions of the Commodore 64 it will run on.

Details from California on (415) 664 0883.

Tramiel set to tackle Tandy

With over 600 computer centres and over 4000 electronic retail outlets, Tandy is one of the largest distributors of personal computers in the world. Only IBM and Apple, with their dealer networks, move more boxes. But for Tandy, it has taken a long time to get to this point.

While the TRS models became a standard for computer hobbyists, Tandy's initial attempt to get into the business market was very poor, partly because the company took a long time to realise that the IBM PC operating system was the *real* standard.

But, when Tandy grasped the direction of the market, it really began to move. The model 3000 and 1000 series are quickly becoming bestsellers in the US and the company-owned stores give Tandy the best distribution network anyone could have. The company has come a long way from the days when it was peddling its leather products.

This success story has caused many a personal computer vendor to envy Tandy and consider emulating its distribution operation.

Now Atari's ever-resourceful head, Jack Tramiel, has decided to take on Tandy with his version of a company-owned distribution strategy. In August, Atari bought the Federated Electronics chain of 70 stores.

These stores, most in the western US, carry everything from car stereos to television cameras.

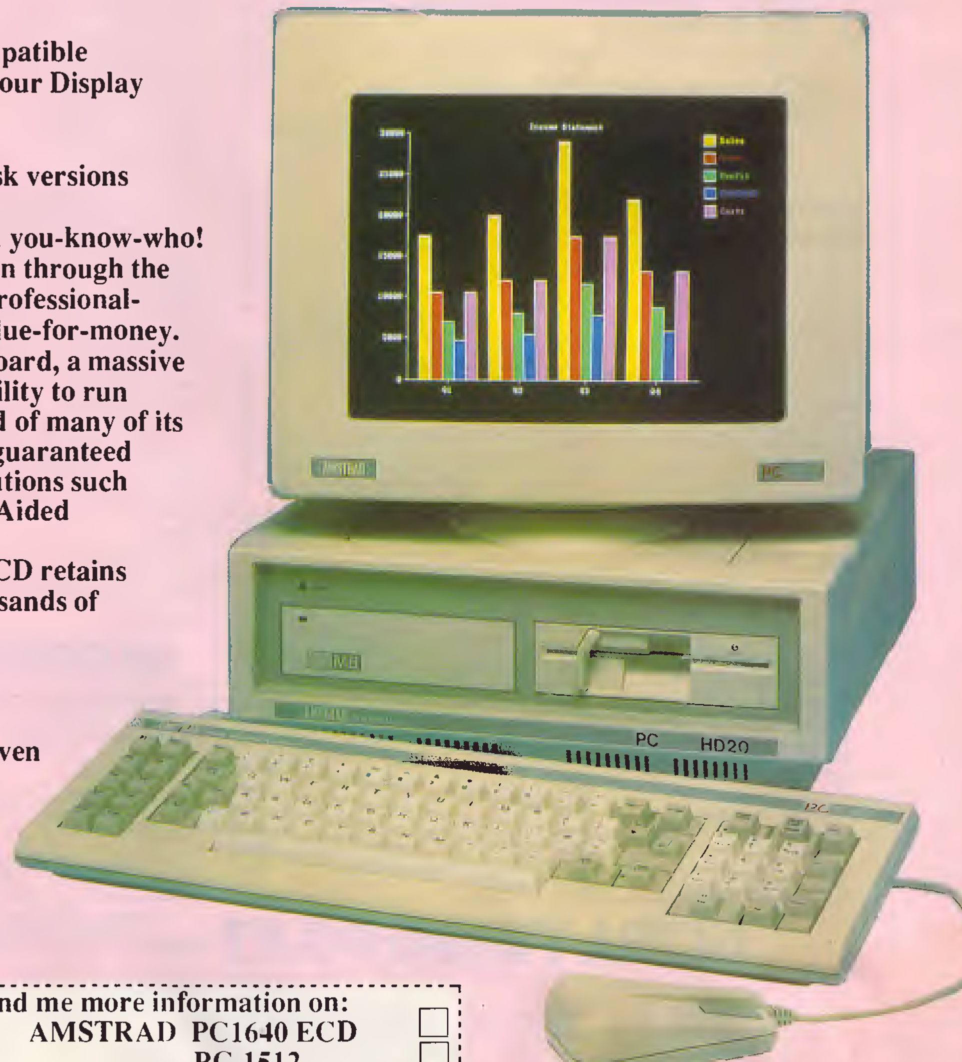
The New Amstrad PC1640 ECD

The 640K ultra-high resolution, enhanced colour display PC compatible for serious business.

Never before has a colour PC given you so much for so little. Your eyes won't believe the quality – or the price!

AMSTRAD

Finally the compromise between price and graphic performance is over. The astounding graphics-handling and expansion capabilities of the Amstrad PC1640 ECD means you don't pay through the nose to give your eyes a treat!



*** EGA, Hercules, MDA and CGA compatible**
*** Extra high resolution, Enhanced Colour Display**
*** 640K RAM**
*** 8 MHz 8086 Processor**
*** Single or Double Drive and Hard Disk versions**
*** 3 full size Expansion Slots**
*** And, of course, fully compatible with you-know-who!**

Amstrad's engineers have again broken through the cost barrier to produce an advanced professional-quality PC range that's unmatched value-for-money. With its built-in-graphics expansion board, a massive 640K of RAM as standard, and the ability to run programs at more than twice the speed of many of its competitors, the PC1640 ECD brings guaranteed definition to exciting new business solutions such as Desktop Publishing and Computer Aided Design with in easy reach!
And of course the Amstrad PC1640 ECD retains PC software compatibility to run thousands of industry-standard programs.

Network compatible

The PC 1640 has been thoroughly proven on the industry standard Novell and IBM Token Ring Networks acting in both a fileserver and terminal capacity!

RamPage Computers
the business solution
Shop 13, 300 Toorak Road,
South Yarra, 3141
PHONE: (03) 241 3031
Fax: (03) 241 0458

Please send me more information on:

AMSTRAD PC1640 ECD ☐
PC-1512 ☐
PCW ☐

Name:..
Address:...
....P/Code:......................
....

MICROLAND

AUSTRALIA'S NO. 1

BEST PRICES IN AUSTRALIA
CALL US WE WON'T LET YOU DOWN.

NATIONAL SALES SERVICE & DELIVERY (all prices include sales tax)

CALL: 02 - 331·7474 OR **FAX: 02 - 331·7499**

NEC MULTISYNCH $1,139 INC. TAX	WORD PERFECT V4.2 $469 INC. TAX	SEAGATE 20MB and controller $575 INC. TAX
NEC POWERMATES ALL CONFIGURATIONS – CALL	X-TREE $79 INC. TAX	INTEL ABOVE BOARD XT $567 INC. TAX

SOFTWARE

LOTUS SOFTWARE INC. TAX

Symphony	$849
Lotus 123	$559
Lotus HAL	$210
Freelance Plus	$670
Graphwriter	$670
In word	$190
Manuscript	$670

MICROSOFT PRODUCTS INC. TAX

Multiplan	$329
Mouse	$239
Window	$189
Window/Mouse	$368
Word	$489
Access	$395
Chart	$480
Learning Dos	$80
Project	$645
RBase System V	$1179
Window/Draw	$330
C Compiler	$695
Cobol Compiler	$1060
Fortran Compiler	$695
Pascal Compiler	$495
Quickbasic	$165

SPREADSHEET INC. TAX

Lotus HAL	$210
Lotus 123	559
Twin	$240
Silk	$250
Javelin	call
VP Planner	$135
Supercalc 4	call

DATABASE INC. TAX

RBase System V	$1179
Fox Base Plus	$575
Fox Base Multiuser	$call
DBase III +	$825
Paradox	$689
Reflex	$215
Q&A VER 2.0	$495

WORDPROCESSING INC. TAX

Multimate 3.31	$575
Multimate Adv II	$669
Wordperfect	$469
Perfect Writer	$250
MS Word	$489
Wordstar 2000 plus	call

INTEGRATED INC. TAX

Enable	call
Ability plus	$285
Framework II	$895
Open Access II	$950
Symphony 1.2	$849
PFS First Choice	$225
DAC Easy	$195

COMMUNICATIONS INC. TAX

Supercom Executive	$130
Mirror	$80
Crosstalk XVI	call
Softerm PC	$430
Carbon Copy	$280
Smarterm	call

GRAPHICS/CAD INC. TAX

Gem Draw PLus	$425
Harvard Presentation	$530
Freelance Plus	$670
Prodesign II	$510
Gem Graph	$360

PROJECT MANAGEMENT INC. TAX

Timeline	$579
Harvard Project Manager II	$695
Microsoft Project	$645
Superproject Plus	$650

BORLAND - BLAISE - POWER INC. TAX

Eureka	$139
Turbo Pascal	139
Turbo Prolog	$139
Turbo Prolog Toolbox	$139
Turbo Basis	$139
Turbo C	$139
Turbo Editor Toolbox	$108
Turbo Graphix Toolbox	$108
Turbo Database Toolbox	$108
Turbo Tutor	$58
Turbo Lightning	$139
Turbo Gameworks	$110
Jumbo Pack	$390
Turbo Power Tools Plus	$240
Turbo Power Extender	$185
Turbo Power Utilities	$205
Turbo Asynch Plus	$240
Tdebug Plus	$155

UTILITIES INC. TAX

DS Backup Plus	$170
FAstback	$168
Copywrite	$85
Smartkey	$68
PC Alien	$92
Above Disk	$195
Poly Boost	$140
Norton Utilities	$133
Norton Advanced	$208
Typequick	$75
Printworks	$125
XTree	$79
PC Tutorial	$85
HOT	$170
Newsmaster	$85
Newsroom	$95
Rapidfile	$480
Superkey	$135
Smartstuff	$92
Mace Ver 4.10	$180
Print Q	$209
Sideways	$128

HARDWARE

NETCOMM MODEMS INC. TAX

NETCOMM INMODEMS

PC inmodem	$345
Inmodem 1200A	$505
Inmodem 2400A	$715
Inmodem 123A	$669
Inmodem 1234A	$849
Modem 3+12	$215

NETCOMM AUTOMODEMS

Automodem 21/23	$429
Automodem 12/12	$539
Automodem 24/24	$785
Automodem 123	$725
Automodem 1234	$875

NETCOMM SMART MODEMS

Smart 1200A	$569
Smart 2400A	$805
Smart 21/23SA	$485
Smart 1200SA	$665
Smart 2400SA	$840
Smart 123SA	$865
Smart 1234SA	$1079
Datalock 123SA	$1075
Datalock 1234SA	$1280
Security Modem	call

VIDEO CARDS INC. TAX

Colour Graphics Card	$110
Mono Graphics Card	$130
Everex EGA	$285
Everex PGA	$295
Vega 480 Card	$585
EVA 480 Card	call
Hercules Graphics Card Plus	$460
Hercules in Colour	$780
EIZO MDB04	$650
EGA WONDER	$575

GENERAL HARDWARE INC. TAX

Intel 8087	$250
Intel 8087-2	$345
Intel 80287-6	$370
Intel 80287-8	$550
Intel 80287-10	$650
Intel 80387	$1280
Intel Above Board PC/XT	$560
Intel Above Board AT	$780
Intel InBoard 386	$2880
Qubie 6Pak Plus 384K	$375
AST Six Pak Plus 64K	$330
AST Advantage Premium 512K	$880
AST Rampage 256K XT	$585
AST Rampage 512 AT	$880
Power Supply 150 Watt	$170
Power Supply 200 Watt	$260
Hyperace 286 Plus	$689
Orchid Tiny Turbo 286	call
Irma 3270 Coax	call

ULTRA TURBO PC-XT

* ABSOLUTELY FREE! – $1,200 WORTH OF PERFECT SOFTWARE WITH EVERY PERCHASE.

cpu 4.77/8mhz, 640k, clock calendar, ser/par. games port, MSDos 3.2 GWBasic, blank diskettes
1 year Imagineering warranty

A.	2 x 360 FDD, monochrome screen + $1,200 free software only from Microland	$1785
B.	20MB HD, 360K FDD, monchrome screen + $1,200 free software only from Microland	$2185
C.	20MB HD, 360K FDD, colour screen + 1,200 free software only from Microland	$2585
D.	20MB HD, 360K FDD, EGA screen + 1,200 free software only from Microland	$2985

Limited stock available and only until stock exhausted.
With every Ultra purchase for the 1st 200 purchases only, one free set of Perfect integrated software (R.R.P. $1,200)
ABSOLUTELY FREE ONLY FROM MICROLAND!!!!

OLIVETTI COMPUTERS

FREE – $1,200 worth of Perfect Software with every Olivetti purchase only from Microland

A.	M24 Computer, 640k RAM 20MB HD Complete	CALL FOR
B.	M24 Computer, 640k RAM 30MB HD Complete	OUR SUPER
C.	M24SP Computer, 640k RAM 20MB HD Complete	SPECIAL PRICES
D.	M28 Computer, 512k 20MB HD Complete	$4865
E.	M28 Computer 1MB, 70MB HD Complete	$5765

KAYPRO COMPUTERS

1.	Kaypro PC, 2FDD, 768KB, 4.77/8MHZ, DOS 3.2, SER, PAR, Clock, Bundled software, 9 expn slots	$1985
2.	Kaypro PC 30. 1FDD, 30MBHD, 4.77/8MHZ, DOS 3.2, SER/PAR. Clock. Bundled software, 9 expn slots	$2385
3.	Kaypro 286i, 10mhz, 8026, 640k expandable to 15MB, IBM AT comp, 1.2 MB Floppy, 40MBHD, 8 expn slots	$call
4.	Kaypro 386, IBM AT compatible, 16mhz 80386, 2.5MB, 32BIT RAM expandable to 16MB, 1.2MB Floppy, 40MBHD, 1 x 32 BIT/3 x 16 BIT/2 x 8 BIT slots	$call

HYPERACE 286 PLUS
$719 INC. TAX

EPSON LX 800
180 CPS $459 INC. TAX

VEGA DELUXE
$585 INC. TAX

VP PLANNER
$135 INC. TAX

QUICKSILVER DB III + COMPILER
$690 INC. TAX

INTEL MATHS CO PROCESSORS

8087-2	$345
80287-8	$550
80287-10	$650

Orchid Tiny Turbo 286	call
Irma 3270 Coax	call
AST 5251	call
64K Dram Chips	$4.50
256K Dram Chips	$750
256K (80 ns) Dram Chips	$9.00

DISK DRIVES INC. TAX

Seagate 20MB + controller	$575
Seagate 30MB + controller	$635
Seagate 30MB voicecoil	$995
Seagate 40MB + voicecoil	$1175
Tandon 20MB + controller	call
Miniscribe 20MB	$550
Miniscribe 30MB	$720
Miniscribe 44MB voicecoil	$1450
Micro Science 44MB voicecoil	$1295
Control Data 42MB voicecoil	call
Control Data 70MB voicecoil	call
Control Data 155MB SCSI	$4070
Control Data 182MB ESDI	$3770
NEC 20MB W/O controller	$550
NEC 20MB with controller	$680
NEC 40MB W/O controller	$1080
NEC 40MB with controller	$1200
Plus Hard card 20MB	$1245
Plus Hard card 40MB	$1939
Mountain Drive Card 30MB	call
Mountain Drive Card 50MB	call

TAPE BACK UP UNITS INC. TAX

Everex 60MB EXT	$1950
Cipher 25MB EXT	$1350
Cipher 60MB EXT	$1850
Alloy 40MB INT	$780
Mountain 60MB INT	call
Mountain 60MB EXT	call
Mountain 40MB INT	call
Mountain 120MB EXT	call
Other Mountain products	call
Archive 60MB EXT	$1590
Tallgrass	call
Tecmar Graphics	call
Irwin full range	call

MONITORS INC. TAX

ADI 12"	$189
ADI 14"	$240
ADI 4/PX22/EGA"	$860
TECO Colour	$585
TECO EGA	$745
NEC Multisync	$1139
Thomson Composite	$210
Thomson TTL	$230
Thomson Dualscan	$290
Thomson Colour	$590
Thomson EGA	$900
Thomson PGA/ultrascan	$1540
EIZO Flexscan .31mm	$1220
EIZO Flexscan .28mm	$1395
Samsung Full Range from	$210
Viking Full Range	call
Wyse Full Range	call
VM 1400	$240
others call	
TVM MD3 CGA	$630
TVM MD7 EGA	$895

PRINTERS INC. TAX

EPSON

LX-800	$459
FX-800	$call
FX-1000	$call
EX-800	$call
EX-1000	$call
LQ-850	call
LQ-1050	call
LQ-2500+	$call
IX-800	$950
SQ-2500	$call
GQ-3500	$call

CALL - WE CANNOT BE BEATEN ON PRICES!

MICROLINE

ML 182	$485
ML 183	$745
ML 192 +	$775
ML 193 +	$1040
ML 292	$1195
ML 293	$1495
ML 294	$2280
Latest 450 cps	call

FUJITSU

Fujitsu DX2300	$775
Fujitsu DX2400	$985
Fujitsu DL3400	$1225
Fujitsu DL2400	$1465
Fujitsu DL2600	$1925

BROTHER

Brother HR20	$845
Brother 1109AP	$520
Brother M1709	$950
Brother 1724L	$1285
Brother 2024L	$1120
Brother HR40	$1375
Others	call

NEC

Nec P5, P6, P7	call

TOSHIBA

Toshiba P321	call
Toshiba P341	call
Toshiba P351	call
Toshiba 351C	call

STAR

Star NL10	$470
Star NX10	$480
Star NL15	$690
Star ND10	$825
Star ND15	$925
Star NR15	$1150
Star NB24 10	$1030
Star NB24 15	$1380
Star NB 15	$1660

LASERS INC. TAX

Epson GQ-3500	$call
HP Series II	$4965
NEC Silentwriter	$4465
Ultra Laser	$3800
Qume Laser	call
Ti Omni Laser	call
Oki Laser	$3450
Others Not Listed Please Call	

AWESOME I/O CARD
$870

- DECREASE ACCESS TIME TO AS LOW AS 3MS. ON AT MACHINES
- DOUBLES HARD. DISK PRICE CAPACITY.
- OPTIMISES AS WELL

WYSE TERMINALS PC-XT-AT 80386

CALL FOR AUSTRALIA'S Nº 1 PRICE

WYSE 60 + KEYBOARD **$890** INCL. TAX

AST SUPER SPECIALS ON ENTIRE RANGE

CALL FOR AUSTRALIA'S BEST PRICE

COMPUTERS
OSBORNE
AMSTRAD

CALL FOR CHEAPEST PRICES

TOSHIBA

CHECK OUR SPECIAL PRICE!

LAP TOPS
T-2100
T-3100 20MB
NEC MULTI SPEED

EPSON COMPUTERS

* ABSOLUTELY FREE! – $1,200 WORTH OF PERFECT SOFTWARE WITH EVERY PERCHASE.

EPSON PC	2 x 360K FDD, 512K RAM, Serial & Parallel ports, OOS 2.11 + GWBasic, complete with desk stand	CALL FOR
EPSON PC	1 x 360K FDD, 20MB HDU, 512K RAM, Serial & Parallel Ports, DOS 2.11 + GWBasic, Complete with desk stand	AUSTRALIA'S
EPSON PCE	2 x 360K FDD,640K RAM, 4.77 – 10MHZ, Serial & Parallel Ports, 'O' wait state, DOS 3.2 + GWBasic	BEST PRICES
EPSON PCE	1 x 360K FDD, 20MB HDU, 640K, RAM, 4.77 – 10MHZ, Serial & Parallel Ports, 'O' wait state, DOS 3.2 + GWBasic.	PLUS FREE
EPSON PCAX	1 x 1.2 MB FDD, 20MB HDU, 640K RAM, 3 speed switchable 6, 8, 10MHZ Volume control, DOS 3.2 GWBasic, Serial + Parallel Ports	SOFTWARE
EPSON PCAX	1 x 1.2 MB FDD, 44MB voice coil HDU, etc	

* PRICES DO NOT INCLUDE VIDEO CARD OR MONITOR

ALL ITEMS NOT LISTED CALL: 02 - 331·7474

Although Atari is not necessarily into the traditional consumer electronics market, Tramiel says that he is interested in making *anything* that uses a micro chip.

In fact, company insiders say that his next major purchase will be a semiconductor company. Some think he may buy into the National Semiconductor consortium, but others believe he is more interested in Inmos, the Thorn EMI subsidiary that produced the Transputer, a chip Tramiel is interested in.

Most US analysts looked at the Federated deal as an important way for Atari to gain US distribution. Up to now, Atari has struggled to persuade 'serious' computer shops to carry his ST line.

With the Federated distribution channel, he can push more products out of the door and continue on his profitable road.

However, the big question is whether, in the end, this risky venture will pay off.

Federated has been losing about $US5 million a quarter, and it will take a lot of money and new marketing directions for it to recover.

Stewart Alsop, editor of a US PC industry insider newsletter, believes this is the "first serious mistake Tramiel has made."

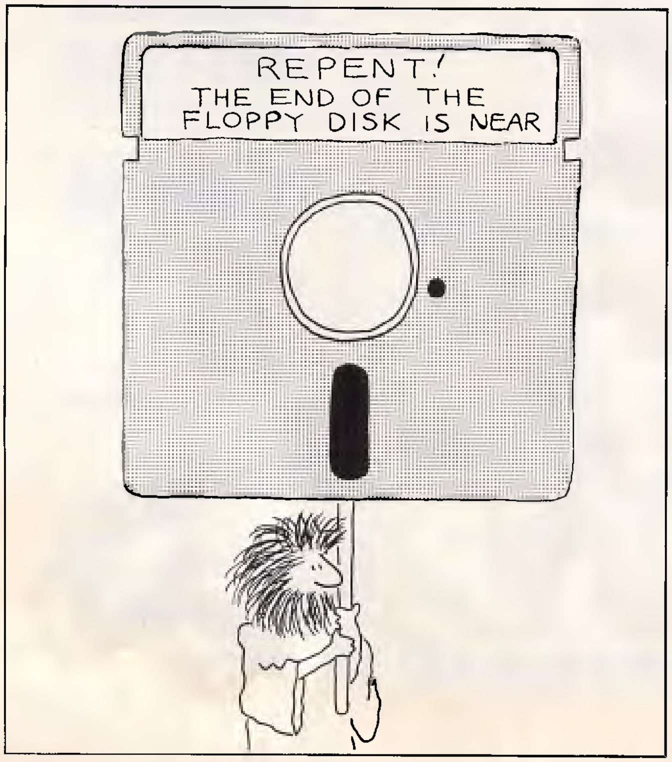
Alsop cites the failures of companies who made similar moves, and thinks that buying Federated could be detrimental to Atari.

But never count Tramiel out — he has a way of making things work. With his new manufacturing plants in Asia, you can expect him to do *exactly* what he says he will do and produce *any* product that uses a microcomputer chip. So, expect to see Atari TVs, phones and CD players, and perhaps even high-tech toasters.

While a lot of attention has centred on Atari's Federated acquisition, Amstrad has also taken some similar steps to gain better control of its US distribution.

Amstrad's purchase of its Texas-based distributor, VidCo, is seen by analysts and vendors as simply a way for Amstrad to have more say in the US market.

In the US, Amstrad products have met with only mild acceptance, and, like Atari, have not penetrated the computer specialty stores.



PageMaker upgrade

In its boldest and biggest move yet, Aldus Corp next week will expand its product line by 500 per cent.

According to sources close to the Seattle-based company, Aldus will announce new versions of its sole product, PageMaker, a page-composition software package for the PC and Macintosh; a Macintosh graphics-arts application program, called Kaleidoscope; and a video-screen capture system called Snap Shot.

"We will announce four products on November 2, at Comdex/Fall," said an Aldus spokeswomen, who declined to be more specific.

Sources who have seen the new programs, but who would not go on the record with their information, said the products are designed for current users in electronic publishing and for expanding into graphic-arts applications.

The new PC PageMaker will run under Microsoft Windows Version 2.0 and thus take advantage of the increased speed and support for expanded memory inherent in the latest version of Windows, the sources said. Also included in the new PageMaker version are features that are already available in PageMaker's rival product, Ventura Publisher from Xerox, of Rochester, New York.

These features include the ability to handle documents that are longer than the current 128-page maximum, style sheets, automatic text flow through several pages of a document, automatic text wrap (which previously was manual), the ability to create colour master copies (a technique called spot colour), and enhanced image editing and manipulation features for photographs that are scanned into PageMaker, the sources said. These features will also be offered in the new Macintosh version of PageMaker, sources added.

According to Creative Strategies, a market-research firm in San Jose, California, PageMaker and Ventura each hold 40 per cent of the desktop publishing software market. But, Ventura has exceeded PageMaker in the actual number of units shipped.

"PageMaker and Ventura are two very different products," one source said. "PageMaker has a page-makeup, cut-and-paste approach, and is more for the mechanical layout person, while Ventura is more typographical."

Kaleidoscope is a Macintosh drawing program designed for technical and graphic artists. It is designed to compete with Illustrator, from Adobe Systems, of Mountain View, California, sources said. Kaleidoscope, however, is easier to use than Illustrator and includes colour, they added. Both Illustrator and Kaleidoscope use Adobe's PostScript page-description language for capabilities such as drawing curved lines.

"The Adobe people should be worried," one source said. "Kaleidoscope can do everything that Illustrator can do, but in a much more straightforward method. And it has colour capabilities."

Kaleidoscope was developed for Aldus by Altsys, a Macintosh software developer in Houston, Texas. The program is expected to be priced in the $US500 range.

Snap Shot is a software program that lets users capture video images from a screen and include them in a PageMaker document.

Pricing and upgrade options for the other programs were unclear at press time. All four of the programs are expected to be available from Aldus during the first quarter of 1988.

MITSUI COMPUTER • RICOH • TOSHIBAFAX • ESPRIT

How productive can a laser printer really be?

A look at Ricoh Lasers will soon tell you!

For a start, Ricoh gives you a choice of 6, 8 and 15 page per minute laser printers. Ricoh has the laser to match your needs and your budget.

Then consider Ricoh's brilliant performance with all popular word processing, spreadsheet, CAD/CAM and database software packages.

Add to this, Ricoh's uncompromising power in bringing out the best in your Desktop

Publishing package. Whether you use Ventura, PageMaker, or any other DTP software, Ricoh's massive 2Mb of RAM makes the others not only lazy, but forgetful.

Perfect impressions can be yours for $3,995...ask for the Ricoh PC Laser by name.

Supported by Mitsui Computer's nationwide service and support.

RICOH
PERFECT IMPRESSIONS

Mitsui Computer
"The best business connections"

Sydney (02) 451 7711 • Melbourne (03) 690 6722 • Brisbane (07) 369 7799
Wellington (N.Z.) (04) 845 819 • Auckland (N.Z.) (09) 395 686

MAIL TO:
Mitsui Computer Ltd.
1-3 Rodborough Road,
P.O. Box 234,
Frenchs Forest N.S.W. 2086
Please send me full details about The Ricoh Range.

Name: ____________________

Company: ____________________

Address: ____________________

____

Title: ____________ Tel: ____________

APC 2/11/87 Y&L3107(c)

TOSHIBAFAX • ESPRIT • SEIKOSHA • MITSUI COMPUTER

MITSUI COMPUTER • RICOH • TOSHIBAFAX • ESPRIT • SEIKOSHA • MITSUI

MITSUI COMPUTER • RICOH • TOSHIBAFAX • ESPRIT • SEIKOSHA • MITSUI

AST's Smartslot architecture

AST Research Inc last month added another route for users wondering which PC bus to take.

The new bus, which AST calls the Smartslot architecture, is an extension of the AT bus that accepts existing AT-type add-on boards. Though it is not a clone of the Micro Channel used in IBM's PS/2 machines, Smartslot offers arbitrated support of multiple processors, a capability of the Micro Channel. Smartslot is featured in the new 20MHz 80386-based PC, the Premium/386.

The Smartslot architecture, AST officials said, accelerates processing speed by off-loading tasks normally handled by the microprocessor onto a coprocessor.

AST officials said the Premium/386 is intended for processing and memory-intensive applications such as networking, desktop publishing, and engineering and design. The Smartslot architecture includes three slots for AT-type add-on boards as well as specially designed processor cards.

AST also announced a small, slim AT-compatible computer and an 80386-basedaccelerator-board upgrade for its 80286-based Premium/286machine.

For users, however, AST officials and analysts said the most significant innovation among the products announced in Smartslot is the Premium/386.

"AST is offering another bus standard," said Jim Weil, a microcomputer consultant with Gartner Securities, a stock-market analysis group in Stamford, Conneticut. The Premium/386, which includes one 32-bit memory slot that interacts along its own separate pathway with the 80386 chip, will be available in January. In PCs, these pathways are shared by all the add-in slots.

AST announced only one peripheral to take advantage of the new architecture: a disk controller with an 80186 processor. However, the firm is developing communication and graphics coprocessors, said Allen Kraemer, AST's vice president of systems engineering. In the next few weeks, he said, AST will publish specifications of the Smartslot architecture in hopes that third-party board makers and computer makers will support it.

However, the big question is whether AST can gain sufficient support from these third-party companies to create the critical momentum required to make this a commercial success.

Totally groundless

A Newsprint fly-by friend phoned to say that Microsoft is gearing up a new product to compete with the venerable Flight Simulator. Apparently, the new product will take advantage of VGA graphics capabilities. Flight Simulator currently works in CGA mode: four colours at 320x200 pixel resolution. The Amiga version of the program can display 32 colours at that resolution, and allows the user to fly a Lear jet and a Cessna.

Newsprint's source urges us to look for a new program, rather than waiting for Flight Simulator, to take advantage of the 640x480-pixel resolution of VGA. What could it be? Space Shuttle Simulator, perhaps? Or Bombers-in-the-Persian-Gulf Simulator?

Or perhaps the most harrowing thought of all: Air Traffic Control Simulator?

END

MicroMania

Announcing the Ultra Laser at Australia's lowest price – $3899 inc. tax!!

SPECIAL FEATURES:

- HP Laser Jet Plus emulation
- Light-weight laser engine
- 1.5 Mbyte RAM on controller board
- Advanced 300 dpi full page bit-map graphics
- Vector graphics capability
- Faster download raster graphics
- More user-friendly utility
- Face-up or face-down paper output
- Second paper tray option

FREE!!
1 Year ON-SITE WARRANTY ON LASER by Honeywell

SOFTWARE

Ability Plus	318.00
Above Disk	199.00
Access	348.00
Anciet Art of War	80.00
Async	63.00
Attache 4 Accounting System	840.00
Auditor Version 3	216.00
Back-It	135.00
Brown Bag Utilities	188.00
Carbon Copy	369.00
Chart	465.00
Chartmaster	576.00
Chartstar	261.00
Clipper	999.00
Complete PC Introduction	95.00
Concurrent DOS 386 – 3 user	634.00
Concurrent PC DOS for IBM	538.00
Copy II PC	65.00
Copywrite	98.00
Crosstalk XVI	199.00
DBXL –	265.00
DESQView	159.00
DS Backup Plus	172.00
Dbase III Plus	875.00
Diagram — Master	534.00
Disk Explorer	105.00
Disk Manager	225.00
Disk'N'Dex	225.00
Dos Lock	150.00
Enter – Accounting System	449.00
Eureka — the Solver	154.00
Fastback	179.00
Fastgraphs	390.00
First Choice	275.00
First Publisher	164.00
Flashcode	269.00
Flashup Windows	145.00
Flight Simulator	90.00
Formtool – Forms Design	255.00
Framework II	1044.00
Freelance Plus	733.00
Gato	80.00
Gem Collection	173.00
Gem Desk Top	99.00
Gem Desktop Publisher	652.00
Gem Draw	480.00
Gem Graph	419.00
Genifer	525.00
Goalseek	329.00
Graphwriter	705.00
H/Hikers Guide to Gal	80.00
HAL by LOTUS	249.00
Harvard Graphics — Version 2	569.00
Harvard Project Manager	809.00
Homebase	138.00
Hot	175.00
IBM PC Story Board	515.00
In-house Accountant	139.00
InWord	209.00
Javelin	420.00
Jet	102.00
Kings Quest	90.00
Knowledgeman	919.00
Lattice C Compiler	779.00
Learning DOS	90.00
Lotus 1-2-3	590.00
Mace – Utility program	169.00
Magician — Graphics	375.00
Manuscript	733.00
Mapmaster	1575.00
Mathplan	460.00
Metastock	495.00
Metro — from Lotus	129.00
Microsoft Basic Compiler	659.00
Microsoft Basic Interpreter	564.00
Microsoft C Compiler	729.00
Microsoft Cobol Compiler	1125.00
Microsoft Cobol Toolkit	650.00
Microsoft Excel	820.00
Microsoft Fortran Compiler	729.00
Microsoft Lisp	424.00
Microsoft Macro Assembler	249.00
Microsoft Pascal Compiler	499.00
Microsoft Project Version 2.0	646.00
Microsoft Quikbasic	135.00
Microsoft Sort	329.00
Microsoft Works	329.00
Mirror — Crosstalk clone	82.00
Multimate 3.31	589.00
Multimate Advantage II	760.00
Multimate Advantage II P/P	815.00
Multimate Local Area N'work	1420.00
Multiplan	334.00
Newsmaster	149.00
Norton Assembly L'guage Guide	145.00
Norton Basic L'guage Guide	145.00
Norton C Language Guide	145.00
Norton Commander	120.00
Norton Pascal Language Guide	145.00
Norton Utilities – Ver. 4	145.00
Norton Utilities Advanced	249.00
Nortons Editor	208.00
Noteworthy	189.00
Open Access II	1090.00
PC Alien	86.00
PC Tutorial	90.00
PC-MOS/386 Operating System	1439.00
Pagemaker Desktop Publisher	1650.00
Paradox Version 2	1102.00

FREE OFFER!!

Every order placed over $199 will receive a FREE copy of the program ZIP — the postcode list for Australia. ZIP is a ram-resident program that "pops" up in the middle of any application and accesses a postcode into your current application. No one should be without this little beauty.

PC's

Kaypro — dual drive	2199.00
Kaypro — 30 Meg	2699.00
Kaypro — 386a	8610.00
Ultra — 2 drives/mono monitor/640K/DOS	1795.00
Ultra — 20 Meg/mono monitor/640K/DOS	2280.00
Ultra — 20 Meg/EGA monitor/640K/DOS	2999.00

Compaq Portable 386 vs Toshiba T5100

Compaq and Toshiba, arch-rivals in the 286 portables market, now do battle in the 386 field with the launch of their respective Portable 386 and T5100 laptops. Peter Jackson dons his referee's cap to decide the winner.

As the PC-compatible world becomes more and more accustomed to seeing 80386-based machines appearing on their desktops, it is no surprise to find Compaq, which invented PC portability, and Toshiba, which dominates the power PC laptop market, offering 32-bit portables.

It is equally unsurprising to find that they have approached the 32-bit market from different directions, based on what they have done before.

The Compaq Portable 386 is similar to the earlier AT-compatible Portable III, with a 'lunchbox' look and a tendency to go for standards such as 51/4in floppy disks rather than pushing for smaller and lighter systems. And the Toshiba T5100 looks like the earlier AT-compatible T3100, with a laptop-style fold-up display and fixed keyboard, the use of space-saving technologies like 3.5in floppy drives and the use of external, non-portable expansion boxes.

In the new portable 80386 market, it is the form factor that seems to count with Toshiba. The company says that the T5100 can still go into a briefcase; that it has the slim, dark good looks that power-user executives prefer; and that it doesn't bang your knees when you try to carry it with its built-in handle. Compaq points to the no-compromise approach to industry standards; the portable expansion board options; a tape back-up option; and the way that the machine protects software investment with its 51/4in drive.

Compaq Portable 386

Hardware

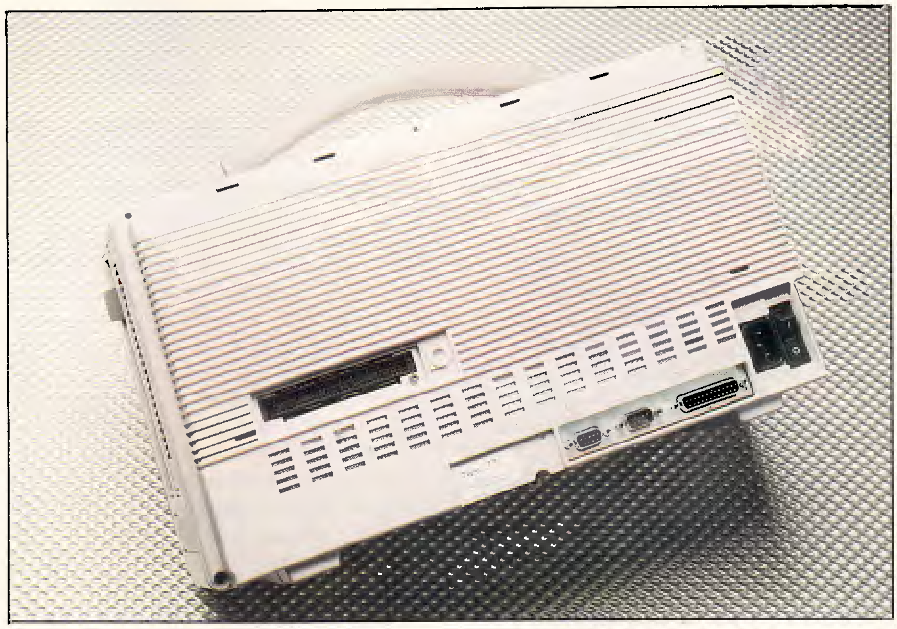
Outwardly, the Portable 386 looks exactly like Compaq's lunchbox-style Portable III, or the earlier Sharp PC-7000. The single floppy disk drive and the 40Mbyte hard disk are mounted vertically at the right-hand end, while the keyboard clips on to form the front face of the enclosure. Unclipping the keyboard reveals a plasma display screen, once again identical with the Portable III's.

Opening up the case by removing six Torx star-slot screws reveals a layout also familiar with the Portable III, but with unfamiliar components.

In the Portable III, Compaq had decided to make the system easy to maintain by mounting the main board at the back of the case with its component side facing outwards; this was a trade-off between accessibility and the risk of damage, since the board components are only protected by a single thickness of case plastic. The solution was to make the case from an immensely strong material described by Compaq as 'bullet-proof plastic', and the same design holds with the Portable 386.

At first, the board was obscured by impressive amounts of electromagnetic shielding, comprising pierced aluminium cages and sheets over the high-frequency components. This is necessary if the machine is to pass the Federal Communications Commission's interference tests in the US, and although a label on the review machine stated that certification had not been achieved, it also stated that production machines definitely would be FCC Class B approved.

The first impression of the revealed circuit board was how small it is for what it does. At the top right-hand corner, the unmistakable square block of the 20MHz 80386 and a socket for the optional 20MHz 80387 maths coprocessor are to be found. Hens' teeth are easier to come by than reliable 80387 chips, let alone 20MHz ones, so it was a considerable surprise to find a 20MHz chip fitted in the



The centrally-mounted expansion slot takes snap-on boxes: one of which holds a 40Mbyte tape streamer: the other takes expansion cards

Compaq maintains that 51/4in floppy drives are the industry standard and so has not been tempted by 3.5in ones. The 1.2Mbyte drive can be replaced with a 360k unit review machine. The 80387 socket is, oddly, too big, leaving a spare row of socket holes around the chip, but this had no effect on performance. The oversized socket is designed to take a Weitek maths coprocessor board as well as a standard 80387. This board provides a 10-fold performance improvement.

The main system RAM is at the centre of the board, using single-in-line memory modules (SIMMs) to provide 1Mbyte as standard; there are four SIMM sockets in all, so each SIMM in the base machine holds 256k. The chip configuration of the 2Mbytes of RAM in the review machine was a little strange, with four surface-mount 256kbit chips and two unfamiliar chips on each SIMM, but it is reasonable to deduce that each of the two extras — labelled 2801J-08 — is an unusual 1.5Mbit chip rather than a now-standard 1Mbit chip. There is room on each SIMM for eight of these, which would take the main RAM to 6Mbytes on the main board; and with a Compaq expansion board, the maximum 32-bit RAM capacity of the machine is 10Mbytes.

All the RAM chips are very fast and very expensive 80ns types rather than the cheaper 120ns and 150ns ones used in most PCs, enabling the RAM to keep up with the speed of the 20MHz processor.

The interfaces around the edge of the board include ribbon cables connecting the on-board floppy and hard disk controller to the internal drives, various power connectors, 9-pin and 25-pin D-type connectors connected directly to the RS232 and Centronics interfaces on the board, and a ribbon cable leading to the display daughterboard. This board fits at right-angles to the main board at the bottom of the case, and provides the control circuitry for both the internal plasma display and the external RGB monitor socket. Using this daughterboard design, as in the Portable III, means that Compaq can offer upgrades either for the internal display or the external monitor driver without changing the main board design. At present, the only option is an EGA card that will drive any external EGA monitor — Compaq offers one of its own — as well as the plasma screen.

There are actually two expansion sockets on the main board, impressive for a portable machine but not meeting anybody else's standards. The first, near the centre, is a 96-pin connector designed either for Compaq's 40Mbyte tape back-up unit or for its PC-compatible expansion box, both of which clip onto the back of the machine. The latter provides sockets for two full-length AT-standard expansion boards at the expense of portability.

The second, smaller, expansion socket provides 32-bit and 8-bit buses for

Prices

Compaq Portable 386

Model 40	
(40Mbyte hard disk)	$14,500
Model 100	
(100Mbyte hard disk)	$17,500
40Mbyte tape back-up unit	$1705
Expansion box	$375
10Mbyte RAM upgrade	$9097
MS-DOS Version 3.2	$170
MS-DOS Version 3.31	$198

Compaq's own expansion boards. There is space for two of these postcard-sized boards in the Portable 386, fitting at right-angles to the main board in a compartment at the base of the enclosure.

The keyboard interface is also new, and allows any standard PC or AT keyboard to plug directly into the socket if required. Plugging in an XT-compatible keyboard from a Taiwanese XT clone proved that this worked; although the plug was tricky to insert and seemed loose, the keyboard worked fine.

The keyboard itself is new, and intended to be compatible with IBM's now-standard Enhanced keyboard layout. However, width limitations mean that the separate cursor keypad on the Enhanced keyboard has been dropped, and the cursor keys share the numeric keypad — as they do on the old PC and AT keyboard designs. Apart from that, the Compaq board has all the advantages and disadvantages of the Enhanced keyboard in general.

As with all other Compaq keyboards, this one seemed squashy and unresponsive compared with the official IBM model or even Taiwanese clone boards. But that, of course, is a matter of taste and Compaq has certainly sold a lot of keyboards in its time.

The hard disk is a 'shock-mounted 3.5in unit with a capacity of either 40Mbytes with access time below 30ms, or 100Mbytes with access time below 25ms. As with the original 16MHz DeskPro 386, these drives use the SCSI and ESDI controller standards, respectively.

The floppy disk drive is a standard 1.2Mbyte 5¼in unit that can read 360k disks but, like every other such drive, fails to write them reliably. A 360k floppy drive is offered as an option for those who do want to write 360k disks properly.

The cantilever mounting of the display, as with the earlier machine, allows the screen to be lifted from the case on a kind of Anglepoise principle, and can be tilted to suit different types of lighting or to fit the user's preferences.

The display itself uses DC plasma technology, and has the usual Compaq display modes: 640x200 and 320x200 for CGA compatibility in monochrome, and Compaq's own 640x400 mixed text-and-graphics standard. The external RGB monitor interface, of course, provides the same modes with colour added.

The advantages of plasma technology are speed, inherent luminescence rather than the reflective operation of LCDs, and the ease of producing high-resolution panels with the same aspect ratio (height to width proportions) as CRT monitors. The disadvantage is the high power consumption, higher than a hard disk drive, which limits any plasma-screen portable to mains operation.

A modem, which fits into the main system unit, is available for $995. It was developed in cooperation with NetComm for the Portable III and works equally well with the Portable 386.

The overall impression of the machine, as with other Compaq products, is that it is a high-quality piece of engineering and industrial design, given the constraints of the system specification. The circuit boards are clear of jumper wires and late additions, and are obviously ready for full-scale manufacturing. The casing is in its final form and material — not surprising, since it is essentially the same as the Portable III. And Compaq is so confident about the shockproof

Photon

• COMPUTERS • PERIPHERALS • COMPONENTS

FULLY INDUSTRY-COMPATIBLE COMPUTERS
12 MONTHS' WARRANTY

CALL FOR A DEALER NEAR YOU

PC-88X

4.77/10 MHz, 640 K
Nortons SI: 3.7
Serial, Parallel & Games Port
84-Key Deluxe Keyboard
Optional 8087-1

360 K Floppy Drive
20 MB Hard Disk (80 MS)
Colour Graphics Adaptor
Clock/Calendar

PC-2 86Z

6/10 MHz, 0-wait state, 1 MB
Nortons SI: 11.7
Serial & Parallel Ports
84-Key Deluxe Keyboard
Optional 80287-8

1.2 M + 360 K Floppy Drive
30 MB Hard Disk (35 MS)
Colour Graphics Adaptor
Clock/Calendar

PC-3 86X

6/16 MHz, 0-wait state, 2 MB
Nortons SI: 18.8
Serial & Parallel Ports
101-Key Deluxe Keyboard
Optional 80287-10
or 80387

1.2 MB Floppy Drive
40 MB Hard Disk (28 MS)
Mono Graphics Adaptor
Clock/Calendar

Photon Computers are built, tested and supported in Australia. Satisfied customers already include Government bodies, numerous Educational institutions, corporate buyers, and thousands of personal and business end users. Whatever your needs we have the right power/price combination for you.

Dealer Enquiries Always Welcome

AUSTRALIA:
UNIT 3, 36 DEVLAN STREET,
MANSFIELD 4122.
P.O. BOX 501,
MOUNT GRAVATT 4122
PH: (07) 849 4350
FAX: (07) 849 4794

HONG KONG:
SUNNING PLAZA,
10 HYSAN AVENUE,
HONG KONG
TEL: 5 8394321
FAX: 5 765356
TELEX: HX74378

mountings of the hard disk that company staff are happy to drop the machine from waist height and demonstrate that it still works.

And as with other Compaq products, the price of this build quality is the high cost of the system compared with comparable hardware from other manufacturers.

System software

As is customary for Compaq PCs, the operating system is not included in the price. Quite what one is supposed to do with $14,500 worth of hardware without operating software is beyond me. Both versions 3.2 and 3.31 of MS-DOS are available from Compaq for $170 and $198 respectively (version 3.31 removes the 32Mbyte limitation on addressable disk space).

As with the DeskPro 386, the Portable 386 comes with the Compaq Expanded Memory Manager (CEMM), which is installed as an MS-DOS device driver at boot time. This can be set up to mimic the Lotus-Intel-Microsoft expanded memory specification in 32-bit main RAM, use the memory above 640k as extended memory for Xenix, and set up RAM disks to make full use of the RAM capacity of the machine. And naturally, since the Portable 386 RAM is contiguous, it should run OS/2 straight out of the box once the CEMM driver has been discarded.

A new feature is a RAM cache for the hard disk, which sets aside an area of RAM to buffer data retrieved from the disk and hold copies of the most recently-used disk sectors. When the processor wants disk data it tries the cache first, and if the information is there it is retrieved from the fast 80ns RAM without any mechanical disk delays. The effectiveness of this depends on the amount of RAM allocated to the cache, and on how often the application software needs to go to disk. For big programs like AutoCAD, or for badly-organised programs like WordStar 3.3, overlay files are kept on disk and constantly referred to. Cache RAM, like RAMdisk, can speed these up wonderfully, but without the severity of risk of data loss inherent in RAMdisks.

More RAM is taken up by Compaq software for the BIOS ROMs, which are copied into fast RAM to speed up all BIOS calls made by operating system or applications software. Once again, this technique was introduced in the DeskPro 386.

The other two main extras concern the plasma display. The Advanced Display Attribute Programming Tool (ADAPT) allows the plasma display attributes to be changed, often necessary when running CGA applications in monochrome. Some colour combinations in CGA programs — in menu bars and pop-up windows, for instance — just do not show up in monochrome without some alternation in the way the plasma screen displays its text. ADAPT allows the display to be altered so that all the information is visible. And, the ScreenSave utility blanks the screen after a user-selectable time period without any keyboard or computer activity.

Otherwise, Compaq's version of MS-DOS is no different from anyone else's, and there is no point in going into more detail.

In use

The surprising thing in using the Portable 386 is that there is no impression of blinding speed, at least when it is compared with, say, a 12MHz AT clone like Compaq's own. The figures show that this is illusory, since the performance is there. But the difference between a fast AT and a 20MHz 80386 machine is by no means as great as the difference between an old 4.77MHz PC and the fast AT, and it would be necessary to run the Portable III and Portable 386 machines side by side to spot the differences in daily use.

'The APC Benchmark figures show that the Portable 386 is a fast machine indeed, but the performance in real-life applications is just as interesting.'

But the Portable 386 is certainly a fast and responsive machine, although it is psychologically difficult to believe that the small plasma-screened brick on the desk is one of the most powerful PCs on the market, and could be sold, if Compaq wished, as a 20-user system. That is a marketing problem for Compaq, and one which the company addresses in its promotional videos.

The *APC* Benchmark figures show that the Portable 386 is a fast machine indeed, but the performance in real-life applications is just as interesting.

For these tests, AutoCAD and Lotus 1-2-3 were set up on the machine, with test data files. The AutoCAD files were the now-standard Nozzle and Columbia drawings, while the Lotus file was a big 500x500 worksheet with a macro to drive it. The base level for the comparisons was an old 4.77MHz PC clone with no 8087 maths processor to help it out; with this machine the Nozzle drawing took 260 seconds, the Columbia drawing took 111 seconds, and the 1-2-3 macro took 182 seconds to complete.

On the Portable 386, with both AutoCAD and 1-2-3 taking advantage of the 80387, the times were 7.4 seconds for the Nozzle, 4.4 seconds for the Columbia, and 11.9 seconds for the 1-2-3 macro.

There was one interesting wrinkle on the tests, when the machine was set up without LIM expanded memory. With the expanded memory driver installed, the 1-2-3 macro slowed down from 11.9 seconds to 17.9 seconds, showing that expanded memory management really does impose a performance penalty on 1-2-3, even with LIM emulation in fast 32-bit RAM.

Those figures are a bit misleading, since the 80387 is an expensive option rather than a standard fitting, and it would have been better to remove it. However, that did not seem wise given the rarity of the machine and Compaq's protective attitude towards it.

Another speed test, this one ignoring the 80387, was provided by Landmark Software's useful SPEED.COM program, which runs continually with a variety of tests and gives average performance figures in terms of megahertz and performance multiples of a 4.77MHz PC. For example, if SPEED.COM shows a figure of 16MHz, that means that the machine is running as fast as a 16MHz 80286 machine with one memory wait state. The wait state gives a comparison with the IBM AT, which runs at 8MHz with one wait state.

SPEED.COM for the Portable 386 gave results of 24.5MHz — or roughly that, since it was right at the top of the scale — and a performance multiple of 11 compared with a 4.77MHz PC. The extra 4.5MHz over the rated clock speed of the machine's 80386 is a result of the fast 32-bit memory access compared with the 16-bit, one wait state memory access of the 80286. This once again emphasises the importance of processor-memory bandwidth in 80386 systems.

THE PARAGON 286S

BRING A LITTLE LUXURY TO YOUR WORKPLACE

A COMPACT, FULL-FUNCTION, HIGH-PERFORMANCE 10 MHz AT-COMPATIBLE

Please contact us today for more information!

Introducing the PARAGON 286S: small enough to grace any desk without overwhelming it, yet so thoughtfully designed that it gives you some very luxurious extras without filling a single slot:

On-board enhanced graphics output dazzles your eyes with a wide range of colors—or soothes them with keen Hercules resolution.

Additional inclusion of the floppy disk controller, serial port, parallel port, and real-time clock on the main board leaves five slots free for a hard disk controller and whatever expansion options best suit your specific needs. The power switch and keyboard connector are built on the front panel for easy access.

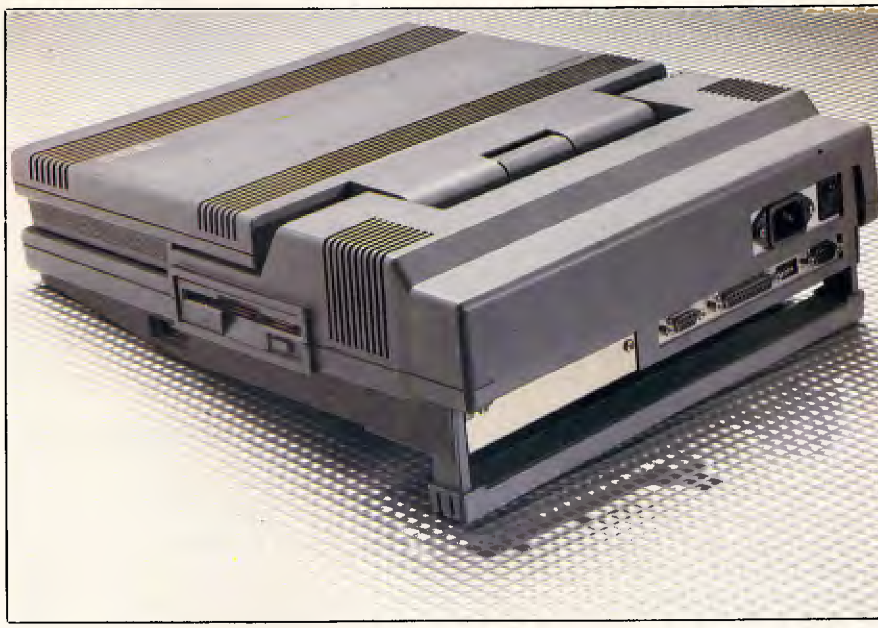
The PARAGON 286S is a highly reliable single-board VLSI design. It has undergone thorough quality assurance tests at every stage of its development, and each machine is submitted to rigorous quality controls with the latest automated testing equipment.

(042) 261183

80386—16MHz
available

mitac
When reliability is a decisive factor

Toshiba T5100



The greater height of the 5100 accommodates the extra memory and video cards. External keyboard and RGB ports allow it to be used purely as a system unit

Hardware

At first sight, the T5100 looks exactly like the 80286-based T3100, which is not too surprising since they are, externally, almost identical. Internally, though, the changes are substantial.

Opening up the case — a tricky procedure, until it is realised that the five screws are only there to back up some tough plastic clips like those on the IBM PC Convertible — demonstrates the simplicity of the internal design. Once again custom chips are used heavily, although this time Toshiba has the advantage of its own massive chip-making facilities, and all the custom circuits feature a Toshiba logo.

The main RAM fits underneath the keyboard, and uses vertically-mounted 1Mbit chips rather than SIMMs to save board space and reduce the vertical space required. The T5100 comes with 2Mbytes of RAM as standard, expandable to a maximum 4Mbytes by plugging in a small expansion card in the space provided next to the main RAM, still underneath the keyboard. The 80386 and its associated 80387 socket are half visible under the disk drive casings, while the back of the box is filled with the line-sensing 110V/240V power supply, running across the full width of the rear. The 80386 runs at 16MHz rather than the Portable 386's 20MHz, which reduces the RAM speed requirements.

As with the Compaq Portable 386, the 2Mbytes of RAM can be treated as LIM expanded memory, as extended memory for Xenix, or for RAMdisks, using a Toshiba driver provided.

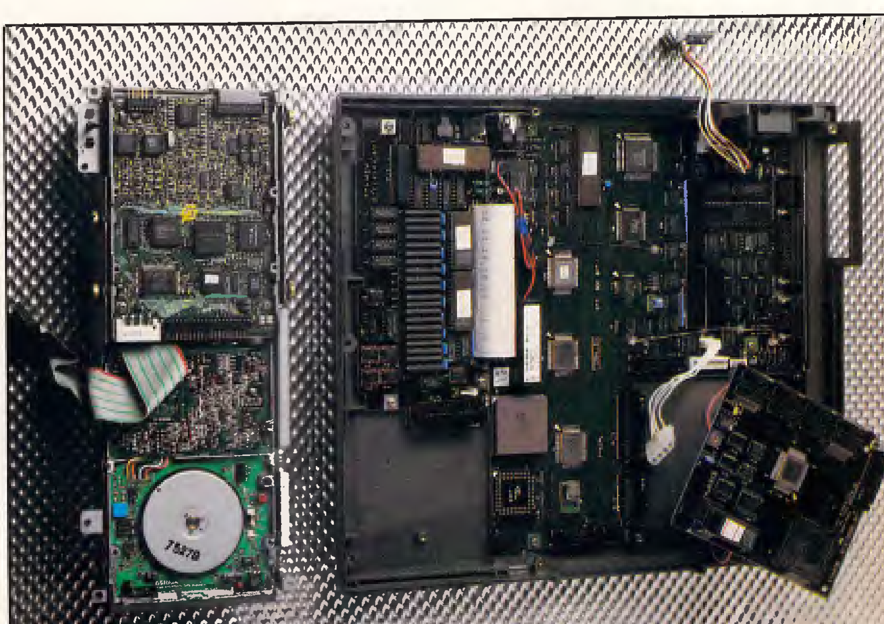
The disk drives provided as standard are a 3.5in floppy drive holding the same 1.44Mbytes as the double-sided, high-density IBM PS/2 drives, and also capable of reading and writing 720k disks; and a 40Mbyte, 29ms access time hard disk in a surprisingly small casing. The floppy disk and hard disk controllers are actually attached to the drives rather than provided on the motherboard, meaning that different drives can be installed if standards or user needs demand it.

There is one Toshiba-standard expansion slot, designed to take a Hayes-compatible 1200 baud modem, a bi-synchronous communications board for mainframe links, or an interface board for the Toshiba expansion box that can hold up to five standard IBM expansion boards.

Unfortunately, at this stage Toshiba does not have a working internal modem, but expects to adapt the model used with earlier laptops within a few months. It should retail for around $985.

Toshiba plans to introduce an Australian-made expansion box which will clip on to the underside of the unit, adding about one inch to its height and able to house two full length IBM-compatible expansion cards.

The standard interfaces on the back panel include an external RGB monitor port, a bi-directional Centronics parallel port that doubles as an external floppy disk drive connector, and a 9-pin RS232 serial port compatible with that on the IBM AT. Another connector on the side of the machine, near the front, is hidden behind a break-out cover and is intended for any IBM-compatible keyboard to be plugged in. This makes it possible to use the machine as the heart of the desktop system; a colour monitor



The modular internal elements comprise power supply, disk drive unit, EGA video board and main motherboards. Surface mounting contributes to the machine's low profile and a full-size detachable keyboard can be kept at the office with an expansion box and external floppy drive if desired, and the T5100 can be used with its lid down as though it were just another very small PC system unit.

The display is almost identical to that in the Compaq Portable III and Portable 386, but Toshiba has stolen a march by including hardware and drivers for EGA displays on the plasma panel, as well as the usual 80x25 text, CGA graphics, and Toshiba-specific 640x400 display modes found on previous Toshiba portables. The display is also taller than Compaq's, making the aspect ratio even more compatible with that of conventional CRT screens.

In EGA mode, the display can show 640x350 dots in four 'shadings', which are really different intensities; those intensities comprise black, full on, and two intermediate levels. As we shall see later, this makes it possible to juggle with the screen settings and produce a readable display even with EGA software using the full 16 colours of that mode.

The keyboard is the same as the T3100's, with a couple of exceptions, and has 10 function keys across the top and a full cursor key set at the bottom right. A new function key, Fn, is provided to give compatibility with the IBM Enhanced keyboard layout. Holding down Fn and pressing the '1' or '2' keys on the top numeric row gives the extra two function keys that may be required by software which recognises the full 12 keys of the Enhanced layout.

Attaching an external 5¼in floppy disk — 360k or 1.2Mbyte drives are available — is simply a matter of plugging its cable into the Centronics port, moving a switch on the side of the machine to A or B depending on the drive letter required, and rebooting to give the system a chance to figure out that the drive is attached. All the test software was transferred to the T5100 hard disk using an external drive, and it worked quickly and reliably. Of course, it is impossible to have an external drive and a parallel printer connected at the same time, but the big hard disk capacity means that the floppy will only be needed to transfer software provided by companies which do not yet support the PS/2 3.5in floppy standard.

Prices

Toshiba T5100

Basic unit with 40Mbyte hard disk	$10,500
2Mbyte RAM upgrade	approx. $2000
Expansion box	approx. $800

According to Toshiba, its entire range of laptops was designed from the case inwards rather than from the electronics outwards, so that the case size and shape were fixed first and the engineers were forced to design the hardware to fit it. So, the inside of the T5100 is crowded, and maintenance will certainly be tougher than with the Compaq Portable 386; but within the constraints, the use of custom chips makes the electronics board design simple and spacious. The problems of dismantling and servicing will be mechanical ones rather than electronic ones caused by too many hot-running components in too small a space.

The T5100 is another neat piece of engineering, and again the feeling is one of surprise that so much power can be built into so small a package.

System software

The operating system provided is MS-DOS 3.2, with some extra utilities to take advantage of the new hardware it is running on. The memory manager driver is installed in a CONFIG.SYS file, with parameters specifying how much RAM is to be used for LIM expanded memory, extended memory, or RAMdisk. Alternatively, the memory configuration can be changed at any time by running a SETUP program and rebooting.

The speed of the processor can be changed from the keyboard using a resident program. Holding the Fn key down and pressing the PgDn key takes the speed down to 8MHz for those few programs — such as communications packages — that may have trouble with the 16MHz clock rate. This command can be issued at any time, and the effects are immediately visible in things like a directory listing on the screen, which is noticeably more sluggish at the lower rate.

Another resident utility, this time one loaded from disk, allows configuration of the EGA mode of the plasma display to fit the software that is running. This utility, XCHAD, is like the CHAD software supplied with the T3100, but altered to handle the extra attributes of the EGA mode. XCHAD can also be called up at any time, and simply puts up a list of the 16 colours of the EGA standard with their current plasma intensities next to them. These settings can be changed from the keyboard using the cursor keys, and the changes are immediately reflected in whatever software is currently on the screen. This interactivity means that different settings can be tried to find the best combination.

For example, in Microsoft Windows the menu highlights were invisible thanks to the colour combination, and in Lotus' Freelance Plus graphics package the currently-selected menu item was also invisible. XCHAD allowed that to be fixed by eliminating the colour clashes.

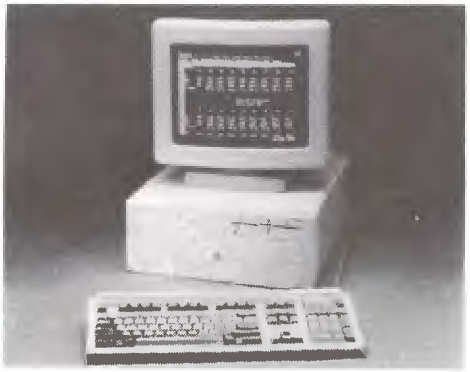
WIN
A TRIP TO BALI
THE PERFECT ISLAND PARADISE

SAVE BIG DOLLARS
on Hardware and Software

ASI-800T XT SUPER TURBO
❖ 10Mhz, 640K RAM ❖ 20Mb Hard Disk
❖ EGA Monitor - card ***$ 3195.00***

Toshiba T1000 Portable
❖ The Smallest, lightest full-featured business computer
❖ 512Kb RAM, 720Kb Floppy
❖ 1 RS-232C & 1 Parallel port ***$ 1895.00***

WYSEpc 286
❖ Fully featured IBM AT Compatible computer ❖ WyseWindow system status display, ❖ an on-line help facility, and a unique software security system. ❖ 80286 8Mhz, 512Kb RAM expandable to 1Mb on board ❖ 1.2Mb floppy, 20Mb Hard Disk ❖ Wyse's enhanced MS-DOS 3.2 supports hard disk over 32Mb ❖ GW-BASIC 3.2 ❖ Disk caching for improved disk performance. ***$ 3978.00***



WYSEpc+
❖ A High Performance IBM-PC/XT Compatible computer
❖ Hi-Res Mono Monitor ❖ 4.77/9.54 Mhz, 640Kb RAM
❖ 20Mb Hard Disk, ❖ integrated modular mono/color/graphic display adapter. ❖ Mono Monitor 132 columns * 44 rows of text, 2 RS-232C & 1 Printer port, MS- DOS plus GW BASIC ***$ 3594.00***

WYSEpc 386
❖ 32-bit Desktop Supermicrocomputer
❖ 80386 CPU, 16Mhz, 1Mb RAM
❖ 1.2Mb Floppy Drive ❖ 40Mb Hard Disk
❖ Hi-Res Mono Monitor....***Call***

ASI AT SUPER TURBO
❖ 80286 CPU, 8/10Mhz, 640Kb RAM
❖ Licenced Phoenix Bios
❖ 1.2Mb Floppy, 20Mb Hard Disk
$ 3392.00

ASI Desktop 80386 Personal Computer
❖ 80386 16Mhz, ***2Mb RAM*** on board
❖ 40Mb Hard Disk ❖ 1.2Mb floppy
❖ Mono Monitor, MS-DOS 3.2

A.S. COMPUTERS
1st Floor, 440b Princes Highway, Rockdale N.S.W. 2216
Phone: (02) 597-7885 Fax: (02) 597-7882

Software On The Cheap
New Releases
November 1987

At Software On The Cheap, we aim to bring you the latest public domain and user supported software from around the world. We have agents in the USA, Great Britain, and Asia scouring for the best programs available. Below we list only some of our new releases. Many of the programs on these disks are exclusive to us at Software On The Cheap. We point this out because in the past others have taken our compilations and resold them under their own name.

• MS-DOS

MS-DOS software is designed for IBM and close compatible computers. It is available in both 5.25 inch and 3.50 inch formats. We can also provide most MS-DOS software for the **IBM JX.**

• BUSINESS

MS2020 dBase COMPATIBLE DATABASE: Excellent NEW easy to use, menu driven, dBase III compatible database. Allows you to create and use dBase III data files, as well as various field types, mail merge facilities, and MUCH MORE! **Two Disk Set** Requires 512K.

MS2060 FASTBUCKS HOME ACCOUNTING PACKAGE: User Friendly Home finance package. Designed for the non accountant to manage his home finances. Supports upto 25 checking, savings, and charge accounts. Very fast due to its own file compression techniques. Includes recursive budget model that allows you to create a family budget painlessly. Also has financial calculation section, and complete loan amortisation generator.

MS2070 SALES PROCESSER: Excellent new program for keeping control of your sales.Allows for invoicing, statement production, and inventory control easily and effectively. Great for anyone in retail or wholesale indusries. **Two Disk Set.**

MS2150 FONTASTIC: Great printing program, uses dot graphics on Epson and compatible printers to print text in numerous fonts and print sizes. Includes Roman, Helvetica, Caligraph, Script, Rotated, and others in sizes from 8 point to 24 point. Use it as your own miniature Desk Top Publisher. **Two Disk Set**

MS2151 SIGNSMIF: Sign printing utility to allow you to produce impressive signs, transparencies, etc using upto four fonts and dot graphics on Epson or compatible printer.

Prices
IBM 5.25 In...$10 Disk
IBM 3.50 In...$15 Disk
Amiga & Atari.$15 Disk
Macintosh......$15 Disk
Commodore ..$8 Disk
Apple II....$8 Disk
Prices include sales tax
Postage & Handling
$3 per Order

• EDUCATION

MS2710 MEMORY MASTER: Great program designed to sharpen up your short term memory skills by a combination of sounds and patterns. Great for young and old!

MS2730 CANTONESE TEACHER: Another good program in the language education section. Learn Cantonese Chinese with the help of your computer.

MS2750 PC-QUIZZER: Computer aided Instruction program suitable for teachers and parents to create and administer quizes, with the option of using graphics! Includes sample quiz.

MS2751 TEST MAKER: Another sophisticated program for creating multiple choice tests. Includes comprehensive context sensitive help screens to make it easy to use.

• GAMES

MS2510 TWO BIT POKER: Addictive copy of the arcade poker game seen at many pubs. Great fun, and cheaper than playing it elsewhere!

MS2520 DEFENDOR: Great new version of the arcade classic.

MS2521 DISK CRASH: Great arcade quality game. Help your floppy disk avoid the evil magnets.

MS2522 STARSHIP: Action packed Star Trek type game. Command your starship which you use to defend your star bases.

MS2525 GIN!: Excellent computerised version of the old Gin Rummy game.

MS2530 NEBULA ADVENTURE: Great new adventure game from thr Button stable

MS2550 FSPILOT: Great enhancement for Micro Soft Flight simulator. Print out specific flight plans and other info. Requires Micro Soft Flight Simulater.

Free Catalogue for
IBM & Compatibles
Macintosh
Atari ST
Amiga
Commodore 64/128
Apple II

(02) 51-3615
or (02) 260-0546 if engaged
24 Hours

or write to
Software On The Cheap
P.O. Box 63
Erskineville NSW 2043

Technical specifications

Compaq Portable 386

Processor:	Intel 80386, 20MHz
Co-processor:	Optional Intel 80387 or Weitek 1167 floating-point chips
RAM:	1Mbyte expandable to 10Mbytes with LIM support
Mass storage:	Single 1.2Mbyte 5¼in floppy drive, 40Mbyte hard disk
Storage options:	360k 5¼in floppy drive, 100Mbyte hard disk, clip-on 40Mbyte tape back-up unit
Keyboard:	IBM Enhanced keyboard compatible
Display:	Plasma, 80x25 text, 640x400 graphics, CGA-compatible
Standard interfaces:	RGB monitor port, parallel printer port, RS232C, IBM-compatible keyboard socket
Expansion:	One 8-bit and one 32-bit Compaq-specific slots, 96-pin expansion port for clip-on IBM-compatible expansion box
Size:	24.8cms x 19.8cms x 40.6cms
Weight:	9.1kg (Model 40) 9.6kg (Model 100)
Bundled software:	Expanded memory manager, cache manager

Toshiba T5100

Processor:	Intel 80386, 16MHz
Co-processor:	Optional Intel 80387
RAM:	2Mbytes, expandable to 4Mbytes with LIM support
Mass storage:	Single 1.44Mbyte 3.5in floppy drive, 40Mbyte hard disk
Storage options:	External 360k or 1.2Mbyte 5¼in floppy drive
Keyboard:	82 keys
Display:	Four-intensity plasma panel; EGA-compatible
Standard interfaces:	RGB monitor port, bi-directional parallel printer or external disk drive port, RS232, IBM keyboard socket
Expansion:	Single internal Toshiba-specific slot, or external IBM-compatible expansion box
Size:	31cms x 9.2cms x 36cms
Weight:	6.8kg
Bundled software:	MS-DOS 3.2, expanded memory manager, EGA colour editor

In use

The T5100 ran everything thrown at it, in EGA and CGA modes, including things like Freelance Plus, Windows, GEM, Word Perfect, RapidFile, AutoCAD, 1-2-3, and the rest. No hitches apart from the EGA colour problem, and fast performance as expected.

The fixed keyboard and screen of the machine, necessary because of its laptop design, seemed limiting compared with Compaq's detachable keyboard and more flexible tilt and swivel display. But overall, there is nothing to stop the T5100 becoming a user's only system as long as the plasma display is satisfactory. And the display, even in EGA mode, is fast enough and clear enough to satisfy most users.

The same tests were performed on the T5100 as on the Portable 386, although it is worth emphasising that the Toshiba machine was without an 80387 and that all the T5100 tests were in EGA mode. So, direct comparisons are a little risky to make.

The T5100 took 42.6 seconds to draw the Nozzle in AutoCAD, and 18.9 seconds for the Columbia; while the 1-2-3 worksheet macro took 33.9 seconds without LIM expanded memory, and oddly, 33.3 seconds with the LIM driver omitted. Toshiba claims that its expanded memory is superior to Compaq's, and these figures seem to back that up.

As with the Portable 386, Landmark's SPEED.COM came up with a 1MHz rate higher than the clock rate of the 80386 chip; this time the machine was

LAP RECORD

Can any other Laptop do this?

Only Hitachi thought you would want a Laptop that's also a desktop!
With a detachable keyboard and advanced tiltable screen, you can use your Hitachi on top of anything. In fact, the new HL300 is tops everywhere you use it, with so many features, you'd never believe it could be so portable. Running on mains or its own re-chargeable batteries, the HL300 is always ready to store and communicate your ideas. You already know Hitachi for reliability and quality – now add computing power and portability and you've got the HL300 - it's tops.

SPECIFICATION

80C88 (Running at 4.77MHz)
512K RAM
Dual 3.5" 720K disc drives
Liquid Crystal Display,
Text Mode:
25 lines x 80 characters/line
25 lines x 40 characters/line
Graphic Mode:
640 x 200 dots resolution
320 x 200 dots resolution

Detachable Keyboard
U.S. ASCII based 78 keys
Parallel Interfaces - for printer
Disk Drive Interface - for external
5.25" disk drive (option)
Serial Interface - RS.232.C
Rechargeable Ni-Cad Battery -
6 hour cycle
Dimensions:
358(W) x 276(D) x 72(H) mm

Weight: 5.6kg,
excluding AC adaptor
Starter Kit:
User's Manual
MS-DOS V2.11 Manual
MS-DOS V2.11 3.5" Disk
Accessories:
AC Adapter
AC Power Cable
Battery Charge Cable
DC Power Cable
Carrying Case

HITACHI

Hitachi Australia Limited
AGL Centre 18th Floor,111 Pacific Highway, North Sydney 2060
Telex: 120857 (HITACH AA120857) Fascimile: (02) 929-8883
For more information contact your local dealer.

BYRNE & STEWART HIT 44/1176

shown performing as fast as an AT running at 18.5MHz with one memory wait state. The fast 32-bit RAM access was again responsible. And the SPEED program also showed the machine performing 9.9 times faster than a 4.77MHz PC.

Conclusion

It would be wrong to think that no user will ever need portable machines at this level of performance. In the future, this standard will be the minimum that users require for any job. Looked at that way, the Portable 80386 is just another standard tool that people who want portability will need to run the big software packages, which are on the way.

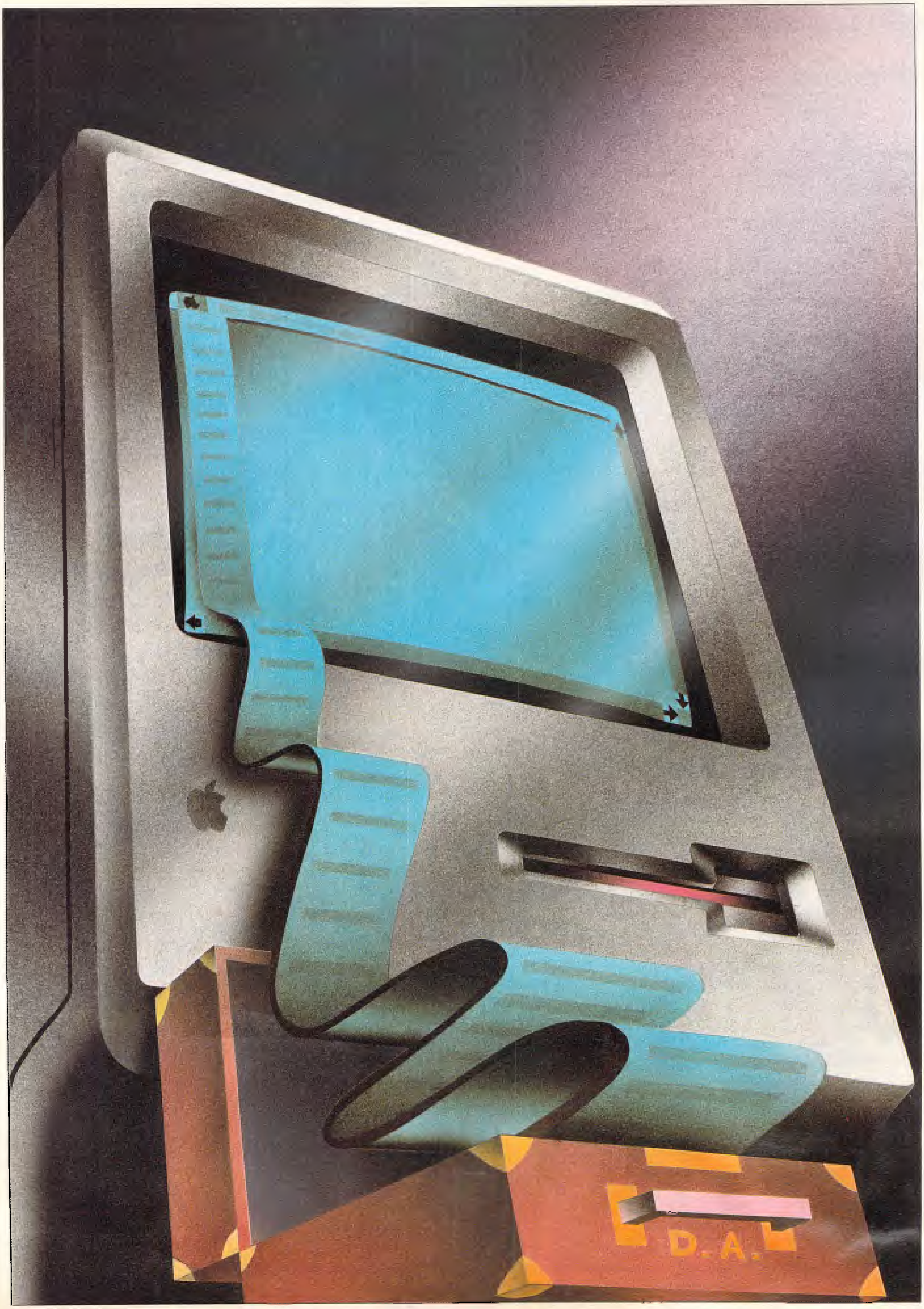
What's more, either of these machines combined with an external monitor and a full-size IBM-compatible keyboard would make a fine desktop system with portability thrown in, at the cost of limited expansion options that can only be put right by spending more money.

In terms of performance, these systems are right at the top of any league. In terms of marketing, it was inevitable that Toshiba — which has carved out a market in high-power laptops without having any desktop systems worthy of note — would take this route. It was less likely that Compaq would produce a 32-bit portable, since the company's desktop systems, including the 16MHz DeskPro 386 and the new 20MHz 80386 desktop originally codenamed X-15, are making the company most of its revenue these days.

But with both these machines on the desktop, the Compaq Portable 386 seems too bulky for a true portable, and does not have EGA as standard; while the Toshiba is smaller, easier to carry, has EGA, a better display aspect ratio, and, trivially, a better keyboard feel as far as *this* observer is concerned. The missing 4MHz in the T5100 clock speed should not deter those who *must* have an 80386 with portability. If portability is the real concern, then the T5100 is undoubtedly the superior machine. Against that, the Compaq has available now a clip-on expansion box and internal modem. But it *is* $4000 more expensive than the Toshiba.

END

Compaq is on (02) 660 0077; Toshiba is on (02) 8<illegible> 3322.



JIM LUDTKE

Suitcase

Suitcase lets you use all of your fonts and all of your DAs all of the time. Steven Bobker reports on this innovative utility.

Fonts and DAs = Mac? Two of the things that make the Mac what it is — the most widely copied and easiest to use computer interface of recent years — are fonts and desk accessories (DAs).

Being able to have as many fonts as you want and to use them at will has revolutionised computer output, changing it from something you put up with to something that you prefer to use. And DAs take the IBM concept of always available, memory-resident utilities to heights no other computer (of any size) can begin to reach. But with all the good they provide, they have a drawback. Fonts and DAs also multiply like, well, rabbits, and it's the rare Mac owner who doesn't soon have too many to use all of them at once.

There are workarounds. Back in our May, 1987 issue we published Billy Steinberg's article on how to hack Apple's venerable Font/DA Mover so that you could install (and thus have on constant call) more than the 15 DAs Apple allows. That process involves working inside your programs using both Fedit (or some similar program like MacTools) and ResEdit. While the process isn't hard, it also isn't for the faint of heart.

Initial freedom

So what do you do if you have — and want to use — more DAs and fonts than Apple System software allows? Well, there are several products that swap sets of DAs in and out of your System. However, these generally have severe limits, because you need to be careful to avoid ID numbering conflicts. The Mac may be showing you names, but it's actually looking for and using numbers: resource ID numbers, directory ID numbers, just numbers. And you better not confuse it by giving two things the same number. The results of doing so are often spectacular and rarely what you want.

There are also some programs, DAs and FKEYs that let you use up to a few uninstalled DAs or fonts. Some of these are pretty slick and popular, but they take time and effort to install (often using precious DA and FKEY slots themselves) and have a limited ability to help.

An ideal solution would be a program that transparently lets you have access to all your fonts and DAs all the time. That would be a dream come true.

And with very minor limitations, Suitcase makes the dream a reality. Suitcase is a small 13k program that you simply drag into your System folder. Then move the DAs and fonts you want to have access to into files or folders with the names 'DAs', 'FKEYS', 'Fonts' and 'Fonts/DAs'. Move these files and folders (you can mix and match) into your System folder. The final step is restarting the Mac.

When you next pull down the Apple menu you'll discover all the DAs are there, ready to use. And at the top, there's a special DA called Suitcase that lets you access fonts and DAs still not installed (for example, you can check out a new DA on a friend's disk) and otherwise manage your fonts and DAs.

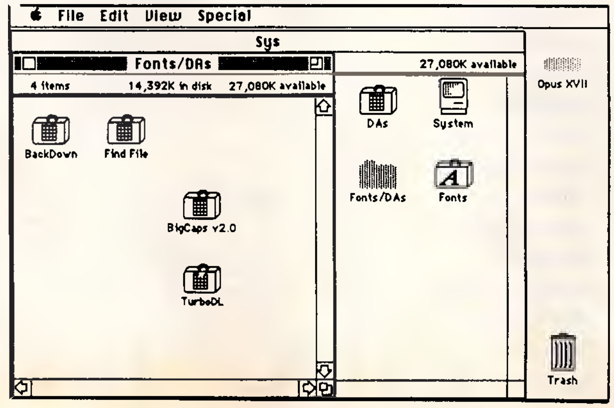
How and why

Suitcase is what is called an INIT. This is a special type of Macintosh file that is installed or run as part of the startup process. These only work with System 3.0 and higher, so you must be using such a System to use Suitcase. (Of course, you should be using the most recent Apple recommended System for your hardware configuration.) System 3.X and System 4.X treat INITs in slightly different ways, but in the case of Suitcase the results are identical.

When Suitcase is run as part of the startup process it looks for the files and folders with its names. It opens the files and looks into the folders, opening any suitcase files it finds there.

Normally, only the System file remains open all the time — that's why fonts and DAs had to be there. Suitcase keeps its suitcase files open all the time also.

There's now a real possibility of having to duplicate font or DA names. What happens in that case is that the duplicate names are omitted when the



These are suitcase files of the type Suitcase opens. It also opens suitcase files in folders with these names. All of the suitcase files shown here will be opened when the Mac is started. Any and all fonts and DAs in them will be available

Apple or Font menu is created. But while the name might be the same, the fonts and DAs involved might be different. Thus, it's important to know which one Suitcase will be opening.

Fortunately, the Mac opens files in a very strict and known order. The manual explains this order in detail. You should read this section of the manual carefully.

The limits of freedom

You must have at least 512k of RAM. And while Suitcase is very careful about DAs (making sure you won't be bothered by numbering conflicts) you have to help a bit with fonts. All sizes of a particular font must be in the same file or you will not have access to all sizes of that font. For example, if 9 to 12-point Helvetica are installed (in the old manner) in the System file and 10, 18 and 24-point Helvetica are in a font (suitcase) file called Fonts in the System folder, Suitcase can only make 9 and 12-point Helvetica available. Fortunately, there's a simple solution.

Apple's Font/DA Mover has much looser restrictions on the number of fonts or DAs it will put into an ordinary (not a System) file. So open Font/DA Mover and create a new file. Call it 'Fonts' and pack all sizes of all your fonts into it. (To make things easy though, leave all sizes of Chicago, Geneva and Monaco in the System file — Font/DA Mover won't remove all sizes of them from a System file.)

Now create another new file (call it 'DAs') and move all your DAs into it. Now remove all but one DA from the System file. You should leave one DA (any one will do) in your System file just in case Suitcase doesn't get loaded. If there are no DAs and Suitcase doesn't load, you're likely to have serious problems.

Suitcase may not load for several reasons. It might have been removed from the disk it was on. Or, if you're working on an HFS disk, it might have been removed from the System folder (it doesn't matter where it is on the disk if you're running MFS). Or, you might hold the Shift key down when starting the Mac — that prevents Suitcase from loading.

Added baggage

You can have no more than ten suitcase files open at any one time.

That's because the Mac has a limit on the number of files it allows to be open at once. If Suitcase didn't restrict itself, you might, under some circumstances, not be able to open any additional files. Considering that you can put up to 52 DAs (that's Font/DA Mover's limit) and up to 200 fonts (each size counts as one — 10-point Bookman and 12-point Bookman would count as 2 of your 200) in a file, you shouldn't run out of suitcase space. If you do, however, remember that each suitcase holds 52 DAs and 200 fonts. There's no need to keep them separate. (One small note: although you can theoretically load 520 DAs in suitcase files, you'll only see the first 512 opened. That's an internal Suitcase limitation.)

Added benefits

If you are still using a Mac with the original 64k ROMs you know that fonts and DAs appear in the order they were installed, the latest on top. Suitcase alphabetises these menus for you automatically.

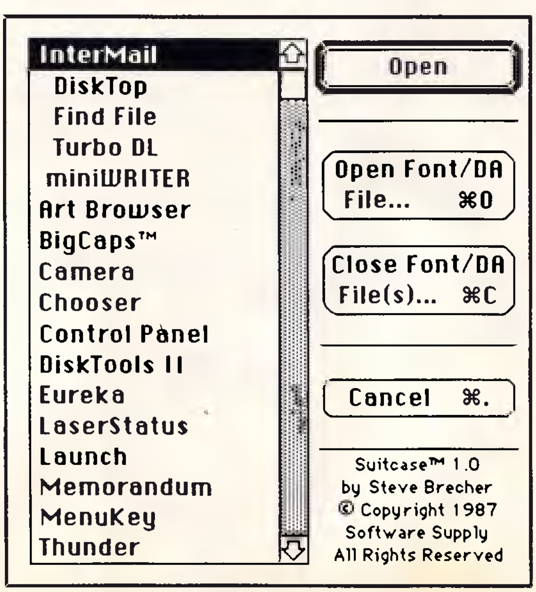
If you have a Mac with 128k or 256k ROMs, you'll find that Suitcase also constructs long font menus much faster then the Mac normally does, because it uses a new and advanced sorting routine. The days of waiting for what seemed like forever for your many fonts to appear are over.

Suitcase can be fairly heavily customised by advanced users. The manual gives all the details. Unfortunately, these details fall right in the middle of sections covering more basic operations. This can make the otherwise outstanding manual somewhat intimidating. The solution (aside from revising the manual) is to pick and choose the parts you read.

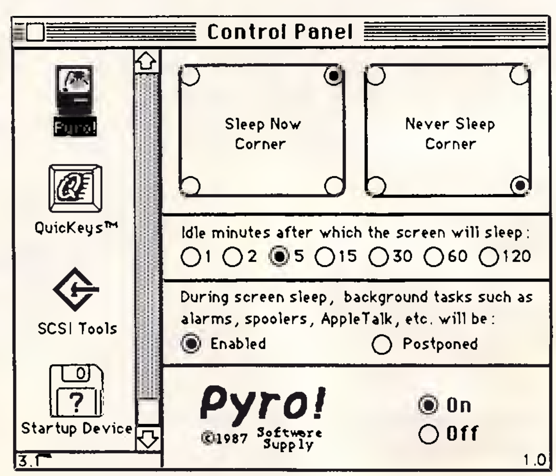
Fireworks display

Suitcase comes with two added bonuses: Pyro! and an evaluation copy of Software Supply's other new product, PowerStation. Of the two, Pyro! (written by Billy Steinberg and Steve Brecher) is the more useful. It is the best screen saver or blanker yet created for the Macintosh. (PowerStation is the best Finder alternative yet developed. However, it's not for everyone. Check the accompanying box for more details on PowerStation.)

Screen savers are very important, especially for those of you who leave



The Suitcase DA. This is where you can manage your fonts and DAs. Use the Open File and Close File buttons to access fonts and DAs not installed either in the System or in a currently open suitcase file



This Pyro! control panel is reached by clicking on the Pyro! icon in the Control Panel. You need System 4.0 or higher for this to work

PowerStation

PowerStation is meant to replace your Finder. It uses a system of pages and buttons to let you go immediately to any application or document. It's particularly useful for people who use many different applications and documents during a single work session. It's also very useful if you have lots of files that are organised in many folders and levels.

If you tend to use only one or two applications or if your files are essentially flat (that is, all on one or two levels), you won't gain as much as other users from this program.

There's an evaluation version of PowerStation on every Suitcase disk. And it's worth trying out.

your Mac on all day (or like me, all the time). An ordinary static image eventually 'burns itself in' on the screen. That is, a faint rendition will be there forever, even when the original image is no longer being displayed. This is not a Mac-specific problem, but rather a trait of all CRTs. It could happen to your TV if you left it tuned to a never-changing image for a long time.

Screen savers, by blanking the screen, prevent burn-in. However, if all a screen saver did was blank your screen, you wouldn't know if your Mac was actually on or off. So what all screen savers do is create some pattern and display it at full brightness every few seconds in a different location. That's safe for all screens.

There have been some ingenious screen savers. For example, AutoBlack's moving pattern is a small analog clock that shows the correct time (if the Mac's internal clock has been set correctly).

Pyro!'s patterns are a bit different. They're fireworks that launch from the base of the screen, rise up and explode in a burst or bursts, much like real fireworks. (If the application you're running uses a lot of RAM and there isn't enough memory left to show the fireworks, you'll get roving Apples.) And if you're fortunate enough to have a Mac II with a colour display, the fireworks will be in full and glorious colour.

What makes Pyro! really different and better is the control you have over all aspects of its operation. Normally Pyro! simply blanks the screen and starts its fireworks after a user-specified period of idleness. However, you can make Pyro! active at any time by moving the pointer into the upper right (you can change this) corner and holding it there for two seconds or so. You can prevent Pyro! from ever becoming active by moving the cursor to the lower right corner (of course, you can also specify which corner will activate this feature, too). Pyro! remains active until the mouse is moved or any key is depressed. Then you are right back where you were.

Setting it off

Pyro! is a 9.5k cdev resource. That means that if you're running System 4.0 (or higher) the Pyro! icon appears in the scrolling list at the left side of the Control Panel. Click once on the Pyro! icon and the Pyro! Control Panel appears. There are five operations you can perform here. The first thing you should do is click on the word Pyro! at the bottom.

Then adjust Pyro! to your tastes. The two miniscreens at the top let you select which corners of the real screen will activate Pyro!'s Sleep Now and Sleep Never features. If you select the same corner on each screen, Sleep Now will be disabled.

The next row of radio buttons lets you set the amount of idle time before Pyro! takes over. The third row determines how Pyro! treats such background tasks as electronic mail reception, print spooling and alarm clocks. As a rule, you should have these on, but be aware that some background tasks (such as print spooling) can take a lot of time and make the fireworks appear jerky. Finally there are buttons to turn Pyro! on or off. They're located in the bottom right section of the Control Panel.

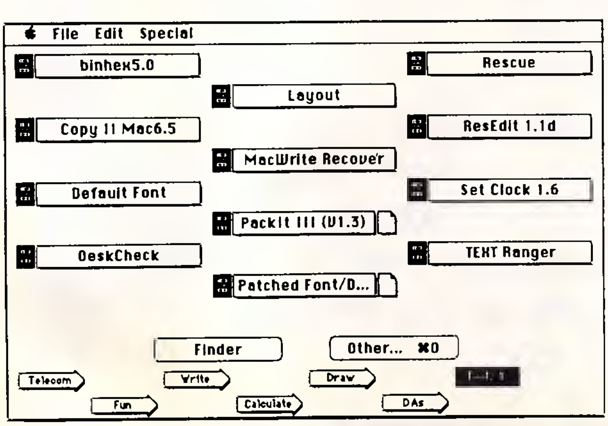
All changes take effect as soon as they're made. That means you can easily try out all of Pyro!'s options. You don't have to restart the Mac to see their effect.

Pyro! is a bit picky. It only works with System 4.1 or higher. If you're still using System 3.1.X, 3.2 or 3.3 (no one should be using 3.0, which is very dangerous), you have a choice. You can upgrade to System 4.1, which is on the Pyro! disk, or you can use PyroEdit.

PyroEdit has two major functions. The first is to let you configure Pyro! You need to use a separate program to do this because systems earlier than 4.1 don't support the separate cdev icons. PyroEdit also notices if you have an older System and asks if you want Pyro! configured to work with it. Click on YES, and Pyro! is converted to work properly with your System. PyroEdit can also undo this conversion if you upgrade to a new (4.1 or higher) System.

I have only one complaint about Pyro! That's that it can be too entertaining and, indeed, mesmerising. I often find myself watching it, waiting to see how big and where the next burst will be. I knew that I might have a problem the day I discovered I could tell how high any rocket was going to go by watching the size of the flame at the base of the screen when it took off.

END



This is a typical PowerStation screen. Click on any box to go directly to that application or document. You no longer need to search through your folders for anything

Software Supply is at 599 N. Mathilda Avenue, #210, Sunnyvale, California 94086 and on (408) 749 9311. Within two months, Software Supply assures us, an Australian distributor will be appointed — watch the December and January issues' Newsprint column. If you'd like to order direct from the States, the US price is $59.95.

MICRO

PERSONAL COMPUTING FOR BUSINESS

SPECIALS

HYPERACE 286
PLUS 10 MHZ PC/XT
$689 INC TAX

SEAGATE 20 MB
AND CONTROLLER
$610 INC TAX

ULTRA LASER
PRINTER
$3799 INC TAX

NETCOMM
AUTOMODEM 123
$720 INC TAX

TIMELINE
$575 INC TAX

PLUS HARCARD
40MB
$1899 INC TAX

VEGA DELUXE
$599 INC TAX

SOFTWARE

LOTUS SOFTWARE

Lotus 1-2-3	$569
Symphony	$845
Lotus HAL	$215
Freelance Plus	$669
Manuscript	$669

SPREADSHEETS

Lotus 1-2-3	$569
Javelin	$385
SuperCalc 4	call
Twin	$240
Silk	**$249**

DATABASES

DBase III Plus	$859
Paradox	**$679**
Clipper	$825
Fox Base Plus	$550
Reflex	$205
RBase System V	$1175

WORD PROCESSORS

Word Perfect	$465
MultiMate Adv II	$665
MicroSoft Word	$485
Wordstar Prof. 4	$440

MICROSOFT PRODUCTS

Word	$485
Mouse	$235
Windows	$185
Windows/Mouse	$365
Multiplan	$325
Project	$640
Windows/Draw	$329
Chart	$479
Compilers	call

INTEGRATED

Framework II	$894
Symphony	$845
Open Access II	call
PFS First Choice	$199

BORLAND

Turbo Pascal	$138
Turbo Prolog	$138
Turbo Basic	$138
Turbo C	$138
Turbo Lightning	$138
Sidekick	$114
Eureka	**$138**
Reflex	$205
Jumbo Pack	$389
Turbo Database Toolbox	$106
Turbo Editor Toolbox	$106
Turbo Prolog Toolbox	$138
Num. Methods Toolbox	$138

COMMUNICATIONS

Crosstalk XVI	call
Supercom Executive	$130

GRAPHICS

Freelance Plus	$669
Gem Draw Plus	$425
Harvard Graphics	$494
Drafix 1 Plus	$675

PROJECT MANAGEMENT

Timeline	$575
Superproject Plus	call
Harvard Project Manager II	$695
Microsoft Project	$640

UTILITIES

Norton Utilities	$135
Norton Advanced	**$209**
Norton Commander	$120
Xtree	$85
Fastback	$175
DS Backup Plus	$170
Copywrite	$85
Typequick	$79
PC Tutorial	$89
Above Disk	$199
Poly Boost	$149
PC Alien	$95
Mace Ver 4.1	$189
Sideways	$135
Print Q	$209
Printworks	$129
HOT	$179

DELIVERY (UP TO 3kg)

- FREE DELIVERY FOR PURCHASES OVER $1,000
- ANYWHERE IN AUSTRALIA FOR $7.50

PRICES ARE CORRECT AT THE TIME OF PRINTING BUT ARE SUBJECT TO CHANGE AND STOCK AVAILABILITY

CHECKOUT

4th Dimension

Once known as Silver Surfer, 4th Dimension is the database the Mac has been waiting years for, according to Jan Harrington.

Well over a year ago rumours started flowing in the Mac community. They mentioned the most wonderful Mac database — and it was for sale! In France, where it was developed. It was written by Laurent Ribardiére.

It was so good that Apple Computer acquired the rights to market it in the United States. Development of an American version began. The project code name 'Silver Surfer' was heard when and wherever Mac products were discussed.

Eventually, after much protest from third-party developers and much internal soul-searching, Apple dropped the project. It was promptly picked up by a new company, Acius. (ACI was the French publisher and Acius is the US subsidiary.)

Acius was founded by Guy Kawasaki, who left Apple mere weeks after being made a director. Guy was joined by Scott Knaster formerly head of Apple's Tech Support department and one of the best and most knowledgeable Mac writers around. They have a huge amount of faith in the product. Now, ironically, Apple is so keen about the product that it has assisted ACI by offering to handle the product in Australia for the next eight months or so until ACI establishes its own Australian offices.

Has all the fuss been worth it? What exactly is this program?

4th Dimension is a relational database management system. It joins Double Helix 2.0 and Omnis 3 Plus as one of only three Macintosh software packages that can be used to develop customised standalone data management applications. (At the time this review was being written, Ashton-Tate's dBase Mac was still not a released product.) These three DBMSs are also the only Macintosh database packages that provide multi-user access. Let's take a look at 4th Dimension's features and capabilities and how they compare to Double Helix and Omnis 3 Plus.

Entering 4th Dimension

Interaction with 4th Dimension takes place in one of three environments — Design, User or Custom. The Design environment is used to define database structure, to define input and output forms, to write programs (called procedures) and to put together the elements of data management applications. To enter, modify or retrieve data without a complete application, you must transfer to the User environment. Both the Design and User environments are intended for the application developer. End users work with standalone applications in the Custom environment.

The Design environment

The Design environment has five editors. These provide the facilities that create custom applications. They are:

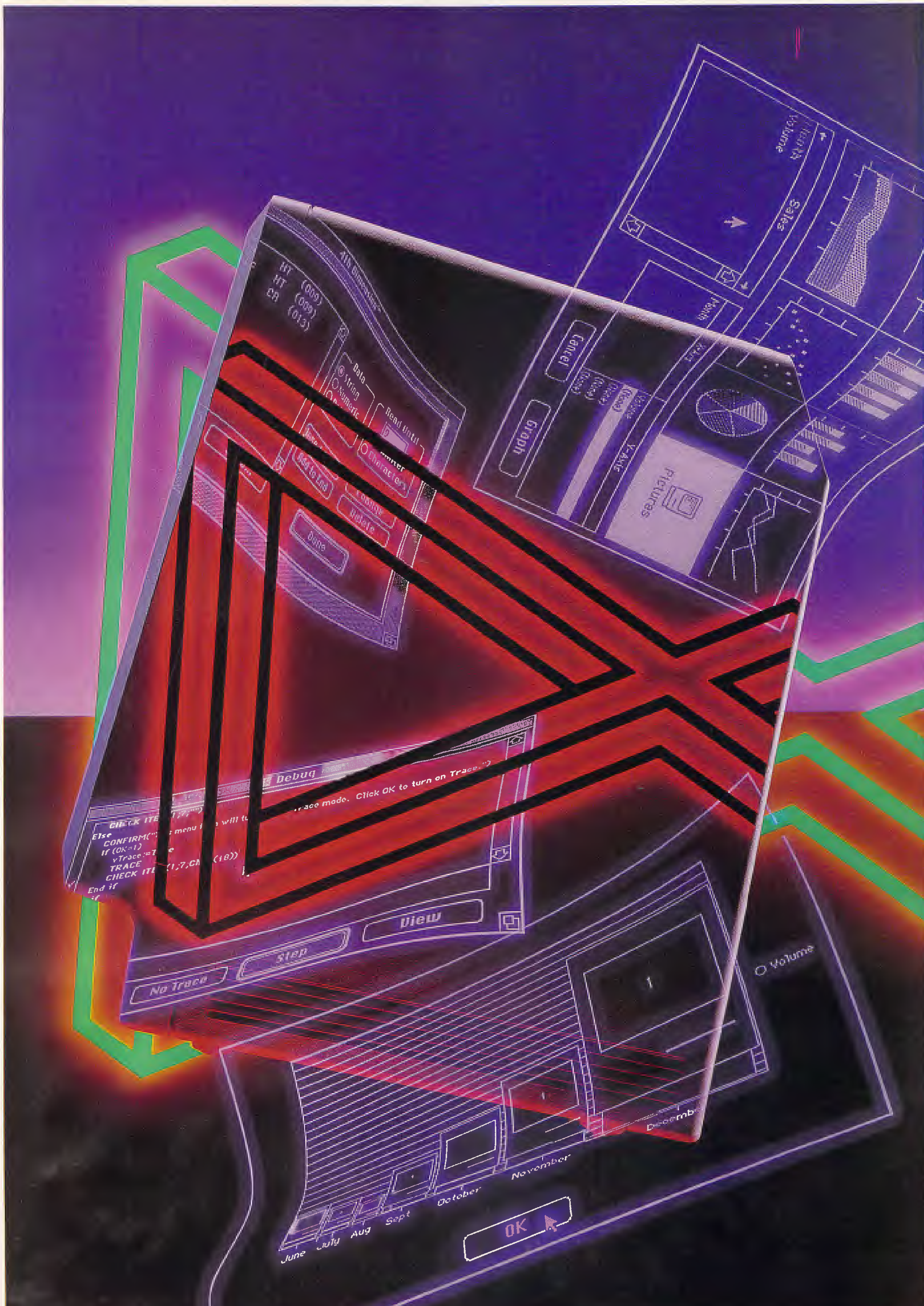
- The Structure Editor (creates and modifies database structure).
- The Layout Editor (creates and modifies input and output forms).
- The Procedure Editor (creates and modifies procedures).
- The Menu Editor (creates and modifies menus for custom applications).
- The Password Editor (creates and modifies a hierarchical password scheme for database security).

Each of these editors runs in its own windows, more than one of which can be open at any given time.

The Structure Editor

The Structure Editor window is a visual representation of a database's logical structure. Because 4th Dimension is a relational database, it views data as if they were stored in two-dimensional tables, which 4th Dimension calls files. Each rectangle in the Structure window represents a single file, which is made up of a collection of fields. Fields may contain any one of eight data types: alpha (alphanumeric strings of 2 to 80 characters); text (alphanumeric strings of up to 32,767 characters); real (numbers with fractional portions); integer (integers in the range ±32,767); long integer (integers in the range ±2,147,483,647); date; picture (graphics in a variety of formats, including scanned images); subfile (pointer to records in a subordinate file).

Double Helix supports the same range of data types (though some have different names and formats). Omnis 3 Plus cannot come close to


Debug
No Trace
Step
View
OK
June
July
Aug
Sept
October
November
O Volume
Pictures
Sales
Cancel
Graph

either of the other packages in terms of data type flexibility, since it can handle neither graphics nor blocks of text longer than 280 characters.

Each file is represented in the Structure Editor window by a rectangle, whose title bar contains the file's name. The rectangle itself contains the names of the fields in the file, which can be added to, modified and removed at any time during the life of the database. Field types and other field characteristics are set from the Change Field dialog box. For example, fields may be mandatory (a record will not be stored unless this field has a value). They may also be indexed: 4th Dimension can then be instructed to verify that values in the index are unique. The Standard Choices option will store a set of values from which the user can pick when entering data; this is a useful option when a field should contain one of only a few permitted values. These field characteristics make it easy to perform data validation on individual fields. They can be used to ensure, for example, that a key field always has a value and that key values are unique.

The drawback is that these characteristics cannot be applied to keys that are made up of more than one held (ie, a concatenated key). The alternative is to either include an extra field in the file for the concatenated key, whose contents must be created within a procedure (a portion of a program), or to verify key integrity through a procedure. This problem arises because 4th Dimension does not support derived fields; fields whose contents should not be entered directly from the keyboard but instead computed from other data must have their values computed by a program.

Omnis 3 Plus supports many of the same field characteristics as 4th Dimension and does allow derived fields. However, unique indexing is not available on derived fields and after several months of trying, I have been unable to create a working Omnis 3 Plus sequence that would verify that a concatenated key was unique. Double Helix supports both derived fields and field level validation. Since validation criteria can be created with abacus icons, there is no limit on the type or complexity of the validation that can be performed.

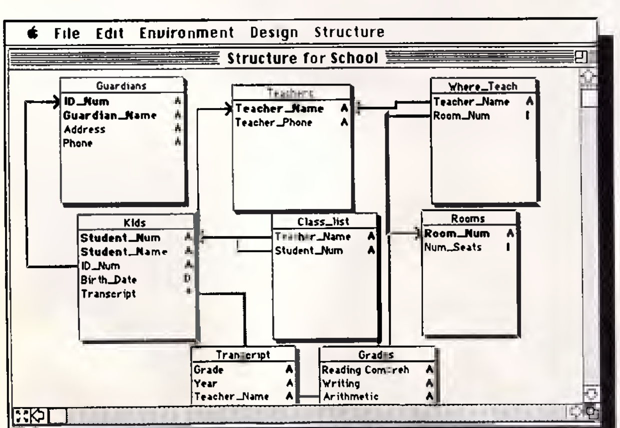
Relationships between 4th Dimension files are established with links, which show up as dark lines between files in the Structure Editor window. For example, in a database for an elementary school, there is a link from the file Kids to the file Guardians, which links a record for a child to the record for his or her legal guardian. Links provide the pathways for retrievals that require data from more than one file. Once established, links are very easy to use. However, if you decide, after the database has been designed, that you need to retrieve data in some way not provided by an existing link, the database structure will have to be modified. In contrast, Double Helix' Lookup files are more flexible, since they permit retrieval between multiple relations without pre-established links. Omnis 3 Plus also supports retrieval from multiple files. However, the setup and use of links (known as connected files) is more difficult than with 4th Dimension.

Subfiles, which appear in the Structure Editor window as separate files linked to another file by a light grey line, are complete files which are subordinate to another file. The school database, for example, contains a subfile called Transcript which is subordinate to the Kids file. A subfile could also be used for line items for a purchase order. Strictly speaking, subfiles are not relational. (A relational database should include no multi-valued fields and no pointers between tables.) In fact, subfiles are characteristics of a hierarchical database, since each record in a file 'owns' many records in the subfile. This doesn't mean, however, that they aren't practical or that they shouldn't be used.

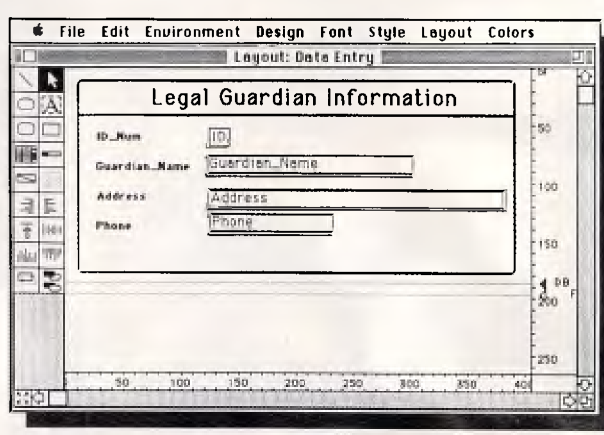
Neither Omnis 3 Plus nor Double Helix provides subfiles. Omnis 3 Plus doesn't particularly need them, since it is more of a network database than a relational database and its connected files act to create the one-to-many relationships similar to 4th Dimension subfiles. Double Helix sticks closer to what theorists call a relational database. A Double Helix design relies on multiple relations rather than subfiles to show one-to-many and many-to-many relationships. Whether 4th Dimension's strategy is better than that of Double Helix is a matter of personal choice.

The Layout Editor

All user interaction with a 4th Dimension database takes place through the use of input and output layouts. A new layout often begins with a default form, which might be a single-record screen (used primarily for data modification) or a listing screen (used primarily for data retrieval). The Layout Editor's window looks much like any Macintosh Draw-type program with its palette of tools on the left. It can be used to modify a default layout or to create a custom layout from scratch. Layouts can include custom buttons whose functions are controlled by a 4th Dimension procedure.



You can establish search logic with the Search Editor. The black arrows link files, which are represented by boxes



The Layout Editor uses Paint-like tools to customise the input and output environments

The Amiga 500...
buy tomorrow's computer today at The Local Computer Shop!

You are looking at some of the basic components which help make the **Amiga 500** the most advanced affordable home computer on the market today. The Amiga 500 is the only computer **for under $1000** which can offer the home user full software compatibility with the Amiga 1000 and 2000. Other outstanding features include, 512 KB Ram multi-tasking, analog RGB video output with 4096 colours, stereo audio outputs and RF (VHF) modulator option for home TV use and additional external 3.5 or 5.25 disk drives and internally expandable to 1 Meg with battery backed real time clock for under $300.00. Impressed? You will be even more impressed by the amazing Amiga deals you will receive from The Local Computer Shop. And when you purchase your Amiga, you will also get an unbelievable deal on a printer and software. Come into The Local Computer Shop today and discuss your needs, whether it be for Amiga, Commodore PC's, Epsons PC's, peripherals or software. The Local Computer Shop won't be bettered on service and price.

The Local Computer Shop, Commodore Computer Specialists, 1216 Glenhuntly Road, Glenhuntly, Vic. 3163.
Telephone (03) 572 2544 Fax: 211 7662.
Mail order Telephone (03) 211 4584.

THE LOCAL COMPUTER SHOP

Free shipping anywhere in Australia on PC-5 systems. Limited offer while stocks last. Other brands stocked with unbeatable deals, Kaypro and Super 5. Bankcard, Visa, MasterCard. No deposit finance through AGC to approved customers.

Now using a PC is this simple.

Introducing Keymaster. The revolutionary keyboard that lets anybody use a PC, with ease.

As easy as using an auto teller.

The Keymaster keyboard uses ten interactive LCD function keys to display the command options. Just press a key and the selected command is carried out. As you move through the program the keys change, prompting you with new commands. No more searching through hard to read manuals. No more hard to remember keystrokes. No more templates. Because every command you'll ever need is at your fingertips.

Keymaster's liquid crystal display allows all commands to appear on the keys in plain English. And commands for the top selling PC programs are built in. Training time is slashed, and mistakes and lost data are a thing of the past. And by using the inbuilt editor, commands for specialised programs can be standardised.

Will it work on all IBM PC's and compatibles?

No problem. All you have to do is plug in the Keymaster keyboard or Keypad, switch on and get productive. Leave the hard work to Keymaster.

KEYMASTER

DESIGNED AND MADE IN AUSTRALIA BY

Keycorp Ltd. 486 Elizabeth Street,
Surry Hills, NSW 2010
Tel: (02) 698 5299 Fax: (02) 698 3413 Telex: 120970

DISTRIBUTED IN AUSTRALIA AND NEW ZEALAND BY

Mitsui Computer Limited Incorporated in NSW

1-3 Rodborough Road, P.O. Box 234 Frenchs Forest NSW 2086.
Phone: Sydney (02) 451 7711 Fax. (02) 451 4692
• Melbourne (03) 690 6722 • Brisbane (07) 369 7799
• Wellington (NZ) (04) 845 819 • Auckland (NZ) (09) 395 686

Of the three programs, 4th Dimension provides the most flexible palette. Omnis 3 Plus is by far the most limited. Screen layouts are limited to a single, monospaced font; the only drawing tools are rectangles. Report definition is not WYSIWYG, but looks more like the procedure used in MS-DOS packages like R:base System V. Double Helix has the same amount of flexibility in layout design as 4th Dimension, but doesn't provide the same range of drawing tools (for example, no line, circle, or round-cornered rectangle drawing tools).

Though 4th Dimension layouts are tied to a single file, they can include data from any linked file. Whenever data from a linked file are included, 4th Dimension automatically writes a layout procedure, a program which loads the linked data. Layout procedures are programs that are run whenever their associated layout is used. (The other type of procedures are global procedures, which are invoked from menus in the Custom environment.) These procedures can be modified and enhanced with the Procedure Editor.

The Procedure Editor

The Procedure Editor is used to write and modify both global and layout procedures. 4th Dimension comes with a full-featured, Pascal-like programming language. Programmers can work with either listings, the most common way, or with flow charts. However, once a procedure type has been chosen, it can't be changed for that particular procedure. The Procedure Editor window contains four areas: an editor area, a keywords list, a list of fields and a list of 4th Dimension routines — functions that perform actions specific to the 4th Dimension database environment. 4th Dimension routines provide functions that can give a 4th Dimension application a Macintosh-like feel, such as enabling and disabling menus when appropriate. They also can manipulate graphic objects — controlling the scaling and layering (the 'pen mode') used when graphics are displayed — and draw eight different types of graphs based on stored data.

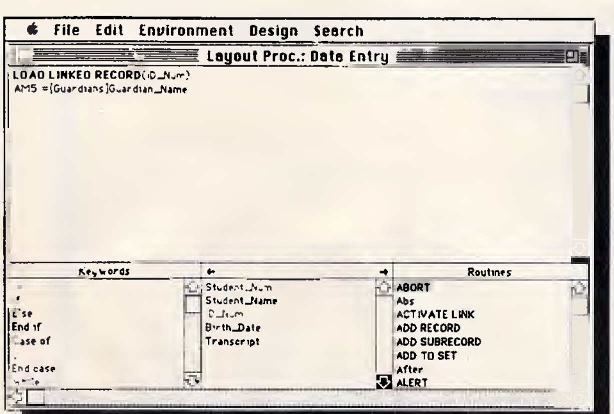
At first glance, the Procedure Editor window may look a bit like Omnis 3 Plus' Sequence window. However, there are major differences in both the way programs are written and the types of programs, that *can* be written with the languages provided by the two packages. To create an Omnis 3 Plus sequence, the designer must click on radio buttons to enter a command into a sequence. By contrast, 4th Dimension provides a real test editor, into which language statements and comments can be typed directly or entered by selecting a command, field or routine from the lists at the bottom of the window. 4th Dimension's language is a traditional programming language, with the type of assignment, selection and repetition statements a programmer expects. Anyone comfortable with Pascal with find 4th Dimension programming easy to learn. 4th Dimension's routines are enhancements to the language and do not replace well-understood programming constructs. Outside of its selection and control structures, Omnis 3 Plus' sequence commands are rather arcane. The 'Prepare for Update' mode, for example, makes it more difficult than necessary to control data entry and is cancelled by any commands that retrieve data.

'4th Dimension's programming language is traditional, with the type of assignment, selection and repetition statements a programmer expects.'

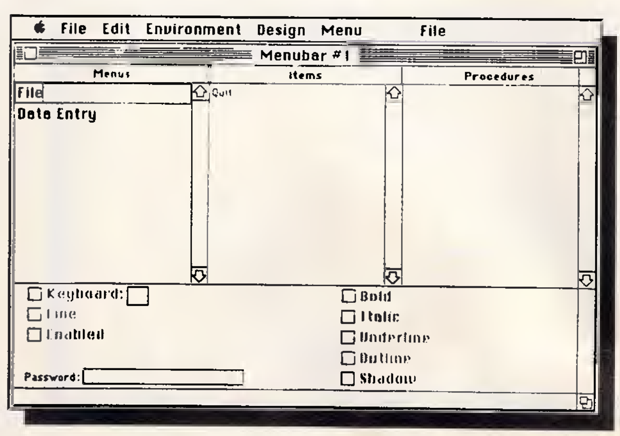
In terms of programming, it's impossible to compare 4th Dimension to Double Helix. Double Helix has no programming language, but it doesn't need one. Virtually anything that can be done with a 4th Dimension procedure can be done with Double Helix abacuses. (The exception is in the production of graphs, something Double Helix doesn't support directly.)

The Menu Editor

4th Dimension's Menu Editor allows a database designer to completely customise the Macintosh menu bar for standalone applications. (The Apple and Edit menus are supplied automatically; the application designer does the rest.) The leftmost section of the window shows a list of menus in the order in which they'll appear on the menu bar. The centre section contains the menu items for any currently active menu title. Associated with each menu item in the centre section is the name of a procedure which is invoked when the menu item is selected. If a menu item has no procedure associated with it, 4th Dimension assumes that it means 'quit'. The Menu Editor's window can also assign keyboard equivalents to menu items, assign passwords and vary the style of menu items.



The Procedure Editor modifies functions and routines using a programming language that is similar to Pascal



Standalone database applications are modified using the Menu Editor

Double Helix and Omnis 3 Plus are very similar to 4th Dimension in the creation and management of custom menu environments. Omnis 3 Plus custom menus are tied to sequences (that is, each menu item invokes a sequence). Double Helix custom menus are tied to views, each of which invokes a single application function.

The Password Editor

The Password Editor is used to create a hierarchy of passwords (the hierarchy can have as many as 32,767 levels). The passwords are assigned with the Menu Editor to menu commands or with the Layout Editor to layouts. Once a password is assigned, any password above it in the hierarchy can access its command or layout. (The password at the root (top level) of the hierarchy has access to the entire database.) The Password Editor's window is the only place where passwords can be changed; it also records the number of uses and last date each password was used.

4th Dimension's password scheme is not as flexible as that provided by either Double Helix or Omnis 3 Plus, since both of these packages can customise access by the user. 4th Dimension's passwords are an all-or-nothing affair; either you have access to a layout or you don't. The other two DBMSs not only permit or restrict access, but specify what kinds of access users might have. For example, you might be able to retrieve data using a particular layout, but not be able to add or modify data.

Omnis 3 Plus supports detailed customised access for up to eight users; Double Helix has no arbitrary restriction on the number of users for whom an environment might be customised.

The User environment

In the User environment you can test layouts and procedures; no data modification or retrieval can be performed from the Design environment. When you switch from the Design environment, the User environment uses the default output layout for the most recently accessed file. Both file and layout can be changed by selecting Choose FILE/LAYOUT from the File Menu.

When an input layout has been selected for use, enter data by selecting NEW RECORD from the Enter menu. 4th Dimension displays the input layout and waits for either a press of the Enter key or a click on the Enter button. This procedure is similar to that used in both Double Helix and Omnis 3 Plus.

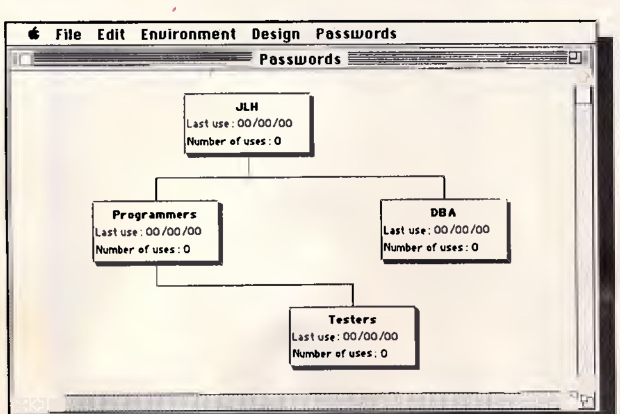
Output layouts that are designed to produce list-type forms have a variety of uses. For example, the simplest way to find one or more existing records for modification is to select them with the mouse on an output layout. Selecting MODIFY RECORD from the Enter menu will then bring back the default input layout for that file with the first selected record. Once a single record has been selected for modification, the input layout supports sequential access to records in the file. Both Double Helix and Omnis 3 Plus work in a similar manner, though neither requires a previous record selection before the sequential access commands are effective.

The order in which records appear in output layouts can be changed by sorting the file. 4th Dimension supports virtually unlimited sort keys (you can sort by every field in the file) in either ascending or descending order. Omnis 3 Plus will also sort files. Double Helix does not sort, but relies instead on indexes to affect the logical order of records in output forms. The records which appear in a 4th Dimension output layout can be restricted by creating and applying search criteria. The Search Editor is entered by selecting SEARCH from the Select menu. This gives you a window for defining compound search criteria. This way of constructing search expressions is very similar to Double Helix query icons and Omnis 3 Plus search formats.

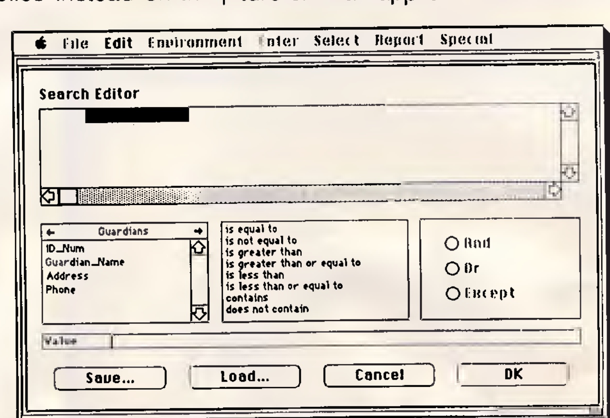
The Custom environment

4th Dimension provides development tools to create customised standalone applications that are virtually indistinguishable from any other application that adheres to the Macintosh user interface guidelines. The Menu Editor, discussed earlier in this review, forms the backbone of a custom application, allowing you to access procedures through menu selections. Custom applications can also include dialog and alert boxes, all types of buttons and scrollable areas on layout.

Entry to the Design and User environments can be prevented in one of two ways. If the user is working with the complete 4th Dimension package, then the designer can set 4th Dimension's Preferences to launch the Custom environment. So long as the custom application menu bar does not contain the Environment menu, the end user cannot leave the Custom environment. The second way to keep end users from the Design and User environments is not to provide them with the complete 4th Dimension program, but to give them only the run-time version. The run-time version will only run standalone applications; it cannot be used to make changes in the database structure or in an application.



A hierarchy of passwords of up to 32,767 levels can be created with the Password Editor



Choose SEARCH from the Select menu to enter the Search Editor

Utilities

4th Dimension is shipped with a set of standalone utility programs for the use of database designers and administrators. 4D Tools, for example, is a program that can be used for a variety of database maintenance activities, including cloning of a database (making a copy of the database structure), repairing damaged files and resizing data files used in a multi-user environment. 4D xRef produces a cross-reference report showing where layouts, procedures, variables and fields are used throughout the database.

Since 4th Dimension creates a large number of files and names them with its own naming scheme, it is risky to change file names. The 4D Renamer utility, however, can be used to change the name of a database. Once a new name for the database is supplied, the utility will properly rename all files used by that database. Other utilities include 4D External Mover, which imports program code written outside 4th Dimension, and 4D Customizer, which can tailor the Mac environment.

Documentation

4th Dimension comes with four spiral-bound manuals, a slim stapled booklet about the utilities and another small booklet containing errata and enhancements made since the documentation was printed. The documentation is aimed at database developers, not at someone who will be working with a custom 4th Dimension application. Even so, it is remarkably complete and clear.

The tutorial goes along with the sample database provided on the Examples disk. If you work through it, you will get good, in-depth exposure to the essential parts of 4th Dimension. The User's Guide provides complete documentation for using the Design environment's editors and the User environment's functions. It also contains suggestions about database design, an introduction to the control statements in the programming language and the creation of a custom user interface. It ends with a menu command reference section and a description of 4th Dimension disk files.

The other two manuals, the Programmer's Reference and Command Reference manuals, are primarily for programmers. The Command Reference Manual describes all of the commands in the 4th Dimension programming language in alphabetical order. The Programmer's Reference Manual discusses 4th Dimension programming; it is organised by function.

On the whole, the documentation is excellent. It is as good as that supplied with Double Helix and is better than that of Omnis 3 Plus, which does not provide anywhere near enough programming examples, especially considering that its sequences are so unlike traditional programming languages.

Support

4th Dimension comes with no online help. For novice software users, that is often considered a drawback. However, 4th Dimension is not really a package for novices, and experienced database application developers will not miss on-line help. Given the most likely users of the DBMS and the excel-

The Japanese made storage a fine art.

Our disk drives continue the tradition.

At Fujitsu the Japanese tradition of attention to fine detail has enabled us to produce disk drives with astounding performance and reliability.

Our disk drives range from 3.5 inch to 10.5 inch. They're fast, they're cost-competitive and enjoy the best MTBF of at least 30,000 hours.

Our disk drives are compatible with just about every computer system worldwide.

At Fujitsu, information storage is indeed a fine art.

Phone now for the name and location of your nearest supplier. Fujitsu Australia Limited Sydney (02) 959 6544, Melbourne (03) 529 7633.

FUJITSU

FUJ 2059

lence of the documentation, the absence of this type of support is probably not important.

Apple is making a good deal of noise about the support level it will offer application developers, training all its Australian support staff and dedicating three staff members to the task of supporting 4th Dimension end-users. Lack of support, it seems, is something Apple wishes not to be accused of.

Conclusion

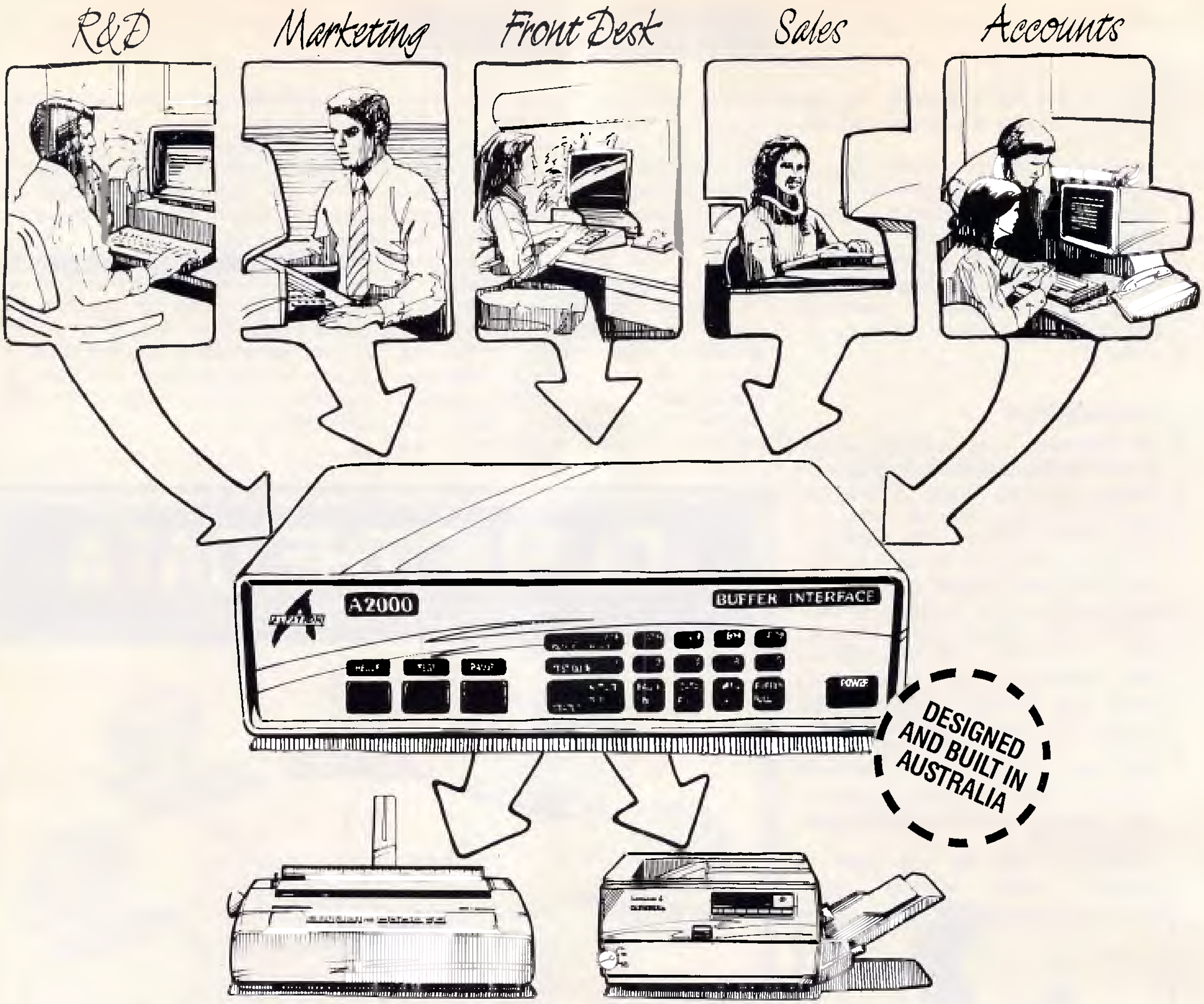
4th Dimension is an extremely powerful and flexible database management system. Anything Omnis 3 Plus can do, 4th Dimension can do better. If I were Blythe Software (the publishers of Omnis 3 Plus), I'd be very worried; their only saving grace may be their large installed base. In terms of competition with Double Helix, however, there is very little. The two DBMSs, while relatively equal in terms of power and flexibility, are totally different in the way in which a database designer interacts with them. Designers who want a more traditional database system based on a programming language should probably select 4th Dimension.

Designers who do not want to program should probably select Double Helix. Some totally unscientific crystal-ball gazing suggests that the market will continue to support both 4th Dimension and Double Helix, since they appeal to entirely different kinds of users. If dBase Mac is ever released, it (based on its beta), like Omnis 3 Plus, will have a hard time competing against 4th Dimension.

Should you buy 4th Dimension? Is it worth the $1295 retail price? The answer is a qualified 'yes'. If you are looking for a traditional database management system that requires programming to produce custom applications, buy 4th Dimension. It will do everything you need, and more, and will prove itself to be well worth the cost. However, if you don't want to program, you'll probably be happier with Double Helix, also well worth its price for custom application development without programming.

END

4th Dimension retails for $1295. It requires a Macintosh Plus, SE or II, and a hard disk is highly recommended. A runtime version for up to four users is available for $495. Apple is on (02) 888 5888.



"Share and share alike."

Flexible interconnections at an affordable price

The Alfatron A2000 Communications Interface lets you maximise three very important resources – your people, your computers and your printers.

And, it costs far less than you might think. In fact, the A2000 is significantly lower priced than equivalent imported products.

Much more than a switching device, the A2000 also functions as a data buffer so there is no waiting for devices to become free – your people can keep working without frustrating delays.

Easy to set up and use

Working with the A2000 could hardly be simpler. On power-up or reset, the A2000 connects all devices to one port such as a printer. To connect to another device, the user has only to key in another port. That's all there is to it. Several personal computers or work stations can conveniently share printers or work stations can conveniently share printers as well as transfer data or files amongst themselves. Menu set up is available as an option.

All systems go

Up to eight independent channels can be operated simultaneously, using the basic memory size of 256K which is expandable to 1M. What's more, a dynamic memory allocation algorithm ensures that each channel only uses as much memory as it needs, leaving the remaining memory free for other channels.

You're in charge

The A2000 is very flexible. User controlled configurations range from simple serial/serial, serial/parallel or parallel/parallel conversion to an intelligent networking interface. The two parallel ports can be either input, output, Centronics or Data Products and the six serial ports are RS-232. If desired, units can be cascaded to increase the number of input channels to suit the application.

One of a series

The A2000 is one of the Australian designed and built Alfatron A-series of interfaces which between them cover virtually all data interface requirements.

The A500 is a low cost serial/serial converter whilst the A1000 is a serial/parallel buffered converter featuring speeds up to 19.2K Baud and a choice of buffer size up to 32K. The A3000 Flexible Buffered Converter is available in 2 or 4-channel versions and is microprocessor based. It provides intelligent multiple line interfacing and storage up to 256K Bytes.

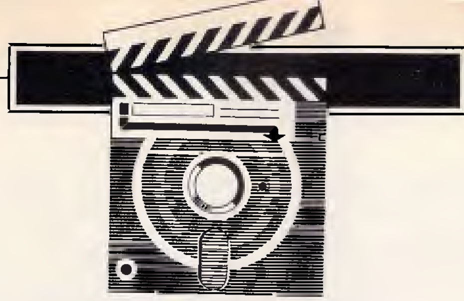
For information on any of the Alfatron A-series converters, please ask for the comprehensive literature. Dealer enquiries welcome.

ALFATRON

Alfatron Pty Ltd
Solid Solutions
1761 Ferntree Gully Road
Ferntree Gully
Victoria, 3156

Telephone (03) 758 9000
Fax (03) 758 9421

Price & Payne 1827 ALF



SCREENTEST

PC Works

Going down but not quite out, the line of MS-DOS applications is sustained by Microsoft's PC Works, a basic integrated package for the PC and compatibles. But is it too little, too late? Owen Linderholm finds out.

Although Microsoft is trying to lead the PC market into a new age with the OS/2, Windows and Presentation Manager programs, it still has a commitment to the old world of MS-DOS. I am sure, however, that we will be seeing fewer and fewer of the old-style text-based programs from Microsoft. PC Works could thus be described as the first of the last MS-DOS programs: the process will take years but is beginning now just the same, a decline equivalent in style but not scale to that of the Roman Empire.

PC Works is a fairly simple text-based integrated package consisting of word processor, spreadsheet, database and communications programs. It is aimed at the cheap compatible market and those users who don't want to move on to Windows.

In keeping with the new Microsoft style of a standard user interface across its range of products, PC Works uses a common menu interface with a single splittable window, very similar to Microsoft's programming products. The window takes up most of the screen and has horizontal and vertical scroll bars, making it a virtual window onto a much larger area.

There are two ways to do almost everything in the program. One is to select commands and move the cursor around using the mouse. This works speedily and seems to be the way the program was intended to be used. You can also move around and select items with the keyboard and, although this is often as fast, it is much slower in some cases (scrolling through a document, for example).

Menus are drop-down and show an unusual level of design. They have 'shadows' — the latest fashion trend in WIMP design — but the shadows are 'real'. You can see through them to the underlying text. This holds true for every sort of display the program can use except LCD on portable machines, where the shadows are dappled but do obscure the underlying text. It's a shame that the design of PC Works' features and power isn't quite on the same level as the design of the program's interface and functionality.

'PC Works . . . is aimed at the cheap compatible market and those users who don't want to move on to Windows.'

Installation

Installing PC Works is an intelligent, semi-automatic process. The program will install itself automatically onto a working disk — an extremely sensible practice because this makes using and therefore, damaging your master disks difficult. The installation program automatically recognises the configuration of your machine and then pops up a menu of additional information for you to alter. This involves display types and monitor types you want to use, printers for text and graphics, file organisation, whether to use Help or not, whether to include graphics printer fonts, which country defaults to use, which mouse driver to use, and whether or not to delete unwanted printer drivers, and so on.

When an application is open, two of the menus that appear are common to all of the applications. These are the File and Window menus. The File menu is used to launch new applications in new windows, to save the current file, to exit PC Works or to switch to a DOS shell to temporarily run other applications. The Window menu allows you to call Help or consult the tutorial (two features I was unable to test at the time of the review), to change the settings or to switch to a different open window (you can have up to eight of these).

Word processor

This is a fairly basic-level word processor, as you would expect in an introductory integrated package. It is essentially a straightforward WYSIWYG program, but not on the same level as the Macintosh-based Microsoft Works program which provides the usual onscreen Macintosh fonts and bit-mapped display.

At the top of the applications window is a ruler bar showing character positions and left and right margins. You can scroll through the document using the scroll bars at the bottom and right of the screen window, or cursor keys. Text is entered as usual by typing it in, with all the standard editing keys (delete, backspace, insert, and so on) operational. Editing also works on selected pieces of text which can be marked using the F8 key and the cursor keys or by using the mouse.

I found the word processor pleasant to use for entering and editing text. The response to typing is very good and mouse-based editing is a pleasure after the rigours of WordStar. It can be hard to force your fingers not to push Control-K, but once you get used to the mouse, what a relief!

The menu options available in the word processor, apart from File and Window, are: Edit, Print, Select, Format and Options.

Edit is used for standard editing functions like Undo, Move, Copy and Delete, with the last three referring to marked blocks of text and the first to the last editing command performed. Other editing options allow character or paragraph formats, special characters, dates and times, insertion of fields from a database file or charts from a spreadsheet file.

The Print menu allows you to select the text printer you want to use, although the default will be assumed if you don't want to choose one. You can also use a database file for mailmerge printer and for label printing. The other options are to set up the page layout for printing and to print and select which pages should be printed.

The Select menu is used for search and replace and for going directly to a specified page in a document.

The Format menu allows you to specify text formats like bold, italics, and so on. You can also specify paragraph formatting, including spacing and justification. This menu is also used for setting tabs and for setting the global paragraph style (indenting, alignment, spacing and paragraph gaps).

The final menu is for miscellaneous options. This lets you split the document window into two for separate views of a single document (and more convenient cutting and pasting), display or hide the ruler, special characters (hard carriage returns, soft spaces, and so on) and the complex headers and footers, alter pagination and perform a spell check.

The spelling checker is a fairly typical American phonetic spelling checker. I used it to spot my mistakes and then often had to enter the replacement myself. As an example (which many other spelling checkers also get wrong), I mistyped database as 'daabase'. The spelling checker suggested the following alternatives: debase, debaser and Tabasco. More thought to the people who make typing mistakes as well as spelling mistakes and less concentration on pepper sauce, please!

The rest of the word processor operated as expected — I had a little trouble getting printer drivers to work correctly, but nothing like I've had with printer drivers on *some* programs.

Spreadsheet

The basic form of the spreadsheet is similar to that of the word processor — a window surrounded by scroll bars and data lines of information — but there are the expected differences in organisation. At the top is an editing line which displays spreadsheet cell contents and allows values or formulae to be edited. The rest of the window holds the usual spreadsheet cells, with the top line and left-most four columns used to show cell labels.

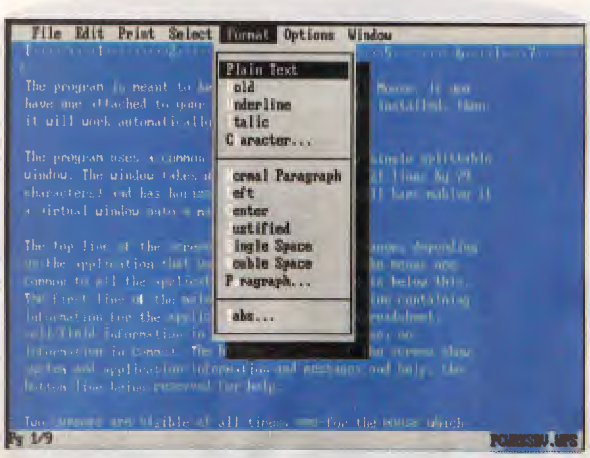
A cell-sized cursor is used rather than usual character-sized cursor, and the contents of the cell over which the cursor is resting are displayed in the editing line above the spreadsheet window. To enter data, simply move the cursor to the desired cell and start typing. The data will appear on the editing line and, when you press Return, the correct value will be transferred to the cell.

Superficially, the menus are almost the same in the spreadsheet as in the word processor; the only difference is that there is a menu called Chart. However, the items selectable under each menu are different.

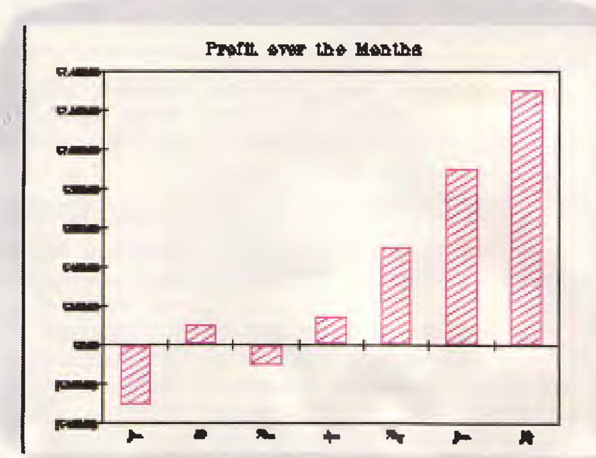
The Edit menu has the standard options: 'move', 'copy', 'clear' (the value), 'delete', 'insert' and 'copy special'. This last option lets you copy values only, add values to destination or subtract values from destination.

Some new items are also on the Edit menu: Fill Right, Fill Down and Name. The Fill options let you copy a cell into a range of cells that have been marked below it or to its right. If these have formulae, then the cell references will be adjusted accordingly. Name is used to provide a special name for a cell.

The Print and Select menus operate as expected, with modifications for their use within a spreadsheet program.



The PC Works word processor. This is a typical PC Works screen with the standard menu interface; notice the shadows 'underneath' the menu. Formatting options are shown



A screen view of the chart shown in Fig 1. You can see that although the lettering is almost illegible on a CGA, it matches the printout in terms of style

TO PASS ATs, JUST FLOOR OUR NEW TWIN TURBO 12.™

PUT THE PEDAL TO THE METAL AT 12 MHz.

If you're about to soup up your PC, XT or 8088 clone, why settle for a single turbo? Orchid's new TwinTurbo 12™ will *double* turbo-charge your PC. Making an ordinary accelerator's performance obsolete.

ONLY ORCHID'S 12-MHz TWINTURBO GIVES YOU DUAL TURBO POWER.

Orchid's TwinTurbo 12 replaces your 4.77-MHz 8088 with a powerful 12-MHz 80286, while it increases your PC's motherboard speed by up to 50%. With this dual turbo technology, your PC will run applications up to 4.5 times faster. So now you can smoke IBM's fastest AT—or even their new Personal System/2 Model 30.

FINALLY, A TURBO THAT SUPPORTS THE ENTIRE PC WORLD.

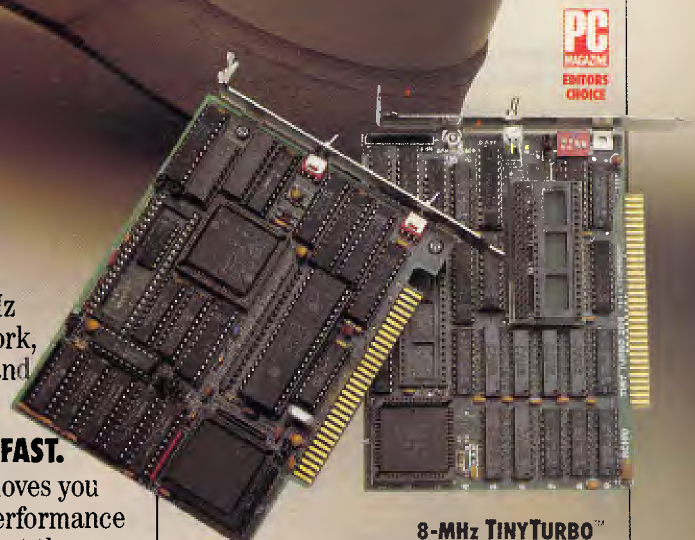
The TwinTurbo 12 is compatible with all application programs for the IBM PC, XT and 8088-based clones—even 8-MHz imports. As well as network, multifunction, graphics and other add-on cards.

PRICED TO MOVE FAST.

The TwinTurbo 12 moves you instantly into the high-performance world of an AT. But without the AT's high price tag. Even at $1,295 the TwinTurbo 12 comes complete with productivity software and a 4-year warranty. Plus, for the truly economy minded, Orchid offers the TinyTurbo,™ the Editor's Choice of *PC Magazine.* At $995 it's the best choice in single turbos today.

Model	Price	Performance	CPU Speed	Dual Turbo
TwinTurbo 12	$1,295	**4.5 x PC**	**12 MHz** 80286	**Yes**
TinyTurbo™	$995	**3 x PC**	**8 MHz** 80286	**No**

*Guaranteed compatible: Guarantee applies to certain models of manufacturers listed here. TwinTurbo 12 and TinyTurbo 286 are trademarks of Orchid Technology. All other product names are trademarks of their manufacturers.



8-MHz TinyTurbo™ $995 R.R

12-MHz TwinTurbo 12™ $1,295 R.R

TWIN TURBO 12 GUARANTEED COMPATIBLE

ORCHID

IN EUROPE Orchid (Europe) Ltd. TEL: +44 256 479898 TLX: 946240 Ref. 190233802

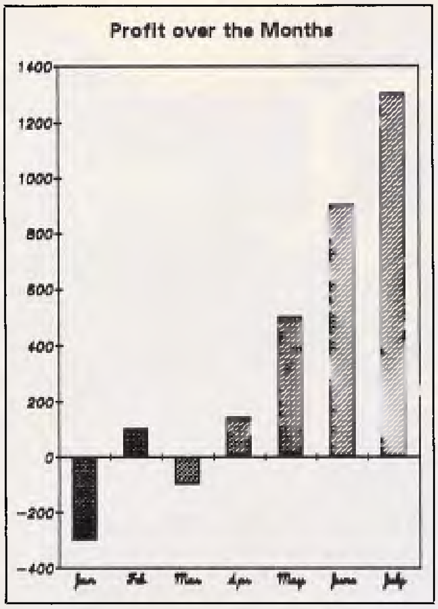


Fig 1 A piece of sample output from the Chart area of PC Works' spreadsheet

The Format menu is essentially used for formatting cells. The available display/data formats are: general, fixed, dollar, comma, %, exponential, logical and time/date. Other entries in the menu are for style (bold, italic and justification) and cell width.

The Options menu, as with all the options menus in PC Works, is a mish-mash of miscellaneous features. You can freeze or unfreeze titles, split a display into two, show formulae rather than results, protect cells from being changed inadvertently, and switch between manual and automatic recalculation.

The final menu is the new one, Chart. This is a gateway to the second dimension of PC Works' spreadsheet, the Chart Window. The menu lets you define a set of cells for a chart, create a new chart, view a chart, or select any one of the currently-defined charts (if any). The first two take you into the Chart Window, while the third will display the chart if one is currently defined. This is done in the best colour-graphics mode available and is displayed full-screen.

The onscreen charts are generally as good as they can be and PC Works knows enough to make full use of any graphics mode it is in. I tried it on screens ranging from LCDs on portables through to a VGA display using one of the VGA-compatible display cards with a new high scan-rate monitor. It worked fine on every single one, although the pie-chart labelling could have been done considerably more intelligently: overlapping text is hard to read.

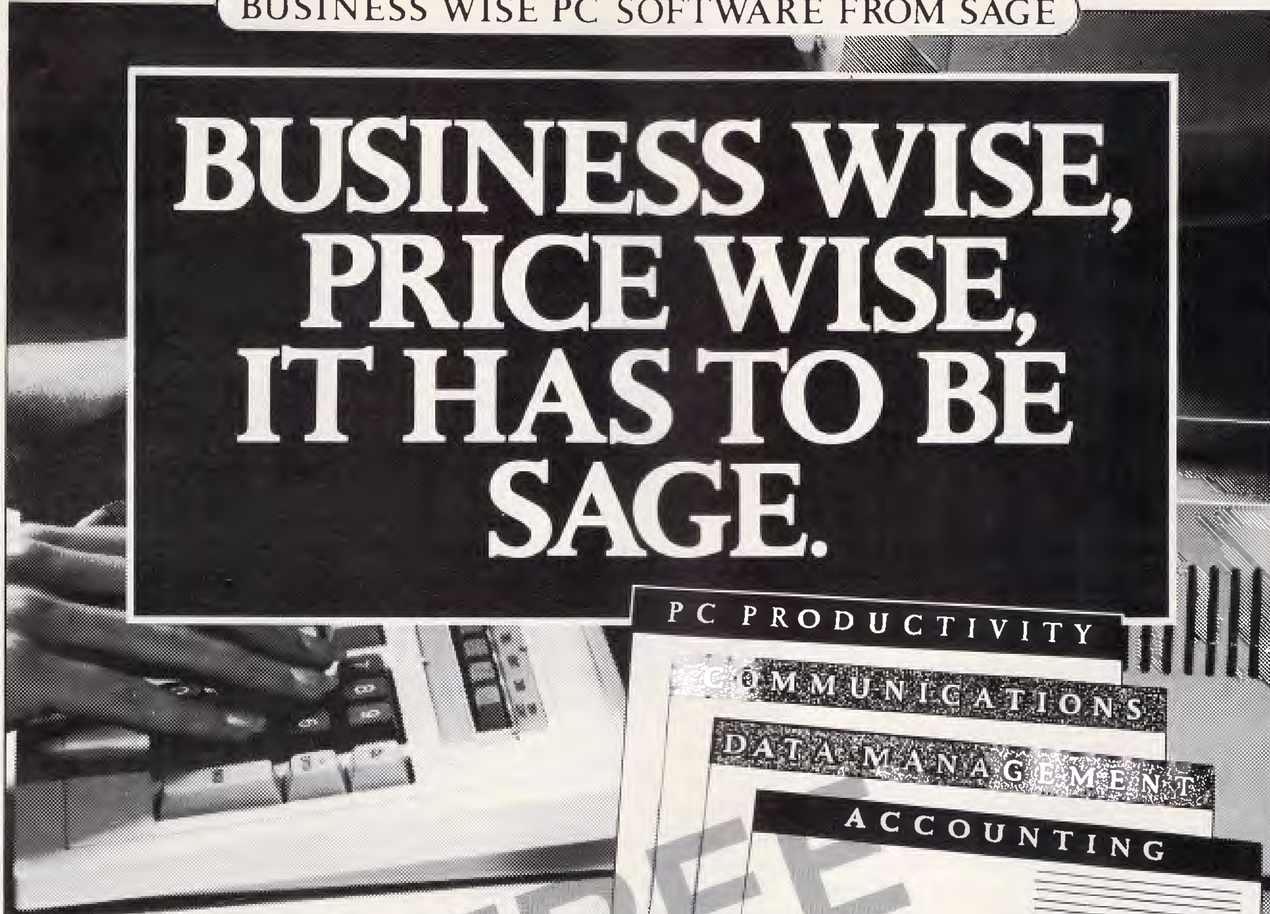
I found the spreadsheet very functional and easy to use. The formats and commands available are similar to those in other Microsoft spreadsheets such as the Mac version of Works and Excel, although they are much less powerful than in the latter program. I used it for various businesslike things such as graphing Benchmark results and averages and checking the disastrously low figure at the end of my payslip. I'm quite sure it would be up to checking the comparative yields of the various share portfolios that I don't own!

Database

The database is the most complex-looking part of PC Works but is in fact the simplest, especially since it is a flat-file database rather than a relational one. It is obviously a database that was designed to integrate with a word processor — the report and export

BUSINESS WISE PC SOFTWARE FROM SAGE

BUSINESS WISE, PRICE WISE, IT HAS TO BE SAGE.



Australia's newest range of low priced, high performance, full feature software programs to cover most business needs.

Designed for use with the Amstrad PC 1512, IBM PC and all compatible personal computers. With 90 days' technical support absolutely free.
Available now from all good computer outlets.
Send for details now.

BOOKKEEPER Small business bookkeeping & accounting	$299
ACCOUNTANT Powerful integrated accounting	$449
ACCOUNTANT PLUS Accounting with stock control & invoicing	$599
RETRIEVE Data storage & management	$299
CHIT-CHAT E-mail, Viatel & file transfer	$299
PC PLANNER Lotus 1-2-3 ® compatible spreadsheet	$299
DESK-SET Desk top organiser & utilities	$249
PC WRITE Word processor with spelling checker	$299
FREE DEMONSTRATION DISK For a free 5¼" demo disk of all Sage programs, attach a letterhead or business card to the coupon.	

Personal Computer Software P/L
68 Alfred St.
Milson's Point 2061
Phone (02) 923-2899

PLEASE SEND FULL DETAILS

NAME

POSITION

ADDRESS

POSTCODE TEL:

Or telephone the Sage Sales Desk on: (02) 923-2899
Personal Computer Software P/L
68 Alfred St., Milson's Point 2061

SA6

facilities are *very* good. These features are all, however, carry-overs from the Macintosh Microsoft Works program. PC Works tries to cover much the same ground.

For new files, the database opens up in the 'forms designer' where you set up the way you want the input form for a single record in the database to look. The forms designer is simple and only has two menus for editing and field formats. You simply move the cursor to where you want the fields to be, and enter the field name, and format and size. Once this is done, you leave the forms designer and enter the main viewing window of the database.

The database has three further modes: 'form view', 'list view' and 'report designer'. The form view presents records in the format designed in the forms designer and lets you step through records with Ctrl-PgUp and Ctrl-PgDn. The forms view window looks like a word processor window except that the cursor highlights a whole field and you can't do anything with the blank areas where no field is defined.

At this point you are ready to enter information into the database or edit information. This is straightforward. Simply move the cursor (which in form view highlights the data part of a field) to the correct field using the mouse or the cursor keys, and then type in the information.

The database forms view has the widest range of menus available of any of the parts of PC Works. Besides the usual ones, there are menus for formatting fields in the same manner as the spreadsheet, setting up queries using the Query Define window, and obtaining reports using the Report Define window. The Options menu switches from form view to list view, lets you redesign forms and protect fields from modification.

All the other menus and options are the usual ones that crop up throughout PC Works for printing, editing, selecting, and so on.

> *'PC Works may seem to have more disintegration than integration, but its cut-and-paste facilities are very powerful.'*

The list view window is essentially the same as the spreadsheet view in the spreadsheet module of the program except that each column corresponds to a field of the database and each database record appears on a row below this. The field names are displayed at the top of columns and lets you see a great deal of information from the database at once and for tabular data can be an easier way to enter or analyse data.

The Query menu lets you define a query by entering search criteria into fields in a Query Design window that is almost exactly the same as the Forms Design window. Other options on the menu then let you apply the query to your data, show and hide records, and also sort the database on any combination of the various fields.

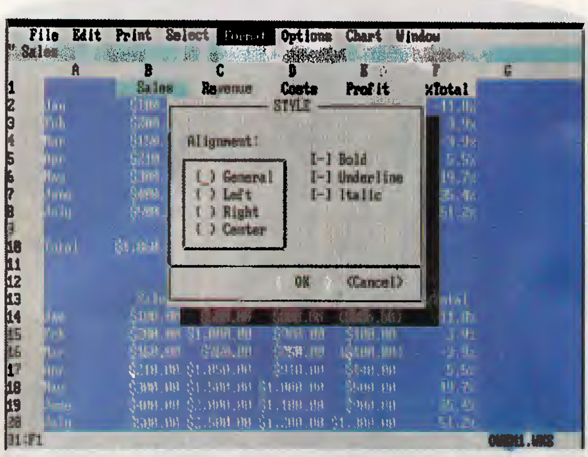
The Report Menu is simpler, but its main function is to take you into the Report Design window which is almost as complicated as the rest of the database program. The options available let you look at and edit old reports you have set up, create new reports, view the text output from the report generator, save the output as a text file, and load in and switch reports around.

The Report Design window displays the database in list view. However, in the Report Design window, no values are displayed, nor are the field names given at the top. Instead, you are able to design a report format that consists of any of the fields from the database displayed in any format you like, with any of the query criteria already applied. In addition, you can enter new titles and fields containing additional information to make a more comprehensive report.

The database is a fairly simple one, with nothing like the programming power or functions of standalone database programs. Nevertheless, it is useful in conjunction with the spreadsheet and word processor, especially for presenting reports. A finished report can be exported to the word processor for embellishment with explanations, sample data and charts.

Communications

This is *always* the weak link in in-



The PC Works spreadsheet is data format compatible with Lotus 1-2-3. As you can see, the basic layout of the screen is the same as that for the word processor

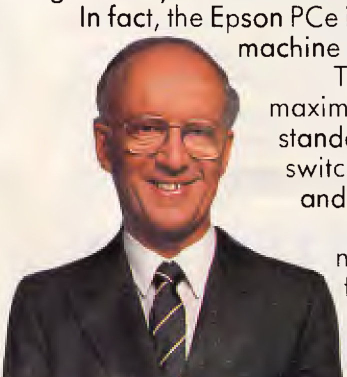
The PC Works database in form view mode with a record consisting of two fields visible. The right menu is the Window menu which lets you easily switch between applications

"Epson challenges you to find a faster XT compatible than the new Epson PCe."

JAMES DIBBLE

The Epson PCe personal computer has been designed for your business.

In fact, the Epson PCe is the fastest XT compatible machine there is.



The Epson PCe makes maximum use of popular industry standard architecture and is switch selectable between 4.77 and an incredible 10 Mhz.

But the Epson PCe is not only fast, it is also very flexible, with five expansion slots.

Which means you can increase the capacity of your PCe to suit your business growth.

The power switch, speed selector and re-set buttons are all accessible from the front panel.

Standard features include: 640 KB RAM, Parallel and Serial Ports, Clock/Calendar, and a small footprint. All first class features in their own right.

As well as offering high performance as a stand-alone desk top unit the Epson PCe is also ideally suited for a L.A.N. or mainframe environment.

For more information, including details of our twelve month national warranty, phone Epson for your nearest dealer.

In computers and printers your number one choice.

EPSON®

Sydney (02) 436 0333; Melbourne (03) 543 6455; Brisbane (07) 832 5400; Adelaide (08) 373 1377; or Perth (09) 325 1744.

EPS0240

tegrated software. Comms is a specialised field, and it often isn't worthwhile for an integrated package to devote too much of its available room and functionality to comms since it is probably the least-used of the main applications.

Even to look at, the communications window is the simplest of the applications. The communications program is the only PC Works window without scroll bars. All it has is the menu bar across the top and the two program information lines along the bottom. There is no option to load standard settings from disk: you will have to keep a separate PC Works communications file for each communications service you access.

Firstly, you go to the Options menu to set up terminal information like baud rate and emulation type, communications information such as port settings, phone information such as the number to call, and the type of dialling (tone or pulse) to use. The range of options available in each of these sections is very small and is evidence of the application's limitations.

The communications program can manage all of the usual baud, parity and data settings, and can connect via all the usual ports. However, you can only emulate an ANSI or a VT52 terminal with limited settings and you can only use one modem initialisation string. This leads to questions about hanging up the modem, and access to other modem functions. The answer is that they aren't available unless you have a Hayes-compatible modem and, even then, only limited access is possible. Of course, you *could* enter the complex and weird modem commands manually . . .

The only two menus available apart from File and Window are Connect and Transfer. Connect lets you dial, redial, hang up, pause or break. You can also record or replay one — and only one — sign-on sequence.

The Transfer menu lets you capture or send text (ASCII) files and also transmit or receive files in Xmodem format.

And that is *all* PC Works' communications program does. The acid test for comms is what happens when you try to access online services. The good news is that I had no problem and, in fact, PC Works would be perfectly capable if that were all you wanted comms for. I was able to access various bulletin boards with reasonable success except that I wasn't able to use the best transfer protocol for files, Kermit.

However, when I tried to access the Source via PSS, I had a rude shock. I

In perspective

The major competitors to PC Works are Ability, Ability Plus, PFS:First Choice, Enable and Open Access II. PC Works falls somewhere near the top of this list in terms of power and functionality, and also in terms of price.

In the end, however, since PC Works is neither outstandingly better nor considerably worse than any other programs, you are going to have to make a choice based on personal preference. As Microsoft is slowly rationalising its user interface and the presentation of its programs, you will be fairly happy with PC Works if you like other Microsoft applications programs.

couldn't even log on to PSS. Almost immediately, I received pop-up messages saying 'parity error' even though I was at the correct parity. Not surprisingly, the messages stayed when I tried again at a different parity setting. I was also given the more mysterious message of 'frame error'. I gave up.

Integration

The integration between the different programs within PC Works is mostly done on a cut-and-paste basis with marked data from window to window. This always works, and allows you to extract data from the various programs and send it to any other program within PC Works. The exception to this is the communications program which can only export information as text files and cannot accept any input information.

In addition to the cut-and-paste functions, some of the menus include items for transferring information. Specifically, graphs can be included in text files, as can database fields for mailmerge facilities. These are the only 'live' data-transfer facilities, where data values change in the copy when they are changed in the original. Otherwise, the cut-and-paste facilities are 'dead', in that once data has been transferred, it is immutable. This is a shame since programs like Ability, which have been around a long time, have fully live integration.

PC Works may seem to have more *dis*integration than integration, but its cut-and-paste facilities are very powerful. It is easy to take a paragraph from the word processor and drop it into the spreadsheet, or take a set of fields from the list view of the database and put them into the word processor.

Documentation

PC Works' documentation consists of the usual Microsoft-standard manual with rather lengthy explanations and clear diagrams.

Conclusion

PC Works is a reasonably well put together program. It has arrived rather late on the integrated software scene, coming very much after programs like Framework, Symphony and even Ability, Enable or Open Access II. If the company producing it had been smaller or less well established, I would say that this program stands little chance in an increasingly powerful and sophisticated market — regardless of how good the program is. However, Microsoft has the clout and power to push PC Works very hard and is likely to make a reasonable success of it.

The word processor is fairly good and integrates well with the other parts of the program. The spreadsheet is also good and is easy to use. The database is a bit simpler and is acting purely as the database part of an integrated program; it wouldn't stand up on its own. The communications program is barely adequate — it's just okay if you only want basic email facilities.

PC Works certainly isn't my favourite integrated program, but neither is it anything like my most hated.

END

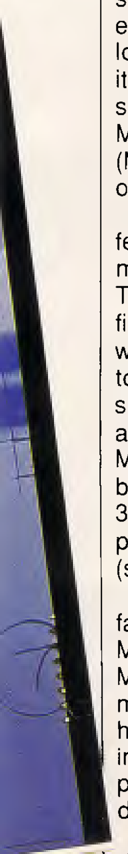
PC Works costs $392 and is distributed by Microsoft, tel: (02) 452 5088.


833 KODAK
CEMENT PLASTER ON GALVANIZED EXPANDED WIRE LATHE
A/C UNIT BEYOND
PANEL WITH 1" WIDE LOUVRES CUT INTO FACE LAP OVER ALUM. TUBE
DUCT TO A/C UNIT
EXISTING 1" DIA. PIPE (WITHOUT INSULATION)
EXISTING VENTILATION DUCT IN CEILING BELOW FIRST HUNG CEILING
FACE OF EXISTING STORE FRONT
FACE OF 1/2 ROUND TUBE
GLASS BLOCK FRONT PPG "VUE"
4" CONCRETE BASE
SATIN FINISH ALUMINUM BASE TO MATCH STOREFRONT
SECTION THROUGH STOREFRONT

GARY BUSS

MGMS

Joseph Greco investigates this value-for-money professional level CAD/CAM package for the Macintosh.



Any engineering or architectural firm choosing a micro-based computer-aided design (CAD) system is faced with an important decision. Do they go with a proven IBM/AutoCAD setup or should they 'take a chance' with a Macintosh-based system? Not long ago, the lack of sophisticated CAD software on the Mac made this an easy choice. However, even though a lot of people may not want to admit it, there now exists serious CAD software for the Mac. The MicroGraphic Manufacturing Station (MGMS) from Micro CAD/CAM is one of the leaders.

MGMS (version 2.09) is a fast and full-featured CAD program for producing mechanical and architectural drawings. The program originated in Israel and first ran on the Apple Lisa. In 1986, it was redesigned to run on the Macintosh and by June the first Mac versions began to appear, and it's now available in Australia from Symbiotic in Melbourne. Many new features have been added since its premiere. Version 3.0 is just around the corner, and it promises to turn even more heads (see box at the end of this article).

MGMS adheres to the Macintosh interface, though not as well as some other Macintosh CAD programs such as MacDraft or MiniCAD. This does not mean that the program is hard to learn, however. Although MGMS sometimes inhibits a user's work, most CAD professionals will be pleased with the drawing quality this program produces.

The program offers a full range of drawing features for professional CAD work. (It supports colour for those with a Mac II and RGB monitor.) In most cases, your ability to create geometry is only limited by your imagination.

Pulling into the station

When you open MGMS you are greeted with 'View Definition?' — a choice of user-defined or standard engineering A through E sized sheets. Drawings can be done in either inches or centimetres.

The first thing you notice about MGMS is that it has that Macintosh look — due to the icons and menus. But click on the icons located on the left side of the screen, and the differences between MGMS and other Macintosh CAD programs immediately become noticeable. In MGMS, each icon has its own menu offering you a series of options. For example, under the top icon titled 'Point' a menu appears with ten different ways to place a particular point. Included are the placement of points using absolute, incremental and polar coordinates. You can also place a point at any specified distance on a line or at its midpoint.

'If all this grouping and ungrouping sounds confusing, it really isn't — it is, however, very tedious.'

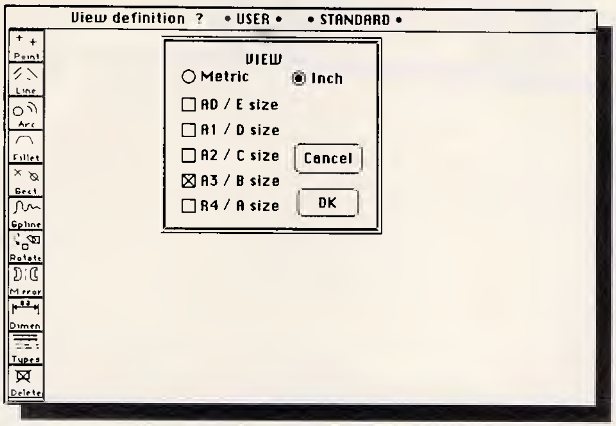
After placing a few points you should notice a unique feature of the software, the mouse escape. Although difficult to get used to at first, the mouse escape proves to be a great asset in speeding up the drawing process. It allows you to leave your present drawing mode just by bringing the mouse over to the icons. This works best when you make a mistake in the middle of a drawing mode. In many CAD programs, if you make one error while entering a series of data relating to a command, you'll have to carry out the rest of the command. With MGMS, you can rely on the mouse escape to start again at any point.

Further up the line

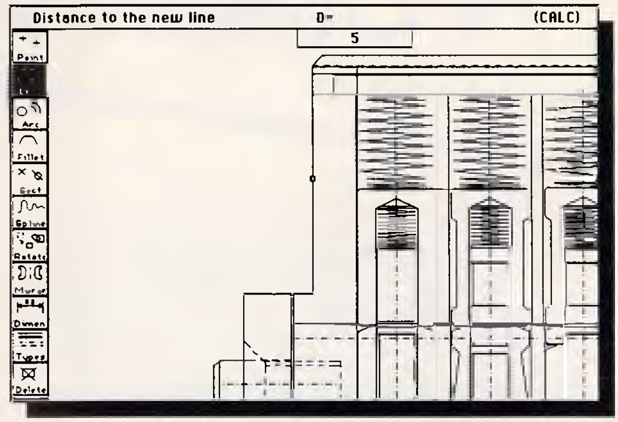
Underneath the icons, you'll find a buried treasure of geometric creation. The Below the Point icon is for line placement. Lines are easy to create and, again, the number of line placement options is impressive. Two of the most helpful line tools are the Perpendicular and Parallel lines. With Perpendicular Line you can select a line and scribe a perpendicular line from it. Parallel lines can be created by selecting an existing line and either typing in an offset distance or selecting an existing point with the mouse.

One drawback in creating both perpendicular and parallel lines with the mouse is that they must be snapped to an existing point in order to work. For example, you can't just select a line and click anywhere on the 'sheet' (a free point) and have the line copied parallel to that point. To accomplish this you have to select FREE POINT under the Point icon and place that point where you want it. Then copy the line parallel to that free point. This is not a very intuitive way of drawing and I feel it's a basic flaw of the software.

Circles, arcs and fillets are frequently used in creating any type of engineering or architectural drawing, and are a good test for determining the power of a CAD system. MGMS allows a great deal of creativity in drawing these ele-



The view dialog allows you to select sheet sizes using either metric or inch dimensions



To draw a parallel line, select the Line icon and calculate the distance between the parallel lines

ments by offering various ways of creating them.

Laying the track

Once you've placed some basic geometry, you may want to edit it. MGMS features all the necessary modification tools (move, copy, rotate, delete, etc); however, this is where another flaw of the software appears. Any piece of on-screen geometry you want to edit must first be made into a group. For example, if you need to move an object it must be grouped first and then moved. If it is already part of a group, you cannot group it separately — you must smash (ungroup) the entire group and then group the line, then, finally, move it. If you want to group this line to the previous group, it has to be ungrouped and then regrouped. If this sounds confusing, it really isn't — it is, however, very tedious.

All this grouping and ungrouping definitely slows down what is usually a smooth drawing process. Groups also have to be used to simulate layers because MGMS has no definite layering system like those in MiniCAD or SNAP! This only leads to more problems as drawings become more complex. Instead of having a drawing on which might be 10 or 20 layers, which can be easily turned on or off (made visible or invisible), you have to use groups to act as layers. These groups cannot be turned on or off or edited as easily as CAD programs with traditional layering systems. Avi Lipski, president of Micro CAD/CAM, told me that a different layering system is being worked on for future versions of MGMS.

Creating shapes such as rectangles and hexagons is easy to do in MGMS. Once the geometry is created, MGMS has several ways to enhance it. A good example is hatching, which allows you to define the pattern, angle and spacing of the hatch. You can also access a separate module of the program called MGMS GEOMetry which calculates the perimeter, area, centre of gravity and moment of inertia of a particular shape.

Once all the geometry is placed, there are many ways to change its appearance. You can change the line thickness of any element or change its style from solid line to a centre or dashed line. Lines and shapes can also be trimmed and chamfered to exact specifications. One of the most useful features is the Offset command. Any element, including arcs and circles, can be offset to any specified distance from the original element.

Switching tracks

MGMS supports the standard Macintosh Clipboard, which means that you can copy and paste a drawing into other Macintosh programs or other MGMS files. When copying to the Clipboard you have the option of taking the complete drawing or just the basic geometry with or without the text, dimensions or hatching. This is a very versatile and clever feature. When working in a MGMS file it's possible to call up a previously saved drawing and use it in your present work.

One of the top priorities at Micro CAD/CAM is to develop a DXF file transfer with AutoCAD and its 300+ modules. Currently, MGMS supports the latest

A Compact Excellence

LOGI PERSONAL COMPUTER

Finally — a computer that breaks through the barriers of time and space; the LOGI 286-AT personal computer. The LOGI 286-AT is a unique machine which provides excellent IBM-AT compatible computing power. Based on the 16-bit Intel 80286 microprocessor, the LOGI 286-AT is designed to run both the IBM PC/AT and IBM PC software. Also, the LOGI 286-AT main board is designed using the Japanese 6-layer board technology to improve the system's stability for a high performance standard.

The LOGI 286-AT offers increased power, speed, compatibility and reliability. Its casing design is slim and compact and is endowed with new innovative features.

The LOGI 286-AT with its superior architecture combined with excellent performance standard makes it the best choice for a high quality personal computer.

LOGI 286-AT

- 16-bit 80286 CPU 6-layer PCB (6MHz/8MHz)
- 640K RAM on board expandable to 1Mbyte
- Eight Expansion Slots (6 slots for 16-bit I/O)
- Monographics or Colorgraphics Card
- Serial/Parallel Adaptor
- Fixed Disk and Diskette Adaptor
- Single 1.2Mbyte Floppy Disk Drive
- 195 Watt Power Supply (110/220 VAC)
- 84-key Keyboard
- Licensed Award Bios
- Optional MS DOS and GW Basic (Ver. 3.21)
- Software and Manual

LOGI 88-XT

- 16-bit V20 CPU 4-layer PCB (4.77MHz/8MHz)
- 640K Ram on board
- Eight Expansion Slots
- Parallel Printer Port
- Serial Port Interface
- Real-time Clock/Calendar with Battery back-up
- Joystick Adaptor
- Two 360K Floppy Disk Drives
- Monographics or Colorgraphics Card
- 135 Watt Power Supply
- 84-key Keyboard
- Licensed Award Bios
- Optional MS DOS and GW Basic (Ver. 3.21)
- Software and Manual

Physical Dimensions: 356 mm x 405 mm x 140 mm
System Carton Weight: 15 kg

IBM PC/XT/AT are registered trademarks of International Business Machines Corp.
MS-DOS, GW Basic are registered trademarks of Microsoft Corp.

Distributor:

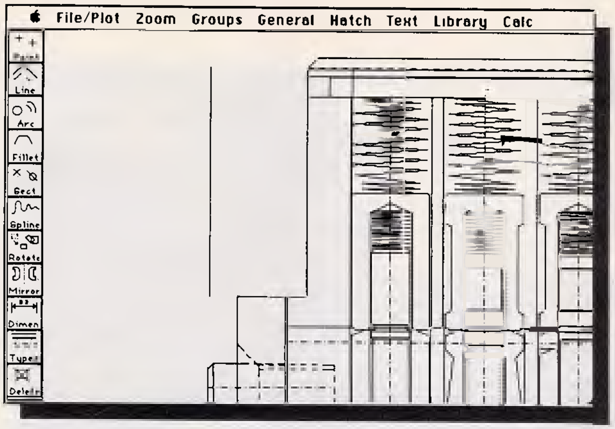
MANDATE PTY. LTD. (Q'LD) 8/32 Spine Street, Sumner Park, 4074 Queensland. Tel: (07) 3762733 Fax: (07) 3763998

Distributor (Victorial & South Australia)

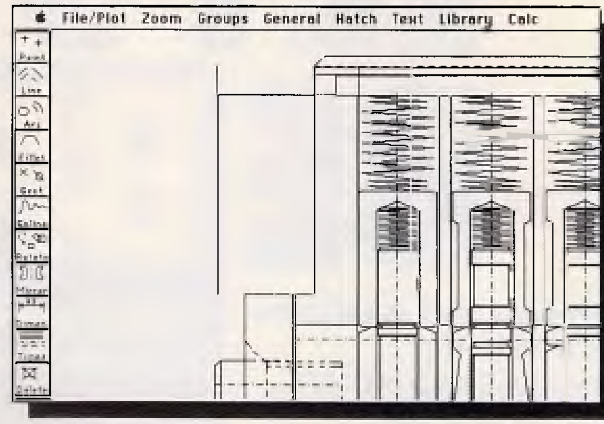
OSHIMA

OSHIMA COMPUTERS PTY. LTD.
56 Burwood Road, Hawthorn, Vic., 3122. Telephone: 8196060 Telex: AA[illegible]4126 OSH

Manufacturer: LOGICRAFT PRODUCTS MANUFACTURING PTE LTD 35 Tannery Road, #05-01 Tannery Block, Ruby Industrial C[illegible]pore 1334.
Japan R&D Office LOGICRAFT CORPORATION 1-18-5 Azumabashi Sumida-Ku Tokyo, Japan.



After entering the distance and hitting Return, the line is offset parallel to the previous line



After drawing the parallel line, a perpendicular line, if desired, can then be created

standard of IGES (using a utility program called MGIGES) and this can be used to transfer AutoCAD drawings into MGMStation. Unlike its previous versions, this latest version of MGIGES supports the transfer of dimensions.

First the good news — any element on your current drawing can be made into a symbol. Now the bad news — it must first be made into a group. As already mentioned, this leads to extra steps and only makes the drawing process longer. Once you get over the fact that you must deal with groups, you begin to realise how powerful the symbol creation mode of MGMS is. Users can graphically preview symbols, so it's nearly impossible to place the wrong symbol. You can also rotate or scale the symbol before you place it.

Compu-Arch, a US-based company, has enhanced MGMS for both architects and engineers by providing various packages of symbol libraries. Included are architectural symbols such as doors, furniture, bathroom facilities and staircases. These symbols are excellent for providing the finishing touches to architectural drawings. Recently added to the line are symbols for the drafting of schematic capture design (for use in designing printed circuit boards) and illustration. The company also plans to release a new interior design symbol library in the near future. This will include standard interior design patterns and room layouts.

Keeping on track

Dimensions. How could we build anything without dimensions? They are so important in the creation of working drawings that we often take them for granted. So do programmers — who casually develop CAD programs with non-standard dimensioning ability. This is not the case with MGMStation. Here dimensions are created intuitively, quickly and technically correct. Although dimensions only follow engineering standards on screen, there is a plotting option called Plotter Install which allows you to change the dimension standard from mechanical to architectural. It also permits you to globally change the dimension accuracy (up to four digits), the dimension mode (inches or metric) and even the type of arrowhead (you can choose triangular, wedge, slash, circle or none at all).

Type of text

After placing your basic geometry and creating the necessary symbols and dimensions, usually the last step in finishing off a drawing is to place the text. The developers of MGMStation realised the importance of the text on a drawing, so they designed the program with its own window for placing text. There are only two options under the Text menu — Edit Text and Repaint Text. When you click on EDIT TEXT, a new window opens up with five more menus and six side icons. The icons allow you to place text in various ways — surrounded by a border, in a table or in a balloon, just to name a few. Since the Scrapbook is supported, you can paste text in from a word processing program.

It is easy to move or redefine the shape of the rectangle it is in even after the text is placed. One problem I have with text is that you have to define its height as a percentage of the drawing height. Engineers and ar-

LET'S BE BRIEF

Solution Systems

The Programmer's Editor by Underware, Inc.

INCREASE PROGRAMMING PRODUCTIVITY. SAVE TIME AND MONEY.

Brief is simply the world's best programmers' editor with advanced features like:

- A high level, readable Macro Programming Language. Allows customization for programming languages ... Complete, unlimited variables. etc.
- Edit multiple files of unlimited size. (2 meg is OK)
- Multiple Windows on screen with different or same file, fragments. etc.
- A bona fide UNDO stack (up to 300) of all operations; deletions, reading files, search, translate, more.
- Reconfigurable keyboard.
- Full "regular expression search" wild cards, complex patterns.
- Adjustable line length – up to 512.
- Keystroke macros – for common typing sequences.
- Suspend BRIEF to execute, exit to DOS, run another program (like a a compiler, dir, XREF, DIFF, or DEBUG) then resume BRIEF session.
- Compiler specific support like auto indent, syntax check, **compile within BRIEF.**
- And hundreds more features you can program yourself.
- Not copy protected.
- Our own programmers swear by BRIEF.

OFFICIAL AUSTRALIAN IMPORTER

DELTA TECHNOLOGY

TELEPHONE (07) 832 5377
DELTA TECHNOLOGY PTY LTD

DELTA TECHNOLOGY PTY LTD,
P.O. BOX 53, SPRING HILL, BRISBANE Q. 4004.
Please send me full information on BRIEF.

NAME AND POSITION ....

COMPANY ....

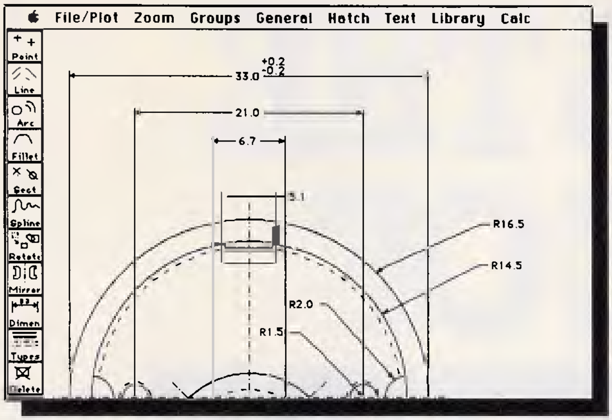
ADDRESS ....

....

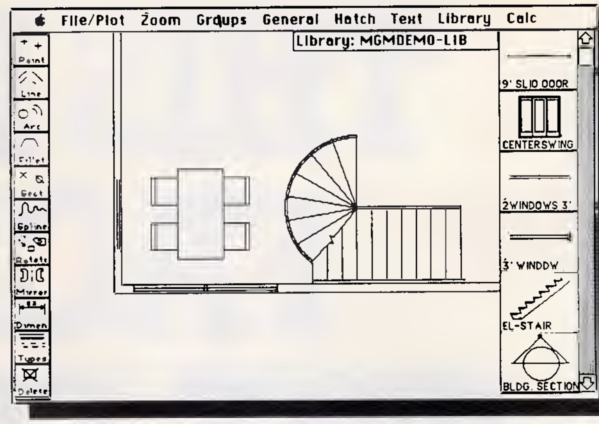
POSTCODE .... PHONE (   ) ....

$395

- INCLUDES SALES TAX
- UPGRADES ALSO AVAILABLE



MGMS allows for sophisticated dimensioning features. Note that the top dimension has a tolerance on it



ADS-MGMStation-Architecture is a symbol library which aids architects in creating plans and elevation drawings

chitects usually think of text as being .5 of a centimetre high, not 2.5 per cent of the drawing height.

MGMS allows two text fonts — Monaco or Symbolic — which are suitable for most drawings. *(Symbolic is a san-serif font built into the program. It should not be confused with the Symbol font – Ed.)* You have the option of four different styles of text: plain, bold, italic and underline, which is more than sufficient for working drawings.

Scenic route

MGMS has many unique features, one of which is the style of panning it employs. It works in a fashion which allows you to see the entire drawing as an inset on the upper left side of the screen. Within the inset is a smaller box, representing your current view. By using the scroll bars you can move the smaller box and easily determine where your next view will be located.

The zooming features of MGMS are also very convenient. You can either zoom in or out by defining a certain scale factor, or you can zoom in by defining an area which then becomes your new view. You can also return to the original view, and a new feature in version 3.0 allows you to return to the previous view.

When looking at CAD software, one aspect that will usually grab your attention is the speed at which the program redraws images on the screen. MGMS redraws produce very satisfying results. This is due not only to the speed of the redraw, but also to the number of redraw options. The redrawing of certain time-consuming elements such as dimensions, text and hatching can be avoided by selecting REPAINT DRAWING. You can then individually repaint the dimensions, text and hatching. To view the complete work, just select REPAINT ALL.

Documentation

The claim that a true Macintosh program means "you don't need to open the manual", will be disproven as Mac programs become more complex. However, it should still be possible to operate 70 to 80 per cent of a program without having to resort to the manual. This is indeed the case with MGMS. Program operation is intuitive for the most part, and when the manual is needed, it's a reliable source. It features step-by-step instructions for every command, plenty of illustrations, an index and a tutorial.

Conclusion

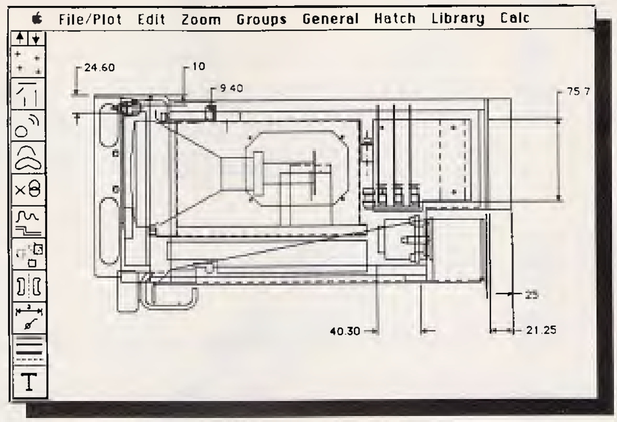
MGMS is in some ways a unique CAD application — performing many typical CAD operations atypically. Some operations — such as pan — work fine, while others — namely groups — make the program more rigid and actually disrupt the usual smooth flow of work. Despite these faults, MGMS' powerful geometry creation makes it ideal for many applications.

While MGMS' $1380 price tag is a bargain, it should not be considered bargain basement software. Many professionals have the mistaken idea that the highest priced software is always the best. This is one of the reasons why the lower-cost Macintosh CAD software has been overlooked in architectural and engineering

circles. However, these professionals are now giving Macintosh-based solutions serious consideration — regardless of industry dogma. And MGMStation is a powerful program deserving positive recognition.

END

MGMS is distributed by Symbiotic Computer System, tel: (03) 836 4482 or (03) 882 2248. Compu-Arch's symbol libraries are also available from Symbiotic (prices have not yet been set) as well as the MacCAD library (for $228 per volume).



The icons are slightly different in MGMS 3.0, offering the user more advanced features. This drawing was done in version 2.09 and altered in version 3.0

Looking ahead: MGMS 3.0

MGMStation version 3.0 is proof that the developers of the program are constantly working and listening to the needs of their users. Version 3.0 initially appears to be no different from version 2.09. However, a few clicks here and there immediately prove this first impression incorrect.

One new add-on is a second series of icons which can be obtained by clicking on any one of the two arrows above the top icon. This 'second series' of icons is strictly geared toward geometric input. It includes rectangles, rounded rectangles, polygons and several other basic geometric elements.

You can double-click on certain icons and then define where the origin point of that element will be. For example, double-clicking on the rectangle icon will give you a choice of placing its origin point at any of the four corners or at the centre.

The double line feature, ideal for drawing walls, is an addition that will be welcomed by architects. At press time, however, this feature was not yet fully operational.

One capability that users will have for the first time is the ability to cut, copy and paste elements. What this means is that you no longer have to group an element in order to move it. You can now paste elements to an existing grid or a free point. This idea of using the Clipboard for copying, cutting and moving elements makes MGMS' drawing process a lot smoother. However, an element which is part of a group still must be ungrouped in order to be cut or copied. Right now the standard command keys for copy, cut and paste are not implemented.

The grouping feature still exists, and here, too, improvements have been made. Groups can now be listed by name as well as by icon. This helps the user who has many groups and does not want to take the time to scroll through a few hundred icons — it is much faster scrolling through a list of names. Groups can also be concatenated — two or more groups can be combined to form one group.

There are also two new additions under the Zoom menu. The first, called Real Absolute Scale, lets you set the scale you draw in. For example, if you wanted to draw at a 1:10 scale, just set the real absolute scale to '.1'. Another handy addition is the inclusion of a previous zoom setting, which allows you to return to your previous view. This is most helpful when you have just zoomed or panned into the wrong area and want to start again.

Looking past MGMS 3.0 there are many other features which Micro CAD/CAM is working on. One priority is a definite layering system, making it easier to view and edit separate layers. Enhancements such as this promise to make MGMStation an even more powerful and flexible CAD program.

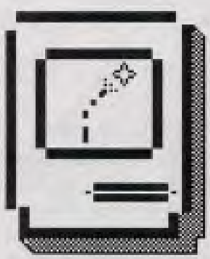
MGMS 3.0 is due for release early in the new year.

SPACE EDIT ® SIMUL ® DIMENSIONS

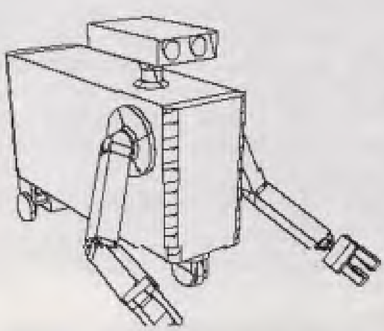
PROFESSIONAL 2D/3D DESIGN TOOL DYNAMIC SIMULATION. POWERFUL 3-D COLOUR GRAPHICS.

New CAD Software for Macintosh from ARCOM MAC.

- 2D / 3D Design tool.
- High speed (*uses Mac II co -processor*).
- Easy to use Mac interface.
- Four windows interactively linked. Plan, elevation, side elevation & isometric. Perspective visualization from any angle or location.
- Hidden line removal.
- Accurate output to plotters up to "A0".
- New version has **colour** rendering on MacII.



- Applications include mechanics, robotics, economics, statistics, physics, animation, structures and electronics.
- Display graphically or ...mathematically from elements drawn from software or pasted from any pict file.
- Simulates virtually all dynamic movement.
- SIMUL generates values with its formula compiler, takes values from another source, or lets you create them with its drawing tools.



- Up to 16 design windows.
- Free form curve/surface design.
- Colour rendering features.
- Advanced ray tracing and anti-aliased smooth edges.
- Colour output from palette of 16.8 million.
- Output from Matrix film recorder to 4000 line resolution.

Call Rob Keeping at Arcom Mac:
(02) 552 1115 for more information

Please send more details:

Company Name:____________________

Address:____________________

Title:____________ Tel: ____________

100 Harris Street • PYRMONT • 2007 • Tel: (02) 552 1115 • Fax: (02) 660 7490

ARCOM MAC
(02) 552 1115.

Data projection

Bringing your pie chart to the big screen requires the right equipment and the right know-how. Derek Powell, the technical director of Gaytone Productions, a Brisbane-based company specialising in data projection, demystifies the jargon and the hardware in this guide to successful presentation.

A powerful new peripheral is transforming the way computer generated data is communicated. Video projection of computer output is helping users to sell hardware, teach software, and make an impact in the boardroom.

Large screen display is very effective in software and hardware sales, where demonstrations of a system's capabilities must be given to a group of potential customers. In the training field, the use of a projected image allows an instructor to quickly demonstrate procedures to a class. With one or more large graphic displays, the status of a computer controlled factory can be instantly monitored by a number of operators.

A growing area is the 'electronic slide show' where a series of images, either graphic, text, or both are displayed to an audience directly from the computer that generated them. This eliminates the sometimes costly and time consuming stage of imaging computer graphics onto slide film for projection and allows for short deadlines and instant updates.

It is a thrill to see the graphic images you laboured over for so many hours projected on a twelve foot screen, but the practicalities of achieving this should not be underestimated.

The key to successful large screen presentation of computer data lies in understanding your own computer's display and the strengths and weaknesses of the various large screen options.

We will review the basics of computer displays and what you need to know, then check the systems available for large screen data presentation. Finally we'll look at the interface devices used to link them together.

Computer display drivers

Large screen displays all have to be connected to the same video output port as the computer's own monitor. Projectors and monitors vary in their ability to handle the output of high-resolution display drivers, so which graphics board you use will largely determine what projection options are open to you. It is vital to know the type of display driver fitted to your computer and its specifications, before attempting to use it with a particular projector or monitor.

PCs often use interchangeable display driver boards to enable them to be configured for different tasks. Terminals have many different types of display depending on the application of the host computer.

You must start with the correct display board as video projectors do not add any extra graphic capabilities to your PC. A monochrome display adaptor will project in black and white even on a colour video projector.

TTL or analogue

There are many types and formats of video output signal employed by computer manufacturers but, whether colour or monochrome, they fall into two broad categories of display drivers: TTL (also called digital) and analogue.

Broadly speaking, an analogue video signal is steplessly variable and can produce a continuous tonal range. Where high-resolution graphics are required the computer manufacturer commonly elects to provide analogue video outputs directly from the display driver. There are usually separate outputs for the red, green and blue video signals and a synchronisation pulse output.

However, analogue circuits are difficult to build, especially within a computer where the rest of the signals are digital. Where the display requirement is only for text and limited graphics, a simpler system can be used. Here the video and sync signal are output as digital pulses instead of analogue signals.

This 'digital video' output is called 'TTL' and consists of nominal five volt pulses on several parallel output lines. The pulses are decoded by circuits in the computer's monitor and converted to stepped analogue video signals.

These are applied to the picture tube where they are used to turn individual picture elements ('pixels') on or off. In colour systems, separate output lines are used to control the red, green and blue electron guns of a colour monitor.

TTL systems can only reproduce a limited number of colours or shades, typically (in colour) 8, 16 or 64. Also these high impedance, wide bandwidth signals are limited to a cable length of two metres or less before they degrade.

Most large screen displays accept analogue RGB inputs. Not all are capable of accepting TTL signals. Fortunately, conversion from TTL signals to analogue can be done relatively easily. This conversion is one of the functions of an interface unit.

Scanning rates

Whether your computer uses analogue or TTL output, the resolution of the dis-

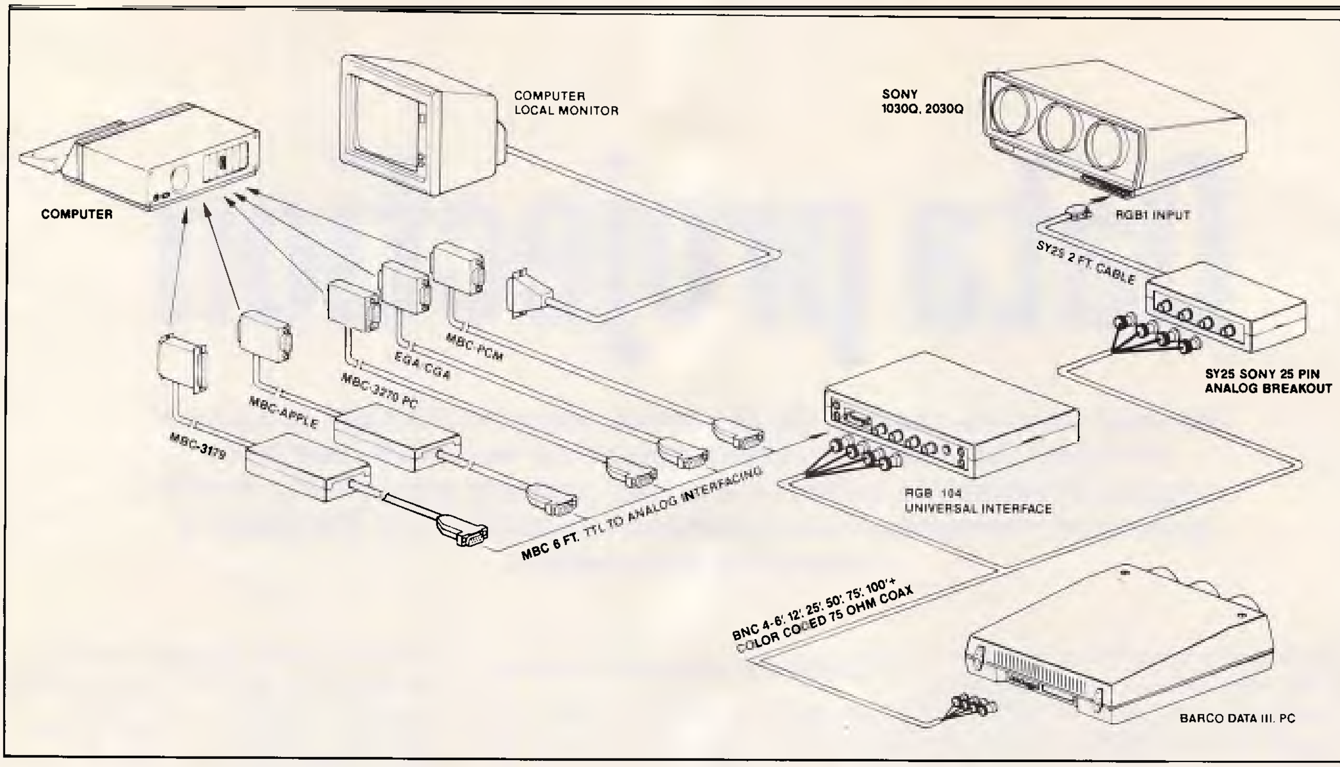


Fig 1 A typical connector diagram for data projections

play driver is a critical consideration. The resolution available from a computer display is generally linked to the number of scanning lines presented every second by the computer.

High resolution graphics display drivers output 18,000 to 32,000 lines per second or more, compared with the standard television rate of 15,625 lines per second.

Not all projectors and monitors can scan quickly enough to track medium to high-resolution text and graphic output cards. Virtually all can handle output based on the RS-170A standard (such as the IBM Colour Graphics Adaptor), but for higher scanning rate cards you must resort to special multiscan projectors and monitors.

There is currently no cheap 'black box' or interface which will adapt high scan rate output signals for display on a conventional TV monitor.

Large screen video types

Now, armed with the details of the type of graphic output you wish to display to the assembled multitude, we are ready to consider which large screen option best suits the purpose.

There are three basic categories of large screen display that can be linked to PCs and terminals. They are: monitors, data video projectors and LCD projection pads.

Monitors

Typical PC monitors have screens that measure about 30cm diagonally, however, monitors with 50 to 65cm screens and RGB analogue inputs are readily available and can produce good results on low to medium-resolution output (up to 640x200 pixels).

Monitors are the only real option for colour display in conditions of high ambient light such as trade shows and exhibitions. Video projectors, like slide and movie projectors, need a darkened environment. Several monitors may be connected together to provide viewing for larger groups.

Monitors such as the Barco DCD range and the Sony PVM and Profeel can be used with computers providing output similar to the IBM CGA standards although it is often necessary to use an interface box between the computer and monitor.

Large monitors capable of handling output standards other than CGA have been impossible to obtain in Australia. However, at the IREE exhibition in Sydney this year, Mitsubishi Electric released a 90cm (36in) high-resolution monitor capable of handling a wide range of graphics and text.

The screen uses the world's largest picture tube and gives a picture twice the size of a conventional 63cm (26in) type. With a horizontal scanning range of 15-32kHz it can handle output with a resolution of up to 640x480 pixels.

The Mitsubishi is in the vanguard of a new breed of large screen multi-scan monitors. The 32kHz-plus horizontal scan rate of the IBM PC/II series has given fresh impetus to the major manufacturers and we can expect a lot of activity in this area in the near future.

Data video projectors

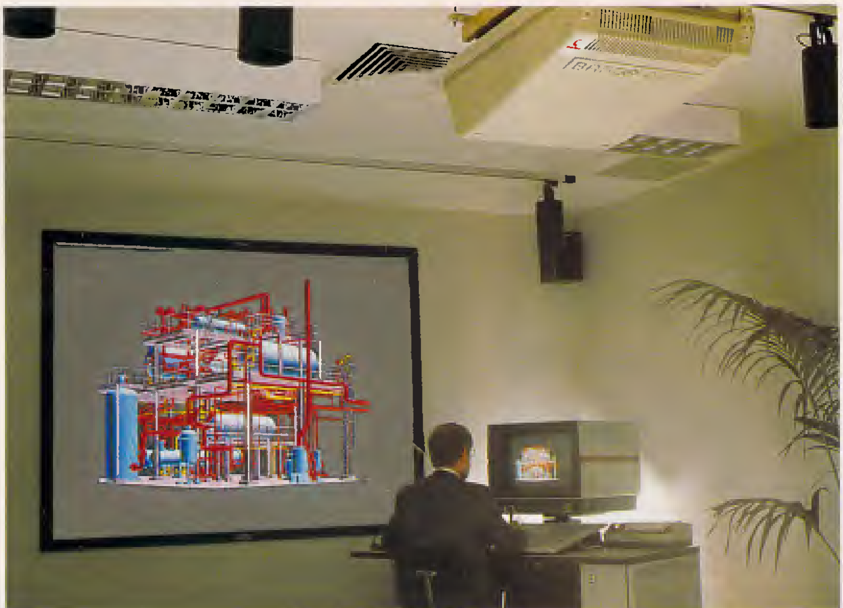
The real stars in data display are the data video projectors and the impact of really *big* images is unsurpassed.

The times of blurred, dull images on 'pub projectors' are long gone. Specialist manufacturers like Barco and Sony are producing projectors to match the highest resolution CAD display technology. 'Data' video projectors have wideband video amplifiers and special scanning circuits to allow projection of high-resolution output.

Three tube data video projectors are the most widely used display devices for audiences of 20 or more. These use liquid cooled CRTs with different coloured phosphors, one each for red, green and blue. Coupled to the tubes are three lenses which focus the images onto a separate flat screen.

Data projectors can be aligned to screens of various sizes. Projected picture width can range from one and a half to six metres. Most commonly, a

When computer graphics count move up to Barcodata



The Barcodata, especially designed for high resolution large screen computer graphics projection.

Slides are out – living graphics are in.

IT USED TO BE: A slide was taken from high resolution graphics on a CRT for enlarged projection, for board room or conference applications, for simulators to reduce training time on actual unit, for anywhere four or more people gathered to view the same information.

NOW: Imagine the flexibility and impact of large screen viewing using the same computer and Barcodata projectors. "Living projections, inter-actively showing the result of changing parameters and computations displayed in graphics – bar, pie and other charts – as you do it; as you want it.

Ideal CAD/CAM multi-terminal, multi-source data and video projection. Direct remote access from up to 10 different sources (video, RGB TTL, RGB analogue): scanning frequencies ranging from 15 to 72 KHz Autolock. Optional Infra Red remote control.

Crisp, clear high density graphics. Large screen. "Living Images", front and rear projection, table operated or ceiling mounted.

The ultimate computer graphics projector. Not only graphics and text, but enlarged viewing of drawings such as building layouts, site layouts, real-size presentations of new car, truck, aeroplane design using "solid modelling" or "solid shading" techniques . . . all with a better impression of dimension and depth.

Barcodata, the evolution-proof projector. Build your system with the projectors which anticipate the use of higher scanning rates and facilitate the connection of additional terminals with different scanning rates in the future. That's profiting from today's technology evolution.

Send the coupon and find out more.

Better because it's BARCO from Cunningham Consolidated Limited.

Cunningham Consolidated Limited

Cunningham Consolidated Limited

15A Anderson Road,
Thornbury 3071. Vic.
Ph: (03) 484 0791

Exclusive importers and distributors for Barco products.

Please send further information on:

- ☐ High resolution Data Monitors
- ☐ Cedata Modems
- ☐ Barcodata Projectors
- ☐ Public Address Display Monitors
- ☐ Your complete product list
- ☐ I would like a demonstration

Name: ____________

Title: ____________

Company: ____________

Address: ____________

____

Postcode: ________ Tel: ________

CCL 018/AV&P

Cunningham Consolidated Limited

Australian and exporting to U.S.A., Europe, Africa, S.E. Asia and the Pacific Region.

Manufacturers and distributors of products like these for our electronic age:

Retrodata projectors: Compact, stand alone and transportable, the complete retroprojection system featuring high resolution data and video projection in high-ambient light conditions. Built-in stereo amplifier and bass reflex loudspeakers all in one compact unit.

Public address display monitors: Timed cycling of messages and graphics; alpha-numerics and semi-graphics in up to 7 colours; easy editing; 32 or optionally 64 pages of non-volatile memory.

Cedata modems: For sync or async data formats in full or half duplex modes; baud rate converter, stand alone or high density rack mount; multi-function, conforming to V21, V22, V23, V22 bis.

Head Office, Victoria
15A Anderson Road, Thornbury VIC 3071.
Tel: (03) 484 0791. Fax: (03) 480 4643.

New South Wales
Suite 7, 4-8 Waters Road, Neutral Bay NSW 2089.
Tel: (02) 909 2388. Fax: (02) 953 8416.

Queensland
Suite 3, Newstead Place,
26 Argyle Street, Albion QLD 4101.
Tel: (07) 862 1234. Fax: (07) 262 6923.

Western Australia
163 Abernethy Road, Belmont WA 6104.
Tel: (09) 478 2111. Fax: (09) 478 1835.

picture size of two and a half metres wide by 1.8 metres high (eight feet by six feet) is used for data work.

Liquid crystal projection pads

The third major category, the liquid crystal projection pad, is making great inroads on the data projection market, particularly in education. The great advantage of this type of equipment is its portability and ease of set-up.

Kodak was the first to launch such units in Australia with its 'DATASHOW'. The Datashow uses a translucent liquid crystal plate, which resembles the screen of a lap-top portable computer, placed on the plate of an overhead projector.

The LCD panel acts as an electronic transparency of the computer screen and the light transmitted by the overhead projector projects the image.

The 20 x 15cm display area of the projection pad projects large, bright monochrome images ideal for classroom situations or other uses where colour reproduction is not required.

Currently, projection pads are limited to computers with TTL outputs conforming to IBM CGA standards but developments are coming very rapidly. A one piece LCD projector, with interchangeable lenses for larger screen sizes has already been announced by Kodak and capacities for high resolution are being actively developed. Colour reproduction is likely to be two or three years off yet.

Interfacing

This is where the fun starts, for there is a wide variation in computer output standards and several special requirements for successful projection. Fig 1 shows, in general terms, how interface units are used to connect between the computer and video projector.

The first link in the chain is the 'Monitor Breakout Cable'. This is selected, from a range of connections, to suit the computer in use and connects to the monitor port on the computer. The special plug allows the computer's own monitor to be attached as well.

The MBC connects to the interface unit which may be one of several types depending on the processing required to match the computer's output to the projector's input.

Incompatible synchronising pulses are the most common cause of problems when matching computers to projectors. The interface must be capable of accepting the incoming sync signals and regenerating pulses of the correct polarity, amplitude and duration to enable stable projector operation.

The Mitsubishi XC-3720 multi-scan data monitor features the world's largest picture tube

Some interfaces have controls which enable the video signal to be moved horizontally or vertically within the raster to allow proper centering. This can also reduce problems associated with loss of characters by moving the picture so that any loss occurs on the right hand margin and at the bottom (which is usually more acceptable).

Where the projector is located some distance from the computer, the interface must provide a signal capable of driving a long cable without degradation. If the computer has a TTL output it is better to use a 'TTL to analogue interface' to convert the signals to analogue as close as possible to the computer and run 75ohm coax cable to the projector.

If TTL to analogue conversion is required, the intensity signals must be decoded and used to modulate the vision levels to produce the required range of colours.

Four signals — red, green, blue and sync — are finally output by the interface unit to drive the projector.

Putting it all together

Let's recap the principle requirements to successful projection of computer data.

- Know thy computer: be sure you understand the type of display driver fitted to your computer. Find out the horizontal scan rate.
- Select a projection device which has the capacity to handle the computer's output.
- Use the correct interface. The interface must buffer the output; provide the right syncs; decode the TTL lines and adjust the picture centering.

It pays to seek out specialist data projection suppliers to obtain the right interfacing advice and equipment. Data video projectors and monitors, together with interface equipment, are available for daily hire in all capital cities and some provincial centres.

New ways of presenting computer generated data and graphics are emerging all the time. Rental of facilities on a presentation by presentation basis is a very cost-effective option in many situations.

If you are arranging to hire equipment for a particular presentation, make a time to meet the installation technician on site. Make sure you arrive in plenty of time with your computer and software. On-site line-up of a data projector can take up to an hour and you need to allow enough time for the technician to show you how to operate the equipment. Make sure you have a rehearsal and run through each screen that you will be using

END

5¼" DOUBLE SIDED DOUBLE DENSITY

NEW

Now, for the very first time, you can have DOUBLE SIDED DOUBLE DENSITY 5¼" flexible disks at a really amazing price. (Note: we said DSDD not SSDD).

10 pcs for $10.00 ONLY

That's right! DOUBLE SIDED DOUBLE DENSITY disks supplied by a leading manufacturer of disks made to exacting industry standards for only $10 per box of ten disks plus postal charges.

FAX ORDERS AND CREDIT CARDS ACCEPTED.

Why only $10?

We are entering our 70th year in business and our 21st year as a manufacturer and supplier to the Australian computer industry...so, to celebrate, we are giving you this amazing offer. But hurry!

Wilbroprint & Computer Supplies
P.O. Box 56, Chippendale N.S.W. 2008.
Telephone: (02) 699 9933 Fax: (02) 699 4152
Shop: 134 Abercrombie Street, Chippendale
(Cnr. Cleveland Street)

QLD Distributor:

SWIFTFORMS
PRINT & COMPUTER SUPPLIES PTY LTD
Unit 2/49 Logan Road (Entrance Jurgens St)
Woolloongabba QLD 4102
Phone: (07) 891 5515 Fax: 891 5506

ORDER NOW

Sydney City 699 9933
Brisbane City 891 5515
Brisbane Country (07) 891 5515
(reverse charge)

TOLL FREE
008 225 542

The DataPerfect brand is backed by Wilbroprint's 70 years of service and commitment to Australian industry.

Graphics power

Developers of graphics software are expecting great strides in this area, thanks to increasingly powerful '386-based computers.

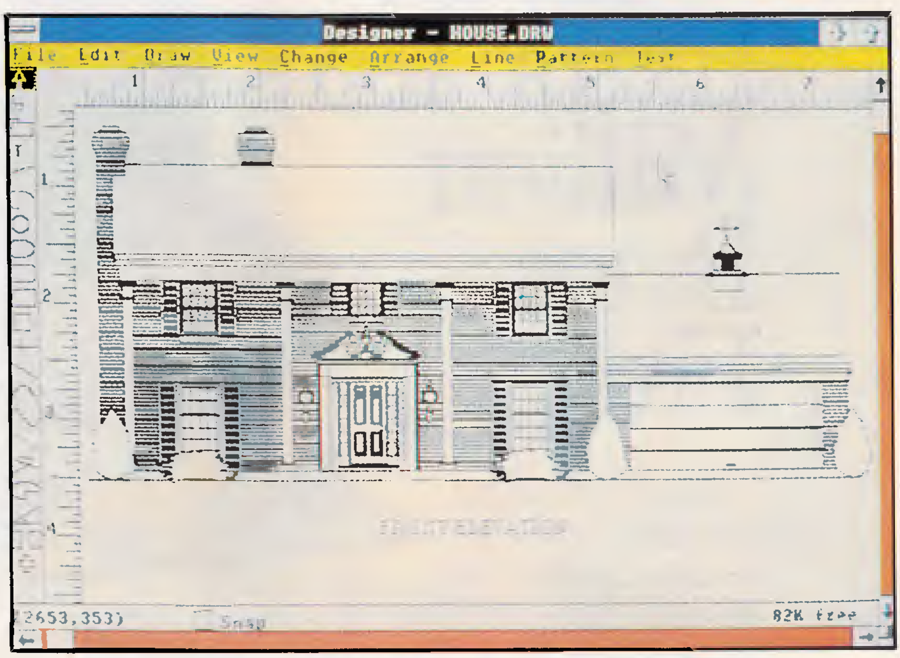
Due to the introduction of more powerful 80386-based computers, graphics software vendors expect a tremendous surge of growth in the PC graphics market beginning in 1988. The hardware platform delivered by 32-bit machines, dealers and developers say, will allow them to provide users with easy access to a level of sophisticated, high-quality graphics never before possible on micro-based systems.

Growth is expected to come not only from current PC users with limited or no experience with graphics products, but from users of mainframes and graphics workstations as well. In addition, some graphics software vendors believe they now have the power to create new graphics markets, attracting many novice users who will venture into the PC environment for the first time.

What hardware and software technology is behind these bullish predictions? And what will it take to lure large numbers of new users into the graphics marketplace?

First and foremost, according to some analysts, graphics software developers will have to offer users easy access to the increasingly sophisticated graphics tools now in development. They will also have to overcome the reluctance among many current PC users to work in a graphics environment.

That reluctance to work with graphics may stem from a perception that graphics software is difficult to learn and manage; it may also stem from the reluctance to purchase and piece together the hardware necessary to support graphics.



Microsoft's Designer, which runs under the interface provided by Windows, aims to coax artists and drafting people away from their drawing boards and into computer-aided design

Built-in interface

Enter the built-in graphical user interface designed specifically for ease of use. Only with the current generation of more powerful '386-based machines, software developers say, has there been enough speed, memory and processing power to support both a graphical user interface and the resources required for high-quality graphics. New operating systems to be introduced in 1988 that take full advantage of the 32-bit processing power of '386-based machines will further boost the dazzle, functionality and ease of use of the graphics applications designed to run with them.

"Starting late this year and continuing next year we're going to have the system software and applications that will satisfy not only the power users — giving them 'more, better and faster' — but that will also allow for a much friendlier interface," said industry luminary and chairman of the board of Compaq, Ben Rosen.

Rosen believes the PC industry is on the verge of a third generation of computing power that will push the industry far beyond its current boundaries, stimulating growth in many software and application areas, including graphics.

J Paul Grayson, head of Micrografx Inc, in the US, said he is already experiencing a surge of graphics software sales, due to the introduction

Kaypro Computers Announces the KAYPRO PC-30.

With an Extra Ten Million Bytes – Free.

Kaypro has added ten million bytes of storage capacity to the hard-drive KAYPRO PC – but not one penny to the price. That means you get IBM compatibility, American-made durability, and the convenience of a 30-megabyte hard drive. All at a Kaypro price that's easy to take.

Get two-speed processing (4.77/8.0 MHz), AT-style keyboard, and free software that includes WordStar Professional Release 4, MS-DOS 3.21, GW-Basic & more!

KAYPRO®

COMPUTERS

The Future's Built In

made in U.S.A.

For more information on Kaypros complete line - PC, XT, AT and 386 micro-computers, or the location of your nearest dealer, Phone: **(03) 597 0133 or (02) 542 386**

Trademarks: IBM, AT, International Business Machines, Inc.; WordStar Professional Release 4, MicroPro International.

of more powerful hardware. "Our sales have doubled just in the last six months," he said.

Grayson is a staunch advocate of the power of the graphical user interface to attract more users to the PC in general, and to graphics in particular.

"We are looking to create new markets as opposed to replacing current products," he said. "We want to bring new users into the market who aren't currently using computers."

For example, he noted, Micrografx's new graphic art and technical illustration program, Designer, is not aimed at replacing a drafting program such as AutoCAD. Instead, he said, the new program is designed to coax artists and drafting people away from their drawing boards and into computer-aided design.

Micrografx Designer derives much of its ease of use by running under the graphical interface provided by Microsoft Windows 2.0, said Grayson.

Vendors and analysts are unanimous in their agreement that one of the most powerful growth stimulants injected into the PC graphics market has come from IBM with the introduction of its PS/2 line. Users of IBM's new machines no longer have even the option of running without graphics capabilities. The new machines come equipped with extensive graphics capabilities built into every motherboard.

Most visibly, the graphics in IBM's new product line deliver a higher resolution of 640x480 pixels, with 256 colours — a substantial boost in quality over the widely used Enhanced Graphics Adaptor (EGA), with its 640x350 pixel resolution and 16 colours. Memory management is also a key feature of the PS/2 line. With the introduction of OS/2 in 1988, applications will have direct access to almost 16Mbytes of memory, which means that graphics software can carry many more features.

But improved resolution and increased memory alone is not enough to draw substantial numbers of new users into exploring the graphics capabilities of the new generation of machines. The graphical user interface currently embodied in Windows, and in development for the Presentation Manager, will be an important element in attracting more users to the graphics environment, and maintain Windows-based graphics software developers such as Grayson.

It's no secret there are many parallels — particularly in the area of graphics — between Windows 2.0 and Apple's Macintosh interface. In fact, according to Grayson, the two interfaces are identical.

Graphics software for the Macintosh represents a hefty share of the Macintosh software market. It seems a fair assumption, then, that PCs equipped with built-in graphics capabilities and a graphical interface like Windows will foster similar successes in the PC-graphics market, some vendors and analysts believe.

There are other advantages to the Macintosh interface, and correspondingly, to Windows and the Presentation Manager. Both are designed to provide a common front-end to all applications designed to run under them.

Since Macintosh's introduction, the consistent user interface presented by all Macintosh application software has been a boon to users. Once users have learned to navigate their way through one application, their skill can be carried over to other applications (which is all applications in the Macintosh world). As a consequence, it's much easier to learn new applications. Many Windows enthusiasts are hoping for the benefits in the IBM PC world.

PS/2, Mac hardware parallels

While the similarity between the Macintosh interface and Windows and the Presentation Manager is software related, there are also hardware parallels that can be drawn between the IBM PS/2 line and the Macintosh.

System configuration for all PS/2 models is designed to be simple and straightforward. Instead of dealing with add-in graphics boards and compatibility concerns, the graphics card is included on the motherboard.

Bill Higgs, director of software research at the market-research firm InfoCorp, agreed that marked growth in the PC graphics market in 1988 could be related to parallels between the PS/2 systems and the Macintosh.

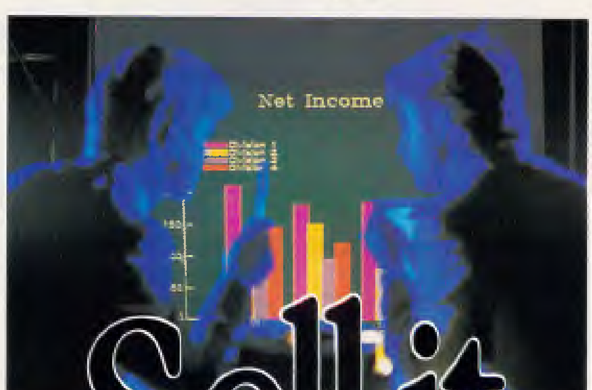
While graphics software sales made up only five per cent of the PC retail software market in 1986, according to InfoCorp, graphics software sales were more than three times that in the Macintosh market, making up 18 per cent of total retail software sales.

"This could be primarily due to the nature of the Macintosh's graphically based hardware," he said. But, he cautioned, there may be pitfalls in making projections for the PC market based upon figures for the Macintosh market, somewhat akin to comparing apples and oranges.

Database management software

Tap it

Snap it



Sell it

Presentation is everything.

The **Matrix PCR** digital film recorder allows you to make 35mm slides from computer images. Combined with Lotus' masterful graphics software package **Freelance Plus**® it means professional business presentations everytime. For companies with vision. Call us on 712 3111 and we'll tell you all about it.

Reg. TRADE MARK OF LOTUS CORP.

QUENTRON DIGITAL SYSTEMS

PO Box 147 Five Dock 2046 NSW (02)712 3111 GPO Box 2212 Adelaide 5000 SA (08)223 6224

PCCQ3

sales, for example, made up 20 per cent of PC retail software sales in 1986, but less than five per cent of Macintosh software sales. Consequently, "We may be talking about two different kinds of users," Higgs pointed out. Users primarily interested in database applications may not necessarily have much interest in acquiring graphics software, whether their machines are graphically based or not.

However, Higgs believes other elements, specifically the lifting of certain hardware constraints in the PC world, will clearly have a positive effect on the PC graphics software market.

In addition to IBM's sophisticated graphics capabilities built into the hardware, Higgs cited three other hardware-based factors that are likely to boost sales of PC graphics software: the availability of affordable laser printers that allow users to combine quality text and graphics; the growing acceptance of the mouse, and important tool for graphics manipulation; and the availability of scanners for producing ready-made images, thus freeing users from the burden of having to create an image from start to finish.

Grayson, on the other hand, builds a convincing case for the key role that '286 and '386-based machines equipped with Windows will play in opening up the PC graphics market.

"For the first time since the PC was introduced, there is a clear path to the graphics capabilities of the future," he said. "IBM is showing us that path — '286 and '386-based machines equipped with VGA and Windows are becoming standard across the industry."

As proof of this developing standard, Grayson pointed to companies such as Compaq Computer and AT&T, which will begin bundling the Windows 386 multi-tasking operating environment with their '386 machines. Further, he noted, windows is an integral part of the PC desktop publishing solution through Aldus' PageMaker, which runs under Windows.

"IBM itself embraces the Windows user interface through the Presentation Manager," Mr Grayson said. "Users can clearly see a path from current Windows applications to OS/2 and Presentation Manager applications."

There are several benefits in store for future graphics users under the OS/2 and Presentation Manager environment, Grayson noted. For experienced users who need to link with mainframes and minis, the Presentation Manager and OS/2 will come equipped with ready-made links to IBM minis and mainframes.

Portability between programs running under Windows and the Presentation Manager will benefit users on all levels of experience, allowing files from one program to be imported to, or exported from, other programs. Whether or not Windows and the Presentation Manager graphical interface becomes an industry standard, it's clear that the graphics power unleashed by the new generation of fast '286 and '386-based machines is already having an impact on the PC-graphics market. Graphics software is CPU-intensive even at a basic level. And graphics-software developers say the increased memory and speed of '386 machines allow them to pack more functionality, high resolution and more colour into their packages.

With the 32-bit operating systems on the drawing board for introduction in 1988, graphics applications will become even more powerful and dazzling, as well as easier to use, injecting further growth stimulus into the marketplace.

"1987 is far from a one-shot spike in the computer industry's growth," said Compaq's Ben Rosen. "It's just the groundwork for the subsequent growth in 1988 and 1989, growth that will be stimulated by the advent of the new generation of software."

There's no question that graphics software will become one of the most striking members of that new generation.

END

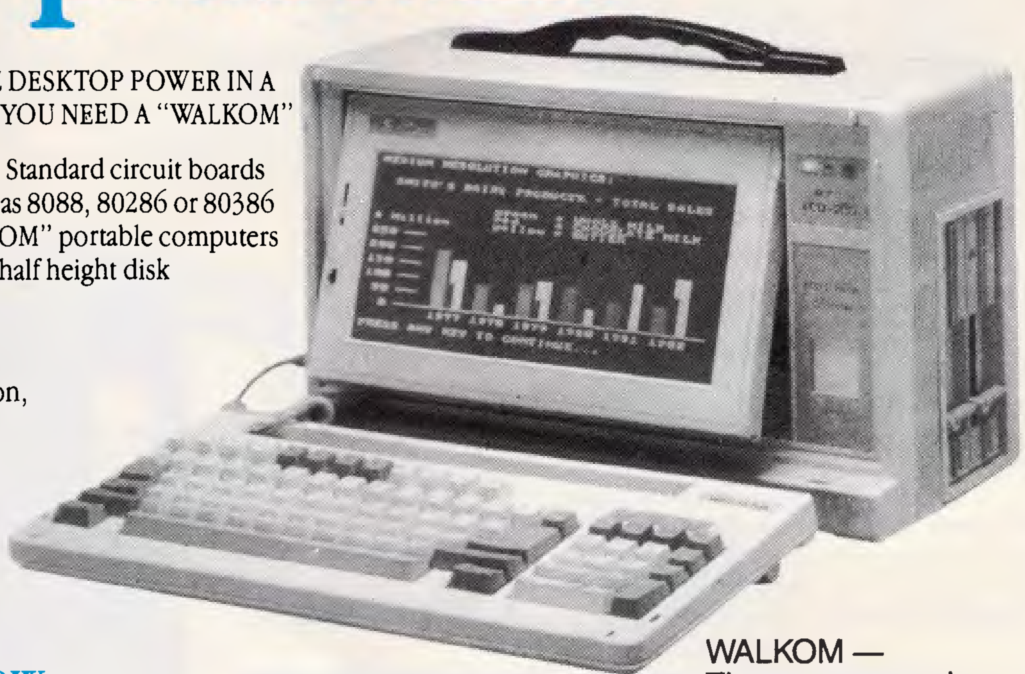
The lightweight solution to heavyweight problems!

WHEN YOU NEED 16MZ DESKTOP POWER IN A PORTABLE COMPUTER YOU NEED A "WALKOM"

Designed to use Industry Standard circuit boards and available configured as 8088, 80286 or 80386 models the NEW "WALKOM" portable computers take 2 Industry Standard half height disk drives inbuilt, AND 6 expansion slots.

Fitted with high resolution, high contrast EPSON backlit LCD screen with 80 col × 25 line display.

The Ultimate Desktop Power — Portably.



WALKOM —
The no compromise portable

PHONE NOW
043 885133

for the dealer nearest you and look at the future Desktop Computer.

ALL AMERICAN Business Machine Computers are built in Australia by:
Pannell Plant Engineers Pty Ltd.

Winners of The
Australian Design Award

Prince Philip Prize for Australian Design

AMERICAN
Business Machines

P.O.Box 1, Berkeley Vale 2259 Fax: (043) 88 5035

WE UNDERSTAND BUSINESS

SAVE THOUSANDS OF DOLLARS

At last a low cost fully integrated Accounting Package for your Business

Dac Easy Gives you Seven Full Feature Accounting Modules In A Single Integrated Package. Accounting software doesn't have to be expensive to be the best. Dac Easy gives you a fully integrated accounting system with instant access to General Ledger, Accounts Receivable, Accounts Payable, Inventory, Purchase Order, Billing and Forecasting. Imagine, you can generate over 300 reports from 80 different routines .... all in a non copy protected package. And, with Dac Easy you'll get a handsome slipcase binder with easy-to-follow documentation. Best of all, Dac Easy Accounting can be used to manage either service or product oriented businesses – Find out for yourself why Dac Easy is the fastest selling accounting package on the market. Compare Dac Easy's features against other packages costing thousands more. Then order your Dac Easy Accounting by phoning your nearest stockist or returning the coupon below.

General Information
- Menu driven
- Password protection
- File capacity limited only by disk space
- Support contract availability

General Ledger
- Unlimited number of accounts with multi-level accounting, unlimited departments
- 3 Year account history for CRT inquiry
- Pencil & pen feature to correct mistakes without reverse entries
- Unique budgeting routine (see Forecasting)
- CRT transaction inquiry, unlimited journals
- Activity report, trial balance, financial statements, etc.

Accounts Receivable
- Open invoice or balance forward
- 7 Customised columns for aging report
- Unlimited number of customers
- Mailing labels and directories with 4 different sorts
- Automatic finance charges
- Supports partial payments
- 3 Year customer history for number of invoices, sales, costs, and profits
- Customised text on statements
- Cash flow analysis
- Sales analysis
- Automatic sales forecasting by customer salesperson or customer type

Accounts Payable
- Cheque printing and up to 10 invoices paid per cheque
- Automatic allocation of available cash to payables
- Vendor directories with sorting by vendor code, name or territory
- Aging reports with 7 customised columns
- Unlimited number of vendors
- Mailing labels with 4 different sorts
- 3 Year vendor history for CRT inquiry and printing
- Flexible payment calendar
- Automatic forecasting of purchases
- Unlimited allocations per invoice

Inventory
- Supports average, last purchase and standard costing methods
- Powerful physical inventory routines
- Accepts any unit of measure like fractions/dozens/gross/hours/minutes, etc.
- Automatic changing of costing methods
- Time and product inventory
- 3 Year product history in units, dollars, cost and profits
- Automatic forecast of product sales
- Automatic pricing assignments
- Alert and activity reports with 11 sorts
- CRT shows on-hand/on-order/committed/sales/cost/profit/turns/GROI

Purchase Order
- Usable for inventory and non-inventory items
- Allows up to 99 lines per purchase order
- Per line discount in %
- Purchase Order accepts generic discounts/freight/taxes/insurance
- Purchase Order accepts back order & returns
- Purchase journal
- Automatic interfacing with general Ledger, Payables, and inventory

Billing
- Invoicing on plain or pre-printed forms.
- Prints sales journal
- Automatic updating of committed products in inventory
- Ability to customise invoice for remarks.
- Allows return credit memo
- Interfaces with Inventory Accounts Receivable and General Ledger

Forecasting

Unique program that automatically forecasts using your 3 year history.
- Forecast revenue and expense accounts
- Forecast vendor purchases
- Forecast customer sales, cost, and profit by customer or salesperson
- Forecast inventory item usage by 4 automatic methods
- Forecast by same as last year, or % base from last year or trend, or line analysis method

Minimum Hardware Requirements IBM (PCjr, PC, XT or AT) or other compatibles, 128K memory, on 5¼ DSDD floppy disk, 132 column printer or 80 column printer in compressed mode, 80 x 24 CRT, MS-DOS[1] PC DOS[2] 2.0 or later.

[1] Trademark of Microsoft Corporation.
[2] Trademarks of International Business Machines

AWARD WINNING

NOW ONLY $220

HOW THE EXPERTS RATE DAC EASY

Inforworld:	"Best Software".
PC World:	"Trendsetting Accounting Product of the Year".
PC Magazine:	"Dac Easy is a genuinely amazing deal".
Business Software:	"I enthusiasticaly award four stars and I recommend the purchase of Dac Easy".
PC Week:	"I've never before in a review come right out and told readers to buy a product but I'm doing it now. Dac Easy is an incredible value".
Personal Computing:	"Dac Easy offers the versatility and flexibility real accounting demands".

MACE SOFTWARE

SYDNEY Mace Software, 122 Arthur Street, North Sydney 2060 (02) 922 4344
MELBOURNE Tamiym Pty Ltd, 390 Burwood Highway, Hawthorn Vic. 3122 (03) 670 8999
BRISBANE Mace Software, 23 Sylvan Road, Toowong Qld 4066 (07) 870 3600

Simply send in this coupon with the correct money, plus $7.50 for courier to:
MACE SOFTWARE in Sydney or Brisbane

☐ BANK ☐ CHEQUE ☐ MONEY ORDER ☐ BANKCARD ☐ VISA ☐ MASTERCARD

Account No. ☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐
Name ____________ Expires ______
Address ____________ Postcode ______
City ____________ State ______
Phone ____________ Signature ______

MAIL ORDER PRODUCT REQUIRED
(TICK APPROPRIATE BOX)

☐ Dac Easy Accounting $220
☐ Dac Easy Port $70 ☐ Pop Up $80
☐ Dac Easy word II $110 ☐ Dac Easy Base $110
☐ Dac Easy Tutor $50 ☐ Dac Easy Mate $100

MACE-SOFTWARE Guarantees that claims & features listed in this advertisement are true and provide a money back guarantee per license Agreements.

BYRNE & STEWART MAC 5/1156

CHECKOUT

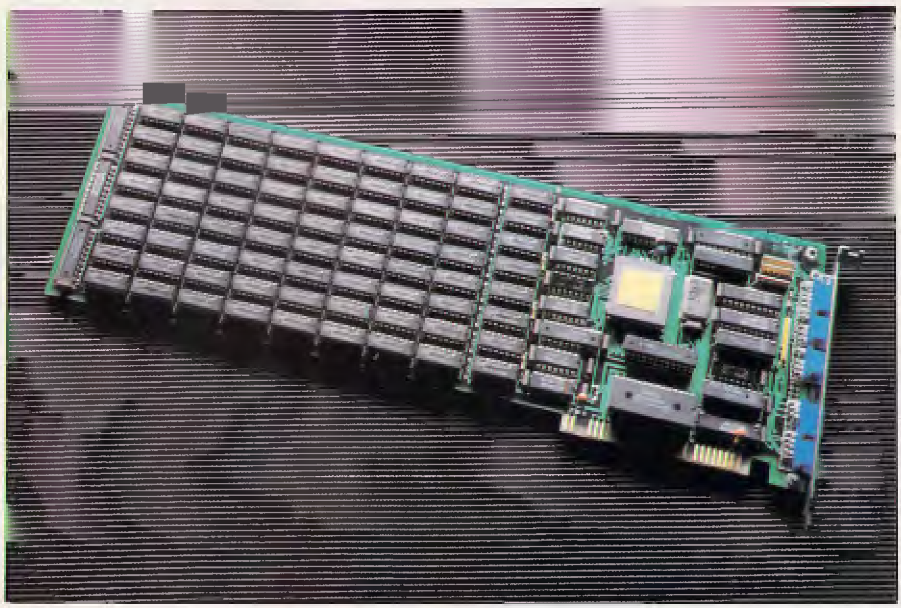
Monoputer

The much-heralded Transputer is at last available on a reasonably-priced PC add-in board. Howard Oakley has become hooked on its speed and power, and describes the hardware and software now available for the more adventurous user.

There can hardly be any computer enthusiasts who have not heard of Inmos' Transputers, and most of us have dreamed hard and waited long to get our hands on one. The original Inmos evaluation board, designated the B004, was relatively expensive at around $9000— especially when bought with the development system software — and can still only support the T414 Transputer rather than its faster and more powerful big brother, the T800.

Earlier this year, a US firm MicroWay Inc (well-known for its specialist knowledge and support of the 8087 and other coprocessors and accelerators) started to market what is essentially a cheaper and improved version of the B004, which can take either the T414 or T800 chips, and bundles an Inmos-written Occam-2 compiler with it. The board fits into any IBM PC, AT or compatible, so offering itself to the widest possible market.

I received my Monoputer board at the end of June, and it has now had over two months of intensive evaluation. Although the hardware — and much of the software — described here has been used in final-release form, they are but the start of a new wave of Transputer-based add-ons. The recent announcement that Atari is to design a whole machine based on the Transputer came as little surprise, and I expect several other manufacturers to follow suit over the next few months. However, this board is available now, at relatively low cost, and could give a taste to developers and others of what this next wave of machines will be like.



Hardware

The Monoputer board is, like most Transputer-based products, a fairly simple piece of hardware. It occupies one long slot in a conventional PC clone, and consists of one Transputer (which can be a T414 or a T800 — they are pin-compatible), 2Mbytes of RAM, and the supporting chips to enable I/O with the host.

The board is designed to act as a prototype card, in that it is normally seen to be at addresses hex 300 to 31F as far as the host PC is concerned. However, the external interface consists of three D connectors, two of which sport jumpers which must be correctly configured to support use of the correct I/O links. In the near future it may be possible to use these to link to other devices (such as Transputers), but this will be of little use unless you buy a special-purpose board (such as MicroWay's graphics board). In its current configuration, the host occupies one of the board's Transputer links.

Installing the hardware is simple, as no hardware or DIP-switch reconfiguration is necessary. The job is made a little more complicated, though, because it is easier to remove the external jumpers before putting the board in, so you should make note of their exact location for replacement purposes.

When the jumpers have been replaced and the machine reassembled, you can power-up and run the Transputer. The only problem that you might experience is at which addresses the file server functions on the PC will look for the I/O links for the Transputer: on IBM PCs the base is hex 300 and other machines may vary. If the base address differs from the default, it can be set when you call the host file server (to load and run any Transputer program), and should then be embedded in all batch files which call the server. The optional upgrade to

WE HAVE MOVED TO:
150 BROADWAY, BROADWAY NEW
SHOWROOM - CUSTOMER PARKING

DISCWARE
New Software Products

GET A NEW HANDLE ON YOUR BUSINESS WITH SBT.

SBT

Now you can handle up to 254 users, all working in the same data files, with the SBT MultiNet Database Accounting Library.

The accounting software written in dBASE III PLUS.

So whether your business is large or small, you can grow to the limits of the most advanced PC networks available.

When you want that special report, or your business needs something we didn't think of, you can quickly and easily modify our programs to meet your needs exactly (because our dBASE source code is included **absolutely free**).

And if you don't have time to make the changes yourself, there's a nearby consultant who can make them for you.

So if your company has two users or two hundred and fifty, you can add customers, update records, and have as many people enter orders as it takes to keep your business growing.

Isn't it nice to know there's software you can't outgrow? The SBT MultiNet Database Accounting Library.

Now you can get a new handle on your business.

Call today for our demo disk and brochure.

THE SBT DATABASE ACCOUNTING LIBRARY.

dProfessional	Time & Billing	$695
dOrders	Sales Orders	$535
dInvoice/dStatements	Accounts Receivable/Inventory	$695
dPurchase	Purchase Order	$535
dPayables	Accounts Payable	$695
dPayroll	Payroll/Labor	$695
dLedger	General Ledger	$695
dAssets	Asset/Depreciation	$535
dProject	Project/Job Accounting	$695
dMaterials	Material Requirements	$695
dMenu/Backup	Menu/Backup	$129

Multi user versions $400 additional per module.
Clipper and FoxBase compatible.

DRAFIX 3-D MODELER

CAD SOFTWARE YOU'LL BE USING IN MINUTES – CAD SOFTWARE YOU'LL BE USING FOREVER

Drafix 3-D Introducing Drafix 3-D Modeler, the first low-cost, high performance 3-D CAD software package for your PC.

Drafix 3-D Modeler is a new product from MEGACADD, the creators of Design Board Professional, the #1 rated 3-D/PC CADD software and Foresight Resources, creators of Drafix 1 and Drafix 1 Plus.

Powerful, Easy-to-Use. Drafix 3-D Modeler is a powerful but easy to use software package for true three dimensional computer-aided design on your PC, XT or AT.

Unlimited Perspective Views. Its true 3-D database allows you to create a three-dimensional computer model and generate unlimited perspective views. By setting your eye location and viewing target, you can view the model from any angle. You can even walk inside the model and look out!

Simple Screen Menuing. Drafix 3-D Modeler features a straightforward on-screen menuing system and "helps prompts" so you'll be creating dimensionally accurate 3-D drawings soon after installing the program.

Automatic Hidden Line Removal. Drafix 3-D Modeler actually removes obstructed lines from the view, not just masking them with solid fill. This allows you to generate clear, accurate perspective plots or prints from the model.

Fully Drafix Compatible. Drafix 3-D Modeler was specially designed to work smoothly and efficiently with the Drafix 2-D programs. It is compatible with all Drafix 1 and Drafix 1 Plus-supported hardware configurations. Any view of your 3-D model can be easily transferred to Drafix 1 or Drafix 1 Plus for further drafting enhancement. Once the drawing is complete it can be printed out or plotted through Drafix 1 or Drafix 1 Plus.

DRAFIX 3-D MODELER HAS THE SAME FEATURES FOUND IN THE PRODUCT RATES AS THE #1 3-D CADD IN THE JANUARY 1986 AIA CADD REVIEW.

ONLY $695.

SPECIAL NOTE: Drafix 3-D Modeler must be used with Drafix 1 or Drafix 1 Plus for plotter or printer output. A Math Coprocessor, which can increase product speed by up to 6 times, is highly recommended but not required. Supports all Drafix 1 & 1 Plus supported hardware.

DISCWARE

DISCWARE (02) 212-6933

150 Broadway, Broadway, NSW 2007. FAX: 211-4065 TLX: AA23509

ALL PRICES INCLUDE SALES TAX. AVAILABILITY MAY BE LIMITED AT PRICES ADVERTISED. PRICES APPLY TO STOCK HELD AS AT 23/9/87.

$249

Why Your Hard Disk May Be Only Seconds Away From Total Failure!

WELCOME TO THE INNER WORLD OF HARD DISKS: WHERE MICROSCOPIC PROBLEMS CAUSE MAJOR CATASTROPHIES.

A typical 20-megabyte hard disk contains over *200,000,000 bits.* If *only one bit* changes or fails, you can lose *everything* on your disk. Hard disks are subject to so many inherent, uncontrollable conditions that random failures occur with alarming frequency. You already may have been tortured by one of these hard disk error messages: **DATA ERROR, GENERAL FAILURE, ERROR READING, WRITE FAULT, BAD SECTOR, SECTOR NOT FOUND, FILE ALLOCATION TABLE BAD, DISK ERROR READING FAT, DISK NOT READY, INVALID DRIVE SPECIFICATION, NON-SYSTEM DISK OR DISK ERROR, READ FAULT, BAD DATA, ABORT-RETRY-IGNORE** — plus hundreds more that we simply don't have space to mention. Here is why:

PROBLEM ONE: OUT OF ALIGNMENT. There are hundreds of circular tracks packed into every inch of your hard disk's magnetic recording media. They are *extremely* thin, about as thick as a single strand of hair. Perfectly aligned tracks on a new, out-of-the-carton hard disk look like those in **figure 1**. Your programs read, but *never* write, to any of the special Track and Sector ID areas shown in black.

When your system has been off and is cold — in the morning, for instance — head positioning mechanics shrink, causing heads to read and write towards the inside. As the unit warms they expand and tend to read and write towards the outside. Add friction, wear-and-tear, play, torquing, repeatability, vibration, irregular platter and surface expansion, etc. — and within a very short time your data, program and system sectors can go out of alignment like those shown in **figure 2**. This is a continual, serious problem: valuable data may be written so far off current head tracking that it is no longer readable, resulting in devastating errors and lost data.

Disk Technician^tm Automatic AI Software System's early warning detection *must be used daily* to keep data, program and system sectors in perfect alignment. When even the slightest change is detected, Disk Technician safely removes any data and stores it in your computer's RAM, then restores perfect alignment by rewriting the *entire* track, *including* the "read only" Track and Sector ID areas, using Disk Technician's own *factory low-level, Real format.* This new track is then thoroughly retested, *and only if has been perfectly repaired,* will Disk Technician allow your valuable programs and data to use it again. If retesting reveals that any bit is not perfect, data is relocated to a good area and the bad area is safely blocked from future DOS use. When Disk Technician repairs an area, it *specially monitors* that spot on all subsequent tests to make certain it *stays* repaired. *This is a totally automatic, unattended process.*

PROBLEM TWO: MEDIA AND DISTANCE. The typical distance between the head and the media is about 25 millionths of an inch. By comparison, a smoke particle is about 10 times greater and a human hair is over 100 times greater! Expansion and contraction caused by normal heating and cooling, wear-and-tear, media degradation, vibration, humidity, platter wobble and aging all cause this distance to vary (see **figure 3**). *Read and write quality varies directly with these distance changes.*

No matter how carefully the hard disk media was manufactured, there still will be variations in coating thickness, smoothness and magnetic density (see **figure 3**). Add aging and magnetic retentivity changes, and some spots may change from "good" to "unreliable" *overnight.* Magnetic hard disks act just like old photos: they fade away — along with *your* data! *Disk Technician is the only total solution to these problems.*

Disk Technician *reads, writes* and *tests every single bit on the hard disk, occupied or not,* using special proprietary testing and repair algorithms to check for soft error rate, magnetic retentivity, and the ability to read and write *perfectly.* If even the smallest marginality or error is found, Disk Technician will automatically proceed with its complete repair and restoration process. DOS and other programs can only tell you after 10 to 30 errors have been made. Our testing reveals that once a spot makes more than 3 to 5 soft errors, total failure is imminent. *Disk Technician's daily preventive testing, repair and recovery is the only real cure.*

PROBLEM THREE: POWER. Static electricity, turning power on-and-off, brownouts, surges, spikes and static electricity all can cause the heads to write meaningless "garbage" into whatever tracks they happen to be located over. Although hard disks and computers are designed to minimize accidental head writes, they *still* occur and cause devastating damage — often wiping out an entire disk. *Disk Technician takes a new approach to cure these problems.*

When Disk Technician is run, it automatically installs SafePark^tm memory resident software program and creates a "safe zone" on your hard disk, safely relocating any data in this area. Then, whenever you boot from your hard disk, SafePark becomes memory resident and operates with all of your programs all of the time. When there is no disk activity for approximately 7 seconds (user adjustable), SafePark automatically moves the heads to the safe zone. Once the heads have been moved — which will almost *always* be the case — and there is static electricity or a power glitch, any damage will be confined to the safe zone: *protecting your valuable data and programs.*

WHY SUFFER AND TORTURE YOURSELF WITH HARD DISK GRIEF? Disk Technician virtually eliminates *all* your problems! It is so easy to use — *absolutely no technical skill is needed — and takes less than 60 seconds of operator time daily.* ***BUY NOW! HEAD-OFF HARD DISK DISASTERS BEFORE THEY COST YOU TIME AND MONEY!***

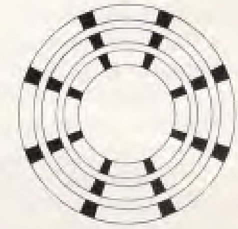


Figure 1* Perfectly aligned tracks. The black areas are "read only." These store *critical* track and sector ID information. The white areas are data sectors and store your system, programs and data.

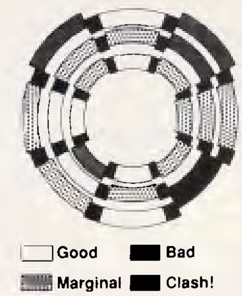


Figure 2* Sectors out of alignment with the track. The most frequent cause of lost or unreadable data. See *Problem One.*

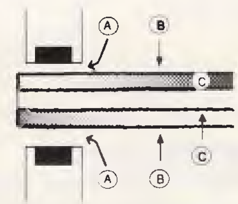


Figure 3* Heads, media and platter. A: The distance from the heads to the media continually changes. **B:** The magnetic coating varies in thickness and smoothness. **C:** Magnetic retentivity varies and decays. See *Problem Two.*

*Magnified and simplified for clarity.

Disk Technician^tm

Automated AI Software System

TECHNICAL SPECIFICATIONS

- Works on a *single system* of any IBM PC, XT, AT, derivative, COMPAQ or true IBM clone.
- Works on both physical C and D hard disk drives up to 32 megabytes and A and B floppy drives that conform to the IBM standard. On drives larger than 32 megabytes, it will work on the first DOS partition only. Disk Technician 2.0 will work on drives greater than 32 megabytes and on multiple DOS partitions provided the drive is partitioned using the IBM-DOS 3.3 standard.
- Can selectively test and repair any and all cylinders, heads and sectors in the DOS partition.
- Requires PC or MD-DOS version 2.1 to 3.3 with 256K of RAM.
- Requires a single 5¼" floppy drive.

DISCWARE

(02) 212-6933

a T800 is a very important one. The T414, while running at 20MHz clock speed and thus offering the full 10 MIPS (million instructions per second) of 'real' Transputers, was designed as something of a stop-gap. It carries out all floating-point arithmetic routines in software, and has only 2k of fast 'on-chip' memory. The Benchmark timings may *look* impressive, but they are only for a T414 running at 20MHz. When you upgrade to a T800 (another $500 or so on top of the cost of the T414, but all prices are likely to keep falling), you have a hardware floating-point unit which accelerates all the maths routines, and 4k of fast memory which can be filled with commonly-used variables and code subroutines. The net effect is to halve most Benchmark times, except for those which involve floating-point maths, which are reduced even more dramatically.

It is puzzling that MicroWay's board appears to be the only cheap board of its kind which supports both the T414 and the T800. Apparently, the design modification to allow this is not major or costly, but the benefit to the user is great: at present, T800s are in short supply and considerably more expensive, so you can start off with a Monoputer board and the T414, upgrading later. However, suppliers are going to be very reluctant to take back T414 chips when there are good supplies of the T800, so do not plan on getting any allowance on your old chip. It would also be worth your while being *very* careful when pulling Transputer chips to do a swap — they break easily!

Software

Operating system

The Monoputer board runs using a file-server program under PC- or MS-DOS. In the case of the bundled Occam-2 compiler, programs run in parallel with a pair of Occam processes which pass messages to and from the links with the host PC. A simple MS-DOS program, AFSERVER.EXE, runs on the host PC to convert these messages into calls to the host operating system. Your Occam-2 program thus calls various file-server functions to read the keyboard, write to the screen, access host files, and so on, by passing messages through Occam software channels to the Occam file server, which then passes the message to the PC, which carries out the action required and returns a result which goes back over the link to the Occam file server, and so to your program.

This means that every program written and compiled for the Monoputer must be linked with two parallel processes and then run under the host file-server program. Unfortunately, this does not make the best use of the Transputer's speed, and the Benchmarks reflect this. Inmos has Benchmarked the T414 using a separate chip to handle the host interface, and reports times roughly half those which I have given here; so, if the server overhead can be reduced, your programs will run much more quickly still. Some users — myself included — are currently examining ways in which this can be achieved (including sequential and asynchronous host access).

However, for someone used to fairly low-level access to the PC's facilities, the file server is almost complete in the support it provides. It allows you to write to and read from host memory blocks, call BIOS and DOS interrupts and do most tasks short of pushing and popping the stack (required for TopView, for instance). The host server is also 'well-behaved' in that it does not modify interrupt vectors or (necessarily) directly manipulate hardware. Therefore, it will run under TopView, Windows, or other host operating environments, even if it will not actually make the most of their added facilities. Provided that your Occam program does not make too many demands on the host, such host-based multi-tasking can be very useful as it does not slow the Transputer at all.

The greatest problems with the file server become apparent when using an Enhanced Graphics Adaptor (EGA). As you can only write pixels on the EGA by means of interrupts and not (as with the CGA) by writing direct to memory, a program which is graphics-intensive becomes bound by the slowness of the file server. A classic example of this is in displaying the Mandelbrot set, which can be calculated amazingly quickly (typically, times of a couple of minutes for an EGA screen) but then requires, say, four minutes for the pixels to be written to the screen. The answer must lie in using a graphics adaptor in which the screen is mapped into accessible memory, or even a Transputer-based graphics board which bypasses the host altogether.

Accessing the file-server functions from parallel processes is no easy matter. One software channel is provided in each direction to communicate with the Occam server, so only one process at a time can access host facilities. If you allow two or more processes to try access in parallel, disaster soon strikes when messages become confused or deadlocked. On the other hand, it makes a lot of sense to run processes such as reading the keyboard and writing to the screen at the same time, and code for this runs very efficiently on the board.

```
PROC tester.program(CHAN OF ANY from.filer, to.filer)
  #USE "C:\OCCAM2\FLIBST4.OBJ"    -- these are the two file server channels
  #USE "C:\OCCAM2\IOCONV32.OBJ"   -- and these are library files
  VAL Close.Option IS 0:   -- constant definitions
  VAL f.ok IS 0:
  VAL Read.Key IS 29:
  VAL ready IS TRUE:         -- BOOLs for use in channels
  VAL go IS TRUE:
  VAL step IS FALSE:
  VAL done IS FALSE:
  VAL err1 IS 1:
  VAL err2 IS 2:
  VAL err3 IS 3:
  INT len, screen.id, keybd.id, result1, result2:
  [1]BYTE outchar:           -- write.block only works on arrays
  BOOL more, running:
  CHAN OF BOOL scwrre, scwrok, kbrere, kbreok,
               cldere, cldeok:  -- one CHAN in each direction for each
  CHAN OF INT kbtesc, antoer:   -- PAR process with controller
  SEQ                           -- and INTs to screen & errors
    more := TRUE                -- more keys to read
    running := TRUE             -- program still running
    outchar := " "
    open.output.stream(from.filer, to.filer, 0, screen.id, result1)
    open.input.stream(from.filer, to.filer, 0, keybd.id, result2)
    IF          -- these open file server streams
      (result1 = f.ok) AND (result2 = f.ok)
        PAR             -- these are the parallel processes:
          INT keyint:       -- (local variables)
          BOOL fine:
          SEQ             -- 1  KEYBOARD READ
            WHILE more
              SEQ
                kbrere ! ready  -- to controller, ready to access
                kbreok ? fine   -- wait for go ahead from controller
                IF              -- ( chan ! var outputs var to chan,
                  fine          --   chan ? var inputs from chan to var )
                    SEQ
                      write.integer(to.filer, Read.Key) -- read 1 key
                      read.integer(from.filer, keyint)  -- stroke
                      read.integer(from.filer, result1)
                      kbrere ! done  -- tell controller we've finished
                  TRUE
                    result1 := 1
                IF
                  result1 = 0  -- we have a keystroke, so
                    kbtesc ! keyint  -- send integer value to screen
                  TRUE
                    SKIP
          INT keyint:     -- (next local variables)
          BOOL fine:
          SEQ           -- 2  SCREEN WRITE
            WHILE more
              SEQ
                kbtesc ? keyint  -- get integer from keyboard read
                outchar[0] := BYTE(keyint)  -- convert into byte array
                scwrre ! ready   -- do AFserver controller protocol
                scwrok ? fine
                IF
                  fine
                    SEQ
                      write.block(from.filer, to.filer, screen.id,
                                  outchar, len, result2)
                      scwrre ! done  -- char written to screen
                      IF
                        keyint = 13  -- if return pressed, quit
                          SEQ
                            more := FALSE
                            cldore ! ready
                            cldook ? fine
                            IF
                              fine
                                SEQ  -- close down
                                  close.stream(from.filer, to.filer,
                                      screen.id, Close.Option, result1)
                                  close.stream(from.filer, to.filer,
                                       keybd.id, Close.Option, result1)
                                  terminate.filer(from.filer, to.filer,
                                        result1)   -- close streams & quit
                                  running := FALSE
                                  cldore ! done
                              TRUE
                                antoer ! err1 -- error message
                        TRUE
                          SKIP
                  TRUE
                    antoer ! err2
          BOOL req:
          SEQ            -- 3  AFSERVER ACCESS CONTROLLER
            WHILE running   -- this is a series of alternative processes
              PRI ALT       -- note priorities in ALT are highest = first
                cldore ? req  -- wanting to do close & terminate
                  IF
                    req
                      SEQ
                        cldook ! go   -- give go-ahead
                        cldore ? req  -- and wait until complete
                    TRUE
                      antoer ! err3
                scwrre ? req -- wanting to do screen write
                  IF
                    req
                      SEQ
                        scwrok ! go
                        scwrre ? req
                    TRUE
                      antoer ! err3
                kbrere ? req  -- wanting to do keyboard read
                  IF
                    req
                      SEQ
                        kbreok ! go
                        kbrere ? req
                    TRUE
                      antoer ! err3
          INT err, i, j:
          [2]BYTE answer:
          SEQ          -- 4  DEMO ERROR HANDLER
            WHILE running
              SEQ
                antoer ? err
                IF
                  err > 0
                    SEQ
                      -- insert your error handler code here:
                      write.block(from.filer, to.filer, screen.id,
                              "I've fallen over*N", len, result1)
                      answer := "  "
                      INTTOSTRING(len, answer, err)
                      write.block(from.filer, to.filer, screen.id,

                                       answer, len, result1)
                          -- then do close or debug as desired
                  TRUE  -- i.e. if err <= 0
                    SKIP  -- do nothing and then get on with program
      TRUE
        SKIP
```

Transputer usage

At the present time, at least in Australia, you cannot just walk into your local computer store and pick up a Transputer-based computer. What you can do however, is purchase a Transputer chip from the Australian distributor of Inmos products and produce your own system; either a complete computer based on a Transputer, or, more likely, a card which has as its heart a Transputer, but which uses either an IBM PC or Macintosh as its host. The latter approach utilises the host's storage and I/O facilities.

The Monoputer tested here is a development along this line: MicroWay, like several other US companies, has recognised the market for these boards, especially prior to the widespread availability of Transputer-based computers. Unfortunately, while there are several developments underway, no Australian company has yet produced such a system, and the cost of the imported boards is not cheap.

While these boards are interesting and certainly very useful development systems, the real action begins with the launch of Transputer-based computers for general use and specially-designed dedicated computers utilising a number of Transputers to achieve massive computational throughput.

To deal with the latter first: a number of Australian companies are developing or have developed (but not released, yet) machines for use in a variety of areas. Most will not permit publication of their name for commercial reasons so the following description may appear a little vague.

A firm in Adelaide has produced a computer based on a whopping 144 Transputers to analyse signals from an infra-red camera mounted on an army helicopter. Another system in the related area of machine vision is expected to be released early next year; while another has used 320 Transputers in a video post-production facility. This system is said to be close to achieving real-time video animation effects.

As revealed in last month's Newsprint column, Atari is set to release a Transputer-based machine 'for the masses'. No firm launch date has been forthcoming from the company, but sources indicate it could be as early as December. Do not underestimate the impact this machine could have on the market. Critics argue that a machine with massive computational power could not counter the momentum of the IBM and Macintosh market, but consider this: an 8086 software emulator has the potential to bestow upon Atari's machine many times the performance of an IBM PC/AT running MS-DOS software — and the same machine could, with a Mac emulator, outperform any Macintosh system. If you want more power, just add another Transputer. The implications of this machine could be enormous.

Readers interested in learning more about Transputers and Occam (the Transputer's native language) could attend a $250, two-day course by calling Dr Tom Hintz or Mr John Cady on (02) 218 9119.

One answer lies in creating a third process to coordinate server access, as shown in the example program above (reproduced with permission from the compiler manual). This kind of tool could easily be provided within a more sophisticated file server, which could also provide libraries of operating system functions at a higher level and so form a primitive operating system for the board itself — an enhancement which many users would value.

Occam-2 standalone compiler

If you wish to access all the facilities of a Transputer, Inmos claims that you should write your programs in Occam. The compiler bundled with the MicroWay board was produced by Inmos and is compatible in almost all respects with the far more expensive TDS. The two main omissions are an editor, something most users will be quite happy with as it enables them to use their own favourite with a clear conscience; and the configurer program which sets up linked code to run on different hardware configurations, and which is irrelevant for programs to run on this board alone.

Occam is a sparse language, not dissimilar from the Pascal family, and has unique features for parallel processing (a cursory glance at the example program in this article will reveal some of its differences). This implementation has some restrictions from the standard language definition, but none that should cause much concern as they can either be circumvented easily (for example, the lack of ports, which can be simulated by channels placed at fixed locations in memory) or prove irrelevant (such as the omission of CASE as a process, as IF can have multiple condition-choices). There are a few rough corners still, such as the fact that segments of arrays must be of a size given by a variable or a constant but not an expression, and problems with word alignment when you retype BYTE variables.

However, when you start to compile an Occam program, you realise that the compiler was not designed for the faint-hearted. In the first instance, every Occam program must run under a 'harness', a short, prefatory section of Occam code which must be re-edited for every new program. You then run a change control utility on that harness source so that library and program files which must be linked together can be identified. Next, you compile your own source, then that of the harness, using different compilation options. Finally, you link all the object files — either using the output from the change control utility (the easy option) or a long and error-prone command line. If this sounds longwinded and unnecessarily unfriendly, it is. Most users resort to a batch file, but this causes problems if errors occur during the initial compilation.

With reference to errors, the compiler unfortunately halts and aborts when it finds your first error. If you are prone to making a few little typographical errors in your source code, or when you are first learning Occam, you might wish that it had the courtesy to inform you about a few more each time. As Occam is very sensitive to little things such as the number of spaces by which each line is indented, and is a heavily type-orientated language, frustration is common during the early learning phase. As you generate less errors, you start to appreciate the fact that in and out-dentation dictate program structure. You do not have to insert a host of semicolons and dreary ENDs, and the richness of some of the language's unique features will become apparent to you. For myself, it is a relationship which began with hate, but is now approaching something like love.

The machine code generated by the Occam compiler is closely related to its source — indeed, there is a facility for inline assembly (using a subset of the Transputer opcodes) which may prove useful to those prepared to flout the Inmos' ethic that writing assembler is playing with fire.

The documentation for the compiler was initially very poor, but a new version of the manual is now supplied and

FAIRSTAR COMPUTER CENTRE

BUSINESS COMPUTERS AFFORDABLE PRICES

COMMODORE PC-20 XT

20MB HD, 360K FDD, Parallel, Serial, Advanced Graphics

INCLUDES MONITOR: WITH $400 OF FREE SOFTWARE

$1999

COMMODORE PC-40 AT

10 MHZ, 1MB RAM, 1.2MB FDD, 20MB HD,
Parallel, Serial ,and $400 worth of free software

ADVANCED GRAPHICS INCLUDES MONITOR $3499

293 CHURCH ST. PARRAMATTA N.S.W. 2150
(02) 891 1944 OPEN 8AM - 6PM 7 DAYS

this should provide almost all the information which you might require in an accessible way.

In summary, although this compiler is rather unfriendly in operation, it is otherwise an ideal bundled compiler if you wish to run parallel processes. If you are reluctant to learn Occam and see no practical use for its features, then this compiler is unlikely to tempt you towards the Inmos camp.

Lattice Logic's C Compiler V1.3

Although originally commissioned by Inmos, Lattice Logic is now selling a range of other language compilers through MicroWay. This implementation of C has just gone to full release, and supports a full *Kernigham and Ritchie* standard with additional features almost to the level of an established PC standard like Microsoft C Version 4.0. In operation it is very much simpler than the Occam-2 compiler, as in most instances you merely compile your source and link it with the libraries provided, using two simple command-line entries. However, if you are trying more sophisticated things, such as linking your own libraries and using your own harness, or linking object files from other languages, all the complex hooks and options are provided.

'Include' files provided are: ASCII, ASSERT, CHANIO (supporting low-level access to links), CTYPE, DOS (providing compatibility with Microsoft C), ERRNO, MATH, SETJUMP, STDIO, STRING, and TIME (to the ANSI standard). No allowance is currently made for Occam-style use of channels to communicate between processes, or parallel processes themselves, except by linking C programs within an Occam harness.

There are a few puzzling omissions from the implementation — for example, the 'rand' and 'srand' functions are still not provided. In general, though, this is a complete and professional version of C. It is remarkable in surpassing Occam in its performance, under certain conditions. Lattice Logic has taken a good deal of time and trouble to optimise use of the fast on-chip memory, and this becomes particularly worthwhile when using the T800. For example, the 'triglog' Benchmark has been reported to run twice as fast under C than under Occam, when using a T800. I suspect that, as there are no such differences on the T414, it shows a deficiency in the Occam compiler for T800 targets too.

Pascal and other languages

Lattice Logic is also supplying a very pleasant implementation of Pascal which is now becoming available in its full release version (1.2) and is conforming to BS 6192:1982, level 1 (which is functionally equivalent to the ISO 7185 standard). For those who wish for a more Modula-like version, it comes with extensions to allow modules, inline assembly, relaxation of type-checking, short (32-bit) reals, and so on. The purist will be pleased that these only operate if you deliberately invoke a compiler option.

I have been particularly impressed with the friendliness of this compiler, as its error messages come close to telling you just what you should correct and are thoroughly documented. The major omission, which I suppose is inevitable in a Pascal centred on the ISO standard, is a complete lack of graphics facilities. I understand that Lattice Logic is addressing this, and graphics modules will probably be placed in the public domain soon.

The Benchmarks for Pascal seem perfectly respectable when you consider the additional run-time overhead that the language demands.

Lattice Logic is also marketing what is claimed to be a full-featured Fortran 77, now on full release too, although I have not had the opportunity to examine that yet.

There are a couple of other C compilers shortly to become available, one from Norway and one from the US. I have looked at a very fast Prolog Interpreter, from Coherent Research Inc (US), which offers a good Clocksin and Mellish-style Edinburgh syntax implementation which is the fastest AI language I have ever seen. The machine hardly seems to take any time in backtracking, and always generates output very quickly. Version 0.4 offers 56 predicates, and comes with a lovely display of logic programming in setting a monkey a goal as a task. The result is a blow-by-blow account of the actions required to achieve that goal, generated at lightning speed.

I hope that MicroWay intends to market this interpreter, and that Coherent is going to expand the number of predicates to take it up to a full-blown and user-friendly Prolog implementation, as it alone could be a good reason for filling a lot of PCs with Monoputer boards.

Applications

The only current application which appears to be available for the Monoputer board is Predict, a numerical forecasting package which is claimed to be so number-intensive that it really needs a maths coprocessor, a 80386 or a Transputer before it is a practical proposition.

There are a number of demonstration programs available from the Transputer Users' Group or written by MicroWay. These include the inevitable Mandelbrot graphics, Conway's Game of Life (a classical example of parallel programming) and a shareware disassembler.

Benchmarks

Benchmark times are given for three of the compilers reviewed here. They were carried out on a T414 Monoputer board running in a standard IBM PC/XT (4.77MHz) with an IBM Colour Graphics Adaptor, a standard IBM 10Mbyte hard disk, and PC-DOS 3.0. I have not run the other host-bound Benchmarks for Pascal as they are little different from C, using almost identical file-server code.

You may, for interest, like to compare these timings with those for 80386 machines (without a maths coprocessor) and the Acorn Archimedes (allowing for its use of inter-

Benchmarks

	Occam-2	Lattice Logic C	Pascal
Intmath	< 0.01	< 0.01	< 0.01
Realmath	0.09	0.32*	0.4*
Triglog	0.53	2.8*	5.0*
Textscrn	150	232	232
Grafscrn†	103	150	—
Store	7.6	3.2	—

Notes: * Using 64-bit IEEE floating-point reals
†IBM screen mode 4 (medium-resolution CGA)
For a full explanation of the APC Benchmarks, see the November 1986 issue. All programs are compiled.

Technical specifications

Processor:	Inmos T414-20 Transputer
RAM:	2Mbytes, plus 2k on-chip
ROM:	None
Host:	IBM PC, AT or compatible, requires one full-length expansion slot
Host operating system:	PC-DOS or MS-DOS version 2.10 or later
Bundled software:	Occam-2 standalone compiler, file server

preted Basic — see *APC*, August 1987). The T414 Monoputer board certainly matches the best, and all indications are that a single T800 will outperform any other microcomputer when compared for 'onboard' Benchmarks. The slowness of the host file server is all too apparent, though.

Documentation

At present the Monoputer board does not come with a hardware manual, but this should be available shortly. The manual for the Occam-2 Standalone Compiler has been rewritten and should now prove thorough and clear, but does not include a tutorial in Occam; I would recommend Dick Pountain and David May's *Tutorial Introduction to Occam Programming,* published by Collins, which may even convert those who see little point to the language. I find the Inmos documentation on Transputers rather opaque, and would like to see a text which covers the chips and their instruction sets in detail but in a lucid way.

Future hardware

MicroWay and other suppliers of Transputer boards are developing more new and potentially revolutionary products than any other sector of the industry. Over the next few months, expect to see a broadcast-quality graphics board, multiputer boards and more, as well as add-ins and add-ons for other machines.

Conclusion

It's available, it's reasonably cheap, and it's now quite well-supported by a range of languages. But is it useful? As the Monoputer board stands now, it could serve as a specialist accelerator for those who have computation-intensive tasks of any type. It could well have a significant impact on the stock market, for instance, in providing much faster analysis and forecasting. This board is really the tip of an iceberg, though. When you can push output to a Transputer-run graphics engine, more markets open up — and they should prove market leaders for really fast high-quality graphics.

The two major drawbacks seem to be the host, and the lack of an operating system which can cope with varying hardware configurations. Frankly, PC clones may be the most popular boxes around, but they are too slow and crude to do justice to the Transputer. It is essential that some form of operating system be available soon to cope with the problem of running programs on multiputer boards: at present, any program can only be configured for a specific hardware setup. If I write and compile an application for the T414 Monoputer board, it will not make use of a brace of T800s on someone else's board, say.

Would I recommend the Monoputer board? If you are a hardware or software developer, and you want to be at the leading edge in a couple of years time, you have to buy one and start learning soon. If you have a vertical-market application which still runs slowly, or could benefit from a lot of processor power, then you will be delighted with one, when your software runs on it. If you are into high-quality graphics, it will be the cheapest professional system. If you're a hacker or techno-yuppie, you should have one already.

END

As mentioned above, no Australian company has yet produced Transputer-based boards for the IBM PC or Macintosh. Unfortunately no Australian company is even yet importing these boards from the US, so to persue this product you'll have to call the States directly. MicroWay is in California on (617) 746 7341. The boards available from MicroWay range from one using a single T414 to one with four T800s; rices vary accordingly, but start from around $US1500. We'll publish details of any local distributor which picks up this or any like products. Watch Newsprint for details.

AT LAST, A PRINTER THAT GOES THROUGH THICK AND THIN TO GIVE IT TO YOU STRAIGHT.

BROTHER M-2518-*EXPRESS.*

Our revolutionary new Brother is dramatically different to any printer in its price bracket. Thanks to its unique Paper Express feature, the straight paper path on the M-2518 makes it ideal for printing thick, multi-part forms. The Automatic Paper Thickness Adjustment handles any type of paper up to six-part forms. And with Paper Parking, it's easy to load single sheets without having to remove continuous paper. Fast and quiet with a draft speed of 360 c.p.s., the M-2518 gives you near letter perfect print.

A remarkable performer with a remarkably low price tag. Brother offers you a complete range of eleven quality printers for every office situation. All are guaranteed for 12 months and all are backed by first-class service from Brother Dealers right across Australia. For red carpet treatment, just give us a call.

SYDNEY 887 4344 MELBOURNE 873 3655 BRISBANE 252 5257
ADELAIDE 42 6373 PERTH 478 1955

M-1709
The M-1709 Impact Dot Matrix Printer. A high-speed 240 c.p.s. printer that offers near letter quality printing and a graphics capability as well as many other innovative features.

M-1724L
The versatile Text/Graphic Printer. Another high-speed 216 c.p.s. printer producing draft text to letter quality printing and having an outstanding text/graphics capability.

M-4018
This super-fast and durable dot matrix printer has a draft speed of 480 c.p.s. It is designed for volume printing and three quality/speed combinations.

TWINRITER 6
The integrated printer for data processing, word processing and graphics. This printer fulfils the complete needs of the microcomputer user.

NEXUS 13/010/B

brother®

BROTHER INDUSTRIES (AUST.) PTY. LTD. 7 KHARTOUM ROAD NORTH RYDE NSW 2113

Machine vision

The human visual system is a complex and sophisticated one but there are severe limitations on what the eyes and brain can take in. Nick Hampshire examines the development of computer vision systems which could enable us to see things never before seen.

The human eyes and their associated areas of brain form a visual system of amazing complexity and sophistication. Let's take a fairly simple scene such as a pile of books on a wooden desktop; on top of the books is an orange and a tennis ball, and beside the pile of books is an old-fashioned alarm clock. The eye and brain are unable to analyse and understand such a scene in an instant. We recognise the books as being books, we do not think that perhaps they may be blocks of wood or plastic. We do not confuse the orange and the tennis ball, and attempt to eat the ball and play tennis with the orange. We know the position of everything in the scene, and can reach out and pick up the orange or select a book from the pile.

The visual system formed by the brain and the eye is capable of performing this visual analysis in just a fraction of a second. If we look at the scene for a slightly longer period, perhaps as little as one second, we are able to gain more information. We can analyse the position of the hands on the clock and from that information determine the time. We can analyse the writing along the spines of the books and from that information determine the contents of the books.

In as little as one second, the human eye and brain have gained enough information to be able to answer such questions as 'What time is it?' or 'Is the blue book on top of the pile a dictionary?' or even 'Is the orange ripe?' In a very short space of time, the human visual system has acquired a lot of knowledge about a scene.

The visual process is thus concerned with the conversion of an optical image into knowledge about the world as it is perceived in that image. It is a process which we all take for granted — we do not have to *think* about seeing, we just *see*. Yet the process is so complex that it is unlikely that computers will be endowed with any but the most rudimentary visual capabilities until well into the next century.

Blind spot

The human visual system, despite its enormous sophistication, does, however, have severe limitations. Foremost of these is its very limited spectral response. The unaided human eye cannot see images in the far ultraviolet, or infra-red areas, neither can the human eye perceive X-rays or microwave radiation. It is also very difficult for the human eye to differentiate between subtle variations in light intensity. With 200 different shades of the same colour, ranging from full intensity to totally colourless, the human eye will fail to distinguish between adjacent shades.

It is these limitations in human visual capabilities which have been the primary target for development by researchers into machine vision. The result of this work has allowed computer vision systems to see things which mankind has never seen before, from the moons of Jupiter to the metabolism of chemicals deep within a living human body. These developments have considerably augmented the human visual capability, and are proving to be of enormous scientific and economic value.

Given the current state of development, the subject of machine vision can thus be divided into three areas of development. The first of these is the technology of visual input, and involves the sensing of an image and its conversion into digital form. This data can then be utilised by the second area of development which is image manipulation. This involves performing mathematical operations upon the image to change it or extract more information from it. The third and last area of development is image analysis and recognition — in other words, the extraction of knowledge about the world from visual information. The first two of these areas of development are now well understood; the third area is still a long way from being even remotely solved and, if you excuse the pun, is the subject of much academic groping in the dark.

Image input

The most obvious means of placing a visual image into a computer's memory is to use a conventional TV camera. The camera can be colour or monochrome, even infra-red, and equipped with lenses to allow it to view microscopic objects or objects at great distances. To make it sensitive to selected wavelengths of light, it can be fitted with filters, and it is even possible to use filters to input a colour image with a monochrome camera. The TV camera can be connected directly to the computer or located at the far ends of our universe and linked by radio communications.

A TV camera's output contains information about the image as a measurement of the light intensity at every point in the image. This image can be considered as being divided into a grid which, on a standard TV camera, is scanned line by line in about forty milliseconds. During this period, 625 lines are scanned with each line containing the equivalent of over 1000 image points. This stream of data is in analogue form and has to be converted to digital format by a very high speed analogue to digital converter before it can be put into a computer.

Each picture element, or pixel, can have a varying intensity value which depends on the amount of light hitting that point on the image detector. In digitised form, each pixel thus requires between four and eight bits to represent the intensity value, and a standard black and white TV image is represented by between two and four million bits of data — this translates into a data rate of 50 to 100 million bits per second. If the image is derived from a colour TV camera then the data rate is even higher.

In practical computer image processing systems, the high data rate is overcome by analysing just a single image rather than a flow of images. The high data input rate can be slowed down to a manageable level by a special piece of hardware called a frame grabber. As its name suggests, this device takes a single frame from the TV camera, digitises it and then stores it in memory. The data output does not necessarily have to be an array of 625x1000 pixels: the frame grabber hardware can produce a scaling of this image by sampling every other line and every fourth pixel as well as omitting the top and bottom 30 lines — this would produce a digitised image of 256x256 pixels square. When the image data has been acquired by the frame grabber, it can be accessed by the computer at a much slower rate.

The data provided by a frame grabber is simply an array of values stored in memory. If the frame grabber digitises an image into a 256x256 array of pixels with 64 levels of intensity, or 'grey scales' as they are usually referred to, then the image will occupy

These examples show a set of full-colour photographs input to the computer by means of a video camera. As well as the main picture, up to 15 windows can be displayed holding, among other things, user-generated graphics, images being digitised in real time, text or, as here, a set of freeze frames. These frames can be moved around independently. Image processing is performed using a co-processor board based around the Intel 82786 chip. First, the main picture is pseudo-coloured and displayed on a standard EGA screen before being modified with standard paint-type software. Individual areas of the image can be selected and enhanced using edge-detection techniques. When the area around the eye has been enlarged, it can be used to analyse and classify certain features


Dear Andrew
Further to our recent telephone discussion, please find below an outline of some of the benefits that we have experienced as a result of installing an Epson LQ-850 into our general office.
For a non-computer literate like myself, the easy operation of the front control panel is a real winner, especially when changing from letter head to tractor forms.
The unique paper handling capabilities means that we can change paper media, cut sheet to continuous at the flick
COMMAND: Copy Delete Format Gallery Help Insert Jump Library
Options Print Quit Replace Search Transfer Undo Window
Select option or type command letter
Microsoft Word: MS50.DOC

Price Breakthrough Complete PC compatible for under $1000

ACER PC500 PLUS By Multitech

Pigs fly backwards! When you see the incredible performance and value of the new DSE Acer PC500+ by Multitech you'll realise that anything is possible.

Starting at less than $1000 you get a high speed computer system with mono monitor and MS.DOS 3.2 software! It's ready to run.

Featuring standard 256/640K RAM (depending on system), switchable 4.77 or 8 megahertz clock speeds, serial and parallel ports, single or double 5¼" disk drives, optional hard drive, Hercules compatible MGA card... and more! * 12 months carry-in warranty

New Super-Fast Operation!!

Three systems to choose from:

System 1

Value plus! With 256 RAM (expandable to 640K) single 5¼" floppy disk drive, MS.DOS V3.2 software! Cat X-8050

Mono monitor Cat X-2400 (Includes monitor!)

COMPLETE! $995

System 2

For home or business! With 256K RAM (expands to 640K), twin floppy disk drives and MS.DOS. Cat X-8051

Mono monitor Cat X-2400 (Includes monitor!)

ONLY $1295

System 3

Huge 20 Meg hard drive, single 5¼" floppy disk drive, 640K RAM, MS.DOS software — all at this amazing price! Cat X-8052

Mono monitor Cat X-2400 (Includes monitor!)

Hard Drive System! $1995

1200 Baud Intelligent Modem!

Bit Blitzer

Check out the price! Then check out the features. The Bit Blitzer 1200 Baud full duplex, intelligent modem is sensational in all respects. Features 1200/1200, 300/300 (and 1200/75 for Viatel on the 123E) baud rates, auto dial/answer, tone/pulse dialling, full Hayes AT command set, the most comprehensive instructions we've seen and much more!

Model 12E

300/300 AND 1200/1200 full duplex. Cat X-3306

$399

Model 123E

Works with Viatel! 300/300, 1200/1200 and 1200/75 Baud rates! Cat X-3307

$499

Full Duplex

B478/GU

DICK SMITH ELECTRONICS COMPUTERSTOP

NSW • Brookvale 93 0441 • Chullora 642 8922 • Gore Hill 439 5311 • Miranda 525 2722 • Newcastle 61 1896 • North Ryde 88 3855 • Parramatta 689 2188 • Tamworth 66 1711 • Wollongong 28 3800 • York St 267 9111 • ACT • Canberra 80 4944 • VIC • Elizabeth St 670 9834 • Richmond 428 1614 • Springvale 547 0522 • QLD • Brisbane City 229 9377 • Buranda 391 6233 • SA • Adelaide 232 1200 • WA • Perth 481 3261 • NT • Darwin 81 1977 • TAS • Hobart 31 0800 just under 50k of memory. This is quite a modest image digitisation and is typical of some of the frame grabber systems which can be purchased for use with desktop computer systems. Professional high-resolution systems, such as those used on spacecraft, will digitise images with a resolution several thousand pixels square and perhaps a thousand grey scale levels. Whatever the resolution of the digitised image, the data store in memory can then be analysed and manipulated by the computer.

Medicinal purposes

Image data need not necessarily be derived from a TV camera — indeed, some of the most exciting work on machine vision has used totally non-visual imaging systems. Perhaps the best known of these is the medical CAT scanner. The term CAT stands for Computerised Axial Tomography; this refers to the mathematical techniques which are used to construct an image of a slice through a living body and which, unlike conventional X-ray pictures, shows all the soft tissue locations as well as the location of the bones.

The data required to construct the image is obtained by taking a series of about 300 measurements at regular intervals all around the patient. Each of these measurements produces a series of values indicating reflections, refractions or intensities, typically giving a total of over 100k of data. This data is then used by the computer to construct an image of the slice through the patient defined by the plane of rotation of the detector. The mathematics used are quite complex and involve extensive use of Fourier analysis.

Space-based remote sensing and medicine have both been the major driving forces behind the development of computerised imaging and machine vision systems. They have made enormous advances since 1964, when many of the foundations for this work were laid down by Dr Robert Nathan at the Jet Propulsion Laboratory in California for the Ranger 7 moon probe. There are now a whole range of imaging techniques which rely on computers to build images which would be impossible to obtain by any other means.

Image manipulation

When it has been digitised and stored within the computer's memory, an image can be manipulated to improve and extract more information from it. The image will be stored as an array of pixels, with each pixel having an intensity value. Thus, each pixel might be stored as a single byte which would allow it to have up to 2^8 or 256 grey scale levels of brightness. With colour images this would be repeated three times — once for red, once for green and once for the blue component of the image. The number of grey scales and the resolution of the digitised image would depend on the frame grabber or image capture hardware.

One of the first things which can be done with such an image is to remove any 'noise' which may have been introduced into the image by the imaging hardware or in its transmission. These are things like the 'snow' or regular interference patterns often seen on TV screens when reception is bad or the antennae is faulty. The 'snow' in an image can be easily removed by locating individual pixels whose brightness shows an abnormal variation from those surrounding it. It can then be reset to a brightness level equal to the average of the surrounding pixels.

The image can also be corrected for faults or inadequacies in the image capture system. Many TV cameras have a tendency to have a non-uniform response to light across the tube's surface, so an object may appear brighter in the centre of the tube than at the edge. This effect can be measured with the camera aimed at a uniformly-lit plain surface. This measured variation in intensity can then be used to correct the intensity of any image by adding a correction factor to every pixel's intensity.

Another correction which can easily be performed is to rectify distortions created by the lenses of a camera. Many low-price TV cameras use cheap lenses which often give rise to geometric distortions at the edge of the image. By measuring these distortions against a reference grid, it is possible to use a 'rubber banding' technique to remove this distortion from the received image.

The computer can also be used to alter the brightness in an image which is either too dark or too light. This is done by first drawing a histogram of the intensities of all pixels in the image. In a properly exposed image, this histogram should form a standard bell-shaped distribution curve centred

in the middle of the intensity range. If the histogram shows that the intensity is weighted too heavily towards either the light or dark ends of the intensity scale, then it is a simple matter to adjust this by adding or subtracting a correction value to the intensity of each pixel.

The contrast within an image can also be altered using the histogram analysis of pixel intensities. If the histogram shows a very narrow bell curve with the majority of pixels having very similar intensity values, then the computer can be used to adjust these values in order to improve the contrast, so broadening the spread of values in the histogram. This can be done by multiplying each pixel's intensity value by a constant in order to produce the required contrast, and then adjusting the position of the histogram in order to ensure its location in the centre of the intensity range. The manipulation of image contrast and brightness should be compared to the controls on a TV set which allow the same type of manipulation.

Since the human eye is not very good at discriminating between very slight variations in light intensity, it is possible to use contrast manipulation to show detail in an image which would not otherwise be visible. It is this ability to manipulate an image in order to extract the maximum information from that image which is one of the most powerful features of computerised image processing.

One form of such manipulation is the process of 'pseudo-colouring'. This technique can be used to identify certain light intensities by displaying them in colour. For example, a user might be interested in examining all pixels with the intensity range 30 to 35. By assigning these with the colour red on a colour monitor, they can then be immediately identified from pixels with other intensities. This form of pseudo-colouring has been used with great effect in the display of many satellite images or in CAT scan images. It has also been used recently to add colour to old black and white movies — thanks to computerised image manipulation, you can now see Laurel and Hardy in full colour.

Computerised image manipulation also allows portions of an image to be extracted, masked out, rotated, magnified or even be replaced by portions of other images. It is these techniques which are currently revolutionising sections of the printing and advertising industry. It is now possible to electronically retouch and amend photographs or film with such precision that it is impossible to detect where any changes have been made — a technology which means that photographs can now lie very convincingly.

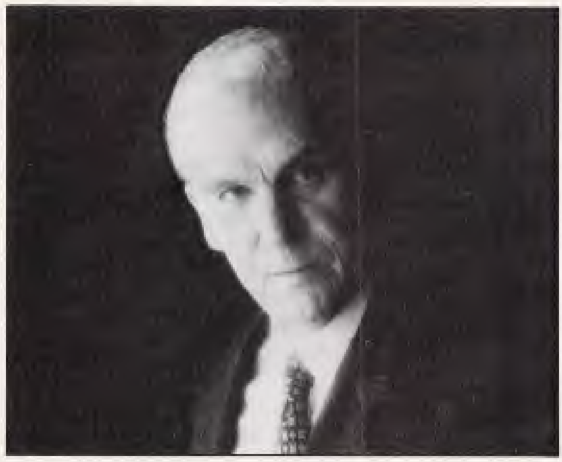
Another form of image manipulation which is finding considerable use in industry is image comparison. This technique compares a reference image with the image which is being input, and checks to see if they match. This is done by comparing each pixel and calculating the absolute value of the difference between the two intensity values. This process can be used to automatically check that complex products such as printed circuit boards are complete. Any difference between the reference and test images will stand out on the resulting comparison image as bright areas, whereas all the rest will be a very dark image.

Image recognition

As can be seen from the example earlier in this article, the process of image analysis and recognition is an exceedingly complex one. It is a process which involves the analysis of a visual scene and the extraction of information from that analysis in order to build a knowledge base about the environment within the image. This visual process not only creates new knowledge but also utilises existing knowledge in order to carry out the visual analysis. This places image recognition firmly into the domain of artificial intelligence — indeed, some researchers consider that it is one of the main foundations upon which AI will develop.

Image recognition techniques have been developed from early work on recognition of printed text, work which has now resulted in a range of commercial products such as the Kurzweil Discover which was reviewed in the September issue of *APC*. Compared with the analysis of real world images, character recognition is relatively easy. Characters are fixed, 2D and black and white, whereas the image of a machined metal part will have many levels of light intensity which will vary according to the attitude of the part in space and the distribution of light sources. Many of the problems encountered in machine vision are the result of trying to reduce such complex images to the simplicity of a black and

ANYONE WHO HAS JUST PURCHASED A CONVENTIONAL P.C. HAS MY SYMPATHY.



AMIGA 500

REC. RETAIL PRICE $999 excluding monitor	MEMORY 512K internally expandable to 1Mb	MULTI-TASKING yes
COLOUR 4096 colours	SOUND 4 independent stereo channels, built in music and voice synthesiser	IBM COMPATIBLE no
SOFTWARE More than 500 commercially released programs available		

AMIGA 1000

REC. RETAIL PRICE $2495 excluding monitor	MEMORY 512K internally expandable to 9 Mb	MULTI-TASKING yes
COLOUR 4096 colours	SOUND 4 independent stereo channels, built in music and voice synthesiser	IBM COMPATIBLE yes*
SOFTWARE More than 500 commercially released programs available		

AMIGA 2000

REC. RETAIL PRICE $2999 excluding monitor	MEMORY 1Mb internally expandable to 9 Mb	MULTI-TASKING yes
COLOUR 4096 colours video interface	SOUND 4 independent stereo channels, built in music and voice synthesiser	IBM COMPATIBLE yes*
SOFTWARE More than 500 commercially released programs available		

Too bad you couldn't wait just a little bit longer.

Because Commodore has just released the complete Amiga range.

And any conventional PC is in grave danger of becoming rapidly obsolete.

There are three computers in the Amiga range, and each one of them has its main processor boosted by three co-processors.

So when it comes to performance, comparing Amiga with the conventional PC is like comparing the family car to a Formula 1 racer.

And we're not just talking about speed and power, either.

Every Amiga, from the A500 to the incredible A2000, offers no less than 4096 colour options. The opportunities for graphics and animation are incredible.

Every Amiga can multi-task (run more than one program simultaneously).

And every Amiga has 4 channel stereo sound, a built in music synthesiser, and a pitch and tone modulated speaking voice.

And yet, the most impressive thing about the Amiga is not the features.

It's the price tag.

Less than $1000 for the Amiga 500, $2495 for the Amiga 1000, and only $2999 for the Amiga 2000 with optional IBM* compatibility.

With a wide range of business software and specialised graphics tools, the Amiga is the only choice for home, education and business use.

So why invest money in the technology of the past, when the technology of the future is available today.

From Commodore, naturally.

For further information on the Commodore Amiga Range, send this coupon to Marketing Department, Commodore Business Machines Pty Ltd, 67 Mars Road, Lane Cove, NSW, 2066.

Name ______________________

Company ______________________

Address ______________________

Postcode __________ Telephone __________

*IBM is a registered trademark of International Business Machines Corporation.
*Optional

AMIGA

ARE YOU KEEPING UP WITH THE COMMODORE AMIGA?

John Singleton Advertising COM0069

white character. Machine vision thus draws together the three related fields of image processing, pattern recognition and scene analysis.

A typical example of the capabilities of current image recognition systems is a robot which visually selects the correct component from a box of assorted components, and then orientates the component correctly so that it will fit into the object being assembled. For a human this is a very simple task; for a computer using the latest machine vision techniques; it is a task of enormous complexity.

The first problem is one of inputting the image and converting it to a form in which it is possible to perform object recognition on the various components in the image. A TV camera is normally used and the resulting image is then processed to identify the edges of the various components in the image. However, the simple detection of the edges is insufficient for any pattern recognition process to be performed, as objects may be touching or on top of each other. Similarly, variations in light intensity, object surface reflectivity and shadows cast by one object over another, all complicate the problem.

The only way to overcome these problems is to give the vision system some degree of knowledge about the objects which it is trying to recognise — knowledge about the various shapes which make up the images of the various components, plus knowledge about the lighting and the surface reflectivity of the various objects. With this level of knowledge, the system can be designed to refine the raw edge image and give each of the components in the image a more solid shape and definition.

Simple components can be recognised at this stage from an outline since there are probably a limited number of ways in which they can be orientated. Thus a bolt has just two orientations, lying on its edge and standing up on its head, and both have easily identifiable outlines. Components with complex shapes are, however, much harder to recognise and usually require an analysis of their component shapes and surfaces — a task made much harder by the 2D nature of the input image. Again, the system must utilise a knowledge of shapes in order to deduce information about the depth and spatial positioning of the objects in the image. Programs which perform this task usually have as their output a line drawing of all the objects in the image.

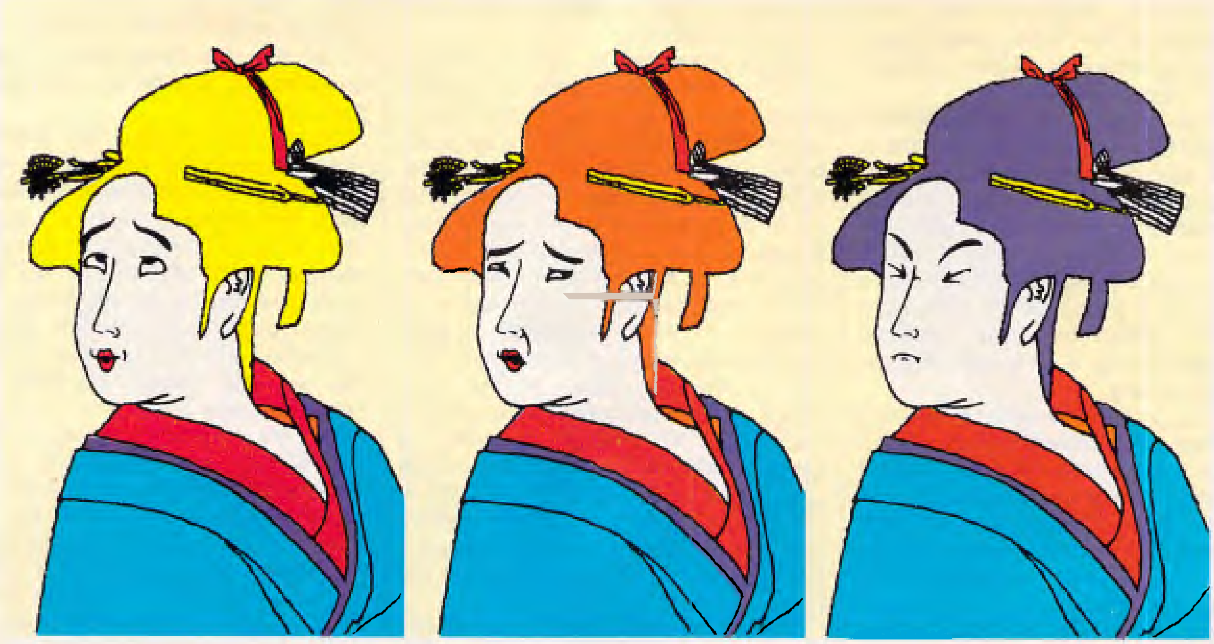
This type of image analysis is usually sufficient to ensure recognition of components by a robot. The line drawing will be compared to images of known objects stored in a database, with the computer making full allowance for size normalisation and object orientation. This will usually ensure successful recognition in most cases, although difficulty will be encountered where different objects are identical at certain angles of viewing.

In order to progress beyond the recognition of an object from a small universe of different objects, and for the computer to analyse unknown objects and acquire knowledge about the relationship between objects, it is necessary to apply artificial intelligence techniques to the problem. It is at this stage that the image recognition process splits into two separate areas — on the one hand there is pattern classification, and on the other there is scene analysis.

Pattern classification is concerned with the mapping of feature vectors containing measurements of the objects, and grouping them into classes. This is important because it defines the physical shape and size of an object. In the example at the beginning of this article, pattern classification would be concerned with the spherical nature of the ball and orange, the rectangular surfaces of the books, the circular face of the clock and the angular association of the hour and minute hand; it would also be concerned with the 'orangeness' of the orange and the 'blueness' of the book. Scene analysis is concerned with building up a description of the objects in an image in terms of 3D solids and how they relate spatially. Thus scene analysis would be concerned with how the orange and the ball were placed upon the book, their relative positions and sizes.

With these two analyses of the image, it is then possible to build up a knowledge base about the visual scene. The knowledge base can then be interrogated about relationships between objects, object sizes and positions, and even about the nature of objects. Only when the computer has built up such a knowledge base does it become possible to successfully interact with the objects which have been perceived. A full knowledge of the scene with the orange, the ball, the books and the clock is essential before any attempt can be made to remove

The DL 2400/2600 print quality graphics easily.



The hard part is choosing the colours.

The Fujitsu DL 2400/2600 offer you high resolution printing for crisp, clear images in eight colours, programmed internally to make colour changes easy.

High speed printing at up to 34,000 dots per second. Automatic sheet load and unload of cut or continuous stationery. And bit image graphics in two modes.

It is also compatible with other well-known computer brands – including IBM.

FUJITSU

All these qualities make it an exceptional printer. What makes it extraordinary is the fact that it is yours for very little more than an ordinary daisy wheel printer.

Fujitsu make printing reliable.

For more information contact your nearest Authorised Fujitsu Supplier for all the details.

Telephone Fujitsu Australia Limited on Sydney (02) 959 6544, or Melbourne (03) 529 7633.

FUJ 2065

the orange from the books and place it upon the table. Armed with this type of visually derived knowledge, a computer can use a robot arm to not only select the required object, but also calculate the required set of movements in order to orientate the object correctly and put it in the required place.

The future

Machine vision covers a range of different subjects, most now quite well developed — the exception being the area of true machine vision with its recognition of objects and scene analysis. So far such systems have been limited to very simple worlds containing toy blocks or a small number of different components. This is a long way from a practical, general-purpose machine vision system.

Part of the problem lies in our lack of understanding about the way in which biological vision systems work, particularly the way that information is extracted from an image. The other problem is that standard general-purpose computers are not necessarily the best devices for performing the computation required by machine vision. Indeed, the computational power required for machine vision has been estimated at between 1 and 100 billion instructions per second. To put this into perspective, a supercomputer like the Cray 2 is only capable of working at a maximum speed of half a billion instructions per second. Even the extraction of fairly low-level features from an image requires in excess of 10,000 operations per pixel.

Improvements in our understanding of biological vision systems and the need to reduce the computational overload in image analysis are leading scientists towards the development of new architectures for vision systems. It is these new architectures which offer the best chances of overcoming many of the problems currently facing researchers.

Most of these new architectures are based around special-purpose parallel systems. This is a logical choice since a visual image is a truly parallel set of data. For fast preliminary feature extraction, each pixel should, in theory, have its own processor. This is not real-

The mathematics of image manipulation

Most of the simpler image manipulation techniques, such as contrast or intensity enhancement, can be performed by simple calculations on individual pixels. However, the more complex operations such as edge detection or convolution are processors which use comparisons between the pixel whose intensity value is being calculated and its neighbouring pixel's intensity values. These calculations are usually performed using blocks of nine pixels, thus:

A	B	C
D	X	E
F	G	H

where X is the pixel being calculated and A to H are its surrounding pixels. Every pixel in the image will need to be calculated in this manner, with the result being stored as a new image in another part of memory.

The convolution and edge detection algorithms are virtually the same and are 2D adaptions of linear processes which were developed for signal processing. The basic calculation is as follows. Where p is the named pixel's intensity value and K is the value of a kernel for that pixel; the kernel is a 3x3 grid of values which determines the nature of the filtering operation:

p(X)=p(A)*k(A)+p(B)*k(B)+p(C)*k(C)
+p(D)*k(D)+p(E)*k(E)
+p(F)*k(F)+p(G)*k(G)+p(H)*k(H)

A typical kernel to detect edges would have the following values:

−1	−1	−1
−1	8	−1
−1	−1	−1

This is known as a Laplacian area filter. To convolve an image and make it 'sharper', use a similar kernel but with the centre value increased to 9. Particular features can be detected by using a matched filter kernel. The following kernel will enhance only the vertical edges of the image:

−1	0	1
−1	0	1
−1	0	1

All these techniques are computationally very intensive — it takes over half a million calculations to detect the edges in a 256x256 resolution image using the above technique, which is one of the simplest and least computationally intensive.

PC MAGAZINE EDITOR'S CHOICE

"The AST Premium/286 rates as what may be the best designed and built AT compatible on the market today."

— PC Magazine,
April 28, 1987

Recently, PC Magazine awarded the AST Premium/286 with their Editor's Choice Award for its "winning price/performance combination."

We weren't surprised

When we designed the Premium/286, we built in uncompromising compatibility, speed and power.

But, that's not all. We also built in a commitment to quality.

The same quality that has been the trademark of our complete line of exceptional enhancement and communications products.

So, when it comes time for you to make a decision about buying a personal computer, you might want to remember what PC Magazine had to say about the Premium/286.

Prices start at $5860 (including sales tax)

"The Premium/286 is without a doubt the best-looking and best-performing system with a 10MHz rating. Its quality makes its price a bargain."

"Workmanship is clearly top-notch."

"The AST Premium/286 uses a unique memory configuration to gain top honors in RAM access time."

"Overall, the AST Premium/286 rates as what may be the best-designed and built AT compatible on the market today."

AST's incorporation of "FAST slots" into the unique architecture of the Premium/286 gives true zero, wait state memory.

The bottom line to you is automatically increased productivity, as illustrated in the comparison chart.

BENCHMARK TEST RESULTS FOR SELECTED PERFORMANCE COMPUTERS

CPU measures main processor performance relative to the 6MHz (Model 099) IBM PC AT. Hard disk performance is tested for sequential and random data access.

System (Clock speed in MHz/No. of wait states)	CPU	Hard Disk (sequential)	Hard Disk (random)
80286-Based PCs			
IBM PC AT (6/1)	1.00	1.00	1.00
Toshiba T3100 (6/1)	1.36	0.50	0.68
IBM PC AT (8/1)	1.37	1.17	1.40
Televideo Telecat 286 (8/1)	1.71	1.70	1.07
IBM PS/2 Model 60 (10/1)	1.72	2.02	1.67
Sperry Micro IT (8/0)	1.80	1.32	1.15
Compaq Portable III (12/1)	2.03	1.03	1.86
PC's Limited 12MHz (12/1)	2.08	1.08	1.68
AST Premium (10.0)	**2.25**	1.41	2.12

☐ Please send me more information on the AST Premium/286.
☐ Please organise for a dealer to contact me.

Nominate preferred dealer: ____________
NAME: ____________
TITLE: ____________
COMPANY: ____________
ADDRESS: ____________
____________ POSTCODE: ____________

Send to: Imagineering, 77 Dunning Ave,
IM058FB Rosebery NSW 2018.

AST RESEARCH INC.

AST and the AST logo are registered trademarks and AST Premium/286 is a trademark of AST Research, Inc. IBM and AT are registered trademarks of International Business Machines Corp. Imagineering is a Division of Studio Australia Pty Ltd

IMAGINEERING™
• AST DIVISION •

SYDNEY (02) 697 8666 MELBOURNE (03) 6909022 BRISBANE (07) 369 2911 ly practical, but the development of special-purpose visual signal processors has shown considerable improvement in operational speed, particularly when used in parallel or in pipelined structures. The purpose of these processing chips is to perform all the low-level feature extraction and, in the process, reduce the quantity of image data to more manageable quantities.

Some success is also being shown in the application of array processing systems. An example of this is the Wizard adaptive image classifier developed by Professor Igor Aleksander of Imperial College, London. This is a deceptively simple system which uses RAM chips to emulate a neural network. The system has shown itself to be very good at performing image recognition, particularly on such complex images as the human face. It has proved very tolerant to wide variations in the image's orientation compared to the training images, and will even successfully recognise a partial image. There has been considerable interest in this system for security applications as well as the more conventional machine vision applications.

Conclusion

The ability to be able to put an image into a computer opens up the possibility of a whole range of fascinating applications. General-purpose machine vision may require special, very powerful computers, highly complex programming techniques and may take another 50 years to develop, but most image processing can be performed with a desktop computer. Frame grabbers are available for machines like the Amiga or the IBM PC for as little as $1000, including a black and white TV camera.

One such system is the NewTec DigiView for the Amiga, which will give a 320x200 resolution image with 16 grey scale levels. (It should be noted that the Amiga is a very good machine for image processing since it combines an excellent display with a fast processor and does not suffer from the 640k maximum memory size of the IBM PC.) Another system which is available for the PC is the more expensive but more sophisticated Microsight II from Digithurst which costs considerably more but produces a 512x512 image with 63 grey scale colours.

With image input devices such as these, it is possible to do a whole range of image manipulations — even image analysis and recognition with a standard PC.

END

20Mb power. No power cord. The new Toshiba T1200.

Think how much more you will be able to do with the new Toshiba T1200.

With its removable, rechargeable NiCad battery pack, 20 megabyte hard disk drive, 720 kilobyte 3.5 inch diskette drive and one megabyte random access memory, it offers real portability, and real power.

There's one other point we should clear up. Should you need it, the Toshiba T1200 comes complete with an AC/DC power adaptor.

The new Toshiba T1200.

Real computer power, with a power point. Or without.

And, like all Toshiba computer products, one less thing to go wrong.

TOSHIBA

...In Touch with Tomorrow.

TOSHIBA (AUSTRALIA) PTY LIMITED, COMPUTER PRODUCTS DIVISION, 84-92 TALAVERA ROAD, NO[illegible] RYDE 2113.
SYDNEY (02) 887 3322. MELBOURNE (03) 765 2111. BRISBANE (07) 352 9888. CANBERRA (062[illegible]05100.

Conroy Carpenter/TCP0387

LETTERS

This is your chance to air your views — send your letters or contact us via Microtex on Telecom's Viatel, page 666. The address to write to us is Australian Personal Computer, 124 Castlereagh Street, Sydney 2000.

DTP brickbats

As you know, InfoMagic is the exclusive Australian distributor of the PageMaker desktop publishing system. PageMaker is the top-selling DTP solution in the world. It has more than 180,000 installations world-wide and has more Australian installations than any other DTP offering.

It is in this light that we take exception to the article on desktop publishing software which was published in the October 1987 issue of *APC*.

A competent evaluation of such a complex issue would easily take hundreds and perhaps even thousands of man hours. The issues in determining which is the best package is not as black and white as "PageMaker is good for short documents and Ventura is good for long ones". I'm sure that your readers would agree that any in-depth endorsement of a software offering could only occur after a thorough examination of the entire 'application system' and not just the bits and bytes of the binary code.

In the United States and other places, major industry leaders, who have the skill, ability, and man power to scrutinise all the popular packages have unanimously chosen PageMaker as the complete desktop publishing system to use and market. These leaders include: IBM, Digital Equipment Corp, Hewlett-Packard and Wang Computer.

While your reviewer acknowledged PageMaker as the 'granddaddy' of desktop publishing, he failed to adequately understand the desktop publishing process and entirely overlooked many exclusive features our system has which continue to differentiate it from the Johnny-Come-Latelys. 'Smart' image scaling, interconnectivity between Macintosh and DOS environments, grey scale TIFF manipulation, background file saving, and background print spooling not only make PageMaker unique, but also contribute to the reason so many corporations and individuals have made it their standard choice.

Aldus Corporation (USA), has tracked over 250 document types which are being created by PageMaker users day in and day out. These publications include books, daily newspapers, magazines, newsletters, advertisements and restaurant menus, to name just a few. I assure you that only PageMaker has the innate ability to transcend document size and style thus assuring the user the maximum value for his investment. To suggest otherwise is to do your readers a disservice.

I will not take the time here to go into the many inaccuracies that the article contained, but we have documented more than four pages of notes that we are willing to make available to *APC* readers if they would like to call and request it from us.

I have enjoyed *APC* since you founded it eight years ago, and am sure that it is your intention to accurately inform your readers and assist them in cutting through the technicalmumbo-jumbo which is so often prevalent in the computing field. I hope you will take note of our opinion and correct, what we felt, is an inaccurate perception about which desktop publishing system is the best.

R Graham
InfoMagic Australia

I have just re-read the DTP feature in last month's issue and do not believe that our treatment of PageMaker was as harsh as you state.

We believe that, at this stage of development of DTP products, there is no clear leader. This is evidenced by Computer Publications' use of Ventura to produce the editorial of this magazine and use of PageMaker to create advertisements in another part of the company — Ed.

Not so squeezy

It can be proved by using concepts from mathematics that there is no method for compressing files in general. Specifically if we consider any algorithm for 'file compression' and consider giving it in turn every file (of any type) up to a certain number of characters, and then we were to compare the total bulk of the resultant files with that of the original files in total, then we would find that the resulting bulk would be at least as big as the original. To repeat: the result over all files up to a certain length will be at best no increase in total bulk of files, in fact there may be an increase in the total bulk.

The use of file compression algorithms is in decreasing the expected value of the length of the

El-Cheapo qualification

Last month's El-Cheapo comparison featured a couple of comments which one of the suppliers felt could be open to misinterpretation, and I'd like to set him straight.

The review stated that the MicroDOS machine is assembled either in Australia or Hong Kong, depending on supply and demand. This is correct, but MicroDOS would like to point out that the machine is manufactured in Hong Kong (like many others), in a factory of which the company owns fifty per cent (unlike many others). This manufacturing has not included the etching of boards to-date, but will do so from November onwards. Apparently having an interest in the factory provides a guarantee over the source of the components used in the machine, and assures that all batches of the PC are in fact the same machine.

The review also stated that the floppy disk drive was 'unidentifiable'. This was not meant to imply that the drive was of questionable origin, rather that I could not locate the manufacturer's badge. MicroDOS tells me that the drives are from National and made in Japan.

I Davies

compressed file to below that of the expected value of the length of the original file. If the files have an even distribution over all files to a certain (unspecified) length this is not possible. The only way to gain on this sort of a process is when the files have an uneven distribution which includes at least one short file having a lower probability of occurrence than some file which is longer than it. In extreme cases this includes possibilities like text files where some characters do not occur, and so many files have a zero chance of occurrence, in particular many short files onto which the longer text files can be mapped. Such a routine optimised for text files would increase the length of the other files, empirically they tend to expand executable files more than others.

The point being that if no information is available on the distribution of the files involved then testing one algorithm against another on a number of files is nothing much short of a lottery (with some bias in favour of algorithms with low explicit overhead).

I would be pleased if you could give me some information on the distribution of files in the Microsoft Data Compression Competition, ie, what type of files are you dealing with, or any other information that you feel would clarify this issue.

B Mills

Interesting. What can we say? Perhaps: "You don't win!"

Seriously, Mr Mills raises a valid point and serves to highlight the inherent difference between mathematics and computer science. Computing is literally full of instances of processes which according to a pure mathematics definition are not really possible.

The point is this: Mr Mills is correct in as far as he goes, but the issue is not relevant.

Many commercial products exist which perform data compression over undefined data distributions, and I am fairly sure the manufacturers of these would be greatly surprised to hear that their products do, at best, nothing.

Different compression strategies exist for dealing with different distribution profiles, and a good compression system is able to quickly gather statistics on the local data profile and accordingly select the best strategy. This is a common technique in computing, and is employed in technologies ranging from artificial intelligence through to database query systems, such as DB2, through to high performance modems.

We will not release any additional information on the types of files to be compressed, as we feel that it is unnecessary. For everybody else who is currently achieving compression around the twenty per cent mark, keep at it, after all, it's only impossible!

Ian Davies

Computer of note

Leafing through the March issue of *APC* I was interested to read the article by David Levy about the 'musical dice' method of composing minuets which was published in 1792 and attributed to Mozart. He also mentions a similar system devised by Bach's pupil, Johann Philipp Kirkenberger.

There is a growing body of opinion among music historians that JS Bach himself could not have found time to achieve his vast output of musical compositions — and also to have fathered approximately 20 children — without the help of some form of primitive music computer.

Some device providing a readout from a clavichord-style keyboard has been suggested. The fact that Bach's third son, the most gifted of all at the keyboard, should have been christened CP/M Manual (or CP Emanuel) can be no accident, and is obviously a thinly-veiled reference to the user guide for his machine's operating system.

E Chance

Mandelbrot algorithms

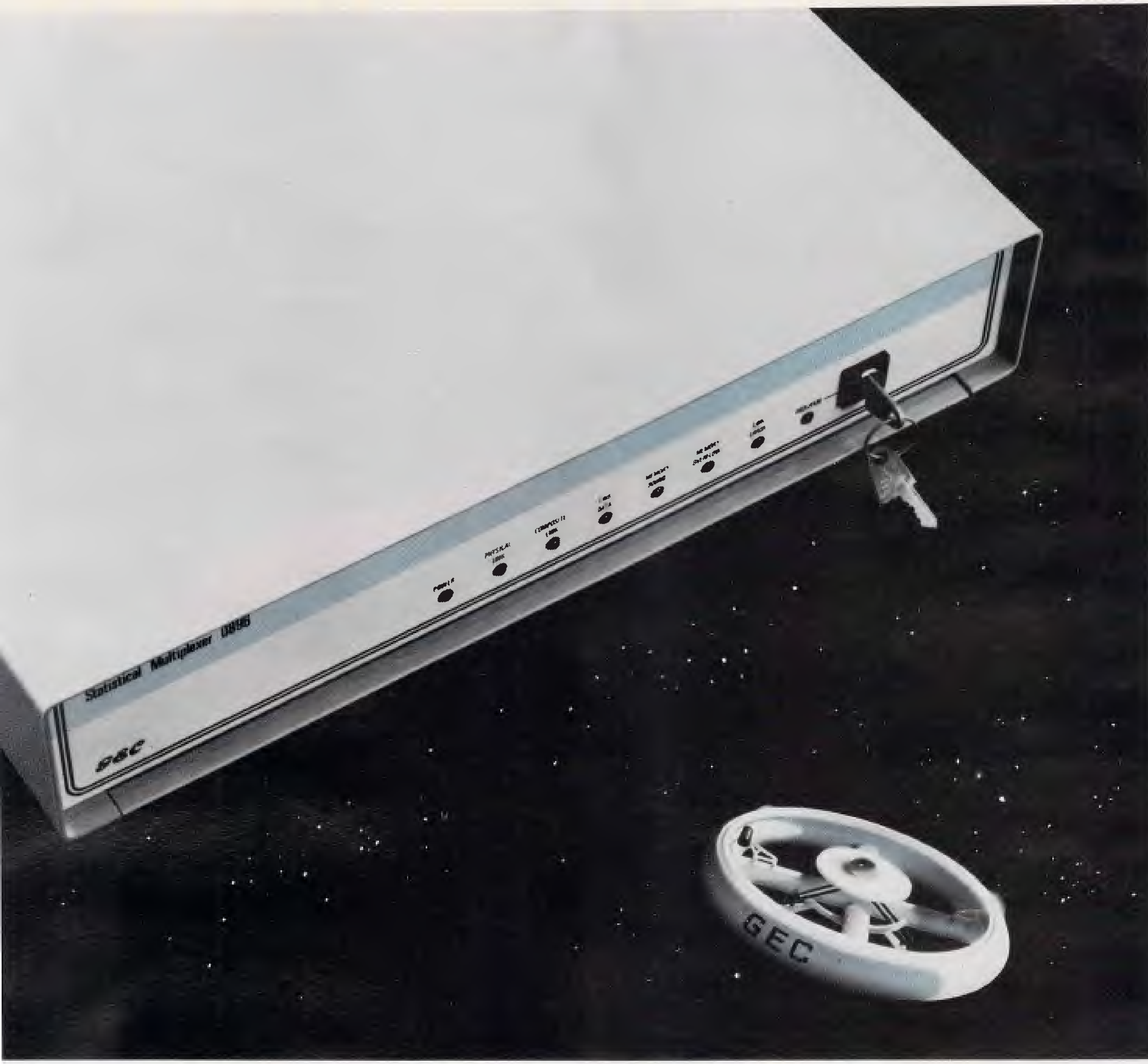
The front cover of your August issue showed the Acorn Archimedes displaying a Mandelbrot set. Where can I find the formula to produce this type of graphic myself?

Also, I want to produce some vector graphics on my BBC Micro that have been drawn in perspective, but the formulae I use are very longwinded. Can anyone help?

S Smith

Jack Weber's article 'Fractal sets' (APC, *January 1987) contained some innovative and fast algorithms for drawing parts of the Mandelbrot set. Though written for the Apple Macintosh, they were produced in Basic and you might find it an interesting task to convert them to BBC Basic — Ed.*

END



"GEC high-tech Multiplexer? Now you're talking!"

High-tech is right! GEC Statistical Multiplexers are sheer state-of-the-art. 4-, 8- and 16-port with the 4 and 8 upgradable to 8 and 16 respectively. GEC gives a full range of terminal data rates to 9600 bit/s. Programmable character codes and flow control options. Remote programming of far end multiplexer. Synchronous composite channel up to 64000 bit/s. And here's something to talk about: back-to-back operation up to 1 km without modems!

GEC are a major supplier to Australian Telecom and British Telecom. And now you can put the GEC world of experience to work for you. Talk to GEC soon about their Statistical Multiplexers and other high-tech data communicators.

GEC

A world of experience.

GEC Communications Division, 2 Giffnock Avenue, North Ryde, NSW 2113. Phone: (02) 887 6222. Telex: AA26080. Fax: (02) 888 3447

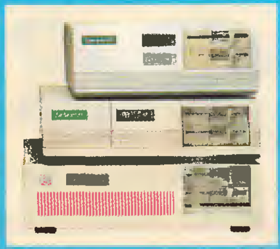
GEC2JPC

IF SPEED IS A CRITERION

The Datamini AT Compact Desktop outperforms any of the PC XT's by 10 times.

That means by the time Big Blue has made it from Melbourne to Adelaide, Cartels Datamini Desktop has made it from Melbourne to Perth, back to Sydney and home to Melbourne. Now that's fast!

Innovative Dual Function Keylock



30% smaller than other PCs

The Datamini Desktop from Cartel Personal Computers is available as the superfast AT Turbo, or the versatile XT Turbo, and is built from the finest Japanese components.

The AT is a versatile multi-tasking and multi-user system running virtually any industrial off-the-shelf software and it handles operating systems such as MS-DOS, PC-DOS, XENIX etc.

The XT Compact handles a 1.2MB Floppy and is supported by a high speed 8088 16 bit micro-processor, which is 2.1 times faster than PCXT. With an optional NEC V20 processor, speed can be enhanced to 3.7 times faster than others.

A unique front panel switch facilitates selection of either turbo or standard speed at ease.

With our computers it is possible to mix and match with a variety of floppy drives. We even handle 3½" floppies.

If Price is another Criterion need we say more than . . . if you think we're fast then you just have to check out our prices.

Dealer enquiries welcome.

CARTEL PERSONAL COMPUTERS
823 Glenhuntly Road,
Caulfield South, Vic. 3162
Phone: 523 0006

Datamini WINS!

Portable

This is truly an innovative portable PC with many outstanding features.

Like the Desktop range, the DATAMINI PORTABLE is available as the AT TURBO and XT TURBO.

The PORTABLE AT TURBO houses a 10MHz 80286 CPU with an optional 80287 co-processor.

Similarly, the PORTABLE XT TURBO runs at an incredible clock speed of 10MHz with an 8088-1 CPU. An optional 8087-2 co-processor enhances numeric computation. A NEC V20 IC further enhances processing speed.

The DATAMINI PORTABLE range comes with a built-in 9 inch Dual Frequency high resolution monitor and a 84 Key PC AT/XT compatible keyboard.

Secondary storage is virtually unlimited as it can support up to two Floppy Drives and one hard disk.

Port. XT	$1890
with 20 MEG HDD	$2530
Port. AT	$2790
with 20 MEG HDD	$3330

Parts are innovatively laid out with room for expansion

W 480 mm D 460 mm H 190 mm

DATAMINI DESKTOP AND PORTABLE COMPUTERS

SPECIFICATION Main Board	AT TURBO	XT TURBO
	16-24 Bit Microprocessor 80286 (10 MHz) CPU with Socket for optional, 80287 Co-Processor Expandable to 1MB Memory on board 8 Expansion I/O Slots (6AT & 2XT slots) 32K ROM BIOS, Expandable to 64K	**High speed 8088-1 16 Bit Micro-processor** **8087-2 co-processor (optional)** **10/4.77 MHz dual speed selectable** **640 byte RAM on board** **8K ROM BIOS, Expandable to 40K** **4 LAYER BOARD** **8 I/O PC Compatible Interface Slots.**
Colour Graphic Card	RGB Director and Composite Video 15.750 KHz Horizontal Scan rate Display 25 Rows by either 40 or 80 Characters with 5 x 7 Character Matrix Graphic Mode: 640 x 200 Addressable Dots	
Monochrome Graphic card (in place of colour graphic card)	TTL Positive Video Output Display 25 Ros by 80 Character Text with 9 x 14 Character Matrix 64 KB Screen Memory for Graphics and Text Graphic Model: 720 x 348 Addressable Dots Support Graphic Software eg: Lotus graph, Frame work graph, AutoCAD, Paint Brush Build in Parallel Port	
Serial Parallel Adaptor	RS232 Port (9 Pin OUTPUT) IBM PC Parallel Standard	On Multi I/O Card
FDD/HDD Adaptor	Supports 2 Floppy Drives (1.2MB & 360KB) and 2 Winchester Disks	
Floppy Disk Drive and Hard Disk	One 1.2MB 20 MB Hard Disk (Optional)	Two 360 Byte Teac Drives 20M Hard Disk (Optional)
Key Board	84 Keys PC XT/AT Compatible with "Click" Feel Enlarged RETURN and SHIFT Keys	
Multi-I/O Card		Real time clock/calendar Serial Ports which can be configured for COMI & COM2 Centronics Parallel Printer Port operates as Lpt 1 & 2 Game Paddle Joystick Interface Utility diskette for real time clock setting and RAM DISK configuration
Power Supply	Input: Ac 90-130V/180-260V. 50 to 60Hz Power Output: 200W, Support 2 Floppy Drives and 2 Hard Disks	

Licensed BIOS & MS-DOS, 12 months warranty.

SENDATA

LEADERSHIP THROUGH EXCELLENCE

MODEMS — Free Comm. Software with all auto dial modems

V21 300 BPS FD Manual	$195
V21AA 300 BPS FD Auto Ans.	$280
1275 300 FD, 75/1200 (Viatel)	$250
1275 INT-Internal Modem V.21, V.23, Bell 103, Auto Dial 300 FD, 75/1200 (Viatel)	$460
321AD 75/1200 (Viatel), 300 BPS FD 1200 HD & FD, Auto Dial, Ans. Disc. V.21, V.22, V.23, Bell 103, 212A	$790
321Ad INT. Internal 321 AD Modem	$790
V22 1200 BPS FD, Auto Ans	$590

MONITORS

Thomson TTL	$240
Duel Scan Monochrome	$200
Thomson EGA	$795
Thomson Composite	$220
DMC MD3 Color	$620

PRINTERS

Brother M1709	$980
Star NX-10 120 CPS	$490
Star NX-15	CALL
Star NB-15	CALL

Datamini Desktop XT	$1495
AT	$2290

CPC 10 – XT/Turbo 10 MHZ **$1250**

Same specification as Datamini XT
BUT: 150W P/supply, STD. 'AT' Type Keyboard MS-DOS – Optional
Floppy drives-Mitsumi-Japan

POPULAR XT/TURBO 8 MHz **$1195**

Same specification as CPC 10
BUT: 2 Layer M. Board @ 8 MHz

5 MEG Hard Drive & Controller	$395
10 MEG Hard Drive & Controller	$495
Tandon 20 MEG Hard Drive	$540
20 MEG Hard Drive & Controller	$640
Link 125 Terminal	$660
Genius Mouse	$120
4164 Dram	$2
8087 Co-processor	$260
80287 Co-processor	$490

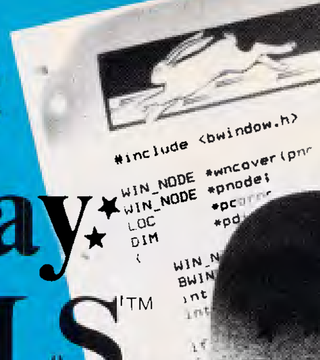
CARTEL PERSONAL COMPUTERS

823 Glenhuntly Road, Caulfield South, Vic. 3162
Fax: (03) 528 5360. Telephone: (03) 523 0006

Our Warranty is covered nationally by Datacraft Services Pty. Ltd. — a member of the Datacraft Group.

*IBM IS A REGISTERED TRADEMARK OF INTERNATIONAL BUSINESS MACHINES

More Magic from MicroWay. Turbo C TOOLS™



Magic is easy with Turbo C TOOLS in your bag of tricks. New Turbo C TOOLS™ from Blaise Computing is a library of compiled C functions that allows you full control over the computer, the video environment, and the file system, and gives you the jump on building programs with Borland's new C compiler. Now you can concentrate on the creative parts of your programs.

The library comes with well-documented source code so that you can study, emulate, or adapt it to your specific needs. Blaise Computing's attention to detail, like the use of function prototyping, cleanly organized header files, and a comprehensive, fully-indexed manual, makes Turbo C TOOLS the choice for experienced software developers as well as newcomers to C.

Turbo C TOOLS provides the sophisticated, bullet-proof capabilities needed in today's programming environment, including removable windows, "side-kickable" applications, and general interrupt service routines written in C.

The functions contained in Turbo C TOOLS are carefully crafted to supplement Turbo C, exploiting its strengths without duplicating its library functions. As a result you'll get functions written predominantly in C, that isolate hardware independence, and are small and easy to use.

Turbo C TOOLS embodies the full spectrum of general purpose utility functions that are critical to today's applications. Some of the features in Turbo C TOOLS are:

◆ **WINDOWS** that are stackable and removable, that have optional borders and a cursor memory, and that can accept user input.

◆ **INTERRUPT SERVICE ROUTINE** support for truly flexible, robust and polite applications. We show you how to capture DOS critical errors and keystrokes.

◆ **INTERVENTION CODE** lets you develop memory resident applications that can take full advantage of DOS capabilities. With simple function calls, you can schedule a Turbo C function to execute either when a "hot key" is pressed or at a specified time.

◆ **RESIDENT SOFTWARE SUPPORT** lets you create, detect, and remove resident utilities that you write with Turbo C TOOLS.

◆ **FAST DIRECT VIDEO ACCESS** for efficiency, and support for all monitors including EGA 43-line mode.

◆ **DIRECTORY AND FILE HANDLING** support let you take advantage of the DOS file structure, including volume labels and directory structure.

In addition to Turbo C TOOLS, MicroWay has a full line of support products for Microsoft, Lattice and Datalight C, Microsoft Pascal and Turbo Pascal. Call today for details, and make magic!

Turbo C TOOLS supports the Borland Turbo C compiler, requires DOS 2.00 or later and is just $328.00

E BLAISE
E N U

Turbo POWER TOOLS PLUS
Screen and window management including EGA support; DOS memory control; ISRs; scheduled intervention code; and much more. For Turbo Pascal.

Turbo POWER SCREEN
COMING SOON! General screen management; paint screens; block mode data entry or field-by-field control with instant screen access. For Turbo Pascal.

Turbo ASYNCH PLUS — $281
Interrupt driven support for the COM ports. I/O buffers up to 64K; XON/XOFF; up to 9600 baud; modem and XMODEM control. For Turbo Pascal.

PASCAL TOOLS/TOOLS 2 — $374
Expanded string and screen handling; graphics routines; memory management; general program control; DOS file support and more. For MS-Pascal.

C TOOLS PLUS — $374
Windows; ISRs; screen handling; multiple monitors; EGA 43-line text mode; direct screen access; DOS file handling and more. For MS and Lattice C version 3.00 and later.

LIGHT TOOLS — $328
Windows; ISRs; EGA 43-line text mode; direct screen access; DOS file handling and more. For the Datalight C compiler.

ASYNCH MANAGER — $374
Full featured interrupt driven support for the COM ports. I/O buffers up to 64K; XON/XOFF; up to 9600 baud; modem control and XMODEM. For C or MS-Pascal.

VIEW MANAGER — $525
General screen control; paint screens; block mode data entry or field-by-field control with instant screen access. For C or MS-Pascal

RUNOFF — $170
Text formatter for all programmers; flexible printer control; user-defined variables; index generation; general macro facility. Crafted in Turbo Pascal.

EXEC — $246
NEW VERSION! Program chaining executive. Chain one program from another in different languages; specify common data areas; less than 2K of overhead.

TO ORDER CALL
(03) 555 4544
FAX (03) 555 9871

YES! I want to make magic!
Enclosed is $______ for ______ copies of ______
☐ Please send me more information on your products.
Add $7.00 for overnight freight.
Name: ______ Phone: (____) ______
Address: ______
City: ______ State: ______ Postcode: ______
VISA or MC#: ______ Exp. Date: ______

Turbo C is a trademark of Borland International.

microway™ SOFTWARE & HARDWARE

MicroWay is the exclusive Australian distributor of Blaise Computing products.

292 Chesterville Road, Moorabbin, Victoria 3189. Australia
Telephone (03) 555 4544. Fax (03) 555 9871. Telex AA30625 (ME2322)

Data compression competition

APC's tutorial series for the Microsoft $30,000 programming competition continues this month as it examines some of the well established techniques used in many commercial products.

Sponsored by Microsoft®

Many of the most effective compression strategies are reliant upon the software possessing a detailed understanding of the data at hand. Initially these application dependent techniques may not seem to be of any use to a generalised compression system. However, they are worthy of brief examination, even if only because of the other ideas they might stimulate.

To impose a layer of compression over the top of an existing application system, one must first presuppose that the application software is generating its own redundancy or inefficiency. If this seems an unlikely state of affairs, then just dump a dBase database in hexadecimal. Unfortunately (or fortunately, depending on how you look at it), many commercial application systems generate high levels of disk inefficiency, and dBase is just one at which we will look.

dBase stores its numeric fields in the database as a series of displayable ASCII digits. For example, the number 123 is stored as '123'. No fancy coding, no IEEE 64-bit real representation, just plain ASCII characters. Clearly this implies that dBase spends much of its time converting numeric quantities from ASCII to real and back again, perhaps explaining why its performance is less than desirable in some circumstances. The importance of this for our purposes, however, is that numeric values occupy twice as much space as they really need to.

Numeric constants consist of the characters '0' through to '9', '–', '.' and one or two others in special circumstances. Using a very standard alternative form of representation called packed decimal, the number of bytes occupied by a numeric value of any size can be reduced by 50 per cent. This is achieved by using the high and low nybbles of each byte to represent one digit position each. Thus a field which may contain up to ten numeric digits would consume only five bytes instead of ten. The conversion is a simple one, extremely fast and totally reliable.

dBase indexes are not exempt from inefficiency. Numeric quantities in the b-tree index structure are represented in IEEE 64-bit real format, which indicates a real design problem within the product, but that's another story.

The nature of a b-tree index is such that at every node at every level throughout the index, there will be two pointers. One points at the next level in the index, and the other contains a pointer to the data record. At non-leaf nodes, the index pointer will be used. At leaf nodes, the data pointer will be used. The two pointers are never both used at the same time.

Each pointer is four bytes in length. For indexes numeric fields, the IEEE representation of the number is eight bytes. Thus the total length of a node entry is 16 bytes when it really only needs to be 12 plus a flag to indicate whether the pointer is a node or data pointer. The dBase designers could have quite satisfactorily made space for the flag by supporting only 2 billion index entries instead of the current 4 billion.

Of course, dBase has been written the way it is, and no amount of 20/20 hindsight can alter the fact. However, the example does serve to illustrate that commercial products do generate redundancy, thereby creating an opportunity for its elimination by compression schemes.

Some readers may choose to approach the problem by creating a series of highly specialised compressors designed to deal with specific types of file. For example, you may elect to construct Multimate, Lotus 1-2-3, dBase and .EXE compressors, transparently selecting between them internally. This may not be the best way to go. Rather, you might get better value from the examples of specific product inefficiency by constructing a generalised (although possibly multi-faceted) compression system and verifying that it can capitalise on all or most of these areas.

Some application systems choose to represent dates in grossly inefficient ways, for example, '10 Jan 1988'. Dates can very effectively be represented as the number of days since the year zero, and this would require only three bytes of storage to cater for up to the 459th century. The allowable date range could be shortened, or a fourth byte added, to claim some spare bits to represent the decoded format of the date, for example, month numbers or month names, upper case only or mixed case, DDMMYY, MMDDYY or YYMMDD. The only real shortcoming with this scheme is that only valid dates may be compressed. It could be argued that any application system of any worth should only allow valid dates to find their way into the database. It is perhaps a better argument that invalid dates could be handled by the exception rules.

One particularly cute system is specifically tailored for high volumes of sorted data, for example, the names in a telephone book. The system relies upon recognising that the front portions of the sorted records will be greatly similar between consecutive records. The similar portion can be replaced with a single marker showing how many characters should be utilised from the preceding record. Fig 1 illustrates this technique. As you can see, the approach only works when the data is sorted, and only works when a very large volume of data is involved, as otherwise there will rarely be repeated prefixes. Turning to any page of your local telephone book will amply demonstrate how effective this approach can be when the data is right.

Moreover, the approach only works when the data is being read sequentially, as a random access into the file will require that the data be read backwards until the prefix is fully resolved. Initially these limitations may seem to be so severe as to render the approach useless. However, there is one common scenario in which the data is sorted and always read in a semi sequential fashion, that being b-tree indexes. Again, this is a technique which could effectively be built into an application at design time, but is very hard to add on later.

For name-based applications, it has been estimated that a table of 128 surnames would encompass 80 per cent of all surnames encountered in real life, even in a multinational environment such as Australia. A table of 256 surnames would cater for 90 per cent of all surname occurrences, with the exceptions being dealt with separately.

Other techniques which utilise a high degree of application knowledge may perform compressions such as converting one byte boolean flags to 1-bit flags, or recognising that given bytes may only contain a particular subrange of values. Immediately the system can resolve some form of record based orientation, a whole new range of opportunities are created.

Thus the best place for a compression system to reside, in terms of the absolute maximum effectiveness possible, is within the application, as part of the application and drawing on all of the available application knowledge. However, most application developers have other considerations on their minds, and so we are left with the need for generalised schemes.

Rerepresentation

We have said that simple algorithmic preprocessing can serve to transform difficult blocks of data into a far more compressible form. It is also true that higher degrees of compression may be achieved by first converting the data into a far more redundant form, that is, larger.

Very simple methods exist for increasing the redundancy in a block of data, for example, duplicating each byte. These methods gain little. What is real-

Original	Compressed
JONES, ALBERT.	JONES, ALBERT.
JONES, ALFRED.	9FRED.
JONES, B.	6B.
JONESTON, GEORGE.	5TON, GEORGE.
JONESTON, XAVIER.	10XAVIER.
JOPLIN, BERT.	2PLIN, BERT.
KAPLIN, SALLY.	0KAPLIN, SALLY.

Fig 1 Suppression of similar record prefixes

14 INCH FLAT SCREEN

IBM PC COMPATIBLE MONOCHROME MONITOR

This is the monitor you've been looking for. It gives you everything you require of a top quality monitor, and it is compact and stylish in design. Furthermore, it is IBM PC compatible and meets the most important agency standards. Contact us right away for a winner to boost your sales!

MAIN FEATURES:

- Flat screen, non-glare, dark glass, flicker-free, ultra high display quality.
- Compact, stylish, ergonomic cabinet with tilt and swivel mounting.
- Power on-off, contrast and brightness controls at front.
- Compatible with IBM PC, XT, AT* and other popular systems.
- Proven hardware reliability in compliance with most important agency standards.

Distributors & Dealers Wanted

VM-1400

EGA Models now available

DIGITAL RESOURCES PTY LIMITED

169 Phillip St., Waterloo, N.S.W. 2017, Australia

P[illegible] (02) 690 1268 — 690 1540 Fax: (02) 699 9636 Telex: AA75406

* IBM is a Registered Trademark of International Business Machines Corporation

ly required is a totally different representation of the data which may serve to open up opportunities not previously available.

One of the best ways to rerepresent the data is to draw on database inverted file techniques. Rather than in a positionally dependent fashion list the bytes values which occur, we can instead in a byte value dependent fashion list the positions in which they occur. We can, for example, form a matrix whose dimensions are the 256 possible byte values by the size of a block, for instance 512. The elements of the matrix then become a bit-map showing where each value occurs. This is shown in Fig 2. Naturally, only the elements of the matrix need to be stored at one bit per entry, as the details of each dimension will always be known.

The resultant matrix is incredibly inefficient, absolutely packed full of redundant information. Moreover, the matrix is 'sparse' and can therefore be processed using standard sparse matrix techniques. The point is, however, that the data has now been completely rerepresented, and the patterns formed by the bits will be significantly different from those formed

```
ORIGINAL BLOCK
          --------------------------------------------------
          !  12  01  0F  FF  0C  01  0D  0A  0F  02         !
          --------------------------------------------------
 BIT MAP                    Byte offset

           001  002  003  004  005  006  007  008  009  00A       1FF
           ------------------------------------------------- ... -----
      01 !       Y                   Y
      02 !                                               Y
      03 !
B     04 !
y     05 !
t     06 !
e     07 !
      08 !
V     09 !
a     0A !                                     Y
l     0B !
u     0C !                      Y
e     0D !                                Y
      0E !
      0F !            Y                             Y
      10 !
      11 !
      12 !  Y
       .
       .
       .
      FF !                 Y
           ------------------------------------------------------------
```

Fig 2 Rerepresentation of a block of data as a bit map

Win with the

It's been a hard-fought game.
The **breakthrough** you've
been waiting for has come.

TVM's **FULL HOUSE ♠™.**

Whatever your **Computer** type . . .
Whatever your **Brand** of PC . . .
Whatever your PC Video **Card** . . .
Whatever your **Software** . . .
Whatever your **Upgrade** task . . .
Whatever your **Future** needs . . .
Whatever your **VCR,** Video Disk . . .
Whatever your **Location** . . .
Whatever your **Budget** . . .

. . . **TVM,** World Leaders in Monitor technology, have produced the All-new, **ALL-IN-ONE*** Multisync/2 **MD-11®** Colour & **MM-11®** Mono 3rd Generation Multisync Monitors. Now both **in stock,** together with the **EGAMAX-860** Card, they offer the Ultimate in Compatibility*.

They **fully** support:

* **VGA** Analogue (New IBM PS/2)
* **Apple Macintosh II** & Mac SE
* New CAD/CAM **800 x 600** Std **132 x 45,**32,29,25 or **80 x 66** Text. With window driven utilities and ALL Drivers for **GEM, VENTURA, PageMAKER, AutoCAD, Symphony, Lotus, WINDOWS, Framework II, Wordperfect, Wordstar.**
* **PGA,** EVA/TGA/GENOA **640 x 480**
* EGA 640 x 350, **VEGA** 752 x 410
* **Olivetti-AT&T CGAII 640 x 400**
* **CGA 640 x 200, Hercules,** MDA
* **IBM 3270** (Models 2, 3, 4 & 5)
* **PAL/NTSC** Composite Video/Audio

by the original data stream, and this may lead to better compression ratios than would otherwise be achieved by applying standard techniques to the basic data.

Alternative coding

The two main character sets in use today are ASCII and EBCDIC, but it is interesting to note that a very old code with roots back to 1874 called the Baudot or Murray code offers an alternative form of character encoding implemented through bytes of less than eight bits.

The original Baudot code utilised 5-bit bytes, with the meaning of each byte changing according to the current mode. The mode was selected through two special 'shift' characters, and one mode was reserved for letters while the other was used for figures and punctuation. A small number of characters were the same in both modes, thereby providing good throughput for common codes without the overhead of transmitting the shift characters. The Prestel-based telesoftware protocol such as is used on Viatel uses a very similar approach.

The code was designed for textual transmission only, supporting a total of 58 character codes in five bits. However, the concept can be expanded to utilise more than two shift modes and therefore support a full character set of 256 codes. Using a 5-bit byte, this would involve dedicating 16 values to being shift markers, which would greatly reduce the effectiveness of the scheme. A 6-bit approach, however, would only require five shift codes and would be far more practical.

The efficiency of the coding scheme depends on the grouping of the 256 possible byte values into shift ranges, as the transmission of a shift code greatly reduces the throughput. The worst case is where each character must be preceded by a shift, and would make the effective byte length more like 12 bits.

The average number of characters between shifts will depend on how well the distribution of byte values in the data stream conforms to the ideal as expressed by the allocation of byte values into the shift groups. In other words, the type of file. This can be dealt with by providing the system with a collection of shift group tables to use in different circumstances. The textual table, for example, would concentrate the displayable characters together and might bear some similarity to the original Baudot code. The system could evaluate which profile works best for a given block of data and include some indication of which profile should be used for decompression purposes.

Variable length bytes

Compression relies on one of two forms of redundancy to be present in the input data stream. One is where certain patterns can be detected and utilised, for which we have already looked at a number of approaches. The other is where the distribution of possible byte values is highly skewed, that is, on average over a given substantial portion of the data stream, not all byte values occur approximately the same number of times. We have also said that this is a remarkably common situation, as very simple statistical analysis of the average hard disk will reveal.

A well established and commercially utilised technique for exploiting highly skewed character distributions is the 'Huffman' code. This scheme employs a different number of bits to represent each character, dedicating the shortest bit patterns to the most commonly occurring byte values.

The clever part of the scheme is that the codes are constructed such that no delimiter is required to indicate where one code finishes and the next begins. The key is to ensure that each character code does not correspond to the prefix of another. Fig 3 shows a sample portion of a Huffman coding system, along with the assumed relative frequency of each character being encoded.

For example, the most common character could be represented by a single bit, '0'. No other character codes may now begin with a zero as this would cause unmanageable ambiguity during decoding. The second most common character could then be represented by two bits, '10'. Subsequent characters would then be encoded in longer bit streams, '110', '111' and so on.

The effectiveness of the coding system can be easily and accurately calculated by multiplying the frequency of occurrence by the number of bits for each character, and summing over the entire character set, that is:

$$\sum_{i=\emptyset\emptyset}^{FF} [F_i * L_i \ / \ 100]$$

Where F is the percentage frequency of occurrence and L is the length of the corresponding Huffman code. In an average, well skewed environment, the effective average number of bits per character given by the above formula should work out to be well under four, sometimes as low as 2.5.

Clearly the performance of a Huffman coding system will depend greatly on how well the skewing of the data matches the expected skewing as reflected by the construction of the code table. However, even within the one skew profile, various configurations are available for the code table which will yield different results. Conceptually, the idea is to match the gradient of the skewing curve to the

Character	Frequency	Code	Number of Bits
0	55.0%	0	1
1	6.7%	100	3
2	4.5%	101	3
8	3.5%	11000	5
3	3.3%	11001	5
A	3.2%	11010	5
5	3.0%	11011	5
6	2.7%	111000	6
4	2.7%	111001	6
9	2.2%	111010	6
7	1.9%	111011	6
F	1.5%	1111000	7
B	1.2%	1111001	7
Blank	1.1%	1111010	7
D	1.0%	1111011	7
E	0.9%	11111000	8
	.		
	.		
	.		
@	0.001%	11111111111111001	17

Fig 3 Sample Huffman coding system

244 ➤

Interior design

A database may be the answer to your prayers, but don't assume that it's an instant solution to all your filing problems. Design and implementation is often an intricate and long drawn-out process. Nick Walker guides you through the design stages involved.

Microcomputers, whether for home or business use, are ideally suited to the storage and fast retrieval of data. It is hardly surprising, therefore, that one of their most popular uses is for database management: small home users frequently need to create an index of software or a record collection; while business users commonly expect the machine to cope easily with stock control, payroll and accounts.

However, the reality of creating a database can come as a complete shock. Writing your own database from scratch could take many years and commissioning a consultant to create one usually costs many times more than the hardware purchased. As a result, the solution for most people is to use one of the many database application generators such as dBase III, Omnis Quartz or Reflex. These programs promise the easy creation of a customised database application for little more than the cost of a decent word processor.

Look before you leap

If you were to believe the advertising of the database generator manufacturers, creating a database consists of: installing the software at 9am, creating the database before lunch, debugging if for an hour in the afternoon and then spending the rest of the afternoon training end-users. Although this may be a slight exaggeration, there is no doubt that these packages tempt you into designing a database in the same way that you might consider writing a letter on a word processor. Unfortunately, it doesn't take long to realise that creating any decent-sized database can easily take several months and that you would pay dearly for any wrong assumptions made in the early stages of database design.

This article describes some of the techniques I've used in the creation of database systems. I openly admit that the majority of these techniques were 'pinched' from other sources — though a couple were discovered the hard way. It was partly the fact that I could

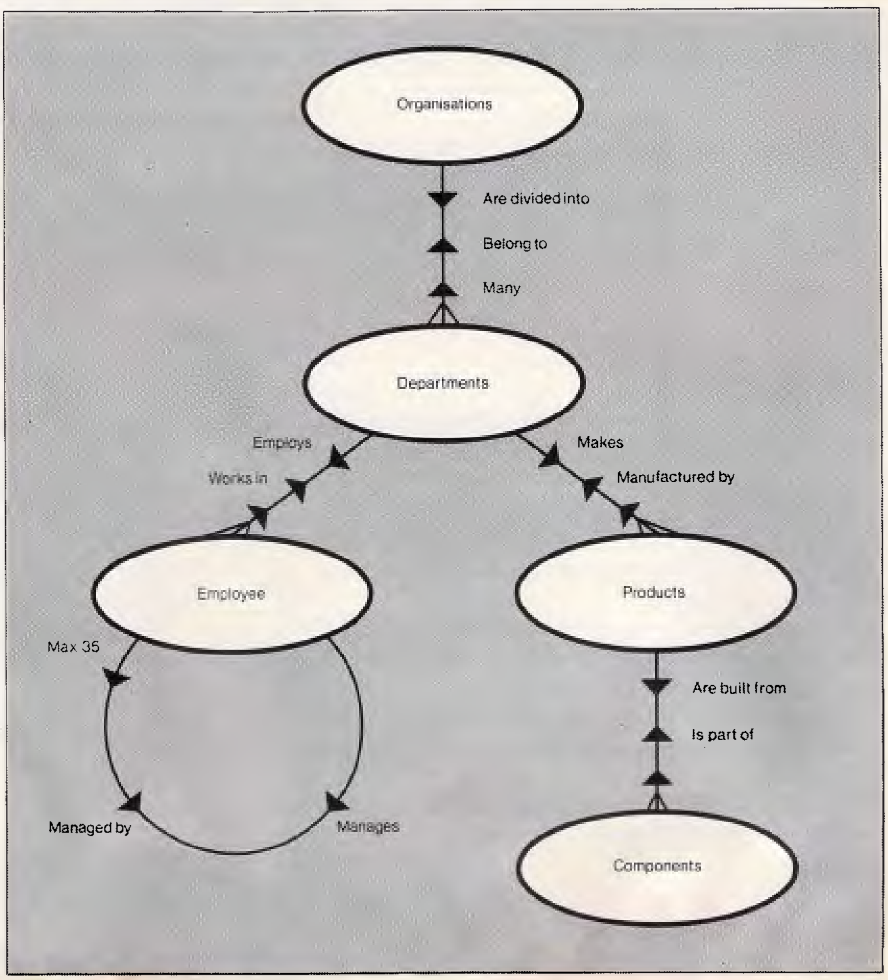


Fig 1 Organisational chart used to describe the application area

find *no single source* to solve these problems that inspired me to write this article. This is not a textbook formula for creating a database and not all the techniques presented here will be appropriate to your particular application. I've assumed a basic knowledge of what a database generator is capable of and I've tried not to use the sort of trivial examples that make a technique more powerful than it actually is.

Overview

Typically the design of a database can be broken down into six stages:

- 1 Description of the application area
- 2 Determination of data to be modelled
- 3 Determination of relationships between data
- 4 Privacy and data integrity
- 5 Back-up and recovery procedures
- 6 Hands-on use of the database generator

- **1 DESCRIPTION OF THE APPLICATION AREA**

The description of the application area is the most abstract element in the creation of a database and yet probably the most important one. The whole object is to define the system in some 'hardcopy' form without any reference to the 'computerised' form it will eventually take. Don't think of records, updates or files but entities and the relationships between entities. What you are trying to do is define a limiting 'world' in which the application exists. Using this as the basis of your design stops irrelevant objects creeping in later. There seem to be no hard and fast rules for generating this description except that it should consist of

Product number	Product name	Price	Category
103	Lego	12.95	Building
490	StickleBrix	7.99	Building
138	Action Man	14.50	Dolls
490	Transformers	3.95	Models
197	Action Man	0.75	Comics
^ Index			

Fig 2 Table showing Third Normal Form (TNF) technique

Customer table	Postal area table
Customer code (Index domain)	Post code (Index domain)
Customer name	Region
Customer address	
Post code	

Fig 3 Table showing foreign index technique

easily comprehensible text and diagrams. Three things you should definitely consider are:

- the entities involved: for example, employees, department, products, components;
- the relationships between the entities: for example, employees work in departments, products are made of components; and, finally,
- constraints: for example, if employee X works under employee Y and employee Y works in department Z, then employee X must also work in department Z.

Remember that what you are describing is the real situation, not the data that will model it. (A diagram such as that shown in Fig 1 may help to present a clearer picture.)

Many people still prefer to hold all these details in their heads, but the benefits of setting them down on paper are:

- it's easier to spot and cut out any ambiguities;
- you can use the description to get early feedback from the potential users of the system;
- after the database has been designed it can be used to introduce new users to the system; and finally,
- if you want to create a similar system at some later date, it will help you identify any fundamental differences.

One of the problems in creating such a description is in getting all the users to agree that what you have created reflects the *real* situation. This is largely due to exceptions that every organisation seems to allow to override general rules. For example, it might be true that an employee has only one manager but there might be a special exception in the case of secretaries. Although such exceptions complicate the picture, it is better that they are identified early.

• 2 DETERMINATION OF DATA TO BE MODELLED

Now that an application universe has been defined, the next step is to identify which parts of the application area should be represented by data, and when and how this data should be presented to the user. I am not aware of any techniques for doing this, but the important thing to remember is to stay within the application area. Try to forget any other knowledge of the situation being modelled.

Once the required data has been identified, it will be necessary to produce a definition and classification for all the

Third Normal Form analysis

Third Normal Form analysis is a method of reducing a vast amount of data into separate and relevant tables, each with a unique index. These tables can then be used as the basis for your database file structure. The steps involved in finding the third normal form are simply methodical ways of finding the index in the construction of tables. The starting point is of course the data of the system. The best way of following each step is to take an example data set and obscure the relationships between the *actual* data. The five steps involved are:

1 organise the data into basic tables known as 'unnormalised' tables;
2 transform the unnormalised tables to First Normal Form (FNF);
3 transform the FNF tables to Second Normal Form (SNF);
4 transform the SNF tables to Third Normal Form (TNF); and,
5 optimise all the TNF tables.

An example of these steps follows:

Step 1 Organise the data as unnormalised tables

The sales record of a product broken down by last customer order is shown below and makes a good starting point for an example of normalisation.

Product number: 490 **Product category:** Models
Product name: Transformers

Customer number	Customer name	Post code	Region	Date of last order	Quantity of last order
3454	Jones	2000	Central	12/3/87	20
1689	Smith	2088	North	07/5/87	37
6000	Duffy	2026	East	09/6/87	25
3550	Clark	2500	South	09/9/86	3

The following table shows how combining two or more product sales reports can form an unnormalised table.

Product number	Product category	Product name	Customer number	Customer name	Post code	Region	Date of last order	Quantity of order
490	Model	Transformers	3454	Jones	2000	Central	12/3/87	20
490	Model	Transformers	1689	Smith	2088	North	07/5/87	37
490	Model	Transformers	6000	Duffy	2026	East	09/6/87	25
490	Model	Transformers	3550	Clark	2500	South	09/9/86	3
103	Building	Lego	9362	Roberts	2150	West	24/5/87	12
103	Building	Lego	3454	Jones	2000	Central	23/9/87	5
103	Building	Lego	4513	Howard	2026	East	06/2/87	120

Step 2 Remove repeating groups

The data items that repeat are placed in a separate table as below:

Product number	Product category	Product name
490	Model	Transformers
103	Building	Lego
^ Index		

The index of this table is then combined with the index of each table that contained the repeating index to form a combined index. In our example the index product number is added to customer number to form a combined key, while product category and name form can only be found in the separate table.

Product number	Customer number	Customer name	Post code	Region	Date of last order	Quantity of last order
490	3454	Jones	2000	Central	12/3/87	20
490	1689	Smith	2088	North	07/5/87	37
490	6000	Duffy	2026	East	09/6/87	25
490	3550	Clark	2500	South	09/9/86	3
103	9362	Roberts	2150	West	24/5/87	12
103	3456	Jones	2000	Central	23/9/87	5
103	4513	Howard	2026	East	06/2/87	120
^	^					

(Combined index)

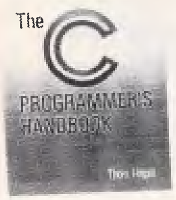
Continued . . .

008 335757 TOLL FREE MAILORDER HOTLINE FOR CREDIT CARD ORDERS! LOCAL ORDERS & INQUIRIES CALL (03) 543 7877

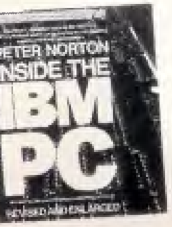
Rod Irving Electronics
The cheaper alternative...

IBM PC TROUBLESHOOTING & REPAIR GUIDE
-Robert C. Brenner
Keep your IBM PC in top operating condition with this handy reference book. Inside you will find pages of schematics, photos and block diagrams to help you identify problems. Simple instructions tell you what's wrong and how to fix it fast.
- Make most repairs with few or no tools
- Quickly zero-in on a malfunctioning component
- Reduces downtime
- Pays for itself many times over in repair savings
- Easy to understand circuit diagrams.

The IBM PC Trouble Shooting & Repair Guide will make even the computer novice feel comfortable with the complex world of electronic trouble shooting. This fully illustrated book is recommended for anyone who uses an IBM PC.
Cat.B **$44.95**



THE C PROGRAMMER'S HANDBOOK
-Thom Hogan
While other books will tell you how to learn C, this one shows you how to use it. It's a literal encyclopedia of the information you'll need to get it to work for you, efficiently and effectively. Handy and well organized, it gives you quick access to the things you need, when you need them, plus a clear definition of C language with examples and explanations of restrictions and defaults. You won't find an approach this understandable and objective anywhere else.
B20120 .... **$39.95**



INSIDE THE IBM PC
(Revised and expanded edition)
-Peter Norton
T. e widely acclaimed guide to the IBM PC's inner workings. The latest edition now covers every model of the IBM micro: PC, XT and AT, and every version of DOS from 1.1 to 3.0
B20080 .... **$44.95**

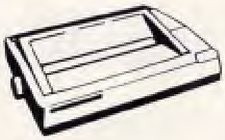
CP/M PROGRAMMER'S ENCYCLOPEDIA
-Bruce Brigham
The CP/M Programmer's Encyclopedia is a time saving, comprehensive reference for serious CP/M users. Covering all the commands and syntaxes for CP/M 2.x and CP/M 3.0, this encyclopedia gives you the information you need in an easy-to-use format especially designed for programmers. The CP/M Programmer's Encyclopedia is the only major compilation of CP/M commands and syntaxes. If you use CP/M extensively, you should not be without this important reference guide.
Cat.B **$39.95**

UNDERSTANDING UNIX
-James R. Groff, Paul N. Weinberg
This exploding popularity of the UNIX operating system is one of the most important trends in computing in the 1980's. UNIX is available on hundreds of different computers, ranging from personal computers to mainframes and supercomputers. *Understanding UNIX* offers an overall perspective on UNIX, including a discussion of where UNIX fits in the worlds of computing, business, and education. Individual chapters address the UNIX structure, file system, multiuser capability, specific applications tools, and more.
"A book that balances scope with depth; comprehensiveness with brevity." -Alan Kaplan
Cat.B21240 .... **$44.95**

HANDS ON
Practical tips and useful programs for IBM PC's from the editors of PC World
A collection of the best tips, programs, and routines for IBM computers from the popular "Hands on" and "." columns. Covering both hardware and software, the book is organised so that you can quickly find information on virtually everything you need to know.
B20100 .... **$34.95**

PANASONIC KX-P1081 DOT MATRIX PRINTER
- 120 C.P.S.
- Pica or Elite character set
- Print Modes: NLQ, Dot Graphics, Proportional Font, Draft
- Proportional Printing
- Reliable and Compact
- Proportional Printing
- Logic Seeking
- 1K Printer Buffer

Cat. C20035 .... **only $595**



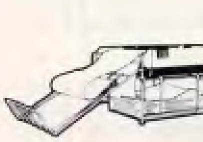
CPA-80 DOT MATRIX PRINTER
- 100 C.P.S.

.... **only $375**

CANON A-50 PRINTER
- Serial Impact Dot Matrix
- 180 C P S
- Near Letter Quality Mode
- 1.4K Buffer

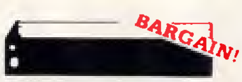
Cat. C20045 .... **$595**

COMPUTER PAPER
Quality paper at a low price! 2,500 sheets of 60 gsm bond paper.
Cat. C21003 11 x 9 1/2" **$49.95**
Cat. C21005 15 x 11" **$67.95**



PAPER TAMER
- Restores order to the top of your desk or work area
- Made of white plastic coated steel
- Stores up to 900 continuous sheets
- Allows perfect paper feed
- Allows easy examination of print out

C21050 (10") .... **only $49.95**
C21050 (15") .... **only $79.95**
(Printer and paper not included)



PRINTER RIBBONS
CP80, BX80, DP80, BX100, MB100
ALL A CRAZY LOW $9.95

PRINTER RIBBONS TO SUIT EPSON MODELS...
MX100, FX100, RX100
(Cat. C22002) **$19.95**
MX70/80, FX70/80, RX70/80
(Cat. C22031) **$10.95**

2 & 4 WAY RS232 DATA TRANSFER SWITCHES
If you have two or four compatible devices that need to share a third or fifth, then these inexpensive data transfer switches will save you the time and hassle of constantly changing cables and leads around.
- No power required
- Speed and code transparent
- Two/Four position rotary switch on front panel
- Three/Five interface connections on rear panel
- Switch comes standard with female connector

2 WAY Cat.X19120 only $59
4 WAY Cat.X19125 only $79

2 & 4 WAY CENTRONICS DATA TRANSFER SWITCHES
Save time and hassles of constantly changing cables and leads around with these inexpensive data transfer switches. These data switches support the 36 pin centronic interface used by Centronics, Printronics, Data Products, Epson, Micronics, Star, and many other printer manufacturers.
- No power required
- Speed and code transparent
- Two/Four position rotary switch on front panel
- Three/Five interface connections on rear panel
- Switch comes standard with female connector
- Bale locks are standard

2 WAY (X19130) only $59
4 WAY (X19135) only $79

VERBATIM DATALIFE DISK DRIVE ANALYZER
Automatically tests 4 critical areas of drive performance

Disk drives are delicate instruments. And when they get out of adjustment, the integrity of your data is jeopardized.

With the Datalife Disk Drive Analyzer, you will know the exact condition and accuracy of your drives and avoid losing or damaging your valuable data.

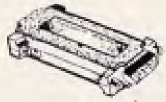
Tests 4 critical areas...
In just minutes, the Datalife Disk Analyzer tests your drives' radial alignment, speed, write/read ability and clamping accuracy. And for each of these areas, it analyzes whether your disk drive is in good condition, fair condition or might need service.

If service is required, you can also use the Disk Drive Analyzer afterwards to ensure that the work was done properly.

No technical knowledge or special tools needed...
Everything you need is in this package. All you do is place the preprogrammed Disk Drive Analyzer in the drive to be tested, and select from the display screen menu the test or tests you want. And you can perform each test separately or have them all run automatically in just minutes.

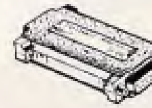
Your data is worth protecting...
Your flexible disks represent a valuable investment of time and money. The data they carry may be difficult or time consuming to replace. That's why it's vital to know the exact condition of your drives.

With the Datalife Disk Analyzer, that's a quick and easy task. If you value your data, you can't afford to be without it.
C12525 IBM* PC/XT **$59.95**
C12530 Apple* **$59.95**



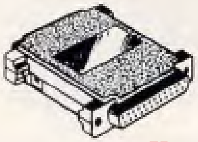
DB9 GENDER CHANGERS
- Saves modifying or replacing non mating DB9 connections
- All 9 pins wired straight through

X15640: Male to male
X15641: Male to Female
X15642: Female to Female
.... **only $14.95**



DB15 GENDER CHANGERS
- Saves modifying or replacing non mating DB15 connections
- All 15 pins wired straight through

X15645: Male to male
X15646: Male to Female
X15647: Female to Female
.... **only $14.95**



RS232 GENDER CHANGERS
- Saves modifying or replacing non-mating RS232 cables.
- All 25 pins wired straight through

Cat. X15650 **Male to Male**
Cat. X15651 **Male to Female**
Cat. X15652 **Female to Female**
Normally $14.95 each
Only $9.95

CENTRONICS GENDER CHANGERS
- Female to Female.
- Saves modifying or replacing non-mating Centronics cables.
- All 36 pins wired straight through.

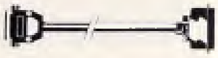
Cat. X15663 **Male to Male**
Cat. X15661 **Male to Female**
Cat. X15664 **Female to Female**
Normally $33.95,
Only $24.95

RS232 INLINE SWITCHING BOX
- 25 pin "D" plug to 25 pin "D" socket
- DIP switches allow easy switching of internal wiring

Cat X15662 .... **$32.95**

RS232 WIRING ADAPTOR BOX
- Male to female
- 25 Detachable plug on leads
- 2 mini jumpers
- Ideal for experimenting or temporary connections

Cat. X15665 .... Normally $49.95
Only $44.95



PRINTER LEAD FOR IBM*
- Suits IBM* PC XT and compatibles
- 25 pin "D" plug (computer end) to Centronics 36 pin plug

Cat.P19029 1.8 metres ... **$17.95**
Cat.P19030 3 metres ... **$22.95**

SEMICONDUCTORS!
Always check our prices before you buy!

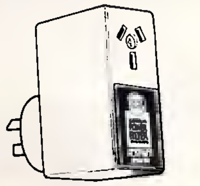
	1-9	10+	100+
2114	$2.95	$2.75	$2.50
2716	$9.95	$9.50	$8.95
2732	$8.95	$8.50	$7.95
2764	$7.95	$7.50	$6.95
27128	$9.95	$8.95	$7.95
27256	$11.50	$10.50	$10.00
27512	$19.50	$18.50	$17.50
4116	$3.95	$3.50	$2.95
4164	$3.95	$2.95	$2.75
41256	$7.95	$6.95	$5.95
5558pin	$0.50	$0.40	$0.35
6116	$3.95	$3.75	$3.50
6264	$7.95	$8.95	$6.50
6802	$5.00	$4.00	$3.75
6821	$2.00	$1.80	$1.70
6845	$5.00	$4.00	$3.75
7406	$0.40	$0.30	$0.25
INS8250	$29.95	$27.95	

NE5534AN
1-9	10+	100+
$1.95	$1.85	$1.75

AM/EF 7910
WORLD MODEM CHIP
1-9	10+
$19.95	$17.95

MEL9501
Have you blown up your Apple drive by plugging it in backwards or not turning off the power while changing boards? We have the MEL9501 chip!
SPECIAL, ONLY $29.95

8087
Genuine Intel chips with manual and data sheets packed in boxes!
8087-3 (4.77MHz) **$269**
8087-2 (8MHz) **$385**
8087-1 (10MHz) **$585**
80287-6 (6MHz) **$475**
80287-7 (8MHz) **$679**



CPF CONTINUOUS POWER FILTER SPIKE ARRESTOR
The Fortron CPF Filtered Electronic Spike Protector provides a protective electronic barrier for microcomputers, printers, telephone systems and modems electronic typewriters, audio and stereo systems and other sensitive electronic equipment.

The CPF provides protection from dangerous electrical spikes that can cause anything from obvious damage (like immediate equipment failure) to less obvious harm that can drastically shorten a system's life.

CPF's superior circuitry design and semi conductor technology responds instantly to any potentially damaging over-voltage, ensuring safe trouble free operation.

Additionally, CPF's filtering capability helps eliminate troublesome and annoying interference, general hash created by small motors, fluorescent lamps, and the like that threaten the performance and shorten equipment life of unprotected electronic components.

SPECIFICATIONS:
Electrical rating: 220-260 volts (AC) 50Hz 10 Amp
Spike/RFI Protection: 4,500 amps for 20m/second pulses
Maximum clamping voltage: 275V differential mode.
Cat.X10088 .... **$69.95**

008 335757 TOLL FREE MAILORDER HOTLINE FOR CREDIT CARD ORDERS! LOCAL ORDERS & INQUIRIES CALL (03) 543 7877

SAMSUNG 12" FLAT SCREEN COMPOSITE MONITOR

FEATURES....
- Flat, high contrast, non-glara screen
- High resolution, 80 or 40 character display
- Tilt/swivel base
- Compatible with Apple* and IBM* colour composite signal

SPECIFICATIONS....
Picture tube: 12" diagonal and 90° deflection
Phosphor: Available in Green or Amber
Video input signal: Composite Signal
Polarity: Negative Sync
Level: 0·5-2·0Vp-p
Impedance: 75ohm
Scanning frequency:
Horizontal: 15.734 KHz + −0·1%
Vertical: 50-60Hz
Video bandwidth: 20MHz
Active display area: 216(H) x 160(V)mm.
Display character: 80 character x 24 rows.
Input terminal: RCA Phono Jack.
Controls:
Outside: Power Switch, Contrast, Brightness, H-Shift, V-Size.
Inside: H-Width, H/V hold, H/V linearity, Focus.
Power supply: 110/120V 60Hz, 220/240V 50Hz
Dimensions: 310(W) x 307(H) x 300(L)mm
Weight: 8·1 Kg
Shipping weight: 9·6 Kg

Cat.No.	Description	Price
X14510	(GREEN)	$249
X14512	(AMBER)	$249

SAMSUNG 12" 20MHz COMPOSITE MONITOR ONLY $149

FEATURES....
- High contrast, non-glare screen
- High resolution, 80 or 40 character display

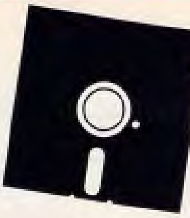
SPECIFICATIONS....
Picture tube: 12" diagonal and 90° deflection
Phosphor: Available in Green (P39) or Amber
Video input signal: Composite Signal
Polarity: Negative Sync.
Level: 0.5V-2·0Vp-p
Scanning frequency:
Horizontal: 15.734 KHz + −0·1%
Vertical: 60Hz
Video bandwidth: 20MHz
Active display area: 216(H) x 160(V)mm.
Display character: 80 characters x 25 rows.
Input terminal: RCA Phono Jack
Controls:
Outside: Power Switch, Contrast, Brightness, H-Shift, V-Size.
Inside: H-Width, H/V hold. H/V linearity, Focus.
Power supply: 110/120V 60Hz, 220/240V 50Hz
Dimensions: 308(W) x 307(H) x 297(L)mm
Weight: 7·3 Kg
Shipping weight: 8·3 Kg

Cat.No.	Description	Price
X14514	(GREEN)	$149
X14516	(AMBER)	$149

VERBATIM DISK SPECIALS!

All prices 10 disk boxes!

Description	1-9 boxes	10+boxes
5¼" 1S/2D	$24.95	$22.50
5¼" 2S/2D	$29.95	$28.50
5¼" 2S/4D	$75.00	$70.00
5¼" 2S/HD	$44.95	$42.95
3½" 1S/2D	$47.50	$46.50
3½" 2S/2D	$49.50	$48.50



"NO FRILLS" DISKS!!

Now you can buy absolute top quality disks that are also the cheapest in Australia! They even come with a 5 year guarantee, which indicates the quality of these disks. So why pay 2-3 times the price for the same quality?

Bulked packed, D/S D/D without boxes, or brand name, just their white paper jacket, index labels and write protects.

5¼" D/S "NO FRILLS" DISKS FROM $0.85 EACH!!

1-9 PACKS	10+PACKS	100+PACKS
$10ea	$9ea	$8.50ea

(SEND $2 FOR SAMPLE DISK!)
(TAX EXEMPT PRICES LESS $1 PER PACK)

3½" "NO FRILLS" DISKS!

1-9 PACKS	100+PACKS	100+PACKS
$35 (PER PACK)	$34 (PER PACK)	$32 (PER PACK)

(SEND $5 FOR SAMPLE DISK!)
(TAX EXEMPT PRICES LESS $4 PER PACK)

SAMSUNG 12" TTL/COMPOSITE MONITOR

FEATURES....
- At last a monitor with both TTL and Composite modes!
- High contrast, non-glare screen
- High resolution, 80 or 40 character display
- Swivel/Tilt base

SPECIFICATIONS....
Picture tube: 12" diagonal and 90° deflection
Phosphor: Green (P42)
Video input signal: Composite/TTL Switchable
Polarity: Negative/Positive
Level: 0·5 - 2·0Vp-p/4·0+ −1·5Vp-p
Impedance: 75ohm, more than 6·8K ohm
Scanning frequency:
Horizontal: 15.75 KHz + −0·1%/18·432KHz+ −0·1%
Vertical: 47·63Hz
Video bandwidth: 20MHz
Active display area:
Composite: 206(H) x 160(V)mm.
TTL: 216(H) x 160(V)mm
Display character: 80 characters x 25 rows.
Input terminal: Phono Pin Jack. 9 pin D-Sub Connector.
Controls:
Outside: Power Switch, Contrast, Brightness, Signal Select, V-Hold, V-Size.
Inside: H-Width, H/V linearity, Focus, H/V-Shift.
Power supply: 110/120V 60Hz, 220/240V 50Hz
Dimensions: 308(W) x 297(H) x 307(L)mm
Weight: 7·3 Kg
Shipping weight: 8·3 Kg

Cat.No.	Description	Price
X14509	(GREEN)	$239

SAMSUNG TTL 12" MONITOR

- High contrast, non-glare screen
- Excellent value for money!

SPECIFICATIONS:
Picture tube: 12" diagonal 90° deflection
Mode: TTL
TTL input signal:
Polarity: TTL Positive
Level: 4V p-p + −1·5V
Impedance: 75ohm
Video bandwidth: 16MHz (−3dB)
Scanning frequency:
Horizontal: 18·432 + −0·1KHz
Vertical: 50HZ + −0·5%
Active display area: 216(H) x 160(V)mm
Display characters: 80 characters x 25 lines
Input connector: 9 pin connector
Controls:
Front: Power ON/OFF, Contrast.
Rear: V-Hold, V-Size, Brightness
Internal: Vertical Linearity, Horizontal Linearity, Horizontal Width, Focus.
Power supply: 110/120V 60Hz, 220/240V 50 Hz
Dimensions: 308(W) x 297(H) x 307(L)mm
Weight: 7·3Kg
Shipping weight: 8·3Kg

Cat.No.	Description	Price
X14500	(GREEN)	$189
X14502	(AMBER)	$189

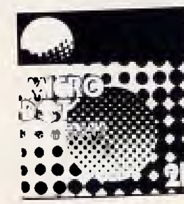
SAKATA 13" RGB COLOUR MONITOR

High quality IBM* compatible monitors, great with VCR's too!
SPECIFICATIONS:
CRT: 13", 90° deflection colour
Input Signal:
Video Signal: Separate video signal
Video: Positive
Sync.: Positive
Input Level: TTL Level
Scanning Frequency:
Horizontal: 15.7KHz
Vertical: 60Hz
Display Size: 245(H) x 182(V)mm
Resolution:
Horizontal: 640 dots
Vertical: 200 lines
Size: 343(H) x 362(W) x 421(D)mm
Weight: 11.6kg
Cat. X14530 .... **$695**

5¼" DISK STORAGE

Efficient and practical. Protect your disks from being damaged or lost!
Features...
- 70 disk capacity
- Smoked plastic cover
- Lockable (2 keys supplied)
- Dividers/spacers

Cat. C16025 .... **only $14.95**



MICRODOT 5¼" DISKS!

DESCRIPTION	1-9 BOXES	10+ BOXES
5¼" S/S D/D	$14.95	$13.95
5¼" D/S D/D	$15.95	$14.95

(SEND $2 FOR SAMPLE DISK!)

3½" DISK STORAGE UNIT

- Holds up to 40 x 3½" diskettes.
- Lockable (2 keys supplied)
- High impact plastic lid and base

Cat. C16035 .... **only $14.95**

RS232 DATA SWITCH WITH TESTER

- No power required
- Ideal for 1 computer to 2 peripherals or 2 computers to one peripheral.
- 25 pin RS232 "D" connectors.
- Six dual coloured LED indicators showing certain flow status:

T.D. Transmit Data
R.D. Receive Data
R.T.S. Request To Send
C.T.S. Slear To Send
D.S.R. Data Set Ready
D.T.R. Data Terminal Ready
- Size: 200(W) x 68(H) x 150(D)mm

Cat.X19110 .... R.R.P. $169
Our Price $149

rie

Rod Irving Electronics
48 A'Beckett St, MELBOURNE
Phone (03) 663 6151
425 High St, NORTHCOTE
Phone (03) 489 8866
Mail Order and Correspondence: P.O. Box 620, CLAYTON 3168
Telex: AA 151938
Fax: (03) 543 2648

APPLE* COMPATIBLE SLIMLINE DISK DRIVE

Compatible with Apple 2+
Cat. X19901 .... Normally $225
SPECIAL $179

APPLE* IIC COMPATIBLE DISK DRIVE

(including cable .... **only $199**
(*Apple is a registered trade mark.)

ANTI GLARE SCREEN

Half the price of other brands!!
Relieve eye strain and headaches and increase productivity with these Anti Glare Screens. Suitable for 12" monochrome.
Cat. X99995 .... **$24.95**

MAIL ORDER HOTLINE
008 335757
(TOLL FREE)
(STRICTLY ORDERS ONLY)
LOCAL ORDERS & INQUIRIES
(03) 543 7877

POSTAGE RATES:

$1	$9.99	$2.00
$10	$24.99	$3.00
$25	$49.99	$4.00
$50	$99.99	$5.00
$100	$199	$7.50
$200	$499	$10.00
$500 plus		$12.50

The above postage rates are for basic postage only. Road Freight, bulky and fragile items will be charged at different rates.

All sales tax exempt orders and wholesale inquiries to:
RITRONICS WHOLESALE,
56 Renver Rd, Clayton.
Ph. (03) 543 2166 (3 lines)

Errors and omissions excepted

IBM*, PC*, XT*, AT* are registered trademarks of International Business Machines. *Apple is a registered trade mark. *Denotes registered tradmarks of their respective owners

SENDATA DIRECT CONNECT MODEM

- CCITT V21 300 baud full duplex
- CCITT V23 1200/75
- Bell 103 300 Full duplex
- Bell 202 1200 Half duplex
- Auto answer, auto disconnect
- LED display for Power, TX, RX, CD
- AC power adaptor included
- DB25 pin connector
- Telecom Approval N° C83/37/1045

Cat. X19120 .... **$295**
(SOFTWARE FOR VIATEL .. $95)

RS232 FAST CABLER

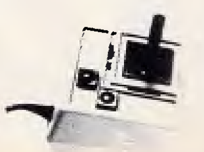
Makes RS232 interface configurating fast and simple. 3 slide switches enable line swapping functions, positive and negative voltages are displayed on 6 tricolour LED's.
SPECIFICATIONS:
Connector: DB25 plug on 100mm cable and DB25 socket on 100mm cable.
Indicators: Tricolour LED's for pins 2(TD), 3(RD), 4(RTS), 5(CTS), 6(DSR), 20(DTR).
Switches: 3 Slide switches to swap leads.
Power: Interface power.
Enclosure: Black, high impact plastic
Dimensions: 85 x 95 x 30mm
X15710 .... **$145**

RS232 BREAK OUT BOX

A simple way of monitoring RS232 interface lead activity. Interface powered, pocket size for circuit testing, monitoring and patching. 10 signal powered LED's and 2 spares. 24 switches enables you to break out circuits or reconfigure and patch any or all the 24 active positions.
SPECIFICATIONS:
Connectors: DB25 plug on 80mm ribbon cable and DB25 socket.
Indicators: Tricolour LED's for TD, RD, RTS, CTS, DSR, CD, TC, RC, DTR, (E)TC.
Jumper Wires: 20 tinned end pieces.
Power: Interface power.
Enclosure: Black, high impact plastic.
Dimensions: 85 x 95 x 30mm
X15700 .... **$94.95**

SWIVEL BASE

Make life easier with these quality, swivel and tilt bases, complete with rubber fittings!
Cat.D11100 .... **Special, $19.95**



JOYSTICK FOR IBM

Features Selectable "spring centering" or "free floating". Electrical trim adjustments on both axis. 360 degree cursor control
Cat. C14205 .... **$39.95**

Step 3 Test whether data depends on the whole index

To transform FNF into SNF each data item within these tables is examined in turn and the question asked is: 'Is this item unique to the whole FNF index?' Taking each item in turn in our example:
— Is the customer name unique to the whole index? No, only the customer number
— Is the post code unique to the whole index? No, only the customer number
— Is the region unique to the whole index? No, only the customer number
— Is the date of the last order unique to the whole index? Yes
— Is the quantity of the last order unique to the whole index? Yes

The first three data items (Customer name, post code and region) depend only on the customer number of the combined index. This 'partial index dependency' enables these data items to be collected in a separate table with their appropriate index. The data items that were dependent on the whole combined index stay where they are, producing the following tables.

Customer number	Customer name	Post code	Region
3454	Jones	2000	Central
1689	Smith	2088	North
6000	Duffy	2026	East
3550	Clark	2500	South
9362	Roberts	2150	West
4513	Howard	2026	East
^			
Index			

Product number	Customer number	Date of last order	Quantity of last order
490	3454	12/3/87	20
490	1689	07/5/87	37
490	6000	09/6/87	25
490	3550	09/9/86	3
103	9362	24/5/87	12
103	3454	23/9/87	5
103	4513	06/2/87	120
^	^		
Combined index			

Step 4 Test whether data items depend on each other

In Step 4 SNF is transformed finally to TNF. So far, the concern has been determining the table index, and finding whether or not data items within tables depend on each other, and if so which items. According to the rules, every data item within each table is then to be compared to every other item within that table. Then the question should be asked 'Is there any way you can work out one data item from another?' In practice, it will be apparent which data items ought to be considered.

In the above example knowledge of the data will cause 'Region' and 'Post Code' to be related. Asking the question the right way round 'If Post code is known, is Region known?' yields the answer 'Yes'. Thus the top table of the two above can be split as below:

Customer code	Customer name	Post code
3454	Jones	2000
1689	Smith	2088
6000	Duffy	2026
3550	Clark	2500
9362	Roberts	2150
4513	Howard	2026
^		
Index		

Continued . . .

data items. The best vehicle for doing this is a data dictionary — a document that you will find invaluable from now on. In my data dictionaries I include the following for each data item:

1 Name
2 Definition (that is: a description of the real world item which it represents)
3 Type (for example, string, integer, real)
4 Format
5 Restrictions on by whom or how the data is accessed
6 Limits on the possible values of the data
7 Relationship to other data items

Some database generators let you create the data dictionary as part of the system for later combining into files. If your database generator has this facility, use it as long as it doesn't involve any extra stages in the design.

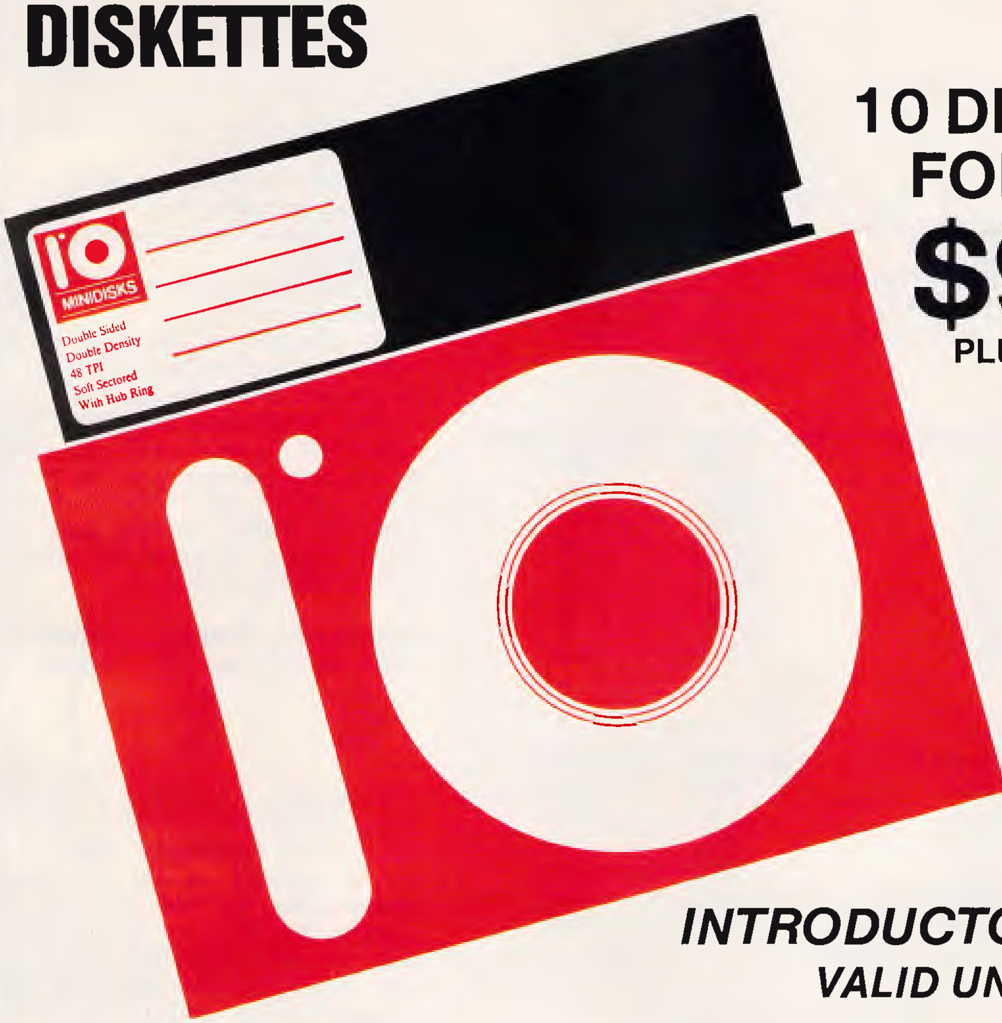
After the data dictionary has been defined, you will need to determine how groups of data items should be collected together to form the input and output of the system. You'll have to try not to think of records and files, but as far as possible to specify groups without any reference to the implementation details. For example, group X consists of an employee name, manager and department, in a human readable form generated by a user entering an employee number.

• 3 DETERMINATION OF RELATIONSHIPS BETWEEN DATA

Grouping the wrong data items together in a single file seems to be the most common mistake brought on by 'easy to use' interactive database generators. I use a technique called 'normalisation' to be sure that the files contain the correct fields — and nothing more. This technique seems to have fallen out of favour with the academics but I like its simplicity and methodical approach.

The final form of the data once normalised is known as Third Normal Form (TNF) and results from successively reducing the data items into sets of simple tables, each table having a unique index item (see the explanatory box on these pages). The method comes from research done in the early 1970s by Codd and was originally meant to be the basis of a powerful 'relational database' implementation (a paper by Codd in 1972 was the first to describe the technique). However, the simplicity of the method and the orderliness of the resultant tables makes Third Normal Form a technique useful for anyone

5¼" DOUBLE SIDED DOUBLE DENSITY DISKETTES



10 DISKS FOR ONLY

$9.90

PLUS POSTAGE

SPECIAL INTRODUCTORY OFFER

VALID UNTIL 31/12/87

CREDIT CARDS ACCEPTED

LIFETIME WARRANTY
MADE IN AUSTRALIA

GUARANTEED TO EXCEED THE ANSI SPECIFICATION

YOUR MONEY BACK IF YOU ARE NOT COMPLETELY SATISFIED

DISKETTES		10 PACK
5¼"	10 BRAND DS DD	$ 9.90
5¼"	VERBATIM BRAND 1.2 MB DS QD	$41.10
3½"	VERBATIM BRAND 720 K DS DD	$39.70

ORDER NOW

ADVANCE Peripherals
EXPANDING COMPUTER POWER

ADVANCE PERIPHERALS PTY LTD
Suite 3, 846 Pacific Highway.
(P.O. Box 215) Gordon, N.S.W. 2072.
Prices Quoted Include Sales Tax
Prices Are Subject To Change Without Notice

TO ORDER PHONE
(008) 25 1489
FAX: (02) 498 2665
IN SYDNEY CALL
498 2411

Post code	Region
2000	Central
2088	North
2026	East
2500	South
2150	West
^	
Index	

The end of Step 4 gives all the TNF for the data originally in the analysis, consisting of four tables each with a unique index:

Product number	Product category	Product name
490	Model	Transformers
103	Building	Lego
^		
Index		

Product number	Customer number	Date of last order	Quantity of last order
490	3454	12/3/87	20
490	1689	07/5/87	37
490	6000	09/6/87	25
490	3550	09/9/86	3
103	9362	24/5/87	12
103	3454	23/9/87	5
103	4513	06/2/87	120
^	^		
Combined index			

Customer number	Customer name	Post code	Region
3454	Jones	2000	Central
1689	Smith	2088	North
6000	Duffy	2026	East
3550	Clark	2500	South
9362	Roberts	2150	West
4513	Howard	2026	East
^			
Index			

Post code	Region
2000	Central
2088	North
2026	East
2500	South
2150	West

Step 5 Combine other tables with identical indices

Using the same process result on other related data (say, product sales) will yield other tables also in TNF. If any of these have the same index they must be combined. For example, other analysis may have generated the table:

Product Number
Product Name
Product unit price

This table can be combined with one of the one derived to produce:

Product Number
Product Category
Product Name
Product unit price

unsure of how to group data items for the easiest processing.

Fig 2 shows a table with an index of 'product number'. The table in TNF is known as a relation, frequently also the columns are referred to as domains, and the rows referred to as tuples.

The table in Fig 2 has the following properties:

i the index item (product number) is the only possible index;
ii no two rows or columns are the same; and,
iii the order of rows and columns is not significant.

It is common for the index to be made up of two or more domains. In the example below, the index is a combination of both product number and department number with the third column being delivery time. So, in the example below, the combined department and product numbers gives the unique index numbers as follows: 001103, 001490, 003103.

Department number	Product number	Delivery time
001	103	2
001	490	4
003	103	4

TNF analysis is explained in the box alongside but the concept of 'foreign' index needs elaboration here. If a domain appears as the unindexed column within one table but also appears as the index column of another table, the domain is known as a foreign index within the first table. Fig 3 illustrates this with the domain post code.

• 4 PRIVACY AND DATA INTEGRITY

Database integrity is defined as the extent to which the database is an accurate model of that part of the universe it represents; furthermore, it can be maintained by using the computer to detect any data that represents an invalid state of the system (an example being checking date of order against, say, the date on which the company was founded). Ideally, the enforcement should be grouped together in a single program.

In practice, however, they are added in an *ad hoc* fashion and embedded into the data input routines. This is because few database generators have a separate facility for data integrity checks.

The maintenance of integrity is a difficult, and often time-consuming, task. However, it is *crucial* that the database is sufficiently accurate to allow the database to be used for the purpose for which it is intended.

LePrint Solutions to your Desktop Publishing Needs

Whether you are a novice typographer or a professional publisher, LePrint has a solution for you. If you have not yet decided *which* desktop publishing solution is for you, why not attend a one day seminar free of charge? And if you have already joined the growing number of LePrint users — we can show you some new tricks.

You can include graphic images into your LePrint output. The command is *Graphic Insert*. This command causes the specified image to be *pasted* onto the page at the position you indicate.

Having decided the height you require, you also have total control over the *aspect ratio* of the width to the height for the graphic image. Increasing the aspect ratio makes the printed image narrower while keeping the height the same, thus enabling you to position the image with an accuracy not found in many desktop publishing programs.

"Picture yourself using LePrint..."

Can't you picture yourself using LePrint with its powerful Graphic Insert command?

Enrol now for a seminar at LePrint Academy and we will show you how you can begin producing outstanding publications using LePrint — *even if you only have a dot-matrix printer!*

This entire page was, of course, output *exactly* as you see it, using LePrint.

You don't need to spend a fortune to make a start in desktop publishing if you choose LePrint — but, of course, if you have already invested in LePrint, you know that already!

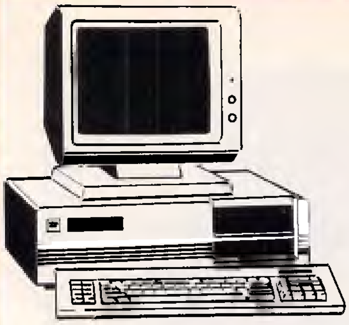
When you attend a course or seminar at LePrint Academy, you have personal use of your own computer — we will sit beside you and take you, step by step, through the many facets of this popular program. If you already have a word processing package and a dot-matrix printer, all you are missing to be able to produce this advertisement is LePrint. Perhaps you don't have time to attend a seminar, but would like a complimentary copy of our book "What can I do with LePrint?" — please call (02) 680-3930 today.

LePrint Academy

a division of OptSoft Pty Limited

Suite 9B, 261 Old Northern Road, Castle Hill.

Correspondence to: P.O. Box 558. Castle Hill, NSW. 2154.



IBM* XT* COMPATIBLE COMPUTERS FROM $795

Check these features and our prices. We're sure you'll agree they're exceptional value for money!

- Assembled in Australia!
- AT* style keyboard
- Tested by us for 24 hours prior to delivery!
- 8 Slot motherboard
- 6 months warranty!
- 150W power supply
- Switchable 4·77/8MHz Turbo versions available for an extra $50

* $795 COMPATIBLE COMPUTER

256K RAM Single Drive, Graphics and Disk Controller Card. **$795**

256K RAM COMPATIBLE COMPUTER

2 x 360K Disk Drives, Multifunction Card, Colour Graphics, Disk Controller, 1 Parallel Port. (Includes Timer Disk) **$1,095**

640K RAM COMPATIBLE COMPUTER

2 x 360K Disk Drives, Multifunction Card, Colour Graphics, Disk Controller, 1 Serial, 1 Parallel Port. (Includes Timer Disk). **$1,150**

20 M/BYTE HARD DISK COMPATIBLE COMPUTER

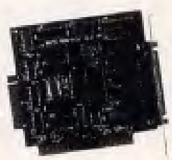
20 M/Byte Hard Disk, 360K Disk Drive. 1 Serial, 1 Parallel Port. (Includes Timer Disk)
Single 360K Floppy Disk Drive **$1,750**
Dual 360K Floppy Disk Drives **$1,895**

NEW BABY AT* COMPATIBLE COMPUTER! $2,595

- Assembled & Tested in Australia!
- 1 M/Byte Main Board
- Switchable 8/10/12 MHz
- 1.2 M/Byte Floppy Disk Drive
- 80286 CPU
- Colour Graphics Display Card
- 8 Slots
- Floppy & Hard Disk Controller
- 20 M/Byte Hard Disk
- Printer Card and RS232
- Keyboard
- 200W Power Supply
- Manual
- 6 Months Warranty
- Dimensions: 360(W) x 175(H) x 405(D)mm

IBM* AT* COMPATIBLE COMPUTER $2,795

- Assembled & Tested in Australia!
- 1 M/Byte Main Board
- 6 MHz
- 1.2 M/Byte Floppy Disk Drive
- 80286 CPU
- Colour Graphics Display Card
- 8 Slots
- Floppy & Hard Disk Controller
- 20 M/Byte Hard Disk
- Printer Card and RS232
- Keyboard
- 200W Power Supply
- 6 Months Warranty



16 BIT FLOPPY DISK DRIVE CONTROLLER CARD

This card will control up to 4 double sided 360K IBM* compatible disk drives.

X18006 (4 Drives) **$57**

1·2 M/BYTE/360K FLOPPY CONTROLLER CARD

The ideal solution for backing up hard disk, archiving etc. Suitable for 1·2 M/Byte and 360K drives. XT* and AT* compatible

Cat. X18008 .... **$129**

GRAPHICS CARD

- Hercules compatible
- Interface to TTL monochrome monitor
- One Centronics parallel printer port
- 2K-Static RAM, 64K Dynamic RAM
- Display Mode: 720 dots x 348 lines

Cat. X18003 .... **$145**

COLOUR GRAPHICS & PRINTER CARD

This combination card features printer and monitor interface. It has 1 parallel printer port, composite colour, RGB CTTC outputs as well as composite monochrome video output with display buffer.

Colour:
Text Mode: 40 columns x 25 rows.
Graphics: 320 x 200

Monochrome:
Text Mode: 80 columns x 25 rows.
Graphics: 640 x 200

Cat. X18010 .... **$129**

ENHANCED GRAPHICS ADAPTOR CARD

- 256K RAM.
- Handles monochrome, CGA Hercules and E.G.A.
- Standards: 320 x 200, 640 x 200, 640 x 348, and 720 x 348

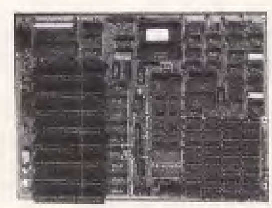
Cat. X18070 .... **$275**

COLOUR GRAPHICS CARD

This card plugs staight into I/O slot and gives RGB or composite video in monochrome to a monitor.

Colour graphics: 320 dots x 200 lines.
Mono graphics: 640 dots x 200 lines.

Cat. X18002 .... **$112**



XT* MOTHERBOARD
(WITHOUT MEMORY)

- 4·77MHz
- 8088 Processor
- Expandable to 640K on board.
- Provisions for up to 6 x 2732 EPROMs on board.
- Keyboard connector
- 8 Expansion slots

Cat.X18020 (Excl. Ram) **$149**

XT* TURBO MOTHERBOARD

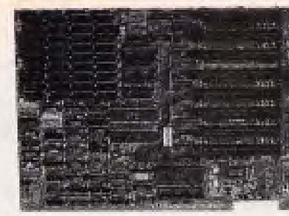
- 8MHz
- 8088 Processor
- Expandable to 640K on board.
- Provisions for up to 6 x 2732 EPROMs on board
- Keyboard connector
- 8 Expansion slots

X18030 (excl. RAM) **$245**
X18031 (incl. 640K RAM) **$415**

BABY AT* MOTHERBOARD
(WITHOUT MEMORY)

- 6/10 MHz system clock with sero wait state or 8/12 MHz one wait state
- 80286-10 Microprocessor
- Hardware and software switchable
- Socket for 80287 numeric data co-processor
- 256K, 512K, 640K, or 1,024K RAM
- 64K ROM
- Phoenix BIOS
- 8 Expansion slots

X18200 (excl. RAM) **$695**
X18201 (incl. 640K RAM) **$895**

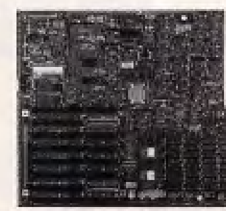


10 MHz XT* TURBO MOTHERBOARD

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
- 4 Channel DMA
- Keyboard port

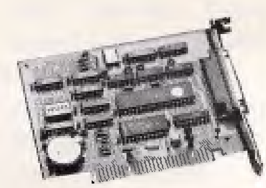
(Excl. RAM) **$295**
(Incl. RAM) **$465**



6/8 MHz AT* MAIN BOARD

- 6/8 MHz system clock with zero wait state
- Hardware and software switches for alternative system clock.
- Rechargeable battery backup for CMOS configuration table and real time clock.
- 80286-8 microprocessor
- Socket for 80287 numeric data co-processor
- 256KB, 512KB, 640KB, or 1,024KB RAM
- 64KB ROM, expandable to 128KB
- 8 Input/Output slots
- Hardware reset jumper
- Power and turbo LED connector
- Phoenix BIOS

X18100 (Excl. RAM) **$695**



RS232 & CLOCK CARD
(WITHOUT CABLE)

This RS232 card supports 2 asynchronous communication ports. Programmable baud rate generator allows operation from 50 baud to 9600 baud. Fully buffered. Clock includes battery back-up and software.

Cat. X18028 .... **$95**

RS232 (SERIAL) CARD
(WITHOUT CABLE)

This RS232 card supports 2 asynchronous communication ports. Programmable baud rate generator allows operation from 50 baud to 9600 baud. Fully buffered. Second serial port is optional.

Cat. X18026 .... **$54**

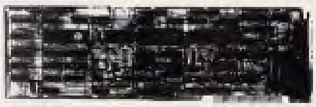
GAMES I/O CARD

Features two joystick ports. (DB15).

Cat. X18019 ... **$39.50**

Rod Irving Electronics!
The cheaper alternative!

Rod Irving Electronics policy is to have the cheapest prices on IBM compatible peripherals. Regardless of where you live in Australia, you can take advantage of these exceptional prices either through our stores or with our Mail Order Service. 008 33 5757. (Toll free!) Inquiries to (03) 543 7877*



MULTI I/O & DISK CONTROLLER CARD

This card will control 2 x double sided, double density drives, and features a serial port, a parallel port, and a joystick port or games port. It also has a clock/calendar generator with battery backup.

Cat. X18040 .... **$169**

I/O PLUS CARD

Provides a serial port, a parallel port and a joystick port, and even a clock/calendar with battery backup!

Cat. X18045 .... **$129**

VERBATIM 20 M/BYTE HARD DISK CARD

IBM* compatible, plugs straight in to your computers bus connectors! Includes Q & A software.

X20020 .... **$1,095**

640K RAM CARD (SHORT SLOT)

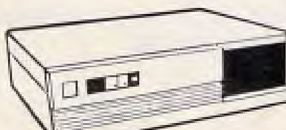
- 640K memory installed
- User selectable from 64K to 640K
- DIP switches to start address

X18014 .. **ONLY $229**

MULTI SERIAL CARD

- 4 RS232C asynchronous communication serial ports
- NS16450 Asynchronous communication elements (ACE)
- COM1/COM2 COMPATIBLE
- DTE/DCE Selectable
- Drive support for PC*/AT*, XENIX*
- Interactive installation procedure available.

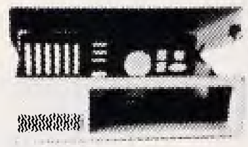
X18154 .... **$169**



"IBM AT* TYPE" COMPUTER CASING

Features security key switch, 8 slots, and mounting accessories etc.
Size: 534(W) x 163(H) x 426(D)

Cat. X11092 .... **$139**



"IBM* XT* TYPE" COMPUTER CASING

Give your kit computer a totally professional appearance with one of these "IBM* style" casings. Includes room for 2 x 5 1/4" disk drives, connection ports and mounting accessories etc.
Dimensions: 490 x 390 x 140mm.

Cat. X11090 .... **$89**

BABY AT* STYLE COMPUTER CASING

Our latest computer casing, featuring security key switch, 8 slots, and mounting accessories etc.
Size: 360(W) x 175(H) x 405(D)

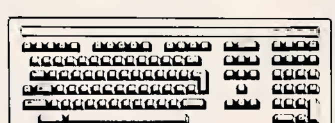
Cat. X11093 .... **$149**

"IBM* XT* TYPE" KEYBOARD

- 100% IBM* PC*, XT* compatible,
- 84 keys, including function keys, and a numeric keypad
- low profile keyboard design,
- proper placement of shift keys with large key tops to suit professional typists
- 3 step height/angle adjustment.
- Curl lead plugs straight into IBM* PC/XT
- Status displays, Power, Cap Lock and Numeric Lock

Just like the "real McCoy" only at a fraction of the price! Why pay more?

Cat. X12020 .... **$109**

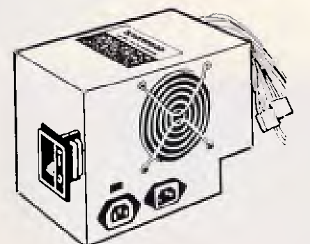


IBM* COMPATIBLE EXTENDED KEYBOARD (101 KEYS)

These new keyboards are both XT* and AT* compatible!

- 20 Dedicated function keys
- Enlarged "Return" and "Shift" key
- Positive feel keys
- Low Profile Design, DIN standard
- Separate Numeric and Cursor control keypads
- Additional Functions: Key-in-Lock, Audio Beep, Previous Word, Next Work, Fast Repeat, Line Feed, Pause, Clear Screen, Reset.

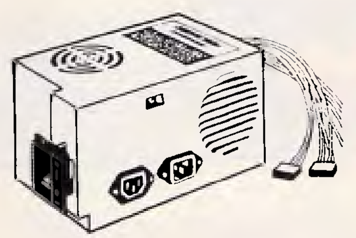
Cat. X12022 .... **$125**



150W SWITCH MODE POWER SUPPLY FOR IBM* PC*/XT* & COMPATIBLE

DC OUTPUT: +5/13A, -5V/0.5A
+12V/4.5A -12V/0.5A

Cat. X11096 .... **$149**



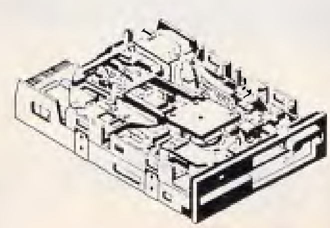
200W SWITCH MODE POWER SUPPLY FOR IBM* AT* & COMPATIBLE

DC OUTPUT: +5/16A, -5V/0.5A
+12V/5A -12V/0.5A

Cat. X11097 .... **$269**

180W SWITCH MODE POWER SUPPLY FOR BABY AT* COMPATIBLES

Cat. X11098 .... **$169**



NEC 1·2 M/BYTE DISK DRIVE

Top quality at an incredibly low price! Double sided, double density. Switchable 1·2 M/Byte to 720K formatted capacity. IBM* AT* compatible.

C11906 .. **ONLY $279**

MITSUBISHI 4851 DISK DRIVE

Slimline, 360K, Double sided, double density

C11901 .. **ONLY $239**

TANDON 20 M/BYTE HARD DISK

Includes DTC controller card. IBM* compatible.

X20010 .. **ONLY $695**

ROD IRVING ELECTRONICS

MELBOURNE: 48 A'Beckett St.
Phone (03) 663 6151

NORTHCOTE: 425 High St.
Phone (03) 489 8866

MAIL ORDER & CORRESPONDENCE:
P.O. Box 620, CLAYTON 3168
Mail Order Hotline: 008 33 5757
(Toll free, strictly orders only)
Inquiries: (03) 543 7877
Telex: AA 151938
Fax: (03) 543 2648

MAIL ORDER HOTLINE
008 335757
(TOLL FREE)
(STRICTLY ORDERS ONLY)

LOCAL ORDERS & INQUIRIES
(03) 543 7877

POSTAGE RATES:

$1 – $9.99	$2.00
$10 – $24.99	$3.00
$25 – $49.99	$4.00
$50 – $99.99	$5.00
$100 – $199	$7.50
$200 – $499	$10.00
$500 plus	$12.50

The above postage rates are for basic postage only. Road Freight, bulky and fragile items will be charged at different rates.

Errors and omissions excepted

IBM*, PC*, XT*, AT*, are registered trademarks of International Business Machines. *Apple is a registered trademark.
*Denotes registered tradmarks of their respective owners

SYSGEN....
COMPARE THE DIFFERENCE

5 1/4" EXTERNAL DISKETTE DRIVE

51/4" EXTERNAL DISKETTE DRIVE

RRP $999 INCL. TAX, SOFTWARE AND ADAPTOR CARD

A PRACTICAL DATA EXCHANGE OPTION FOR PC, XT, AT AND PS/2

- THE 3 1/2" BRIDGE FILE HANDLES BOTH 720KB DISKETTES AND ALSO 1.44MB FORMATTED DISKETTES FOR PC AT'S
- THE 5 1/4" BRIDGE FILE READS AND WRITES BOTH HIGH DENSITY (1.2MB) AND NORMAL DENSITY (360KB) FORMATTED DISKETTES
- SYSGEN'S DAISY CHAINING CAPABILITY ALLOWS YOU TO CONNECT THE EXTERNAL DISKETTE DRIVES TO THE BRIDGE TAPE BACKUP UNIT - SAVING A PS/2 INTERNAL SLOT.

ONE TAPE DRIVE FOR AN OFFICE FULL OF MACHINES

RRP $1899 INCL. TAX, SOFTWARE AND ADAPTOR CARD

- 42 MB
- CERAMIC READ/WRITE HEAD
- AUTOMATIC DATA VERIFICATION
- NETWORK COMPATIBLE
- MENU DRIVEN SOFTWARE
- SIGNIFICANT ENGINEERING ENHANCEMENT
- PC, XT, AT AND PS/2 30, 50, 60

Guardian Data
SYSGEN

57-59 Alleyne Street,
Chatswood NSW 2067 Australia
Tel (02) **406 6144**
Fax (02) 407 0297

***** CALL FOR DEALER AND CORPORATE DISCOUNTS *****

- **5 BACK-UP AND RECOVERY PROCEDURES**

It's quite possible that commercial back-up programs can perform all the back-up and recovery the system needs and, as it's a known fact that users never perform a back-up frequently enough, it makes sense to build back-up routines into the database. At the very simplest this need be nothing more than a message — after a certain number of transactions or an agreed length of time — prompting the user to make a back-up. However, the best solution, if the system supports it, is to write a user transparent back-up routine.

- **6 HANDS ON USE OF THE DATABASE GENERATOR**

Only when you have successfully dealt with the above tasks should you sit down in front of the machine and begin to code in the application. Obviously, this area is too application-specific to be included in any detail here. However, as a word of general advice, remember that there is little to differentiate a database generator's programming language from that of any other programming language, so all the usual rules of top-down design, meaningful variable names and structure diagrams apply.

Conclusion

This article has been able to touch only the surface of database design and many areas have not been considered here. If there is one rule for database design it is this: thinking and planning come first, hands on the keyboard comes last!

END

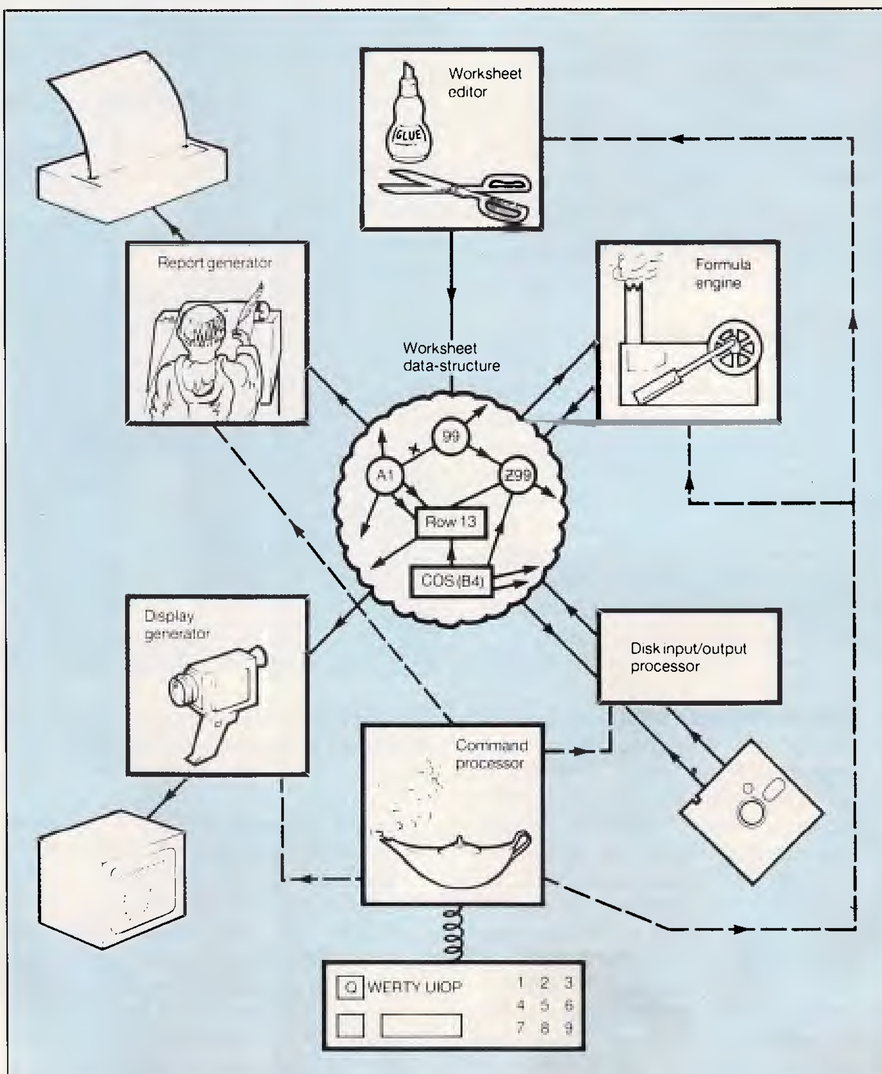
Spreading the load

The benefits of spreadsheet software in financial modelling and forecasting are well-recognised in speeding up what would otherwise be a time-consuming and labour-intensive task. Mike Liardet looks behind the figures to explain exactly how they work.

One of the most widely used types of personal computer software is the spreadsheet, which is invaluable wherever repetitive calculation work, such as budgeting and modelling, have to be performed. Although many readers will already be familiar with the 'concept' of a spreadsheet system — or perhaps even using one — the inner workings of the software may be a total mystery. This article attempts to explain how a typical spreadsheet system works: it does not address any particular system but, in a general way, it describes how popular spreadsheets such as 1-2-3, Excel, SuperCalc and Multiplan, operate. And just as a little knowledge of what goes on under the bonnet of your car could turn you into a better driver, so a little knowledge of the spreadsheet's method of working will make you a more informed spreadsheet user. Furthermore, for anyone interested in implementing their own spreadsheet system, this article should serve as a useful first step along the way. But be warned — there are *many steps*.

There are, of course, many components to a typical spreadsheet system which are common to all types of software and I do not intend to cover them here. In this article I'll be presenting an overview of the organisation of a spreadsheet system, and then focusing on the two most interesting aspects of it:

- firstly, the complex data structure used to represent the spreadsheet's 'worksheet' with all its cells, numbers and formulae stored within it; and,
- secondly, the essential software to manipulate and calculate the formulae: that is, the 'formula engine'.



Organisation of a spreadsheet program. Conceptually there are five program modules; all interfacing to the worksheet data structure and controlled by the command processor which, in turn, is driven by the keyboard. The data structure and the formula engine are the fundamental components of a spreadsheet

Organisation

A typical spreadsheet program allows the user to work with a single table of 'cells', called a 'worksheet'. An average-sized worksheet might be about 250 cells across by about 16000 cells down. It's best to visualise the worksheet as a huge sheet of paper, with a typical system allowing some small part of it, say, 20 rows by 8 columns, to be 'windowed' on the screen. Each cell in a worksheet is capable of holding either a number, some text or a formula. Individual cells are usually identified by a row number and column letter (for example, 'A1' for the top-left cell, 'Z99' for the 26th column, 99th row and so on) and a formula in one cell can refer to the contents of other cells. For example, a typical formula would be:

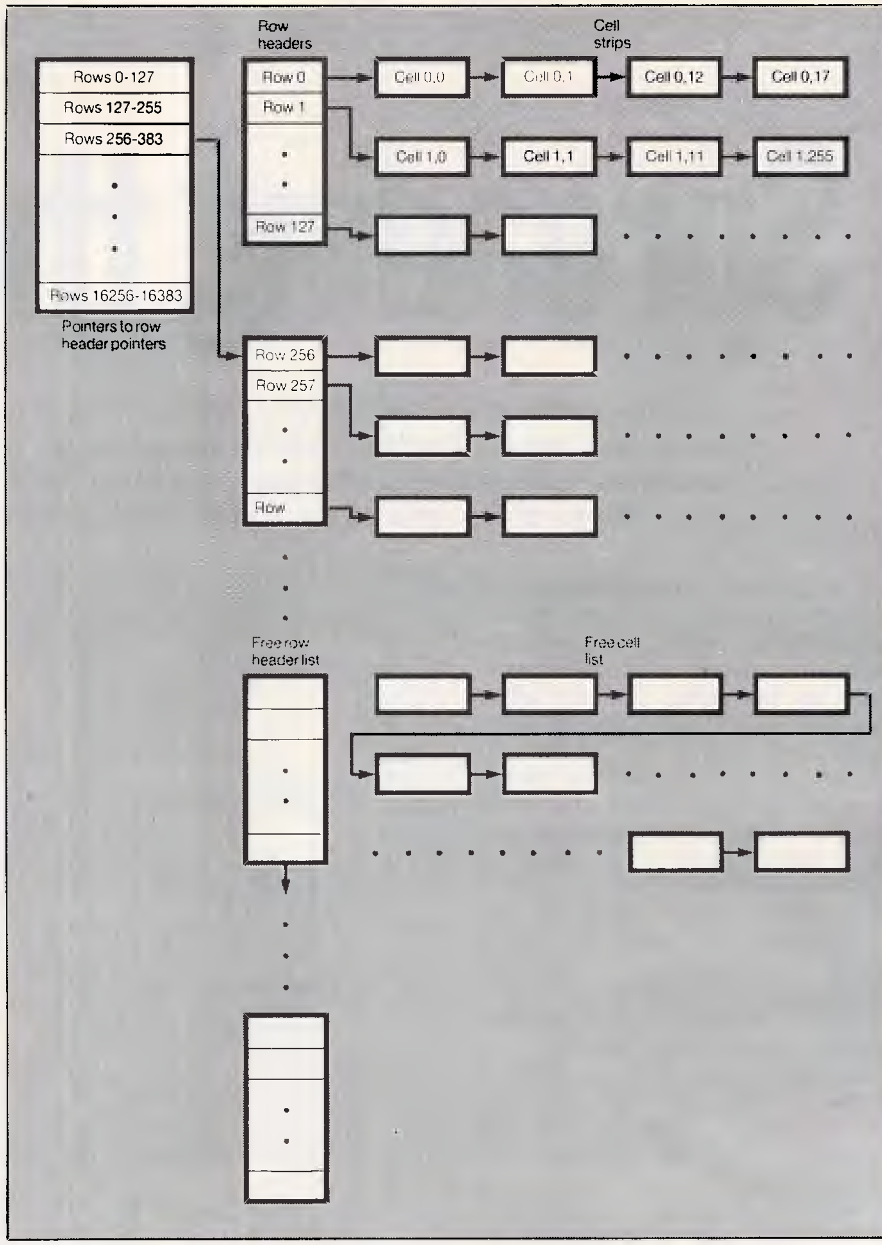
A1 + cos(Z99) * 10

The key feature in a spreadsheet program, and the main reason for the spreadsheet's wide acceptance, is that whenever a cell anywhere in the worksheet is changed, then all the cells with formulae depending upon it are automatically updated in line with the change. This makes the spreadsheet a very flexible tool for experimental modelling.

As is common with all software, a spreadsheet program is, of course, driven by keystrokes (or mouse input) from the user. The 'command-processor' examines the user's keystrokes and decides what is to be done and, after proceeding through the usual menus, prompts and help information, it calls upon one or more of the other modules to perform the required task. (Notice that all these modules either access or update the worksheet data-structure.)

Let's now examine what these other modules do:

- **The worksheet editor** is used to modify the worksheet data structure in various ways. Changing a cell's contents, inserting and deleting cells, rows or columns, copying and moving blocks of cells, and erasing the entire worksheet are typical editing activities. Of course, any changes to the worksheet must also be reflected in the screen display of the worksheet. In addition, when rows or columns are inserted or deleted, the editor must alter any relative cell references contained in formulae.
- **The display generator** generates the screen image of the worksheet from the data structure. This module may just arrange the display of a single rectangular portion of the spreadsheet, or it could be a lot more sophisticated, with multiple windows of different parts of the worksheet simultaneously in view. Some of the more advanced spreadsheet systems can also produce graphs of the data and, although this can be a major selling point for a spreadsheet product, conceptually, a graphing facility is just another part of the display generator.
- **The report generator** is rather like a display generator for paper. Although it does not have to compete with menus and help-screens — as does the display generator — it must deal with different printers and paper-sizes, and schedule the printing of reports which are too wide for the stationery. Obviously, if the display generator can draw graphics, then the report generator should be able to print them.
- **The disk input/output module** loads and saves the worksheet data structure on the disk. This part of the program may also be able to handle a variety of disk file formats, in order to 'import' data to, or 'export' data from, other programs. Finally,



This data structure allows the user to use any of the cells in a 16384x256 cell worksheet without excessive demands being made on memory

- **The formula engine** is primarily responsible for calculating and recalculating the formulae in the worksheet. It is also responsible for manipulating the formulae as they are entered or edited by the user.

Worksheet data structure

At the heart of the spreadsheet system is the 'worksheet data structure'. By worksheet data structure I mean an (internal) representation of the worksheet, arranged in some yet-to-be-defined manner, and lying in the computer's main RAM memory. For every number, cell, formula, row and column, and so on, that the user *sees* in the worksheet, there will be a counterpart in the worksheet data structure.

It is fundamental to the efficient operation of the spreadsheet that the worksheet data structure be properly designed. For example, a very simplistic worksheet data structure might allocate a fixed amount of storage for every cell, whether it is used or not. With an allocation of just eight bytes per cell, a 16000 x 250 cell worksheet would immediately require 32 million bytes of RAM — and still this would allow only a tiny amount of information to be held in each cell!

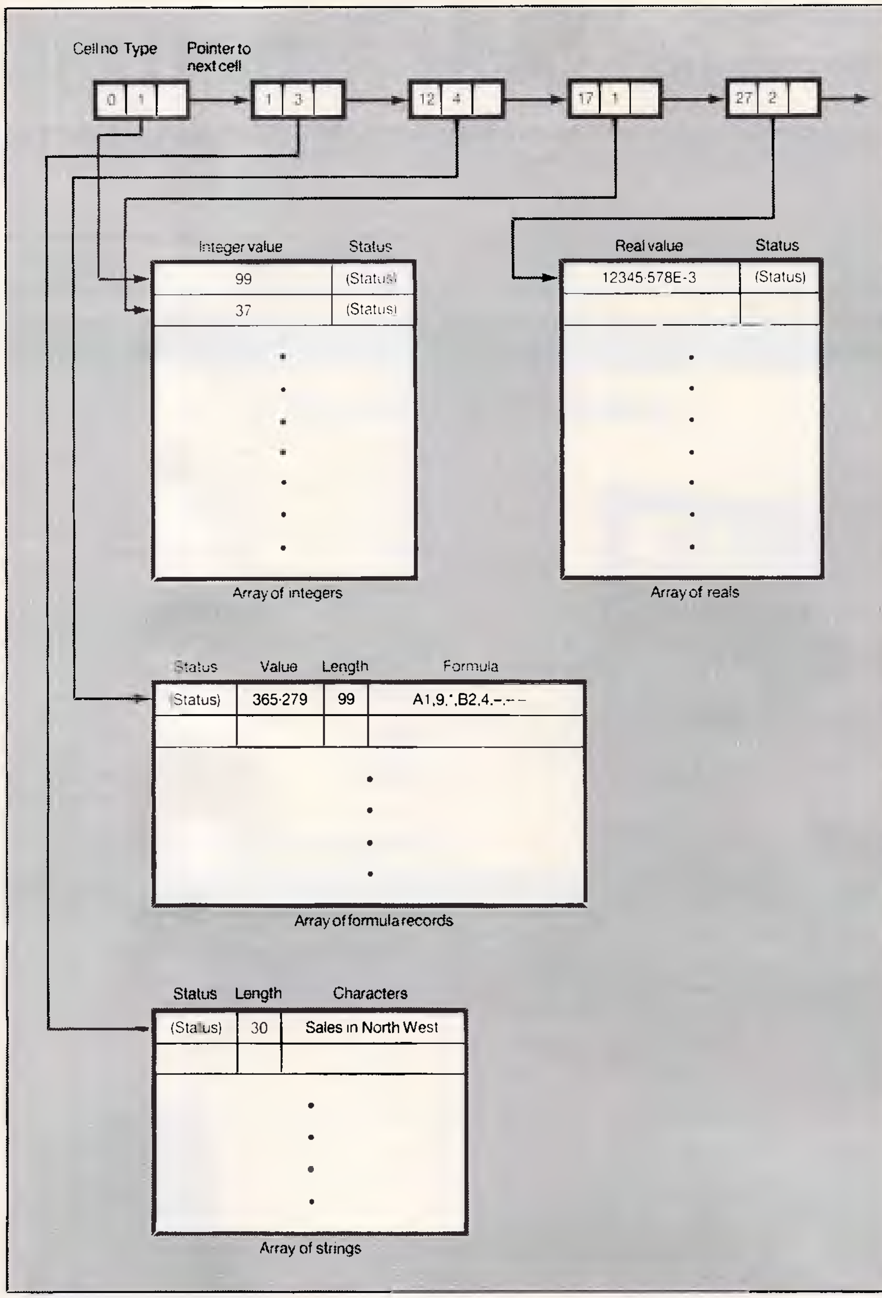
The diagram on the previous page shows how a worksheet of over 16000 x 250 cells can be represented with comparatively modest memory requirements. Of course, with, say, only half to one megabyte of RAM, there is no data structure that would allow all four million of these cells to be used; but, with the structure given, virtually any arbitrary scattering of cells throughout the area can be accommodated. Not only that, if the user confines his usage of the worksheet to rectangular-sized areas (as is usual) then memory utilisation will be very efficient. That is the best that can be achieved with a limited amount of memory available.

To understand how cells are stored and accessed it is necessary to grasp the notion of a 'pointer'. A pointer behaves very much like its name suggests: it tells you where to find something. Thus a pointer in a data system will indicate where the data is located, rather than 'holding' the data itself. Taken a step further it is possible to build arrays or tables of pointers, with each array element pointing to a subset of the data structure.

The contents page of a magazine is in fact an array of pointers. Each entry 'points' by means of a page number to where the actual article is located. Furthermore, if each page of the magazine contained, for example, a set of names and telephone numbers (telephone numbers are 'pointers' to people, or at least to their telephone) then each page of the magazine would be an array of pointers. And the contents page would in fact be an array of pointers to an array of pointers!

Back with our spreadsheet: all cell accesses start by consulting a table of pointers to 'row headers' in the worksheet. In this top-level table, each entry refers to a group of 128 rows. Thus entry 0 points to another table which looks after rows 0 to 127, entry 1 to a table for rows 128 to 255, and so on. If *no* cells have been used in a given range of rows, then the table entry contains a special entry or 'null' pointer.

The use of the 'null' value produces a great saving of storage space because, with this one special value, it is possible to indicate that a whole area of the worksheet is empty, and the area need not be explicitly represented in the data structure. Nulls are not confined to the top-level table, but can be



This detail of the cell-strip data structure shows four types of cell in one row — 'integer', 'real', 'formula' and 'strings'

.......Have you ever wondered What's in it for me? ....We have the answer

THE COMPUTER KEY GROUP

Computer Key Group

$1995.00

'KEY' COMPUTER SYSTEM ......

"KEY" 640K TURBO COMPUTER SYSTEM INCLUDING SINGLE FLOPPY DISK DRIVE, MULTI I/O, CLOCK/CALENDAR, AT STYLE KEYBOARD, 12 MONTHS WARRANTY.

YOU ALSO RECEIVE

OLYMPIA NP PRINTER, 160 cps, TRACTOR AND FRICTION FEED MECHANISM.

'KEY' COMPOSITE MONITOR.

Your nearest Computer Key Store.

SOFTWARE 80 COMPUTERS
BRISBANE, QLD.
(07) 369 6888

ELTRONICS
ROCKHAMPTON. QLD.
(079) 22 3446

TOOWOOMBA. DEALER
FOR INFO
(07) 812 1611

TOWN & COUNTRY COMPUTERS
TOWNSVILLE, QLD.
(077) 75 4000

COMPUTING FOR PEOPLE
DARWIN. N.T.
(089) 81 1346

HARRIS BUSINESS MACHINES
BUNDABERG. QLD.
(071) 72 0777

SOUTH QUEENSLAND BUSINESS SYSTEMS
IPSWICH. QLD.
(07) 281 2066

B. & P. COMPUTERS
GATTON. QLD
(075) 66 1317

ELECTRONIC WORLD
CAIRNS. QLD.
(070) 51 8555

RELCO OFFICE EQUIPMENT
MT. ISA. QLD
(077) 43 2324

**ALL PRICES INCLUDE SALES TAX.
MS-DOS OPTIONAL
MONITOR MAY NOT BE AS DEPICTED**

LAY-BY NOW FOR CHRISTMAS

VAPORWARE

P.O. Box 286 Guildford, N.S.W. 2161

(02) 632 8841
8am to 8pm

(02) 214 7181
24 Hrs, 7 Days

CAD PACKAGES

Generic Cadd 3.0	$180
In-A-Vision	$789

COMMUNICATIONS

Brooklyn Bridge	$180
Mirror II	$98
SuperCom (Version 3)	**$159**
Carbon Copy Plus	$288

DATABASE

dBXL	**$230**
PARADOX 2.0	**$940**
Quicksilver Compiler	$725
Reflex with Workshop	$299
VP Info	$160

DESKTOP PUBLISHING

Ventura 1.1	**$1175**
NewsMaster	$130
PageMaker (PC)	$ CALL

SPREADSHEET

PlanPerfect	$420
S I L K	**$260**
VP-Planner	$140
VP-Planner Plus	$260

WORD PROCESSING

Microsoft Word 4.0	**$569**
WordPerfect 4.2	$469
WordPerfect Library	$160
WordPerfect Executive	$350

PROJECT MANAGEMENT

Timeline 2.0	$575
Timeline Graphics	$289
Timeline/Graphics Bundle	$840

UTILITIES

Above Disc	$190
Bookmark	$183
Copy II PC	$88
Copy II PC Option Board	$215
Disk Technician	$189
FormTool 2.0	$195
FormTool's Greatest Hits	$75
HOT! (Ver. 4)	$CALL
Mace Utilities (Ver 4.1)	**$150**
Microsoft Windows 1.04	$175
Norton Utilites 4.0	$130
Norton Advanced	$199
PC Alien	$92
Print Q	$159
Smart Notes	$150
X-Tree	$89

HARD DISK BACKUP

COREfast (NCP)	$199
DS Backup+	$140
Fastback 5.14 (NCP)	$220
Fastback 5.15 (P/S2 - NCP)	$220
Fastback *PLUS*	$CALL
Hard Disk Survival Kit	$185

BORLAND

Turbo Basic	$145
Basic Toolboxes	**$CALL**
Turbo Pascal Ver. 4	$150
Turbo C	**$145**
Turbo Prolog	$145
Turbo Prolog Toolbox	$145

LOGITECH PRODUCTS

Bus Mouse	$229
Serial Mouse	$229
LogiPaint	$310

dBXL *$230*

Completely compatible with dBase III Plus. Offers both FILE and COMMAND compatibility with dBase III Plus. dBase III Plus programs will execute without modification and you can use the same database programs, reports, index files and format files.

Other enhanced features to make life easier for you include automatic initialisation of memory variables, on-line HELP system, faster indexing, smarter error messages, and a prompt that indicates the work area and database in use. Supports up to 99 windows.

Ability Plus *$279*

All of the advanced features of Ability but Ability Plus takes you closer to the ultimate integrated package.

Ability Plus gives you Spreadsheet, WYSIWYG Wordprocessor, Spelling Checker, a Fully Relational Database, Graphics, Comms (inc. XModem) and Slide Show Builder. Ability Plus also supports EGA, two window split screen and has advanced macro facilities.

Also Available: • ABILITY **$139**
• Ability to Ability Plus Upgrade **CALL**

- Call us with your best price for any products not listed.
- All Prices **INCLUDE** SalesTax and come with full factory warranty.
- All Products are originals and Latest Release.
- Terms available for approved clients.
- All prices are subject to change without notice. Please check before ordering.
- Dealer Enquiries Welcome.

Send orders to: VAPORWARE
P.O. BOX 286 GUILDFORD, N.S.W. 2161

Please Tick Payment Method:
MASTERCARD ☐ VISA ☐
BANKCARD ☐ Cheque ☐

Please send your
☐ IBM Price List
☐ Macintosh List

APC 11/87

Signature: ____________ Expiry Date: ________

NAME ____________
ADDRESS ____________
STATE ________
P/CODE ________ PHONE ( ) ____________

Product Name	Qty	Price	Amount
Shipping			$7.00

All prices include SalesTax **TOTAL** ________ used to indicate that a particular row, or group of cells, is also empty.

Suppose a cell in row 129 were being accessed. The 'Pointers to row-headers' table, location 1, is accessed. This contains a pointer to a row-header. Row-headers have one entry for each row they represent, and this particular row-header represents rows 128 to 255. In order to access row 129, its location 129-128=1 must be consulted. If the value in this location is null, then the row has not been used; otherwise there is a pointer to a 'cell-strip' indicating that there is something in the row. Each cell-strip contains a sequence of cell-pointers, prefixed by an indication of the column numbers of the first and last cells represented by the cell-strip. There is also provision for a pointer to any further cell-strips, which represent cells further along in the same row.

The cell-pointers in each cell-strip point to the actual data structures for the individual cells. All cells must be capable of storing some status information, such as the display format and 'protection' status, and so on. But other than that, the precise data structure for a cell differs, depending on what type of data the user puts there. For the spreadsheet software to be able to identify the type of cell and interpret its structure correctly, each cell data structure must be prefixed with a type-code. The actual type-codes used can be arbitrary — as long as they are all different from each other.

A formula cell requires some further explanation. It needs to be able to hold both a formula and the value calculated by the formula. In some spreadsheet systems formulae can produce numerical or textual values, but the latter possibility is not for consideration here. Of course, the formula can be of arbitrary length, so its actual length must be specified in the cell data structure.

In most spreadsheet systems formulae can contain: 'absolute' and 'relative' cell references (absolute references always refer to the same cell, even when a formula is copied or moved into a new cell, whereas relative references refer to cells *relative* to the position of the cell in which they are used); 'numeric' and 'textual constants'; 'range' cell references (a pair of cell references); and 'operators' (for example '+', 'cos', 'lookup', and so on). All these formula components need to be represented in the formula encoding.

One good formula encoding scheme allocates a single character code for each operator or punctuation mark, reserving a handful of unused codes for the other cases. As on most computers, character codes can be in the range of 0-255. This scheme allows for nearly 250 operators to be represented, with, say, codes 0-5 reserved for non-operators (that is, the 'operands'). Of course, each of the operand codes must also be followed by information about the operand. For example, a cell reference might be represented by the code '1', immediately followed by the cell coordinates represented as two integers.

When new information is added to the worksheet, in general, the data structure is extended to accommodate the new information. Initially, when the worksheet is empty, only the pointers to the row-headers table will exist. All its entries will be 'null' indicating that there are no row-headers and, therefore, no rows containing data. As data is added it may be necessary to create row-headers, or cell-strips or individual cells.

Occasionally it will be necessary to expand cell strips — say, when a cell is added alongside an existing row of cells — or even join two together, when a cell *bridges* between two. Likewise, it may be necessary to remove cells, remove or reduce cell-strips and even occasionally delete row-headers, as information is deleted from the worksheet.

All the data-structure editing operations depend upon a 'pool' of unused memory being available for creating the new data structures. Initially, this pool of memory can comprise whatever RAM is left over after the program has been loaded, but gradually it is used up. Obviously it makes sense to put the memory used by unwanted data structures back into this pool — following worksheet deletions, for example.

The formula engine

The fundamental software in a spreadsheet system is the 'formula engine', which deals with all aspects of formulae and rearranges the spreadsheet for calculation efficiency. (A spreadsheet cannot really *be* a spreadsheet unless it can handle formulae and rapidly calculate with them, however sophisticated it might be in other respects.)

When a worksheet is to be calculated, the software must iterate through every cell in the worksheet, and wherever it finds a formula its value must be calculated and stored in the cell (so that it can be available for display purposes and for the subsequent formula calculations). Even with the encoding scheme described in the previous section, the formula calculation

Reverse Polish Notation

Reverse Polish Notation represents complex formulae in such a way that they can be calculated efficiently. The notation is not only used by spreadsheets, but also in the implementation of expression evaluation facilities in many programming languages. Readers with long memories may recall that some of the early pocket calculators had to be used with Reverse Polish input.

The Reverse Polish form of a formula such as:

- A1 * B2 + 9 / C3 is

A1 - B2 * 9 C3 / +

(The minus in this example is a 'unary' minus as in '-3', not a 'binary' minus as in '5-3'.) Notice that the order of the 'operands' ('A1', 'B2', '9' and so on) is the same in both representations, but the 'operators' ('-', '*' and so on) are in different positions and in a different order.

In Reverse Polish, operands must precede the operators and the operators must be in the order in which they are to be used — *not* the order in which they were originally entered. Thus, '9' and 'C3' precede the '/' that operates on them, and '+' comes at the end.

Where formulae are concerned, the calculation process amounts to a single 'sweep' through the expression from left to right, without backtracking. The only complication is that a 'stack' is needed to hold intermediate results as the calculation progresses.

A stack is a simple data structure in which values can be 'pushed' onto or 'popped' off the top but cannot be accessed in any other way. At each stage in the calculation, only two possibilities have to be considered: if an operand is encountered (which can only be a cell reference or a number, in the formulae we will consider here) then the value of the operand must simply be pushed onto the top of the stack; or, if an operator is encountered, then the required number of items are popped from the stack, operated upon, and the result is pushed back.

The Commodore Experts

PC Prices Tumble

LIMITED OFFER FREE $300 WORK STATION WITH EVERY PC5

PC-5
IBM compatible, 512K (expandable), single disk-drive Mono monitor and fully integrated software. Call for our low low price . . .

PC-10
IBM compatible, 640K, dual-disk drive, AGA card for stunning graphics, 5 expansion-slots allow your system to grow with you. $1395 with mono monitor $1695 with colour monitor

PC-20
IBM compatible, 640K, disk-drive and 20Mb hard disk, AGA card for stunning graphics, expansion slots allow your system to grow with you. $1995 with colour monitor.

***Super deals available on printers and hard-disks when you buy your PC.

PC-40
The top of the range Commodore PC/Turbo AT, with a 16 Bit processor, 1 Mb of RAM and a 20Mb hard-disk, features 8 expansion slots, AGA card for stunning graphics, and more! It's the ultimate Commodore PC. Call us for our 'deal-of-a-lifetime' price.

THE AMIGA CENTRE

BY COMMODORE®

BUSINESS	
Acquisition	$575
Datamat A200	$299
Mi Amiga	$219
Organize	$225
Superbase	$190
Financial Cookbook	$59
Logistix	$549
Maxidesk	$169
SPREADSHEETS	
Analyse! I	$175
Analyse! II	$199
Maxiplan	$249
VIP Professional	$299
WORD PROCESSING	
LPD Writer	$225
Pagesetter (DTP)	$219
Laserscript	$60
Prowrite	$225
Publisher 1000	$349
Scribble	$199
GRAPHICS	
AEGIS Draw	$289
Deluxe Paint II	$239
Deluxe Print	$135
Dynamic CAD	$890
Sculpt 3D	$179
VIDEO	
De Luxe Video 1.2	$225
Digiview 2.0	$399
Genlock	CALL
Pro Video CGI	$350
Video Scape 3D	$319
MUSIC	
Deluxe Music Construction Set	$239
Future Sound (Digitiser)	$375
Soundscape Pro Midi Studio	$275
Sonix	$169
Soundscape Sound Sampler	$199
UTILITIES	
Cli Mate	$69
Disk Wik	$129
Zing	$139
ENTERTAINMENT	
Sinbad	$55
Barbarian	$59
Silent Service	$49
Uninvited	$55
Faery Tale	$55
Space Battle	$29
Demolition	$29

WRITE OR CALL FOR OUR COMPLETE AMIGA PRODUCT LIST – IT'S FREE

For service, support or value, you can't beat the AMIGA CENTRE at HIGH TECHNOLOGY COMPUTER SYSTEMS.

HIGH TECHNOLOGY

290 Bay Street, Brighton, (03) 596 6211

Item	Quantity	Unit Price $	Total Price $

Or Order by Phone: (03) 596 6211 or FAX: (03) 596 7350

Please add $10.00 for postage and handling, $25.00 for PC's.

Cheque enclosed ☐ Please debit Bankcard ☐ Mastercard ☐ Visa ☐

No. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Signature__________ Card Expires__________

Name__________ Address__________

__________ P/code__________

MICRO-EDUCATIONAL PTY LTD

Unit 8, 235 Darby St, Cooks Hill 2300 Phone (049) 264122, Fax (049) 262194

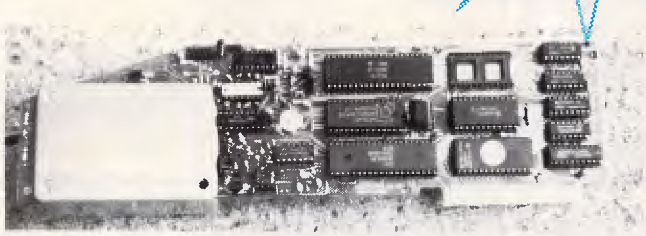
COMPUTER MODEMS FROM $199

GPA SuperModem $349 inc, $310 ex, or $449 inc, $410 ex with V22 installed

Our top-selling fully featured modem. Australian designed and manufactured, standalone **V21**, **V23** with optional **V22** expansion board available now, optional **V22bis** board available early 1988.

* Auto-answer, auto-dial, auto-disconnect
* Hayes compatible
* 300 Bd full duplex, 1200/75 **VIATEL** mode
* V22 (1200/1200) option ($150 inc, $125 ex)
* Connects to any computer with RS-232 serial
* Viatel software for Apple/IBM/Macintosh
* Cable to suit most computers including Macs
* Telecom Approved

NEW LOW PRICE



AUTO ICE Apple Modem $299 inc, $279 ex,

Card modem for the Apple II+, //e and //gs (yes, in colour!). Direct connect, auto-answer, auto-dial, auto-disconnect with a full suite of onboard EPROM software including communications, **VIATEL** and a simple word processor. V21 and V23. Suitable for users wishing to quickly, simply and easily connect to bulletin boards and **VIATEL** applications. This is a complete package requiring no further software or cabling to be operational. And at $299 it is ***great value!***

Maestro Flyer

From the designers of the all-conquering GPA SuperModem comes a stand-alone V22 modem for the ***embarrassingly low price of $199.***

The brief we gave Maestro: Design a "No Frills" V22 modem for existing modem users who need the speed increase but who don't want to junk their existing modem. And do it under $200!

Do you need 1200/1200? If so the Maestro Flyer may be the modem for you. Nothing fancy. No auto anything. Just V22 1200/1200 cps transmission.

$199 including tax, $179 exempt of tax.

Bit Blitzer 123E

Unbeatable value. Australian design and Asian manufacturing combine to bring you this full featured Modem at the lowest price around. Check out these features V21,V22 and V23. Telecom Approved (C87/37/105). Full Hayes command set including all 'S' registers. Ultra-low power consumption (500ma). Very small (130mm x 190mm x 36mm). Synchronous and Asynchronous. CCITT and Bell. Tone and Pulse dial. Modem parameters stored in non volatile RAM.

NEW PRODUCT

Call Us For The Price That Is Too Low To Publish

MICRO-EDUCATIONAL PTY LTD

Unit 8, 235 Darby St, Cooks Hill 2300 Phone (049) 264122, Fax (049) 262194

DISKS FROM 80c

We sell **two million** disks a year.
Why? Look at our prices.

Disks	10+	100+	200+	500+
Plain Label Micro-Ed Jacket	1.00	0.95	0.90	0.85
5.25 SSDD Micro-Ed Label	1.30	1.20	1.10	1.00
5.25 DSDD Micro-Ed Label	1.50	1.40	1.30	1.20
5.25 DSDD Wabash Label	1.90	1.70	1.50	1.40
5.25 DSHD Wabash Label	3.50	3.20	3.00	2.90
3.50 DSDD Wabash Label	3.50	3.30	3.10	3.00

Our huge volume bulk buying power enables us to bring top quality disks to Australia. These are not seconds or factory rejects but are of the highest quality, manufactured by Wabash DataTech, the United States largest disk manufacturer. Each and every disk is 100% certified and guaranteed for life. You won't buy better quality. We have disks to suit all popular computers including Apple, IBM, Macintosh, Commodore, BBC, Apple GS, Amiga, Apricot, Data General One, Hewlett Packard 150 and many others ....

wabash DATATECH
Professional Quality Diskettes

How to Order from Micro-Educational.

By Phone

1. Grab your Bankcard, Mastercard or Visacard and call our toll FREE order hotline 008 025229
2. Tell us which goods you want.
3. Tell us where you want them sent to.
4. Quote your credit card number.

By Mail

1. Find a piece of paper or cut out and use the attached order form.
2. Write down your name, address and phone number.
3. Describe the goods you want.
4. Enclose a cheque for the total of the order plus the delivery charge.
5. Post it to PO BOX 160 THE JUNCTION 2291.

That's it. It really is that simple. Your order is delivered to your door by either KWIKASAIR courier or Australia Post.

Wow, what great prices! Please send me the following,

____

____

Name ______________________________

Address ______________________________

____

Postcode __________ Phone ______________

Credit card number is ______________________

Expiry Date ________ Send by Post ($4)/Cour ($8) introducing

OSCAR 386

Oscar p.c. Worth a closer look

Why? Because our Oscar is much more than a box of chips. Only the latest multi-layered PCB and VSLI technology and the best electronic components are used — carefully selected by the same team of research and development engineers working with the Reserve Bank of Australia and CSIRO.

We are so proud and confident of Oscar's performance that we are giving him and you our total support by offering a full 24 month warranty. An Australia wide on-site warranty is available from Honeywell Bull.

If you are interested in looking into Oscar Turbo/Mini AT/386, ring us on 02 516 5244.

DIGITAL LABORATORY

process is still fairly slow unless the formula is also rearranged to speed things up.

The formula engine converts the formulae into Reverse Polish Notation. Some readers may already be familiar with Reverse Polish Notation (RPN) but for those who are not, an explanation is presented in the accompanying box. This explanation also shows how easy it is to calculate with RPN expressions.

Together with an ability to calculate with RPN expressions, it is also necessary for a spreadsheet system to be able to convert both ways: between the familiar 'school algebra' notation and RPN.

> *'When new information is added to the worksheet . . . the data structure is extended to accommodate the new information.'*

Both conversion processes are more tricky, and computationally expensive, than the simple Reverse Polish calculation itself. However, in the context of spreadsheets, they are only performed fairly infrequently — for example, when a formula is first entered by the user.

As well as converting formulae into Reverse Polish Notation, it is essential that a spreadsheet system be able to convert back into the original school algebra notation so that it can display a cell's formula and allow it to be edited if necessary. It would be possible to maintain both the user's original input text and the Reverse Polish version of it in a cell, but this is wasteful of memory space. It is better to reconstitute the formula from RPN.

Further pointers

A valuable source of reference on both the formula engine and a highly recommended worksheet file structure is Lotus' *Worksheet File Format* document to which I am indebted for much of the material in this article.

For readers interested in implementing their own spreadsheet systems, Borland's newly released Turbo C includes a fairly substantial spreadsheet program with complete source code. Although its data structure is cruder than the one described here, it could form a useful starting point for spreadsheet design.

END

NEW

COMPUTER DRIVE

YOUR APPLE MACINTOSH HARD DISK DOLLAR FURTHER

Introducing Easy Drive from Computer Drive

The SCSI Hard Disks that are not only quieter and faster than most other systems, but are also up to 50% less expensive, with more megabyte per dollar, by selling direct to you.

30 Mb External Hard Disk **$1675.00**

40Mb External Hard Disk **$2195.00**

80 Mb External Hard Disk **$2995.00**

(For Macintosh Plus, SE and II)

30 Mb Internal Hard Disk **$1475.00**

40 Mb Internal Hard Disk **$1995.00**

80 Mb Internal Hard Disk **$2795.00**

(For Macintosh SE and II)

Includes Delivery, Tax, All cables, Just plug in to run

Specifications

Data recording method uses RLL encoding technologies, on latest sputtered media (harder than oxide) resulting in track to track access times of 18 ms and data transfer rates of 1.25 Mbits/sec. Using half height 3.5" drives with automatic head park during shutdown. Built in cooling fan, surge suppressor and EMI line filter provide maximum reliability and efficiency.

Technical Support Line

Answers all your questions about Easy Drive no matter how simple or technical.

Speed

SCSI based so it's fast, 16 times faster than floppies

Size

30 Mb to 80 Mb External and Internal Drives

Compact

Designed to fit under your Apple Macintosh Plus and SE Computer

Quality & Reliability

Full 12 months warranty with auto head-parking feature and Easy Drive back-up and diagnostic programes

Computer Drive Pty Ltd

Leading Edge Technology

PO Box 2246 St Kilda West Victoria 3182

Telephone (03) 690 1689 Telex 30625 (ME3939)

Facsimile (03) 690 7335

ORDER FORM (Includes Sales Tax and Delivery)

Mr, Mrs, Ms

Address

Post Code

Telephone

Signature

☐ Please send 30Mb Easy Drive
☐ Please send 45Mb Easy Drive
☐ Please send 80Mb Easy Drive
☐ Internal / External Hard Disk

I enclose my cheque/money order for $

I prefer to pay by credit card $

☐ Visa
☐ Bankcard

Computer Drive P/L
PO Box 2246
St [illegible]
Victoria [illegible]

Macintosh P[illegible] trademarks of Apple Computer Inc.

VIP Professional

For those people who don't own a bona-fide PC-compatible, VIP Professional is a versatile, advanced spreadsheet which serves admirably as a Lotus 1-2-3 clone for the Atari ST, the Commodore Amiga and the Apple IIGS. Geof Wheelwright tests an ST GEM version.

Serious software support for small-business computing is once again stepping out from under the wing of the IBM PC and Macintosh hardware designs. New business applications for the likes of the Atari ST, the Commodore Amiga and Apple IIGS have started to timidly make their way forward onto the software shelves of the nation's retailers.

One of the most popular applications among all manner of business microcomputer users has always been the spreadsheet — the classic financial 'what-if?' tool that allows users to conduct complex extrapolations with electronic versions of their ledgers. It should, therefore, be heartening to users of those machines to see the recent releases of Logistix (a spreadsheet-based integrated package for the Amiga), K-Spread (a spreadsheet for the ST) and AppleWorks 2.0 (the latest version of an integrated package for the Apple IIGS that includes a spreadsheet).

Unfortunately, all of those applications still shut these users off from the main body of work written about this subject, as most books about spreadsheet design use the PC-based Lotus 1-2-3 spreadsheet as their starting point. Such applications also generally cut off Amiga, ST and Apple IIGS users from sharing spreadsheet files with PC users operating under Lotus 1-2-3.

There is, however, a solution at hand. It is called VIP Professional, from VIP Technologies, and comprises a fully Lotus-compatible spreadsheet which is available in versions for the Atari ST, the Commodore Amiga and the Apple IIGS.

Overview

The most popular current version of VIP Professional is for the Atari ST. This is sold in Australia by Atari itself and retails for $369 for the version that provides full support to the ST's Macintosh-like GEM interface. VIP Professional is also one of the few full-range spreadsheets available for any of these machines (with the possible exception of the IIGS, which can run the full range of Apple II software — including the original VisiCalc software which started the popularity of spreadsheets in the first place).

In my view, it is the latter point which is of more immediate concern. Despite the dominance of Lotus 1-2-3 in the PC world, a spreadsheet for the ST, Amiga or IIGS will have to stand or fall on its own merits for the users of those machines. After all, each of the buyers of those systems had the choice to buy a PC-compatible system and did not: therefore, any software they use for it has to be judged on how well it exploits that machine, as opposed to how well it helps to turn their micro into a PC clone.

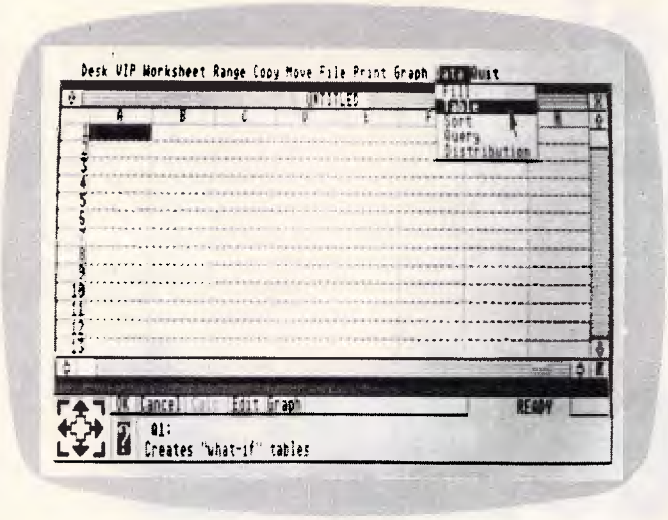
Indeed, impressive hardware and software emulators now exist for all three of these machines which permit them to run full-blown PC software. And, in most cases, these emulators cost little more than VIP Professional.

So, if someone is looking at VIP Professional, they should judge it entirely on its own merits — although comparisons with Lotus 1-2-3 may be useful in context-setting.

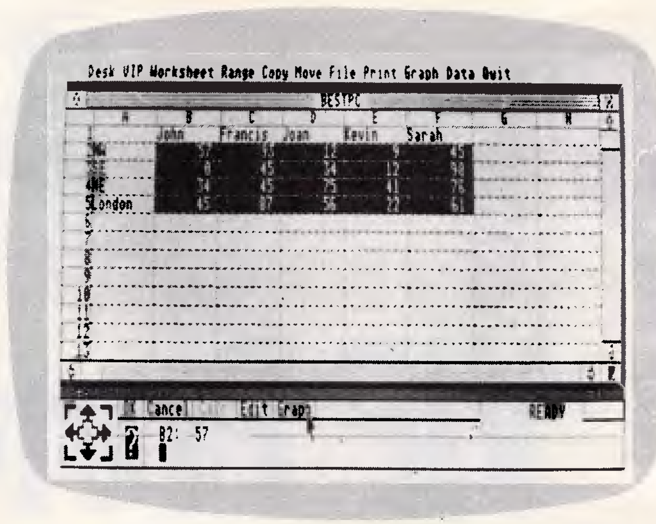
The first question we must thus address is just how useful VIP Professional is for the first-time spreadsheet user on the Amiga, ST or IIGS. I'll deal with this question mainly in terms of the ST, as that is the machine I primarily used to review the software. Not surprisingly, I would say that, overall, VIP Professional is no easier or harder for the novice ST user to learn than it would be for that person to start with Lotus 1-2-3 on a PC.

Setting up

VIP Professional comes with two floppy disks: one containing the software itself; and the other being used for context-sensitive 'help' files, and some sample spreadsheets and macros. These are configured such that you can run the system off a single drive if necessary; the entire application loads into memory from disk one (after double-clicking the mouse on the filename 'PROFESS.PRG'), then you can stick disk two into the drive to gain



The VIP Professional blank screen looks much as you would expect from a Lotus-compatible spreadsheet, but with pull-down menu titles and a graphic-enhanced command line



VIP Professional uses the GEM interface properly. The mouse is used to highlight figures that are to be cut, pasted or used for a graph

access to help and example files.

I found that by placing the help disk in drive A after loading up the software and using the 'Directory' command to set the directory to C (as in MS-DOS), I was able to save and load files from the hard disk while obtaining help files from the A drive.

In use

There are several important innovations within VIP Professional that make the package somewhat simpler to use than the software it is trying to copy. First and foremost, the version I tested uses the Atari's GEM interface to the full. This means that when you start up the application, it provides you with the same kind of consistent look and feel that you will have become used to in other Atari applications.

The main spreadsheet grid dominates the middle two-thirds of the screen, with pull-down menus running across the top, a pointer (which changes shape from a thick cell indicator to a regular pointer icon, depending on where it sits on the screen) somewhere in the middle of the screen, and a large graphics-driven 'status box' runs along the bottom.

The graphics-driven status box along the bottom of the screen allows you to enter data in the form of commands to move about the spreadsheet using the mouse. There is a large cursor cluster at the far bottom left-hand side of the screen which can be used to 'page up' and 'page down' quickly around the spreadsheet (all controlled by the pointer), and a question-mark icon which brings up the help menu as opposed to obtaining it by pressing the F1 key.

There is also a series of action boxes above and to the right of the question mark which allow you to confirm or cancel a command using the pointer, as well as giving recalculation, editing and graph commands. The rest of this box is dedicated to telling you which cell you are editing and allowing you to enter data into it.

I would suggest that for a user new to spreadsheets and only recently acquainted with GEM, these commands are by no means intuitive. In addition, the documentation I was sent for the GEM version refers almost exclusively to the text version of the software, with mention in the first few pages only of any pull-down menus and icons. There was, however, a brief introductory booklet which did address this version and seemed to provide all the help I needed — although that may be small comfort to a novice.

At any rate, the main data entry section of the VIP Professional spreadsheet looks exactly as you would expect it to, with the names A through H running across the top to show initial names of columns (the vertical portions of the electronic ledger) and the numbers 1 through 12 providing the same for the rows (horizontal references for the spreadsheet).

Along the top is a set of pull-down menus that should be familiar to all ST users. The left-most of these is the 'DESK' menu, containing any desk accessories you may have installed in the machine; while immediately next to it is a menu entitled 'VIP'. This menu offers the choice to GOTO a named cell immediately, get context-sensitive help, construct a database query, build a table, or switch the background grid of the spreadsheet on and off.

All the other menus are exact replicas of the menus contained in the Lotus 1-2-3 spreadsheet. For non-Lotus users, these are:

- **Worksheet** The menu title for a series of options which govern large-scale changes of a spreadsheet model you have loaded in from disk or created in memory from the keyboard. This is where you would insert and delete cells, change the size of cells, and change the 'format' of the data contained within the cells.
- **Range** The commands under this menu title are designed to allow control over a specific group of cells or 'range'. Using the options under this range, you can carry out operations such as erasing specific cells, change the way in which some are displayed, and 'name' a range for later operations on that 'named range'.
- **Copy** Allows you to duplicate the contents of a cell or range of cells to another cell or range of cells. This is a particularly useful function when dealing with formulae that you might wish to repeat throughout a spreadsheet model.
- **Move** This performs the same function as copy, but moves the cell or cells rather than simply making a duplicate of them and placing this in another area of the spreadsheet.
- **File** You use this menu to carry out all file operations, such as saving files and retrieving them.

Postpak.
For those who feel uncomfortable putting their brains in a paper bag.

Now you can mail up to 5 computer diskettes in special protective Postpak containers from Australia Post.

They're safer, stronger and cheaper than the paper bags you're using now.

What's more,the more you buy the more you save. Buy them from any Post Office.

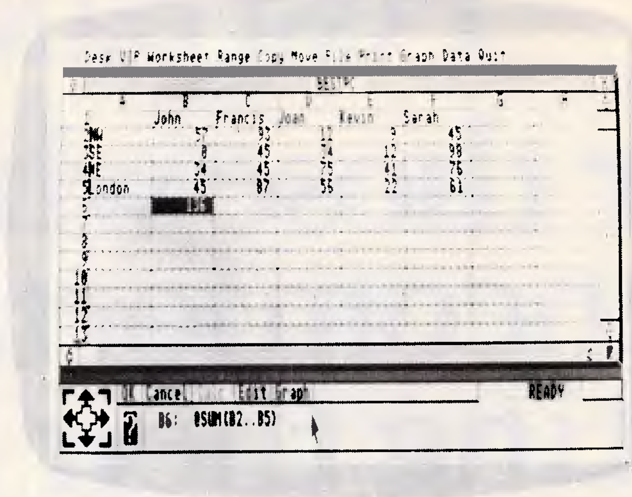
POSTPAK. WE DELIVER.

Australia Post

Mojo MDA APC137

This menu is also used to change the name of the directory from which VIP Professional will draw data files, and to allow parts of files to be imported and exported to disk.

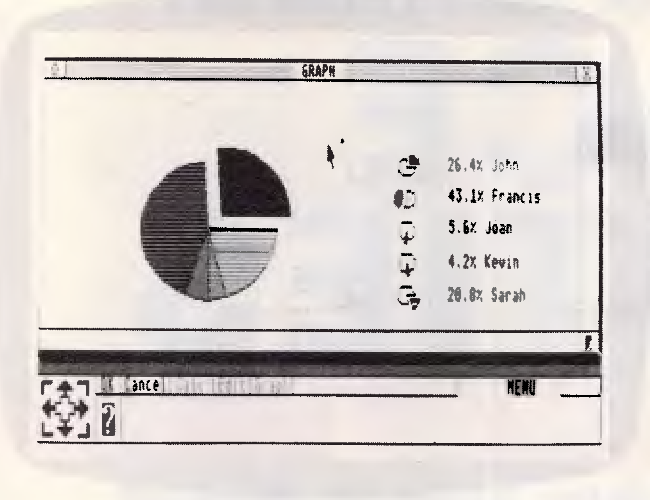
- **Print** This menu does what you would expect — it allows you to print a VIP Professional spreadsheet to paper or to disk. It also allows you to control the way in which information is sent to the printer, particularly with regard to headers, footers, margins and page length.
- **Graph** This menu allows you to use the data you have already entered into VIP Professional to create and add to graphic representations of that data. The system supports bar, pie, stacked bar, line or XY graphs and, when used with an Atari colour monitor, also provides a choice of colours for the graphs.
- **Data** You use this menu command to carry out VIP Professional's limited database operations. These allow database tables to be queried, sorted and redrawn in accordance with any changes that may have been made to the information contained in them.
- **Quit** Leaves the program when you reply with a 'yes' to the 'Yes/No' question that this command generates. If you haven't saved your file, VIP Professional will give you a chance to say whether or not you wish to do so when you use the Quit command.



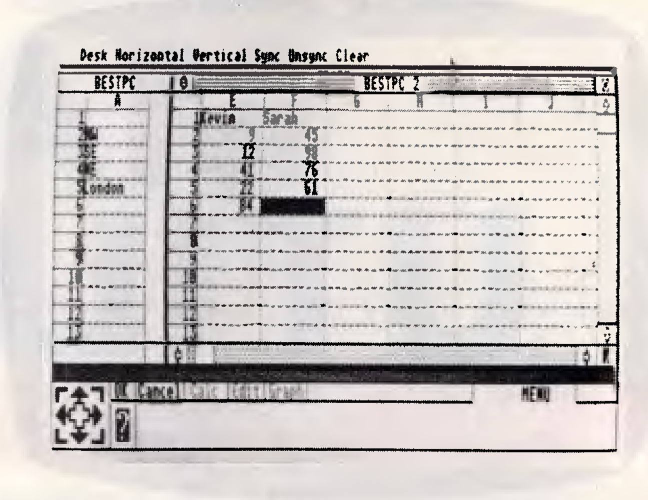
You can see from the entry format of this formula that it is identical to what you would use in Lotus 1-2-3 and, therefore, that everyone familiar with 1-2-3 should have few problems with VIP Professional

Those are the basic menus and their functions, and you can access these menus in one of two ways. You can either use the mouse and pointer to point to the pull-down menu in question and then use the mouse button to select your choices; or you can use the traditional Lotus 1-2-3 '/' command key to invoke the 'Command' mode, and then use the cursor keys to access the menu of your choice.

Some confusion does arise, however,



VIP Professional offers essentially the same graph types as 1-2-3, including the fairly standard pie chart. Unfortunately, it also requires the same degree of complexity



The Split Windows function of 1-2-3 is mimicked to great success within VIP Professional, and uses GEM to make the most of resizing and scrolling around windows

which is inherent in the way that VIP Technologies has implemented this laudatory choice of command keys. The command choice is structured in such a way that if you start by selecting menus using the '/' key and the first letter of each command (that is '/' and the 'F' key would select the File menu), you cannot easily switch over to issuing commands with the mouse again. You need to press the Esc key a couple of times to get the system back to having a mouse 'pointer', and then you will be able to issue commands from the mouse.

In that sense, VIP's attempts to be more user-friendly than Lotus do not work so well, as you can either use the spreadsheet like a Lotus user or an ST user, but not like a mixture of both.

It is, however, praiseworthy that VIP has tried to ensure that every command you could issue via the keyboard using normal Lotus commands in VIP Professional, can also be issued via the mouse for those ST users who may know nothing about Lotus 1-2-3 and who have just bought VIP Professional as a high-powered spreadsheet.

Suitability

In terms of how well VIP Professional satisfies the needs of the first time user, I have to admit that it is no easier to use for the novice than Lotus 1-2-3. While VIP Technologies has made every attempt to make use of the ST interface and make the system more friendly, you can see that the company has always been held back (in terms of how far it can go with this approach, that is) by the fact that it is committed to the program being fully 1-2-3 compatible.

This gives VIP Professional some disadvantages when compared with other 1-2-3 spreadsheets such as Kuma's K-Spread, which is dedicated solely to providing spreadsheet power under GEM (on both the PC and the ST) and makes none of the compromises in the interface that are necessary to keep VIP compatible.

This leads me to the next question — whether or not VIP Professional is an acceptable Atari substitute for Lotus 1-2-3 among experienced Lotus 1-2-3 users who perhaps have a PC at the office and an ST at home.

The major advantage of the ST version of VIP Professional for this job — and the reason why ST implementation currently scores over that of the Amiga and the IIGS — is that the ST's disk drives can read from and write to file formats from most compatible computers which use 3.5in disks. Such machines include the entire Toshiba range of desktop portable computers and the new IBM Personal System/2 range.

In theory, this also means that anyone running Lotus 1-2-3 on a PS/2 or Toshiba portable can take their 3.5in disk with Lotus data files on it, stick that disk in an Atari ST running VIP Professional, and expect VIP to read all the data and formulae without any problems. At least, that's the theory . . .

I discovered something slightly different. Yes, the ST could easily read data files from both DOS 3.3 and Toshiba DOS 2.11 without any problems, and could even import Lotus .PRN files as ASCII. But, I did have problems with spreadsheet files.

The problem may well have been with my software, but it is not likely to have been unique. I tried taking a file saved under Lotus 1-2-3 version 2.01 for the Toshiba 1100 series, and reading that file into VIP Professional. I encountered two problems. The first revolved around the fact that my version 2.01 of Lotus 1-2-3 saves files with the extension .WK1, while VIP Professional expects the older .WKS extension on its Lotus 1-2-3 files. Thus, the first thing I had to do when trying to read my Lotus files into VIP Professional was change the file extension on my file from .WK1 to .WKS. This was carried out without any problems. But, when I tried to then load the file into VIP Professional, I was still faced with the dreaded 'Not a valid worksheet file' message.

Undaunted, I tried to create an 'exported' version of my Lotus 1-2-3 file on the Toshiba and found that it would read into VIP Professional without any problems as an ASCII file — stripped of formulae and proper cell placement.

To try and see where the problem was, I then created a new spreadsheet file under VIP Professional, and tried saving that to my Toshiba disk and loading it up under Lotus 1-2-3. To my joy, the file created under VIP Professional worked without any trouble under Lotus 1-2-3 — formulae and all.

Whatever the reasons for this, it seems that, at least in my test version of the software, VIP Professional has still not quite got the business of bringing data in from Lotus 1-2-3 down pat,

although it does seem that it can get information back out to Lotus 1-2-3 without troubles.

Comparison

It would be interesting to conduct a little comparison between Lotus 1-2-3 and VIP Professional — and I think even the most hardened Lotus enthusiast will find it hard to fault the ST software.

To start with, VIP is huge. It operates in an 8192-row x 256-column matrix, using sparse memory management. This latter point is important as it means that VIP will only ever map the data that's in its cells, rather than having to keep track of the empty cells. On some spreadsheets, for example, placing a single number in the last cell of the spreadsheet (commonly somewhere like IZ8192) will cause the whole spreadsheet to be filled up, as it has been designed to fill all the cells upwards and to the left of IZ8192 with zero values.

But, sparse matrix spreadsheets such as VIP Professional and Microsoft Excel merely remember the cells that have data in them, and where those cells are located in the spreadsheet. All the remaining cells are assumed to be blank and, therefore, VIP Professional doesn't have to bother remembering them.

Another feature offered by VIP Professional that you won't find in Lotus 1-2-3 is the use of multiple windows. You can, for example, have a spreadsheet in one window, a database in another and a graph in a third, with the graph updated each time you change the data linked to it and then click on the graph window to redraw it. In this respect, VIP Professional is more like Symphony than 1-2-3.

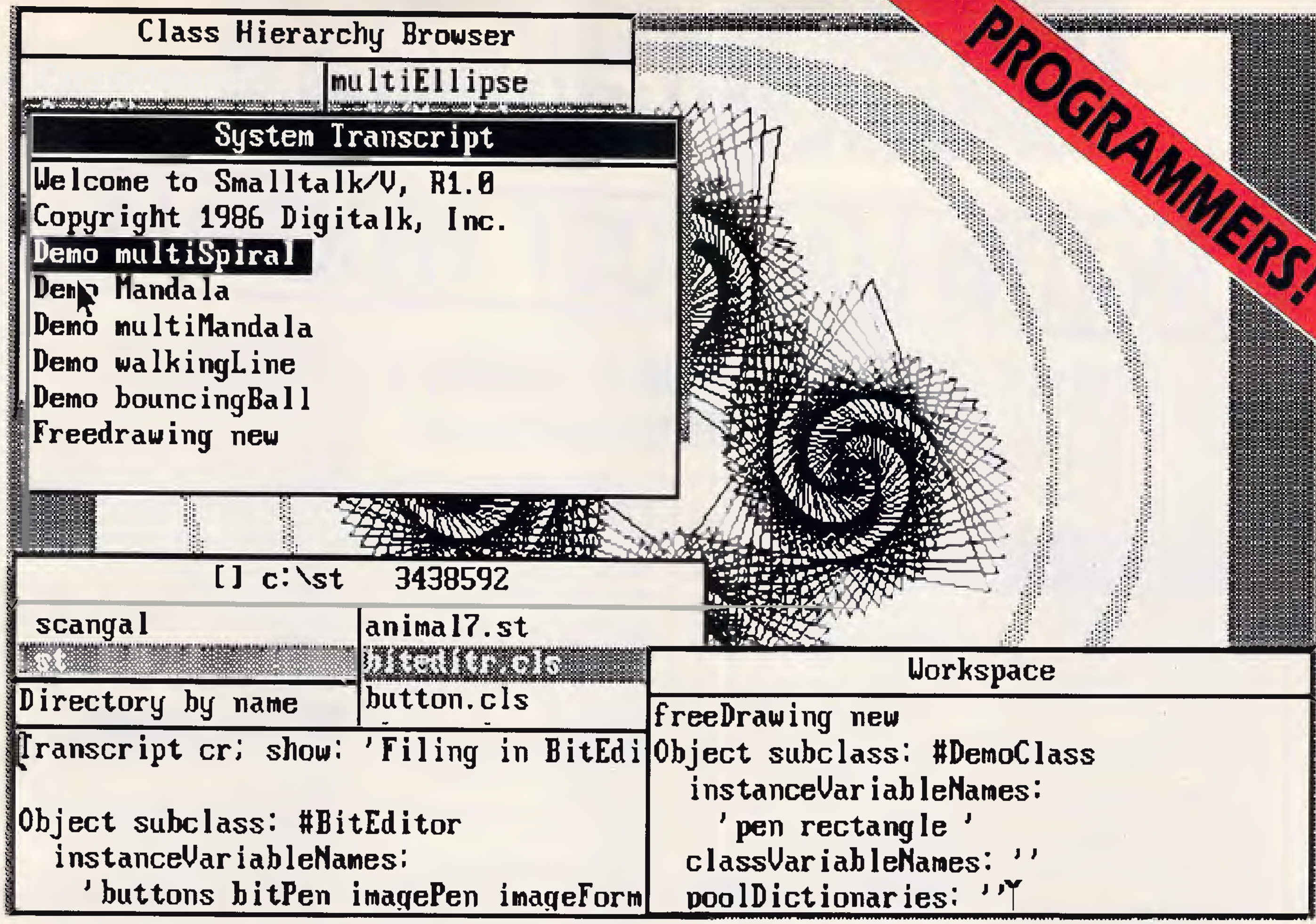
> *'. . . a spreadsheet for the ST, Amiga or IIGS will have to stand or fall on its own merits for the users of those machines.'*

Movement around the spreadsheet is also a lot easier than it is in 1-2-3. In a large spreadsheet, where you might well have a vast amount of data spread out on a large worksheet, you can use the 'express' icon to move around quickly. This is the cursor key icon I mentioned earlier which sits at the bottom left-hand corner of the screen. By pointing to any one of the four corners of this icon and clicking on the mouse, you can control movement to the four corners of your current worksheet. You will note here that I use the word 'current' — the express icon will only move as far out in the spreadsheet as you have placed the data, and no further. Consequently, there is no chance of 'over-shooting' the end of the spreadsheet.

You will also find that the arrows in this iconic key cluster provide you with much finer control than the horizontal and vertical slider bars at the bottom and side of the main data entry screen — these move around the spreadsheet a little too quickly for my liking.

With regard to spreadsheet functionality itself, you'll find nothing missing from what you would expect in a Lotus 1-2-3 clone including keyboard macros (although with no facility yet for including mouse movements in the macros), a vast range of '@' functions (including PMT, IF, TRUE, SUM, DATE and others).

PROGRAMMERS!



Get a feel for the future with Smalltalk/V

- **Real windows! Look at the screen dump. This is how windows were meant to be done. Just like pieces of paper on a desk!**
- **Extendable! Smalltalk is extendable like Forth. Compile your own extensions to become part of part of the language. 90% of Smalltalk is written in itself. Source code comes with the software so you can explore the language fully.**
- A huge toolkit of classes, objects, and methods to work with. Over 200 easily modified building blocks for creating and manipulating symbols, characters, numbers, and graphic objects. Source code included.
- Bit-mapped graphics with bit and form editors and turtle graphics for the creation and animation of graphic objects.
- A sophisticated source-level debugger to speed program development.
- An object-oriented Prolog compiler for logic programming within Smalltalk programs.
- Not copy protected.

Some talk about Smalltalk/V...

"This is the real tr[illegible] folks. A super Smalltalk like this turns your PC into a hot workstati[illegible] It's fantastic... Highly recommended."

John Dvorak, Contributing Editor, PC Magazine

"The tutorial provides the best introduction to Smalltalk available."

Dr. Andrew Bernat
AI Expert Magazine

"I solve problems quickly using Smalltalk/V because its classes and objects help me organise my thinking. And besides; it's fun to use."

Dr. Barry Fishman, Senior Project Engineer
Hughes Aircraft Company

$199

SOFTWARE Express

48 A'BECKETT ST, MELBOURNE, 3000. PHONE (03) 663 6580

SELECT

LOW-LOW-LOW-COST PROGRAMS

Out of the thousands of programs we have collected, for a small service charge of $15 we bring you a **SELECTION OF THE BEST** that have been carefully tested and documented. Suit IBM and compatibles. 5¼" and 3½", DOS2 or greater. Please note that in those instances where Basic is required, users should have Basica/GW Basic, or our shareware compatible version on disk M9001. Basic2 is not suitable.
Our games disks have a CGA emulator so those with Hercules boards can play.

MS-DOS

GAMES

M1014: CREATE FOR YOUR OWN ADVENTURES. Express your own ideas and fantasies. Generates games of your design.

M1044: MARTIAL ARTS: Match your skills against all sorts of villains and dangers.

M1050: SUPER COMPILED GAMES (7). With Polymaze, Landmine, Drain, Elevator, Eliza, Starwars. Ready to run.

M1051: 50 BASIC GAMES. Includes a Startrek, Swarn, Baseball, Hobbit, Blackfri, Antonyms, many more.

M1052: GAMES OF STRATEGY (3). Be challenged with Air Traffic Controller, Interbridge Construction, and Global War.

M1053: GAMES FOR 8's AND UNDER. Special selection for the young'uns. 13 games, including a design your own secret adventure. Some games require Basic.

M1055: PINBALL GAMES (2). Good graphics and absorbing arcade game. Has Centre Fielder, Cyclops, Flume, Magic, Pin.

M1056: CHINESE CHECKERS. A well designed board game with good graphics.

M1058: MUSIC COMPOSER. Use your computer to write songs, melodies. Shows real notes.

M1059: EGA LIFE. Generates patterns of bacteria based on your input. Brilliant in hi-res colour.

M1060: CHAMPIONSHIP GOLF COURSE. You play on a course based on a real one used on professional circuit.

M1061: ADULT GAMES. Including strip poker, adult trivia, etc.

M1063: SPACE RESCUE ADVENTURE. A comprehensive and sophisticated game to challenge you.

M1064: ADULT JOKES. A collection of witty, funny and often blue jokes.

M1065: TEST YOUR ESP. Could be used seriously or in fun. Computer shuffles and displays one of 25 cards with special symbols.

M1066: CROSSWORD SOLVER. Helps you find those elusive words in crosswords.

M1067: BRIDGE. A comprehensive and well-designed game to sharpen your play.

UTILITIES

M2041: BAYLEY UTILITIES. Has mail facility for those who share the computer with others, wish to log computer time, more.

M2042: EGA UTILITIES. Help you to make better use of screen — change colours, borders, lines, etc.

M2043: SPECIAL COLLECTION UTILITIES. With Nsweep (genuine), PC-Sweep, add line ends to ascii file, hard disk directory, adjust margins on epson printer, etc.

M2045+: LIKE-SIDEKICK RESIDENT UTILITIES. Calculator, note pad, data base, appointments calendar, cut & paste, term, communications. 2 disks. Easy, powerful. $30.

M2046: HOT UTILITIES. Superior directory, system stats, diskcheck, file find etc. For colour screen.

M2047: MACINTOSH EMULATOR. Doesn't run programs, but provides a Dos shell like the Mac's. Great to watch, use.

WORD PROCESSING/ PRINTING

M3007: SPELLING CHECKER. Works with most word processors. We've added thousands of new words incl. business/computer terms.

TOP QUALITY PUBLIC DOMAIN & USER SUPPORTED SOFTWARE

M3020: EXCELLENT WORD PROCESSOR. Compatible with Wordstar, has clear, easily followed commands on screen.

M3021: QUALITY MULTI-FRONT PRINTING on dot matrix, incl. Courier, Greek, Helvetica, Palatino, Roman, Italics, etc.

M3024: WORD PROCESSING FOR KIDS. Special features, large lettering, easy to use. A gem.

M3025: TOUCH TYPING — PRACTICE AND EVALUATION. Lets you read script from screen, reports speed/accuracy.

M3026: EGA/CGA WORDPROCESSING. A many featured program that makes extensive use of colour screens. Delight to use.

M3028: FANCY PRINTING FOR WORDSTAR. Access many special characters, change line spacing, do sub/superscript, etc.

M3029: PC-WRITE ENHANCEMENTS. Uses macros to enhance the key command structure for easier and faster use.

M4017: ONE-PAGE DESKTOP PUBLISHING. Suits preparation of flyers, notices.

GRAPHICS

M4014+: COMPUTER-AIDED DESIGN. Dancad-3d will do complex drawing, 2 or 3 dimensions, print sharp lines for mechanical drawing, illustration, animate parts. We've squeezed 4 disks on to 2. Needs CGA. $30.

M4025: SCREEN CAPTURE UTILITIES. Grabs colour, b/w, graphics, etc. A professional printing aid.

M4022: EGA GRAPHICS. 3 dimensional, wireframe modelling. Move, tip, scale, rotate.

M4023: BUSINESS GRAPHICS. For pie/bar charts, graphs, comparisons. Easy to use.

M4024: PAINT GRAPHICS FOR MONO/HERCULES. Good facilities— and you don't need colour. Patterned shading, backgrounds, etc.

LANGUAGES

M9001: BASICA/GWBASIC COMPATIBLE INTERPRETER with tutorial. Runs programs written in industry standard Basic. Suits PC compatibles.

M5023: Z80 CROSS ASSEMBLER. New version that lets you write & compile CP/M programs on PC.

M65034: MINI-ADA. Substantial subset of major new language. Pascal & Basic source code + disassembler. Requires Turbo Pascal.

M5035: ZBASIC COMPILER. Fast, easy to use version, with editor & examples on disk.

M5036: TURBO PASCAL CROSS-REFERENCER. Lists, beautifies, cross references source code.

M5038: EXPERT SYSTEM SHELL. Contains utilities to develop, test and run new expert systems. Menu driven. Turbo Prolog source provided. Book available.

COMMUNICATION

M6011: COMMUNICATION UTILITIES. New version with compression/decompression tools, RS232 tutorial.

M6014: SUPER NEW COMMUNICATIONS. Telix. Powerful, yet easy to use, menu-driven. Contact bulletin boards.

M6016: PRESTEL/VIATEL COMPATIBLE. Communications program for contacting these bulletin boards. Handles split baud rate (1200/75).

CALCULATION/BUSINESS

M7001: GENERAL LEDGER ACCOUNTING. Has GLedger, Cash Book, Profit/ Loss, Balance Sheet. Prints cheques. Data can be read by Lotus 123. Easy to use.

M7004: STOCK MARKET ANALYSIS. Special aids to help you "think and grow rich". For managing and evaluating portfolios and prospects. Needs basic.

M7024+: PAYROLL SYSTEM. Flexible, easy to use, adjustable rates. 2 disks. Good doc. $30.

M7040: 123 COMPATIBLE SPREADSHEET. Also does graphs, pie charts. 52x200 cells.

M7041: MEMORY-RESIDENT SPREADSHEET. Full — featured. At hand when you want it. Insert calcs into text, etc.

M7042+: BILLINGS FOR SERVICES. (Professions/trades, etc). Costs, mailing list, invoices, controls drs, file merge. Quality program, easy to use. Powerful reporting. 2 disks. $30.

M7043: INTEGRATED SPREADSHEET/EDITOR. On one disk. Effective combination.

M7044+: CONTRACT BID ESTIMATING. 5 disk set of powerful program for calculating costs, margins, progress and final estimates. Flexible to use. Needs hard disk. $50.

M7045: ACCOUNTS RECEIVABLE AND INVENTORY. Integrated system for small business that has up to 200 debtors. Prints invoices, cost of sales reports, etc.

M7046: GOAL SEEKING FOR SPREADSHEETS. Works backwards with your spreadsheet from a specified target and lets you examine options.

M7047: POINT OF SALE INVOICING. Suits retailer with different products/depts, reads bar codes, controls inventories, etc.

M7046: PURCHASE ORDER SYSTEM. Keeps track of orders, goods received, quantities, prices, suppliers.

M7049: PERSONAL FINANCIAL ANALYST. Examines your monetary/assets situation and makes projections for planning.

DATABASE

M8009: SUPER DATABASE MANAGER. New version. 120 fields, 16 million records, fast sorting, fields anywhere on screen. Calculations. Two disks on one!

M8018+: DBASEIII COMPATIBLE DATABASE MANAGER. Same functions and runs same files as DB3. Major or small tasks, good reporting, labels. Extensive docs. Highly rec. 2 disks. $30.

M8019: DBASEIII UTILITIES (2). Weighted Retrieval. New view of data based on your selection criteria. Attach relative importance to factors.

M8020: DBASEIII UTILITIES (3). Add ons and utilities. Compiled, with C source, Display header info, port addresses, date entry, count comments, encryption, view files, strip characters, more.

M8022: HOME INVENTORY. Keep a record of your possessions re theft, fire, insurance, etc.

EDUCATION

M9019: CHEMISTRY GAME that teaches chemical valences, atomic bonding and structure.

M9020: IQ WORKOUT. Gives practice on synonyms, antonyms, analogies, numbers. Evaluates. Needs Basic.

M9021: COMPUTER-AIDED TESTING. Shows questions, checks answers, re-presents questions until correctly answered, evaluates.

M9022+: MODULAR2 TUTORIAL. 2 disks that teach you how to program in this important new language. $30.

M9023+: TURBO C TUTORIAL. If already familiar with another language, this will give you a good grounding in Turbo C. Sample source included. 2 disks. $30.

M9024: SPANISH LANGUAGE TUTORIAL. Includes vocabulary and conjugation of verbs. Extensive.

M9025: JAPANESE TUTORIAL FOR BUSINESS AND TRAVEL. The words, pronunciation, grammar most useful to the casual speaker.

M9026: FRENCH TUTORIAL. Emphasis is on conjugation of verbs.

M9027: SECONDARY MATHS (2). Compiled with Pascal source. Equations, lines, triangles, Ohms Law, Parallel Circuits.

GENERAL

M9504+: RECIPE MANAGEMENT. Contains hundreds of recipes and excellent searching. Add your own. 2 disks. $30.

M9512: GOURMET PIE RECIPES: Some of the most delicious you've ever tasted. Menu-drivan.

M9512: PERPETUAL DIARY. Plan ahead for appointments, events, birthdays. Print reports. Needs Basic.

M9513: LIFESTYLE & HEALTH ANALYSIS. Has personality assess, biorhythms, heart disease risk, alcohol screen, life expectancy. Needs Basic.

M9514: CHURCH MANAGEMENT (1). PROSPECTS. Keeps track of those interested in joining, personal data, etc.

M9515: CHURCH MANAGEMENT (2). MEMBERSHIP. Details of new members, anniversaries, birthdays, Sunday school membership, etc.

PHONE NOW WITH YOUR ORDER

(02) 29 2866

SHAREWARE REQUIRED FOR INTERNATIONAL DISTRIBUTION

We have extensive marketing and distribution facilities locally and overseas and require quality software for international distribution. Adequate documentation should be on the disk. Please forward submissions to our Chief Executive at the address below.

CP/M, MACINTOSH, APPLE II, COMMODORE 64.
Call or write for free catalogue.

PUBLIC DOMAIN NEWSLETTER

For news, reviews, views and how to use public domain and user-supported software subscribe to our bi-monthly newsletter and keep informed on the free programs that help your computer to serve you. INCLUDES UPDATES TO CATALOGUE. Only $15.

ORDERS:
For individual disks, the cost is $15. 3½" $18. Sets are as specified.

Add 20% Sales tax and $3 post/pack.

ORDERS MUST BE PREPAID.

PAYMENT BY MAIL TO:
SELECT SOFTWARE,
Box C343 Clarence St PO
Sydney, NSW 2000
(Office: 3 Barrack St, Sydney)

TELEPHONE ORDERS:
(02) 29 2866, (02) 29 3810
Fax: (02) 262 1290.

NEW ZEALAND:
(054) 84 622.

We cannot guarantee the suitability of public domain/user-supported software for users needs or equipment. AK1002

Documentation

Getting VIP Professional up and running is a fairly simple task although I could not give VIP Technologies high marks for the installation section of the documentation. The information on how to install VIP Professional to run on my ST hard disk was buried obscurely in an introductory update booklet, so that I ended up conducting part of my test from floppy disks.

Frankly, VIP Professional's documentation lets the package down. While it is excellent as a minimalist reminder for existing 1-2-3 users, it is definitely not aimed at first-time spreadsheet users. These users may obtain some help from the onboard example files, but I suggest that any novice who seriously wants to get to grips with VIP Professional will have to buy a book on 1-2-3 and learn the rudiments from that.

Conclusion

For the first-time spreadsheet buyer, whether you're using an Amiga, an ST or an Apple IIGS, there are easier spreadsheets that you could buy than VIP Professional. There are, however, few that would be more powerful or well-supported in third-party documentation (via the vast library of training books which are available for 1-2-3 users).

For experienced PC users who run STs, Apples or Commodores as their home systems and want to have a Lotus 1-2-3 clone for those machines, give VIP Professional a careful look before considering a full-blown PC emulation and a real copy of Lotus 1-2-3 (or one of its many PC clones).

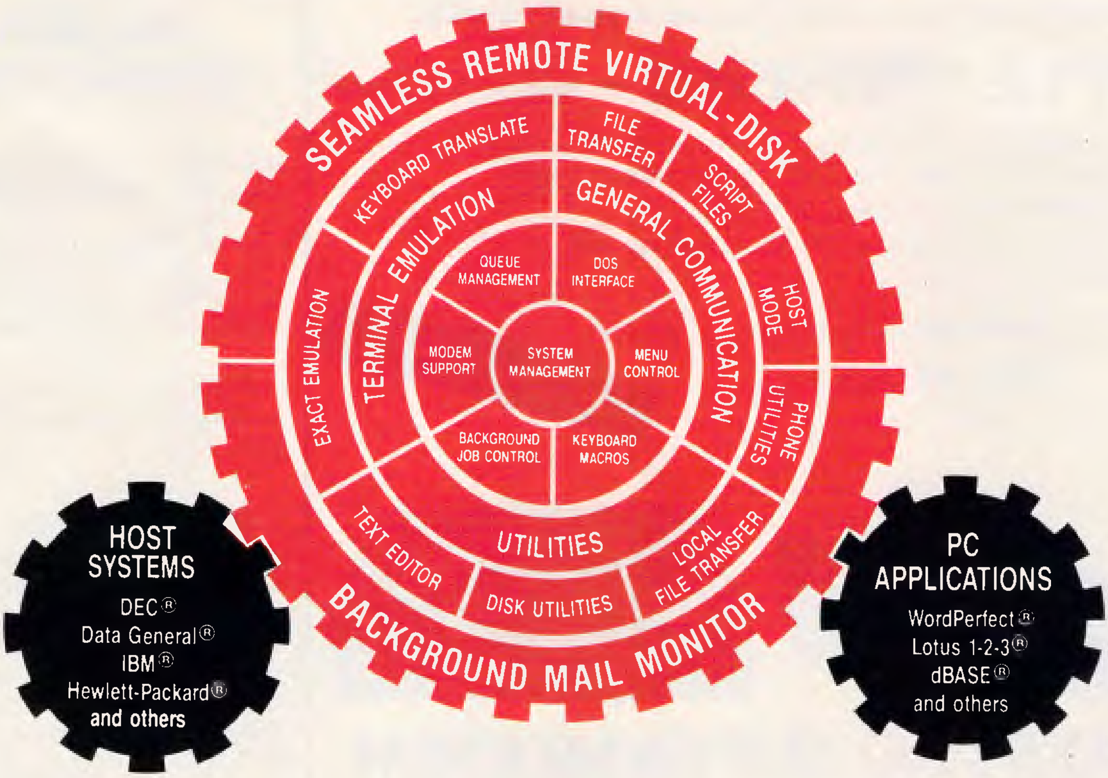
While ST users should look carefully at any disk compatibility problems they might have in reading PC files directly, users of all the machines should be able to get Lotus 1-2-3 files onto VIP Professional and back using a modem and communications software, so this is not an insurmountable problem.

If you don't own a PC clone and want to run Lotus 1-2-3, this is probably as close as you'll ever get. And, given the better user interface on the GEM edition I tested — along with the large worksheet and easy navigation — some may even find it better.

END

VIP Professional for the Atari costs $369, for the Amiga $399, for the Apple IIe $399 and $566 for the Apple IIGS version.

SOFTERM PC®



"40 Exact Emulations, 7 File Transfer Protocols, and Multi-port Background Communications"

- Includes over 40 exact emulations,supporting block and conversational modes
- Runs on IBM PS/2 PC,XT,AT, compatibles
- Seamless Remote Virtual Disk integrates file transfers between remote systems and your favourite PC application using local disk syntax
- Supports up to 4 serial and 3 parallel ports simultaneously
- Speeds up to 115,200 baud, full or half-duplex
- Operates serially or with most LAN's, NetBIOS and custom

TERMINAL EMULATIONS

ADDS Regent 20,25,40,60
ADDS Viewpoint ,78
AT&T 610
Data General D210,D410
Datapoint 3601,8220
DEC VT52,100,102,220
Hazeltine 1400,1410,1500,1520
Hewlett Packard 2622A,2392A
Honeywell VIP7205,7801,7803,7813
IBM 3101-10,3101-20,3162
Lear Seigler ADM 2,3A,5,11
Microdata Prism II
Perkin Elmer 1251
Prime PT 100
Televideo 910,921,925,950
Texas Instruments 931
TRS-80 Model 16 Console
TTY Compatible
Wyse WY-50
User Defined

Level 5, 120 Pacific Highway, St Leonards
N.S.W. Australia 2065
Phone (02) 439-7144 Fax (02) 437-4168

Exclusive Australian Distributer

MODEMS by MAESTRO

Don't send your money overseas, support Australia.

APPLE OWNERS! – feeling neglected?

What has happened to the good old days when everybody was making cards for your computer? Well, here's a card to put a smile back on your face.

A "Hayes Micro-Modem Compatible" modem with 1200/1200 full duplex, plus 1200/75, 75/1200, 300/300, auto-answer and auto-dial.

PRICE: **$349.00** fully built and tested,
$249.00 for the kit.

No serial card required!

NEW RELEASE

MAESTRO SUPERMODEM

– new model and new prices!

Australian designed and manufactured.
Built in Gosford by the Challenge Foundation.
Over 3000 sold in just 12 months.
Expansion port allows easy upgrades to V22 and V22bis.
Hayes compatible
Auto-answer/auto-dial
Baud rate sense
Built-in bit rate converter
Telecom Approved

Prices (inc. tax)

$349 V21, V23
$449 V21, V22, V23
KIT **$250** V21, V23
KIT **$350** V21, V22, V23

BIT STREAM FLYER

This must be the cheapest V22 modem in Australia!
1200/1200 full duplex communications for

ONLY $199 or $179 – kit price (allow $8.00 delivery)

BANKCARD and MASTERCARD accepted.

PROJECT "MISSING LINK"

Step inside the USS Enterprise as it shifts from impulse to warp drive.

Capture the raw power of lightning before it plummets to the Earth. Stand on the flight deck and key-in the micro-code to control your destiny.

Cross the threshold between software and hardware – discover the "missing link"!

Very emotive stuff, right? But I did want to get your attention and now that I have it, read on – it gets more interesting.

This is a computer kit based on the Novix 4000 processor. There are many extraordinary things about this chip. For instance: there is no internal micro-code which means there is no delay between your application program in high level Forth, with no speed penalty.

The Novix 4000 has many of the qualities of the Transputor or the RISC-type processors, but even more incredible is its ability to jump to subroutines and back in one cycle!

The board is supplied with an on-board EPROM programmer, programmable (0 to 8 MHz) processor clock and on fire-up, loads its running system from EPROM to fast RAM. It can be plugged into an IBM slot, or used with a serial link with any computer or stand-alone with its own video and keyboard controller.

PRICE: $699.00

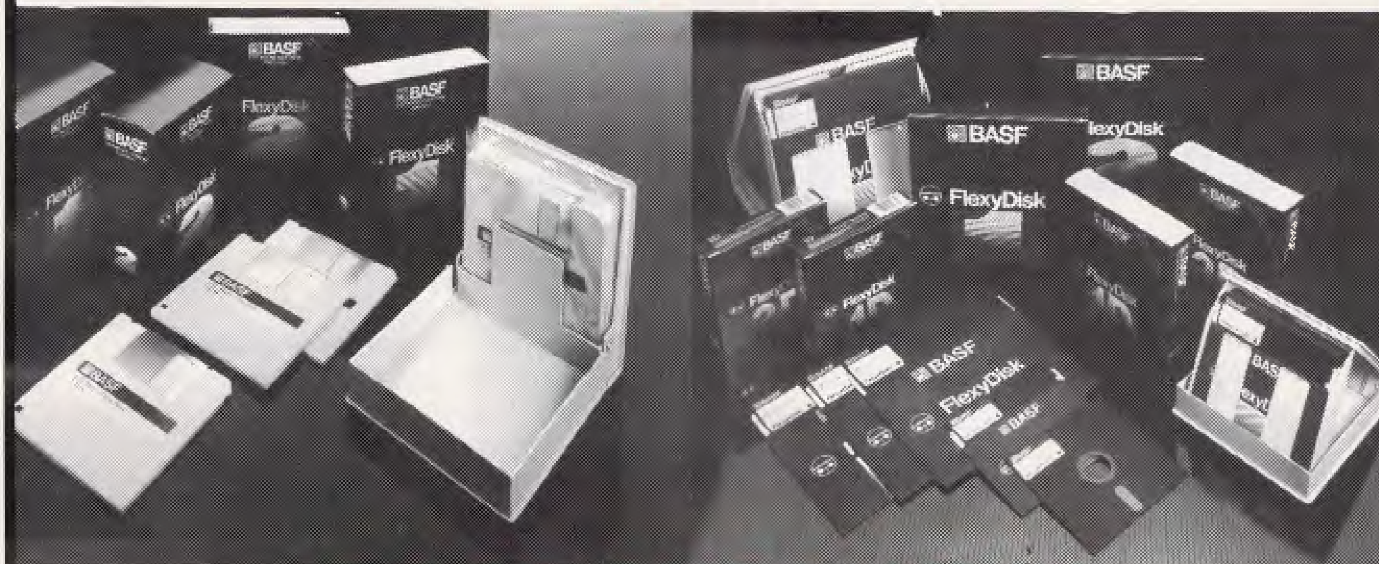
This is not a games machine but an experiment with the future.

MAESTRO DISTRIBUTORS

Calool St, South Kincumber 2256 NSW
Telephone: (043)68 2277, 68 2278

DEALER ENQUIRIES WELCOME

BASF 5.25" & 3.5" Flexy Disks



BASF CHROMIUM

BASF CHROMIUM-DIOXIDE HIGH-DENSITY COMPUTER DISKS IN THE DEVELOPMENT OF THE NEW GENERATION OF COMPUTER DISKS OF A HIGHER CAPACITY

BASF diskettes are temperature-resistant beyond 70 degrees centigrade. Their covers are treated so as to be antistatic. Stricter testing criteria and improved abrasion resistance, even when the head travels over on track more than 70 million times on an average, result in an extremely long service life, which is virtually independent of the drive used.

BASF DISK SPECIALS

ITEM		PRICE 10	10+	100+
5 1/4" D/S D/D	2D	$2.50	$2.25	$1.99
5 1/4" D/S 80 TRACK	2/96	$4.50	$4.25	$3.99
5 1/4" HIGH DENSITY	2HD	$5.89	$4.89	$4.65
3 1/2" D/S D/D	3 1/2	$5.89	$5.49	$4.99

ALL PRICES INCLUDE SALES TAX

***20+ PAY $5.00 EXTRA AND RECEIVE THE LIBRARY CASE**
***100+ FREE LIBRARY CASE**

QUANTITY (10	20+	100+)
2D		
2/96		
2 HD		
3 1/2		
TOTAL $		

C.P./M. data systems PTY LIMITED

**184A Barkly Street,
Footscray, 3011
Telephone: (03) 687 6790**

NAME:..
ADDRESS:..
POST CODE:..
CHEQUE ☐ MONEY ORDER ☐ VISA CARD ☐ BANKCARD ☐
MASTER CARD ☐
CARD NUMBER/ORDER NUMBER
EXPIRY DATE ....SIGNATURE

CPM DATA SYSTEMS 184 A BARKLY STREET, FOOTSCRAY VIC 3011 (03) 687 6790 FAX (03) 689 6894

DEALER ENQUIRIES WELCOME

Challenging 1-2-3

There's no denying that 1-2-3 remains the most popular software program of all time, but that fact hasn't discouraged these eight developers from trying to improve on a classic for the IBM PC and compatibles.

Spreadsheets, word processors, and databases have helped to transform the very texture of life in the office: business would lurch to a stop without them. And, of the three, spreadsheets take a certain historical pride of place. It is spreadsheets that have charted the early progress and power of the microcomputer industry. Their history is the history of the microcomputer.

What likewise sets spreadsheets apart from the others is the dominance of a single program. Lotus Development's 1-2-3 has a tight grip on the market that isn't likely to be loosened by competitors from its own generation. Years ago, 1-2-3's market share reached critical mass, and conformity to the Lotus standard became more important than buying a better program.

OS/2, the new operating system that will address 16Mbytes of memory and support the 80286 chip's protected mode, could change everything. Three or four years from now, spreadsheets will be doing things we never thought possible or haven't even thought of at all. They won't be souped up versions of what we see today — they'll be brand new, uncompromising programs that make no concessions to the cramped past of MS-DOS. And 1-2-3 may be an also-ran.

From VisiCalc to 1-2-3

When Apple first introduced microcomputers, it was VisiCalc that turned a toy into a tool. Visionaries and pioneers brought Apple IIs to work, ran VisiCalc, and were soon out-producing everyone else in the office. SuperCalc brought the same respectability to CP/M machines. Microcomputers would have conquered the office with spreadsheets or without them, but without them, it would have been a slower, bumpier march. Word processing programs worked well on CP/M machines, but the computational needs of spreadsheets required more power.

Not long after IBM introduced its PC in 1981, Apples began to look silly in offices. They didn't have the PC's crisp, monochrome resolution or its top-quality keyboard. And they didn't have 1-2-3.

1-2-3 was not the first spreadsheet to run on the IBM PC, though. Both VisiCalc and SuperCalc were available for MS-DOS a few months before 1-2-3's release in January of 1982. Microsoft's Multiplan was already out, as were less-well-known spreadsheets like Report Manager, which is still with us as part of McDonnell Douglas' microCUBE.

However, these programs had two things against them. The first was their parentage. Most had been written for other operating systems and then ported to MS-DOS, whereas 1-2-3 was written, from the ground up, for the 8088 microprocessor. 1-2-3 took advantage of the 16-bit chip and of the PC's ten marvellous function keys. To the extent that they didn't, 1-2-3's competitors got off to an awkward start.

The other blow to the competition was 1-2-3's massive advertising war chest. This may have been what pushed 1-2-3 over the top, but the program had everything else going for it, too. It was serious, well-designed business software of the kind that had already turned other microcomputers into business machines. Even more important, it was for the 'right computer' — the one that said IBM on it. Finally, it was released at the right moment, when IBM was pushing its machines in earnest and business had begun to buy them. 1-2-3 and the PC took off together.

In retrospect, 1-2-3, or something like it, seems like an obvious product. And yet, it had more than a touch of good luck. When IBM first announced PCs, it didn't know if they were going to end up in the hands of hackers or on the desks of executives. The first 64k IBM PCs came with a cassette port, remember? 1-2-3 put the PC in pinstripes, and businessmen decided that they liked it.

The standard

Before long, 1-2-3 was the best-selling applications program in the world and was on its way to becoming the spreadsheet standard. But how did 1-2-3 take such a large piece of such an important market? Good quality and savvy promotion were part of it. But just as important was a feature that went into the program almost as an afterthought: macros. Lotus called them 'The Typing

Alternative' and didn't expect people to use them for much more than speeding up keystrokes. There were only 14 pages on macros in the manual.

But macros were a simple programming language, with gotos, subroutines, and true/false tests. This was enough to turn 1-2-3 into a development environment for commercial and shareware templates that did everything from mortgage calculations to pig feed analysis. These homegrown and store-bought macro routines clinched the market for 1-2-3.

You might be able to translate spreadsheets from one program to another, but you couldn't run 1-2-3 macros without 1-2-3. Lotus was the language that colleagues, clients, and competitors all spoke. Before long it just didn't make sense to buck the trend.

Standards feed on themselves, and 1-2-3 kept on booming. It spawned a huge aftermarket of templates, utilities, and accessories.

Release 2.0

Nevertheless, by 1985, the 4-year-old spreadsheet began to look threadbare. Lotus' competitors hadn't been sitting still, and new versions of SuperCalc, Multiplan, and a host of upstarts began to look very good. Lotus finally struck back in September 1985 with Release 2.0. Release 2.0 was a seriously beefed-up spreadsheet with four times the worksheet space, plus coprocessor and EMS support, string functions, and 40 new macro commands. Another plus: Release 1A was almost perfectly upwardly compatible with the new 1-2-3. Since then, Release 2.0 and its debugged successor, Release 2.01, have kept Lotus at the top of the spreadsheet heap.

1-2-3 continues to get a lot of help from non-Lotus programmers. The best-known third-party accessory is HAL, which lets you give 1-2-3 commands in something resembling English. Lotus liked the product so much that it bought the program before it was released and now sells it. Add-ins have given Release 2.0 another important boost. These take advantage of built-in 'hooks' in 1-2-3 that let third-party programmers embed new features directly into the spreadsheet. After a quick modification of the 1-2-3 driver set, the program will recognise add-ins on disk and let you run them directly from within 1-2-3. You can then do word processing, linear programming, or goal seeking, say, with the data that's *already in your spreadsheet.* As the number of add-ins grows, you'll be able to build your own integrated

Contenders put pressure on Lotus

As new and better spreadsheets heat up the market, the big guns of the industry are putting the final touches on the new generation of contenders. Lotus has promised to deliver 1-2-3, Release 3.0, by early next year, but it will launch the new version of the spreadsheet standard into the choppy wake of two major competitors. Coming to the market this month are Microsoft's Excel for the PC and Borland's first-ever spreadsheet. And, although these two products take very different approaches, both could put serious pressure on 1-2-3.

Lotus plays coy

Lotus has been coy about the details of Release 3.0 but will admit this much: the new version will add a new dimension to columns and rows by letting you stack spreadsheets on top of each other like pages. Live formula references from page to page will allow effortless consolidation. Lotus has also heard the plea of many a frustrated user and will give us better graphics and an 'undo' feature. Besides this, we are promised better ergonomics, higher performance, and improved mouse support.

Release 3.0 will also incorporate the Lotus Extended Applications Facility, or LEAF. This is described as a step beyond macros, something that will allow sophisticated users to build even more complex applications. It will allow seamless communications within the Lotus 'family' of spreadsheets: Release 3.0 and the forthcoming mainframe and graphics-interface versions. Symphony 2.0, which is expected soon, will also talk LEAF. Finally, Lotus promises full compatibility with the current release of 1-2-3 to protect your investment in training and templates.

Borland compatibility

Borland's spreadsheet, Quattro, will take deliberate aim at 1-2-3's massive following. Like Daybreak Technologies' Silk, it improves boldly on Lotus standards but will stick to them where necessary.

There is nothing to install, except for printers. The program figures out what hardware you have, and you can configure your printer from within the program. You'll be able to control the colours on every part of the screen and use colour intelligently to indicate numbers above or below the limit. Minimal recalc will improve calc speed: when you make a change, the program refigures only the numbers that are affected — not the whole spreadsheet. A search and replace function will find any string in your worksheet and let you replace it. You'll get all of 1-2-3's at-sign (@) functions, as well as several more, such as @dayofweek and @degrees. And like all good 1-2-3 challengers, the program will draw much better graphs.

The most dramatic improvements, though, are in the user interface and the macro language. The Borland spreadsheet will have a soft interface that lets you build any command tree you want. If you like the feel of 1-2-3, you can set up menus to mimic it. If

software program containing the features that suit you best.

New challengers

Release 2.0 is now 2 years old, and the spreadsheet market has hardly been sitting still. Some of the biggest news was the introduction, last year, of unabashed 1-2-3 clones. These were programs that mimicked 1-2-3, Release 1A, keystroke for keystroke. The most famous were VP-Planner, by Paperback Software, and The Twin, by Mosaic Software. Both added features to 1-2-3, but their main draw was price: retailing at under $199 rather than 1-2-3's $970.

Earlier this year, 1-2-3 got tough and sued Paperback and Mosaic for copyright infringement in the US. The cases may not be resolved for years, but the very nature of the industry could change according to how courts rule on the central issue: can programmers use each other's good ideas, or can a company lock up the 'look and feel' of a product with no more than a copyright notice?

More recently, a clearly legitimate form of competition has come from programs that maintain just enough compatibility with 1-2-3 but offer features that go well beyond it. Silk, SuperCalc4, PFS:Professional Plan, and the six others reviewed in this issue can make plausible claims to being better spreadsheets than 1-2-3. True three-dimensional programs, such as Boeing Calc, operate in a dimension

you have your own ideas about the commands, you can rewrite the whole interface.

The macro language will have ten more commands and a Learn mode, and it will let you write an unlimited number of macros instead of 1-2-3's 27. It will also have an excellent debugger than lets you put absolute and conditional breakpoints in routines and trace the effects of macro execution on specific cells. Even 1-2-3 macros will work, no matter how you reconfigure the spreadsheet commands.

Finally, Borland will make a strong appeal to the pocketbook. Quattro, which will sell for around $400 when it is launched this month, will give you a lot more spreadsheet than 1-2-3 at a fraction of 1-2-3's $970 cost.

Bold new Microsoft trail

Microsoft is making a few concessions to the 1-2-3 standard but is carving out its own, distinctive look and feel in Excel for the PC. This is a beefed-up version of Microsoft's successful Macintosh program. It will come with a run-time version of Windows, so its scroll bars, dialog boxes, and icons will have a Mac-like personality that PC users won't find familiar. It will have a rich keyboard interface, but most users will want to run Excel with a mouse.

Excel will have minimal recalc and background recalc. It will recalculate the whole spreadsheet only if it needs to, and if you don't want to wait while it does arithmetic, it will politely suspend calculation while you work.

Excel will let you put multiple spreadsheets in memory and link them with formulae. Different spreadsheets can be active in different windows, and you can size, move, and hide windows to your heart's content. You'll be able to vary row heights, as well as column widths, to get fonts of any size. With a laser printer, you'll be able to print documents that no one will guess came from a spreadsheet. Excel will use colour for certain kinds of values and will let you highlight your spreadsheet with boldface, italics and shading. Its graphics will be presentation quality.

Excel will also have good auditing features that let you trace spreadsheet logic by listing dependent and antecedent cell references. You can document your work with notes on individual cells. There will be seven different kinds of formula error displays, so you can fix things quickly.

Excel's macro language will have a Learn mode and will let you call subroutines in C that you write yourself. You'll be able to write custom spreadsheet functions and design applications with menus, windows, and dialog boxes. Macros will also activate dynamic data exchange (DDE), which will let Excel pass data to and from other Windows applications and actually execute commands in other programs with simultaneous grace.

As an important concession to 1-2-3, Excel has a built-in macro translator that should let most 1-2-3 macros run in Excel. It even has a 1-2-3 help mode, which will tell you how to do something in Excel if you know the equivalent command in 1-2-3!

Unlike Borland, Microsoft is not going to fight a price war. Excel's list price will be $994 when it's released late this month or early December.

Jared Taylor

that 1-2-3 has never even heard of. (3-D spreadsheets will be reviewed in the December issue of *APC* — Ed.) Microsoft's Excel for the PC and a powerful spreadsheet by Borland International, both scheduled for imminent release, will only heat up the competition. Lotus is already responding to the competition with a new release of 1-2-3 scheduled to appear in 1988 (see accompanying box 'Contenders put pressure on Lotus'). At the low end of the spectrum is a wealth of minispreadsheets, such as PFS:First Choice, which lacks the power of traditional spreadsheets but offers handy, easy-to-use solutions to many business problems. We directed this and next month's set of reviews at both kinds of Lotus challengers: programs that take on 1-2-3 feature for feature, and 3-D spreadsheets programs — those that bind together worksheets like an electronic book in which every page analyses the detail from the page before.

OS/2 and beyond

Nevertheless, the real challenge to 1-2-3 isn't likely to come until OS/2 is firmly established. Huge investments in data and training, as well as pure force of habit, make the 1-2-3 standard all but impossible to budge. People won't abandon it until the vast new powers of a new operating system make them revamp their entire computing base.

The new operating system will let the 80286 address 16Mbytes of RAM and huge amounts of virtual memory. The 80386 opens up even broader horizons. Multi-tasking and intertask communications will become routine. This leap in brute computer power is far greater than the jump from 64k to 640k bytes of RAM. Ambitious software developers are drooling at the prospect of writing programs to use all that power.

Spreadsheets written for OS/2 will do things we haven't yet thought to ask for. They will be designed by people whose minds aren't prisoners to the conventions of rickety old MS-DOS. No one can say who will rule the spreadsheet roost five years from now. But for the first time since 1982, there's a chance it might not be 1-2-3.

Jared Taylor

Multiplan

It is sad to see a company as prominent as Microsoft let a product slide into obsolescence, but that's what seems to have happened with the company's $392 spreadsheet, Multiplan. Multiplan, Version 3.0, has no graphics or database, which might be okay if nothing else were available, but the spreadsheet market is crowded with packages that have more to offer.

This month, Microsoft is scheduled to release Excel, a powerful new spreadsheet that was previously available for the Macintosh. Excel is targetted at the 80286 and higher market. Multiplan will continue as Microsoft's mainstay in the 8086 market. A company spokesman said that, while Microsoft will continue to support Multiplan, no new versions are under development.

In our tests, Multiplan showed itself to be a product of old technology. It is hard to list all of its deficiencies. But at a list price of $392, Multiplan is much cheaper than many other spreadsheets.

The documentation includes no keyboard overlay, nor even a keyboard diagram. There is a list of functions by topic buried in the middle of the book, but since the quick-reference guide is alphabetical, you can't find a function unless you already know its name. The index is decent, but using the document was extraordinarily frustrating. Time and again you are told 'see XXX in Chapter YY', but none of the cross-references had page numbers!

Cryptic page numbers

Pages in the introduction are numbered in Roman numerals, so the

Our mice have evolved into world leaders.

First, we became the USA's and Europe's leading mouse manufacturer. Then we became the *world's* leading mouse manufacturer.

That's because we design and manufacture our mice ourselves. And even publish our own software.

Which allows us to keep our prices down.

The result: a high quality, less expensive mouse which, when combined with our very affordable software, provides a complete solution for almost any graphic need.

It's no wonder we've become a major supplier of mouse products to OEMs and retailers the world over.

Or why our reputation for technological know-how in all facets of mouse production continues to build in the USA and Europe.

Our latest achievement is the new LOGITECH Series 2 Mouse. It's 100% compatible with the latest IBM PS/2.™ And it plugs right into the mouse port, freeing the serial port for other peripherals.

The LOGITECH Series 2 Mouse incorporates opto-mechanical technology—so you have long-term reliability, excellent resolution, and ergonomic design that feels great to the hand.

And also, it comes with our *PC Magazine* award-winning Plus Software—making it even easier to use.

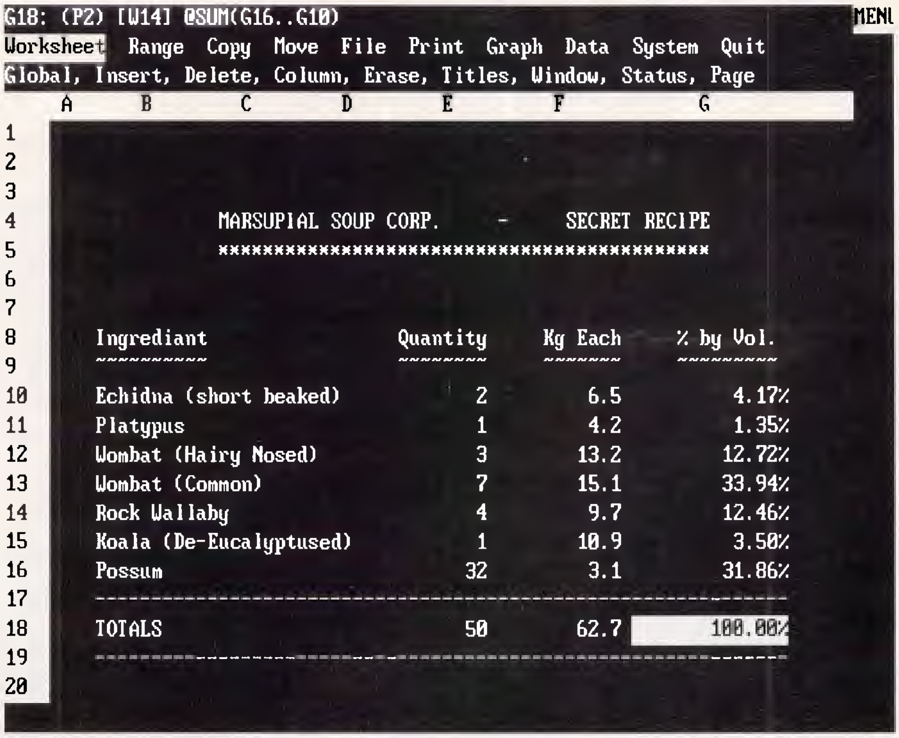
So if you're interested in how our mouse can evolve into your business solution, call one of our local distributors for the name of the dealer nearest you: BJE Enterprises (02) 858-5611, Dataflow Computer Services (02) 331-6153 or Micro Australia (02) 809-6722.

Logitech's complete PUBLISHING, PAINT and CADD Solutions. PUBLISHER $229, LOGIPAINT $269, and LOGICAD $359 all come with Mouse and Plus Software. For beginner to advance

PS/2 is a trademark of International Business Machines; Lotus 1-2-3 is a trademark of L velopment Corp.

Logitech Series 2 Mouse $179, with Plus Software $299. Our new mouse is 100% compatible with IBM PS/2. Plus Software includes drive, programmable pop-up menu system, Point and Click Shell for 1-2-3,™ and Point, the mouse-based text editor.

LOGITECH



Lotus 1-2-3 pioneered the moving bar menu: the top three lines are the control panel, in which the main slash-command menu appears

the top of the screen, with the first choice highlighted. The third line of the control panel displays information about each choice. This is either a one-line explanation of what the command will do or a list of additional choices in the menu at the next level. You make a choice by highlighting the menu item with a cursor key and hitting Enter, or by typing the first letter of the word. Typing the letter is usually quicker. This style of menu has been very successful and is widely imitated.

Some top-level menu choices lead to many levels of submenu, so a command from the Ready state can be long. For example, to set the bottom print margin to five rows and return to the Ready state, you'd enter

/ppomb5<Enter>qq

At every step of the way, the command menu displays your choices. If you need instructions, you get good, context-sensitive help by hitting F1.

Logical commands

When you enter data into cells, the program automatically distinguishes between text and numbers. You can move data around, copy it, and format it in many convenient ways. Commands for these common operations are invariably logical and easy to use.

To build a spreadsheet, you set up relationships between different numbers or values in different cells. The links between cells are standard mathematical operators and special, built-in functions that must be identified with a leading at-sign (@). There are nearly 90 @ functions — statistical, financial, logical — and so forth — and you can combine them within formulae to make very complex and sophisticated mathematical models. Some @ functions operate on text strings, so 1-2-3 formulae can work with words as well as numbers.

1-2-3's editor for cell entries is reasonably good. You can move to the first or last characters in a cell with Home or End, and you can move right or left five characters at a time with Tab or Shift-Tab. Cell contents needn't be formulae. They can be lines of text, which can be printed or stored as ASCII files on disk. Thus many people who work frequently with 1-2-3 find themselves using it for simple word processing.

With numeric data, you can use 1-2-3 to draw graphs. There are only five graph types — line, bar, x-y, stacked-bar, and pie — and the program does not give you much control over their appearance. If you print a graph, you have more choice over the size of the graph, as well as colours and text fonts. However, in order to print, you must save the graph to disk and then run a separate PrintGraph program that sends the image to a printer or plotter.

You can organise 1-2-3 data handily into simple databases. Each record is a single row of the spreadsheet, and different cells in the row are different fields. You can sort records by two keys at a time in ascending or descending order, alphabetically or numerically. You can search for records according to elaborate mathematical or logical criteria, and either copy the matches to a blank part of the worksheet or have the cursor go to them.

Other sophisticated data commands let you determine data distributions, which show the frequencies of certain values, or do regression analysis. You can also invert or multiply square data matrices and build data tables that show the results of changing one or two values in a formula.

1-2-3's databases are convenient, but their size is limited by the amount of memory in your computer. This is because searches and sorts can be done only on data in a single spreadsheet, and the spreadsheet must fit in memory.

One of 1-2-3's great strengths is its powerful, built-in macro language. The language not only automates routine keyboard chores, it's a programming language you can use to write full-blown applications. The language can make logical decisions, branch, loop, prompt users for input, open and write disk files, call subroutines, and pass arguments to them. Even experienced 1-2-3 users are constantly finding powerful new ways to use the language.

Language barrier

One of the most common complaints about the language, though, is that macro routines must operate from within the spreadsheet currently in memory. If they could operate from a macro library on disk, they could manipulate multiple spreadsheets more easily.

1-2-3's great popularity has spawned an accessories industry. You can buy independently written programs that compact your files, change the colours on your screen, troubleshoot your spreadsheet, or let you attach explanations to spreadsheet cells. There are also macro templates, for free or for sale, that turn 1-2-3 into a tax program, real estate analyser, general ledger, or whatever. Also, since so many people know the [illegible], it's easy to find

help if you need it. Recently introduced add-in programs let you attach special capabilities to 1-2-3 and use them almost as if they had always been there. There are word processing, linear programming, and goal-seeking add-ins, with more to follow.

Since its introduction in 1983, 1-2-3 has been substantially updated only once. In 1985, Release 2.0 brought us a larger, better-designed spreadsheet, as well as a greatly improved macro language. However, not all changes have been improvements. The original release came with an excellent disk-based tutorial that was replaced by a strictly passive View program. Release 2.0 started out with the serious reference material in a separate and very handy paperback book that fitted on any bookshelf. When the debugged and slightly improved Release 2.01 appeared, the reference material was back in with everything else, in an unwieldy ring binder. You win some and you lose some, but the personality of 1-2-3 hasn't changed.

Newer spreadsheets offer powerful features 1-2-3 doesn't have. However, its limitations are often more than made up for by 1-2-3's overwhelming acceptance and support. Buying 1-2-3 is like buying IBM: there may be a better product out there, but you can't go far wrong with the industry standard.

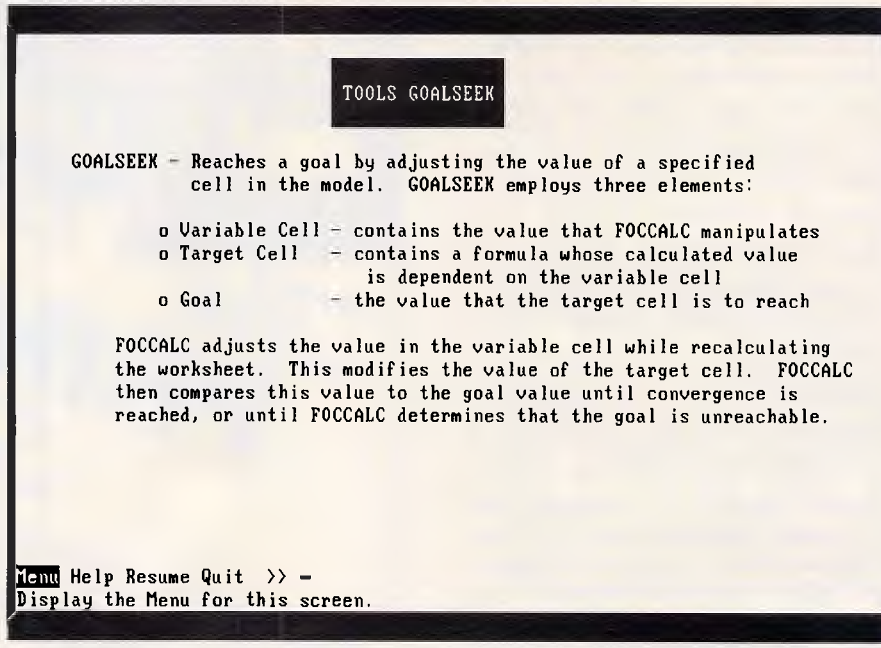
Jared Taylor

PC/Foccalc

PC/Foccalc, a $900 spreadsheet add-on from Information Builders, makers of the Focus and PC/Focus database programs, is a private-label version of the mainframe and micro spreadsheet, 20/20, from Access Technology. PC Foccalc has some particularly attractive features, some of which come from 20/20, and others that are due to its integration with Focus itself.

We say 'Focus itself' because, in fact, versions of Foccalc run both on mainframes and on micros, as does Focus. To put PC/Focus into perspective is important because its position in the PC database market is not generally known outside of the mainframe community, which uses its big brother. Sales are direct to corporations and as a result are not generally reported, but PC/Focus is second in dollar volume worldwide only to dBase. Thus the prospect of integrated spreadsheet/database functionality is very attractive to a large (tens of thousands) audience of corporate power users.

PC/Foccalc can be accessed only from within Focus. This is a weakness,



The Goal Seek function of PC/Foccalc is a very powerful tool; the help screen that explains it is generally narrative and quite useful

because the program is certainly attractive enough to stand on its own. If you don't need the Focus-dependent functions, you should certainly consider 20/20. However, PC/Foccalc gives the user who is comfortable with the spreadsheet metaphor a spreadsheet-style view into Focus databases, as well as into many other data types via the integration of the two products.

The interface is Lotus style: the Slash key invokes the two-line Lotus-style menu bar, and many of the same functions are available with similar syntax, such as using the @ for function identification and the $ for absolute cell references in formulae. By placing labels in row or column 0, you can create range names like 1-2-3's and refer to cells by name with the $, which fixes them as well. You can end a 'Point mode' definition of a range by entering $, or you can use R to fix rows or C to fix columns.

Still, there are significant differences from 1-2-3. For example, numbers and not letters are used for column identification. The pairs are enclosed in square brackets rather than parentheses; the brackets are required only within functions. This is actually quite useful; it's often easier to decipher [7,53] than (7,BA). In addition, the user of parentheses for expressing computational priority is much clearer if cells are identified this way. If you imagine typing

(@SQRT[3,8]+@SUM–[5..17,2])*@TAN[8,34]

exclusively with parentheses, you get the point. It is a little easier on the eyes, and it doesn't take long to get used to it.

There's a tutorial that gives a generally useful introduction to a number of fundamental concepts such as Point mode and absolute references. (The latter is nicely implemented. You are allowed to conclude pointing by typing $, which makes the references absolute, as it does in 1-2-3.) Another well-handled element in the tutorial is goal seeking, which is effectively demonstrated by using an (American) IRA as an example. After constructing the spreadsheet and learning a number of functions along the way, you can use goal seeking to determine what it would take to have, say, $50,000 after 10 years at varying rates of interest and principal contributions.

Easy linking

Spreadsheets may be linked with ease. You can construct a consolidation model — a very powerful tool that can be used to produce consolidated income sheets, divisional summaries, annualised or year-to-date data; the list goes on. In addition to Lotus-style File Combine additions and subtractions of spreadsheets, PC/Foccalc can perform multiplication, division, and comparison-based (greater or less than) merges.

Perhaps PC/Foccalc's most powerful feature is its integration with Focus. Focus's [illegible] nguage permits retrieval [illegible] n a file with a

WHICH MONITOR WILL GIVE YOU THE BEST VALUE NOW AND IN THE FUTURE?

SKAI-IDEC 15″

MULTIFLAT

Here's why:

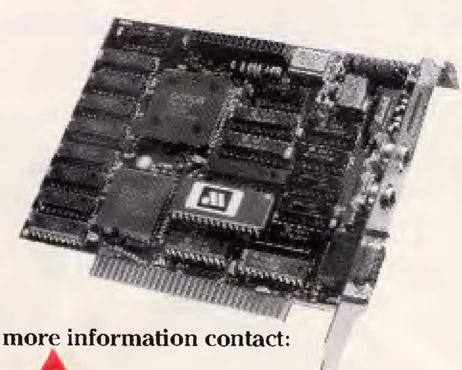
IDEC Corporation has drawn on its experience in manufacturing monitors for some of Japan's largest companies to produce this technologically advanced monitor.

15″ display area. Draw and read text right to the corner on this monitor without distortion.

MULTI automatic scanning from 15.5-37KHz. This means it is compatible with all recognised video standards, including IBM's new PS/2 range.

FLAT square anti-glare tube means:

1. you get a clearer picture.
2. no more bowed lines.
3. glare is virtually eliminated.



Announcing the SKAI "DEGA", a deluxe EGA card, setting a new standard in high quality GRAPHICS PRODUCTS!

Choosing the SKAI "DEGA" could be one of the wisest buying decisions you could make for your organisation. This amazing product offers you compatibility with every recognised video standard plus many more advanced features which give you:

- Readable text when displaying an A4 Ventura document.
- Display 132 column lotus 1-2-3 spreadsheets on screen at once.
- Enjoy AutocAD, GEM, WINDOWS and PageMaker in 640 x 480 resolution.
- 132 characters across the screen when using WordStar and WordPerfect.
- Display colour graphics programs, including games in 640x400 resolution, even games that boot from floppy.

Available from

Sydney: Video Technology 569-3700 Melb: Monitor Shop 836-6368
Perth: Data-tek 328-8777 Brisbane: Pacific Data Systems 391-5077
Hobart: Albatross Computers 310-119 Townsville: AD Computers 799- 211

For more information contact:

PORCHESTER COMPUTERS

SOLE AUSTRALIAN DISTRIBUTOR

177 Barkly St ... Ph: (03) 537 2722.
Fax: (03) 537 ...

At a glance

PC/Foccalc
Supplier: Computer Power
Tel: (03) 520 5333
Price: $900
Requires: 640k RAM, hard disk, DOS 2.1 or later.
In short: A powerful, flexible spreadsheet but highly complex and not recommended for the quick-and-dirty project. Copy protected.

phrase like 'Print sales and cost and compute margin = Sales – Cost if region is NSW'. PC/Foccalc's power becomes evident when you realise that you can embed one of these queries, or report requests, at levels of significant complexity, within a cell of the spreadsheet and have the results automatically populate the appropriate range of the spreadsheet with the /Focus Current command. If the report or query has been stored as a PC/Focus procedure, it can be invoked by name with the EXEC procedure Name command. A RECALC (invoked with the Spacebar) will execute the query. What-ifs can become what-nows and can be moved to a cell location that is specified in the command. Add goal-seeking and dependencies to other linked spreadsheets, which may also contain such references in other files, and the potential is enormous.

The spreadsheet does not depend exclusively on the use of PC/Focus for database operations, however. One-key data sorting is possible, and data table operations can be performed. The Tools Database selections include Sort, Find, Extract (Find plus Copy), and Operate (Find plus some computation or statistics on the result). The level of logic support here is particularly impressive. By first evaluating a logical operation and then selecting based on the field that holds the return value, you can put together a procedure within the spreadsheet that functions as a selective query report operator.

Replay feature

In complex operations such as these, the Replay feature is a great asset. PC/Foccalc remembers your last sequence of keystrokes in Tools Database Select mode and lets you replay it, changing only the target field that will hold the results.

PC/Foccalc's graphics are reasonable, although hardly overwhelming. Device drivers are available for HP plotters, and the common printers. If you wish, you can split spreadsheets four ways with the /Window command and place the graphics in a particular window. The full range of formatting options is available.

Macros are handled differently from those in 1-2-3. They're called command files, and they're stored outside the spreadsheet itself. Every keystroke that can be entered can be duplicated with macro commands. The syntax is no more attractive than Lotus's, unfortunately, but it seems a little shorter. #U is used for {UP}, for example. There's a Quiet mode that suppresses screen display of the executing command file, and you can comment on the procedures. There is no Learn mode as yet — a major failing, but a common one. (In 1-2-3 you can get the mode if you buy HAL.)

Import and export capabilities are interesting but limited. There is no provision for Lotus import or export, and none for .DIF files. You can handle delimited files (.CSV is one example), though. Numbers, text, and command files can be moved in and out as well. If you select Export Data, you are prompted for the delimiter you want; one is placed between fields, and two at the ends of lines.

The number of available functions is impressive: four financial, nine math (plus

Say Sayonara to Symphony with 1-2-3 add-ins

It's no news, certainly, that people have been doing weird and irrational things with 1-2-3 for a long time. Like writing memos (chuckle) by stacking up lines of text in Column A. And actually using 1-2-3 as a (giggle, snort) database.

And we shouldn't be surprised. Lots of people do lots of strange things, from jumping off tall buildings wearing parachutes to diving among great white sharks on the Great Barrier Reef. They, too, usually survive — if only slightly less bruised and battered than those who use 1-2-3 as a word processor or database manager.

Now, though, that kind of eccentric behaviour at the PC is being legitimised by the small flood of add-ins appearing for 1-2-3. Indeed, Computer Associates has validated the concept by beginning its own line of add-ins for SuperCalc4

From Lotus's side of the ledger, building the add-in capability into 1-2-3 (Release 2.0 and later) is a masterstroke. It helps further establish 1-2-3 as the corporate computing standard. It extends the franchise, without litigation, of Lotus's moving-bar menus. It opens opportunities for other developers while simultaneously entrenching Lotus. And at least in Lotus's view, it relieves the company of the burden of having to develop some features that should have been in 1-2-3 since at least Release 1A* (which superseded 1A until 2.0 came out).

It's not bad from the 1-2-3 user's side, either. A lot of corporate PC users never use anything *but* 1-2-3, so it's natural that they've been trying surreptitiously to bend it to their word processing and database needs. Now they can do so with a smile and without apology to anyone, because some of these add-ins are very, very good indeed.

Increasingly, business users of 1-2-3 (is there any other kind?) have been using the program as a platform, or engine, for work that may well be finally presented by, analysed in, exported to, or imported from another program. 1-2-3 is becoming the standard target for downloaded data from mainframes, for example. And it works two ways: 1-2-3 graphs, feeble as they are, are the starting point for exports to many Freelance Plus and Harvard Graphics presentations.

So why not stretch that platform into a complete operating environment? Finally 1-2-3 really has become the kind of context-switching universal 'operating environment' that many business people have shown they want. And just in time, before the Windows/Excel juggernaut comes over the hill.

Simple idea

The idea behind 1-2-3 add-ins is simple: you never leave the Lotus worksheet environment. Hit Alt-F10 to bring up 1-2-3's own Add-In Manager, then A for Attach, then Alt-F7, F8, or F9, depending on which add-in you want to use, and you're in a program-within-a-program that, depending on the developer's skill, looks somewhat to very much like Lotus. You can even selectively unload add-ins to reclaim memory.

Continued . . .

GRAND PRIX PERFORMANCE WITHOUT THE GRAND PRICE.

Drop in a Hypertec accelerator board and you'll be amazed at the personality change in your IBM PC, XT or compatible. It simply becomes a turbo-charged speed machine with astounding performance.

And you save $thou$and$ by avoiding upgrades to more expensive AT (or faster) machines.

Hyperace-286 and 286 Plus are our high performance Australian designed, built and supported boards with the emphasis on high quality and reliability. Join thousands of happy users already experiencing the benefits.

NEW RELEASE! For PC users wanting even faster speeds we've added Hyperace-286 Super Plus and Hyperformance to our range.

Hyperace-286 Super Plus is our famous Hyperace-286 Plus accelerator board now running at a lightning 12.5MHz.

Hyperformance is for the real PC aficionado! It has a unique programmable automatic slow-down feature, adjusting its speed when it detects speed sensitive applications and slow peripherals. Total compatibility is assured.

A feature on all our accelerator boards is software speed switching. Simply slow-down to PC speeds where necessary without groping for switches or continuously re-booting.

Number of times faster than an IBM PC each Hypertec board runs for a given task.

	IBM PC	IBM AT 8MHz	HYPERACE 286 PLUS 10MHz	HYPERACE 286 SUPER PLUS 12.5MHz	HYPERFORMANCE 12.5MHz	HYPERFORMANCE 16MHz
Norton SI (V3.0)	1.00	7.70	10.10	12.9	13.30	17.70
PC Bench Prime Sieve	1.00	3.78	5.81	7.2	7.30	9.06
Symphony Recalc	1.00	2.78	2.96	3.55	5.82	7.76

Regardless of measure used and Hypertec board selected, the speed advantages of our boards over a standard PC are quickly obvious.

Our boards set the standard for speed and compatibility in the IBM PC architecture. Needless to say, our competitors aren't in the race!

If you're serious about requiring the absolute maximum performance from your PC, drop in a Hypertec accelerator board.

Anything else may leave you at the starting line!

HYPERTEC

Advanced Technology

HYP 108AR

Hypertec Pty Ltd., Suite 404, Henry Lawson Business Centre, Birkenhead Point, Drummoyne, NSW 2047. Telephone: (02) 819 7222 Fax: (02) 819 7428.

Among the early 1-2-3 add-ins, several are outstanding. A whirlwind tour:

Turner Hall's 4Word is a good, utilitarian word processor on the memo-writing level. Since it stores its text inside the 1-2-3 worksheet, you can read (if not print very well) the contents of a 4Word text block in a 1-2-3 worksheet file that has been given to you on disk (or sent to you on a network), even if you don't have a copy of 4Word.

WriteIn is even better still, if what you want is an almost-full-featured word processor instead of a memo writer. WriteIn even has a miniature style sheet feature, reminiscent of Microsoft Word, for speed and consistency in formatting documents. Because it stores its files *outside* the worksheet, you can't accidentally overwrite anything in the rows-and-columns matrix, which is easy to do in 4Word. You choose the approach you like.

In databases, Informix has a product that at first seems ludicrous: the Informix Datasheet Add-In, an SQL-compatible fully relational database front and back end, which lets you create, query, and spec reports from a Lotusy front end, within 1-2-3, while using the WriteIn trick of storing the data files themselves outside the worksheet.

Who wants an industrial-strength SQL database nested inside 1-2-3? A lot of people, I'll bet, who work with Informix's 4GL and SQL mainframe products, as well as other vendors' SQL-query programs, and who sometimes want to build and use their own PC-resident databases within the familiar confines of 1-2-3 and the familiar context of SQL.

In the same vein, Personics offers @BASE, a 1-2-3 add-in that reads dBase III files and extends 1-2-3's analytical powers to the data in those files. You can, for example create a 1-2-3 worksheet from a selected subset of a dBase database, then use 1-2-3's native tools to sort, count, sum, and otherwise manipulate those rows and columns, then do a quick 1-2-3 bar graph of your column footings.

Another winner

Personics has another winner in SeeMORE, which, in addition to its splendid if misspelled name, finally gives 1-2-3 users easy access to EGA video cards' and monitors' ability to squeeze more than 76 columns and 20 rows of spreadsheet data onto the screen. (The rest of the usual 80 by 25 display is consumed by 1-2-3's menus, status lines, and row-and-column identifiers.)

With SeeMORE, you can get up to 124 columns by 38 rows of small but legible type on an EGA or VGA display, or up to 156 columns by 53 rows of tiny, threshold-of-legibility characters if you're willing to risk eyestrain. (With a Hercules card, you can get up to 176 columns by 53 rows.)

Both Turner Hall and Funk Software offer cell-annotation add-ins. Note-It Plus brings Turner-Hall's existing Note-It inside 1-2-3 and enhances its features; Funk's Noteworthy takes a new approach, with some familiar word processing features such as block copies and moves, as well as search and replace (only with notes, not 1-2-3 data, unfortunately).

Intex Solutions has brought a laser printer setup add-in, JetSet, to market, and now 3D Graphics. The latter is no match for an external, dedicated 3-D presentation-graphics program such as Perspective, but it is a very useful adjunct to the analytical-level graphing powers of 1-2-3 itself.

Many more add-in products have been announced, and some actually delivered. More are coming this year.

Developing the add-ins facility may have been a defensive move for Lotus, an effort to hold the fort against Excel — since programs running under Windows, such as Excel, can easily swap data and even swap themselves in and out of the user's 'live' window.

But by developing a mechanism to graft add-ins onto its lead product, Lotus has so extended the reach and convenience of 1-2-3 as to have redefined its role for many users. Forced to choose between changing to a new spreadsheet product, climbing another learning curve, then adding still more new products and learning *them* versus simply extending their use of 1-2-3 through familiar-looking (and inexpensive) add-ins, many 1-2-3 users are going to stay firmly tucked into Lotus's hip pocket. And very comfortably so.

The real loser in this won't be those competing spreadsheet products, which will attract plenty of buyers interested in their special features, but Lotus's own Symphony, a nice spreadsheet with incredibly feeble word processing, database, graphics, and communications modules more or less built-in. The old bag lady's surely done for. Lotus has promised another upgrade sometime early in 1988, but after that we can expect to see Symphony shuffle off-stage, the victim of 1-2-3's better idea for adding-in functionality.

Jim Seymour

seven trigonometric), as well as statistics, logic, lookups, date functions, and others. There is no string handling, though, other than the ability to count labels within a range. Given that the basic technology belongs to Access, it's hard to predict support for such things as extended memory, extended graphics and additional device drivers, better file import/export, Learn mode, and so on, but even with these omissions, PC/Foccalc is a very impressive offering. It's difficult to imagine passing up its power if you're a Focus user, and if you're not, it's just another reason to look at one of the premier families of software products available in the DBMS area.

Merv Adrian

PFS:Professional Plan

Software Publishing was one of the first software companies to successfully market inexpensive packages for the PC. The PFS series (File, Report, Write) was very successful, but as PC users matured, so did their software needs. Software Publishing has recognised the changing market and produced the PFS:Professional series, a more full-featured set of packages aimed at the new market. PFS:Professional Plan, which sells for $448, is Software Publishing's spreadsheet offering in the series.

Unlike 1-2-3, PFS:Professional Plan isn't copy protected. You can quickly install its two program disks onto your hard disk by using DOS's COPY command. Plan greets you with a menu where you tell it whether you want to create or edit a spreadsheet, set up hardware parameters, or exit Plan. Hardware setup is simple, with menus leading you through changes in the screen and printer choices.

Create/Edit brings you to the familiar spreadsheet cell structure. Plan follows the same bothersome convention of cell references found in Microsoft's Multiplan. Unlike 1-2-3, where columns are labelled with letters and rows with numbers, Plan labels its rows R1,R2 and its columns C1,C2, so that getting there requires double the number of

Borland's Turbo Lightning™ FREE

Enlarged *Shift* keys

Two *Ctrl* and *Alt* keys for ambidextrous access.

Isolated *Escape* key.

Positive-tactile, firm-feel keys.

12 *Function* keys for increased automatic operation.

Extra-wide, easy-to-find *Return* key. *IBM changed sizes again by shrinking their Return key.*

Dedicated *Function Control* keys.

Caps, Num and *Scroll* Lock indicator lights. *IBM has no lights on their XT.*

Separate dedicated *Numeric Pad* with enlarged *Enter* key, four *Arithmetic Function* keys.

Switch-selectable compatibility with IBM, PC, XT, AT, and all compatibles. *IBM's new Enhanced Keyboard runs only on their new XT's, AT's and ignores their installed base which probably includes you.*

Separate *Cursor* and *Screen Control* keys.

Switch allows you to swap position of *Ctrl* and *Caps* lock. *IBM moved Ctrl to bottom row, you have no choice!*

Here it is...DATADESK'S *TURBO-101 ENHANCED KEYBOARD* for the 10 million PC users IBM just ignored!

IBM just announced their new redesigned "standard" keyboard for personal computers. There's only one problem: *it won't work* on your IBM computer if it was purchased prior to June 1986 or on *any* PC compatible purchased at any time!

Not to worry. Our new *Turbo-101* Enhanced Keyboard gives you the layout and enhancements of the IBM with some logical improvements (see above photo). And it works on your existing PC, XT, AT, PCjr, AT&T, Epson and virtually all compatibles!

Get Borland's Turbo Lightning™ For FREE!

To really turbocharge your productivity, we are including, free-of-charge, Borland's red-hot Turbo Lightning software with each keyboard. Now, when using SideKick, WordPerfect, Microsoft Word, 1-2-3 or most popular programs, our Turbo-101 Keyboard will check your spelling *as you type*, gives you instant access to Random House's 80,000-word Concise Dictionary and 60,000-word Thesaurus and much, much more!

"Lightning's good enough to make programmers and users cheer, executives of other software companies weep," says Jim Seymour of PC Week. Sold separately, Turbo Lightning retails for $99.95!

The Turbo-101 is the best data entry tool since the pencil!

For users of spreadsheets like 1-2-3, the Turbo-101's *separate* cursor controls and numeric keypad makes entering numeric data into cells and moving from cell to cell as natural as moving your fingers. And for *word-processing*, the *'Selectric'* typewriter layout makes the Turbo-101 as easy to use as a pencil; and with the extra large Enter, Shift & Control Keys, you'll make so few mistakes, you won't even need an eraser!

SPECIAL OFFER!

ONLY $275.00 FOR BOTH KEYBOARD & SOFTWARE*

Includes 30-day money back guarantee and 2 year full warranty.

To prove that we don't ignore you or your pocketbook, you get our Turbo-101 Enhanced Keyboard and Borland's Turbo Lightning for an astounding $275.00.* No, you didn't read it wrong. During this amazing ***Introductory Offer*** you get both keyboard and software for less than most software programs by themselves! Now, if you're still feeling ignored, you can always do what you-know-who wants you to do . . . *and buy a new computer to get their keyboard!*

Up to now, DataDesk International may be one of the best kept secrets, but here's what's being said about our first *end-user* Keyboard/Borland software bundle:

"Who Can Pass Up a Deal? Department. Talk about an aggressive product!"
John C. Dvorak, InfoWorld Mar 86

"It solves all of the problems exhibited by their regular PC/XT keyboard...it's a great bargain!"
PC Productivity Digest May 86

"DataDesk Intl. has designed a sturdy and handsome keyboard that has tactile response...is the hardware bargain of the year" says Charles Humble, Oregonian Jan 86

"The best part of the keyboard is the way it feels. It's ideal! And fast. I've never worked on a keyboard with a nicer touch."
Business Computer Digest Aug 86

"It's a good keyboard. Good feel: the keys have tactile feedback. No mush at all. This is about as good a keyboard deal as you're likely to find...I have absolutely no hesitation in recommending the Model PC8700."
Jerry Pournelle, Byte Magazine Sept. 86

"This keyboard is neat to type on and feels solid. It has tactile feedback keys...I can type much faster on it."
Test Drive Scorecard: DataDesk-10 Key Tronics-9 Teleconnect Magazine May 86

BOTH TURBO-101 ENHANCED™ KEYBOARD AND BORLAND'S TURBO LIGHTNING™ SOFTWARE FOR ONLY:

$275.00* LIMITED OFFER

*Plus Shipping & Handling

NO. UNITS: ____
PAYMENT: ☐VISA ☐MC ☐CHECK
AMOUNT ENCLOSED: $ ____

Enter

NAME: ____
ADDRESS: ____
CITY: ____ STATE: ____ ZIP: ____
PHONE: ____ COMPUTER TYPE: ____
CC NO.: ____ EXP: ____

The Only Alternative

datadesk™ INTERNATIONAL

7650 Haskell Avenue
Van Nuys, California 91406 (818) 780-1673

Distributed by:

Computec Pty.Ltd.
269 Auburn Road
Hawthorn Vic 3122
In Melbourne Call
882 1326
Outside Melbourne
Area (008) 33 1005

MADE IN USA

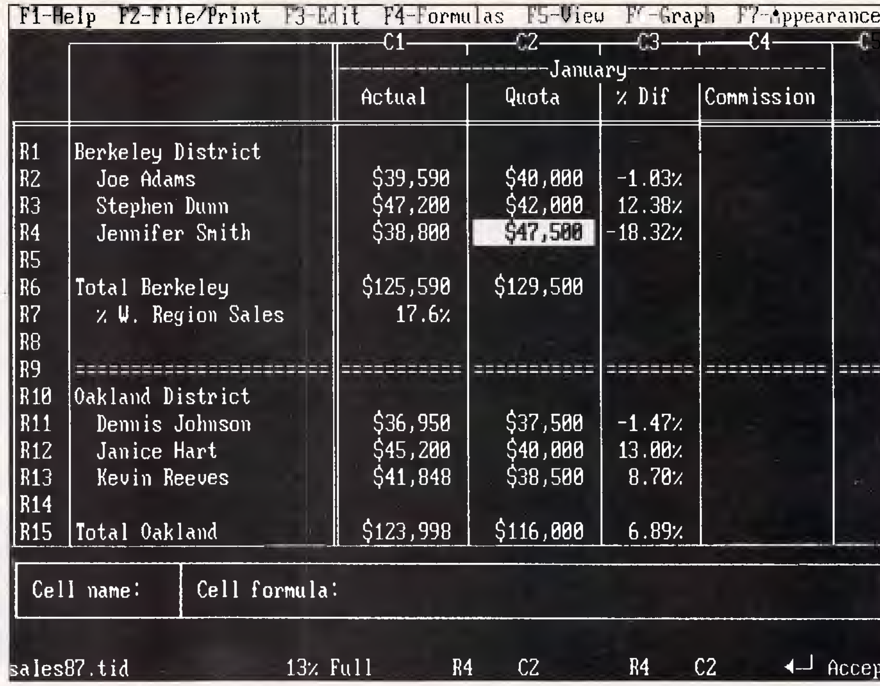
*Price does not include adaptor cables required by certain compatibles • A limited offer — price subject to change without notification.

keystrokes. Individual cells are referenced as R1C1, R2C2, and so on. The manual tells us that Plan also uses the 'IBM standard for cursor movement keys', which really isn't so standard to spreadsheet veterans who cut their teeth on Lotus. The IBM standard moves the left arrow one character to the left rather than one cell to the left, as 1-2-3 does. Similarly, the tab moves one cell to the right, rather than taking you a full screen to the right, as 1-2-3 does. This may not bother novices, but it's a sizable pain to practised spreadsheet users.

Where you would find the second line of a two-line menu at the top of 1-2-3's screen, Plan lists seven function keys and tells you what to do. F1, for instance, calls up detailed context-specific help. The other function keys display pull-down menus that lead you through such things as formatting and copying. You can use the F keys, select the function from the menu using cursor keys, or access the function with a Ctrl-key combination, such as Ctrl-S for save.

Labels and numbers can be typed directly into a cell. The column widths expand automatically to match the widest entry. Cells are five spaces wide, and when you reach the sixth, the margin scoots to the right. To enter a formula you must select F4, Formulae, or use Ctrl-F to enter your information in a dialog box. You can use cursor movement keys to build formulae, but you must type a Ctrl-W each time that you want Plan to note the current cell location. Plan also contains many of 1-2-3's @ functions and a few of its own, although a number of them do what can easily be accomplished in 1-2-3 with formulae.

Each spreadsheet has special regions for column headings and row titles. You can use entries in this region as names in the spreadsheet, and formulae can be attached to these names so that they affect the entire row or column. For example, a cell in the title region next to row 2 that is labelled 'Cost of Sales' can contain a single formula, 'Sales *.5'. All columns with a formula heading will be replaced with the calculated value of that formula using the figures from the row that has the title 'SALES, row 1,' in it.



PFS:Professional Plan requires you to enter formulae from a menu or use Ctrl-F to display the dialog box shown here. Cells are referenced by row and column numbers or by row and column titles, such as (ACTUAL-QUOTA)/QUOTA

Circuitous commands

Copy and Move commands are more circuitous in Plan than they are in 1-2-3. It will take you a bit of practice to execute them properly. To copy a single cell, you select Ctrl-C for copy, move the cursor to the first point of the copy, type Ctrl-X for mark, cursor over to the end point, and type F10 to finish the copy. To copy a column, you first mark the column, then select Ctrl-C to copy, mark the destination, and type F10.

Where 1-2-3 gives you window, row, and title locking, Plan gives you a View capability that is more powerful than 1-2-3's approach but, again, different enough from 1-2-3 to be irritating to power users. In View, you can display any rows or columns, contiguous or not, without changing the look of the original spreadsheet. To specify a view, you select the menu choice and put a '+' above the column or to the left of the row to identify the items that are to be shown in the view. In the same areas where you place the +, you can specify sort sequences and reorganise the view, again without changing the original spreadsheet.

Plan lets you print the entire spreadsheet or print a specific view in which you tell the program which columns or rows to print. This feature gives you more flexibility to customise printed reports than you get from 1-2-3. Printer codes, headers and footers, and other features are handled in Plan's print routine.

Unlike 1-2-3, macros are stored in a separate file and executed like a batch file. You can create macros by recording keystrokes or by using the macro editor, a mini word processor. You simply type them as you would a document, and Plan writes them to disk rather than to the cells as 1-2-3 does. The macros look like a structured programming language and can execute all commands from pull-down menus. Macro names can be Alt-A through Alt-Z and Alt-0 through Alt-9. Plan doesn't give you as many macro keywords as does 1-2-3, but the list is more than adequate.

Good with graphs

Plan's graphics abilities go one step further than do 1-2-3's. Graph definitions appear in clear, simple screens, and data itself is selected in a special area

At a glance

PFS:Professional Plan, Version 1.0
Supplier: Imagineering
Tel: (02) 697 8666
Price: $448
Requires: 512k RAM, two floppy disk drives (hard disk recommended), DOS 2.0 or later.
In short: A nice complement to the PFS:Professional series, matching 1-2-3's features but not its style. Nice for the novice but annoying to power users. Not copy protected

BETTER ALTERNATIVES FROM MICROAUSTRALIA

Here's the spreadsheet package that's better than all the others, including Lotus 1-2-3.

Supercalc 4, from Computer Associates, was Info World Readers Choice Spreadsheet Product of the Year and is now here, through MicroAustralia. Supercalc 4 gives advantages that Lotus 1-2-3 cannot:

- Full word menus.
- Powerful macro language with unique learn facility to simplify the creation of macros.
- Non-copy Protected.
- Network facilities for all popular LANS.
- Corporate Site Licence policy available.
- Easy-to-use with superior graphics capability.

$729 (Ex Tax Recommended Retail)

For more on Supercalc 4's extensive, powerful features, call (02) 736 3299, or mail the coupon.

SuperCalc® 4

COMPUTER ASSOCIATES
Software superior by design.

Tell me more how Supercalc 4 runs on all major networks, and can even be integrated with mainframe spreadsheet processing.

To: MicroAustralia, Software Distributors, 15 McDonald St., Mortlake, NSW 2037.

Name ______________________ Title ______________

Company ______________________

Address ______________________

______________________ Code ________

Telephone ______________________

Type of business ______________________

MICROAUSTRALIA
SOFTWARE DISTRIBUTORS

200-M-CAL APC

that's similar to the View selection. You can create pie, bar, area, and high/low charts, each with a variety of options, and print from the same program using one of four fonts in three sizes: small, normal or expanded. The process is certainly less cumbersome than 1-2-3's, which requires you to go to a 'print graph' program.

Plan supplements its on-line help with meticulous documentation. The index is clear, and the manual helps you along with diagrams and examples. Plan has no tutorial disk. Instead, in the first two chapters of the manual, it gives you a printed tutorial that walks you through a variety of spreadsheet tasks.

Plan lets you import files from and export them to 1-2-3, Releases 1A and 2.0, delimited ASCII, and other PFS products. This feature isn't as nice as it could be. Plan will interface completely with other products in the PFS:Professional series. It will also transport graphs to Harvard Graphics. But Plan will not convert your 1-2-3 macros, graph settings, tables, databases, and other 1-2-3-specific functions. It just gives you labels, numbers, and most of the formulae.

'In PC/Foccalc, macros are handled differently from those in 1-2-3. They're called command files, and they're stored outside the spreadsheet itself.'

Despite its superior graphics, PFS:Professional Plan shouldn't cause many worries at Lotus. Plan may be just the thing for first-time spreadsheet users. It lives up to Software Publishing's reputation for producing user-friendly programs. And, because of its compatibility with other products in the PFS:Professional series, it will be attractive to offices that stock their software shelves with the PFS library.

Otherwise, there's not much here to threaten 1-2-3. The row/column designations aren't often seen in other spreadsheets, and probably with good reason: they're clumsy and awkward. Plan is slower than 1-2-3. Its cursor movement is more awkward, and many of its functions just aren't as logical. Lotus lovers won't find much reason to switch.

Mike Falkner

To Einstein a Second Son

Just as Einstein's special theory of Relativity ushered in the atomic age. So with Advanced REVELATION, a new era in data management is born.

Congratulations are due all round for the most powerful and friendly database management system ever.

Advanced REVELATION's innovative technology rivals Einstein's radical theories. For example, the new "Law of Variable Length" smashes conventional fixed-length field and record systems.

Before this new law of data, you had to fit in with a system. Now with Advanced REVELATION your system fits you.

For such a relative youngster, Advanced REVELATION has a very sophisticated architecture, giving you;

- up to 65,000 characters per field
- word processor fields
- virtual space windows
- unlimited records and open files

Quite the little prodigy, isn't he?

And there's more:

Mac-like environment on your IBM PC/XT, AT, PS/2 or compatible, with exploding windows, three-dimensional menus, popups, and many more!

But like all good ideas, Advanced REVELATION is simple. Anyone who can use a wordprocessor can build applications.

And for Advanced users?

It will bring out the Einstein in you.

Call us or your nearest dealer now to discover more.

Sole Australian Distributors

COSMOS™

Phone (02) 908 4033
Level 1, 7 Young Street, Neutral Bay
Sydney Australia

PICKSOFT
THE PICK SOFTWARE HOUSE
INFINITELY HARDER WORKING

United Notions 1125B

CHECKOUT

PlanPerfect

This past June, WordPerfect Corporation changed the name of its $554 spreadsheet program, once known as MathPlan, to PlanPerfect.

PlanPerfect is built around the same function keys as WordPerfect: Shift-F10 reads a spreadsheet into PlanPerfect's memory, and F10 saves it back to disk. Using the function keys saves keystrokes over traditional spreadsheets that follow the convention of using the Slash key to go to Menu mode, File, Save, Return, and Replace. But the difficulty with function keys is that occasional users have trouble remembering which key does what.

Hearty heritage

PlanPerfect is an offshoot of WordPerfect Corporation's successful word processing program. One of the advantages of this ancestry is that PlanPerfect can use WordPerfect printer drivers, so that if you have WordPerfect, you need not load PlanPerfect's drivers.

It is easy to convert PlanPerfect's ranges to columns in WordPerfect files: hit Ctrl-F5 for Convert. This brings up a submenu. Choose 3 from the menu to select export format, then 1 to choose WordPerfect format. Hit Ctrl-F5 for Convert again, then 2 from the submenu to export the file. In WordPerfect format, each spreadsheet row becomes a line of text. Margins and tab stops are set up to make it look nice.

PlanPerfect automatically spills your spreadsheet out to a work file when it grows too big for memory, just as a word processor spools your document to disk when it outgrows memory. PlanPerfect supports expanded memory, but if you don't have it, the work file is a nifty feature that allows your spreadsheet to grow. It will slow down your spreadsheet, but you'll never get a 'memory full' message. Instead, what you get is 'disk full'. Thus, your spreadsheet is not limited to RAM size but can expand to fit the capacity of the disk.

Also in keeping with its word processor heritage, PlanPerfect has a text-editing window that puts standard spreadsheet windows to shame.

You can use PlanPerfect to generate customised letters from a database. Write the letter in PlanPerfect or WordPerfect so that it gets the name and address from two cells, then write a macro to select records from

PlanPerfect's database, copy data from each record into those cells, and print. This macro implements the mailmerge function, which is explained in minute detail in PlanPerfect's notes.

Link capabilities

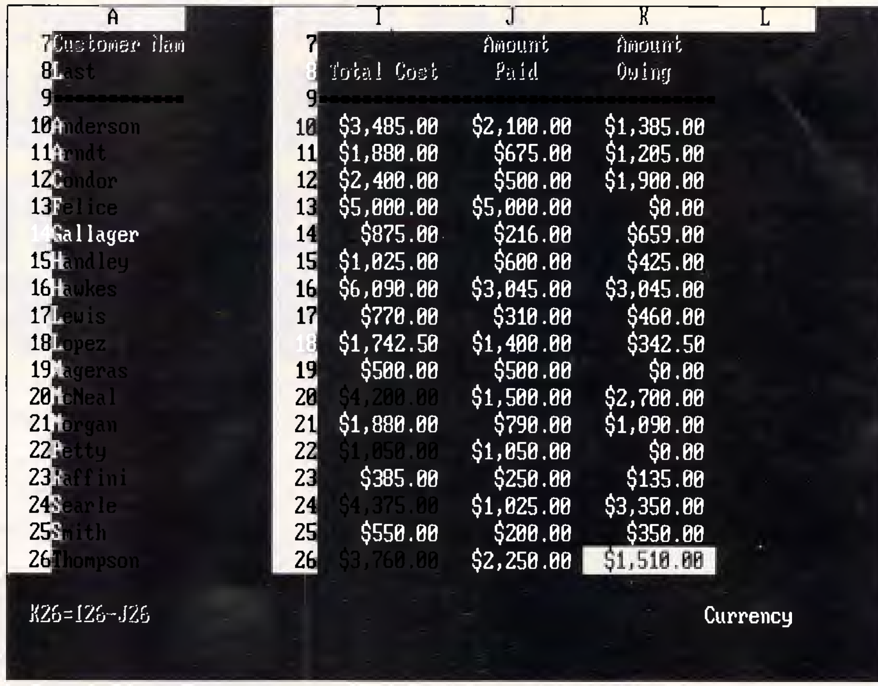
PlanPerfect also lets you link spreadsheets. A link is a disk filename that identifies the worksheet containing the data you want to copy, a cell or range in the source worksheet, and a cell or range in the destination spreadsheet The source data may be copied, added, subtracted, multiplied, or divided into the destination sheet. This is a convenient feature, but more's the pity that PlanPerfect won't let you also link references in a formula. If you change the source worksheet, the destination worksheet is automatically updated the next time you open it.

There are other nice features in PlanPerfect. A formula containing only a '+' sums nonblank cells located immediately above it until it finds the first blank cell. It displays the total in the cell with the +. Unfortunately, you have to update horizontal sum ranges manually when you insert a column.

PlanPerfect lets you attach custom help messages to individual cells. Your messages are displayed when the user asks for help while the cursor is on a cell with a custom message. PlanPerfect's database is above average: it lets you search columns by name. The tutorial does a nice job but, unfortunately, omits databases and macros. The program flags a number that is too big to fit in a column. PlanPerfect's spreadsheet has the feel of a programming language. If you do not find what you need in PlanPerfect's 85 built-in functions, you can develop your own and refer to them when writing formulae. It also supplies real programming constructs, like loops and case statements.

At a glance

PlanPerfect, Version 3.0
Supplier: Sourceware
Tel: (02) 411 5711
Price: $554
Requires: 256k RAM (or 320k RAM for bit-mapped graphics), two disk drives, DOS 2.0 or later.
In short: A powerful spreadsheet that can handle massive spreadsheets without expanded memory. Not copy protected.



PlanPerfect has split-window capability. Each window can be scrolled and formatted independently, and there can be different spreadsheets in each of the windows

PlanPerfect can import 1-2-3 spreadsheets, but keyboard macros are not converted, and you may have to fix some of the formulae. I fail to see why they did not convert all the formulae: there seems to be nothing 1-2-3 can do that PlanPerfect can't.

MathPlan memories

When WordPerfect Corporation renamed its spreadsheet, it changed the packaging but very little else. The documentation and many of the help screens still refer to the program as MathPlan. PlanPerfect's quick-reference guide could be better. It is arranged alphabetically, and it is hard to find functions when you do not know what they are called.

The graphics package is not terribly well integrated. When you try to plot a range it does not like, it tells you 'Illegal Block'. The manual says that means you have misspelled a cell number, but the program blocks you even when the cell number is correct. This and other error messages could be more context dependent. All in all, PlanPerfect is powerful and professionally implemented, even if its philosophy was guided by word processing considerations. It is an excellent tool for word processor users, especially if they use WordPerfect.

William Taylor

Silk

Silk, from Daybreak Technologies, is one of the most promising of the post-1-2-3 spreadsheets. Unlike the champ's traditional competitors, such as SuperCalc and Multiplan, which were introduced before 1-2-3, Silk was designed for a world that had already embraced the Lotus standard. It carefully maintains the features that have made 1-2-3 a success while adding a host of new ones.

At the same time, Silk is not a superset of 1-2-3. It's different enough to avoid a 'look-and-feel' suit, yet close enough to be easy for Lotus users to learn. Whether it's the giant killer its ads claim it to be remains to be seen, but it's certainly one of the toughest competitors 1-2-3 has to face. Moreover, at its list price of $345, it sells for considerably less than 1-2-3. Its only real drawbacks are its gluttony for memory and slightly disappointing recalc times.

Silk has drawn heavily on 1-2-3's style and appearance. Its two-line menus and command structure are comfortably familiar. Simple routines like /File Retrieve or /Worksheet Erase Yes are identical, but complex commands are different. Silk also uses 1-2-3's excellent cursor control commands, and its macro language is close to Release 2.01's. Silk's built-in functions

BLUE CHIP

CALL INTO YOUR LOCAL BLUE CHIP STORE OR PHONE OUR DIRECT ORDER HOTLINE (008) 033841

LOTUS 123 $555

DBASE III+ $825

WORDSTAR 2000+ $250

MICROSOFT WORD $645

POSTCODER $65

ABILITY $175

MICROSOFT MOUSE $239

TRACKER $129

*All prices include sales tax.

SUPPORTED BY THE BLUE CHIP NETWORK AUSTRALIA-WIDE.

OMT COLOUR MONITOR $595

OMT EGA MONITOR $750

OMT MULTISCAN MONITOR $1150

OMT MONO MONITOR $249

NEC MULTISYNC MONITOR $1250

BLUE CHIP DSDD DISKETTES
per box $19.50
Buy 10 boxes and get a lockable disk storage box FREE.

BLUE CHIP A1
1x360K D/DRIVE
640KB RAM,colour display card, multifunction card, XT-style keyboard green monitor.
$995

BLUE CHIP PC/AT
20 MEG HARD DRIVE
$2995
1MEG RAM, 1X1.2MEG disk drive, extended keyboard, green monitor.

PHONE ORDER ON BANKCARD OR MASTERCARD

SOFTWARE

Lotus 123	$555
Lotus Hal	215
Symphony	845
Dbase III	825
Multimate Advantage II	690
Wordperfect	495
Paradox	690
Wordstar 2000+	250
Sidekick Copy Protected	95
Sidekick NCP	115
Norton Advanced	210
Norton Utilities	130
Norton Commander	120
Norton Guide	130
Norton Editor	195
Framework II	$980
Crosstalk	165
First Publisher	195
First Choice	230
Postcoder	65
Carbon Copy	285
Xtree	105
Harvard Graphics	505
Turbo Basic	155
Turbo Pascal	150
Turbo C	155
Clipper	859
Javelin	405
Wordstar Pro 4	460

MICROSOFT PRODUCTS

Word	$645
Mouse	239
Chart	595
Project	665
Learning Dos	85
Quick Basic	115
Windows	180

OTHER HARDWARE

Tandon 20MB H/Disk	650
Dysan 20MB Hard Card	905
Other Hard Disks	CALL
AST Multifunction Card	255

PRINTERS

Epson FX1000	$882
Epson FX800	705
Epson EX1000	1020
Other Epson	CALL
Brother 1509	850
Brother 1709	1078
Brother HR35	1150
Other Brother	CALL
Canon PW1156	800
OMT VP1814- 80 column	499
OMT VP1821- 132 column	1185

MODEMS

Interlink 300/1275	265
Interlink 1200/1275	685
Netcomm Modems	CALL

NEW STORE NOW OPEN AT CROWS NEST!
272 PACIFIC HWY , CROWS NEST. Tel:(02)436 3655

DANDENONG 92 Thomas Street Ph: (03) 794 0966
RINGWOOD 8 Railway Place Ph: (03) 870 2243
COBURG 328 Sydney Road Ph: (03) 383 5655
ST. KILDA 106 St. Kilda Road Ph: (03) 534 9437
A CHIP OFF THE OLD BLOCK
SURRY HILLS 90 Foveaux Street Ph: (02) 281 1044
CHATSWOOD 807 Pacific Highway Ph: (02) 412 4122
PARRAMATTA 463a Church Street Ph: (02) 683 1599
CANBERRA 30 Lyell Street, Fyshwick Ph: (062) 80 7833

Performance tests: spreadsheet programs

Even though competitors have had two years to match and exceed Release 2 of 1-2-3, the program is still faster than all but two of the spreadsheets on flat-out calculation speed. Silk, our choice among traditional spreadsheets, is below average on calc speed but makes up for it with richness of features. PC/Foccalc, which runs in the Focus environment, is the fastest product tested in terms of calculation speed. Several programs — including Silk, VP-Planner, and Multiplan — offer faster disk load and save times, which may be preferable for doing many small spreadsheets rather than a single large one.

For the spreadsheet performance tests, we filled the 2080 cells between A1 and Z80 with labels and with formulae that do four-function math and square roots. The tests were conducted on an 8MHz AT with 640k RAM and a 30Mbyte hard disk drive.

The **Calc speed** test measures how long it takes the program to recalculate the test spreadsheet.

The **Save to disk** test measures how long it takes the program to write the spreadsheet to disk.

The **Load from disk** test measures how long it takes the program to read the spreadsheet from disk.

The **Worksheet memory** test reports how much RAM is available for spreadsheet models when the spreadsheet is empty.

The **Memory used** test reports how much RAM is available after the test spreadsheet has been loaded.

The **Disk space** test measures how large a file the program writes when it saves the spreadsheet to disk.

Performance times

(Times are given in seconds.)

	Calc speed	Save to disk	Load from disk	Worksheet memory (k)	Memory used (k)	Disk space (k)
The Twin Classic	182.0	34.0	30.0	363.0	89.0	80.9
SuperCalc4	124.0	23.0	22.0	260.0	86.0	90.9
Silk	124.0	13.0	14.9	250.9	90.5	85.6
PFS:Professional Plan	112.3	9.3	10.5	N/A*	N/A*	45.1
Plan Perfect	91.0	26.0	34.0	401.4	99.3	86.2
VP-Planner	104.7	19.8	15.7	402.0	72.0	71.0
1-2-3, Release 2.01	70.0	32.0	29.5	424.0	73.7	79.9
Multiplan	66.0	20.0	17 7	N/A*	N/A*	38.6
PC/Foccalc	12.8	37.1	35.0	201.6	41.8	92.3

N/A — Not applicable: program does not report the amount of RAM used by the empty worksheet and reports Memory used as a percentage of the total RAM available. The test spreadsheet used 18 per cent of PFS:Professional Plan's work space, and 8 per cent of Multiplan's work space.*

are nearly identical to 1-2-3's, except for database and time functions: Silk simply left them out.

One interesting departure from 1-2-3 convention is the way that Silk interprets input data. You must always precede a label with a label prefix, since Silk won't automatically treat alpha strings as labels. On the other hand, function names don't have to start with a special character like the at-sign (@), and you don't have to start a formula like A1+B1 with a plus sign. Silk recognises these entries as formulae, not labels.

Aside from these differences from 1-2-3, Silk is packed with improvements. The flashiest is Silk's interactive help. When you turn it on, the right half of the screen turns into a constant tutor. Every time you make a menu choice, the tutor updates immediately to explain your new choices. Help screens in other programs interrupt your work with their explanations, but Silk's are by your side while you work. Explanations are fully detailed, and you can scroll the help text if necessary. Silk is so confident you'll use its help screens that it hasn't bothered to include full descriptions of functions in the manual. They're all in the help screens.

Silk uses function keys more cleverly than does 1-2-3. All ten have control-shifted as well as unshifted functions. Ctrl-F5, for example, is a quick way to blank the current cell. If you're tracking circular errors, F4 takes you to the next offending cell. F8 inserts a single cell vertically in your worksheet, and Ctrl-F8 deletes one — a wonderful tool for editing macro script. F10 sends the cursor to the most recently edited cell and restores its previous contents. Ctrl-F9 executes whatever macro script the cursor is on — a quick way to test a macro without running it from the beginning. And so on.

Easier editing

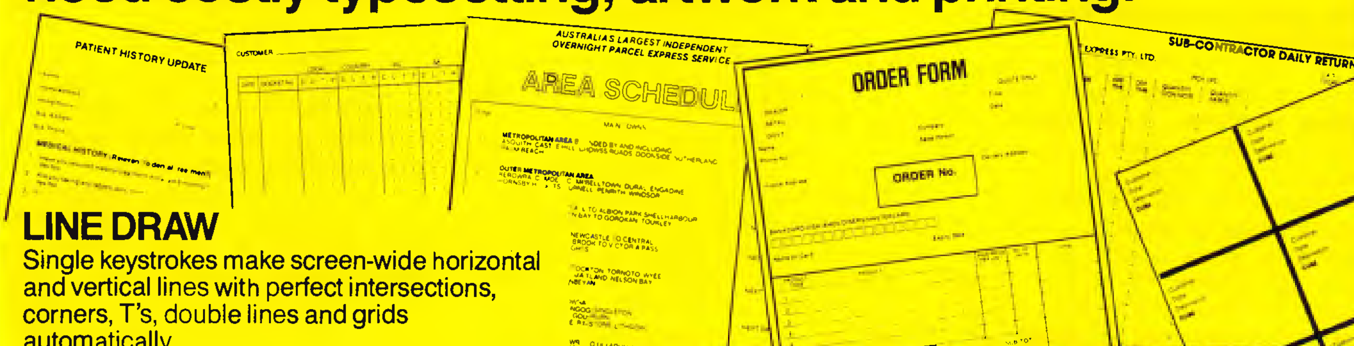
Silk also makes editing long formulae easier. You can use the whole bottom half of the screen if you need it and view nearly 800 characters at a time. A single cell can hold as many as 4000 characters, though I can't imagine formulae that long. What could push you past the 1000 character mark, though, is formula annotation. If you put the number sign (#) at the end of a formula, Silk treats anything that follows it as comments. This device lets you write detailed explanations of formula logic.

Even formulae without comments are

THE IMPORTERS OF MACE $195 AND XTREE $112 INTRODUCE

FORMTOOL

FORMTOOL is the sophisticated software package that allows you to custom make forms, letterheads — all office stationery. With FORMTOOL you no longer need costly typesetting, artwork and printing.



LINE DRAW
Single keystrokes make screen-wide horizontal and vertical lines with perfect intersections, corners, T's, double lines and grids automatically.

MERGE
Fill in form or just specify dBase, DIF or ASCII data files and let FORMTOOL merge data into your new form.

PRINTING
Print your own office forms. Just plug in for use with most dot matrix, laser and injet printers. Sideways printing included.

TEXT COMMANDS
Variable fonts, typestyles and sizes. Direct access to graphic symbols, horizontal and vertical typesetting. Foreign characters etc. etc.

ONLY

$295

A GENUINE PRODUCTIVITY TOOL

PERFECT INTERFACE (AUSTRALIA) PTY. LTD.
Level 8, 56 Berry St., N. Sydney NSW 2060
Phone (02) 957 6686

Please send me ______________ copies of MACE, $195 each.

Please send me ______________ copies of XTREE, $112 each.

Please send me __________ copies of FORMTOOL, $295 each.

I enclose my cheque for $__________ or please debit my American Express, Diner's Club, Visa, Mastercard or Bankcard plus $6.50 freight.

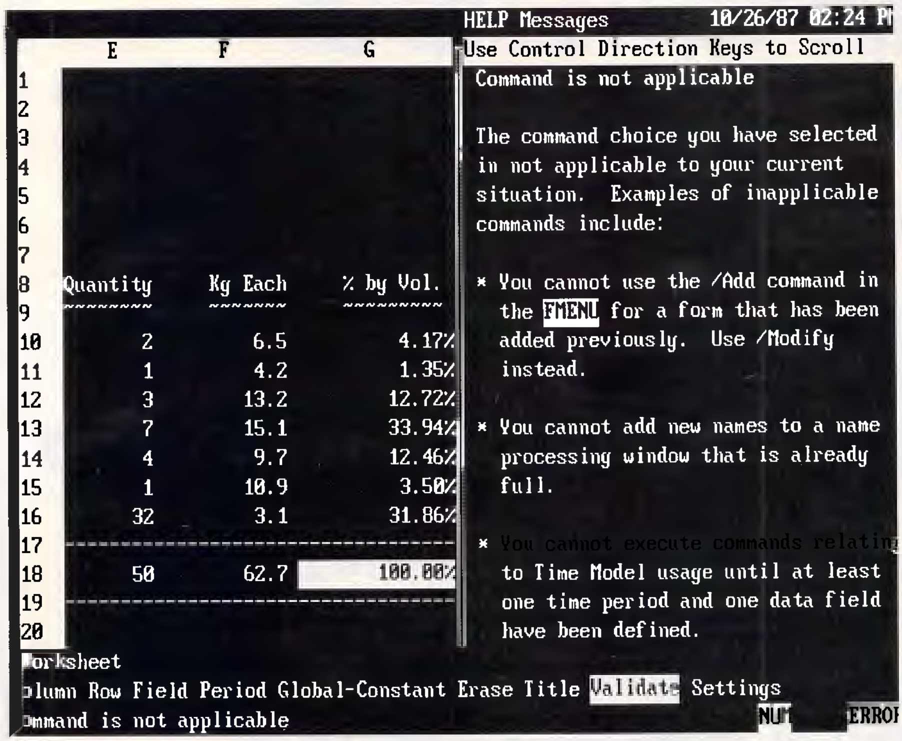
Card expires ______________________ Signature __________

Name ______________________ Company __________

Address ______________________________

Phone No. ______________________________

Buy Now! Save time & printing costs



Silk uses an interactive help window that tells you why the command just selected will not work

likely to be clearer if you use Silk's global constants. If you define TAX-RATE as .28, you can use the word instead of the number in any formula. You can define 240 such constants.

Another way to make sense out of formulae is global search and replace. You can search for text or number strings in labels or formulae. This way you can quickly find all references to cell B52, for example, and change them to F16 if you want. This is such a useful feature; you'll wonder how you lived without it.

Silk also lets you rearrange your worksheet after it's built. Change the column order to C,A,D,B instead of A,B,C,D if you like. Do the same thing with the rows. If you like the new arrangement, Silk can make it permanent. All formulae neatly update.

If you work with foreign currencies, Silk makes your life simpler. You can define a primary currency and two secondary currencies, along with their symbols and exchange rates. Thus, if your primary currency is the dollar and you define the yen as 103 to the dollar, the number 2 in a yen-defined cell will appear as 206. Pretty slick — not to mention useful, too.

Silk's graphics are more powerful than 1-2-3's. Silk offers more types of graphs and allows you to make more changes on the screen. Even so, quality is still not up to the standard of dedicated graphics packages, and you must first dump a graph to disk before you can print it.

Silk has put a lot of work into a feature that lets you build time-series models. Much as you do with Javelin or PFS:Professional Plan, you establish time periods across the top row of the model and figures for Sales, Expenses, Profits, and so forth in the rows beneath. You can then define formulae such as Profits = Sales − Expenses, so that every cell in the Profits row will show that period's profits. Since a single formula does the calculations for every period, models of this kind are quicker to build and take less memory.

Time-series models can be templates for data entry. You can define only certain cells for input and write prompts that tell unsophisticated users what sort of data you expect. You can even set limits on the kind of data a cell will accept — alpha or numeric, greater than, less than, and so forth. This keeps your models from going too spectacularly wrong.

At a glance

Silk, Version 1.0
Supplier: PC Extras
Tel: (02) 319 2155
Price: $345
Requires: 512k RAM, two disk drives, DOS 2.0 or later.
In short: A powerful spreadsheet that offers many features not found in Lotus 1-2-3. Not copy protected.

Recovery system

Another great feature is Silk's model recovery system. If you use a hard disk, the program can log your keystrokes to a file while you build a spreadsheet. If you lose your work, you can read the log file, and Silk will rebuild the spreadsheet, step by step, at macro execution speed. It takes a little time, but it's quicker than doing it yourself. If you like, you can even run a little Silk program to turn the log file into a macro, or vice versa.

A potentially nice feature is a numbers-to-words cell format. This makes the number 666 display as six hundred sixty-six, leaving out the 'and' as Americans do. Silk has two levels of security. Anyone can save models with a password that only the security manager can decode. Silk also has a very handy date-entry technique. Since @ isn't needed for functions, you enter dates in the convenient, but American, form; @12/25/87. This form stores the date as a serial number for date arithmetic and also gives you a choice of 14 different date display formats.

Finally, you can translate worksheets pretty effectively between Silk and either version of 1-2-3. Translated macros will run, but since many command sequences are different, you'll have to adjust them by hand. Most of the built-in functions will translate perfectly.

Nevertheless, for Silk's features, you pay a high price in memory. It leaves you approximately 160k bytes less of RAM for worksheets than 1-2-3 does. On a small system, that could make a big difference. Also, if I write huge spreadsheets, I would want to switch from 1-2-3 to a program that calculates faster, not slower.

I miss the 1-2-3 database, and I also like a complete reference manual; it's hard to put good diagrams into help screens. Finally, the program doesn't support very many printers, though Version 1.01, which is supposed to be on its way, should support more.

Still, depending on your needs, these may be minor complaints. At $345, Silk is an excellent program at a reasonable price.

SuperCalc4

SuperCalc is a survivor. It is one of those rare spreadsheets that were intro-

NEW RELEASES

Introducing our new Compatible Compact AT running at 6/8/10 MHz switchable (also with 12 MHz speed selectable already built-in). With zero-wait state, our Compact AT really performs at 'lightening' speed. Together with new PC/XT Turbo models at 10 MHz, we are offering high quality computers at most affordable prices.

NEW:

Genoa SUPER-EGA +: $450 (EGA/PGA/TGA/CGA/HGC) with 132 col.x 32 rows, auto-switch

CALL FOR BEST PRICE ON ALL EPSON PRINTERS

FREE MONO MONITOR WITH EACH COMPUTER

Limited Offer From Super-PC (Melb.) Only.

SUPER - PC/AT COMPUTER

(Model CAT-10) **$2395** Tax incl.

- .IBM-AT Compatible with Japanese Mainboard
  .80286-10 CPU at 6/8/10 MHz (zero-wait state)
- (12 MHz 0-wait optional)
- .Licensed AWARD BIOS - 8 expansion slots
- .640 KB RAM - Expandable to 1 MB on MainBoard
- .Battery backed real-time Clock/Calendar
- .Parrallel/ Serial Ports
- .Colour Graphic Display Adapter
- .DTC/WDC Hard and Floppy Disk Controller
- .20 MB Hard Disc
- .1.2 MB Japanese Floppy Disk Drive
- .200-Watt Power Supply - Compact Foot Print
- .IBM-AT Style keyboard - Best feel quality

SUPER - PC/XT TURBO

(Model TXT-10) **$1270** Tax incl.

- .IBM-XT Compatible with Japanese Mainboard
- .8088-10 CPU at 4.77/10 MHz switchable
- .8 expansion slots - Socket for 8087
- .640 KB RAM - Battery backed Clock/Calendar
- .Parallel/Serial/Game Ports
- .Colour Graphic Display Adapter
- .Two National 5.25" DSDD Floppy Disk Drives
- .165-Watt Power Supply
- .IBM-AT style keyboard - Best tactile feel
- .Other optional configurations available:

PLEASE CALL

SUPER PC

Personal Computers

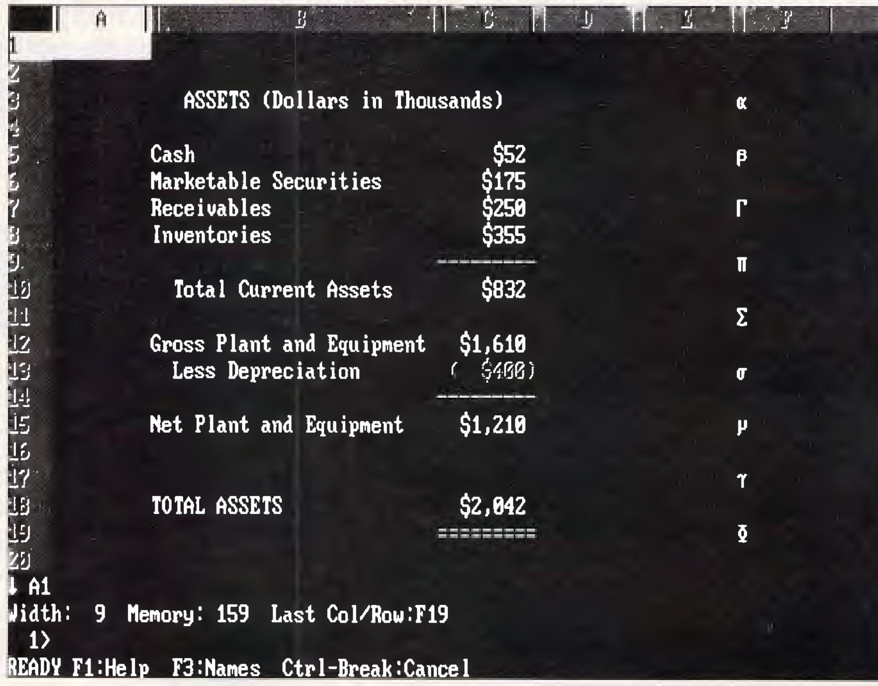
273 Huntingdale Rd, Oakleigh 3166

The Place To Come When You Want The Best

Tel. (03) 5433755 Fax. (03) 5449228

Notes:
1. Operation/Referance Manuals included
2. Full 6-mth parts & labour warranty
3. Delivery Charge extra

SYDNEY	ADELAIDE	ADELAIDE	TASMANIA
Micro Station Computers	Electronic Discounters	JV Computers	(003) 44 7585
(02) 819 6348	(08) 212 1799	(08) 339 3572	



SuperCalc4 has a user-defined format for numbers. All values have a leading dollar sign and floating commas, and are divided by 1000. Negatives are shown in parentheses. To the right are high-bit ASCII characters entered with the Alt-Number Pad combination. The last line clutters the screen, but the column/row borders can be turned off

duced *before* 1-2-3 and are still around in a world now dominated by Lotus. Made by Computer Associates International, SuperCalc has matured over the years into a powerful, well-designed program that can hold its own in a point-by-point comparison with any competitor. It costs a little less than 1-2-3 at $875.

The SuperCalc4 screen has the usual spreadsheet look, with the added touch that the borders use reverse video to show you the location of the cursor. The screen has a slightly cluttered look, though, because of the constant display of what F1, F2, and Ctrl-Break do — nice for real beginners but pointless for anyone else. On the other hand, once you've developed your model you can clean the screen up dramatically by turning off the entire row-number/column-letter matrix. This makes for a very professional look.

SuperCalc has used Slash-key commands since before 1-2-3 existed, so it's no surprise that its command sequence is different. For example, commands to print to a file or printer begin with /O for Output. Likewise, in order to run advanced import-export and macro commands, you bring up a secondary command menu by hitting the Slash key twice. These distinctive sequences are well planned and make sense, but they may seem odd to hardened 1-2-3 users.

One SuperCalc4 feature that everyone will love, though, is its ability to parse data as you enter it into a cell. Functions don't have to be preceded with any special character like the at-sign (@), nor do you have to indicate labels with a label prefix. For example, SuperCalc4 knows that if you enter sqrt(2), you want a display of 1.414214. It also knows that if you enter sqrt(two), you have just entered a rather odd label and not a formula. Since the program almost never confuses labels and formulae, you don't have to worry about how you write them.

At a glance

SuperCalc4
Supplier: Micro Australia
Tel: (02) 736 3299
Price: $875
Requires: 256k RAM, two disk drives, DOS 2.0 or later.
In short: A powerful spreadsheet with better graphics than Lotus 1-2-3, but less sophisticated string capacity. Not copy protected.

One limitation this does impose on you, though, is that you shouldn't use function names as range names. If you call a cell SQRT, the program warns you that you are redefining a function name and sure enough, if you try to use the function later on, it won't work.

SuperCalc4 gives you some handy cursor controls, as well as some excellent screen-building commands. For example, Ctrl-Home takes you to the top left-hand corner of the current screen, and Ctrl-End takes you to the bottom right. There are also commands that take you to the edges of the active area. For rapid data entry, you can combine arrow-key cursor controls with the Return key. This way, you can use the NumLocked number pad with Return to enter a series of numbers very quickly down a column or across a row.

One of the handiest screen-building commands is Move Column or Row. If you move row 4 to row 23, say, row 5 will move up to take its place and row 23 will move down to let it in. Formulae will adjust. This is much handier than the Insert-Copy-Delete routine that 1-2-3 would put you through. Likewise, you can insert ranges anywhere in the spreadsheet, without opening up whole columns and rows. Just drop a chunk down anywhere you like, and the data will move down or to the right just enough to let it in; you don't have to insert or delete anything.

Convenient options

The copy command, which you can use just like 1-2-3's if you like, has other convenient options. For instance, you can copy formulae so that their references aren't adjusted, or so that only values are copied. Even more interesting, you can use the copy command to do four-function math. If the destination range already has values in it, you can multiply them, say, by the values in the source range.

Another command lets you indicate a cell, edit its formula, and then enter the results into another cell. This way, if you need to vary a formula slightly from cell to cell, you can do the editing and copying in a single step.

Another convenience is SuperCalc4's eight user-defined cell-display formats. You could define a financial statement format so that all numbers are preceded by the $, with commas embedded, negatives in parentheses, zeros to appear as blanks, and with all values divided by 1000. You can mix and match different format elements to come up with whatever suits you.

Pick of the bunch

Everyone knows 1-2-3 is a wonderful piece of software headed for stiff competition from the upcoming spreadsheets by Microsoft and Borland. In fact, 1-2-3 has already met its match.

Silk is enough like 1-2-3 to make any spreadsheet user feel at home, and it spoils you with features you can't find in the industry standard. Silk's improved graphics, fine use of function keys, interactive help, global search and replace, and easy-to-arrange worksheet are reason enough to buy. The fact that the list price of $345 is 65% less than 1-2-3's $970 is icing on the cake. Silk's many extras do cost you memory and speed but, if you're a serious spreadsheet user, by now you've equipped your system with expanded memory and a math chip.

Silk lacks the massive user base that makes 1-2-3 so appealing; when you have a spreadsheet question, a co-worker or a friend is sure to know the answer if it's about 1-2-3. Among word processors, WordStar still captures sales for just that reason, even though it's no longer the best. At some point, you have to think about moving onward and upward. Silk gives you reason enough.

You can print a SuperCalc4 worksheet more conveniently than you can using 1-2-3. Printing parameters are easier to set because you get a full display of current settings while you change them. Also, you can specify ALL as the print range if you want to print the whole model. You can print multiple copies and include up to four headers and footers instead of 1-2-3's one each. If you like, you can print the column-letter/row-number matrix along with your model or give it custom-designed borders with characters that you choose. SuperCalc4 comes with a built-in sideways print utility Computer Associates began incorporating into SuperCalc3 under a licence from Funk Software, which sells Sideways as a program for the PC. If you have a graphics printer, you can flip the printout 90 degrees and print models as wide as you like. Sideways printing is slower than conventional printing but quite handy when you need it.

'The Twin is a bargain for the user who isn't in a hurry and needs an inexpensive spreadsheet.'

SuperCalc4 gives you good graphing flexibility, with seven graph types instead of 1-2-3's five: SuperCalc4 adds a high-low chart and an area chart. You have more control over a chart's appearance on the screen, and the charts look better than 1-2-3's. Moreover, you can print from within the program: you don't have to print to disk and then run another program.

SuperCalc4's macro language has many advantages, while it falls short in a few areas. Perhaps its greatest advantage is that macros can be run from files on disk. This means that macro script needn't take up spreadsheet space, and you can run the same macro from any number of different spreadsheets. Macros can use the \y naming convention, where y is a letter of the alphabet. This way, if you hit Alt-Y, SuperCalc looks first for macro script within the spreadsheet. If it doesn't find the range name /y, it looks for a file named Y.QXT on disk and runs the macro script in that file. If you like more-descriptive names for your routines, you can use the Alt-F5 macro-invoking command followed by the macro's name. Another very handy feature for beginners is the macro Learn mode; turn it on and the program will record your keystrokes as a macro script.

The macro language cannot handle string functions the way 1-2-3 does, nor can you use it to write and read ASCII files. It has no equivalent of the @cell-pointer function, though some of its power can be duplicated by using SuperCalc4's logical functions like ISSTR or ISNUM, or indexing functions like CURROW and CURCOL.

Nuts and bolts

At the nuts-and-bolts level, SuperCalc4 has included convenient ways to adapt the program to your hardware. If you need as much worksheet space as possible, you can set SuperCalc4 so that it loads fewer program modules into memory. This means it will go to disk more often, but by using this option I got 174k more RAM for models. If you build very large spreadsheets but would like to carry them around on floppies, you can save a model, in pieces, on more than one disk. One increasing-

PRISMA INTRODUCES ~~ECONOMICS~~

EGA-NOMICS

Introducing Prisma's new EGAMAX 480—the most "EGA-nomical" way to get maximum performance from your EGA or Multisync monitor.

MAXIMUM VERSATILITY. The EGAMAX 480 gives you more modes for your money, providing both Hercules and MDA functions—as well as standard EGA and CGA—on any EGA monitor, eliminating the need to ever have to buy a separate monochrome monitor. And with built-in 132-column text, the EGAMAX 480 lets you get more information up on the screen for crystal clear display of large spreadsheet and word processing programs.

MAXIMUM EXPANDABILITY. And when the day comes to upgrade beyond an EGA monitor, the EGAMAX 480 can move up to Multisync with you, providing a choice of 640×400, 640×480 and 752×410 super-high resolutions and special 80×66 spreadsheet for both CAD/CAM workstations and desktop publishing.

MAXIMUM COMPATIBILITY. 100% IBM EGA compatibility provides 256K display memory, 16-out-of-64 color palette, smooth scrolling, split screen and pixel panning, while full downward compatibility lets the EGAMAX 480 run all of today's most popular software, including MS Windows, Lotus 1-2-3, Symphony, AutoCAD, GEM, Ventura Publisher, Framework and many others.

All together, the EGAMAX 480's combination of unmatched features, unbeatable price and two-year warranty add up to **MAXIMUM SAVINGS**—today's most "EGA-nomical" way to expand your computer system without depleting your budget.

CC CONSUMER CHOICE

Distributor, VAR and OEM iniquiries welcome

Prisma

Prisma Graphic Systems Inc.
7/F., 560 Chung Hsiao E. Rd., Sec. 4, Taipei, Taiwan, R.O.C.
Tel: (02) 701-8999 Fax: 886-2-701-8887 Telex: 29313 PRISMA

Invest in this . . .

. . . and get an extra 4 Meg RAM worth $2000 Free.

How would you like your new Macintosh II with Five Meg of RAM at no extra cost?

Apple's new Macintosh II is far and away the most powerful and exciting personal computer yet.

But to take full advantage of its stunning power and speed, you need more than the 1 Meg of RAM it normally comes with.

We want to increase your new Macintosh II's RAM by 5 times at absolutely no extra cost to you!

So for this month only, invest in a Macintosh II from Robs Computer Centre and we'll give you an extra 4 Meg of RAM worth $2,000, for absolutely nothing.

Now you can run several high-powered programs at once without the need for tedious quitting between applications.

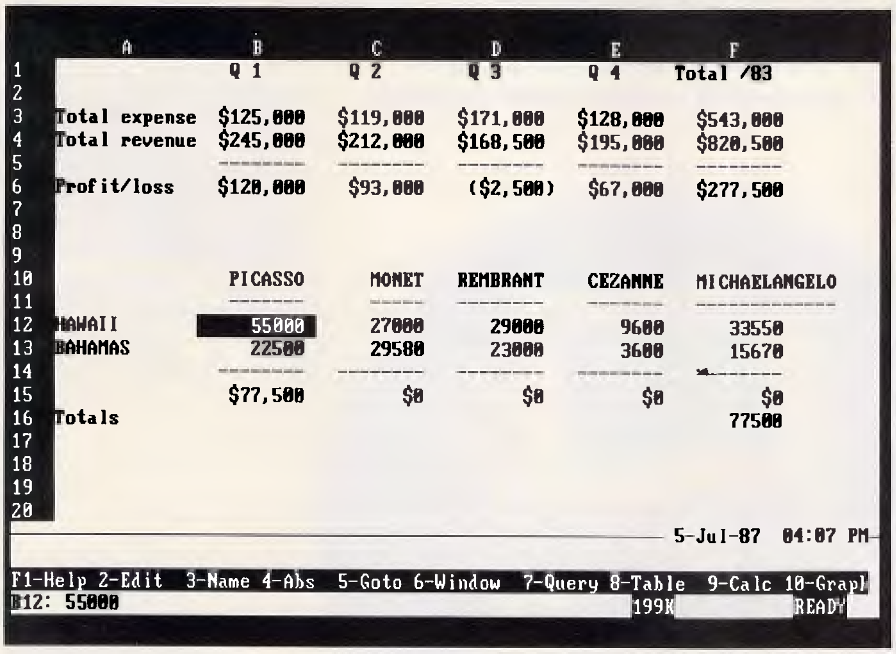
But hurry. This special offer is strictly limited and only available upon mentioning this advertisement prior to purchase.

Call Robs Computer Centre today on (03) 794 8990 for more information.

NB: This offer is not transferable to other advertised specials.

AdShop/Rob315

Robs Computer Centre
Cnr Thomas & Scott [illegible] Dandenong, 3175
Phone (03) 7[illegible]4 8990



Although similar to 1-2-3, The Twin Classic, from Mosaic Software, reverses the screen order so that the spreadsheet area is at the top and the menu lines and status area are at the bottom. Going one better than 1-2-3, the status line shows available memory, and the prompt line shows the function-key definitions

ly common system-level feature that SuperCalc4 did not include is a temporary exit to DOS. That's a convenience I'd hate to do without.

The SuperCalc4 documentation is adequate but certainly not brilliant. I wish it had evolved as steadily and as promisingly as did the program itself. Still, on balance, SuperCalc4 is a great spreadsheet with many fiercely loyal users.

Jared Taylor

The Twin Classic

The Twin Classic, which retails for $282, was one of the first spreadsheets based on the idea that people should be able to buy 1-2-3 functionality without paying 1-2-3's price.

It looks like more of a fraternal than an identical twin to 1-2-3 but it certainly makes a 1-2-3 user feel at home. It comes with a batch file that quickly loads its three program disks onto your system, and it isn't copy protected. The Twin Classic is part of the Mosaic Software's Integrated 7 series that also includes a database, word processing, and communications packages.

You can change printers, plotters, and screen types at any time from a menu command within the spreadsheet. However, Mosaic gives you that ability by limiting the number of printers and screens that are available to you. Printer choices include Epson, Okidata, the HP Laserjet, and some generic types that should work with most printers. The Twin supports a monochrome adaptor, a Hercules card, and a Colour/Graphics Adaptor (CGA). It also supports your Enhanced Graphics Adaptor (EGA), but only in CGA mode.

Look alike

The Twin's screen looks like 1-2-3's, but some items have been moved. The spreadsheet area consists of eight columns, labelled A through H, highlighted at the top, and rows 1 through 20 are highlighted along the side. A

At a glance

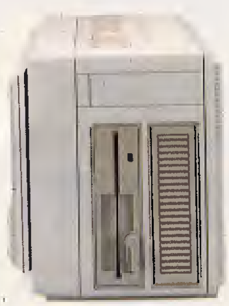
The Twin Classic
Supplier: Software Source
Tel: (02) 389 6388
Price: $282
Requires: 320k RAM, two disk drives, DOS 2.0 or later. Graphs can be displayed on the screen if a graphics card is present.
In short: A clone of Lotus 1-2-3, Release 1A, but with some good additions. The slow speed will irritate you but, if you know 1-2-3 commands and features, you're ready to go the minute you open the manual. Not copy protected.

PC III *ORCHID'88 NEW DESIGN* PORTABLE PC

For PC market trend, we design the PC III portable to meet your business.

IT'S TRULY PORTABLE
410 x 230 x 190 less than 14 pounds

IT'S FULL COMPATIBLE
Standard size design for XT/AT/AT 386 system, RS232 and parallel outlet. 86 key detachable keyboard.



TODAY'S PORTABLE TOMORROW'S STANDARD

IT'S EXPANDABLE:
Case window for 5 expansion slot, storage space for 5 1/4 or 3 1/2 HD or FD changable.

IT'S PERFECT DESIGN:
Super twist LCD with backlight provide excellent visibility. Auto pannel raising and adjustable view angle provides comfortable operation

IT'S OEM DESIGN:
In this new generation PC III, including
- Full ABS case
- LCD pannel (640 x 400 or 640 x 200)
- Display card with RS232, parallel and external video Interface all in one
- 180W portable PC power supply
- 5 Standard expansion slot
- XT/AT option

Your Options:
- 8088/80286 system board
- 6/8/10/12 MHz CPU
- 512/640KB RAM
- Disk Driver: one or two 5 1/4" driver (360K or 1.2MB)
- Hard disk: 20 or 40MB hard disk
- Special configuration

ORCHID SYSTEMS, INC.

Room A, 11th Fl., 669 Jiingpyng Road,
Jongher, Taipei, Taiwan, R.O.C.
Telex: 35373 FORCE Fax: 886-2-2400910 Tel: 886-2-2491410

dotted line displaying date and time separates the spreadsheet from the command area. There is the familiar two-line menu that you access by hitting the Slash key (/). The status line positioned at the bottom of the screen displays the current cell, its contents, available memory, the status box, and a few other items.

The basic operation of The Twin's spreadsheet is identical to 1-2-3's. The cursor keys move you one cell in any direction, while the PgUp, PgDn, Ctrl-Left Arrow, and Ctrl-Right Arrow keys move you one screen at a time. The Twin displays the information you enter in the status area and determines whether you are typing numbers or labels by checking the first character. The Twin's at-sign (@) functions are the same as those in 1-2-3, Release 1A, but you get three additional logical functions (@AND, @OR, and @NOT) and two financial functions (@RATE and @MIRR).

The Worksheet command in the menu contains two additional features. /Worksheet Global Hardware lets you select screen types, printers, ports, and plotters. /Worksheet Global Define Colours lets you control your foreground and background colours for cells, cell protection, and menus. The Copy, Move, and Range commands mirror 1-2-3's, and Range lets you give an area of your spreadsheet a name. The Print command is similar, but it also lets you print row and column labels.

Mosaic also cloned 1-2-3's limited database capabilities. Database information is stored in cells; each column indicates a field, and each row represents a record. To manipulate the data, you must first create a range name that includes all the records in the database. Next, you create a range that contains the same field names and the criteria to be used for searching and extracting data.

Mosaic's import and export capability is impressive. The Twin normally saves a file in its own format, using a .WKT file extension. You can also use File Translate to save your files in a 1-2-3, Release 1A, format with a file extension of .WKS, or in a .DIF format with a .DIF file extension. File Import will load The Twin's files, 1-2-3 1A's files, or any files created with text format, numbers, comma-separated values, or .DIF.

Good graphics

Mosaic has certainly improved on 1-2-3's approach to graphics. The Twin allows you to plot up to eight sets of data on line, x-y, vertical bar, horizontal bar, 3-D bar, pie, 3-D pie, and pie-bar charts. You create the graphs by entering the row and column references for each set of data points. You can print out a bare-bones graph immediately to your screen, printer or plotter.

To add legends, titles, and other chart definitions, you select Options: The Twin will clear the bottom half of the screen and prompt you with three screens requesting data. Titles and footnotes and their colours are added in the first screen. Axes and scales are defined in the second screen, while legends, colours, patterns, and miscellaneous graphs information are given in the third. You can name your graphs and save more than one with your spreadsheet.

The Twin's macro capabilities are also the same as those in 1-2-3, Release 1A. Keystrokes in a cell are given a range name and a letter from A to Z. When the letter is typed with the Alt key, the keystrokes are ex-

Spreadsheet programs: summary of features

(Products listed in ascending price order)

	VP-Planner	Planning Assistant	The Twin Classic	Silk	Multiplan	PFS:Professional Plan
List price	$199	$253	$282	$345	$392	$448
SIZE AND SPEED						
Max. no. of columns and rows in work area	256x9999	70x255	256x8192	256x2048	256x4095	32,766x32,766
Max. no. of characters in cell/range name	255/14	25/25	239/15	4000/15	255/31	250/100
Range of column widths	1-72	3-25	1-72	1-240	1-64	3-100
Has sparse memory matrix to conserve RAM	●	○	●	●	●	○
Database can be larger than spreadsheet	●	N/A	○	N/A	○	N/A
Uses expanded memory	○	○	○	●	○	○
Uses math coprocessor	○	○	●	●	●	●
FUNCTIONS AND FORMULAE						
No. of math/logic/financial functions	19/5/5	7/1/3	18/8/8	17/7/11	11/12/8	21/7/13
No. of date and time functions	7†	8	5†	7	12	12†
No. of statistical/string functions	18/0	3/0	7/0	9/18	6/15	9/0
No. of logical and arithmetic operators	15	13	14	15	17	17
MACRO CAPABILITIES						
Has learn mode for macros	●	○	○	○	●	●
Can run 1-2-3 macros	●	○	●	●	○	○
Macros reside in worksheet/library	●/○	○/○‡	●/○	●/○	●/○	○/●
MISCELLANEOUS						
No. of split screens	6	4§	2	None	8	24§
Split screens scroll/format independently	●/○	●/●	●/○	○/○	●/●	●/●
Cursor keys enter cell data	●	●	●	●	●	●ǀ
Can back-step through previous commands	●	●	●	●	○	●
Hides columns/rows	●/○	○/○	○/○	○/○	●/○	○/○
Hides individual cell contents	○	○	○	●	○	○
Has cell protection	●	○	●	●	●	●
Formats cells to display numbers as words	○	○	○	●	○	○
Can merge contents of spreadsheets	●	●	●	●	●	●
Can import/export 1-2-3 files	●/●	○/○	●/●	●/●	●/●	●/●
Warns against file overwrite	●	●	●	●	●	○
No. of graph types	5	None#	8	7	None#	13
Has context-sensitive help	●	●	●	●	○	●
Does recalc in logical order	●	●	●	●	○	●

● — Yes. ○ — No. N/A — Not applicable: has no database function. ˙Program does not use ranges. †Date only. ‡Program does not use macros. §Has view capability, with full-screen looks at a section of a spreadsheet. ǀTab key replaces left and right cursor keys. Up and down cursor keys work the same way as in 1-2-3. #Uses separate program to pr[illegible]ce graphs.

PlanPerfect	SuperCalc4	PC/Foccalc	1-2-3 Release 2.01
$554	$875	$900	$970
256x8192	255x9999	1000x1000	256x8192
255/20	240/32	235/0*	240/15
1-255	1-127	1-235	1-240
●	●	●	●
●	○	○	○
●	●	○	●
●	●	○	●
28/8/8	16/16/18	40/10/4	17/7/11
8	9	2	11
2/19	15/0	6/0	14/11
12	12	15	15
○	●	●	○
○	●	○	●
●/●	●/●	○/●	●/○
2	2	4	2
●/●	●/●	●/●	●/●
○	●	●	●
○	●	●	●
●/●	●/●	●/●	●/○
●	●	●	●
○	●	●	●
○	○	○	○
●	●	●	●
●/●	●/●	●/●	●/●
●	●	●	●
6	7	5	5
○	●	●	●
●	●	●	●

ecuted. Mosaic also included 1-2-3's /X macro commands for branching, jumping, calling subroutines, asking for input and creating menus. The Twin uses the substitute symbols for keys such as Left Arrow ({LEFT}) and Right Arrow ({RIGHT}) as well as some non-1-2-3 symbols like Ctrl-Right Arrow ({CRIGHT}).

The Twin's documentation is aimed at the new user. It's not likely to win a size-and-weight contest, but the manual does give you the basics. A well-prepared tutorial covers most of The Twin's capabilities. The database and macro sections are a bit skimpy, but the well-organised reference guide is about all that's needed for knowledgeable 1-2-3 users to pick up the program and start using it.

Mosaic did a thorough job of cloning 1-2-3, Release 1A, and did make some nice improvements, but some of 1-2-3's features in Release 2.0, including the way files are accessed and subdirectories interrogated, would make The Twin a nicer package.

The Twin is a much slower program than 1-2-3, taking twice as long to calculate a spreadsheet. EGA screens are not fully supported, and even the graphs done in CGA mode are not impressive. The Twin offers no support for expanded memory; its formulae do not return both text and values, and its macro commands are skimpier than those in 1-2-3's Release 2.0.

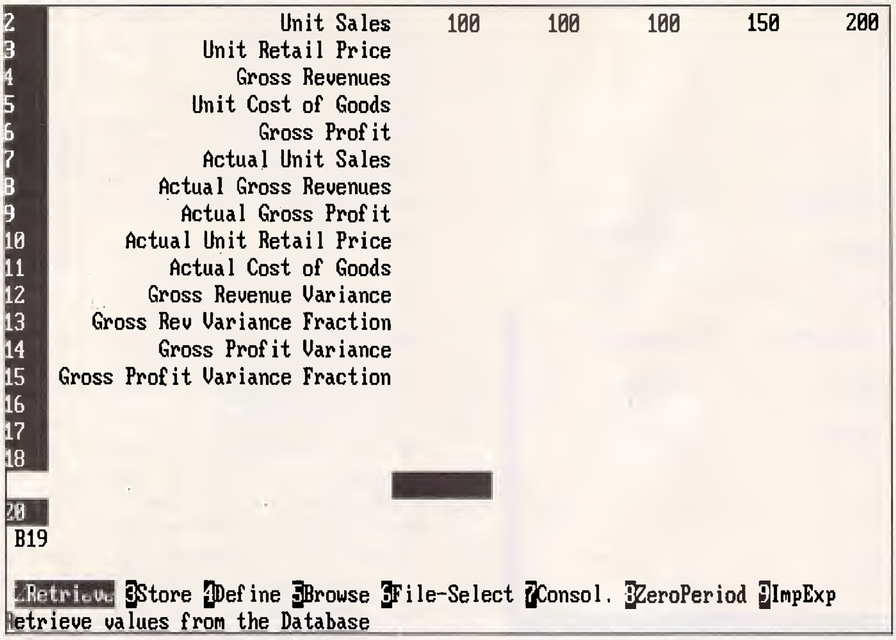
The Twin is a bargain for the user who isn't in a hurry and needs an inexpensive spreadsheet with the capabilities of 1-2-3.

Mike Falkner

VP-Planner

Lotus's look-and-feel lawsuit brought a lot of attention to Paperback Software's VP-Planner, a $199 1-2-3, Release 1A, spreadsheet. Notwithstanding Lotus's claim, VP-Planner is an excellent package that has more features than 1-2-3, Release 1A. You can make it multidimensional, and you can access dBase files.

VP-Planner can do anything 1-2-3, Release 1A, can do, and more. It can read and write to any worksheet composed on any version of 1-2-3 or Symphony, and it can translate to a .DIF or .SDF file format. You can change colours from the menu, protect files with passwords, hide columns by setting column widths to 0, and set column widths by range. Menus are on the bottom of the screen, underneath the spreadsheet. In the Ready mode, the time, remain-



VP-Planner is a 1-2-3, Release 1A, clone with multi-dimensional capabilities. You can create a database with up to five dimensions, but you use a 2-D spreadsheet such as this one to view a 'slice' of your data

ing memory, and function key definitions are displayed.

The macro language is comparable to that of 1-2-3, Release 1A, but VP-Planner has a terrific auto-key feature that records keystrokes to create macros. You can program ten function keys as auto-keys, or record them to cell addresses and assign up to 27 more macros per worksheet. VP-Planner can run any 1-2-3, Release 1A, function, plus a few of its own.

The features that really set VP-Planner apart from 1-2-3, Release 1A, though, are its multi-dimensional databases and its ability to work with dBase files.

Through the '/Data External dBase' command you can create dBase II or III files. You have the opportunity to copy fields and records from a previously created dBase file; you're able to import the fields you want, edit the records, and have them overwrite the original files. VP-Planner will not let you delete records from an external dBase file, but you can append to it or browse through it. Unlike 1-2-3, VP-Planner lets you convert a .WKS file into a dBase .DBF file while in the spreadsheet, without going through an external translation utility.

The multi-dimensional database is far more complicated that the dBase link. VP-Planner recognises up to five dimensions, but the links require a complicated and extensive setup procedure. It's called a database because essentially you are creating five one-dimensional tables that are linked through a two-dimensional worksheet. Because of virtual memory, you can work with a maximum file size of 17Mbytes.

For instance, you can have a multi-dimensional file that contains the time period (Jan to Dec) as the first dimension, accounts as the second, products as the third, sales regions as the fourth, and divisions as the fifth. You can then use the browse feature to view a single dimension or, again through a series of complicated steps, create a worksheet window to view two-dimensional slices of the five dimensions. This is a complicated feature that I do not recommend for the fainthearted.

Graphics are on a par with 1-2-3, Release 1A, with five graph types. But you don't have to leave VP-Planner to print a graph. If you have a graphics printer, you can do it from the menus. You can save the graph as a .PIC file if you want to send it to a high-quality output device later.

VP-Planner has more print controls than 1-2-3, Release 1A. From the menus you can select the standard features. You also have the choice of printing page numbers or row and column numbers. There is even a background print feature that lets you work on a spreadsheet on the screen while VP-Planner is printing a worksheet or an graph. It is copy protected, but for an extra $26, you can get a nonprotected disk.

VP-Planner has an adequate tutorial in the manual, but interestingly enough, the manual recommends that you pick up a book on 1-2-3 if you want more details.

As a 1-2-3, Release 1A, clone, VP-Planner comes very close to being a perfect fit. But it has much more to offer than a simple spreadsheet. The dBase link is a simple and convenient advantage. The multi-dimensional database feature opens many new possibilities, although a real database program, such as R:base System V, may be easier to use. However, at only $199, VP-Planner is a bargain.

END

At a glance

VP-Planner, Version 1.34
Supplier: Pantek Australia
Tel: (03) 836 9633
Price: $199
Requires: 256k RAM, one disk drive, DOS 2.x or later.
In short: An excellent, 1-2-3 Release 1A, clone with multi-dimensional capabilities. It can also read and write dBase files. Copy protected.

"Are you accessible on a 2,400-bps dial-up line?"

Genius Mouse

GM-6 PLUS MOUSE

+ MENU MAKER SOFTWARE
DR. HALO III SOFTWARE
MOUSE PAD, CUTTING PAD
MOUSE POCKET

MORE PRACTICAL
MORE CONVENIENT
LESS EXPENSIVE

The Genius Mouse GM-6 Plus is the most versatile and convenient Mouse there is. It comes in its own handy casing, ready to use any time you need it. No matter what your set-up is nor what program you use, the Genius Mouse GM-6 Plus will run its mazes.

Product	Genius Mouse GM6	Logimouse C7
Function	Genius Microsoft PC Mouse	Logi Mouse
Interface	Serial	Serial
Power Supply	Internal	Internal
Resolution (dot/inch)	22-200 dpi programmable	200 dpi
Button clicks	1 million	0.3 million
Menu maker	YES	NO
Driver	YES	YES
Paint software	DR. HALO III	NO
Slide show	DR. HALO III	NO
Pad	Mouse/cutting pad	NO
pocket	YES	NO

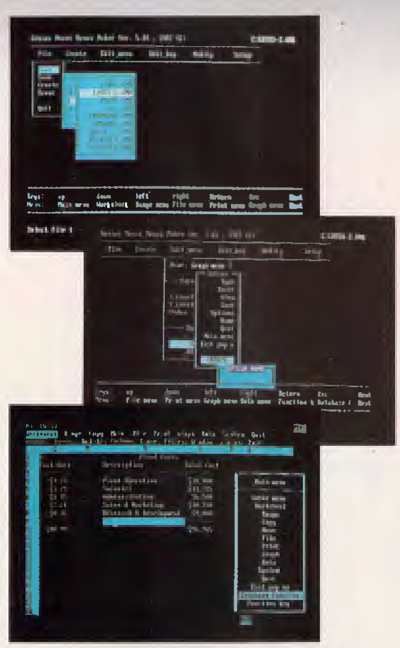
Click a button, flip a switch and your Genius Mouse GM-6 Plus is compatible with PC Mouse and Microsoft Mouse. It compares favorably with other in its category, even with Logitech Mouse.

A house for your mouse, makes it more practical, more convenient to use. When the surface is not smooth, it has its own running pad. Flip the pad, and you have a very convenient cutting board.

Genius Mouse Pocket and Pad

GENIUS MENU MAKER

With most other software is too hard to create a pop-up menu. Even with built-in software, you cannot create your own. Using the Genius Menu Maker, you may create a special pop-up menu for any applications. For example, DBASE II, DBASE III, WORDSTAR, SYMPHONY, MS WORD, GBASIC, FRAME WORK, PERSONAL EDIT, VISICALC, SUPERCALC & SMART WORK... etc.



Creat a Pop-up Menu and Run in Your Applications

PROFESSIONAL PAINT & SLIDE SHOW-DR. HALO III

The Professional Graphics Software:
* Includes 256 color types
* Create and store symbols
* Lasso — move or cut-and-paste an irregular shape, nondestructively across the screen
* On-screen help function
* Can work on CGA, EGA, Hercules, PGA and VGA displays
* Make more than 200 slide show presentation of all pictures stored in memory, one by one, automatically and timed.

Paint & Slide Show

KYE

Kun Ying Enterprise Co., Ltd.
Chung-Hsiao W. Road, Sec. 1,
No. 41, Suite 1311
Taipei, Taiwan, ROC
Telex: 11388 Kunying
Fax: 2-361-5300
Tel: 02-3813682 • 3118545

Lotus 123, Wordstar, Logitech, Microsoft, PC Mouse, Hercules, DR. Halo III are registered trade markers.

◀150

rapidity with which the number of bits per character increases. For example, it may prove more effective to bypass the opportunity of having 2-bit characters in order to secure more 4-bit characters. If the relative abundance curve dropped off so quickly that the additional 4-bit codes could not be gainfully employed, then the strategy would be the wrong one. On the other hand, if the curve formed a plateau of reasonably popular characters before dropping down to the rare ones, then the technique may yield better utilisation in the top end of the character set. Evaluating the formula shown above for each type of code table will quickly indicate which is the best.

Fig 4 shows an alternative code table for the same relative frequencies used in Fig 3. The table seems less efficient as it bypasses shorter codes and plunges straight into 4-bit codes. The result when calculated is actually 3 per cent better than the original table, yielding an average number of bits of 2.91 across the entire assumed distribution.The Huffman code technique relies heavily upon a skewed character distribution. Studies have shown that the average disk does contain a skewed distribution, although over a wide variety of file types much of the potential skewing may be lost. The degree to which skew can be utilised may be maximised by considering individual blocks of data rather than an entire computer full. This way, local skewing effects may be exploited.

Character	Frequency	Code	Number of Bits
0	55.0%	0	1
1	6.7%	1000	4
2	4.5%	1100	4
8	3.5%	10010	5
3	3.3%	10100	5
A	3.2%	10101	5
5	3.0%	10110	5
6	2.7%	11100	5
4	2.7%	11101	5
9	2.2%	11110	5
7	1.9%	100110	6
F	1.5%	101110	6
B	1.2%	111110	6
Blank	1.1%	110110	6
D	1.0%	110100	6
E	0.9%	110101	6
Z	0.7%	1011110	7
	.		
	.		
	.		
@	0.001%	1011111111111111	16

Fig 4 Alternative Huffman code table

In theory, it is possible to build a program which analyses the data distribution within a given block of data and generates the optimal Huffman table. However, information regarding the table would have to be stored along with the compressed data and

PC WEEK'S
TARGET AUDIENCE:
959
volcanic
volume buyer
individual responsible for the acquisition and implementation of PC systems within his/her organisation
In November this definition will have to be changed to include "known to be regular readers of PC Week".
PC Week will be the only Australian computer title targeting this group of individuals. A group which accounts for the majority of PC sales in Australia.
If you need to reach this influential market — reach it through PC Week.
Call PC Week's sales team on (02) 264 1266 or (03) 531 8411 today for more information.
PC WEEK
BE IN IT.
OR BE OUT OF IT.
YOUR ROUTE
TO VOLUME SALES

this could dramatically reduce the effectiveness of the scheme. The drop in effectiveness would depend on the block size chosen. Too small a block size and the percentage of space taken up by the storage of the table would preclude any benefit. Too large a block size and local variations in the character distribution may not be capitalised upon. Even within one type of file, local effects may come into play. For example, an executable object file may contain a mixture of machine code instructions, help text, messages, uninitialised data areas and tables. It could be argued that the ideal compression scheme, rather than dividing the data into blocks of a fixed size, would monitor its own effectiveness and create naturally defined blocks based on dramatic variations in the achieved compression ratio.

Due to the high overhead involved in storing the Huffman table used, it could be perhaps better to equip the system with a library of tried and tested tables which are appropriate in different situations. The system could then either use statistical analysis of the data block to select the correct table, or try each one in turn and utilise the one which yields the best results. In this way, a single byte of overhead would be sufficient to indicate which of the standard tables had been applied.

The standard tables could be created by analysing the average hard disk and the types of data found upon it. Some clear choices are machine language, ASCII text, WordStar text and binary data. The requirement for additional tables could then be determined by applying the standard tables on randomly chosen blocks of data. Whenever the best standard table falls below a certain level of efficiency, that would indicate the possible need for another table to deal with the data characteristics currently in use. Some degree of moderation would be required to ensure tables are not generated to cater specifically for every different block of data located on your particular hard disk. Rather, the objective is to produce a small set of tables which deal with the different types of data which one may commonly expect. Naturally, such an approach may then, in real life, encounter a data distribution it has never before struck and start to rapidly degrade. It is for this reason that any serious scheme should have several strings to its bow.

Decompressing Huffman-coded data streams would appear to be a lengthy process, but in fact a relatively simple binary tree search will perform the decoding very quickly.

Specifics

We have received a great number of letters from readers seeking clarification on several points of the rules and evaluation methodology.

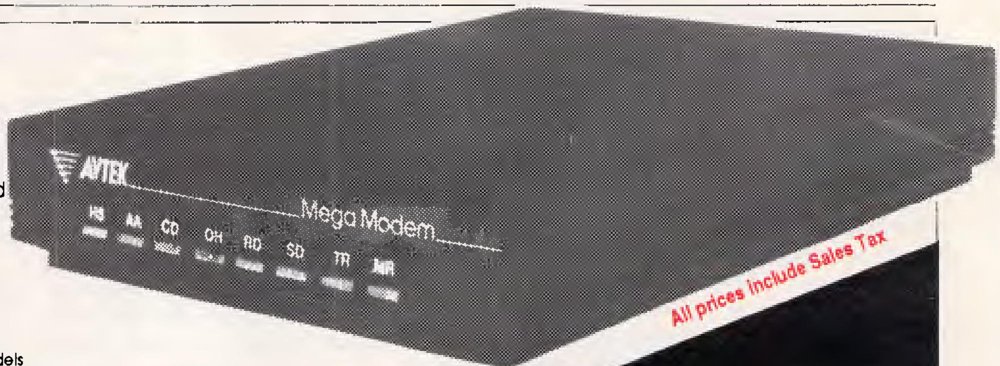
Rather than specify in meticulous detail every event which we can foresee arising, only to find that somebody comes up with a variation we didn't predict, it is perhaps better to clarify our intent, and leave many of the details up to the discretion of the judges. Moreover, we do not want to set guidelines so rigid that potentially good ideas are discarded because they do not seem to conform to the rules. The problem at hand has many lateral solutions, and it is those that are hardest to predict in rigid guidelines.

THE AVTEK ANSWERS

QUALITY AUSTRALIAN MODEMS AT LOWER PRICES

MEGAMODEM - NEW MODELS

DUE IN STOCK - NOVEMBER
New Model - New Price
Don't buy imported/unsupported modems when Australian designed and manufactured models cost less.
Compare the features - look at the value.
(12 month extended warranty on both Megamodems)



All prices include Sales Tax

MODEL 12 $375
MODEL 123 $449
SAVE UP TO $250 ON OLD PRICE

Specifications:

Speeds	300 Baud Full Duplex - both models 1200/75 for VIATEL - model 123 1200 Baud Full Duplex - both models
Data Standards	V21, V22 - both models V23 - 123 model only
Command Set	Hayes with extensions
Interface	CCITT V24 (RS232)
Data Format	Asychronous
Power Consumption	<2 watts
Size	27(H) x 120(W) x 157(D)mm
Indicators	8 LEDs
Internal Diagnostic Loop Back	

PC MEGAMODEM

Same features as the Megamodem but plugs into the expansion Bus of your IBM or compatible.
1/2 card will fit any slot as it is the correct height. Make full use of all your expansion slots.
Use Com1 or Com2.
Will run with almost all communication packages.

MODEL 12 $375
MODEL 123 $449

Multimodem II - Australia's No.1 modem

Australia's top selling modem now offers even more. You get:
Reliability. State of the art digital filters for reliable data transfer, even on noisy lines.
The Expansion Bus. An Avtek exclusive. Developments can be plugged straight in.
Total Flexibility. Both 300/300 and 1200/75 (Viatel) at the flick of a switch.
Autoanswer as standard. A reliable and instant "ring detect" circuit is completely independent of the strength of the ring.

NOW ONLY $299
SAVE $50

MINIMODEM II - leader in the value stakes!

Superb performance for those on a limited budget. The Minimodem II offers the same digital filtering and error correction as the Multimodem but at a much lower price. Full 300/300 baud and 1200/75 baud (Viatel standard) are provided at lower cost than some 300 baud only modems - check for value and you'll find Mininmodem wins every time.

STILL ONLY $199

We also stock a large range of RS232 cables and software.Please phone for further details.
Reseller Enquiries Jeremy Swallow (02) 712 3122

AVTEK
PO Box 651 LANE COVE NSW 2066
Telephone: (02) 712 3733 Facsimile: (02) 713 9598

bankcard MasterCard VISA

MAIL ORDER WELCOME

COMPETITION

Our intention in the rules is to award a prize to whoever can produce the most effective compression scheme. The scheme must be implemented in a Microsoft language, and must be provided with full source code and a general description of the approach employed. The system must run on either an IBM PC compatible under MS-DOS or PC-DOS, or on a Macintosh Plus or Macintosh SE. The system must be able to generate a compressed file, and then decompress the file at a later date back into its original form. Our test environment will be such as to ensure that nobody can utilise any operating system 'tricks' to simulate compression and decompression.

Our primary evaluation consideration is the degree of compression achieved. Our only interest in speed is to ensure that the program operates in a reasonable time to facilitate practical measurement. We don't want to delay awarding the prize for twelve months simply to wait for one solitary entry to complete. On this basis, we have arbitrarily set a target of 1024 bytes per minute throughput for both the compression and decompression stages on all machine environments. That is, it must compress at the rate of 1024 bytes per minute or better, and must also decompress at 1024 bytes per minute or better. Although chosen arbitrarily, we consider this target to be reasonable and achievable.

The machine environment presented will be a single floppy system with one hard disk. The RAM provided will be 640k for IBM compatible entries, and 1024k for Macintoshes. The entries may, if necessary, create temporary files in addition to the final output file. The time constraint described above disregards any speed enhancement products. For example, on IBM PCs, the time constraint must be met on a standard 4.77MHz 8088-based machine. It is *not* reasonable to assume the existence of a Cray X-MP accelerator board, numeric coprocessor, LIM/EMS expansion board, cache software or any other performance products.

Each entry will be tested against a variety of file types. We will not disclose the sizes of these files nor their contents, as to do so would not be consistent with real world application of compression techniques. We will, however, state that each file will be no smaller than 256 bytes and no larger than 131,072 bytes.

The files will be designed to test different aspects of compression performance. Each entry will be run against each file and a compression ratio calculated. This ratio will then be weighted for each file according to how contrived the contents. Files which are totally contrived and designed to measure performance in response to unrealistic data will have a low weighting. Files which are completely realistic and part of every day life will have a higher weighting. The difference between high significance and low significance weightings will not be great. The weighted scores will then be averaged and the entry with the best weighted average will win. If two entries achieve identical final scores, then the entry with the lower average byte per minute execution time will win.

We realise that many competitors would have liked a full specification of the files along with a deterministic formula for calculating the final score. We strongly maintain that a competition of this nature is likely to attract novel and lateral solutions, and we have strived to preserve an environment which will encourage that type of solution, rather than impose an inflexible framework.

The impossible

Next month sees the completion of this series of introductory tutorials, and we have quite a finale worked out.

In all of the repeated string replacement systems we have considered so far, it has always been necessary to build a table of the repeated strings and store the table along with the compressed data. This has had the effect of dramatically reducing the compression efficiency. Other schemes have used standard libraries of compression profiles to be applied in different situations, thereby reducing the overhead but constraining the system to those cases which had, in some way, been predicted.

The technique we examine next month also carefully builds a table of substituted sequences. It's a bit different, though, because having carefully built the table, *it then throws it away!*.

That is, the table is not stored on disk or anywhere else. The decompressing program does not have access to the substitution table generated and used by the compressing program. Nevertheless, it is able to decompress the file.

Sounds good? We think so, and we'll be looking at it next month.

END

Snipper

SNIPPER lets you capture any portion of a screen and send it to a printer or a disk file, or paste it into any applications program that accepts keyboard input.

The normal PC desktop contains a litter of scribbled notes waiting to be lost. If you're a normal user, then, you're routinely violating one of the fundamental rules of PC productivity: *do not handwrite or rekey what you read on your screen.*

DOS does little to prevent this situation. When all you need from the screen is a sentence or two or a couple of addresses turned up by a DEBUG search, waiting around for Print Screen output seems like waiting for Godot. Worse, since you can't redirect the Print Screen output to a file, you'll usually have to rekey the information, as well. That's a waste of time and an error waiting to happen.

My answer is SNIPPER.COM, a pop-up utility that lets you mark any part of the screen at any time and copy just that area to disk, to the printer, or even directly into the keyboard buffer. You can even keep the selected screen section internally and dump it later into another program. You pick what you want, be it a character or a whole screenful, simply by creating a window with the cursor keys. So throw away your pad and pencil and get a copy of SNIPPER.

Getting a copy

If you have a subscription to Microtex, you can download SNIPPER from Viatel. See page *6663#; three versions — .ASM, .COM and .BAS — can be accessed. Alternatively, you can create the command either from the assembly language source code, SNIPPER.ASM listed in End Zone (you'll need the IBM or Microsoft macro assembler, Version 2.0 or later), or by running SNIPPER.BAS. Both SNIPPER.ASM and SNIPPER.BAS are listed in this issue and on Microtex.

SNIPPER.COM is a resident program and so must be loaded into memory before it can be used. It remains instantly available until the computer is turned off or rebooted. The easiest way to ensure that SNIPPER is always ready to pop up is simply to include it as one of the lines in your AUTOEXEC.BAT file. The syntax for loading the program is

SNIPPER [*rows,columns*]

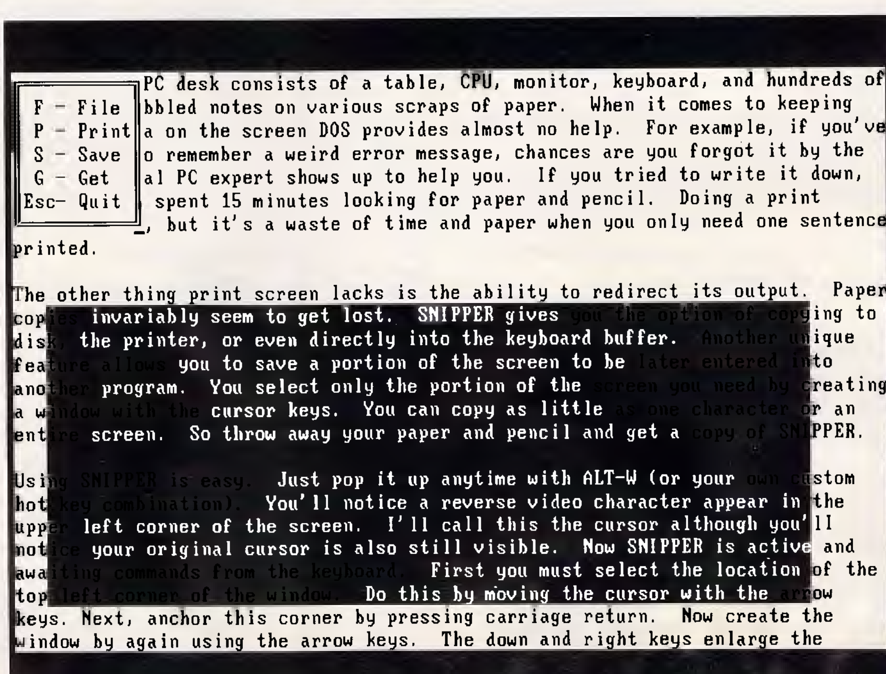
The optional *rows,columns* parameter is needed only if you have an EGA monitor with more than the normal 25 rows by 80 columns. It lets you enlarge SNIPPER's internal buffer to accommodate more than the usual 2052 characters. (A typical 43 by 80-column EGA screen requires 3440, for example.)

SNIPPER's default 'hot key' (which you can change if it conflicts with other software) is Alt-W. When you press this key combination, you'll see a reverse video character appear in the upper left-hand corner of the screen. I'll call this the cursor, though you'll notice your original cursor is also still visible. Move the SNIPPER cursor with the arrow keys to the top left corner of the screen area you want to mark and press Enter to anchor this corner of the window. You can then create the window by moving the cursor keys in various directions (Down and Right to enlarge, Left and Up to narrow). The window area appears in reverse video.

With the desired window visible, you then have five single-keystroke options available.

1. Press P to copy the window contents to the printer. The window disappears as the characters in it are printed. Carriage-return and line-feed characters are inserted at the end of each line. When it is through with its business, SNIPPER again drops into the background, waiting to be popped up again.

2. Press F to write the contents of the window to a disk file. You'll be prompted for the filename in the upper left-hand



A part of a directory screen highlighted by SNIPPER. Notice the menu displayed at the top corner of the screen. The default filename is SCREEN.CUT, but you can backspace over it and type in a different filename, even including a full specification of drive and path. (If you omit the drive and path, the current directory will be used.) When you're finished, press Enter to write the window safely to disk. Note that if the file already exists, the new data is appended to it, allowing you to concatenate a series of windows. SNIPPER makes this easy by always remembering the last filename you used.

3. Press S to save the window for retrieval and insertion into another screen or program. When the window is Saved, its contents are stored in SNIPPER's internal buffer. To recall a Saved window, press Alt-W followed immediately by pressing G. The Alt-W activates SNIPPER , and the G gets its stored contents, which are immediately entered into the keyboard buffer just as if (indeed, more accurately than if) you had retyped the characters. A carriage return is inserted at the end of each row. This is especially useful for transferring data from one program to another. When using the Save and Get commands, you must use Get the very next time you pop up SNIPPER. Any other command will erase the buffer.

4. Even without pressing S, you can use G to re-enter the window contents at the regular cursor position on the same screen. This is a handy way to re-enter a complex command string that appears higher up on the screen or to copy a section of text to a point lower down on the display. Just make sure the applications programs you're running is ready to accept keyboard input at the regular cursor position.

5. Press Esc at any time to cancel SNIPPER and remove the window. If you need a reminder of the various SNIPPER options, just press Enter and a menu will appear.

Customising

With the wide variety of resident programs available, it's hard to select a hot-key combination that isn't already spoken for. The default for SNIPPER is Alt-W. You can easily select your own if the default interferes with another program you're using. If you have the assembler listing, just modify the equates for HOT_KEY *and* for SHIFT_MASK. If you are using the .COM format or you don't have an assembler, you'll have to use DEBUG in order to make the changes. See 'SHIFT-MASK value table' and 'Keyboard scan codes for alternative hot keys'. (Both of these tables are in hexadecimal notation, as DEBUG requires, and were published on pages 188 and 190 of the July issue of *APC*.) After consulting the tables, use DEBUG to let you enter the values for *SS* and *mm* as shown below.

```
DEBUG SNIPPER.COM
E XXXX:056B SS ;Your Scan code
E XXXX;0579 mm ;Your Shift mask
W
Q
```

You need not enter the semicolons and the comments to their right. As always, however, before using DEBUG to make changes, be sure to make a copy of the original in case something goes wrong.

How it works

Veteran readers of this column will notice a number of similarities between SNIPPER and other resident pop-up utilities that have appeared here. It begins by jumping to its initialisation routine, which is strategically located at the end of the program. Since the initialisation code is only needed once, it will be later overwritten by an I/O buffer, thus conserving memory. Since today's large applications programs require so much RAM for themselves, it's important for resident programs to tie up as little as possible.

Initialisation begins by checking the DOS version number (SNIPPER requires 2.0 or later). Next, SNIPPER links itself into the chain of interrupt vectors, where it can monitor the computer processes such as keystrokes, disk accesses, and the like. Nearly everything you do on a PC generates a host of interrupts, and the ability to redirect them is what makes the machine so easy to customise. SNIPPER intercepts the following:

INT 9 — Keyboard service
INT 13 — Diskette I/O
INT 16 — Buffered keyboard I/O
INT 21 — DOS services
INT 24 — DOS severe error

Since knowing when DOS is busy is the key to being able to do file output from a pop-up program, for SNIPPER, interrupt 21 (DOS functions) is the most important of these interrupts. I'll discuss this in more detail further on. Interrupt 9 is the bread and butter of pop-up programs. It is generated each time a key is pressed or released. By monitoring interrupt 9, SNIPPER watches for its hot key. When it's detected, anything else the processor was doing is put on hold while SNIPPER takes command.

Another step in the installation routines is required to accommodate the variety of screen sizes EGA monitors can assume. When SNIPPER creates a window, it must be able to determine how many rows and columns are on the screen. SNIPPER uses the ROM BIOS data area to determine the current screen dimensions. The byte at address 0040:004A always stores the current number of columns on the screen. In addition, if an EGA is installed, the number of rows is stored at address 0040:0084. Standard video adaptors don't bother providing this last, since it's always 24. In fact, they simply leave the number-of-rows byte zero. SNIPPER examines this byte during installation, and if it finds a zero, it fills in the proper value of 24. Later while it's busy constructing windows, it can always determine the proper number of rows and columns.

When normal programs finish, they return control to the operating system and the memory they had occupied is available for the next program executed. Resident programs are different. They return control to DOS, but instead of releasing their allocated memory they instruct DOS to hold it for them. This is known as the terminate-but-stay-resident process. When SNIPPER exits, then, it keeps all of its code resident (except for the initialisation portion itself). In addition it must also retain enough memory to hold the window contents. Normally this is 2052 bytes, enough for 25 rows of 80 columns each. However, if the *rows,columns* parameter is found on the command line, the extra bytes necessary for the EGA's larger screen size are reserved.

Creating a window

Windows are becoming so popular that it's worth taking a close look at what's involved in creating one. In most windows, the underlying text disappears and is replaced with some sort of menu or table. This requires storing the original contents of the screen so it can be replaced later when the window disappears. SNIPPER uses a different type of window. The underlying text remains unchanged but appears highlighted. To produce this effect requires changing only the colour attribute of each character.

The entire screen contents are always stored in the display adaptor's memory. Two bytes are required for each character: one for the ASCII value and one for the character's attribute. The layout of the attribute byte for text modes is as follows:

BLNK R G B I R G B

The three low-order (rightmost) bits are for the Red, Green, and Blue of the foreground colour. When bit 4 is set, the character is displayed in high intensity. The next three bits define the background colour. The high bit, when set, produces a blinking character.

To produce reverse video you simply read the current attribute, switch the background and foreground colours, and then write out the new attribute. The procedure labelled REV_VIDEO is called upon to do this job. Characters and attributes are read from and written to the screen using BIOS functions 8 and 9 of interrupt 10h. Although this is somewhat slower than writing directly to the video adaptor, it's more compatible with the large variety of video modes and adaptors. (SNIPPER will actually work currently in graphics mode, but the lack of attribute bytes makes the window invisible.)

Each character is individually reversed to create the window. This ensures they will all be visible regardless of how many different colours are on the screen. This method has an additional advantage. When it's time to pop down the window, repeating the same process of rotating the colours restores the screen to its original state. The advantage of this is that no memory is required to save the original screen contents.

Creating a window of variable size and location also requires accepting commands from the keyboard. When SNIPPER is popped up, it continually looks to the keyboard for your instructions. The keys of interest are the arrows, which control the size and placement of the window, and S, P, G, F and Esc, which act as commands. If any other keys are pressed, they are simply ignored.

When the window is being positioned, care must be taken not to move off the edge of the screen. To accommodate displays of varying dimensions, the BIOS data area is consulted to determine the current number of rows and columns on the screen.

Some applications programs use the colour graphics adaptor's capability for producing multiple pages. To ensure that SNIPPER always pops up in the current page, it again looks to the ROM data area. The active page is stored at address 0040:0062.

Moving the cursor

The ideal memory-resident program should be able to work correctly with any applications program. To do this sometimes requires being smarter than the application. Manipulating the cursor is an example of this. Moving the cursor would be no problem; the trick is being able to restore it to its original location and size after it is manipulated.

The standard blinking cursor is produced by hardware on the display adaptor. It can be controlled using BIOS routines or by setting registers on the video adaptor. Normally the current settings for the cursor size and location are stored in the ROM BIOS data area and may be obtained through the BIOS interface. If this were always true, it would be a simple matter to determine the initial state of the cursor. Unfortunately (for the programmer), not all programs use the BIOS display services. Programming the display adaptor directly produces faster screen output, but when this is done the ROM data area may not hold the true cursor location. This makes it difficult for a resident program to know for certain where the cursor is.

The cursor location could be obtained by reading registers on the display adaptor. Unfortunately, the cursor size registers are write-only, making it impossible to determine their current values.

SNIPPER takes an elegantly simple way out: it ignores the hardware cursor completely. To position the 'cursor', it simply writes its own desired cursor position into the BIOS data area. The BIOS functions that read and write characters at the current cursor location always use the location found in memory. The fact that the cursor isn't actually there doesn't matter. When a blinking cursor is needed (as when prompting for a filename), SNIPPER creates its own by using a blinking box character for accepting input.

SNIPPER commands

After forming the window, its contents must be read and output to either the printer, the disk, or the keyboard. The procedure READ_WINDOW reads each character in the window. How does it know where to send them? One common programming technique is to set a flag to indicate the proper destination. A series of compare instructions would then be used each time a character of data is to be sent. SNIPPER uses a more efficient method that makes these compare and conditional branch instructions unnecessary. A pointer (SEND_CHAR) is used to point to the procedure that must be called to send each character. For example, if the printer is selected, the address of the procedure PRINT_CHAR is moved into the pointer.

Printing begins with a check of the printer status, using the BIOS printer support (interrupt 17h). If the printer is busy or out of paper, the window is simply taken down. (Programs that don't make this precautionary initial status call often lock the machine if no printer is present.) If all is well, SEND_CHAR is set to point to the procedure PRINT_CHAR and then READ_WINDOW is called. As each letter is read from the window, it's placed in register AL and sent to the printer using function zero of interrupt 17. A carriage return and line feed are added after each row to advance the paper properly.

Save and Get

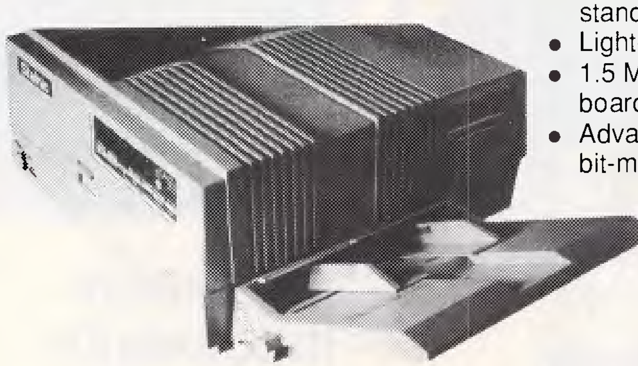
Programming the Get command involves a bit of trickery with the keyboard buffer. Let's first look at how the keyboard normally works. Keystrokes are placed in the buffer by the BIOS each time a key is pressed. Whenever a program needs keyboard input, it simply requests the next available key from the buffer. When a key is available, its scan code and ASCII code are returned in register AX. Normally the BIOS provides this service through interrupt 16h. SNIPPER intercepts this interrupt and returns characters from the window. The program requesting the keystrokes thinks they came from the real keyboard.

But there's a catch. The keyboard returns both the scan and the ASCII codes. SNIPPER can return only the ASCII code. For most uses this is less a problem than it might seem, since the scan code is seldom used by applications software.

When the Get or the Save command is given, the pointer SEND_CHAR is set to the procedure BUFF_CHAR. Then READ_WINDOW is called. This puts each letter in SNIPPER's I/O buffer, where the letter waits until needed. Two pointers (BUFF_NEXT and BUFF_LAST) are also set to the first and last characters in the buffer.

To get the letters from SNIPPER's buffer to the application program requires processing interrupt 16h requests. Two functions must be simulated. Function 0 waits for the next available keystroke. This is done by getting the byte pointed to by BUFF_NEXT and returning it in register AL. BUFF_NEXT is then incremented to point to the next byte. Function 1 (of interrupt 16h) also returns the next keystroke. The difference is that function 1 is a status call only, so BUFF_NEXT doesn't change. When BUFF_NEXT equals BUFF_LAST, the buffer is empty and SNIPPER stops in-

U-1 ULTRA LASER PRINTER



Special Features

- HP Laser Jet Plus emulation standard
- Light-weight laser engine
- 1.5 Mbyte RAM on controller board
- Advanced 300 dpi full page bit-map graphics
- Vector graphics capability
- Faster download Faster graphics
- More user-friendly utility
- Face-up or face-down paper output
- Second paper tray option

ONLY $3899

MONITORS

ADI EGA	$820
TATUNG MONO 12"	$189
TATUNG MONO 14" DUALSCAN	$249

DOT MATRIX PRINTERS

CANON A-50	$530
CITIZEN 120D	$480
OKI MICROLINE 182	$530
FUJITSU DX 2400 132 COLUMN	$880
FUJITSU DX 2300	$720

DAISYPRINTERS

CITOH A10-30	$500

HARDDISK DRIVES

SEAGATE 20MB WITH CONTROLLER	$590
SEAGATE 30MB WITH CONTROLLER	$620
TANDON 20MB HARD CARD	$800
MICROSCIENCE 25MS 63MB DRIVE	$1499

DISK DRIVES

CHINON 3.5" 720K	$259
CHINON 5.25" 1.2MB	$269
CHINON 5.25" 360K	$219

GENERAL HARDWARE

XEGA CARD	$399
MODEM LE FLOPPY	$399
BIT BLITZER 123E MODEM	$480
WITTY MOUSE	$95
JOYSTICK	$49
SPEED CARD	$500
COPY BOARD	$200

CALL FOR CATALOG OF IBM COMPATIBLE CARDS

ULTRA TURBO XT

Special Offer

All inclusive package opportunity!

- MS DOS 3.2
- GW BASIC
- 640K RAM
- CLOCK CALENDAR
- SERIAL PORT
- PARALLEL PORT
- GAMES PORT
- TACTILE/LED KEYBOARD
- 360K FLOPPY DRIVE
- 4.77 MHZ/8MHZ CPU
- 10 BLANK DISKETTES
- PUBLIC DOMAIN SOFTWARE

A. 2 x 360K FDD, monochrome screen..................$1685
B. 20 Mb HD, 360K FDD, mono screen...................$2050
C. 20 Mb HD, 360K FDD, EGA screen.....................$2890

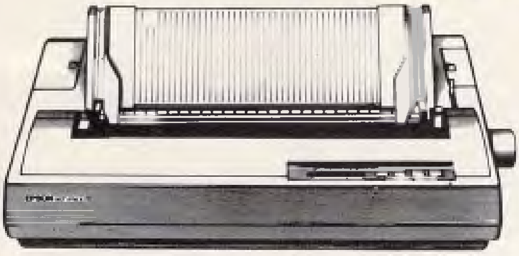
KOOKABURRA COMPUTERS

12 MONTHS WARRANTY

Limited stock available only until stock exhausted.
ALSO, FIRST CHOICE - INTEGRATED SOFTWARE PACKAGE $195
To order or for further information call:

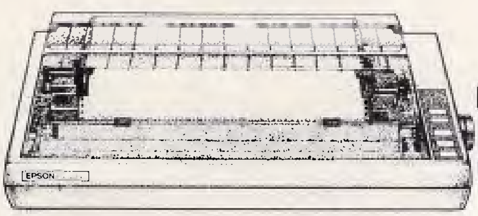
SYDNEY Fax: (02) 365 0366 Telephone: (02) 365 0706
WE ALSO SERVICE COMPUTERS, MONITORS AND PRINTERS

There's still no better place to save yourself money on an Epson printer!

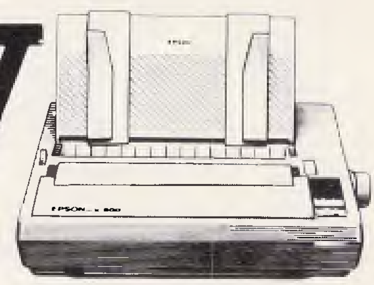


SQ-2500. Only $1,975, Save $523!
Large 136 col; superquick 540 cps, 24 nozzle ink - jet dot matrix; 5 fonts; noise free.

LQ-1000. Only $1,194, Save $150!
Large 136 col; fast 180 cps; Roman font 24 pin dot matrix.



FX-1000. Only $922, Save $244!
Large 136 column; fast 240 cps; 9-pin dot matrix.



LX-800. Only $499, Save $145!
80 col; 180 cps; two fonts; 9 pin dot matrix

Thanks for helping us to become one of Australia's largest suppliers of Epson printers.

We aim to keep bringing you the best prices possible with the finest support and service there is.

We'll match any advertised price to ensure you don't go elsewhere.

robs

Robs Computer Centre

Cnr Thomas & Scott Sts, Dandenong 3175
Phone (03) 794 8990

AdShop/Rob276

```
100 REM -- BASIC PROGRAM TO CREATE SNIPPER.COM
110 OPEN "SNIPPER.COM" AS #1 LEN = 1
120 FIELD #1,1 AS A$
130 CHECKSUM = 0
140 FOR I = 1 TO  206
150    LINESUM = 0
160    FOR J = 1 TO 8
170       READ BYTE
180       CHECKSUM = CHECKSUM + BYTE
190       LINESUM = LINESUM + BYTE
200       IF (BYTE < 256) THEN LSET A$ = CHR$(BYTE)
210       PUT #1
220    NEXT J
230    READ LINECHECK
240    IF LINECHECK <> LINESUM THEN PRINT "Error in Line";280 + 10 * I
250 NEXT I
260 CLOSE
270 IF CHECKSUM = 170077 THEN PRINT "Successful Completion!" : END
280 PRINT "COM file is not valid!" : END
290 DATA   233,  110,    5,   83,   78,   73,   80,   80,  742
300 DATA    69,   82,   32,   49,   46,   48,   32,   40,  398
310 DATA    99,   41,   32,   49,   57,   56,   55,   32,  421
320 DATA    90,  105,  102,  102,   32,   67,  111,  109,  718
330 DATA   109,  117,  110,  105,   99,   97,  116,  105,  858
340 DATA   111,  110,  115,   32,   67,  111,   46,   13,  605
350 DATA    10,   72,  111,  116,  107,  101,  121,   32,  670
360 DATA   105,  115,   32,   65,   76,   84,   45,   87,  609
370 DATA    13,   10,   36,   26,   84,  111,  109,   32,  421
380 DATA    75,  105,  104,  108,  107,  101,  110,   65,  775
390 DATA   108,  114,  101,   97,  100,  121,   32,   73,  746
400 DATA   110,  115,  116,   97,  108,  108,  101,  100,  855
410 DATA    13,   10,   36,   82,  101,  113,  117,  105,  577
420 DATA   114,  101,  115,   32,   68,   79,   83,   32,  624
430 DATA    50,   46,   48,   43,   13,   10,   36,    0,  246
440 DATA     0,    0,    0,    0,    0,    0,    0,    0,    0
450 DATA     0,    0,    0,    0,    0,    0,    0,    0,    0
460 DATA    69,  110,  116,  101,  114,   32,   70,  105,  717
470 DATA   108,  101,  110,   97,  109,  101,   58,   32,  716
480 DATA    83,   67,   82,   69,   69,   78,   46,   67,  561
490 DATA    85,   84,    0,    0,    0,    0,    0,    0,  169
500 DATA     0,    0,    0,    0,    0,    0,    0,    0,    0
510 DATA     0,  113,    6,  113,    6,  115,   14,    0,  367
520 DATA     0,    0,    0,    0,    0,    0,    0,    0,    0
530 DATA     0,  201,  205,  205,  205,  205,  205,  205, 1431
540 DATA   205,  205,  205,  205,  187,  186,   32,   70, 1295
550 DATA    32,   45,   32,   70,  105,  108,  101,   32,  525
560 DATA   186,  186,   32,   80,   32,   45,   32,   80,  673
570 DATA   114,  105,  110,  116,  186,  186,   32,   83,  932
580 DATA    32,   45,   32,   83,   97,  118,  101,   32,  540
590 DATA   186,  186,   32,   71,   32,   45,   32,   71,  655
600 DATA   101,  116,   32,   32,  186,  186,   69,  115,  837
610 DATA    99,   45,   32,   81,  117,  105,  116,   32,  627
620 DATA   186,  200,  205,  205,  205,  205,  205,  205, 1616
630 DATA   205,  205,  205,  205,  188,   51,  219,  139, 1417
640 DATA    22,  183,    1,    2,  247,    2,  211,  128,  796
650 DATA   250,    0,  125,    7,   38,  138,   22,   74,  654
660 DATA     0,  254,  202,   38,   58,   22,   74,    0,  648
670 DATA   114,    2,   50,  210,  128,  254,    0,  125,  883
680 DATA     5,   38,  138,   54,  132,    0,   38,   58,  463
690 DATA    54,  132,    0,  126,    2,   50,  246,  137,  747
700 DATA    22,  183,    1,  232,   72,    1,   50,  228,  789
710 DATA   205,   22,   80,  232,   64,    1,   88,  128,  820
720 DATA   252,    1,  117,    1,  195,  187,    0,  255, 1008
730 DATA   128,  252,   72,  116,  178,  187,    0,    1,  934
740 DATA   128,  252,   80,  116,  170,  187,    1,    0,  934
750 DATA   128,  252,   77,  116,  162,  187,  255,    0, 1177
760 DATA   128,  252,   75,  116,  154,   51,  219,   60, 1055
770 DATA    13,  117,   13,  139,   22,  183,    1,  137,  625
780 DATA    22,  185,    1,  232,    8,    1,  235,   13,  697
790 DATA   128,  252,   34,  116,    2,  235,  128,  198, 1093
800 DATA     6,  189,    1,    1,  195,   50,  228,  205,  875
810 DATA    22,  139,   22,  185,    1,  128,  252,   72,  821
820 DATA   116,   60,  128,  252,   80,  116,   71,  128,  951
830 DATA   252,   77,  116,   24,  128,  252,   75,  116, 1040
840 DATA     3,  235,   85,  144,  254,  202,   58,   22, 1003
850 DATA   183,    1,  124,  217,  136,   22,  185,    1,  869
860 DATA   254,  194,  235,   13,  254,  194,   38,   58, 1240
870 DATA    22,   74,    0,  115,  200,  136,   22,  185,  754
880 DATA     1,  232,  186,    0,  254,  206,   58,   54,  991
890 DATA   184,    1,  125,  245,  235,  183,  254,  206, 1433
900 DATA    58,   54,  184,    1,  124,  175,  136,   54,  786
910 DATA   186,    1,  254,  198,  235,   13,  254,  198, 1339
920 DATA    38,   58,   54,  132,    0,  127,  158,  136,  703
930 DATA    54,  186,    1,  232,  144,    0,  254,  202, 1073
940 DATA    58,   22,  183,    1,  125,  245,  235,  141, 1010
950 DATA   128,  252,   25,  117,    9,  199,    6,  187,  923
960 DATA     1,    5,    4,  233,  141,    0,  199,    6,  589
970 DATA   177,    1,  113,    6,  199,    6,  179,    1,  682
980 DATA   113,    6,  199,    6,  187,    1,   24,    4,  540
990 DATA   128,  252,   31,  117,    9,  199,    6,  187,  929
1000 DATA    1,   24,    4,  235,  110,  144,  128,  252,  898
1010 DATA   34,  117,    8,  198,    6,  189,    1,    1,  554
1020 DATA  235,   97,  144,  128,  252,   33,  117,   34, 1040
1030 DATA  198,    6,  190,    1,    0,  232,   11,    1,  639
1040 DATA  128,   62,  190,    1,  255,  116,   31,  232, 1015
1050 DATA   73,    0,  198,    6,  190,    1,    1,  246,  715
1060 DATA    6,  191,    1,    3,  117,    3,  232,  135,  688
1070 DATA    1,  195,  128,  252,    1,  116,    7,   60,  760
1080 DATA   13,  116,   12,  233,   31,  255,  199,    6,  865
1090 DATA  187,    1,  113,    3,  235,   37,  144,  232,  952
1100 DATA  180,    0,   50,  228,  205,   22,   80,  232,  997
1110 DATA  172,    0,   88,  233,   11,  255,  232,   92, 1083
1120 DATA    0,  138,  228,  128,  227,  136,  128,  228, 1205
1130 DATA  119,  177,    4,  210,  204,   10,  220,  232, 1176
1140 DATA   52,    0,  195,  139,   22,  183,    1,  232,  824
1150 DATA  228,  255,  232,   64,    0,  255,   22,  187, 1243
1160 DATA    1,  254,  194,   58,   22,  185,    1,  126,  841
1170 DATA  238,  232,   13,    0,  254,  198,  138,   22, 1095
1180 DATA  183,    1,   58,   54,  186,    1,  126,  223,  832
1190 DATA  195,  176,   13,  255,   22,  187,    1,  176, 1025
1200 DATA   10,  255,   22,  187,    1,  195,   83,  232,  985
1210 DATA   78,    0,   38,  137,   23,   91,   38,  138,  543
1220 DATA   62,   98,    0,   81,  185,    1,    8,  180,  607
1230 DATA    9,  205,   16,   89,  195,  232,   56,    0,  802
1240 DATA   38,  137,   23,   38,  138,   62,   98,    0,  534
1250 DATA  180,    0,  205,   16,  195,   82,   58,  228,  964
1260 DATA   51,  210,  205,   23,  208,  204,  115,    6, 1022
1270 DATA  199,    6,  187,    1,  113,    3,   98,  195,  794
1280 DATA  139,   30,  179,    1,  136,    7,   67,  137,  696
1290 DATA   30,  179,    1,   59,   30,  181,    1,  117,  598
1300 DATA    6,  199,    6,  187,    1,  113,    3,  195,  710
1310 DATA   38,  138,   30,   98,    0,   50,  255,  209,  818
1320 DATA  227,  129,  195,   80,    0,  195,   51,  210, 1087
1330 DATA  141,   54,  193,    1,  128,  250,   12,  124,  903
1340 DATA   10,   50,  210,  254,  198,  128,  254,    7, 1111
1350 DATA  124,    1,  195,  232,  159,  255,   46,  134, 1146
1360 DATA    4,  138,  220,  232,  128,  255,  254,  194, 1425
1370 DATA   70,  235,  225,  141,   54,  136,    1,   51,  913
1380 DATA  255,   51,  210,  185,   40,    0,   81,  232, 1054
1390 DATA  131,    2,   46,  137,    5,   71,   71,   46,  762
1400 DATA  138     4,   70,  179,   71,  232,   94,  255, 1043
1410 DATA  254   194,   89,  226,  233,   78,  254,  202, 1530
1420 DATA  128,   60,    0,  116,  248,  254,  194,  176, 1176
1430 DATA  219,  179,  199,  232,   72,  255,   50,  228, 1434
1440 DATA  205,   22,   60,   13,  116,   52,   60,    8,  536
1450 DATA  116,   27,  128,  252,    1,  116,   38,   60,  738
1460 DATA   46,  124,  228,   60,  122,  127,  224,  128, 1059
1470 DATA  250,   39,  125,  219,  179,   71,  232,   37, 1152
1480 DATA  255,  254,  194,  235,  210,  128,  250,   16, 1542
1490 DATA  126,  205,  176,    0,  179,   71,  232,   21, 1010
1500 DATA  255,  254,  202,  235,  194,  198,    6,  190, 1534
1510 DATA    1,  255,   50,  192,  232,    7,  255,  141, 1133
1520 DATA   62,  136,    1,   51,  246,   51,  210,  185,  942
1530 DATA   40,    0,  232,   16,  255,   46,  136,    5,  730
1540 DATA   71,   46,  139,    4,  138,  220,   70,   70,  758
1550 DATA  232,  235,  254   54,  194,  226,  235,  195, 1025
1560 DATA   46,  198, [illegible]   90,    1,    0,   80,   83,  604
1570 DATA   81,   82, [illegible] [illegible]   14,   31,  184,   36,  464
1580 DATA   53,  205,   33, [illegible]    6,  186,  104,    6,  676
1590 DATA  184,   36,   37,  205,   33,  186,  152,    1,  834
1600 DATA  184,    2,   61,  205,   33,  114,   22,  139,  760
1610 DATA  216,   51,  201,   51,  210,  184,    2,   66,  981
1620 DATA  205,   33,  115,   27,  128,   62,  135,    1,  706
1630 DATA    0,  117,   37,  235,   31,  128,   62,  135,  745
1640 DATA    1,    0,  117,   20,  185,   32,    0,  180,  543
1650 DATA   60,  205,   33,  114,  231,  139,  216,  186, 1184
1660 DATA  113,    6,  139,   14,  179,    1,   43,  202,  697
1670 DATA  180,   64,  205,   33,  180,   62,  205,   33,  962
1680 DATA   31,   90,  184,   36,   37,  205,   33,    7,  623
1690 DATA   31,   90,   89,   91,   88,  195,  251,   80,  915
1700 DATA  228,   96,   60,   17,  116,    6,   88,   46,  657
1710 DATA  255,   46,  119,    1,  180,    2,  205,   22,  830
1720 DATA  168,    8,  116,  242,   46,  246,    6,  191, 1023
1730 DATA    1,    4,  117,  234,   46,  128,   14,  191,  735
1740 DATA    1,    4,  156,   46,  255,   30,  119,    1,  612
1750 DATA   83,   81, [illegible]   85,   86,   87,   30,    6,  540
1760 DATA   14,   31, [illegible]   64.    0.  142,  192,  232,  859
1770 DATA  142,  254,   38,  255,   55,  232,  109,  252, 1337
1780 DATA  232,  133,  254,   38,  143,    7,  128,   38,  973
1790 DATA  191,    1,  251,    7,   31,   95,   94,   93,  763
1800 DATA   90,   89,   91,   88,  207,   46,  128,   14,  753
1810 DATA  191,    1,    2,  156,   46,  255,   30,  123,  804
1820 DATA    1,  156,   46,  128,   38,  191,    1,  253,  814
1830 DATA  157,  251,  202,    2,    0,   83,   46,  128,  869
1840 DATA   62,  189,    1,    1,  116,   36,   46,  128,  579
1850 DATA   62,  190,    1,    1,  116,    6,   91,   46,  513
1860 DATA  255,   46,  127,    1,   46,  128,   62,  192,  857
1870 DATA    1,   10,  116,    8,   46,  128,   62,  192,  563
1880 DATA    1,    8,  117,  234,  251,  232,  248,  254, 1345
1890 DATA  235,  228,  251,   46,  139,   30,  177,    1, 1107
1900 DATA   46,   59,   30,  179,    1,  124,    6,   46,  491
1910 DATA  198,    6,  189,    1,    0,   46,  138,    7,  585
1920 DATA   60,   10,  117,    7,   46,  255,    6,  177,  678
1930 DATA    1,  235,  223,  120,  252,    1,  116,   11,  967
1940 DATA  128,  252,    0,  117,  185,   67,   46,  137,  932
1950 DATA   30,  177,    1,  128,  203,    1,   91,  202,  833
1960 DATA    2,    0,  251,   10,  228,  117,    2,  180,  790
1970 DATA   76,   46,  128,   14,  191,    1,    1,   46,  503
1980 DATA  136,   38,  192,    1,  156,   46,  255,   30,  854
1990 DATA  131,    1,  156,   46,  128,   38,  191,    1,  692
2000 DATA  254,   46,  128,   62,  190,    1,    1,  117,  799
2010 DATA    3,  232,  148,  254,  157,  202,    2,    0,  998
2020 DATA  251,   46,  254,    6,  135,    1,   50,  192,  935
2030 DATA  207,  141,   22,    3,    1,  180,    9,  205,  768
2040 DATA   33,  246,   22,    0,    1,   51,  219,  140,  712
2050 DATA  200,   67,   59,  195,  142,  195,  116,   21,  995
2060 DATA  141,   54,    0,    1,  139,  254,  185,   16,  790
2070 DATA    0,  243,  166,   11,  201,  117,  234,  141, 1113
2080 DATA   22,   79,    1,  235,   12,  180,   48,  205,  782
2090 DATA   33,   60,    2,  115,    9,  141,   22,   99,  481
```

SNIPPER.BAS A Basic program that will automatically create SNIPPER.COM

```
2100 DATA   1, 180,   9, 205,  33, 195,  70, 190,  883
2110 DATA 129,   0, 232, 146,   0,  80, 232, 142,  961
2120 DATA   0,   5,   2,   0,  91, 247, 227,  11,  593
2130 DATA 192, 116,  14,  61,  16,  39, 126,   3,  567
2140 DATA 184,  16,  39,   5, 113,   6, 163, 181,  707
2150 DATA   1, 184,  64,   0, 142, 192,  38, 128,  749
2160 DATA  62, 132,   0,   0, 117,   6,  38, 198,  553
2170 DATA   6, 132,   0,  24, 184,   9,  53, 205,  613
2180 DATA  33, 137,  30, 119,   1, 140,   6, 121,  587
2190 DATA   1, 186, 102,   5, 184,   9,  37, 205,  729
2200 DATA  33, 184,  19,  53, 205,  33, 137,  30,  694
2210 DATA 123,   1, 140,   6, 125,   1, 186, 189,  771
2220 DATA   5, 184,  19,  37, 205,  33, 184,  22,  689
2230 DATA  53, 205,  33, 137,  30, 127,   1, 140,  726
2240 DATA   6, 129,   1, 186, 213,   5, 184,  22,  746
2250 DATA  37, 205,  33, 184,  33,  53, 205,  33,  783
2260 DATA 137,  30, 131,   1, 140,   6, 133,   1,  579
2270 DATA 186,  58,   6, 184,  33,  37, 205,  33,  742
2280 DATA 161,  44,   0, 142, 192, 180,  73, 205,  997
2290 DATA  33, 139,  22, 181,   1, 205,  39,  51,  671
2300 DATA 192, 138,  28, 128, 251,  13, 116,  24,  890
2310 DATA  70, 128, 251,  44, 116,  18, 128, 235,  990
2320 DATA  48, 114, 238, 128, 251,   9, 119, 233, 1140
2330 DATA 183,  10, 246, 231,   2, 195, 235, 225, 1327
2340 DATA 195,   0,   0,   0,   0,   0,   0,   0,  195
```

tercepting the keyboard. Further requests for keystrokes are again passed to the BIOS in the usual manner, without interference.

Writing to a file

A three-step process begins when the File command is given. First, the window contents are copied to SNIPPER's internal buffer. The appropriate carriage-return and line-feed characters are also added at this time. As before, READ_WINDOW does this with the pointer SEND_CHAR set to the procedure BUFF_CHAR.

Step 2 is to get a filename. First, space for a second window is prepared at the top of the screen. To do this we save the underlying contents in the memory that once served as the PSP (program segment prefix). The PSP is a 256-byte data read at the beginning of every program, and usually constitutes wasted space for resident programs. A prompt and the default filename are then displayed at the top of the screen. Displaying a string in assembly language is accomplished by successively advancing the cursor and writing characters. What appears to be the cursor here is actually the blinking box I discussed earlier (remember, we don't want to disturb the hardware cursor). Keystrokes are then solicited to edit the filename. When a normal letter key is pressed, it is displayed at the cursor location. The Backspace key is interpreted as a command — it moves the cursor left and writes a blank at the previous character position. When a carriage return is pressed, the filename is copied from the screen. To close the window, the underlying characters are restored.

Step 3 is what sets SNIPPER apart from the garden variety of pop-up programs. I'll talk about it in detail since it represents a unique solution to a complex problem.

Writing a disk file is one of the most complex jobs a PC undertakes. Without the help of the operating system function calls, it would be a programmer's nightmare. The relevant DOS functions are invoked with interrupt 21h, and SNIPPER makes extensive use of them. Unfortunately, however, these procedures are nonre-entrant. A nonre-entrant procedure is one that once started, must be completed before it can be started again. Since SNIPPER can be popped up anytime, it must be prevented from requesting these DOS functions while one is still in progress.

There are several workable solutions to this problem. One method uses the DOS busy flag, whose location can be obtained by using an undocumented function call. The method I've chosen also utilises busy flags, which SNIPPER sets itself: one for DOS, one for the BIOS, and a third for the window program itself. These flags are all bit mapped into a single byte (label BUSY_FLAGS) to save memory. When a byte is bit mapped, it means that each of the eight bits has a distinct meaning. In this case, bit 0 means DOS is active. Bit 1 is for BIOS disk I/O and bit 2 means the window is currently popped up. Using a bit mask for this purpose allows testing for a busy condition with only one TEST instruction. If any or all of the busy bits is set, the program can take the appropriate action. Individual bits are set or cleared by using the appropriate mask byte with the AND and OR machine instructions.

To keep track of DOS, SNIPPER monitors all DOS function calls by intercepting the interrupt 21h vector. Each time a function begins, the function number (which is found in register AH) is saved in the variable DOS_STAT. At the same time, the DOS busy bit is set. When the function completes, DOS_STAT is set back to zero and the busy bit is cleared. A similar procedure is used to monitor the BIOS disk services. Although BIOS routines are re-entrant, interrupting a disk operation could cause timing problems and so should be avoided.

When it's time to write to a file, SNIPPER checks to see if a DOS function is executing by examining BUSY_FLAGS. If it's zero, the procedure WRITE_TO_FILE is called immediately. Otherwise SNIPPER must wait. Fortunately, waiting for a DOS function generally doesn't take long. The exception occurs when DOS is itself in a wait state. This normally happens when it waits for keyboard input. In this case we turn to Plan B.

The two most common DOS functions that wait for input are 08h (read character) and 0Ah (read string). To avoid unnecessary delays SNIPPER must be able to interrupt them safely. While DOS waits patiently, it repeatedly executes interrupt 16h to determine if there's anything in the keyboard buffer. Each time this happens, DOS is in a stable, re-entrant condition that provides an opportunity for a disk access to be made. SNIPPER detects these opportunities by intercepting the INT 16h vector and testing both DOS_STAT and WRIT_FILE. If a request is queued (and DOS is playing its waiting game), then WRITE_TO_FILE can safely be called to get the job done.

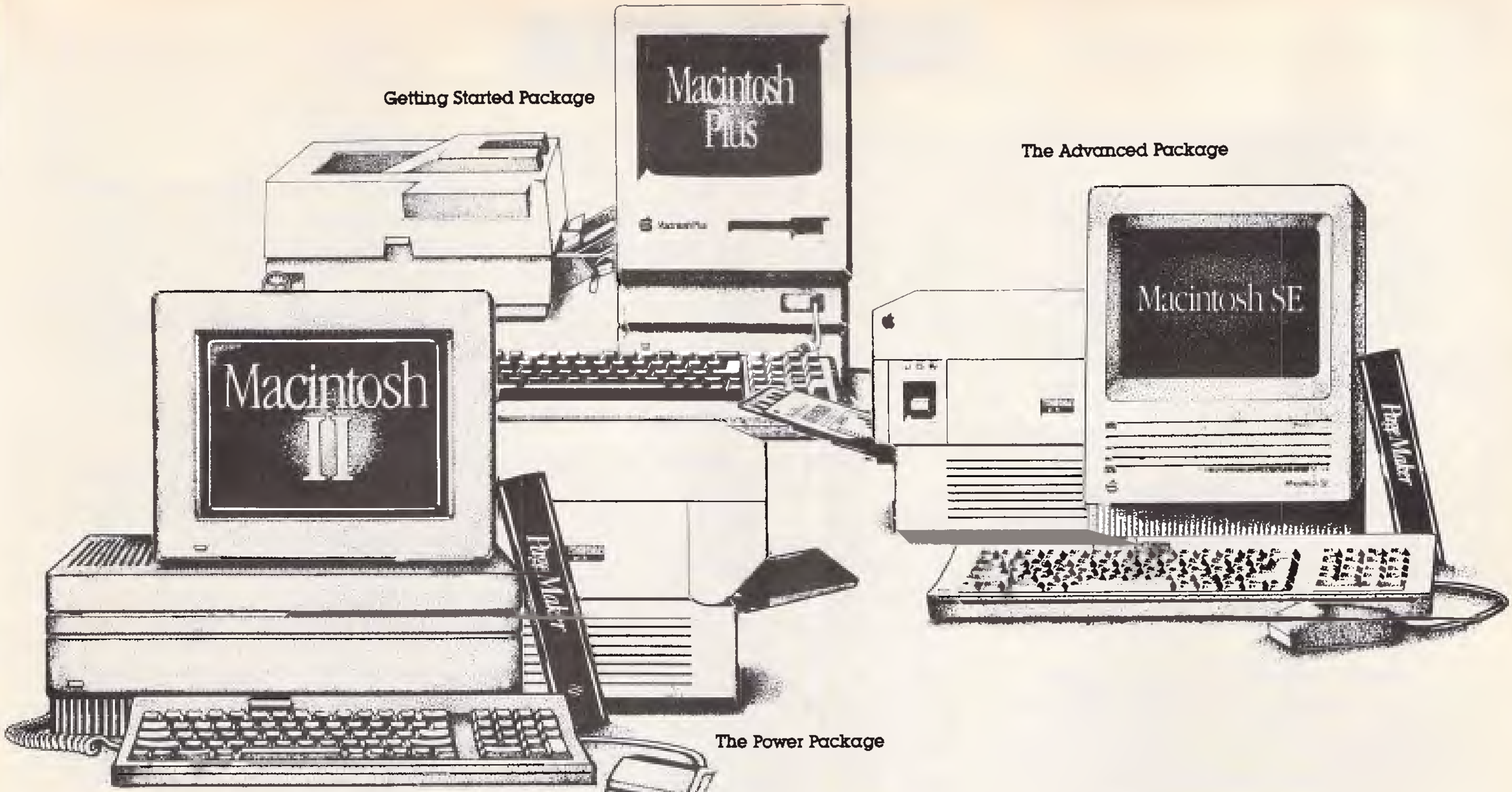
WRITE_TO_FILE is called only when we're sure it's safe to make DOS calls. Like the DOS functions, the WRITE_ TO_FILE is also nonre-entrant. To prevent it from being called recursively, the request flag WRITE_FILE is set to zero immediately. Writing to a file is done using the DOS functions shown below.

Function	Purpose
3Ch	Create a file
3Dh	Open a file
3Eh	Close a file
40h	Write to a file
42h	Move file pointer

First, the registers are set up to open the file. The DS:DX register pair points to the desired file specification. This is stored in an ASCII string and is obtained from the screen prompt.

If DOS can't open the file, it signals the error by returning with the carry flag set. The normal reason for this failure is that the file didn't exist. When this happens, we create the file using function 3Ch. On return, we get a handle in register AX. Handles are DOS's way of keeping track of files. Every file that is opened gets a unique handle. We save the handle and use it every time we refer to this file.

If the file already exists, we advance the file pointer to the end of the file



Laser based desktop publishing on a Macintosh from only $9,499!

At Rob's Computer Centre we've got Desktop Publishing covered.

Whether you're a power user or just getting started you'll find just the right system at just the right investment.

For this month only we're offering big savings on the following packages.

Getting Started Package
Perfect for first timers and single user applications, this package is the best valued Macintosh desktop publishing package available.

You get a Macintosh Plus, a 20Megabyte Rodime External Hard Disk Drive, ReadySetGo software (from Letraset), and a General Computer Personal Laser Printer.

All this for only
$9,499 (Ex Tax). Save **$1,959!***

The Advanced Package
For those already familiar with the Macintosh and who want to share the LaserWriter with other users.

You get:
- The superb Macintosh SE 20 with it's 20 Meg internal hard disk drive
- LaserWriter Plus
- PageMaker software

This is a package that can cope with your serious desktop publishing needs including postscript.

This month only, we're passing on a huge saving and bringing this package to you for only
$14,737 (Ex Tax). **Save $2,531!***

The Power Package
This is the ultimate desktop publishing package for power users whose time is money.

By far the fastest desktop publishing package around, the Mac II can perform graphic manipulations from 4-300 times faster than a normal Mac thanks to its MC68881 maths co-processor.

You get:
- Superfast Macintosh II
- large high resolution monochrome monitor
- 40Meg internal hard disk drive
- PageMaker software
- LaserWriter Plus

This potent package for desktop publishing professionals is yours for only
$19,760. (Ex Tax) **Save $2,851!***

Phone for more information
These offers run out shortly so don't miss the savings on these fantastic packages. Call us now on (03) 794 8990 for more information.

As equipment used in the manufacture of finished art may qualify for Sales Tax Exemption, all prices quoted exclude Sales Tax. Please check with your accountant and the tax department as to your eligibility for this exemption.

* Please call for even greater savings to Govt., Corporate or educational uses.

Authorised Macintosh II Reseller

Robs Computer Centre
Cnr Thomas & Scott Sts, Dandenong, 3175
Phone (03) 794 8990

AdShop/Rob271

using function 42h. This results in appending the new window contents to the file. If any DOS errors occur at this point, the write screen is aborted and the file is closed.

Next, we write the entire window contents that have been stored in the buffer. This time the DS:DX register pair points to the buffer and register CX contains the number of bytes to be written. The handle, which we saved when we opened the file, goes in register BX.

One last DOS service is needed to close the file. Failing to close the file would reduce the number of handles DOS has available for other programs. Furthermore, unclosed files pose a threat to the disk structure should the system crash.

Before WRITE_TO_FILE returns, it must restore all registers that have been modified. Pop-ups must be transparent to the system, and this means putting everything back the way it was found — including all of the processors registers, the stack, and the status flags register.

Handling disk errors

Severe disk errors (from bad media or writing to write-protected disks, for example) must receive special attention to avoid the familiar 'Abort, Retry, Ignore' message from DOS. Not only does this disturb the screen, but it sends DOS into convulsions when a resident program tries to abort from a disk error. Any time DOS encounters a fatal error, it executes interrupt 24h. This interrupt is normally serviced by the resident portion of COMMAND.COM.

While writing the window to a disk file, the fatal error handler (INT 24h) is replaced by a special routine. To replace the vector, we use functions 24h and 35h, respectively, to retrieve and set the interrupt vector. The old vector is pushed onto the stack where it will be safe until we need it back. Then, if a fatal error occurs, NEWINT24 gets control. It then sets ERR_STAT to 1, which indicates that a disk problem has occurred and that no more disk accesses should be attempted on this file. Before returning, it sets register AL to zero, which instructs DOS to ignore the error. When WRITE_TO_FILE is finished, it pops the old vector from the stack and puts it back before anyone notices it was gone.

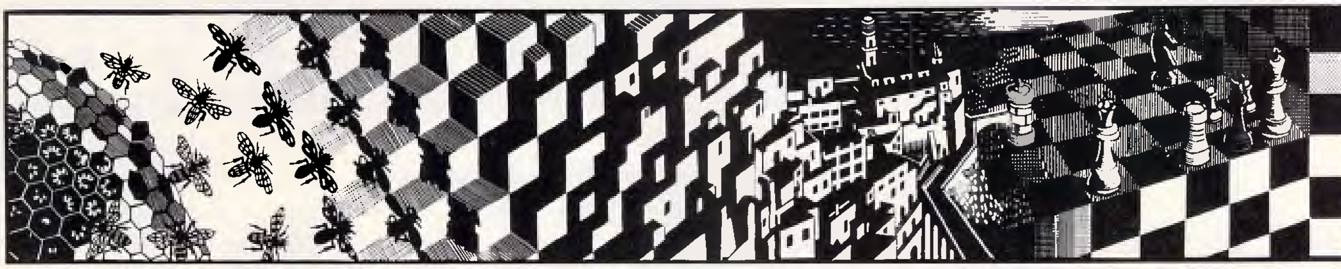
Compatibility

SNIPPER will work with most other resident programs. However, as most resident utility users know, if you have trouble you may have to experiment with the order of installing them. Generally, SNIPPER should be one of the last resident programs you install. Contrary to the usual practice, SideKick users should be sure to install SideKick first.

From a programmer's viewpoint, by far the most interesting part of SNIPPER is its ability to interrupt another program and access the disk. To see this in action, try doing a directory listing and then hitting the hot-key combination. The directory will freeze in its tracks while SNIPPER steps in and calmly carries out its assigned commands. Go ahead and window a portion of the directory listing with the File command. The DIR command will finish its job afterwards, never even knowing it was interrupted.

To most users, though, SNIPPER's attraction is its ability to free you from the tyranny of the handwritten note and the drudgery of needless rekeying. Enjoy the freedom it gives you.

END



In this month's selection of games, Stephen Applebaum decides that a sailor's life — although fraught with danger — is definitely for him.

A life on the ocean wave

Title: Pirates!
Computer: Commodore 64/128
Supplier: Imagineering
Price: $38.60

Pirates! bears little resemblance to anything which Microprose has released in the past year: it doesn't feature warplanes, bombing raids or aggressive Arabs. And, most notable of all, 'Wild' Bill Steely, the company's very own Ramboesque figurehead, has not appended his usual introduction to the program's manual, wherein he preaches about 'freedom' and the 'American way'. No, siree. Pirates! is 100 per cent good, clean fun.

Adventure, strategy and arcade action all feature in this highly enjoyable and eventful romp of the Spanish Main. From humble beginnings, your aim is to amass enough gold and land to enable you to retire into a life of leisure. As well as a small fortune, you might also earn yourself a title in return for services rendered to your country — not to mention winning the hand of one of the many women you meet on your travels.

Pirates! can be played in a number of different ways, depending on the scenario you choose to tackle. The game's 'career' option, for example, plays Pirates! as an adventure, tracing your piratical exploits from your arrival in the New World right up to your retirement.

As your experience grows, you can try a Famous Expedition, where you attempt to emulate the success of a real-life explorer. Six factual adventurers have been programmed into the game, including John Hawkins, Henry Morgan and Sir Francis Drake.

Changing the era in which you operate also adds spice to the proceedings. Some eras are easier to survive in than others, and none more so than 'The Buccaneer Heroes (1660)'. At this time in history, the Caribbean abounded with newly-founded European colonies. Military presence in the region was almost negligible, however, and merchant vessels were easy pickings for the buccaneers.

Other factors to consider before embarking upon a voyage are your character's nationality, his special ability, and the game's difficulty level. Special abilities include fencing skills, navigation skills, gunnery skills, medicinal skills, and wit and charm. The former is ideal for beginners, although the others become increasingly important as you choose more hazardous voyages.

There are four difficulty levels, ranging from 'Apprentice' (easy) to 'Swashbuckler' (extremely hard). Apprentice is excellent for learning the ropes; Swashbuckler, on the other hand, is the most exacting test — you are lumbered with a crew of drunkards. In the final analysis, their drunkenness can actually work in your favour, as they care very little about their share of the loot when it is eventually divided up on the eve of your retirement.

Before taking command of a ship at the start of a game, you must first gain the confidence of its crew by challenging their captain to a fencing duel.

During a sword fight you control an animated figure's fencing actions, using the joystick to make him attack and parry. In all sword fights except the test to impress the crew, the program gives you a choice of weapon — a rapier, a longsword or a cutlass. Each weapon has a different cutting action, and can be the difference between victory and bloody defeat. Hits received by combatants seriously affect their morale until, broken, one or the other surrenders.

Having won the ship, you find yourself land-bound in a town. Many small settlements were dotted throughout the Caribbean in olden times, so Microprose has provided a map to help you to pin-point your exact location. It is a good idea to photocopy this before you play Pirates! for the first time, as it is an invaluable navigation aid used not only on land, but at sea, too.

During your land-based sojourn, the screen displays a number of windows. These contain the portraits of important figures, as well as lists of the options available to you. You can, for instance, visit a town's governor, who may grant you a letter of marque which commissions you into his service. The local tavern should not be missed — this is where seamen on the look-out for work meet to drink and discuss recent events.

When you're at sea, the display changes to a very rough version of the paper map supplied with the package. Your position is indicated by a small sailing ship. Using the joystick as a rudder control, you can steer the ship in any direction. The speed at which the vessel travels depends on its position in respect to the prevailing wind, as indicated by clouds that drift across the screen. Some clouds, coloured grey, represent squalls which throw the ship badly off course.

Occasionally you receive a message

Are You Keeping Up With . . .
COMMODORE AT MAXWELL?

Look at the Range of AMIGA BY COMMODORE® ™ Products we have to offer

SOFTWARE ★ HARDWARE ★ BOOKS ★ MAGAZINES

DATABASES

Acquisition	$595.95
A-Filer	$79.95
DSMan	$359.95
Datamat A200	$359.95
Datamat A300	$499.95
Home Inventory	$89.95
Info +	$194.95
Infominder	$249.95
Mi Amiga	$239.95
Omega File	$239.95
Organise	$249.95
Record Master	$119.95
Superbase	$199.95

ACCOUNTING/BUSINESS/MANAGEMENT

Best Business Management: Accounting	$699.95
Business Statistics	$245.00
Financial Cookbook	$69.95
Financial Time Machine	$129.95
Gizmos (Desk Organiser)	$129.95
Logistix (Spreadsheet, Database, Time Management)	$599.95
Maxidesk (Desk Drganiser)	$189.95
Mi Ledger	$229.95
Money Mentor	$189.95
PAR Home Accounting	$89.95
PHASAR Home Accounting	$149.95
Rags to Riches (Cred., Debt., Gen/Ledger)	$799.95

SPREADSHEETS

Analyse I	$199.95
Analyse II	$212.95
Flipside (Sideways Printing)	$129.95
*Maxiplan 500	$249.95
Maxiplan	$299.95
Maxiplan Plus Macros	$389.95
Unicalc	$185.00
VIP Professional	$385.95

WORD PROCESSORS

City Desk (Desktop Publishing)	$259.95
Goldspell	$69.95
*LPO Writer	$249.95
Laserscript Postscript Driver for Pagesetter	$69.95
Nancy Spell	$129.95
Orator (Talking Word Processor)	$59.95
Pagesetter (Desktop Publishing)	$229.00
Prowrite Colour Graphics & Text	$245.95
Publisher 1000 (Desktop Publishing)	$369.95
Scribble	$245.95
Spellcraft II	$99.95
Talker (Talking Word Processor)	$99.95
Textcraft Plus	$99.95
U-Edit	$149.95
*Word Perfect	TBA
Write Hand	$145.95

GRAPHICS

Express Paint	$179.95
Forms in Flight	$159.95
Aegis Animator	$245.00
Aegis Draw	$299.95
Aegis Draw Plus	$399.95
Aegis Images	$195.95
Aegis Impact (Business Graphics)	$379.95
Amazing Amiga Graphics	$49.95
Art Pak 1	$169.95
Brush Works	$69.95
Butcher	$79.95
Deluxe Help	$69.95
Deluxe Paint	$169.95
Deluxe Paint II	$245.95
Deluxe Paint Art Disk 1	$59.95
Deluxe Print Art Disk 2	$69.95
Deluxe Print & D Print Utility Disk I	$169.95
Digipaint	$149.95
Dimmer	$39.95
DPaint Art: Seasons & Holidays	$59.95
DynamiCAD	$895.00
Easy Touch Tablet	$995.00
Graphicraft	$99.95
Kurta Penmouse Tablet	$699.95
Logic Works Digital Design & Circuit Analysis	$189.95
Printmaster Plus	$139.95
Printmaster Art Gallery I	$89.95
Printmaster Art Gallery II	$89.95
Prism	$139.95
*Sculpt 30	$179.95
Zuma Fonts I, II, III	$69.95
DPrint Art Disk	$69.95

VIDEO

Deluxe Video	$199.95
Oeluxe Video 1.2	$244.95
Digiview I Upgrade	$37.95
Digiview II	$458.95
Genlock	$1,595.00
Video Wizard	$119.95
Video Cataloger	$69.95
Pro-Video OGI Presentation	$369.95
Pro-Video Font Pak 1, 2 (5 Disks)	$169.95
TV-Text Graphics Presentation	$184.95
Videoscape 3D Animation	$339.95

MUSIC

Deluxe Music Construction Set	$245.95
Future Sound (Digitiser)	$429.95
Golden Oldies	$69.95
Instant Music	$149.95
It's Dnly Rock & Roll	$69.95
Soundscape MIDI Interface	$154.95
Soundscape Pro MIDI Studio	$395.95
Music Studio	$89.95
Perfect Sound Digitiser	$229.95
Sonixl	$179.95
Soundscape Sound Sampler Digitiser	$319.95

UTILITIES & PROGRAMMING TOOLS

Quickmerge	$109.95
A-Disk	$49.95
AED Programme Editor	$199.95
Amiga DOS 1.2 Enhancer Pak	$29.95
Visawrite	229.95
Haicalc	119.95
Fire Power	39.95
Gackeo	129.95
Gold Runner	79.95
Plutos	49.95
Dougs Math Aquarium	149.95
Floppy Accelerator	69.95
Animator Junior	139.95
Desktop Artist	59.95
Forms in Flight	159.00
Amiga Assembler	$219.95
CLI Mate	$79.95
Custom Screens	$129.95
DOS-2-DOS	$169.95
*DOS Express	$49.95
Disk-2-Oisk 64/128 Txfer	$99.95
Disk Wik	$149.95
Explorer (Interactive Analytic)	$99.95

AMIGA 2000 available NOW

*Go 64 (64 Emulator)	$224.95
Grabbit	$74.95
K Seka Assembler	$299.95
Lattice Upgrade	$129.95
Linear & Non-Linear Programming	$169.95
Macro Assembler	$245.95
Online DOS	$99.95
Orator	$59.95
Power Windows	$199.95
Printer Drivers HL292, LQ, EX Series	$89.95
Softworks Basic Compiler	$245.95
T-Utilities	$129.95
Tychon Utilities	$79.95
Zing	$159.95
Zing Keys	$99.95
Floppy Accelerator	$69.95

EDUCATION & CHILDREN'S GAMES

Doug's Math Aquarium	$149.95
Amiga Tutorial Video	$74.95
*Analogies I	$99.00
*Analogies II	$99.00
Animal Kingdom	$49.95
*College Aptitude & Comprehension	$99.00
Decimal Dungeon	$49.95
Discovery Maths	$59.95
Discovery Spelling	$59.95
Discovery Trivia	$69.95
First Shapes	$119.95
Fraction Action	$49.95
Keyboard Kadet (Typing Tutor)	$89.95
Kid Talk	$49.95
Kinderama	$119.95
Kwik Speak Spanish	$119.95
Mastertype (Typing)	$89.95
Match It	$69.95
Math Talk	$49.95
New Tech Colouring Book	$59.95
Queue Education Adventure Series II Titles incl. Vocabulary, Talking, Analogies, History, Geography, Business, Reading	$89.95
Read & Rhyme	$119.95
Speller Bee	$49.95
Talking Colouring Book	$69.95
Winnie the Pooh	$49.95
Modula 2 Compiler Editor Pak	$219.95
Modula 2 Developers Pak	$299.95
Multi-Forth	$279.95
True Basic	$239.95
True Basic 30 Graphics	$119.95
True Basic Advanced String Library	$119.95
True Basic Sorting & Searching	$119.95
UCSD Pascal Professional Pak	$259.95

COMMUNICATIONS

A-Term	$99.95
BBS Bulletin Board	$229.95
DIGAI Telecommunications	$179.95
Maxicomm	$195.00
Mi-Term	$79.95
Netcomm 300/Viatel/1200	$495.00
*Netcomm 300/Viatel/1200 Full Duplex	$849.00
On-Line	$179.95
Supertex (Viatel) 2.0	$89.95

SPECIAL INTERESTS

Decision Analysis Techniques	$195.00
Experimental Statistics	$245.00
Expert System (Extrap. & Analysis)	$194.95
Exploratory Data Analysis	$195.00
Flow Idea Processor	$224.00
Forecasting & Time Series	$245.00
Multivariate Analysis	$239.95
Optimisation	$189.95
Performance & Critical Path Analysis	$199.95
Quality Control & Industrial	$199.95
Sales & Market Forecasting	$239.95

OTHER HARDWARE

20 Meg Parallel Hard Disk	$1,795.00
22 Meg SCSI SUPRA Hard Disk with Clock	$1,995.00
1 Meg Amega Expansion (C Ltd)	$849.00
2 Meg Comspec Expansion	$1,595.00
Insider 1 Meg internal + Clock (fitted)	$899.00
Xpander II 2 Meg RAM	$1,659.00
Xpander II 2 Meg Add On	$899.00
A-Time Real Time Clock	$159.00
Kickstart Eliminator (fitted)	$395.00
PAL Conversion Kit (fitted)	$159.00
Jitter-Rid Screen	$49.00
Sidecar (IBM Upgrade)	CALL
10 Meg Hard Card	$995.00
20 Meg Hard Card	$1,350.00
*20 Meg Hard Disk & Controller (fitted)	$895.00
A500 RF Modulator	$75.00
A2088 XT Board	$799.00
2090 Hard Disk Controller	$799.00
A2010 3.5" Drive	$299.00
A2020 5.25" Drive	$299.00
A2052 2 Meg Card	$899.00
Okimate 20 Colour Printer	$499.00
Roland DXY Colour Plotter 8 Colour	$2,295.00
1081 Monitor	CALL
EX800 Colour Printer 9 Pin	CALL
EX1000 Colour Printer 9 Pin	CALL
*LP806 Laser Printer	CALL
LQ2500 Colour Printer 24 Pin	CALL
*MCS820 Colour Printer 24 Pin	CALL
OKI ML292 Colour Printer 18 Pin	CALL
A1000 Printer Cable	$30.00
A2000/500 Printer Cable	$30.00
1081 Cable	$20.00
PC Printer Cable	$30.00
Modem Cable	$30.00
1081 to C64/C128	$18.00
MaxScreen Filter	$25.00
MaxPad Mouse Pad	$15.00
Mouse Pads (3 colours)	$20.00
Sidecar 256K Upgrade	$149.00
Amiga 1010 Drive 3½"	CALL
External Drive 5¼" 440K	$429.00
External Drive 5¼" 880K	$429.00
(See UTILITIES for printer drivers)	

ENTERTAINMENT

Adventure Construction Set	$89.95
Alien Fires	$79.95
*Arazok's Tomb	$79.95
Archon	$69.95
Archon 2: Adept	$79.95
Arctic Fox	$89.95
Arena	$39.95
Balance of Power	$79.95
Barbarian	$79.95
Bards Tale	$89.95
Baseball	$69.95
Black Cauldron	$69.95
Borrowed Time	$69.95
Bratacas	$89.95
Bridge 4.0	$69.95
Championship Football	$79.95
Championship Golf	$59.95
Chessmaster 2000	$99.95
*Chess Mate	$79.95
Crimson Crown	$69.95
Deepspace	$89.95
Defender of the Crown	$79.95
Deja Vu	$89.95
Delta Patrol	$69.95
Demolition	$29.95
Diablo	$69.95
Dr Xas	$49.95
Earl Weaver Baseball	$99.95
Faery Tale	$49.95
Flight Simulator II	$129.95
Flight Simulator Cable	$29.95
Flight Simulator Scenery Disk 7 East Coast	$69.95
Games Gallery I, II, III	$79.95
*Galileo	$129.95
Grand Slam	$59.95
Gridiron Football Strategy	$139.95
Guild of Theives	$89.95
Gunship	$79.95
Hacker I	$69.95
Hacker II	$119.95
Halley Project	$79.95
HEX	$99.95
Hitchhikers Guide to the Galaxy	$79.95
*Hollywood Hi Jinx	$79.95
Hollywood Poker	$49.95
Jewels of Darkness	$84.95
Jump	$49.95
Kampfgruppe	$84.95
*Karate	$49.95
*Karate Kid Pt II	$69.95
King of Chicago	$79.95
Kings Quest I	$49.95
Kings Quest II	$49.95
Max Games I, II, III	$9.95
Challenger	$29.95
Gato	$79.95
Knight ORC	$69.95
Mouse Trap	$49.95
Silicon Dreams	$69.95
Kings Quest III	$49.95
Leader Board Golf	$69.95
Leader Board Golf Tournament Disk 1	$59.95
Leather Goddesses of Phobos	$69.95
Little Computer People	$79.95
Marble Madness	$89.95
Mean 18 Golf	$49.95
Mind Forever Voyaging	$69.95
Mindshadow	$69.95
Mindwalker	$99.95
Moonmist	$89.95
Dgre	$99.95
Dne on Qne	$69.95
The Pawn	$89.95
Phalanx	$29.95
Phantasi III	$69.95
Planetfall	$99.95
Portal	$69.95
Racter	$69.95
Roadwar 2000	$59.95
Rogue	$69.95
SDI	$69.95
Seven Cities of Gold	$69.95
Shanghai	$79.95
Silent Service	$49.95
*Silicon Dreams	$69.95
Sinbad: Throne of the Falcon	$99.95
Skyfox	$69.95
Space Battle	$29.95
Space Quest	$49.95
Star Fleet 1	$69.95
Star Glider	$79.95
Strip Poker	$69.95
Super Huey	$59.95
Surgeon	$119.95
Swooper	$49.95
Tass Times in Tonetown	$99.95
*Telegame	$69.95
Temple of Apshai Trilogy	$79.95
Transyivania	$69.95
Trinity	$59.95
Two on Two Championship Basketball	$79.95
Ultime III	$99.95
Uninvited	$79.95
Video Vegas	$84.95
Winter Games	$59.95
Wishbringer	$69.95
World Games	$69.95
Zork I, II, III	$69.95

BOOKS & MAGAZINES

68000 Reference Guide (Melb. House)	$24.95
Advanced Amiga Basic (Compute)	$37.95
Amiga Applications (Compute)	$34.95
Amiga DOS Reference Guide (Compute)	$35.95
Amiga Handbook (Que)	$44.95

*Denotes New Titles.
Prices as at 14/8/87.
Subject to change without notice.
Please call to confirm availability and price.

★ NEW TITLES EVERY WEEK ★ C64 ★ C128·AMIGA ★ PC5/10/20/48

Maxwell–The Commodore Centre

★ SALES ★ SERVICE ★ SUPPORT ★

162 Nicholson Street, Abbotsford, Melb, 3067

Free Parking and plenty of it!

Open Mon.–Thurs. 8.30–5.30 • 9.00 Frid. • 12.30 Sat.

We love Mail Orders

Just phone 03 419 6811

(6 lines)

VISA

SAME DAY DESPATCH

from the ship's look-out, saying that he has spotted a ship on the horizon. When this happens, you can investigate or sail away. If you choose the former option and the ship belongs to a country hostile to your own, you can attack it.

Sea battles are cat-and-mouse chases between your vessel and another controlled by the computer. The aim is to either sink your opponent's ship with cannonfire, or move up alongside and board it — whereupon you have to fence with its captain. The prize for winning the duel is his ship with its cargo and crew.

Enemy towns can be attacked in similar fashion, only instead of battling with a ship, you take on the might of an onland fortress. The scenario is much the same as a sea battle, however: you attack the fortress with cannonfire and then move alongside it, enabling your men to scale its wall. The finale is a duel between you and the fortress commander.

Pirates! is the best game Microprose has ever produced. Everything, from the program to the informative manual, has been designed by people with an obvious love for their subject. If it marks the beginning of a new trend for Microprose, I look forward to any future releases.

Down among the dead men

Title: Up Periscope!
Computer: Commodore 64/128
Supplier: Imagineering
Price: $59

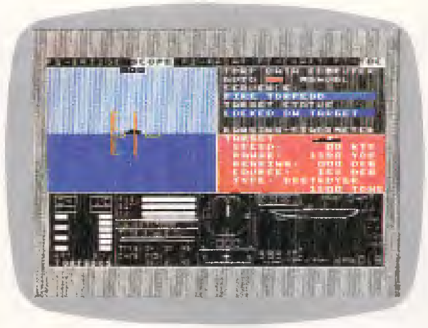
While playing Up Periscope!, I experienced a strong feeling of *déjà vu;* almost everything about it seemed familiar. And then it clicked. Up Periscope! is identical — not in presentation, but in gameplay and scenario — to Microprose's aged Silent Service. Both programs are submarine simulations set in the Pacific during World War II; both contain scenarios based on actual patrols and missions carried out by submarines between 1941 and 1945; and the manuals for both games have nearly identical introductory paragraphs.

Despite these glaring similarities, Up Periscope! survives the inevitable comparisons by virtue of its technically brilliant 3D graphics. However, even these were created using software licensed from SubLogic, the company which designed the incomparable Flight Simulator II.

Up Periscope's! most exciting feature is its display. The Atari ST version of Silent Service had the benefit of GEM's windows environment. Up Periscope! copes very well in comparison, considering that the Commodore 64 and 128 machines do not offer such a luxury.

Initially, the Up Periscope! display looks like any other simulator's. Along the bottom of the screen is the usual box containing various instruments and in this case they are designed to monitor the supply of aft and bow torpedoes; fuel-levels; rudder position and course (bearing); and current depth. The top half of the display, however, is far from run-of-the-mill.

While the submarine is on the surface, you can climb into the conning tower and look out across the sea. By pressing 'Z' on the keyboard or pushing the joystick forward while simultaneously depressing the fire button, you can magnify the



scene. This is ideal for taking a closer look at distant ships.

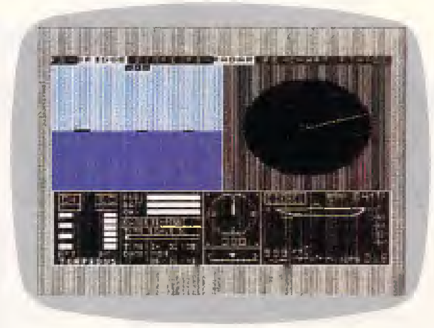
When ships are far away, they appear as black squares on the horizon. But, as you close in on them or vice versa, they gradually change into detailed, majestic, 3D figures of a quality which is rarely seen on the C64. They don't look majestic for long, though — the majority represent the enemy and must be sunk as quickly as possible.

The view from the conning tower normally takes up the full width of the display. However, when one of the submarine's range-finding devices or charts is selected, it is reduced to half the width. I found it necessary to have the sub's radar visible at all times, since it can spot a ship 20 miles away. Without it, I often caused collisions between my ship and other vessels.

Unless you are below the surface, you can use the submarine's deck gun to attack a ship. More impressive — and several times more deadly — is a torpedo.

Up Periscope! provides a number of methods of aiming a torpedo, ranging from the binoculars/periscope to a more reliable device called a Torpedo Data Computer (TDC). The latter is far more trustworthy than your eye, since it can accurately compute a target's range and bearing.

The TDC is equipped with 'manual' and 'automatic' modes to cater for novice and experienced players respectively. Both modes do the same job, although the former is considerably less 'realistic' than the latter.



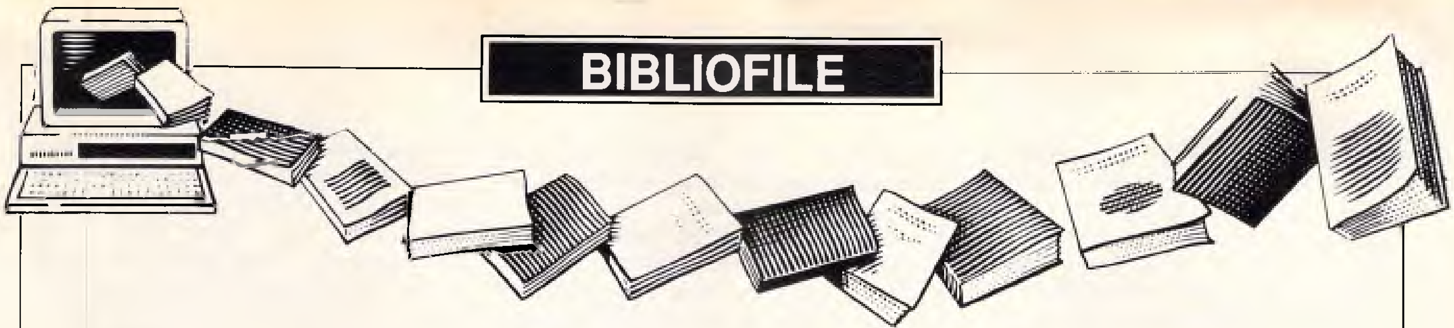
In manual mode, you have to select a target using the binoculars or the periscope, and instruct the TDC as to which range-finding device (sonar, radar, or stadimeter) it is to compute its distance from the submarine with. Before the TDC can work out the range, you have to mark the target by pressing the 'M' key; then you wait for a minute to elapse, and mark it a second time. After you have marked the target three times, the computer will inform you that it has locked on target and that the torpedo can be fired.

Using the binoculars or periscope, you can watch the torpedo as it races towards its target. If it makes contact, the holed ship lists slowly and sinks.

Players who hanker after realism can make life more difficult for themselves by altering the submarine's features and increasing the number of tactical considerations. The reliability of the submarine and torpedoes can be decreased, for example, as can the thickness of the submarine's hull. Enemy ships can be made to zig-zag, attempt to ram you and drop depth charges. You can even change the visibility to anything between 0 per cent and 100 per cent.

Overall, Up Periscope! is an excellent simulation. Graphically it is far superior to Silent Service, and the simple controls make it much more accessible to people who don't want to memorise which key performs which function before being able to play the game.

END



BIBLIOFILE

This month, artificial intelligence and educational computing come under the scrutiny of APC's book reviewers.

How Machines Think

Author: Nigel Ford
Publisher: John Wiley & Sons
Price: $50.25

How Machines Think is a splendid introduction to some of the ideas behind Artificial Intelligence. Nigel Ford has aimed his book at the 'non-computer specialist', whoever that may be, and by and large he has succeeded in writing a book in which ideas are more important than the technical details of computer programming. Admittedly, you could pick up a little basic Prolog by typing the example programs into a suitable computer, but the real point of the book is to get the reader thinking hard about the nature of the tasks AI programs have to accomplish.

The book concentrates mainly on expert systems, but other AI topics such as planning and rule induction get a look in, and there is a very useful chapter which lists tools available for knowledge engineering.

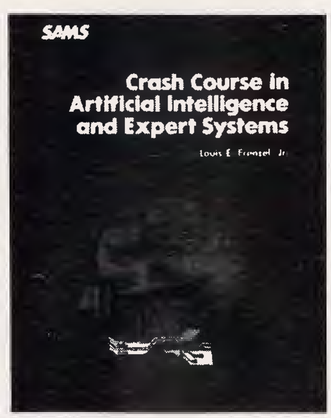
Even better is the annotated bibliography giving the author's comments about further reading for the AI novice.

The final section includes a short discussion on whether computers are a form of intelligent life; however, this fails to convince because, although the author gives the issues a good airing, 13 pages isn't really enough to do more than scratch the surface.

Understanding AI is not so much about writing clever programs as about learning to think about the difficult problems which we solve so effortlessly in everyday life. I like the way *How Machines Think* consistently encourages the reader to think about the limitations of techniques by trying to dream up situations in which they would give misleading or unexpected results. Reading Nigel Ford's introduction to the principles behind expert systems would be a lot more help to someone trying to decide whether to buy one than any amount of glossy promotional literature.

Possibly to emphasise the point that AI systems are not as clever or reliable as all that, one of the longer examples in this excellent book is a firmly tongue-in-cheek program for managing nuclear defences. At least, I *think* that's why he put it in . . .

Chris Brew



Crash Course in Artificial Intelligence and Expert Systems

Author: Louis E Frenzel Jr
Publisher: Sams/Pitman
Price: $44.95

How much does the average personal computer owner need to know about artificial intelligence? How much of an expert does he have to be in expert systems?

Louis Frenzel seems to get the balance just about right. He starts by assuming that the reader is computer-wise. He realises that a good diagram can help people to understand concepts which would be confusing in straight text and downright incomprehensible when described in mathematical notation. In fact, anyone who is capable of making intelligent use of a personal computer should have no difficulty in following this book.

The author's attitude to artificial intelligence is quite healthy. For instance, the chapter introducing expert systems contains paragraphs headed 'Benefits of Expert Systems' and 'The Down Side'; between them, the reader gets a realistic view of the advantages and disadvantages of such systems. The chapter 'Developing an Expert System' contains some practical advice on making sure that an expert system will give a real return on the investment — this is an important factor that is omitted from virtually all the academic books and articles I have seen on the subject.

The range of subject matter considered is wide, with chapters on knowledge representation, problem solving, natural language processing, computer vision and robotics. Lisp and Prolog are introduced in a way that allows the reader to get a 'feel' for the main features although a few of the examples, such as the *list* of lists in Lisp, could have been handled better. There is a chapter on future trends, and an excellent glossary. The appendix is useful for books but, unfortunately, virtually all the addresses given for software suppliers are American.

In covering a wide range of topics, it is not possible to deal with each in depth. As such, many artificial intelligence specialists might claim that the chapter dealing with their particular interest is superficial. Such a criticism would be unfair, however. General introduction books should stimulate the interested amateur and encourage him to read further, or to experiment with commercially available packages. In addition, they should provide a convenient reference guide to terms such as fuzzy logic, MYCIN or SAVVY. *Crash Course in Artificial Intelligence and Expert Systems* is just such a book.

If you use a personal computer and want to keep in touch with the future, this book is required reading.

Chris Reynolds

Science On-Line

Authors: Chris Brankin and John Dunkerton
Publisher: Hodder and Stoughton
Price: $25.95

This book is an introduction to interfacing micros (specifically the BBC Micro, betraying its British origin) to scientific experiments. This is something which microcomputers are particularly suited to and will be of obvious interest to schools. The authors have concentrated on capturing information from experiments, and then presenting it on the screen.

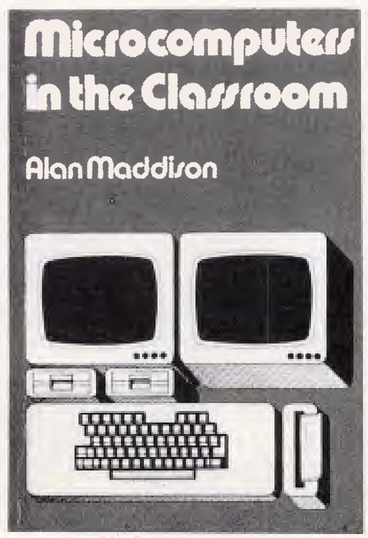
Science On-Line starts off from the premise that any potential user will have had little experience with interfacing, and a couple of short and simple programs demonstrate what it is about. Since the BBC Micro has an analogue to digital converter (ADC), initially no extra hardware is needed and the short introductory program gives a plot of resistance changes when someone runs their fingers across the pins of the ADC.

To interface the computer with experiments in any serious way requires building additional bits of electronics. Some soldering is inevitable. This is nothing to be afraid of as all the circuits are fully diagrammed, and thorough and practical instructions for construction are given.

The remainder of the book details a series of real-world projects, each of which requires further programming and soldering, but by now some really useful results can be achieved. The range of applications covered is very wide, but also very impressive considering the slimness of the book.

Science On-Line will no doubt bring a new lease of life to science lessons.

Helen Brew



Microcomputers in the Classroom

Author: Alan Maddison
Price: $15.95
Publisher: Hodder and Stoughton

Alan Maddison states that *Microcomputers in the Classroom* should give the reader *'enough guidance to start using the computer'* and that this is *'a starting point not a finishing post.'* While this has been achieved very well in 'Part Two: The Microcomputer in the Classroom' and 'Part Three: The Microcomputer in School Administration' — which are strong dynamic sections — the weak link in the chain is 'Part One: Introduction to the Microcomputer' where the author tries to cover too much ground too quickly. If I were a novice to computing, then this would certainly have shaken me up. Which is a pity, because the remainder of the book is excellent.

Part Two covers a wide range of subjects in computer-aided learning (CAL) and the benefits therefrom: from geographical models, grammatical construction in English, analysing results in Science to creating needlework designs in Domestic Science. Computer-aided instruction (CAI) is also mentioned — this is where the computer actively teaches the pupil by drill and practice, testing and assessment.

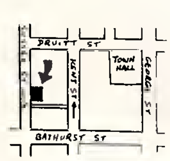
The advantages and disadvantages of the micro for teaching are openly discussed — that is, the never-ending patience of a micro, but the fact that *'Enthusiasm for the computer can be mistaken for enthusiasm for the subject taught . . .'* An unbiased opinion is well-maintained here.

Part Three deals with the setting up of pupil records, constructing timetables, analysing exam results, creating appointment diaries, and so on.

The pace of Part One aside, *Microcomputers in the Classroom* is an indepth analysis of all aspects of the impact of the microcomputer in school life and a useful addition to the teaching library.

Lorna Kyle

END



INVESTMENT CHARTING

at the press of a button

IC (Investment Charting) is a computer programme which will become your "sixth sense" in the share and commodities markets, providing you with an indication of market trends based on past and proven facts.

How it Works
IC is designed to collect, store and chart data for more than 200 companies. Provision is made for entering bonus and rights issues.

Types of Charts
IC offers a wide range of charts including closing price only, daily high/low, and moving averages. Companies may also be graphed against other companies or indexes.

Automatic Updating
IC provides the facility to hook into Money Watch, through the public Viatel service, and quickly collect selected data for storage and charting. Once the data has been collected, you can begin charting and analysis in you own time, *without paying further on-line and frame charges*. **IC** includes fully integrated VIATEL software, along with its automated daily price update facility. *This means that no other software is required!*

Computer Requirements
IC will run on most IBM and compatible computers which have at least 512K Bytes of memory, graphics, and a modem.

ONLY $495

To: ARTEC MARKETING, Freepost 52B
P.O. Box 1015, NORWOOD SA 5067

Name ____________

Address ____________

____________ P/C ____

Phone (   ) ____________

☐ Please send more information
☐ Have a dealer contact me
☐ Send a DEMO DISC – $25

Cheque/Bankcard/Visa/Mastercard
Card No. ____________

MACBUREAU

The desktop publishing experts

Now *you* can produce presentation-quality type and design your own layouts for laser or Linotronic 300 printing. Send your Mac, WP or IBM PC disk or use our typing, design and assembly services. You'll be delighted with the results and the cost savings.

Download and laser print from Mac disk from $1 per A4 page

MacBureau—the first and best in desktop publishing

☎ *(02) 94 5207*

"...you've come to the right place"

MONITORS

SPECIALIST SALES & SERVICE

* Taxan, Thomson, DTX, Etron
* TTL & Composite
* CGA & EGA Computer Monitors
* 12 Months Full Warranty
* Dealer Price Enquiries Welcome

Retail from $150 (incl. ST)

SIMON & MAY CONSULTING SERVICE
3A/10 Pope St, Ryde, 2112
P.O. BOX 218, Ryde N.S.W. 2112
Phone (02) 809 6941

NUMBER FUN 1 ©

Australian Software for Australian kids

Four educational games that turn the drudgery of learning number facts into stimulating and worthwhile entertainment.

NUMBER FUN 1 program disk	**$29.95**
NUMBER FUN 1 demo disk	**$10.00**

Orders to:
J. Grimley, P.O. Box 425,
Mullumbimby 2482. Ph. (066) 842262
(Requires IBM® PC or compatible, plus standard CGA graphics adapter.)

To: All Lotus/Symphony Users

BOEING CALC

The 3-D Power Spreadsheet

If you are:
* Running out of MEMORY
* Wanting more power than LOTUS or SYMPHONY spreadsheets
* Wanting to create larger consolidation models
* Not willing to leave the familiar LOTUS environment

Then BOEING CALC is for you! BOEING CALC was created specifically to meet the limitations of conventional spreadsheets.

FEATURES:
* Disk based (no memory problems — spreadsheet up to 32 Mb!!)
* 3-Dimensional (rows, cols, and pages)
* Existing LOTUS and SYMPHONY spreadsheets run without conversion
* Room to move (16,000 rows x 16,000 cols. x 16,000 pages)

AVAILABLE IN LAN VERSION
* Up to 32 simultaneous users
* Full cell range security

BOEING 3-D GRAPHICS
* Fully compatible with BOEING CALC, LOTUS and SYMPHONY
* Superb graphs and facilities

Evaluation systems for BOEING CALC and BOEING GRAPH are available.

B M S

THE MODELLING SPECIALISTS

83-87 WELLINGTON STREET, WINDSOR, VICTORIA, 3181

Telephone: (03) 51-1572

TJ'S WORKSHOP

APC's monthly pot-pourri of hardware and software productivity tips. APC will pay between $100 and $200 for each tip published. Write to TJ's Workshop, APC, 124 Castlereagh Street, Sydney 2000.

Editing complex formulae

When you edit long formulae in any spreadsheet, it's easy to make mistakes that violate syntax and keep the program from accepting the formula. For example, in 1-2-3, you might make a reference to a range you haven't created yet. In this case, 1-2-3 just beeps when you try to enter the formula. However, if you don't have another range in the spreadsheet that you can substitute in the formula for the one you forgot to create, you can't enter the formula. If you've just put together a piece of complex logic, it's a shame to hit Esc and destroy your formula just because you forgot to name a range beforehand.

There is a way to save your work so that you won't have to retype it later. Just hit the Home key to go to the beginning of the formula and type an apostrophe. This turns the formula into a label, so you can enter it into a cell even with a syntax error. Once you have made all your corrections, go back to the cell with the formula and remove the leading apostrophe. Now it's a formula again.

S Woodruff

There are other good uses for this trick of turning formulae temporarily into labels. If I'm writing a formula with a spreadsheet function with which I'm not very familiar, I'll sometimes be unable to enter the formula because I've forgotten the syntax. If I don't feel like looking up the function right away in the manual, I turn the formula into a label and come back to it later.

The label trick is also handy if you ever want two identical copies of a formula in different places in your worksheet. Unless all the cell references are absolute, the /Copy command will adjust references. Using the /Move command removes the original copy. However, if you turn the formula into a label before you copy it, once you turn it back into a formula, it will be like doing a /Copy without cell adjustment. When would you want an identical copy of a formula? When you're troubleshooting a spreadsheet and want to make adjustments to a copy of a formula without destroying the original — JT.

Easy underlining

I believe macro \L in Fig 1 offers an easy way to underline labels in a Lotus 1-2-3 worksheet. Put the cursor on the label you want to underline and hit Alt-L. Now hit as many hyphens as you see characters in the cell and hit Enter. The {insert} turns on overwrite mode, which many people never use.

I've taken the idea a step further in macro \U, also shown in Fig 1, which automates the process. This macro will underline properly even if a label is centred or right justified. Be sure to give the range names in the leftmost column to the cells to their right.

C Basile

I like \L quite a lot, but \U seems a touch elaborate. I often start labels with spaces so as to position them properly, and \U wouldn't know what to do about them. Yes, you could write a little test for leading spaces and add it to the tests for centred and right-justified labels, but that would really *be overkill. I'll stick with \L — JT.*

More-efficient copies

I wrote the COPYEASY.BAT batch utility in Fig 2 to copy several groups of files from the current directory to another directory or disk on IBM PC compatibles. Everyone uses shorthand filespecs like *.BAT whenever possible, and COPYEASY makes it easy to use as many as eight shorthand filespecs on a single command line.

I share batch files with people who don't care to know the inner workings, so a friendly, helpful presentation on-screen is essential. This batch utility provides help if needed and specific feedback on what to type on the com-

```
\L        /C~{DOWN}~
          {DOWN}{EDIT}{HOME}{RIGHT}{INSERT}


\U        /RNCund~~{DOWN}
          @REPEAT("-",@LENGTH(und))~
          /RV~~
          {IF @CELL("PREFIX",und)="^"}{BRANCH CENTER}
          {IF @CELL("PREFIX",und)="'"}{BRANCH LEFT}
          {BRANCH RIGHT}

CENTER    {EDIT}{HOME}{INSERT}^~
          /RNDund~

LEFT      /RNDund~

RIGHT     {EDIT}{HOME}{INSERT}"~
          /RNDund~
```

Fig 1 Two macros that underline labels

```
ECHO OFF
IF "%2" == "" GOTO HELP
ECHO This will copy %2 %3 %4 %5 %6 %7 %8 %9
ECHO from
CD
ECHO to %1
ECHO Hit Ctrl-Break to abort, or
PAUSE
SET MYVAR=%1
SHIFT
:AGAIN
ECHO Copying %1 to %MYVAR%
FOR %%A IN (%1) DO COPY %%A %MYVAR% > NUL
SHIFT
IF NOT "%1" == "" GOTO AGAIN
SET MYVAR=
GOTO END
:HELP
ECHO To use this %0 utility, enter:
ECHO %0, DESTINATION, and up to 8 filespecs
ECHO in current directory.  For example:
ECHO -----------------------------------
ECHO %0 B: *.BAT *.D?? MYFILE.TXT TEST.*
ECHO -----------------------------------
:END
```

Fig 2 COPYEASY.BAT utility that lets you copy up to eight filespecs on one command line

mand line; it also requests confirmation before proceeding.

D Coffin

This utility takes advantage of a slick DOS variable technique. Mr Coffin uses replaceable parameters to read everything off the command line, and the DOS SHIFT command to process them one-by-one. Each time the SHIFT command executes, it moves all the replaceable parameters up a notch, so %3 becomes %2, %2 becomes %1, and the old value for %1 is discarded.

So, if you entered the command

COPYEASY D: *.BAT C*.COM ??.EXE

then

%1 would = D:
%2 would = *.BAT
%3 would = C*.COM.
%4 would = ??.EXE

Execute SHIFT once and

%1 would = *.BAT
%2 would = C*.COM.
%3 would = ??.EXE

The old D: value of %1 would vanish, and %4 wouldn't have any value. (The %0 parameter is a special case — it represents the name of the batch file itself.)

The way the batch file works, %1 originally represents the destination for all the copies, and this is used the whole time the batch file runs. But the first time SHIFT executes, it wipes out the old value of %1 and replaces it with what used to be %2. Mr Coffin gets around this by taking the original value of %1 and setting it to an environment variable, with the command

SET MYVAR= %1

He can then use this destination at any subsequent time in the batch file by referring to it as %MYVAR% rather than %1. And he cleans up after the batch file is done by removing the variable from the environment with the command

SET MYVAR=

If you do try this, make sure your environment is large enough to hold the extra variable. Under DOS 2.0 and 2.1, you can patch COMMAND.COM at address ECF to represent the number of 16-byte memory 'paragraphs' that will make up your new environment. (For DOS 2.11, the address is DF3.) For DOS 3.0 and 3.1, use a SHELL [d:][path]COMMAND.COM /E:n /P command in your CONFIG.SYS file, where n represents the number of 16-byte paragraphs. For Versions 3.2 and later, use the same SHELL command but specify the actual number of bytes rather than paragraphs. The default in all cases is 160 bytes (10 paragraphs). You can jack it all the way up to 32k in DOS 3.2 and 3.3, but you are limited to 62 paragraphs in earlier versions — PS.

Initialising dBase variables

To automate writing the code needed to initialise memory variables when appending new records, I've written the dBase III Plus programming utility shown in Fig 3. The program produces a text file, MEMINIT.TXT, that contains the STORE statements to initialise a new memory variable for each field in the database (memo fields excepted, of course). When the resulting code is run inside a program, each new memvar will have the correct field type and field length, and its name will be identical to the database field except for the prefixed 'm'. If the database field name is already at dBase's ten-character limit, the resulting memvar name is truncated to ten characters.

```
*** MEMINIT.PRG   (file must be in use)
SET TALK OFF
PRIV c,n,l,d,x
COPY STRU EXTE TO temp
SELE 9
USE temp
INDE ON field_type;
  +STR(field_len,3) TO temp
SET FILT TO field_type$"M"
GO TOP
n="0"
l=".F."
d="DATE()"
SET ALTE TO meminit.txt
SET ALTE ON
DO WHIL .NOT. EOF()
  c="SPAC("+LTRIM(STR(field_len,3))+")"
  x=field_type
  ? "STOR",&x,"TO ";
   +TRIM(LOWER(LEFT("m"+field_name,10)))
  SKIP
ENDD
SET ALTE TO
USE
ERAS temp.dbf
ERAS temp.ndx
SELE A
RETURN
```

Fig 3 A dBase III Plus code generator that produces a text file with the STORE statements needed to initialise memory variables before appending new records

For example, if you use a database file with the following structure:

Name	Type	Len	Dec
SDATE	D	8	0
EDATE	D	8	0
CO	C	25	0
STR	C	25	0
CITY	C	14	0

MEMINIT.PRG will produce a text file with the following code lines:

STOR SPAC(14) TO mcity
STOR SPAC(25) TO mco

AUSTRALIAN BUILT
8088, 80286, 80386
BASED COMPUTERS

We import components and build computers in our factory, which we have owned and occupied for 30 years. Thousands of customers like Sydney Uni, Sydney College of Advanced Education, Cumberland College of Health Science, Monash Uni. NSW Institute of Technology, Newcastle Uni, Macquarie Uni, Mitchell College, Uni. of NSW, Cambridge College, CSIRO, Telecom, OTC, Government, business and private users will testify for our quality and service — as to prices, see for yourself hereunder — all prices including tax.

GCS XT (IBM XT compatible) parallel serial games ports, hercules & composite switchable video disk drive controller, clock calendar 150W power keyboard

256k RAM 1 360k Disk Drive.................4.77-8 MHZ $850 4.77-10 MHZ $950
640k RAM 2 360k Disk Drives............4.77-8 MHZ $1,100 4.77-10 MHZ $1,200
640k RAM 1 1.2mb Disk Drive............4.77-8 MHZ $1,200 4.77-10 MHZ $1,300
640k RAM 2 1.2mb Disk Drives...........4.77-8 MHZ $1,400 4.77-10 MHZ $1,450

GCS AT (IBM AT compatible) 1mb, 120ns RAM, parallel serial ports, clock, calendar, video cards, 200w power supply, keyboard. No hidden extras!

1-1.2mb Drive..........6,8mhz $1,500 — 6,8,10mhz $1,700 — 6,8,12mhz $2,000
1-1.2mb 1 360k Drive6,8mhz $1,700 — 6,8,10mhz $1,900 — 6,8,12mhz $2,200
2-1.2mb Drives.........6,8mhz $1,800 — 6,8,10mhz $2,000 — 6,8,12mhz $2,300

GCS 386 1mb 120 NS RAM, PARALLEL SERIAL PORTS, CLOCK CALENDAR, VIDEO CARD, KEY BOARD, LEGAL BIOS

1 1.2mb Drive..16mhz $3,900 — 21mhz $4,100
2 1.2mb Drives..16mhz $4,150 — 21mhz $4,240

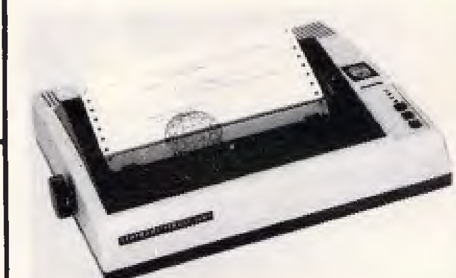
GCS computers use Award or Phonenix legal BIOS. MS-DOS 3.2 GWBASIC as well as ABLE ONE (best selling integrated program in Australia certified by Compass Research, September 87) options are available.

XT HARD DISKS DTC (USA) Controllers..20mb $620, 30mb $720, 40mb $950
AT HARD DISKS DTC (USA) Controllers..20mb $850, 30mb $1,200, 40mb $1,600, 60mb $2,000, 71mb $2,800, 105mb $3,400
TAPE STREAMERS to Back-up Hard Disk — 60mb..Japanese $1300

GCS MONITORS composite high res. monochrome $220, RGB $575 EGA $950
GCS diskettes unconditionally guaranteed s/s s/d $1, d/d 1.5 d/s 4/d $5

SUPER SPECIAL $750 WILL TRANSFORM YOUR PRESENT XT TO AT INCREASE THE SPEED 6 TIMES AND RAM TO 1MB. WE WILL CHANGE 8088 MOTHER BOARD WITH 80286 BASED ONE WHILE YOU WAIT.

GCS MONITORS		PRINTERS	
High resolution monochrome:		CTI. Made in Japan.	
720X385	$220	160 cpi. NLQ:	
RGB 640X200	$550	10 inch	$495
EGA 640X350	$950	15 inch	$725



SPECIALS

GCS DISKETTES UNCONDITIONALLY GUARANTEED S/S S/D $1.60 D/S D/S D/D $1.50 D/S 4H/D $4.80
80286 adaptors make XT computers run like AT 4 times faster..........$350
SUPER MEMORY BOARDS 2mb for XT $200 for AT..........$240
EGA VIDEO CARDS $360 mouse..........$130
MODEM ccitt v22/v21 1200/1200 300/300 $299, v21/23 3]] 1200/75$300, V21 V22 2400/2400 1200/1200 $550

GCS BUSINESS software, payable, receivable, general, ledger, stock, payroll job costing, cash book and point of sale and others.

Complete range of IBM and Apple cases keyboards power supplies drives main boards cards RAM's ROM's joy sticks mouses modems at Australias best prices prompt repair facility and much more. For detailed description on all our products please log on to our bulletin board (02) 570 8961 24 hours service.

1D

GCS

TRADE INQUIRIES INVITED

SYDNEY: 67 Blackshaw Ave., Mortdale 2223. Phone: (02) 570 1215; 570 1225; 570 9861
BRISBANE: Dazy Hill Shopping Plaza, Cupina St., Daily Hill. Phone: (07) 808 4166
CANBERRA: 69 Paterson Street, Ainslie ACT. Phone: (062) 47 2880
NEWCASTLE: 4/22 Lake Street, Warners Bay. Phone: (049) 48 8566

```
STOR SPAC(25) TO mstr
STOR DATE() TO msdate
STOR DATE() TO medate
```

Because the temporary file that holds the field names is indexed on field type and field length, like data types are grouped and arranged from shortest to longest. This makes it easy to combine identical items into more-efficient statements, eg STOR SPAC(25) TO mco,mstr.

F Wampler

Of the many ways dBase provides for appending new records, the most efficient method is usually to initialise matching memory variables (as Mr Wampler's program does), GET the memvars from the user, run any error checking, then APPEND BLANK and REPLACE the fields with the matching memvars.

Mr Wampler's routine combines several powerful but under-used techniques. COPY STRUCTURE EXTENDED creates a new database with one record describing each field of the main .DBF. The variables c, d, 1, *and* n *hold the default initialisations for each field_type. Note that* c *must be initialised inside the loop in order to hold the correct field_len. Once the ALTERNATE is turned on, each '?' statement will be saved in a text file, ready for incorporation into your program. As the loop progresses, the variable* x *does double-duty. First it picks up the current field_type from the database. Then the &x macro converts the field_type into the value of its corresponding memvar, producing the proper default.*

If you will be using these m-variables as macros, you must truncate their length at 9 instead of 10. Also, remember that the m-variables are not PUBLIC, so dBase will discard them when your appending routine RETURNs to the program that originally called it.

Note that this routine has two lines specific to dBase III Plus, both inside the DO WHILE loop. If you are using dBase III, which lacks the LTRIM function, substitute the following for the line where c *is stored:*

```
DO CASE
CASE field_len<10
   c="SPAC("+STR(field_len,1)+")"
CASE field_len<100
   c="SPAC("+STR(field_len,2)+")"
OTHER
   c="SPAC("+STR(field_len,3)+")"
ENDCASE
```

Again with dBase III, *substitute*

```
+TRIM(SUBS("m"+field_name+SPAC
(8),1,10))
```

for

```
+TRIM(LOWER(LEFT("m"+field_
            name,10)))
```

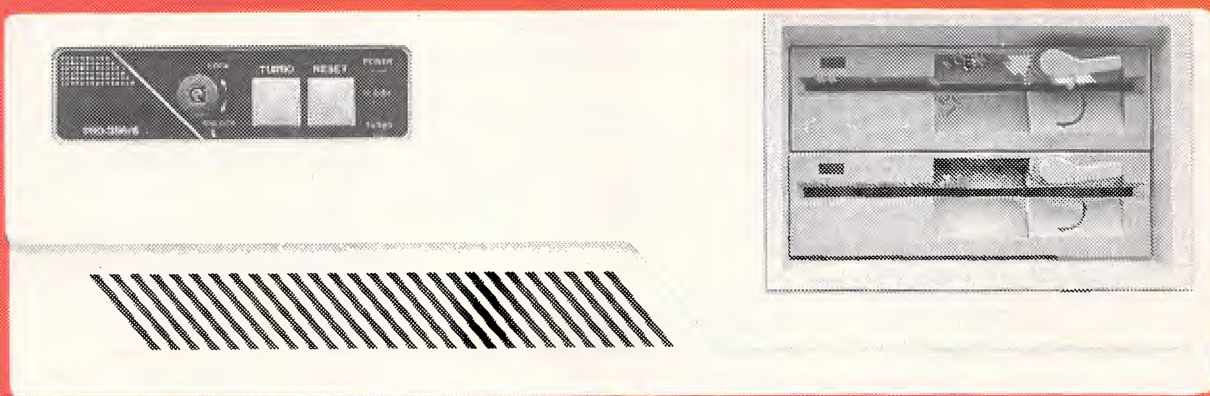
— BS.

Ghost story

We have a StarLAN network with seven stations running off an AT server under Advanced Netware. It worked well for 5 months. Then we noticed that the PC in the boss's office would sometimes mysteriously slow down or even refuse to sign on to the network. The behaviour was odd because it happened only at night! We reinstalled the software and swapped complete systems, but no matter which PC we put on that desk, on some nights it would be haunted and freeze.

It took a while, but we finally found the 'ghost'. A light dimmer in the wall

SHERRY- PRO 386
NOW IN AUSTRALIA



SINGAPORE'S NO 1 COMPUTER COMPANY OFFERS IT'S QUALITY RANGE OF COMPUTERS AT AFFORDABLE PRICES.

SHERRY PRO 386	1Mb RAM: 1.2mb F/D H/D OPTIONAL	$6450
SHERRY PRO 286	1Mb RAM: 1.2Mb F/D: 20Mb H/DRIVE	$2779
SHERRY PC XT TURBO	640K RAM: 360K F/D: 20Mb H/DRIVE	$2160
SHERRY PC XT	640K RAM: 2X360K F/D	$1352
SHERRY LAPTOP	640K RAM: 360K F/D: 20Mb H/D	$4484

ALL UNITS COME WITH
* 101 KEY KEYTRONIC KEYBOARD
* LICENSED M.S. DOS 3.2
* LICENSED GW BASIC 3.2

24 MONTH PARTS WARRANTY

DEALER ENQUIRIES WELCOME

AVAILABLE FROM:
SHERRY COMPUTER TECHNOLOGY AUSTRALIA
UNIT 5, 4 CHARLES ST, SOUTH PERTH, W.A. 6151
TEL: (09) 474 1422 - FAX: (09) 367 7526

was apparently putting out so much electrical noise that it 'deafened' the StarLAN board. The dimmer controlled a desk lamp on a side table, and the lamp wasn't on during the day and often wasn't on during the night. The dimmer was used before the mysterious problems on the network began, but a new television connection was pulled through the ceiling past the dimmer and the desk.

The proximity of the TV cable and the noisy dimmer put the hex on StarLAN when the dimmer was turned on. Replacing the dimmer with a standard wall switch exorcised the problem.

T Babson

This is a haunting story. Light dimmers and television cables are both sources of RF noise. Moving either the data or the TV cable a few feet or changing their orientation toward each other (I bet they ran in parallel) would make a difference — FD.

DOS memory control

The details of DOS memory management, introduced in DOS version 2.0, remain officially undocumented. The US magazine, *PC Tech Journal,* published information about this back in the days of DOS version 2.1 (see 'Managing Memory', August 1984, p. 42). With the recent release of DOS 3.3, it is prudent to review DOS memory management, generalise the previously published information to later versions of DOS, and fill-in some details of memory usage.

The memory above the resident portion of the operating system is divided into blocks, each beginning on a paragraph boundary (an address that is a multiple of 16). Each process 'owns' one or more blocks. Each block of memory is preceded by a 16-byte memory-control record that identifies the size and owner of the block. The layout of a memory-control record is shown in Fig 4.

If the location of one memory-control record is known, the next one can be found as follows. Add 1 to the segment address of the record to obtain the segment address of the beginning of its memory block. To this address, add the length value from word three of the control record. The result is the segment address of the next memory-control record (not the next memory block). If this calculation is performed for the last memory block (identified with a Z in the first byte of its control record), the result is the number of paragraphs of memory available to DOS. For example, in a system with 640k of memory, adding the size of the last block to its starting address results in the value A000H, which is the address of the top of memory.

DOS performs its memory-management functions by following the chain of memory-control records, creating new ones or modifying existing ones. This chain is a singly linked list — it can be followed forward to its end but not backward to its beginning. To find the beginning, DOS has a pointer to the start of the chain. The pointer is kept within the main DOS program, IBMDOS.COM, at an offset that depends on the version number. The double word at this offset, in the segment of IBMDOS.COM, is a far pointer to the first memory-control record. The location of the start-of-chain pointer is: DOS 2.0, offset 10AH; DOS 2.1, offset F6H; DOS 3.0, offset 128H; DOS 3.1, 3.2 and 3.3, offset 22H.

The simplest method for finding the segment where IBMDOS.COM is located is to display the far address at

Offset	Length	Contents
0	Byte	Signature 'Z' if last block in chain, 'M' otherwise
1	Word	ID of owning process (Segment address of its PSP)
3	Word	Length of block in paragraphs (excluding control record)
5	11 Bytes	Reserved (currently unused)

Fig 4 Layout of memory-control record

0:80H, the vector for interrupt 20H (terminate process). This method does not work, of course, if a terminate-and-stay resident (TSR) program has hooked this interrupt. A more reliable pointer is the segment portion of the far address at 0:C1H, which is contained in an instruction that is a far jump to the DOS function dispatcher.

The first memory block contains the DOS file buffers, the file-control blocks used by the handle file I/O function calls, and any device drivers loaded by DEVICE statements in the CONFIG.SYS file. This block is established and owned by IBMDOS.COM, which does not have a program segment prefix (PSP). The block identification word in the first memory-control record, therefore, has the dummy value 08H.

The second memory block contains the resident portion of COMMAND.COM. The command processor, just like an application program, has a PSP. The third block is the master environment containing the COMSPEC, PROMPT, and PATH strings and any strings inserted with SET commands.

Subsequent memory blocks contain any TSR programs, followed by the currently executing process. Each resident program initially owns two blocks. The first contains a copy of the environment; for DOS 3.0 and later, this is followed (in the same block) by the name of the executable file from which the program was loaded. The program's other memory block contains the PSP and the program itself. When a program is loaded, it is allocated all remaining memory, so this block's control record begins with a Z. If a program releases memory by shrinking this block, the signature in this control record is changed to M, the size word is updated, and a new Z record is created for the memory released.

A program gets a pointer to its environment segment at offset 2CH of the PSP. The DOS *Technical Reference* recommends that a TSR program release its environment block to save memory. However, after deallocation the value at PSP offset 2CH still points to the same location, which is no longer owned by this process. The owner identification word in the deallocated memory block's control record is properly updated to reflect deallocation and possibly subsequent reallocation to another process. Furthermore, removing the environment means that the resident program cannot be subsequently identified; this might be more of a problem than the loss of several dozen bytes of memory.

This information is offered with a

```
echo off
prompt (Type Exit and press [RETURN] to return to 1-2-3) $p$g
cd\lotus
123
cd\
prompt $p$g
```

Fig 5 A handy DOS batch file that will remind you that you still have 1-2-3 loaded when you exit to the system

caveat: it is not documented and, though it has remained unchanged since DOS 2.0, no guarantee can be made that it will remain so.
T Mirecki

Remember to exit

Many new spreadsheet programs for the IBM PC, such as Silk and Release 2 of 1-2-3, have a very helpful feature that lets you edit temporarily to DOS while the program and your work stay loaded. When you finish, the program reminds you that all you need to do is type EXIT <Enter> in order to return to the spreadsheet.

That reminder soon scrolls off the screen, however, and after you have done some DOS work or run another program, it's easy to forget that you are still running your spreadsheet. I have unintentionally loaded two copies of 1-2-3 simultaneously and then been surprised at how little memory I had available.

To solve this problem, I have rewritten the original batch file, through which I call 1-2-3, to the one in Fig 5. It now changes the DOS prompt so that if you exit 1-2-3 temporarily with the /System command, the prompt will include the reminder that EXIT will return you to 1-2-3. Since the batch file is still running when you leave 1-2-3 for good, the last line of the batch file restores a more conventional prompt that indicates your current directory. The file assumes that 1-2-3 is in a directory called \LOTUS, but you could, of course, change it to whatever you use.
C Davis

This is a good idea that should work with any program, spreadsheet or otherwise, that lets you temporarily exit to DOS. I wouldn't change the prompt to include the entire "Type EXIT . . ." message, though. Just a word or two would be enough of a reminder.

Switching to a longer prompt adds material to your environment. If you already have a lot in there, the new prompt string could push you over DOS's normal 160-byte limit. You can expand the environment space available when you boot up by using the /E switch with the DOS SHELL command in versions 3.2 and 3.3.

Each copy of COMMAND that is loaded receives a copy of the current environment. In versions of DOS prior to 3.0, the size of the environment copy is limited to the size of the original. So if the environment is full when you start 1-2-3, you will not be able to add to it. Beginning with DOS 3.0, this restriction no longer applies — JT.

Difficult sorts

Every now and then you find you have to sort spreadsheet data of the kind represented in Fig 6. Unfortunately, if you would like to sort the items by the Value figure in Column D, you're in big trouble. Since some of the descriptions are longer than the width of Column C, they take up more than one row. This leaves blanks in Column D, so if you sort by that column, all of the blanks will sort together and mess up your data.

I have a solution that will work in any

```
          B              C                      D          E          F
     --------------------------------------------------------------------
 7 | Item #         Description            Value
 8 |
 9 |   3182   Apples, Oranges, Peaches                     175
10 |            Pears, Plums                  $175         175
11 |   3200   Apples, Oranges                 $110         110
12 |   3215   Apples, Oranges, Pears,                      215
13 |            Peaches, Plums, Bananas,                   215
14 |            Pineapples, Cherries          $215         215


     \A       {goto}e9~
              @if(+d9>0,+d9,+e10)~
              /ce9~e10.e14~
              {calc}
              /rve9.e14~e9~
              /dff9.f14~1~~~
              /dsdb9.f14~pe9~a~sf9~a~g
```

Fig 6 A technique for sorting multi-row entries

Desktop Publishing on the PC

only **$39.95!**

•DESKTOP PUBLISHING: THE BOOK. *Here's what Desktop Publishing Magazine said in October 86: "The Definitive Tome on Desktop Downunder has just been published, and it's a ripper. Tim Hartnell's book tells you just about everything you need to know about gaining power over print - and then some more. The 12 chapters cover almost all the how-to areas: use of type; how to set up a bureau; creating your own ads; business stationery; newsletters and in-house magazines; technical manuals; and book publishing..."*

•CHIWRITER. *A multi-font word processor supporting up to 10 fonts and 250 super/subscript levels per line. It is true 'what you see is what you get' and is extremely easy to use. It works with a variety of printers and can produce both fast draft and final, publishing standard high resolution printing. Comes with the operating manual MASTERING CHIWRITER*

•BUSINESS FORMS. *A significant amount of desktop publishing activities in business centre around designing forms for office use - invoices, stock sheets, order forms and so on. The manual CREATING BUSINESS FORMS tells you how to get underway immediately, generating master forms tailored to your individual needs. The program FORMS allows you to create or revise a master form or a filled-out form. Master and completed forms can be stored on disk as well as printed. Once a master form has been created and saved, it can be recalled an unlimited number of times to be filled out, and then stored - if needed - as a completed form.*

Yes! Now you can enter the world of desktop publishing with *Tim Hartnell's Desktop Publishing Kit* - for just $39.95!

There are ***FOUR*** modules, designed to get you up and running from the *first minute* you get the kit:

- A copy of Tim Hartnell's acclaimed book ***DESKTOP PUBLISHING: THE BOOK***
- The program ***CHIWRITER***, along with the operating manual ***MASTERING CHIWRITER***
- The program ***FORMS***, together with its operating manual ***CREATING BUSINESS FORMS***
- The ***two-disk*** on-screen art drawing program ***PC-KEY DRAW***

To run the Desktop Publishing Kit, all you need is a PC or close compatible, at least 256K, an IBM graphics card and an FX-80-compatible printer.

THE WINNING EDGE - Apple II/IBM PC

If you enjoy investing on the horses, but don't enjoy it so much when your investment doesn't pay off, you'll welcome this program which is designed to give you 'the winning edge' when it comes to betting. All you have to do is answer the questions the program puts to you. Once you've done this, the computer will give you advice on to how to place your 'winning' bets! THE WINNING EDGE - $34.95

24-hour live answering

Call us *any time* to place an order, or to ask for a copy of our *free*, brand new, value-packed catalogue.

03-648 1191

When our receptionist answers, be ready to give her your name, address, make of computer, the names of the programs you want, and your Bankcard, Visa or Mastercard number. *That's all there is to it!*

MS-DOS TUTOR IBM PC/compatibles

Now you can master MS-DOS the proven way with Tim Hartnell's MS-DOS Tutor; large detailed manual, and tutorial disk. "I learned more in four hours with your MS-DOS Tutor than in months of trying to understand the DOS manual" - *Keith McNeil, Nth Ryde.* **And best of all, the *entire* tutorial package is *just* $41.62!**

PC BASIC Tutor IBM PC/compatibles

Now you can learn to program your PC in BASIC in a matter of hours. Well-known computer author and columnist Tim Hartnell leads you step-by-step in this complete guide to first time use of the PC. 108-page manual plus disk. As well as the tutorial programs, the disk contains a *complete starter library* of software including database, spreadsheet and word processing program (and more)! $32.29!

Both tutors together - just $58.26 (instead of $74.91)!!

▶EXPLORING ARTIFICIAL INTELLIGENCE Apple II/IBM PC With this software package, you'll be equipped to take a fascinating voyage. *Can a machine think?* Find out for yourself! Detailed text; programs include BLOCK-WORLD, X-SPURT, TIC-TAC and SYLLOGY. **$39.95**

▶PARADIGM POWER UTILITIES!

For all MS-DOS computers, the *Paradigm Power Utilities* allow you to retrieve deleted files, give you *byte by byte* control over your disks, includes a *RAM-disk* to be your system's third drive, a multi-copy, user-controlled print *spooler*, SECTSAVE to locate and (if possible) retrieve bad sectors on a disk, display the contents of an ASCII file line by line, add or change the volume label of your disk, alter file attributes, and **more**. With a very detailed manual which takes you step by step through using the utilities. **Just $24.95!**

WAKE UP YOUR FINANCIAL GENIUS Apple II/IBM PC. This collection of four, 'real world' management financial simulation games, in which you 'earn' millions of dollars, will test your brains in international finance. **$25.95**

Interface Publications (Aust.) Pty. Ltd.,
34 Camp St, Chelsea, Vic., 3196 *03 648-1191*

OK Tim, please send me the following:

[ ] Desktop Publishing Kit - $39.95 [ ] Exploring AI - $39.95
[ ] MS-DOS Tutor - $41.62 [ ] PC BASIC Tutor - $32.29
[ ] PC BASIC & MS-DOS Tutors - $58.26 ***(special combined price!)***
[ ] Financial Genius - $25.95 [ ] Paradigm Utilities - $24.95
[ ] The Signwriter - $24.95 [ ] ELIZA - $25.95
[ ] The NEW Interface Catalogue - free!

I have [ ] IBM PC/comp. [ ] Apple II [ ] Mac

Total cost of software - $__________
Plus 20% sales tax - $__________
Plus $3.00 post/pack - $ 3.00
Total enclosed: __________

apc 11/87

Or please charge my [ ] Visa [ ] Bankcard [ ] Mastercard

Card no. __________
Name __________
Address __________
__________ P'code __________

NEW FREE CATALOGUE!
IBM PC Apple II Mac

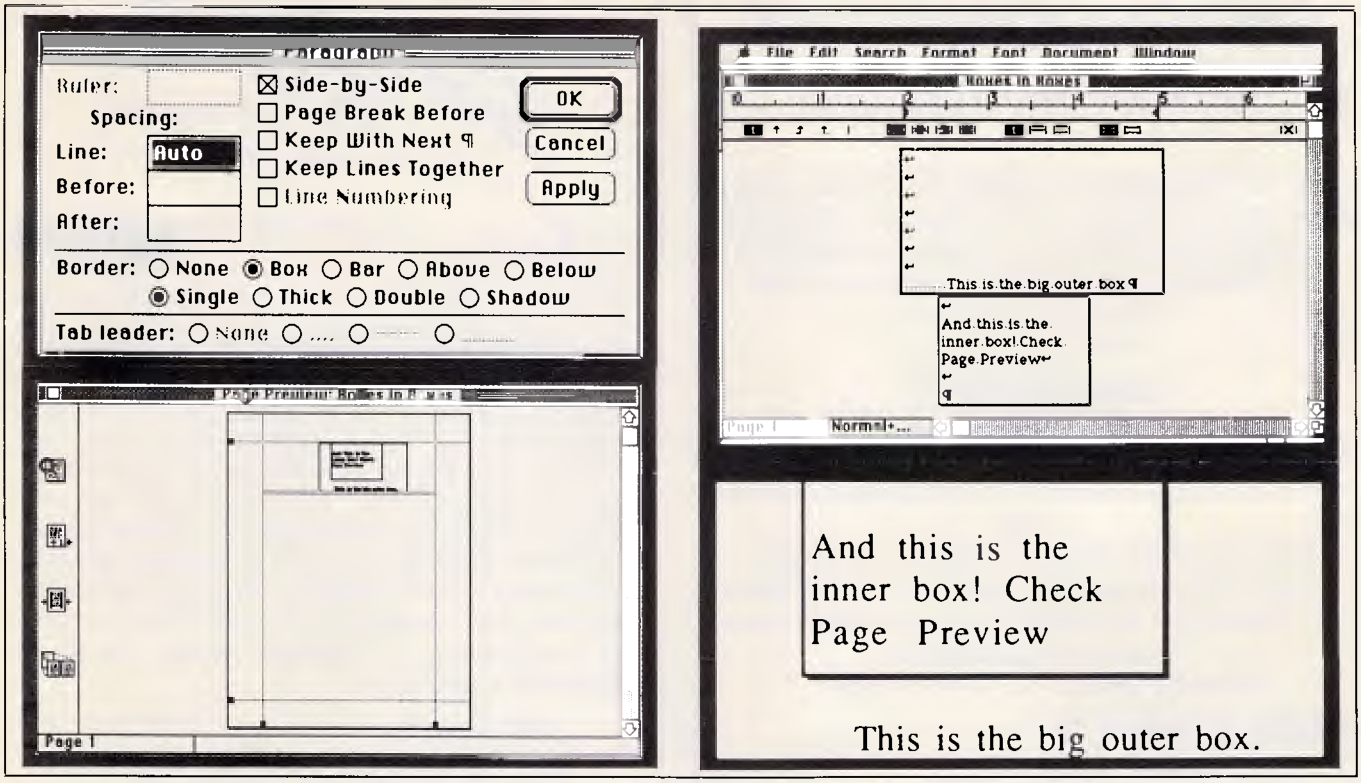


Fig 7 It's possible to create graphic boxes inside graphic boxes in your Word documents. These illustrations (and the accompanying text) show you how to do it

spreadsheet that can fill data and sort by more than one key. For purposes of illustration, I have used 1-2-3 notation.

- Set aside two columns to the right of your data, in this case columns E and F. (E would be blank to begin with.)
- In cell E9 simply enter the following formula:

@if(+d9>0,+d9,+e10)

- Copy that formula down as far as you want to sort data. You may then need to recalculate the spreadsheet. (Fig 6 shows the results at this stage.)
- Turn the formulae into values. (In Release 2 of 1-2-3, you can do this conversion easily enough with the /Range Values command.)
- In Column F, use /Data Fill to enter an ascending sequence of numbers down the length of the data area.
- Sort the data using Column E as the primary sort key and Column F as the secondary sort key.

Your worksheet will now fall into place, sorted by value. If you prefer to use a macro, macro \A will do all these steps automatically.

You can now delete the numbers in Columns E and F if you want to. However, if you ever need to put your data back in its original order, the easiest way is to re-sort on Column F.

R Mohr

The more you use simple sorts, the more you discover what they can't do. This is a good solution to an occasional problem — JT.

Mac Word

Sometimes it's desirable to do a box inside a graphic box. A good example is a disk label, where you might want to put a date box inside a larger box that serves as the label outline. It can be done in Word 3.0X using the Side by side paragraph option. As shown in Fig 7, the graphic is actually two paragraphs side by side, with their margins overlapping. This causes them to print superimposed on each other. Rulers and returns are pretty much self-explanatory. Try a little trial and error in Page Preview mode and you'll see how it works.

You'll find it easier to use Shift-Returns rather than plain Returns, so you're just dealing with two paragraphs.

To make the box within a box, start with the bigger box. Select PARAGRAPH from the Format menu, and format the new paragraph as SIDE BY SIDE, with a single box border. Use Shift-Returns to set the depth and

SUPER PRICES FOR SUPERCOM PC/XT COMPATIBLES

Our XT/Turbo features 256k RAM, 360k disk drive, CGA and multi- function card, 150W P/S, 84key keyboard, Pheonix BIOS and MSDOS 3.1, tilting green screen monitor and ONE YEAR guarantee!
and the price-

just $999!!!

(price includes sales tax!)

640K RAM model with 2xdrives and other features as above available for an amazingly low $1395

Other configurations including hard-disk drives, EGA etc are also available direct from the importers. Just drop in to our show room at our new address or
call us NOW on our new number:

RAM SUPPLY

111 BEST ROAD, SEVEN HILLS
621 5509

prices subject to changes without notice. Delivery charge extra.

SOFTWARE TO GO

AUTHORISED DEALER

AMIGA commodore AMSTRAD

Offers Australia's largest Mail Order range of Hardware, Software and Accessories for AMIGA, COMMODORE C16, PLUS 4, C64, 128 and AMSTRAD 464, 664, 6128 home and small business computers.

Select from a wide range of Printers - Interfaces - Cables - Screen Filters - Blank Disks - Disk Boxes - Data Care Products - Modems - Joysticks - Books - Dust Covers - Printer Ribbons - Paper - Labels - Business Programmes - Spread Sheets - Utilities - Word Processors - Databases - Graphic Designers - Music Makers - Strategy and Arcade Games - War Games and Simulations and more.

In fact anything to do with Home and Small Business computers.

Write or phone now for free catalogue.

SOFTWARE TO GO, P.O. BOX 5A, MT. KURING-GAI. N.S.W. 2080.
Telephone: (02) 457 8289 (all hours).

IBM SOFTWARE

$5 a Disk

We have a great range of Public Domain and User Supported software for the PC and compatibles. As our opening offer we are giving it away at only $5 a disk.. These include programs for Business, Pleasure, and Education. For example a small listing below:

001 PC-WRITE	220 P-BASIC
002 CHIWRITER	410 EMPIRE ADVENTURE
003 PC-OUTLINE	420 MONOPOLY
010 PC-FILE	440 PC-CHESS
011 PC-GRAPH	450 PC-GOLF
031 CHEQUEBOOK	500 TYPING TUTOR
040 PROJECT MANAGER	502 MATHS TUTOR
050 PDS QUOTE	520 COMPUTER TUTOR
080 STOCK ANALYSIS	550 GENEOLOGY
090 FARM MANAGER	600 PC GRAPHICS
200 SMALL C	601 PC KEYDRAW (2 DISK)

Postage & Handling $3 per order

FOR YOUR FREE CATALOGUE

(02) 550-3318

OR WRITE TO

A.P.D. SOFTWARE LIBRARY
P.O. BOX 125
ENMORE NSW 2043

BANK, VISA & MASTERCARD WELCOME
PHONE & MAIL ORDER

A BETTER SOLUTION

To your software and hardware purchases

- FIRST CLASS products
- ECONOMY prices

***TECHWAY External 3 1/2" Disk Drive PS/2 compatible, 720k..$650**
***PFS : FIRST PUBLISHER Economy Desktop Publishing $175**
***WORDSTAR 2000+ Top quality Word Processing $300**

ABS SOFTWARE PTY LTD
Phone (02) 543-1078

Call for items not listed

All prices include sales tax
Products sourced from official Aust. distributors
Bankcard, Mastercard welcome
Some stocks limited at advertised prices

the margin markers on the ruler to set the width of the box. You can add text anywhere in the box. Just position the cursor and type it in.

Format the smaller inside box in the same way. Use the margins to place the box in place horizontally. Vertical spacing is pretty much trial and error. Use Returns and check your work in Page Preview.

R Wallace

Word 3.0

• There's a simple and fast way to count words in a Macintosh Word document. You'll need a public word counting desk accessory such as Steven Martin's WordCount Utility 3.0, which should be installed using Font/DA Mover either in your System or (my preference) in Word itself. WordCount can't read Word files, but it can read Text files. Thus, all you have to do is save your document (under a different name — say Document-Count) as a Text file (click on FILE FORMAT . . . in the Save As . . . dialog box and click on the second radio button, TEXT ONLY). Then close this document. Open WordCount, open Document-Count and WordCount will give you an accurate word count.

I Gerstein

• Word will open any file that has the file creator MSWD and the file-type WDBN, even if Word 3.0 (or 3.01; 3.01 works wherever 3.0 is mentioned here) was not used to create and, in fact, even if it isn't a word processing file. This 'feature' is especially useful when you are recovering files from a damaged disk. When you send such a disk through the repair/recovery facility of Mac Tools, you end up with a bunch of 'recovered Files'. To use these files you give them the correct creator and type.

Start by using Mac Tools' Info Edit feature to change the file attributes as follows: change all the creators to MSWD and all the file types to WDBN. Then launch Word 3.0 and open each 'Recovered File' in turn.

Word 3.0 files open normally (as you would expect). MacWrite and Word 1.0X files open after giving you notice of your origin. You can save them in either their original format or in Word 3.0 format. All other files will display a warning then open as though they were ASCII text files. The content and arrangement of the data can then be used to determine which files are actually Excel, FileMaker, MacDraw, etc, files. You shouldn't have to guess about which attributes belong where. This will save you much time.

H Le Blanc

• When formatting a table in Word 3.0 (or any version including 1.0X for that matter), changing the alignment of columns can be difficult if the table is laid out with Returns at the end of each row of data. If that is done, each row is treated as a separate paragraph, and it's a real pain to realign each paragraph separately.

The solution is to end each line of data with a Shift-Return rather than a plain Return. This puts all the data in the same paragraph. Thus, columns can be realigned by clicking anywhere in the data area and then dragging the tab mark on the ruler to the desired location.

R Wallace

Get your upgrade to Word 3.01 — HP.

Ready, Set, Go! 3.0

Here's a way to stretch or compress a headline to change the proportions of the letters. Simply paste the whole text box that contains the headline in a picture box of about the same size. Then, as you change the vertical or horizontal scale of the picture block in the Picture Block Specifications dialog, your headline text will become tall and narrow, or wide and bold, or even tall and wide, to suit your needs.

D Miles

Disk labels

Have you ever had a label refuse to stick, or worse yet, peel off inside your disk drive? The next time you put a label on, peel off the paper backing and heat the adhesive side with a hair dryer for a few seconds. Then apply the label to the disk. The label will stick longer and better. This technique is an especially good way to apply permanent labels to disks (such as backup disks) that you expect to take a lot of wear and tear.

L Kershner

Random-access data

Applesoft's READ and DATA statements are fine if you're reading in only small amounts of data or if you read the data only once during program execution. If you require multiple reads of data or need to read it out of the order

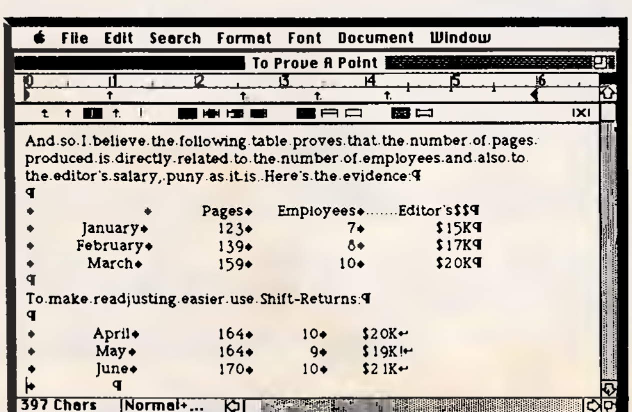


Fig 8 Changes in the alignment of columns in tables in Word documents are much easier if you use Shift-Returns at the end of each line of data rather than ordinary Returns

TIGER POWER CREATE HIGHER ADDED VALUE

We offer 80386 power supplies at a wattage range from 200W to 350W.

Quality Guaranteed:

1) 100% Power cycle burn-in at 50°C
2) Every Unit is tested by Automatic Test Equipment

R60200

E-97155

LR-65589

FMC8HM

FTZ

BM-7000, BM-6000 Series
- 200 — 350w
For Universal Model UL, CSA, TÜV Label optional or 3 Label in 1 Unit.

BM-3000 Series:
- 135 — 200 W
- 150 × 160 × 150 mm

BM-2000 Series:
- 100 — 200 W
- 150 × 140 × 86 mm

OEM WANTED!

TIGER

Manufacturer & Exporter

LEAD YEAR ENTERPRISE CO., LTD.

3F, NO. 481, CHUNG HSIAO E. ROAD SEC. 6, TAIPEI, TAIWAN, R.O.C.
P.O. Box 53-352 Taipei, Taiwan, R.O.C. Telex: 10862 LEADYEAR
Tel: 886-2-785 7858 (Rep) Fax: 886-2-785 7852

IBM AND COMPATIBLES

RACEFORM TECHNOLOGY

PRESENTS

Dealer Enquiries Welcome

A HORSE RACE SELECTION PROGRAM THAT EMBODIES ALL THE CRITERIA WHICH ARE DEEMED BY PROFESSIONALS TO BE INHERENT IN SELECTION SYSTEMS. FOR IBM AND COMPATIBLES.

FOR DETAILS:

RACEFORM TECHNOLOGY
G.P.O BOX 483
BRISBANE 4001
PHONE (07) 849 5057

FOR DOS PARTITIONS UP TO A GIGABYTE

Vfeature® DELUXE

You can put your entire hard disk, or *two*, in one bootable partition, or you can create up to twenty-three partitions which DOS sees as separate drives.

Vfeature Deluxe lets you use the big drives you thought your system couldn't support. You aren't bound by the AT Drive Types or by the XT 10-megabyte limit—you can use *any* physically-compatible drive, without hardware modifications.

Vfeature Deluxe is smart software. It runs under DOS with AT, XT, and compatible hard disk controllers, including RLL, ESDI, and SCSI controllers. It comes with everything you need to install it—a physical formatter with bad track mapping, a high-level format, a thorough manual, good Tech Support when you need it—and extras, like cluster size control for each partition (bet you thought that was another DOS limit), and passwords to lock your keyboard, your disk, and your system.

See your dealer or call us for information about this and other smart software.

BEAT THE LIMITS!

GOLDEN BOW SYSTEMS

$210.00
+tax if applicable

Distributed by
PCs PLUS
11 Sevenoaks Rd,
East Burwood
Tel: (03) 233 7955
Fax (03) 233 2909

Vfeature is a registered trademark of Golden Bow Systems

FTL MODULA-2 Compilers $90-$125

You've probably heard of Modula-2, Niklaus Wirth's newest language: It's now available for a range of machines from JED Microprocessors.
This implementation was written in Australia, and is being sold world-wide. It's available for small-memory MS-DOS and CP/M Z-80 at $90 and large memory MS-DOS and 68000 (Atari) at $125.
It contains an integrated full-screen editor with fast compilation and linking from libraries, which makes it more powerful than Turbo-P., and much easier to use on large programs. You get 1 meg of soft-ware on three full disks, with full sources of the editor and many other modules and utilities. It produces fast, PROM-able code which closely follows Wirth's third edition, with 8087 and LONG support.

MTBASIC Multitasking BASIC Compiler................$125

MTBASIC is an easy to use BASIC which allows interactive program writing and checkout, followed by easy production of a PROM-able COM file on disk. The multi-tasking allows time or interrupt task switching, ideal for process control where operator I/O and communication occurs while the control work goes on. MT8087: $160.

Both compilers are available for many MS-DOS and CP/M formats. (Above prices are tax-exempt. Add 14% for tax inc.)

Phone (03) 762 3588 to order (VISA, B/C, cheque OK), or to receive detailed data or a JED 30-page catalogue of STD-bus CMOS single board computers for data logging or control.

JED

JED MICROPROCESSORS PTY. LTD.
Office: 7, 5-7 Chandler Rd, (P.O. Box 30), Boronia, 3155 VICTORIA, AUSTRALIA

```
10 HOME : VTAB 3: PRINT "OPTIONS"
15 PRINT : PRINT "1. OPTION ONE": PRINT "2. OPTION TWO": PRINT
"3. OPTION THREE": PRINT
20 PRINT "CHOICE=> ";
25 GET A$: IF A$ < "1" OR A$ > "3" THEN 25
30 ON VAL (A$) GOSUB 100,200,300
35 GOTO 10 1
00 A = PEEK (121) + 256 * PEEK (122) + 1: GOSUB 400: READ B$:
VTAB 12: PRINT B$: GOSUB 500: RETURN
105 DATA THIS IS OPTION ONE
200 A = PEEK (121) + 256 * PEEK (122) + 1: GOSUB 400: READ B$:
VTAB 12: PRINT B$: GOSUB 500: RETURN
205 DATA THIS IS OPTION TWO
300 A = PEEK (121) + 256 * PEEK (122) + 1: GOSUB 400: READ B$:
VTAB 12: PRINT B$: GOSUB 500: RETURN
305 DATA THIS IS OPTION THREE
400 B = PEEK (A) + 256 * PEEK (A + 1) - 1: POKE 125,B - INT (B /
256) * 256: POKE 126, INT (B / 256): RETURN
500 VTAB 23: PRINT "PRESS ANY KEY TO CONTINUE: ";: GET A$:
RETURN
```

Fig 9 Random-access DATA statements

in which it appears in the DATA statements, then using READ and DATA statements is troublesome — you can read DATA statements only sequentially, not randomly.

What Applesoft really needs is a command to RESTORE to a specific line number, where the line number contains the DATA statement you wish to READ. Although no such command exists, you can simulate it by manipulating Applesoft pointers. In the line immediately before the DATA statement you want to READ, you must PEEK the two-byte pointer at locations 121 and 122 — the address of the statement being executed. Next, add 1 to this number and then PEEK the resulting two-byte pointer and subtract 1. This procedure gives you the address of the next line, which contains the DATA statement to be read. Finally, POKE this value into locations 125 and 126, which holds the memory address of the next DATA statement to be read. You can now READ the DATA statement.

The program in Fig 9 illustrates this technique.

V O'Connor

Open-Apple Auto-repeat

I'm not sure why, but the ⌘ /open-apple key on the IIGS begins to automatically repeat if you hold down the Control and Delete keys at the same time. (Make sure you press ⌘ /open-apple before holding down Control and Delete.) The system thinks that the push-button input it defines keeps switching between on and off, which is great for rapid firing in shoot-'em-up games. Change the Control Panel Repeat Speed setting to adjust the firing speed.

This same trick does not work with the Option (solid-apple) key. What happens instead is that the system thinks the Option key is always on, even if you release it. To return to normal, type Control/open-apple/Delete.

S Corley

Trapping Ctrl-Alt-Del

Most good programs provide some type of protection against inadvertent operator errors. For example pressing Ctrl-Break on an IBM PC in an accounting program could cause it to end before important information has been written to disk. But one action that's difficult to guard against is rebooting with Ctrl-Alt-Del.

Personally, I've always felt that if someone wants to get out of a program that badly, then you should let him. Still, preventing even this drastic action is possible.

Trapping Ctrl-Break is easy, because the address for this routine is kept in low memory. All a program has to do is POKE a new address there, which usually points to a return instruction located somewhere in ROM. But Ctrl-Alt-Del is handled entirely by the PC's BIOS, so another approach is needed.

The Answer

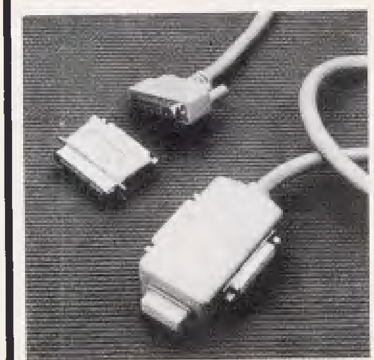
To Costly Printer and typewriter Cartridges

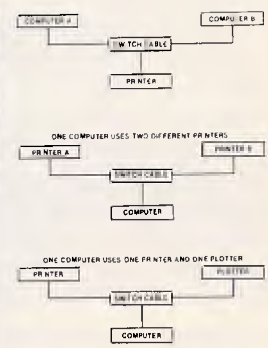
Re-ink ribbons again and again on your premises with Macinker. Driver kits fit onto a Universal base to re-ink many kinds of printer and typewriter fabric ribbons. Coloured inks and un- inked cartridges and reloads also available. If you use a lot of ribbons, or if ribbons for your printer are hard to obtain or if you need to use coloured ribbons then you need a Macinker. Call us for your nearest stockist.

Aussoft
(07) 286 5590
PO BOX 476, CLEVELAND
Q 4163

$66 incl. tax Switch Cable

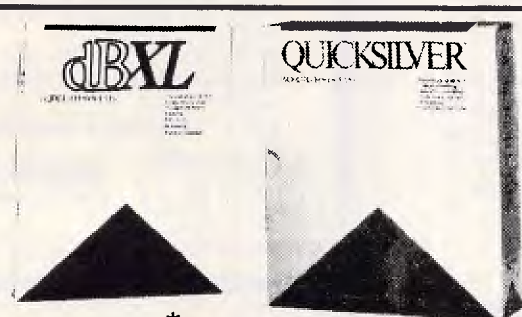
- Introducing the all new, revolutionary switch cable.
- Small, mount-anywhere design, printer A-B switch complete with built-in printer cable replaces the old switch box and eliminates clutter.
- Each switch cable comes with a free printer adaptor plug, enabling you to switch quickly from main board to printer, adding versatility to the cable and your system.





MANY VALUABLE FEATURES!

THE MONITOR SHOP
Computer Visual Systems
315 Whitehorse Road Balwyn, 3103 (03) 836 6878
DEALER ENQUIRIES WELCOME



dBASE* SUPERPOWER

dBXL $200

The dBASE III* plus "Superclone".

Just as you can buy two versions or more of programs like BASIC, you can now buy two versions of dBASE power.

QUICKSILVER $599

The first compiler for dBASE III* Plus.

Quicksilver compiles your dBASE III Plus programs into machine code that runs almost at the "speed of light".

dBCHART presents data from dBASE II and III files in graphic forms. Options are available to allow the presentation of charts in many graphic formats and colour combinations.

dB COMPILER
The first true compiler for dBASE II. No more License fees, substantial speed improvements, 96 memory variables, plus several new features. dB COMPILER runs on CPM, MS/PC-DOS

All packages run on PCDOS and generic MSDOS machines. Special INTRODUCTORY price for a limited period only. Normal price of dBXL is $369 and Qicksilver $1198. CHEQUE. VISA or BANKCARD acceptable. Add 20% for SALES TAX.

CALL FOR A PRICE ON ANY OTHER PRODUCT

WORDTECH AUTHORISED REPRESENTATIVE

MDMS (02) 745 1995, Suite 7/15 Parnell St, Strathfield, NSW 2135

*Trade Marks of Ashton-Tate

DISKETTES

3½ — 5¼

QUALITY

LIFETIME G'TEE

DEALERS REQUIRED

energy CONTROL

ENERGY CONTROL INTERNATIONAL PTY LTD
P.O. Box 6502
GOODNA Q 4300
26 Boron St
SUMNER PARK Q 4074
Brisbane AUSTRALIA
Phone 61 07 376 2955
Telex AA43778 ENECDN
Fax 61 07 376 3286

```
N NOBOOT.COM
A
JMP  0139          ;JMP INITIALIZE
DW   0
DW   0
STI                ;New_INT9 starts here
PUSH AX            ;save registers
PUSH DS
IN   AL,60         ;read the keyboard
CMP  AL,53         ;was it the Del key?
JNZ  0132          ;no, CONTINUE old INT 9
MOV  AX,0000       ;prepare to see if any
MOV  DS,AX         ;  shift keys are active
MOV  AL,[0417]     ;get the status byte
TEST AL,08         ;is the Alt key down?
JZ   0132          ;no, CONTINUE old INT 9
TEST AL,04         ;is the Ctrl key down?
JZ   0132          ;no, CONTINUE old INT 9
IN   AL,61         ;acknowledge keystroke
MOV  AH,AL         ;  so the key won't be
OR   AL,80         ;  hanging around later
OUT  61,AL         ;  (we're simply going
MOV  AL,AH         ;  to ignore it)
OUT  61,AL
MOV  AL,20
OUT  20,AL
POP  DS            ;restore the registers
POP  AX
IRET               ;all done, return
POP  DS            ;CONTINUE to old INT 9
POP  AX
CS:                ;jump to address held at
JMP  FAR [0102]    ;  102 in code seg
MOV  AX,3509       ;INITIALIZE get original
INT  21            ;  INT 9 address
MOV  [0102],BX     ;save it at address 102
MOV  [0104],ES     ;  in our code segment
MOV  DX,0106       ;point INT 9 to our new
MOV  AX,2509       ;  handler at address
INT  21            ;  106 in code segment
MOV  DX,0139       ;last address to save
INT  27            ;terminate resident

RCX
53
W
Q
```

Fig 10 NOBOOT.SCR script to create NOBOOT.COM, which prevents rebooting a PC with Ctrl-Alt-Del. Type it using a pure ASCII word processor or the DOS COPY CON command. Ignore the text following the semicolons. Hit Enter at the end of each line (especially the last one with the Q), and be sure to leave a blank line before RCX. Then type DEBUG < NOBOOT.SCR to create the program

The DEBUG script shown in Fig 10 will create a program that stays resident and intercepts keyboard interrupt 9. Once NOBOOT has been loaded, it will receive control every time a key is pressed. If the key is anything but Ctrl-Alt-Del, then it passes on to the original interrupt 9 handler in ROM. Otherwise, it simply ignores the request and returns.

To create NOBOOT.COM, type the instructions with a pure ASCII word processor (omit the text after the semicolons), or use the DOS COPY CON: command to make a file called NOBOOT.SCR. Then, with NOBOOT.SCR on the same disk as DEBUG, enter

DEBUG < NOBOOT.SCR

The remarks are shown for clarity and need not be entered, though be sure to include the blank lines above RCX and after Q. When DEBUG finishes, NOBOOT.COM will have been created. Once NOBOOT has been run, it will be impossible to reboot without turning off the power.

E Winer

Some programs that take over INT 9,

such as SideKick, will steal the interrupt back, so if you want to run NOBOOT with SideKick, be sure to load SideKick last — PS.

Transposition

I very often reverse the order of letters in words (eg, typing 'magaznie' instead of 'magazine'). To simplify correcting this error I have created the following WordPerfect macro:

```
Ctrl-F10  :   Invoke macro creation
Alt-S     :   Define name of macro
Del       :   Delete character under cursor
Rt Arrow  :   Move right one character
F1        :   Invoke the Undelete function
1         :   Restore the character
Ctrl-F10  :   End the macro creation
```

To invoke the macro, place the cursor under the first of the transposed letters and press Alt-S. The letters will switch their positions whether you are in Insert or Typeover mode.

E Feinstein

You may want to modify Mr Feinstein's macro to emulate the style of transposition you need most.

For example, I'm familiar with an editor that transposes the two characters before the current cursor position, so my Alt-S macro starts with <left> <left> — NR.

Banner occasions

Special occasions (birthdays, babies, retirements) can be commemorated with banners. Fig 11 shows a short Basic program for the IBM PC that allows you to make banners using your PC printer.

The characters in the banner are formed using the character pattern table, which is stored in ROM at F000:FA6Eh. The lines that use PEEK extract a bit from that table and use it to determine whether blanks or blocks will be printed.

The program was written for a Gemini 15x printer, though the printer codes will also work with an Epson FX or RX series printer. The number 239 is the code for the completely filled-in block in the Gemini 15x character set. This varies quite a bit from printer to printer; for example, an Epson uses ASCII 140, and many other printers use 219.

J Parsly

For printers that cannot print the extended ASCII character set, you could instead substitute the actual character being drawn. To do this add the statement

Char = Asc(Mid$(Msg$, Letter, 1))

immediately below the line

```
'----- Banner.Bas by James A. Parsly

Width "LPT1:", 255                       'disable line wrap
Def Seg = &HF000                         'segment of ROM characters

Line Input "Enter the message: ", Msg$
Input "Enter Height and Width: ", Height, Wdth

LPrint Chr$(27) "@" Chr$(27) "A" Chr$(4);       'set 4/72 line spacing
Margin = 40 - Height * 4                        'calc vertical center

For Letter = 1 To Len(Msg$)
    Offset = Asc(Mid$(Msg$, Letter, 1)) * 8     'char pattern in ROM
    For Column = 7 To 0 Step -1
        A$ = Space$(Margin)
        For Row = 7 To 0 Step -1                'get bits from table
            Bit = Peek(&HFA6E + Offset + Row) And 2^Column
            If Bit = 0 Then
                A$ = A$ + Space$(Height)
            Else
                A$ = A$ + String$(Height, 239)
            End If
        Next Row
        For K = 1 To Wdth
            LPrint A$
        Next K
    Next Column
Next Letter

LPrint Chr$(27) "@";
```

Fig 11 A Basic program that lets you create a banner

For Letter = 1 To Len(Msg$)

Then simply replace the 239 with CHAR — EW.

Keyboard stuffing

The program in Fig 12 shows how to execute any command or program after an IBM PC Turbo Pascal program ends. The procedure must be called last in a program, just before quitting. The command to be executed must be input exactly as it would be if typed from the DOS prompt. Several successive commands can be invoked by pressing the Enter key between them, as long as the total number of keystrokes is less than or equal to 15.

Type in the program STUFFER.PAS and compile it to disk. To run it, enter

STUFFER *command*

from the DOS prompt, where *command* is a DOS command or program name.

E Rodriguez

This program works by 'stuffing' characters into the keyboard buffer, a task normally handled by INT 9, the hardware keyboard interrupt. It's certainly an easy way to select the program to be executed after your Turbo program. Do note that if you use this technique within a batch file, the stuffed keystrokes will be passed as input to the next program in the batch. Some programs clear the keyboard buffer on input, but many (the Turbo compiler among them) do not. The batch file TURBEDIT, shown as Fig 13, will bring up Turbo and go directly to editing the filename you give it. That's a useful utility! — NR.

END

```
{$R+}
PROGRAM stuff_command;

TYPE
  wstr = STRING[16];

VAR
  i, k : Integer;
  comm : wstr;

  PROCEDURE Stuff(Str : wstr);
  VAR
    i : Byte;
    head : Integer ABSOLUTE $0040 : $001A;
    tail : Integer ABSOLUTE $0040 : $001C;
    buffer : ARRAY[$1E..$3C] OF Byte ABSOLUTE $0040 : $001E;
  BEGIN
    IF Str[Length(Str)] <> #13 THEN Str := Str+#13;
    tail := head;
     FOR i := 1 TO Length(Str) DO
       BEGIN
         buffer[tail] := Ord(Str[i]);
         buffer[tail+1] := $0F;
         IF tail = $3C THEN tail := $1E
         ELSE tail := tail+2;
       END;
   END;

 BEGIN
   comm := '';
   IF ParamCount > 0 THEN
     comm := comm + ParamStr(1);
   comm := comm + #13;
   stuff(comm);
 END.
```

Fig 12 A program to place a command in the keyboard buffer

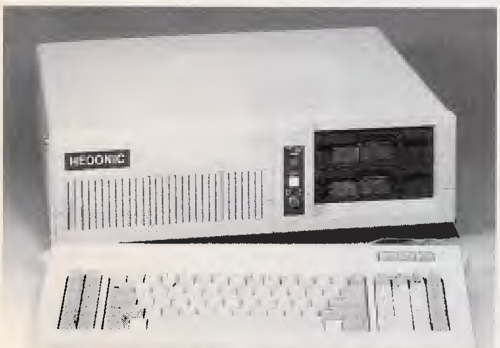
```
REM TURBEDIT.BAT -- type "TURBEDIT <filename>"
stuffer ye%1
turbo
```

Fig 13 A batch file for use with STUFFER.COM

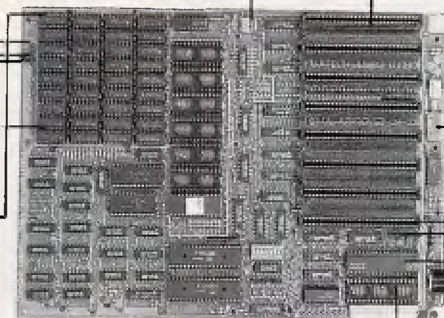
For all your need in IBM PC/XT/AT compatibles

Hedonic is one of the pioneer computer firms in Taiwan, offering a wider range of IBM PC/XT/AT compatible computers & peripherals. Best quality, prompt delivery and the most competitive prices. For your own benefit, contact us today!

BABY AT/TURBO PC/XT SYSTEM



1024K RAM FUJITECH JUMBO TURBO
the Best PC/XT Compatible Turbo Main Board



Small quantity welcome

Manufacturer & Exporter

HEDONIC COMPUTER CO., LTD.
10/F-1, No. 183, Sec. 4, Nanking E. Rd., Taipei, Taiwan, R.O.C.
Tel: (02)716-0994, 716-2021
Tlx: 25343 HEDONIC Fax: 886-2-713-9576

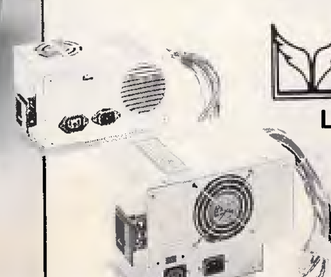
Choose it for the Best!

Top Quality PC Cases & (UL) Power Supply

After signing a royalty agreement with IBM in May, Ling Yih is able to offer the PC cabinets that are high-class, legal and comfortable. Equipped with automatic production facilities and 200 skilled workers, we can always offer you flawless services. And with a monthly production capacity of 60,000 pcs, we can meet whatever quantity demand you may need.

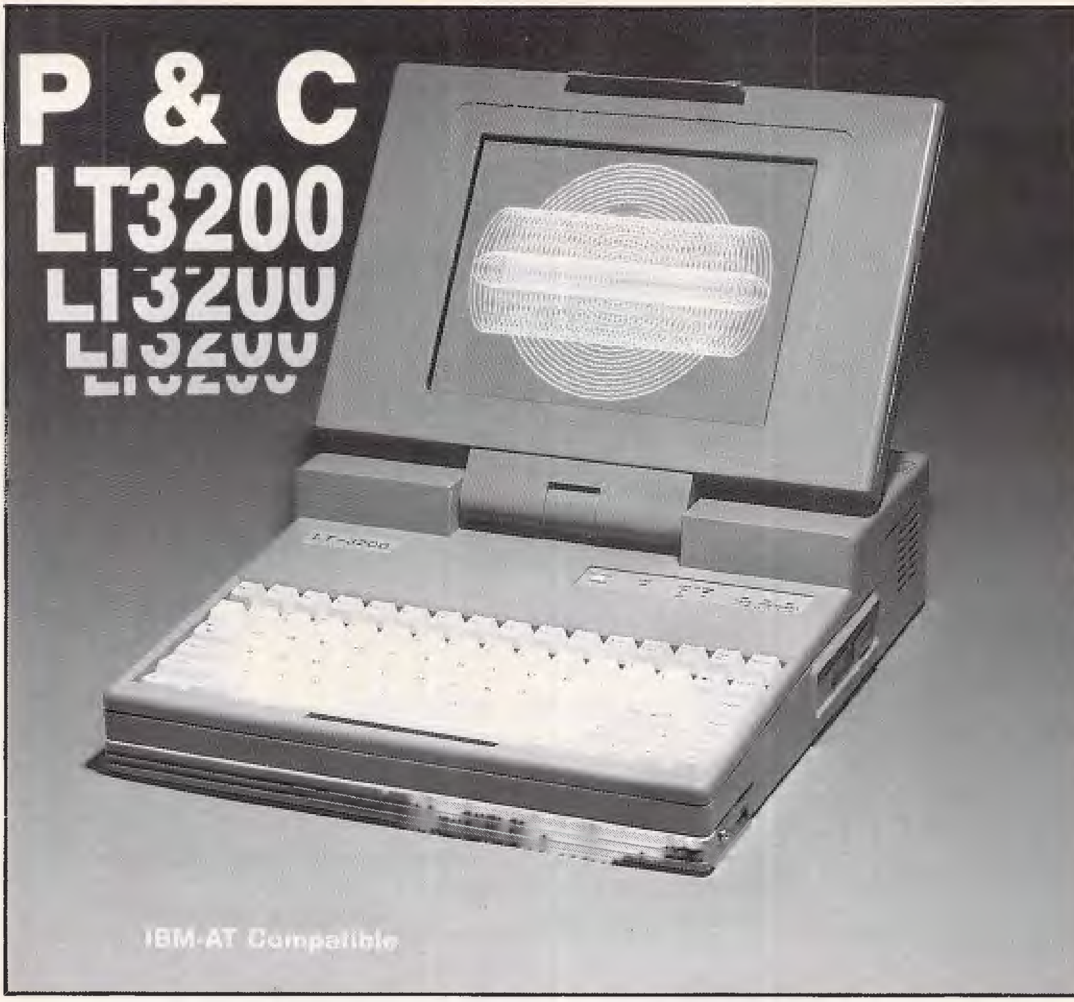
Let Ling Yih take you high in profits with its silver wings. Just contact us today and you'll be on the road to success!

Welcome to tour our factory when you are on your next buying trip to Taiwan.



LING YIH

LING YIH CO., LTD.
9F-3, No. 57,
Fu Hsing N. Road,
Taipei, Taiwan, R.O.C.
TEL: 886-2-7717166
FAX: 886-2-7113506
TLX: 20232 LINGYIH



high speed high performance Laptop

80286, 6/12 MHZ clock
1.44 MB 3-1/2" Floppy Drive
20/30/40 MB Hard disk
640×400 high resolution Plasma Display

P & C SHITEN ENTERPRISE CO., LTD.
RM 7, 8 FL., NO. 100,
ROOSEVELT RD., SEC. 3, TAIPEI,
TAIWAN, R.O.C.
P.O. BOX: 30-291, TAIPEI,
TAIWAN, R.O.C.
CABLE: PCSHITEN
TEL: (02)395-1400
TLX: 19206 PCSHITEN
FAX: 886-2-3512073

IBM PC/AT® are registered trademarks of IBM

SORRY EVERY MOUSE!!

Every MI-KI mouse reflects the engineering we've devoted to it. The Mi-Ki mouse is a productivity tool for all types of data entry, editing, ... etc.

MI-KI MOUSE MO-20
- *Precise, reliable optical encoder*
- *Precise tracking speed — up to 700 mm/sec*
- *Super high resolution — 0.098 mm/count — 259 dots/inch*
- *Baud rate: 150-9600 bps*
- *CMOS CPU*
- *Auto-selection among MICROSOFT MOUSE, MOUSE SYSTEM MOUSE, and LOGITECH LOGIMOUSE*

MI-KI MDUSE MD-7
- *Reliable optical encoder*
- *Tracking speed — up to 200 mm/sec*
- *High resolution — 0.13 mm/count — 200 dots/inch*
- *MOUSE SYSTEM MOUSE COMPATIBLE*

MI-KI MDUSE MD-11
- *Reliable optical encoder*
- *Tracking speed — up to 600 mm/sec*
- *High resolution — 0.098 mm/count 259 dots/inch*
- *Auto-selection between MICROSOFT MOUSE and MOUSE SYSTEM MOUSE.*

HOC

Manufacturer & Exporter
Holco Enterprise Co., Ltd.
2F., No. 1168, Chen Teh Rd., Taipei, Taiwan, R.O.C.
Tel: (02)882-1651 Tlx: 12481 HOLCO
Fax: 886-2-882-7409

IBM PC/XT/AT AT&T Zenith, HP, Compaq, MSDOS, PCODS Hercules. EGA PC Palt.... are Registared trademark

This month Steve Withers discusses the proposal of a communications software survey, and faster videotex speeds.

Software survey

The number of terminal programs for popular machines seems almost limitless. Many of them are either public domain or shareware which means that they can be tested at little or no cost apart from your time. But therein lies the problem — to try every program available for MS-DOS machines would take forever. Apple and Commodore users face a similarly herculean task.

To make life easier for your fellow users, I'd like readers to drop me a line giving opinions on the best and worst communications programs for any computer that you've used. If you can justify your choices, so much the better. Assuming enough people reply to make the exercise worthwhile, I'll summarise the results in a later column.

Faster videotex

British Telecom has installed speed-seeking modems on the Prestel access lines. Subscribers will soon be able to connect at 300, 1200/75, 1200 or 2400bps. I wonder if Viatel will follow suit? It would certainly increase the market for higher-speed modems and (who knows) might even increase the rate at which prices are falling.

Bytenet listings

Some time ago, Byte magazine stopped printing program listings. Instead, the publishers make the programs available for downloading or on diskette. For the convenience of overseas readers, they also made it possible for foreign BBSs to carry the listings. According to a list that appeared in *APC* offices, the following systems have taken advantage of Byte's offer:

NSW	Omen, Tesseract, Newcastle Microcomputer Club.
ACT	Professional Computer Users Group, PC Exchange.
Vic	National.
SA	Electronic Oracle.

Two other systems were mentioned, but one is now offline, and the other did not offer the listings.

System news

Things have calmed down after last month's bumper crop of new listings and updates. Most of the action seems to be in Adelaide, although I have heard of a couple of new boards in Melbourne that should come online during the next month or two.

Acknowledgements: Graham Clark, Keith Farrell, Bob Fletcher, George Tsoukas, and 'Terminal Case'.

New systems

SA

Aquarium (08) 270 4341.
Midnight Magic (08) 337 9959. Nights only.
Postie (08) 347 1046.

Updates

Vic

Compusoft (03) 386 6019. George Tsoukas. 24 hours daily. V22 only.
Zoist (03) 404 1531. P. Bob Fletcher. 24 hours daily.

SA

Nexus (08) 243 2477. M. 24 hours daily. V21 only. Also on (08) 45 9022, V23 only.
SAC64 (08) 387 0249. MV. Peter Hinton. 24 hours daily.

NT

Omen II Offline or number changed — can anyone help?

WA

Kalgoorlie College (090) 21 7755. P. Graham Clark. 24 hours daily. V21, V22, V22bis, V23.

END

Submissions

The material in this column is presented in good faith, but as it is collated from material provided by readers, *APC* cannot take responsibility for its accuracy. New information and corrections are always welcome (but please mention whether or not you can vouch for accuracy of the material provided), and should be sent to:
Steve Withers, C/- Computer Publications, 47 Glenhuntly Road, Elwood, Vic 3184 or to Viatel mailbox 063000030.
Acknowledgements will normally be made through this column. You may also like to send a copy of the information to the Australian PAMS Coordinator at one of these addresses:
PO Box E41, Emerton, NSW 2770.
ASCnet prophet@runx
Prophet BBS (02) 628 7030.

HI-COM UNITRONICS INTERNATIONAL P/L

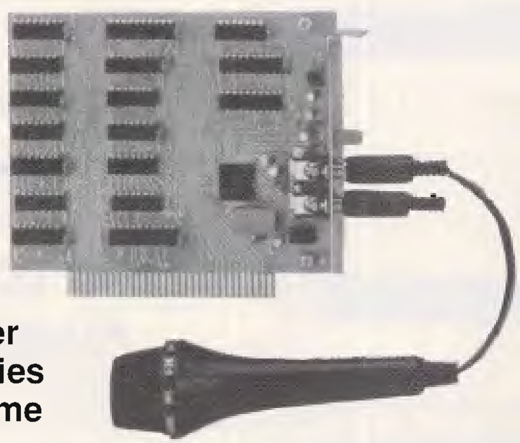
7 PRESIDENT LANE CARINGBAH NSW AUSTRALIA
PH: 02-524 7878 TELEX: 72573MAMS P/CODE 2229

Hicom AT286 $3990

6/12 MHz switchable 1.2M & 360K Floppy Drive
20M Miniscribe Hard Disk
Extended keyboard 101 keys with mechanical "click"
1024K RAM
Multivideo display card (EGA, CGA, MGA)
Version 6 G. Mouse with 3 Button EGA Colour Monitor

DEALER CATALOG AVAILABLE ON REQUEST

TURBO XT 4.7/10 MHZ SUPER FAST
XT COMPATIBLE
FULL SYSTEM WITH 2 DRIVES 640K......$1290
FULL RANGE OF ADD-ON CARDS AVAILABLE



Dealer Enquiries Welcome

ADD-ON CARDS NEW!!!!!!!!

VOICE RECORD & PLAY BACK CARD **$199**

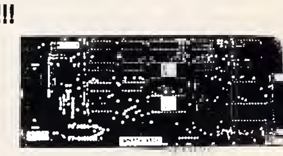
The voice record card includes microphone & speaker plug directly into the IBM PC/XT/AT & ready to be used.
Application includes voice communication, dictation for secretary, language learning tool & computerized security system.

Experimental Plug-in cards for IBM PC/XT
Short card $30.00
Long card $40.00
AT card $48.00
For Apple II +, IIe
$25.00

ELEKTOR SERIAL DIGITIZER KIT
For your computer
PCB 86090-1.2
AEM 10/86 $175.00
8 channels with EV max I/P serial I/O comm. (150 9600 baud)
Main PCB with 2 channels only
$105.00
each additional 2 channels
$30.00

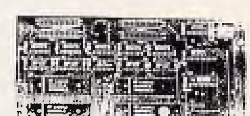
SECOND SERIAL PORT KIT
(include 8250, 1488, 1489 and cable)
FOR XT $32 **FOR AT $45**

NEW!!!!!!!



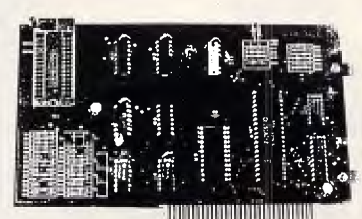
12 BIT AD/DA CARD **$290**

1 channel D/A 0-9V output, 12 Bit 16 channel input 0-9V



MULTI SERIAL CARDS (4 SERIAL PORTS) **$290**

Programmable baud rate 50-9600. RS232 Interface 1488, 1489 SIO 8250



EPROM WRITER CARD **$320**

Program 2716 to 27512, 27C64, 27C128, 27C256, one time prom. VPP 12.5V, 21V, 25V includes external four zif sockets.

EXTENSION CARD FOR YOUR IBM PC/XT/AT **$120**

A plug-in card with cable extension & sockets to bring the slots outside the computer. (2 slots provided)
Experimental plug-in card for your PC/XT/AT

END ZONE

NUMBERS

Magic squares, sums and cubes — no, it's not a combination of Rubik's Cube and Paul Daniels, but this month's Numbers column from our own mathematical marvel, Mike Mudge.

Definition A 'magic square' of order n is a table of n^2 natural numbers written in n rows and n columns such that the sum of the numbers of each row, the sum of the numbers of each column, and the sum of the numbers in the two principal diagonals are all equal.

Albrecht Dürer, a 16th century German artist, made a famous engraving entitled 'Melancholy' which contains the magic square of order 4:

16	3	2	13
5	10	11	8
9	6	7	12
4	15	14	1

in which the sums mentioned above are all equal to 34.

In *Problems in the Theory of Numbers* (Pergamon Press, 1964) W Sierpinski quotes the following magic squares of order 3 & 4 consisting of prime numbers only:

569	59	449
239	359	479
269	659	149

17	317	397	67
307	157	107	227
127	277	257	137
347	47	37	367

The magic sum in the above cases is 1077 and 798 respectively.

Sierpinski further quotes the *Recreational Mathematics* magazine (October 1981, page 28) as displaying a magic square of order 13, consisting of 169 distinct prime numbers.

The conjecture has been advanced that for n greater than 3e (where e is approximately 2.718), there exists infinitely many magic squares formed from n^2 distinct primes.

Readers are invited to write computer programs to construct and display magic squares of a given order using:

(i) natural numbers less than a specified N:
(ii) natural numbers between specified N_1 and N_2; and
(iii) prime numbers only.

An obvious extension of this work would be to magic cubes where, for example the magic sum may be required in each plane parallel to the faces or in some other carefully defined region.

Readers are invited to express their thoughts on the possible generalisation of the magic square to three (or more!) dimensions. Submissions should be sent to Mike Mudge, C/- *APC*, 124 Castlereagh Street, Sydney 2000 to arrive by 15 December 1987.

All submissions will be judged using subjective criteria, and a prize will be awarded by *APC* to the 'best' contribution received by the closing date.

It would be appreciated if such submissions contained a brief summary of results obtained, in a form suitable for publication in *APC*.

Please note that submissions can only be returned if a suitable stamped addressed envelope is provided.

(May's review on 'W-sequences' will appear in next month's issue.)

Mike Mudge welcomes correspondence on any subject within the areas of numbers theory and other computational mathematics. Particularly welcome are suggestions, either general or particular, for future Numbers articles; all letters will be answered in due course.

LAZING AROUND

Brainteasers courtesy of JJ Clessa.

Quickie
Can you find a 4-digit number whose digits reverse when it is multiplied by 9?

Prize puzzle
A simple (!) problem of logic this month. Two families are involved in this 'Whodunnit': the Smiths, comprising of teachers Alan and Betty and hairdresser Cynthia; and The Jones, where Donald is a teacher and Eric and Fiona are hairdressers.

One evening, two of the above were at the cinema, two were shopping at the supermarket, and two were playing golf. One of the two playing golf murdered the other. The facts are as follows:

- A teacher and a hairdresser were shopping.
- The two people at the cinema had the same occupation.
- The victim and the murderer were twins.
- The dead person was married to one of the two people at the supermarket, and the murderer was married to the other.
- The victim and the victim's spouse had different occupations.
- Of the two people at the cinema, one was the ex-spouse of one of the two people shopping, and the other was the same sex as the teacher at the supermarket.

Who was the killer?

Answers on postcards, please, or backs of envelopes only, to reach *APC*, Lazing Around November 1987, 124 Castlereagh Street, Sydney 2000, no later than 30 November.

August prize puzzle
One hundred and seven correct solutions were received, plus 12 incorrect ones. Frankly, I didn't think that the optimum grid-crossing problem would be so popular. For some entrants it was nostalgic, as one wrote: 'I never thought I would find a use for dynamic programming . . .'

The maximum grid total possible was 455 obtainable in several ways, one of which is 38-40-40-40-36-39-40-28-40-37-37-40.

The winning card came from Mr Martin Ravell of Hurstville.

DIARY DATA

Exhibitions

November 3-5, 1987

Infotex '87
Venue: Canberra National Exhibition Centre, ACT
Contact: Alan Tayt, The Interface Group, 9th Floor, 8 West Street, Crows Nest NSW 2065. Telephone: (02) 959 5555

November 4-7, 1987

Queensland Computer Expo '87
Venue: RNA Showgrounds, Brisbane
Contact: Robert Woodland Exhibitions, PO Box 280, Sunnybank Qld 4109. Telephone: (07) 273 4066

November 6-9, 1987

Australian International Technology & EquipmentExhibition
Venue: Rosehill Function Centre, Sydney
Contact: Bob Day, Desiko Pty Ltd, PO Box 1051, Crows Nest NSW 2065. Telephone: (02) 438 4999

November 10-14, 1987

Electric Indonesia
Venue: Jakarta Fairground, Jakarta, Indonesia
Contact: Singapore Exhibition Services Pty Ltd, 11 Dhogy Ghaut, 1509 Cathay Building, Singapore 0922. Telephone:3387741/3384748

November 12-15, 1987

Australian Financial Review New Product/Technology Expo
Venue: World Trade Centre, Melbourne
Contact: Park Productions, 9 Carlotta Street, Artarmon NSW 2064

January 20-24, 1988

Electech '88
Venue: Thailand, TBC
Contact: Mr Carnchai Sawangsopakul, Thailand Exhibition and Management Co. Ltd, 15th Floor, Mahatun Plaza Building, 888/154-5 Ploenchit Road, Bangkok 10500. Telephone: 252 8063-5

Conferences

November 2-4, 1987

Australian Joint Artificial Intelligence Conference and Exhibition
Venue: The Masonic Centre, Sydney
Contact: Computerworld (02) 439 5133

November 15-18, 1987

Victorian Association for Library Automation 87 conference and exhibition. Vala '87.
Contact: Australian Convention Management Services, PO Box 468, Paddington NSW 2021. Telephone: (02) 332 4622

November 21-25, 1987

International conference on technology for development
Venue: Canberra.
Contact: (062) 73 3633

December 6-9, 1987

IREE — 12th Australian Conference on Optical Fibre Technology
Venue: The Gold Coast International Hotel, Surfers Paradise, Qld
Contact: ACOFT Conference Secretary, IREE Australia, PO Box 79, Edgecliff NSW 2027. Telephone: (02) 327 4822

Courses & seminars

November 4-5, 1987

Desktop Publishing. A two-day seminar held at the Hyatt Kingsgate Hotel, Sydney
Contact: Management Technology Education (02) 261 5555

November 11, 1987

CAD/CAE/CAM connectivity. A practical seminar held in Sydney.
Contact: Acads (02) 929 8333

December 17-18, 1987

Mastering MS-DOS & PC-DOS. A two-day course held at RMIT, Swanson Street, Melbourne.
Contact: AMIC at RMIT (03) 663 6853

USER GROUPS

Below is a list of updates and additions to the full User Group listing which is available to readers on request. Please send a SSA envelope to 'User Groups', APC, 124 Castlereagh Street, Sydney 2000.

NSW

The Hawkesbury Microbee Users Group recently held its Annual General meeting at which Peter Christie was appointed the new Secretary of the Group.

The Group's general meetings will be held on the first Friday of each month, commencing at 7.30pm. Workshop meetings will be held on the third Friday of each month at 7.30pm.

All meetings will be held at the Richmond High School, Library Building, Lennox Street, Richmond. Visitors are welcome. For more information contact Peter Christie, 9 Potts Street, Richmond NSW 2753. Telephone (045) 78 4613 (AH).

Vic

The Local Government Engineer's Computer Users Group has recently been formed, which caters for Engineers working with computers in Victorian Local Government.

The Group meets on the first Tuesday of every second month at various venues. For more details contact the Secretary, Steve Hallett, Local Government Engineers Computer Users Group, C/- City of Sandringham, PO Box 27, Sandringham Vic 3191. Telephone (03) 598 8111.

END

```
; SNIPPER is a resident utility which allows cutting out a portion
; of the screen.  The selected portion may be printed, written
; to disk or entered in the keyboard buffer.  Activate SNIPPER by
; pressing ALT-W, then position the cursor in the upper left corner of
; the window using the arrow keys.  Press CR to fix the first corner,
; then expand the window with arrow keys.  Finally, type "P" to print,
; "F" for disk file, "G" to retrieve or CR for a help menu.  Press ESC
; any time to exit SNIPPER.  When installing SNIPPER, use the optional
; parameters to expand it's internal buffer for displays (such as the
; EGA) containing more than the standard 25 rows and 80 columns.
;   SNIPPER  [rows,columns]
;-----------------------------------;
; BIOS_SEG IS THE ROM-BIOS DATA AREA ;
;-----------------------------------;
BIOS_SEG            SEGMENT  AT 0040H
                    ORG      004AH
CRT_COLS            DB       ?                      ;CURRENT NUMBER OF COLUMNS
                    ORG      0050H
CURSOR_POSN         DW       8 DUP(?)               ;CURRENT CURSOR LOCATION
                    ORG      0062H
ACTIVE_PAGE         DB       ?                      ;ACTIVE PAGE FOR CGA AND EGA
                    ORG      0084H
ROWS                DB       ?                      ;LAST ROW NUMBER FOR EGA
BIOS_SEG            EHDS

CSEG                SEGMEHT
                    ASSUME   CS:CSEG,DS:HOTHING
                    ORG      0100H                  ;BEGINNIHG FOR .COM PROGRAMS
START:              JMP      INITIALIZE             ;INITIALIZATION CODE IS AT END

;--------------------------------;
; DATA AREA USED BY THIS PROGRAM ;
;--------------------------------;
HOTKEY              EQU      11H                    ;SCAN CODE FOR 'W' KEY
SHIFT_MASK          EQU      00001000B              ;MASK FOR ALT KEY
;
COPYRIGHT           DB       "SNIPPER 1.0 (c) 1987 Ziff Communications Co."
                    DB       13,10,"Hotkey is ALT-W",13,10,"$",1AH
PROGRAMMER          DB       "Tom Kihlken"
INSTALLED_MSG       DB       "Alreauy Installed",13,10,"$"
BAD_DOS_MSG         DB       "Requires DOS 2.0+",13,10,"$"
OLDINT09            DD       ?        ;OLD KEYBOARD BREAK IHTERRUPT VECTOR
OLDINT13            DD       ?        ;OLD BIOS DISK IO IHTERRUPT VECTOR
OLDINT16            DD       ?        ;OLD KEYBOARD INTERRUPT VECTOR
OLDINT21            DD       ?        ;OLD DDS FUHCTION ENTERRUPT VECTOR
ERR_STAT            DB       ?        ;ERROR STATUS DURING FILE OUTPUT
FILE_PROMPT         DB       "Enter Filename: "
FILENAME            DB       "SCREEN.CUT"           ;THE DEFAULT FILENAME
                    DB       15 DUP (0)             ;LEAVE ROOM FOR DRIVE AHD PATH
BUFF_NEXT           DW       BUFF_START             ;POINTER TO HEXT KEY IN BUFFER
BUFF_LAST           DW       BUFF_START             ;POIHTER TO LAST KEY IN BUFFER
BUFF_START          EQU      OFFSET INITIALIZE
BUFF_SIZE           EQU      25*(80+2)              ;ROOM FOR 25 ROWS OF 80 COLUMNS
BUFF_END            DW       BUFF_START+BUFF_SIZE
TOP_LEFT            LABEL    WORD                 ;FIRST CORNER OF WINDOW
LEFT_SIDE           DB       0                    ;COLUMN NUMBER OF LEFT SIDE
TOP_ROW             DB       0                    ;ROW NUMBER OF TOP SIDE
BOT_RIGHT           LABEL    WORD                 ;SECOND CORNER OF WINDOW
RIGHT_SIDE          DB       ?                    ;COLUMN NUMBER OR RIGHT SIDE
BOT_ROW             DB       ?                    ;ROW HUMBER OF BOTTOM
SEND_CHAR           DW       ?                    ;POIHTER TO CHARACTER HANDLER
SEHD_KEYS           DB       0                    ;IF=1, USE KEYSTROKES FROM BUFFER
WRIT_FILE           DB       0                    ;IF=1, NEED TO WRITE TO DISK
BUSY_FLAGS          DB       0                    ;BIT MASKED AS FOLLOWS:
                                                  ; 1 - DOS IS ACTIVE
                                                  ; 2 - BIOS IO IS ACTIVE
                                                  ; 4 - SNIPPER IS ACTIVE
DDS_STAT            DB       0                    ;CURRENT DOS FUNCTIDN

HELP_MENU           DB       201,10 DUP(205),1B7
                    DB       186," F - File ",186
                    DB       186," P - Print",186
                    DB       106," S - Save ",186
                    DB       186," G - Get  ",186
                    DB       186,"Esc- Quit ",186
                    DB       200,10 DUP(205),188

;---------------------------------------------------------------;
; SNIPPER BUILDS THE WINDOW AND ACCEPTS COMMAHDS FROM THE KEYBOARD ;
;---------------------------------------------------------------;
SNIPPER             PROC     HEAR
                    ASSUME   DS:CSEG, ES:BIOS_SEG
                    XOR      BX,BX                  ;BX IS INCREMENT FOR ROW/COLUMN
GET_KB_KEY1:
                    MOV      DX,TOP_LEFT            ;GET LOCATIOH OF FIRST CORNER
                    ADD      DH,BH                  ;ADD IN THE ROW INCREMENT
                    ADD      DL,BL                  ;ADD IN THE COLUMN INCREMENT
                    CMP      DL,0                   ;AT LEFT EDGE OF SCREEN?
                    JGE      NDT_LEFT_EDGE
                    MOV      DL,CRT_COLS            ;JUMP TO THE RIGHT EDGE
                    DEC      DL
NOT_LEFT_EDGE:
                    CMP      DL,CRT_COLS            ;AT RIGHT EDGE OF SCREEH YET?
                    JB       NOT_RIGHT_EDGE         ;IF NOT, KEEP MOVING RIGHT
                    XOR      DL,DL                  ;IF YES, WRAP TO LEFT EDGE
NOT_RIGHT_EDGE:
                    CMP      DH,0                   ;AT TOP OF SCREEN YET?
                    JGE      HOT_AT_TOP
                    MOV      DH,ROWS                ;JUMP DOWN TO THE BOTTOM
NOT_AT_TOP:
                    CMP      DH,ROWS                ;AT BOTTOM OF SCREEN?
                    JLE      HOT_AT_BOTTOM
                    XOR      DH,DH                  ;JUMP BACK TO THE TOP
HOT_AT_BOTTOH:
                    MOV      TOP_LEFT,DX            ;SAVE HEW CORHER LOCATION
                    CALL     REV_VIDEO              ;CHANGE IT TO REVERSE VIDEO
                    XDR      AH,AH                  ;BIOS KEYBOARD INPUT
                    INT      16H                    ;GET A KEYSTROKE
                    PUSH     AX
                    CALL     REV_VIDEO              ;PUT ATTRIBUTE BACK TO NORMAL
                    POP      AX
                    CMP      AH,1                   ;IS IT ESCAPE?
                    JNE      NOT_ESC
                    RET                             ;JUST RETURN TO EXIT
NOT_ESC:
                    MOV      BX,0FF00H              ;INCREMENT TO SUBTRACT ONE ROW
                    CMP      AH,48H                 ;IS IT UP ARROW?
                    JE       GET_KB_KEY1
                    MOV      Bx,0100H               ;INCREMEHT TO ADD ONE ROW
                    CMP      AH,50H                 ;IS IT DOWN ARROW?
                    JE       GET_KB_KEY1
                    MOV      BX,0001H               ;INCREMEHT TO ADD ONE COLUMN
                    CMP      AH,4DH                 ;IS IT RIGHT ARROW?
                    JE       GET_KB_KEY1
                    MOV      Bx,00FFH              ;IHCREMEHT TO SUBTRACT DNE COLUMH
                    CMP      AH,4BH                ;IS IT LEFT ARROW?
                    JE       GET_KB_KEY1
                    XOR      BX,BX
                    CMP      AL,13                  ;IS IT A CARRIAGE RETURN?
                    JNE      NOT_CR
                    MOV      DX,TOP_LEFT            ;A CARRIAGE RETURN WAS PRESSED
                    MOV      BOT_RIGHT,DX           ;INITIALIZE THE SECOND CORHER
                    CALL     REV_VIDEO              ;CHANGE IT BACK TO REVERSE VIDEO
                    JMP      SHORT GET_KB_KEY2
NOT_CR:
                    CMP      AH,22H                 ;IS IT THE "G" KEY
                    JE       TYPE_BUFF              ;IF YES, THAN GET THE WINDOW
                    JMP      GET_KB_KEY1            ;JUST GET ANOTHER KEY
TYPE_BUFF:
                    MOV      SEND_KEYS,1            ;SIGNAL TO SEHD THE KEYS
                    RET
GET_KB_KEY2:
                    XOR      AH,AH
                    IHT      16H                    ;GET A KEYSTROKE
GOT_KEY2:           MOV      DX,BOT_RIGHT
                    CMP      AH,48H                 ;IS IT UP ARROW?
                    JE       SUB_ROW                ;SUBTRACT A ROW FROM WINDOW
                    CMP      AH,50H                 ;IS IT DOWN ARROW?
                    JE       ADD_ROW                ;ADD A ROW TO THE WIHDOW
                    CMP      AH,4DH                 ;IS IT RIGHT ARROW?
                    JE       ADD_COL                ;ADD A COLUMN TO THE WINDOW
                    CMP      AH,4BH                 ;IS IT LEFT ARROW?
                    JE       SUB_COL                ;SUBTRACT A COLUMN FROM WIHDOW
                    JMP      NOT_ARROW_KEY
SUB_COL:
                    DEC      DL                     ;SUBTRACT A COLUMN
                    CMP      DL,LEFT_SIDE           ;DOHT ERASE IT COMPLETELY
                    JL       GET_KB_KEY2
                    MOV      RIGHT_SIDE,DL          ;SAVE NEW RIGHT SIDE COLUMH
                    INC      DL
                    JMP      SHORT COL_LOOP
ADD_COL:
                    INC      DL                     ;ADD A COLUMN
                    CMP      DL,CRT_COLS            ;AT RIGHT EDGE OF SCREEN?
                    JAE      GET_KB_KEY2            ;STOP WHEH SCREEN IS FILLED
                    MOV      RIGHT_SIDE,DL          ;SAVE NEW RIGHT SIDE COLUMN
COL_LOOP:
                    CALL     REV_VIDEO              ;REVERSE THIS CHARACTER
                    DEC      DH                     ;MOVE TO NEXT ROW
                    CHP      DH,TOP_ROW             ;AT TOP ROW YET?
                    JGE      COL LOOP               ;LOOP UNTIL AT TDP ROW
                    JMP      GET_KB_KEY2
SUB_ROW:
                    DEC      DH
                    CMP      DH,TOP_ROW             ;AT TOP OF WINDOW?
                    JL       GET_KB_KEY2            ;DONT ERASE IT CDMPLETELY
                    MOV      BOT_ROW,DH
                    INC      DH
                    JMP      SHORT ROW_LOOP
ADD_ROW:
                    INC      DH
                    CMP      DH,ROWS                ;AT BOTTOM OF SCREEN?
                    JG       GET_KB_KEY2            ;STOP WHEN SCREEN IS FILLED
                    MOV      BOT_ROW,DH
ROW_LOOP:
                    CALL     REV_VIDEO              ;REVERSE THIS CHARACTER
                    DEC      DL                     ;MOVE TO HEXT COLUMN
                    CMP      DL,LEFT_SIDE           ;AT LEFT EDGE YET?
                    JGE      ROW_LOOP               ;COHTINUE UNTIL AT LEFT EDGE
                    JMP      GET_KB_KEY2
NOT_ARROW_KEY:
                    CMP      AH,19H                 ;WAS IT THE "P" KEY?
                    JNE      NOT_P
                    MOV      SEND_CHAR,OFFSET PRINT_CHAR
                    JMP      READ_WINDOW
HOT_P:
                    MOV      BUFF_NEXT,BUFF_START
                    HOV      BUFF_LAST,BUFF_START
                    MOV      SEND_CHAR,OFFSET BUFF CHAR
                    CMP      AH,1FH                 ;WAS IT THE "S" KEY?
                    JNE      NOT_S
                    MOV      SEND_CHAR,OFFSET BUFF_CHAR
                    JMP      READ_WINDOW
NOT_S:
                    CMP      AH,22H                 ;IS IT THE "G" KEY
                    JHE      NOT_G
                    MOV      SEND_KEYS,1
                    JMP      READ_WINDOW
NOT_G:
                    CMP      AH,21H                 ;IS IT THE "F" KEY
                    JNE      NOT_F
                    MOV      WRIT_FILE,0
                    CALL     GET_FILEHAME
                    CMP      WRIT_FILE,-1           ;WAS ESCAPE REQUESTED?
                    JE       ERASE_BOX
                    CALL     READ_WINDOW
                    MOV      WRIT_FILE,1
```

SNIPPER.ASM: The assembly language source code for SNIPPER.COM.

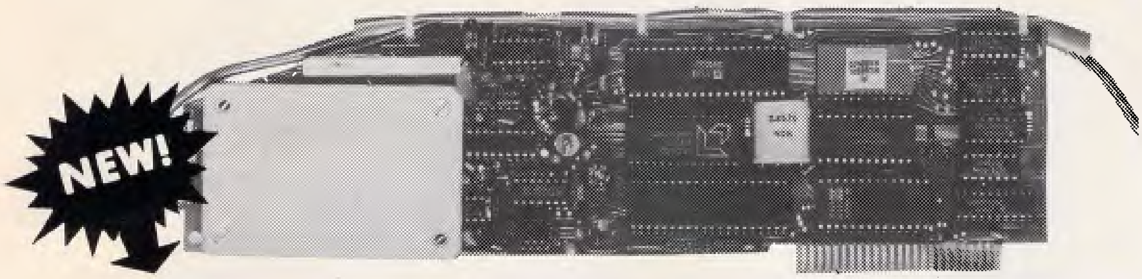
```
                TEST    BUSY_FLAGS,00000011B        ;IS INT21 OR INT13 BUSY?
                JNZ     RETURN              ;IF YES, WAIT TILL LATER
                CALL    WRITE_TO_FILE       ;IF NOT, DO IT NOW
RETURN:
                RET
NOT_F:
                CMP     AH,1                ;IS IT ESCAPE?
                JE      ERASE_BOX           ;IF YES, ERASE BOX AND EXIT
                CMP     AL,13               ;IS IT A CARRIAGE RETURN?
                JE      DISPLAY_HELP        ;IF YES, DISPLAY HELP
                JMP     GET_KB_KEY2         ;OTHERWISE JUST GET ANOTHER KEY
ERASE_BOX:
                MOV     SEND_CHAR,OFFSET RETURN
                JMP     READ_WINDOW
DISPLAY_HELP:
                CALL    EXCHANGE_HELP       ;PUT UP THE HELP MENU
                XOR     AH,AH
                INT     16H                 ;GET ANOTHER KEYSTROKE
                PUSH    AX                  ;SAVE THE KEYSTROKE
                CALL    EXCHANGE_HELP       ;PULL DOWN THE HELP MENU
                POP     AX                  ;GET BACK THE KEYSTROKE
                JMP     GOT_KEY2
;************************************************************
REV_VIDEO:
                CALL    READ_CHAR           ;READ CHARACTER AND ATTRIBUTE
                MOV     BL,AH               ;SAVE ATTRIBUTE IN BL
                AND     BL,10001000B        ;GET BLINK AND INTENSITY BITS
                AND     AH,01110111B        ;NOW LOOK ONLY AT COLOR BITS
                MOV     CL,4                ;ROTATE FOUR COUNTS
                ROR     AH,CL               ;ROTATE FOREGROUND AND BACKGROUND
                OR      BL,AH               ;PUT BACK BLINK AND INTENSITY BITS
                CALL    DISPLAY_CHAR        ;WRITE CHARACTER AND ATTRIBUTE
                RET
;************************************************************
READ_WINDOW:
                MOV     DX,TOP_LEFT         ;GET LOCATION OF FIRST CORNER
READ_LOOP:
                CALL    REV_VIDEO           ;PUT ATTRIBUTE BACK TO NORMAL
                CALL    READ_CHAR           ;READ THE CHARACTER
                CALL    SEND_CHAR           ;CALL TO THE POINTER
                INC     DL                  ;NEXT CHAR IN ROW
                CMP     DL,RIGHT_SIDE       ;AT THE RIGHT BORDER YET?
                JLE     READ_LOOP           ;DO ALL CHARACTERS IN THIS ROW
                CALL    CR_LF               ;SEND CR-LF AFTER EACH ROW
                INC     DH                  ;MOVE TO NEXT ROW
                MOV     DL,LEFT_SIDE        ;BACK TO LEFT EDGE
                CMP     DH,BOT_ROW          ;AT THE BOTTOM BORDER YET?
                JLE     READ_LOOP           ;READ ENTIRE WINDOW
                RET
;************************************************************
CR_LF:
                MOV     AL,13
                CALL    SEND_CHAR           ;SEND A CARRIAGE RETURN
                MOV     AL,10
                CALL    SEND_CHAR           ;SEND A LINE FEED
                RET
;************************************************************
DISPLAY_CHAR:
                PUSH    BX                  ;SAVE THE ATTRIBUTE
                CALL    GET_CURS_ADDR       ;GET ADDRESS OF BIOS CURSOR
                MOV     ES:[BX],DX          ;TELL BIOS WHERE THE CURSOR IS
                POP     BX                  ;GET BACK THE ATTRIBUTE
                MOV     BH,ACTIVE_PAGE      ;GET ACTIVE PAGE
                PUSH    CX                  ;SAVE THE LOOP COUNT
                MOV     CX,1                ;WRITE 1 CHARACTER
                MOV     AH,9                ;WRITE CHARACTER AND ATTRIBUTE
                INT     10H
                POP     CX                  ;RECOVER LOOP COUNT
                RET                         ;DONE WRITING THE CHARACTER
;************************************************************
READ_CHAR:
                CALL    GET_CURS_ADDR       ;GET ADDRESS OF BIOS CURSOR
                MOV     ES:[BX],DX          ;TELL BIOS WHERE THE CURSOR IS
                MOV     BH,ACTIVE_PAGE      ;GET ACTIVE PAGE
                MOV     AH,8                ;BIOS FUNCTION TO READ CHARACTER
                INT     10H                 ;READ THE CHARACTER/ATTRIBUTE
                RET
;************************************************************
PRINT_CHAR:
                PUSH    DX
                XOR     AH,AH               ;USE FUNCTION 0
                XOR     DX,DX               ;PRINTER NUMBER 0
                INT     17H                 ;BIOS PRINT CHARACTER FUNCTION
                ROR     AH,1                ;LOOK AT BIT ZERO
                JNC     PRINT_OK            ;DID A TIMEOUT OCCUR?
                MOV     SEND_CHAR,OFFSET RETURN
PRINT_OK:
                POP     DX
                RET                         ;DONE PRINTING CHARACTER
;************************************************************
BUFF_CHAR:
                MOV     BX,BUFF_LAST        ;GET LOCATION OF LAST CHARACTER
                MOV     [BX],AL             ;PUT THE CHARACTER IN BUFFER
                INC     BX                  ;ADVANCE THE POINTER
                MOV     BUFF_LAST,BX        ;CHECK FOR BUFFER FULL
                CMP     BX,BUFF_END         ;IS THE BUFFER FULL YET?
                JNE     BUFF_OK             ;IF NOT, KEEP GOING
                MOV     SEND_CHAR,OFFSET RETURN
BUFF_OK:
                RET                         ;NOW ITS IN THE BUFFER
;************************************************************
GET_CURS_ADDR:
                MOV     BL,ACTIVE_PAGE      ;GET THE CURRENT PAGE NUMBER
                XOR     BH,BH               ;CONVERT TO A WORD OFFSET
                SHL     BX,1                ;TIMES TWO FOR A WORD
                ADD     BX,OFFSET CURSOR_POSN ;ADD IN BASE ADDRESS
                RET
;************************************************************
EXCHANGE_HELP:
                XOR     DX,DX               ;START AT TOP LEFT CORNER
                LEA     SI,HELP_MENU
EXCHANGE_LOOP:
                CMP     DL,12               ;AT LAST COLUMN IN THIS ROW YET?
                JL      SWAP_CHAR
                XOR     DL,DL               ;BACK TO FIRST COLUMN
                INC     DH                  ;DO THE NEXT ROW
                CMP     DH,7                ;AT LAST ROW YET?
                JL      SWAP_CHAR           ;QUIT WHEN LAST ROW IS DONE
                RET
SWAP_CHAR:
                CALL    READ_CHAR           ;READ CHARACTER AT THIS POSITION
                XCHG    AL,CS:[SI]          ;SWAP WITH THE HELP TEXT
                MOV     BL,AH               ;ATTRIBUTE IS THE SAME
                CALL    DISPLAY_CHAR        ;PUT NEW CHARACTER ON SCREEN
                INC     DL                  ;POINT TO NEXT POSITION
                INC     SI
                JMP     EXCHANGE_LOOP
;************************************************************
GET_FILENAME:
                LEA     SI,FILE_PROMPT      ;POINT TO THE PROMPT FOR SOURCE
                XOR     DI,DI               ;USE THE PSP FOR BUFFER
                XOR     DX,DX               ;PUT PROMPT AT TOP LEFT CORNER
                MOV     CX,40               ;USE MAX OF 40 CHARACTERS
DISPLAY_PROMPT:
                PUSH    CX                  ;SAVE LOOP COUNT
                CALL    READ_CHAR           ;GET CHARACTER ON THIS LINE
                MOV     CS:[DI],AX          ;STORE IT IN THE PSP
                INC     DI                  ;ADD TWO FOR NEXT CHARACTER
                INC     DI
                MOV     AL,CS:[SI]          ;GET NEXT PROMPT CHARACTER
                INC     SI                  ;NEXT CHARACTER IN PROMPT
                MOV     BL,47H              ;ATTRIBUTE FOR PROMPT
                CALL    DISPLAY_CHAR        ;PUT UP THE PROMPT CHARACTER
                INC     DL                  ;POINT TO NEXT COLUMN
                POP     CX                  ;GET BACK LOOP COUNT
                LOOP    DISPLAY_PROMPT      ;ENTIRE PROMPT AND FILENAME
FIND_LAST_LETTER:
                DEC     SI                  ;BACKUP TO LAST LETTER
                DEC     DL                  ;BACKUP TO LAST COLUMN
                CMP     BYTE PTR [SI],0     ;IS THIS A LETTER?
                JE      FIND_LAST_LETTER    ;BACKUP UNTIL A LETTER IS FOUND
                INC     DL                  ;PUT BLINKING BOX AT LAST LETTER
READ_KB:
                MOV     AL,219              ;ASCII FOR BOX CHARACTER
                MOV     BL,47H+80H          ;MAKE IT A BLINKING BOX CHARACTER
                CALL    DISPLAY_CHAR        ;WRITE THE BLINKING BOX

                XOR     AH,AH               ;FUNCTIO 0 TO GET NEXT KEY
                INT     16H                 ;BIOS KEYBOARD INPUT
                CMP     AL,13               ;IS IT A CARRIAGE RETURN?
                JE      ERASE_PROMPT
                CMP     AL,8                ;IS IT A BACKSPACE?
                JE      BACK_SPACE
                CMP     AH,1                ;IS IT ESCAPE?
                JE      ESC_RET
                CMP     AL,"."              ;IS IT A VALID LETTER?
                JL      READ_KB
                CMP     AL,"z"              ;IS IT A VALID LETTER?
                JG      READ_KB
                CMP     DL,39               ;ONLY ALLOW 40 CHARACTERS
                JGE     READ_KB
TTY_KEY:
                MOV     BL,47H              ;ATTRIBUTE FOR FILENAME
                CALL    DISPLAY_CHAR        ;WRITE THE LETTER
                INC     DL                  ;MOVE TO NEXT COLUMN
                JMP     READ_KB             ;GET ANOTHER KEYSTROKE
BACK_SPACE:
                CMP     DL,16               ;AT BEGINNING OF LINE?
                JLE     READ_KB             ;IF YES, CAN'T BACKUP FROM HERE
                MOV     AL,0                ;WRITE A NORMAL BLANK (ASCII 0)
                MOV     BL,47H              ;ATTRIBUTE FOR FILENAME
                CALL    DISPLAY_CHAR        ;WRITE THE LETTER
                DEC     DL                  ;BACKUP THE CURSOR
                JMP     READ_KB             ;THEN GET THE NEXT KEY
ESC_RET:
                MOV     WRIT_FILE,-1        ;INDICATE ESCAPE IS REQUESTED
ERASE_PROMPT:
                XOR     AL,AL               ;GET RID OF THE CURSOR
                CALL    DISPLAY_CHAR        ;WRITE THE LETTER
                LEA     DI,FILE_PROMPT      ;COPY TO FILENAME
                XOR     SI,SI               ;COPY FROM PSP
                XOR     DX,DX               ;PROMPT IS AT ROW ZERO
                MOV     CX,40               ;COPY ALL 40 CHARACTERS
ERASE_LOOP:
                CALL    READ_CHAR           ;GET CHARACTER ON THIS LINE
                MOV     CS:[DI],AL          ;PUT IN BACK IN MEMORY
                INC     DI
                MOV     AX,CS:[SI]          ;GET THE ORIGINAL CHARACTER BACK
                MOV     BL,AH               ;PUT ATTRIBUTE INTO BL
                INC     SI
                INC     SI
                CALL    DISPLAY_CHAR        ;WRITE ORIGINAL CHARACTER
                INC     DL                  ;MOVE TO NEXT COLUMN
                LOOP    ERASE_LOOP          ;ERASE THE ENTIRE PROMPT
                RET
SNIPPER         ENDP

;-----------------------------------------------------------;
; THIS COPIES THE BUFFER CONTENTS TO A FILE. IT SHOULD ONLY BE CALLED ;
; WHEN DOS IS IN A STABLE AND REENTRANT CONDITION.                    ;
;-----------------------------------------------------------;
WRITE_TO_FILE   PROC    NEAR
                ASSUME  DS:NOTHING, ES:NOTHING

                MOV     WRIT_FILE,0         ;TURN OFF REQUEST FLAG
                PUSH    AX                  ;MUST PRESERVE ALL REGISTERS
                PUSH    BX
                PUSH    CX
                PUSH    DX
                PUSH    DS
```

```
                PUSH    ES
                PUSH    CS
                POP     DS
                ASSUME  DS:CSEG                 ;DS POINTS TO OUR CODE SEGMENT
                HOV     AX,3524H                ;GET DOS CRITICAL ERROR VECTOR
                INT     21H                     ;DOS FUNCTION TO GET VECTOR
                PUSH    BX                      ;SAVE OLD VECTOR ON STACK
                PUSH    ES

; REPLACE THE DOS SEVERE ERROR INTERRUPT WITH OUR OWN ROUTINE.

                MOV     DX,OFFSET NEWINT24
                MOV     AX,2524H                ;SETUP TO CHANGE INT 24h VECTOR
                INT     21H                     ;CHANGE DOS SEVERE ERROR VECTOR
                MOV     DX,OFFSET FILENAME      ;POINT TO FILENAME

; FIRST TRY TO OPEN THE FILE.  IF DOS RETURNS WITH THE CARRY FLAG SET,
; THE FILE DIDN'T EXIST AND WE MUST CREATE IT.  ONCE THE FILE IS OPENED,
; ADVANCE THE FILE POINTER TO THE END OF FILE TO APPEND.

                MOV     AX,3D02H                ;DOS FUNCTIOH TO OPEN FILE
                INT     21H                     ;DOS WILL RETURN WITH CARRY FLAG
                JC      FILE_NOT_FOUND          ;SET IF FILE DOESN'T EXIST.
                MOV     BX,AX                   ;KEEP HANDLE IN BX ALSO
                XOR     CX,CX                   ;MOVE DOS FILE POINTER TO THE
                XOR     DX,DX                   ;END OF THE FILE. THIS LETS US
                MOV     AX,4202H                ;APPEND THIS TO AN EXISTING FILE
                INT     21H                     ;DOS FUNCTION TO MOVE POINTER
                JNC     WRITE_FILE              ;IF NO ERROR, CONTINUE TO WRITE
DOS_ERROR:
                CMP     ERR_STAT,0              ;DID A SEVERE ERROR OCCUR?
                JNE     REP_VECTOR              ;IF SEVERE ERROR, JUST QUIT
                JMP     SHORT CLOSE_FILE        ;JUST CLOSE THE FILE

FILE_NOT_FOUND: CMP     ERR_STAT,0              ;DID A SEVERE ERROR OCCUR?
                JNE     REP_VECTOR              ;IF SEVERE ERROR, JUST QUIT
                MOV     CX,0020H                ;ATTRIBUTE FOR NEW FILE
                MOV     AH,3CH                  ;CREATE FILE FOR WRITING
                INT     21H                     ;DOS FUNCTION TO CREATE FILE
                JC      DOS_ERROR               ;ON ANY ERROR, TAKE JUMP
                MOV     BX,AX                   ;SAVE HANDLE IN BX
WRITE_FILE:     MOV     DX,BUFF_START           ;POINT TO BUFFER
                MOV     CX,BUFF_LAST            ;GET BUFFER POINTER
                SUB     CX,DX                   ;NUMBER OF CHARS IN BUFFER
                MOV     AH,40H                  ;DOS WRITE TO A DEVICE FUNCTION
                INT     21H                     ;WRITE TO THE FILE
CLOSE_FILE:
                MOV     AH,3EH                  ;DOS FUNCTION TO CLOSE THE FILE
                INT     21H
REP_VECTOR:
                POP     DS                      ;GET INT 24H VECTOR FROM STACK
                POP     DX
                MOV     AX,2524H                ;RESTORE CRITICAL ERROR VECTOR
                INT     21H                     ;DOS FUNCTION TO CHANGE VECTOR
                PDP     ES                      ;FINALLY RESTORE ALL REGISTERS
                POP     DS
                POP     DX
                POP     CK
                POP     BX
                POP     AX
                RET                             ;FINISHED WRITING TO DISK
WRITE_TO_FILE   ENDP
;-----------------------------------------------------------------------;
; INTERRUPT 09 ROUTINE.  WATCH FOR TRIGGER KEY TO POP UP.
;-----------------------------------------------------------------------;
NEWINT09        PROC    FAR
                ASSUME  DS:NOTHING, ES:NOTHING
                STI                             ;ALLOW OTHER INTERRUPTS
                PUSH    AX                      ;MUST SAVE PROCESSDR STATE
                IN      AL,60H                  ;GET THE SCAN CODE
                CMP     AL,HOTKEY               ;IS IT THE HOT KEY?
                JE      TRIGGER                 ;IF YES, CHECK THE MASK
INT09_EXIT:     POP     AX                      ;RESTORE THE PROCESSOR STATE
                JMP     OLDINT09                ;CONTINUE WITH ROM ROUTINE
TRIGGER:
                MOV     AH,2                    ;GET KEYBDARD STATUS
                INT     16H                     ;BIOS KEYBOARD SERVICE
                TEST    AL,SHIFT_MASK           ;IS ALT KEY DOWN?
                JZ      INT09_EXIT              ;IF NOT, IGNORE IT
                TEST    BUSY_FLAGS,00000100B ;IS SNIPPER ALREADY ACTIVE?
                JNZ     INT09 EXIT              ;IF ACTIVE, THEN EXIT
                OR      BUSY_FLAGS,00000100B ;ITS ACTIVE NOW
                PUSHF
                CALL    OLDINT09                ;LET ROM PROCESS THE KEY
                PUSH    BX                      ;MUST PRESERVE ALL REGISTERS
                PUSH    CX
                PUSH    DX
                PUSH    BP
                PUSH    SI
                PUSH    DI
                PUSH    DS
                PUSH    ES
                PUSH    CS
                POP     DS                      ;SET DS TO CSEG
                MOV     AX,BIOS_SEG             ;ES POINTS TO BIOS DATA AREA
                MOV     ES,AX
                ASSUME  DS:CSEG, ES:BIOS_SEG
                CALL    GET_CURS_ADDR           ;CURSOR ADDRESS FOR THIS PAGE
                PUSH    ES:[BX]                 ;SAVE THE CURSOR LOCATION
                CALL    SNIPPER                 ;DD THE WINDOW
                CALL    GET_CURS_ADDR           ;CURS0R ADDRESS FOR THIS PAGE
                POP     ES:[BX]                 ;GET BACK CURSOR  POSITION
                AND     BUSY_FLAGS,11111011B  ;SNIPPER IS NOT ACTIVE
                POP     ES                      ;RESTORE ALL REGISTERS
                POP     DS
                POP     DI
                POP     SI
                POP     BP
                POP     DX
                POP     CX
```

```
                POP     BX
                POP     AX
                IRET                            ;NOW WERE ALL DONE
NEWINT09        ENDP
;-----------------------------------------------------------------------;
; INTERRUPT 13 ROUTINE. SET BIOS BUST BIT                               ;
;-----------------------------------------------------------------------;
NEWINT13        PROC    FAR
                ASSUME  DS:NOTHING, ES:NOTHING
                OR      BUSY_FLAGS,00000010B    ;SET BIOS BUSY BIT
                PUSHF
                CALL    OLDINT13                ;DO THE BIOS FUNCTION
                PUSHF                           ;SAVE RESULT FLAGS
                AND     BUSY_FLAGS,11111101B    ;CLEAR BIOS BUSY BIT
                POPF                            ;GET BACK RESULT FLAGS
                STI                             ;MUST RETURN WITH INTERUPTS ON
                RET     2                       ;RETURN BIOS RESULT FLAGS
NEWINT13        ENDP
;-----------------------------------------------------------------------;
; INTERRUPT 16 ROUTINE. INSERT KEYSTROKES FROM BUFFER                   ;
;-----------------------------------------------------------------------;
NEWINT16        PROC    FAR
                ASSUME  DS:NOTHING, ES:NOTHING
                PUSH    BX
                CMP     SEND_KEYS,1             ;SENDING KEYS FROM BUFFER?
                JE      INSERT_KEY              ;IF YES, THEN GET NEXT ONE
                CMP     WRIT_FILE,1             ;ANYTHING TO WRITE TO DISK?
                JE      CHECK_DOS_STAT          ;IF YES, THIS IS THE TIME
BIOS_KB:
                POP     BX
                JMP     OLDINT16                ;JUST DO NORMAL KB ROUTINE
CHECK_DOS_STAT:
                CMP     DOS_STAT,0AH            ;DOING READ STRING?
                JE      BEGIN_NOW               ;IF YES, ITS SAFE TO BEGIN
                CMP     DOS_STAT,8              ;DOING KEYBOARD INPUT?
                JNE     BIOS_KB                 ;IF YES, ITS SAFE TO BEGIN
BEGIN_NOW:
                STI                             ;GET INTERRUPTS BACK ON
                CALL    WRITE_TO_FILE           ;EMPTY THE BUFFER
                JMP     BIOS_KB                 ;CONTINUE WITH BIOS ROUTINE
INSERT_KEY:
                STI                             ;INTERRUPTS BACK ON
                MOV     BX,BUFF_NEXT            ;GET ADDRESS OF NEXT BYTE
                CMP     BX,BUFF_LAST            ;AT END OF BUFFER YET?
                JL      GET_A_KEY               ;IF NOT, GET THE NEXT ONE
                MOV     SEND_KEYS,0             ;WHEN DONE, TURN OFF SEND SWITCH
GET_A_KEY:
                MOV     AL,CS:[BX]              ;GET THE NEXT KEY CODE
                CMP     AL,10                   ;IS IT A LINE FEED?
                JNE     NOT_LF                  ;DONT RETURN THE LINE FEEDS
                INC     BUFF_NEXT               ;SKIP TO NEXT KEY
                JMP     INSERT_KEY
NOT_LF:
                CMP     AH,1                    ;REQUEST FOR STATUS ONLY?
                JE      RETURN_STATUS           ;IF YES, RETURN STATUS ONLY
                CMP     AH,0                    ;REQUEST TO GET THE NEXT KEY
                JNE     BIOS_KB                 ;IF NOT, IGNORE THIS FUNCTION
                INC     BX                      ;REMOVE THIS KEY FROM OUR BUFFER
                MOV     BUFF_NEXT,BX            ;SAVE THE POINTER TO NEXT KEY
RETURN_STATUS:
                OR      BL,1                    ;CLEAR ZERO FLAG TO INDICATE A
                POP     BX                      ;KEY IS AVAILIABLE
                RET     2                       ;RETURN WITH THESE FLAGS
NEWINT16        ENDP
;-----------------------------------------------------------------------;
; INTERRUPT 21 ROUTINE.  THIS ROUTINE IS USED TO MONITOR DOS FUNCTION ;
; CALLS. IF THE BUFFER NEEDS TO BE FLUSHED, IT WIL BE DONE HERE.      ;
;-----------------------------------------------------------------------;
NEWINT21        PROC    FAR
                ASSUME  DS:NOTHING, ES:NOTHING
                STI
                OR      AH,AH                   ;DOING FUNCTION ZERO?
                JNE     NOT_ZERO
                MOV     AH,4CH                  ;IF YES, CHANGE IT TO A 4CH
NOT_ZERO:
                OR      BUSY_FLAGS,00000001B    ;SET DOS BUSY BIT
                MOV     DOS_STAT,AH
                PUSHF                           ;SIMULATE AN INTERRUPT
                CALL    OLDINT21                ;DO THE DOS FUNCTION
                PUSHF                           ;SAVE THE RESULT FLAGS
                AND     BUSY_FLAGS,11111110B    ;CLEAR DOS BUSY BIT
                CMP     WRIT_FILE,1             ;ANYTHING TO WRITE TO DISK?
                JNE     NO_WRITE                ;IF NOT JUST RETURN
                CALL    WRITE_TO_FILE           ;SAFE TO ACCESS DISK NOW
NO_WRITE:
                POPF                            ;RECOVER DOS RESULT FLAGS
                RET     2                       ;RETURN WITH DOS RESULT FLAGS
NEWINT21        ENDP

;-----------------------------------------------------------------------;
; NEW INTERRUPT 24H (CRITICAL DOS ERROR).  THIS INTERRUPT IS ONLY IN  ;
; EFFECT ONLY DURING A WRITE SCREEN.  IT IS REQUIRED TO SUPPRESS THE  ;
; 'ABORT, RETRY, IGNORE' MESSAGE.  ALL FATAL DISK ERRORS ARE IGNORED. ;
;-----------------------------------------------------------------------;
NEWINT24        PROC    FAR
                ASSUME  CS:CSEG, DS:NOTHING, ES:NOTHING
                STI                             ;TURN INTERRUPTS BACK ON
                INC     ERR_STAT                ;SET THE ERROR FLAG
                XOR     AL,AL                   ;TELLS DOS TO IGNORE THE ERROR
                IRET                            ;THATS ALL WE DO HERE
NEWINT24        ENDP

;-----------------------------------------------------------------------;
; HERE IS THE CODE USED TO INITIALIZE SNIPPER.                          ;
;-----------------------------------------------------------------------;
                ASSUME  CS:CSEG, DS:CSEG, ES:CSEG
INITIALIZE:
                LEA     DX,COPYRIGHT
                MOV     AH,9                    ;DOS DISPLAY STRING SERVICE
                INT     21H                     ;DISPLAY TITLE MESSAGE
```

MODEM FOR APPLE II & IIE

NOW IN STOCK WITH FULLY OPERATIONAL FIRMWARE & NEW FEATURES



SUPPORTS FULL COLOUR VIATEL AND COLOUR VIATEL PRINTING ON THE APPLE II GS AND IMAGE WRITER PRINTER.

* Super intelligent direct connect MODEM/VIATEL terminal for APPLE II, IIE & compatibles fully contained on a single card — plugs into slot#2 — does not require separate serial card or software. All software is permanently resident in an onboard 128K EPROM. It is hidden in the slot#2 card space, leaving the whole of memory completely free for other programs unlike disk based comms software which must occupy the main memory excluding other programs. It is menu driven and automatically senses for ProDos or DOS 3.3 operation. Received files are appropriately converted before saving and can be used.

Sending/receiving files is very simple:—
— Press "ESC" to display menu.
— Select "(S) END A FILE" option
— Answer the prompt "FILENAME?:"

The modem will search the disk for the file, make all the decisions (e.g. binary, basic, textfile, DOS 3.3 or ProDos) and transmit it in the correct format. <CR> transmits the file in memory. Similarly to receive a file select "(R) ECEIVE A FILE" option.

* AUTO ANSWER — AUTO DIAL. Senses true dial tone, ring tone, busy tone and acts intelligently, returning status messages. Characters can be included in the phone number to set baudrate, pause, "await dialtone" and multiple redial on busy. On answer, it selects the incoming baudrate by precision frequency measurement. This is much more reliable than the normal autosearch using carrier detect which is often confused by voice and phone tones. A reliable autosearch is a must for bulletin board operation.

* 300 Baud full duplex or 1200/75 and 75/1200 with fast automatic line turnaround. An upgrade kit to add V22 (1200/1200 baud) and V22 Bis (2400/2400 baud) will be available later.

*Main menu option "(V)IDEOTEXT" shows the VIATEL menu. It becomes a full graphics VIATEL terminal, automatically dialling and transmitting the user ID stored in the battery backed ram. When online, a keypress will immediately save pictures to memory. These can be reviewed later and selectively saved to disk or printed (requires a graphics printer card). Pictures can be loaded from disk and printed out. The modem can act as a videotext host and can be programmed to act on frame information. e.g. — use the clock to ring "MONEYWATCH" hurly and dial you at the office if your shares move outside a given range.

* TELESOFTWARE DOWNLOAD facility to purchase programs over VIATEL from suppliers such as MICROTEX 666 and TANGO.

* A full wordprocessor in EPROM for pre-composition of text before transmission. It can also be used to edit or print received files as well as for general wordprocessing.

* Onboard battery backed calendar clock can time and initiate calls or keep an activity log. ProDos uses it to time and date disk files and it is accessible from Basic.

* 2Kx8 battery powered CMOS RAM stores default parameters, phone numbers, ID, password, logon strings, search codes and setup parameters (e.g. baud rate, parity, printer ON) for each number, allowing single keystroke call establishment to specific areas of complex databases. Main menu option "(T)ELELIST" displays the list of 23 names and one is selected.

* Incorporates XON/XOFF and CHRISTENSEN error correcting protocol. Textfiles are not so fussy but error correction is a must when transferring program files. A debug function can display normally invisible control characters sent by the host.

* Can output directly to printer even when online at 1200 Baud — a fast printer is not required as the printer is spooled out of the receive buffer. A "FILTER" function is available to remove screen control characters from textfiles (these can drive a printer crazy). Special scroll routines print to 80 column screen and printer at 1200 Baud without any lost characters.

* Unique "PHANTOM MODEM MODE" function allows the modem to be permanently connected with the normal phone. When answering, if it doesn't immediately detect a calling modem it generates ringing tone back to the calling party and sounds the APPLE bell, giving you 60 seconds to answer the phone.

* If you have previously purchased this modem and have not yet received an updated EPROM VERSION V2.18 and a manual. contact AUTOMATIC ICE CO. — there is no charge for these.

AUTOMATIC ICE COMPANY

Mastercard & Bankcard

10 SMITH STREET, CHARLESTOWN, 2290.
PHONE (049) 63 3188 — (049) 63 1386

Price **$299** *(incl S/T)*

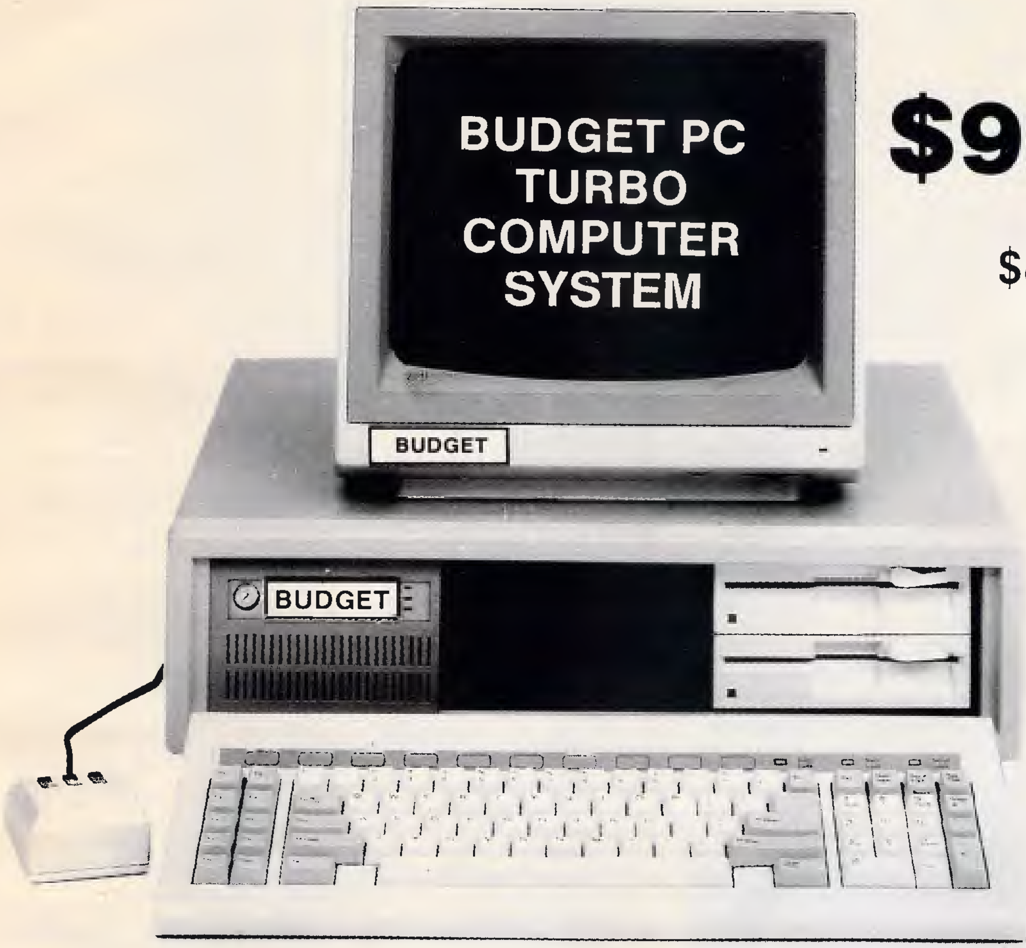
```
  SEARCH FDR AN PREVIOUSLY IHSTALLED COPY OF SNIPPER
                NOT     BYTE PTR START      ;MODIFY TO AVOID FASLE MATCH
                XOR     BX,BX               ;START SEARCH AT SEGMENT ZERD
                MOV     AX,CS               ;COMPARE TO THIS CODE SEGMENT
NEXT_SEGMENT:
                INC     BX                  ;LOOK AT NEXT SEGMENT
                CMP     AX,BX               ;UNTIL REACHING THIS CODE SEG
                MOV     ES,BX
                JE      NDT_INSTALLED
                LEA     SI,START            ;SETUP TO COMPARE STRINGS
                MOV     DI,SI
                MOV     CX,16               ;16 BYTES MUST MATCH
                REP     CMPSB               ;CDMPARE DS:SI TO ES:DI
                OR      CX,CX               ;DID THE STRINGS MATCH?
                JNZ     NEXT_SEGMENT        ;IF NO MATCH, TRY NEXT SEGMEHT
                LEA     DX,IHSTALLED_MSG
                JMP     SHORT ERR_EXIT
NOT_INSTALLED:
                MOV     AH,30H
                INT     21H                 ;GET DOS VERSION NUMBER
                CMP     AL,2                ;IS IT HIGHER THAN 2.0?
                JAE     VER_OK              ;IF YES, PROCEED

                LEA     DX,BAD_DOS_MSG
ERR_EXIT:       MOV     AH,9                ;DOS DISPLAY STRING SERVICE
                INT     21H                 ;DISPLAY ERRER MESSAGE
                RET                         ;RETURN TO DOS
VER_DK:
                INC     SI                  ;POINT TO FIRST PARAMETER
                MOV     SI,81H              ;POINT TO PARAMETER AREA
                CALL    GET_PARAM           ;GET FIRST PARAMETER (ROWS)
                PUSH    AX                  ;SAVE THE ROW COUHT
                CALL    GET_PARAM           ;GET SECOND PARAMETER (COLUMNS)
                ADD     AX,2                ;ADD SPACE FOR CR AND LF
                POP     BX                  ;GET BACK FIRST PARAMETER
                MUL     BX                  ;PRODUCT OF ROWS AND COLUMNS
                OR      AX,AX               ;WAS ANYTHING ENTERED?
                JZ      NO_PARAMS           ;IF NOT, USE DEFAULT VALUE
                CMP     AX,10000            ;MAXIMUM BUFFER IS 10000 BYTES
                JLE     SIZE_IS_OK
                MDV     AX,10000
SIZE_IS_OK:
                ADD     AX,BUFF_START
                MOV     BUFF_END,AX         ;SET THE NEW BUFFER SIZE
HO_PARAMS:
                MOV     AX,BIOS_SEG         ;LOOK AT BIOS DATA AREA
                MOV     ES,AX
                ASSUME  ES:BIOS_SEG
                CMP     ROWS,0              ;IS NUMBER OF ROWS ENTERED HERE
                JNE     MUST_BE_EGA         ;IF YES, AN EGA MAY BE PRESENT
                MOV     ROWS,24             ;IF NOT EGA, MUST BE 24 ROWS
MUST_BE_EGA:
                ASSUME  ES:NOTHIHG
                MOV     AX,3509H            ;GET KEYBDARD BREAK VECTOR
                INT     21H
                MOV     WDRD PTR [OLDINT09], BX   ;SAVE SEGMENT
                MOV     WORD PTR [OLDINT09+2],ES  ;SAVE OFFSET
                MOV     DX, OFFSET NEWINT09
                MOV     AX, 2509H
                INT     21H                 ;DOS FUNCTION TO CHANGE VECTOR

                MOV     AX,3513H            ;GET BIOS DISK INTERRUPT VECTOR
                INT     21H
                MOV     WORD PTR [OLDINT13], BX   ;SAVE SEGMENT
                MOV     WORD PTR [OLDINT13+2],ES  ;SAVE OFFSET
                MOV     DX, OFFSET NEWINT13
                MOV     AX, 2513H
                INT     21H                 ;DOS FUNCTION TD CHANGE VECTOR

                MOV     AX,3516H            ;GET KEYBDARD INPUT VECTOR
                INT     21H
                MOV     WDRD PTR [OLDINT16], BX   ;SAVE SEGMENT
                MOV     WORD PTR [OLDINT16+2],ES  ;SAVE OFFSET
                MOV     DX, OFFSET NEWINT16
                MOV     AX, 2516H
                INT     21H                 ;DOS FUNCTION TO CHANGE VECTOR

                MOV     AX,3521H            ;GET DOS FUNCTION VECTOR
                IHT     21H
                MOV     WORD PTR [OLDINT21], BX
                MOV     WORD PTR [OLDINT21+2],ES
                HOV     DX, OFFSET NEWINT21
                MOV     AX, 2521H
                INT     21H                 ;DOS FUNCTIDN TO CHANGE VECTOR

;-----------------------------------------------------------------------;
; DEALLOCATE OUR COPY DF THE ENVIORNMENT.                               ;
; EXIT USING INT 27H. LEAVE CDDE AND SPACE FOR BUFFER RESIDENT.         ;
;-----------------------------------------------------------------------;

                MOV     AX,DS:[002CH]       ;GET SEGMEHT OF ENVIORNMENT
                MOV     ES,AX               ;PUT IT INTO ES
                MOV     AH,49H              ;RELEASE ALLOCATED MEMORY
                INT     21H
                MOV     DX,BUFF_END         ;LEAVE THIS MUCH RESIDENT
                INT     27H                 ;TEMINATE AND STAY RESIDENT
;-----------------------------------------------------;
; GET_PARAM RETRIEVES AN INTEGER FROM THE COMMAND LINE.  ;
;-----------------------------------------------------;
GET_PARAM:      XOR     AX,AX               ;CLEAR AX FOR TOTAL
GET_DIGIT:      MOV     BL,[SI]             ;GET CHARACTER INTO BL
                CMP     BL,0DH              ;IS IT THE LAST ONE?
                JE      DONE
                INC     SI                  ;PDINT TO NEXT CHARACTER
                CMP     BL,","              ;IS IT THE DELIMITER?
                JE      DONE
                SUB     BL,30H              ;CONVERT ASCII TO INTEGER
                JC      GET_DIGIT           ;IS IT A VALID DIGIT
                CMP     BL,9
                JA      GET_DIGIT           ;IF NDT VALID, JUST SKIP IT
                MOV     BH,10               ;TIMES 10 FOR NEXT DIGIT
                MUL     BH                  ;MULTIPLY SUM AND ADD THIS DIGIT
                ADD     AL,BL               ;ADD DIGIT TO SUM
                JMP     GET_DIGIT           ;READ ALL CHARACTERS DN LINE
DONE:           RET
CSEG            ENDS
                END     START
```

ATLANTIS INTERNATIONAL COMPUTERS

ATLANTIS INTERNATIONAL PTY LTD
49 WADHAM PARADE.
MT. WAVERLEY.
VIC. 3149
PH: (03) 277 3139 277 7187 277 9514
FAX: (03) 277 6824

IMPORTERS
SUPPLIERS
DISTRIBUTORS
& SALES

TOTAL



$985.00

Inc-Tax
$830x-Tax

BUDGET PC-TURBO
2 LAYER MOTHER BOARD
8088-2 PROCESSOR
256K RAM
(EXPANDABLE TO 640K RAM)
1 DISK DRIVE 360K
150 WATT POWER SUPPLY
1 MULTIFUNCTION CARD

SERIAL PORT
(2ND OPITIONAL)
PARALLEL PORT
JOYSTICK PORT
CLOCK/CALENDAR/TIMER
1 COLOR GRAPHICS CARD
RGB PORT
COMPOSITE PORT

FREE

1 SAMSUNG
GREEN SCREEN
MONITOR

THREE MONTHS WARRANTY PROVIDED BY DATACRAFT AUSTRALIA NATIONWIDE

PRICES VALID WHILE STOCKS LAST

Note: *Price and specifications Subject to Change at any time.
*Option second disk drive and mouse shown, not included in the package.
*Budget PC-Turbo Assembled in Australia.

AD INDEX

THE BEST POSSIBLE NEWS FOR IBM PC USERS

SEAGATE 20MB **$590**	LOTUS 123 **$540**	TANDON 20MB **$590**
NEC POWERMATE 80286 AT, 20MB 640K Multisynch EGA **Call for Price**	WORDPERFECT **$485**	TURBO XT 640K, 8MHz, 20MB EGA (12 months warranty) **$2795**
BABY AT 8MHz 640K, 1.2MB FD 80286, 20MB, MONO (12 months warranty) **$3333**	FREELANCE PLUS **$685**	DESKTOP 80386 AT 16MHz, 512K, 30MB HD 1.2MB FD MONO (12 months warranty) **$6969**

SOFTWARE

Lotus 1-2-3	$540
dBase III Plus	$835
Symphony	$855
Wordperfect	$485
Lotus HAL	$250
Freelance Plus	$685
Multimate Adv II	$760
Paradox	$895
MS Word	$525
Harvard Prest. Graphics	$530
The Magician	$390
Crosstalk	$213
Manuscript	$730
123 Report Writer	$220
Lotus Metro	$130
The Auditor	$207
Genifer	$487
Sideways	$135
Copy II PC	$60
Turbo Prologue	$145
Copywrite	$95
MS Chart	$640
MS Project	$674
Professional Write	$277
Total Project Mng II	$775
Reflex	$235

TAPE BACKUP

25MB External	$1195
60MB External	$1895
60MB Internal	$1785
125MB Internal	$1895

MODEMS

Netcom

Smartmodem 123SA	$960
Smartmodem 1234SA	$1200
Smartmodem 1200SA	$718
Automodem 123	$778
Automodem 1234	$945
Automodem 24/24	$840
1200 In/modem	$560
2400 In/modem	$800
1234 In/modem	$982
Trailblazer Ext.	$3600

HARDWARE

Hard disks

Seagate 20MB	$650
Tandon 20MB	$590
Miniscribe 44MB Voice Coil	$1525
Seagate 30MB Voice Coil	$1120
CDC 86MB (wren)	$1990
CDC 50MB	$1435
MT 30MB Drive Card	$1275

Chips

64K per Bk	$25
256K per Bk	$70
8087	$280
80287-6	$475
80287-8	$675
80387	$1490

Add-On Boards

Hyperace 286 Plus	$948
Hyperam	$720
Hyper 512	$324
Mitec Brd	$130
Intel Above Brd PC/XT	$595
Intel Above Brd AT	$895
Qubie MF 384K	$395
Serial Card XT	$45
3MB Multifunction Card AT	$295 plus chips

NEC P7 **$1045**	EPSON EX1000 **$1255**	Fujitsu DL3400 **$1245**

PLEASE CALL FOR ANY ITEMS NOT LISTED

To order or for further information simply call:

SYDNEY (02) 439 7500 MELBOURNE (03) 696 2333

Fax (02)4396547

Or visit our MC-P centres at:

SYDNEY: (02) 439 7500 2nd Floor, 156 Pacific Highway, St. Leonards 2065.
MELBOURNE: (03) 696 2333 29 Park Street, Melbourne 3000.

MC-P APPLICATIONS

ALL PRICES INCLUDE SALES TAX

3% DISCOUNT FOR CASH

"Another Big Performer From ALLAW To Build Up Your Data Storage Muscle!"

ALLAW Introduces The Miniscribe 3053.

As Australia's sole Authorised Distributor and Reconditioning Centre for Miniscribe we are proud to introduce the 3053 model 5.25 inch half height, voice coil drive. It offers 53.3 megabytes of unformatted storage and an amazingly fast average access time of 25 msec.

Ideally suited to micro computers in networked and multi-user situations the outstanding 3053 complements any high performance desk top systems. Like all Miniscribe products it offers that now famous performance and reliability experienced by millions of users worldwide. And, all Miniscribe products purchased from Allaw, or its dealers, carry a full 12 month warranty.

If you're interested in knowing more about the 3053, or any other of the famous Miniscribe models, call us at Allaw. We would be happy to provide you with all product information and details of your nearest dealer.

NEW 44MB. VOICE COIL DRIVE
from Miniscribe and ALLAW Sales

ALLAW SALES Pty. Ltd.
9/1 Short St., Chatswood NSW, 2067
Tel: (02) 406 9111 Fax: (02) 406 9115
P.O. Box 541. Willoughby, NSW 2068
Brisbane: (07) 854 1461
Melbourne: (03) 211 8911
Auckland: (09) 37 1334

ALLAW DATA STORAGE MUSCLE