

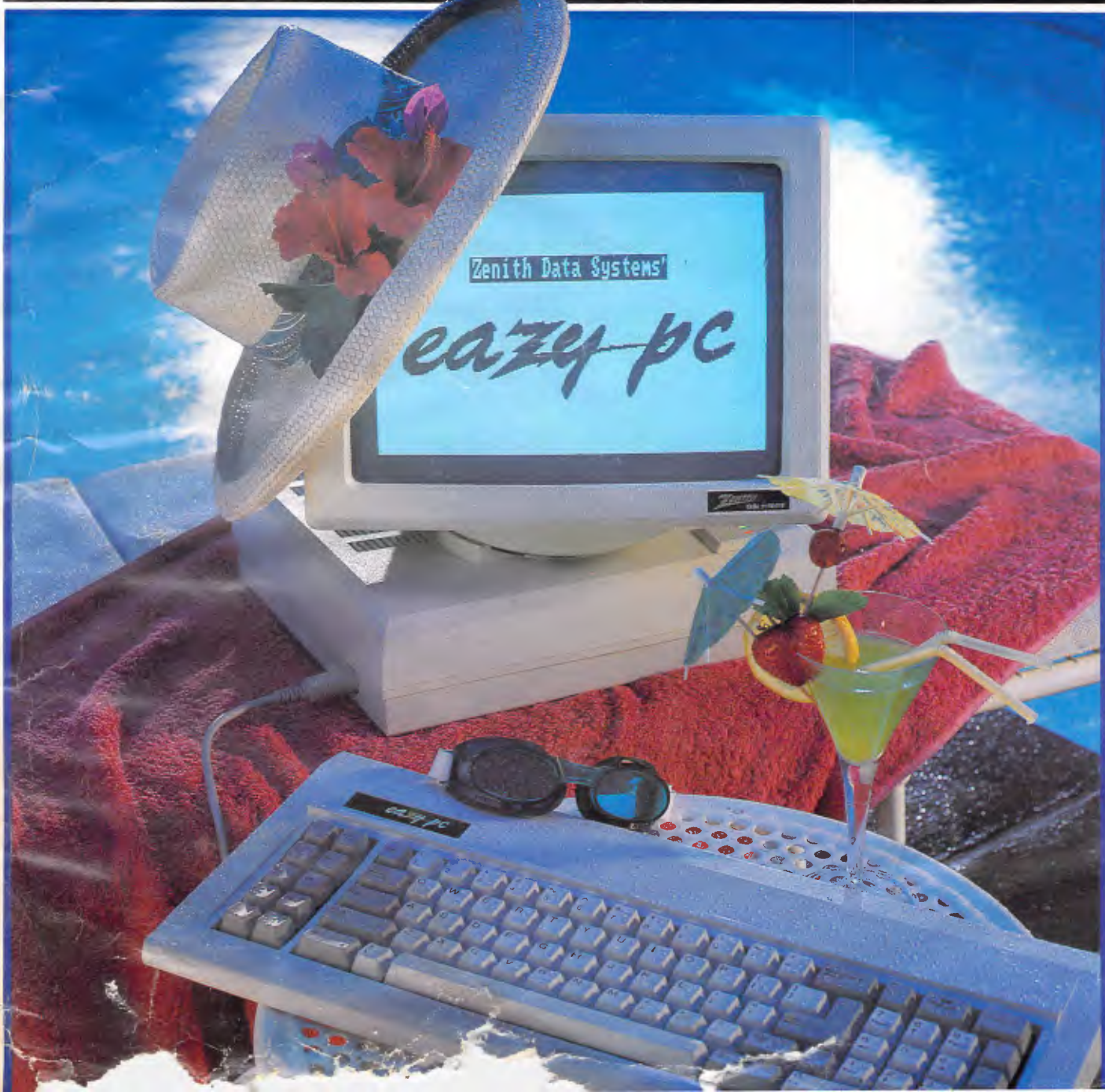
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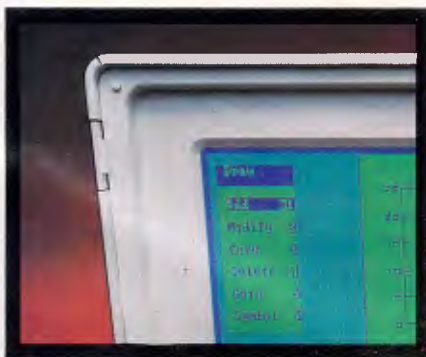
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Guy Kewney and our 'West Coast correspondent' in the US, Tim Bjarin, round up the month's micro news from around the world.

The party's nearly over

Jim Manzi, head of Lotus Development, was talking in sombre tones at Comdex Fall in November about the fact that microcomputers 'do nothing for office productivity'. Nonetheless, he, like everybody else there, seemed convinced that the micro boom would go on and on.

This has nothing to do with anyone's belief that the stock market is about to recover.

I was amazed how few financial optimists I found, visiting Las Vegas for the show. They were all saying: 'Well, there are some real bargains to be had, and just as soon as the price bottoms out, I'll be going after a few.'

I rather doubt it. Okay, I'm not a share analyst. But everyone has had their five cents' worth (or, these days, three cents) about the stock markets and the crash, so why should I let the fact that I don't own shares stop me?

And the fact of the matter is that most American business directors I spoke to expect stock prices to drop. They are all making plans for them to drop. And some are even saying that the point to which they might drop is very much lower than it is this year (1987 as I write).

Adam Osborne, one-time ultra-guru of the micro business and a man who has generally been pretty good in predicting the micro stock market (and does fairly well in other share areas, too, he says) reckons that the Dow

Jones Index will drop to 800 over the next 18 months.

He could well be right, for all I know, and his argument sounds sensible. That's the level where the price of the typical share will bring enough dividends to make a return on investment that compares with buying homes, or putting the money in a building society.

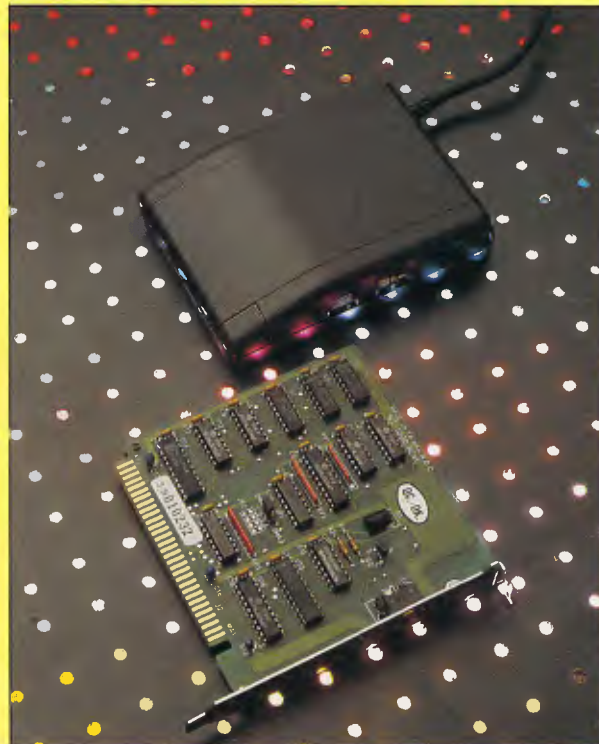
What interests me, however, is what this will mean to the micro business. Will we have higher prices? Fewer sales? Or more sales and lower prices?

This is not a time for making dumb predictions, however lucky one has been in the past. What is observable, however, is the fact that the big players are all making plans for continued good business. Only those companies who are strictly into stockbroker sales — Porsche might be a good example — are expecting the shares slump to hurt them.

Far be it from me to spoil everyone's fun, but I wonder whether this is sensible.

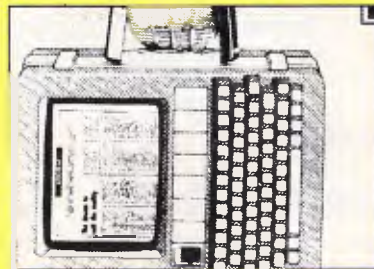
At the moment, the US economy is being given a lot of free money because the Government is spending a lot but is not raising taxes to find the cash. Instead, it has been borrowing from the rest of the world. And all the signs are that this habit is about to stop — slowly at first, and then more rapidly as time goes on.

Now, when things get hard, business



This little device is what is known as a hand scanner. It's comprised of a hand-held scanning device which is connected to a half sized board in an IBM or compatible PC.

We scanned *Newsprint's* introductory graphic in GEM format, edited a few (but not all) extraneous dots out of the image, loaded it into this page under Ventura and output the result on a Linotronic 100. It sells for around \$600.



productivity aids. A computer may replace a clerk, so fire the clerk and buy a computer.

In fact, history shows that computers have *never* reduced staff levels. According to Jim Manzi, there are now clear survey figures of the effects of micros on of-

fices, and they show that, in fact, office productivity goes down.

Apart from the generation of more paperwork (memos and desktop-typeset office magazines) requiring more people to sift through it, most micros have been used for

storing more data (requiring more people to analyse it) or for concocting financial scenarios of such complexity that only a computer can turn the numbers into charts. That's word processors, database and spreadsheet, plus graphics. How would any of that help productivity — even if the wretched things worked all the time?

But that isn't what worries me. What worries me is that people are starting to use their new, cheap micros, and are realising that as long as the 1987 model doesn't blow up, it'll be good for another three years. But people who aren't interested in cheap micros aren't going to become interested until a whole new generation comes along.

Convince me that the new IBM operating system, OS/2, which won't even have its windowing part ready until November 1988, is going to be a whole new generation. Convince me that the new Macintosh II will cost under \$5000, including 18in colour display and 6Mbytes of memory, by November 1988. Persuade me that all the new RISC chips will be up, running, and fully-stocked with new software before Christmas.

I think the boom will fade mid-1988, and won't come back for two years. We'll see if I'm wrong, shall we?

Guy Kewney

Patented silence

Hayes says that the trick of sending three '+' signs preceded and followed by at least a second of silence is a patented method of waking a modem up to the fact that you want to talk to it, not through it.

US Robotics didn't agree, but has ended the lawsuit that followed by settling out of court, and signing a licensing deal with Hayes.

As you can expect, other modem makers are outraged. They were mostly going along with US Robotics in the case, and feel they've been sabotaged.

Every Hayes-compatible modem which uses this technique (nearly all) is now liable to have this precedent waved at it. It could increase modem prices in the US. In Australia, however, the things are so much more costly, that perhaps it won't affect things so much.

Apparently it's the silence before and after the three pluses that is patented. I never cease to marvel at the ingenuity of legal processes. Patenting silence, indeed!

Guy Kewney

Hard chips

I tried very hard to get enthusiastic about Intel's 80486, which it is now talking about to customers. Perhaps I would have succeeded better, if I hadn't been talking to a lot of designers of reduced instruction set computer (RISC) architectures.

Intel has said it will have a million transistors on the 80486 chip, and it will run three to four times faster than the 80386. When I asked whether this was official, a spokesman said it was a laboratory figure, and you could prove anything in the laboratory. So no, that wasn't official. Nor would it be, until 1989 when the company expected to announce it.

Measured in Dhrystones, that would put it around the 27,000 mark. Most RISC designers expect to be over 20,000 Dhrystones next year, and Acorn expects to be there for a reasonable price, too.

"Intel is a conservative producer of processors," commented one designer I spoke to, "and it is doubly handicapped by the need to stay compatible with the 80386." So that's a very unimpressive chip — except for the size, which will probably be very hard for it to make.

The problem is simple: Intel is a leader in Erasable PROM (EPROM) technology, but has dropped out of ordinary memory chip markets under Japanese pressure.

You need expertise in memory technology to make processors.

Not that that's enough, by the way. Japan's NEC recently astonished the world by refusing to indemnify Zilog for any lawsuits that Intel might bring against it for the V20 and V30 processors.

Intel has been doing quite well in its lawsuits so far against NEC, and Zilog has licences to the V-series. What makes it a bit dubious is that Zilog got those licences as part of a legal settlement of its suit against NEC for piracy of the Z80. Now it says that if the Intel lawsuit goes against it (and Zilog), that's too bad.

"Here you are, a nice rubber six dollar note in full settlement of my fine, your Honour," is the way Zilog sees it. It is proposing to hand the licences back, and revive its \$60m suit against NEC.

Guy Kewney

Looking over Intel's shoulder

Phoenix, a company renowned for its IBM BIOS emulation products, was showing an impressive new addition to its range at Comdex which attracted surprisingly little attention. The new product is a complete 80286 emulation for the 68020 processor. Previous attempts to produce such a product have been disappointing, but Phoenix claims that its emulation operates only very slightly slower than the 80286 itself. With the 68020 emulating the 80286 as an AT, it achieved a Norton's SI figure of slightly over 7. Even allowing for the little fiddles Phoenix is bound to have used to achieve this, it is astonishingly fast for a software emulator. Is this the beginning of the end for Intel?

Phoenix was also quick to claim that it wouldn't have any trouble emulating the 80386, although the company admitted: "We would need to use 68030 to achieve full speed." Unfor-

tunately, although Motorola was showing VME developers' systems incorporating the 68030 at Comdex, there was no evidence that they worked properly. The only significant differences between the 68020 and the 68030 are that the 68030 is a bit faster, uses onchip data cacheing and has a somewhat redesigned architecture (called Harvard Parallel) that lets more parts of instructions operate simultaneously.

Phoenix and Motorola are in US on (408) 438 2942 and (408) 864 4254.

Owen Linderholm

A painter's dream

In a couple of months, you will have to start thinking long, hard, and furiously about how you are going to avoid buying a Mac II — because once you've seen Pixel Paint on a Supermac giant display on that machine, no other drawing program will ever impress you again. And that includes De Luxe Paint on the Amiga.

Supermac is the company founded by Steve Edelman in Sunnyvale, California, just on faith that the Mac market would need improvements to the original. Edelman's company is best-known for producing the portable hard 'dataframe' disk drive for the Mac — but now, it looks like it's about to get famous for its display add-ons.

Pixel Paint, which I saw on a recent visit to company headquarters, is very nearly finished, and I'm terribly torn between desperately trying on the one hand to work out a way of financing a system to run it on, and sighing with relief, on the other, that I won't be able to — and as a result, my family will get to see more of me.

Any Mac enthusiast will recall the early days when Mac Paint first appeared, and you could suddenly play with all those graphical ideas — shapes, fills, floods, pixel-bit spotting, spray-can effects — but all in black and white

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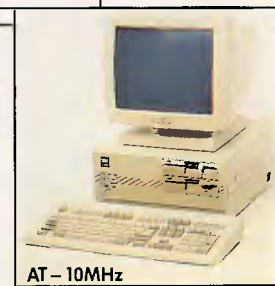
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on the Mac's little screen.

Those who have seen De Luxe Paint on the Amiga will have had a similar sense of inspiration — all those amazing things that became possible, in colour, too.

With the extra power of the Mac II 68020, plus this big screen, plus this software, price is the only barrier to sheer naked covetousness. You're talking about a \$12,000 upwards price tag, depending on which screen you buy.

This is the moment, I think, to remind myself that all these paint programs are only toys, and nobody actually uses them for anything. Or do they?

Guy Kewney

On the radio

The standard Ethernet system for connecting computers together is called a 'broadcast' network, because each machine on the network sends messages to all others at the same time. But it could indeed be broadcast on the ether, and a radio network has now been produced.

It was launched at Comdex by Ray-Net, and is compatible with Novell networks.

To use it, you need a PC adaptor board, a radio frequency transmitter/receiver, and Ray LAN software.

You put the transceiver next to your PC or compatible, connect it to the card, plug in the card and load the software. Hey presto! All machines in the net are connected.

There's a lot to find out about this net, still. It was developed in Spokane, Washington, where buildings aren't typically close-set. Radio waves tend to echo and reflect in built-up areas. Also, the range of a wireless transceiver varies enormously in a high rise from floor to floor. There's also the question of getting a radio licence for it. Exactly how legal the thing might be in Australia isn't possible to tell until someone tries it officially.



Look closely at the display of this Mac II (and don't complain about the repro quality . . . it was difficult enough just to get a pic at all), and you will see an IBM PC display complete with contrast, on/off switch and brightness controls. It (the PC) is running Lotus 1-2-3.

That is really running! The software which does it is Soft PC, which appears to be real. I saw it running, and 1-2-3 appeared to be working. And I was told that it worked at XT speeds — a Norton's rating of 1.0.

That PC display was just one task running on the Mac at the time, so I was really impressed — until I discovered the weasel: you need Unix.

The emulator runs under A/UX, the Mac II's version of Unix; and, at the moment, that cuts you off from all the other Mac applications.

Details from Insignia, 1255 Post Street, Suite 625, San Francisco, CA 94109, or phone (415) 771 7001.

Well, *someone* has to try it. If you'd like to be the volunteer, the company is RayNet Communications Systems, E 12806 Nora Avenue, Spokane, WA 99216, USA. Tel: (509) 924 2855.

Guy Kewney

The writing's in the sky

Pity it rained so much in the Nevada Desert, scene of the Las Vegas Comdex show. It utterly ruined the cleverest dot-matrix printer I've ever seen — five aeroplanes with smoke output.

The normal way of doing sky-writing is to pilot your plane around the shape of letters while billowing smoke out the tail. It's often hard to read, the slightest wind makes any message dissipate in seconds, and it

usually takes minutes to complete a sign of more than four letters.

IBM got around all these problems by lifting an idea from a science fiction book (John Varley's *Demor*), and managed to print the long and complex message 'Thanks a million!' across the sky. The planes flew in formation. They emitted little closely-controlled puffs of smoke which quickly blurred into stripey lines — dot-matrix printing. And it worked!

Well, if the sky had been blue it would have worked. In the event, there was only one morning when they could try it, and even then there was enough white cloud around to make photography impossible.

Sadly, I couldn't find an IBM staff member to explain whether the trick was com-

puterised or not. One character actually told me that he wasn't authorised to answer press queries. Pressed, he admitted he didn't know what I was talking about. "But if you come back in an hour or so, our communications manager will be here . . ."

Users get 'quick peek at dBase IV'

Ashton-Tate disappointed dBase users in the US last month who expected to see a preliminary release of the next dBase. Instead, the users only heard sketchy details.

"The session was called 'A peek at dBase IV', and if we got a peek, it was a quick one," said Larry Josephson, head of a dBase special interest group and the man who set up the meeting.

Willem Stoeller, Ashton-Tate's director of product planning for advanced development, rehashed information about dBase and did not address many key areas, particularly multi-user capabilities, compiler support and developer utilities. Ashton-Tate's Gene Harvey was similarly unforthcoming when interviewed in Melbourne recently.

An Ashton-Tate official said, "The company regrets the misunderstanding, but it has never been our policy to selectively disclose material on unannounced products."

In his talk, Mr Stoeller did confirm that Ashton-Tate plans to incorporate a pseudo-compiler into the next dBase to comply with users' demands for faster performance, unlimited distribution and protection of source code for applications.

Although Mr Stoeller declined to be more specific, sources familiar with the development effort said that the pseudo-compiler translates dBase source code into a time-efficient object code that is executed interpretively.

The use of the object code produces faster-running applications as well as unmodifiable source code, the sour-



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ces explained. To address the ease-of-distribution requirement, the sources said Ashton-Tate will offer a standalone version of the run-time system, which will let users distribute multiple applications that can execute without the help of dBase.

The product specifications show that a separate configuration of the new dBase aimed at developers will include such extras as the standalone run-time system, development utilities, a template language for automatically generating customized applications and a two-disk access pack that enables developers to test multi-user applications.

Other multi-user enhancements slated for the next dBase are an easier installation and network-administration feature, an automatic record-locking feature, so multiple users can work on the same file, and a refresh feature that updates displays at specified intervals.

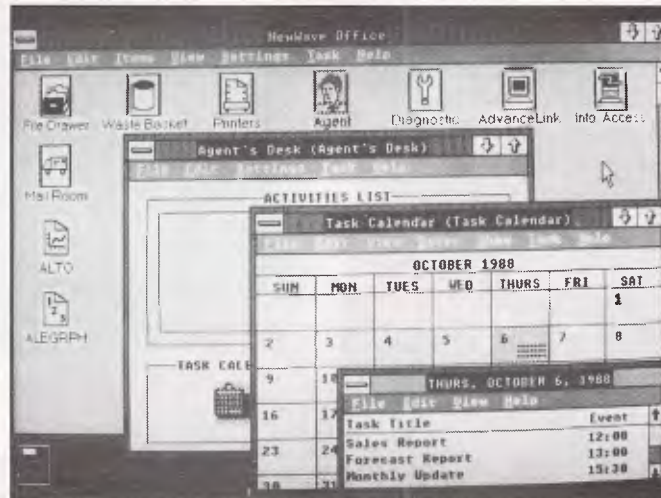
Mr Stoeller declined to announce a shipping date for the next dBase, but said that the program would go into beta-test shortly.

HP's NewWave

Hewlett-Packard (HP) has announced NewWave, a Windows-based environment which is designed for both network and standalone use. It allows developers to provide a consistent user interface between diverse applications through a process called 'encapsulation'.

It also provides access to a network of distributed computers, easy switching between applications, and the ability to program intelligent 'Agents' which can run programs in the background, quite independently of the user.

Voice, text, data and images can be blended into 'compound documents' which, through a technique called 'hot-linking', can remain connected to the original source files. In this way, whenever data in the



source file changes, it is automatically reflected in the compound document.

The NewWave applications environment will work with Windows 2.0, and eventually, OS/2 with Presentation Manager. Unlike Windows, NewWave has a full icon interface, very similar to GEM's. Its Agents are supermacros which HP describes as 'its first practical business application of artificial intelligence principles'. Agents can be activated by system events such as a telephone call or according to a schedule set up in a task calendar. The Agent engine can also be used to run interactive computer-based training (CBT) sessions. Agent scripts can be written or created automatically by using a 'record' mode to log the user's actions.

At the heart of NewWave is an object management facility (OMF) which keeps track of all the files and parts of files which the user regards as discrete entities. These might be voice, text, spreadsheets, parts of spreadsheets, graphs, scanned images, and so on. The OMF manages the relationships between these objects and the programs and documents which use them. Each file is represented onscreen as an icon, and the OMF knows, from the context in which it is used, which view of the file is required at any time.

It is possible, for example,

to create a compound document containing different types of information — bit images, cells from a spreadsheet and text, for example. Should the user elect for the various components of the document to remain hot-linked, the OMF would then ensure that changes to the original files are reflected in the compound document. Compound documents are printed, mailed, copied and moved as a single entity by NewWave.

NewWave also contains a contextual help system which is available at all times. Once inside, certain words and phrases are boxed: these provide hyper-text-like 'back doors' to related subjects elsewhere in the help files.

Developers can 'encapsulate' existing programs, whether written for MS-DOS or Windows, by using tools supplied by Hewlett-Packard. This 'encapsulation' enables these applications to integrate with NewWave and, therefore, with other applications and services served by it. Developers can choose from the several levels of encapsulation, depending on the effort they want to expend and the degree of integration they require.

Although NewWave will do much for the solo user, HP expects it to do more for those linked to a corporate computer system. HP has bonded NewWave very tight-

ly with its HP 3000 minicomputer range. It gives users transparent access to the corporate computer resource — either the HP 3000, or beyond that through its own gateways to other machines. Hewlett-Packard is working on HP 3000 'browser' programs which will enable its terminal users to browse through compound documents sent to them from PCs running NewWave. Data formats will be translated to suit the terminal's characteristics, and incompatible data (bit images, for example) is simply described without being displayed.

According to HP, five of the top 20 software package suppliers have agreed to implement programs under NewWave. Because NewWave relies heavily on the resources of Windows 2.0, Microsoft has spent two years working closely with HP on this project and its Excel will be one of the first packages to appear on NewWave.

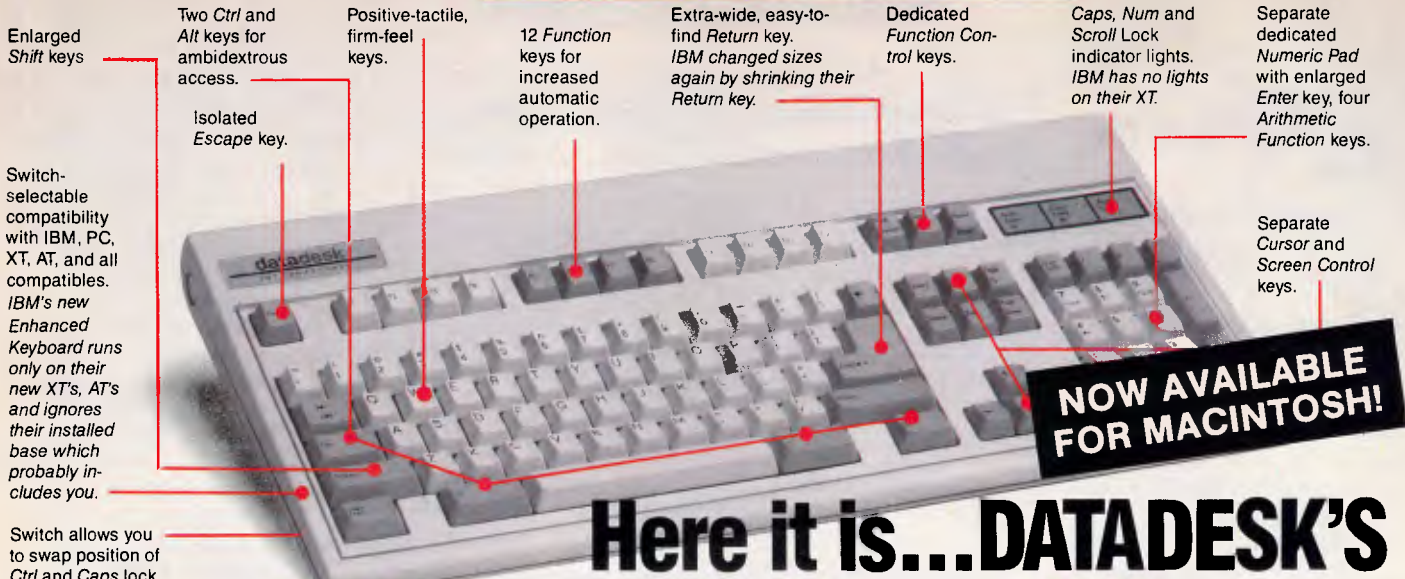
The HP NewWave Developer Kit is expected to be available in Australia next month for around \$1800 and will include the HP NewWave software, development tools and reference manuals. To run, NewWave requires at least 2Mbytes of LIM 4.0 memory.

For the future, NewWave will be implemented on OS/2 with Presentation Manager, and HP is researching the possibility of putting it on Unix under a graphical interface. The company is also exploring the possibility of allowing networked PCs access to each other's 'objects', and is looking at the feasibility of a natural language front end. HP says it would then try to 'disambiguate' (yes, HP really did say that) sentences like 'Get the file that George sent'.

HP hopes that NewWave will lead to significant gains in white-collar productivity due to its ease of use and consistent user interface.

Hewlett-Packard is on (03) 895 2895.

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"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!

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

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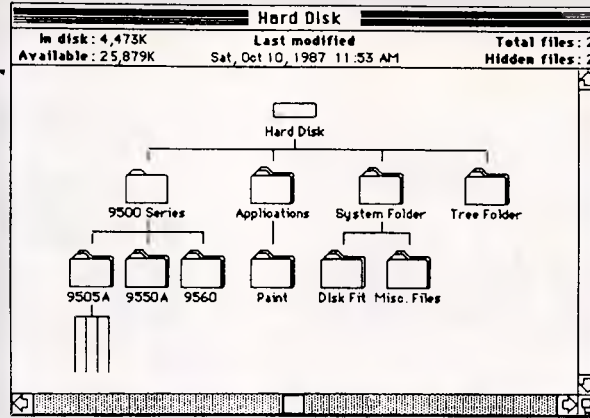
Desktop publishing to the fore

As expected, there was a tremendous amount of DTP software on display at Comdex — mostly in the form of add-ons and extra packages to make greater use of DTP. The most important of these products, Bitstream's Fontware, wasn't new at the show, but what was new was that a large number of printer and software manufacturers supported it.

Fontware lets you design proper fonts for Windows applications like PageMaker and GEM applications like Ventura. These fonts have been designed for onscreen display and for output to printers and typesetting machines.

Aldus announced version 3 of PageMaker for both the Macintosh and the IBM PC. Both products will be released early this year and will include features such as automatic text flow around imported graphics, Bitstream's Fontware, support for long documents, style sheets, spot colour, and special controls for importing scanned images.

A spokeswoman for Info-



Put a hard disk on a Macintosh, and suddenly all those nice pictures of programs and files start to look more like a liability than an asset. Suddenly, you realise that a 'desktop', whether made of wood or dots on a screen, becomes confusing when you put too many files in it.

Users of the IBM family have long known to resort to tree-management facilities like QuickDOS and XTree for managing directories and hierarchies. They will feel at home, at once, with MacTree — described as a hard disk management system for the Macintosh.

This product works rather like the Finder filing system that comes with the Mac, but shows the hierarchies.

Apart from the ability to show the tree of hierarchies, there are several nice-sounding features, such as a 'search' feature. This allows users to look for a file by name (or part of its name) even if they don't know which folder the files are in.

Details from Software Research Technologies, 22901 Mill Creek Drive, Laguna Hills, CA 92653, USA. Guy Kewney

Magic, the Australian distributor for PageMaker expects the new version to cost approximately \$1995 for the PC version, and \$1495 for the Macintosh version — an increase of around \$200 as compared to the current price for earlier versions.

Aldus also announced three new products:

- a Kanji (Japanese script) version of PageMaker;
- a drawing program (yes, another one) for the Macintosh, called Free-Hand; and
- Snapshot, a novel image-capture program for the IBM PC.

A company called Advanced Recognition Technologies showed me a piece of software called SMaRT STaRT OCR for the IBM. This accepts input from eight of the most popular scanners (such as Hewlett-Packard and Canon) and performs intelligent character recognition. I watched it scan a non-standard-sized page from a manual with two fonts, different sizes and proportional spacing, and saw that characters were recognised and stored considerably faster than anyone could type.

The most impressive thing about SMaRT STaRT OCR is how easy it is to control



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Kaypro Corporation — electronics innovator since 1952 — has made a good thing even better. The KAYPRO 286i Model C now features a 40-MB hard drive and the 101-key AT-style keyboard. With the latest standard feature enhancements, the KAYPRO 286i is the smartest choice in advanced computer technology.

Advanced.

The heart of the KAYPRO 286i is the 80286 microprocessor — with a processing rate of 10 MHz and 640 kilobytes of RAM. The perfect match for today's high productivity software.

And Enhanced.

The KAYPRO 286i Model C has

a 1.2-MB floppy disk drive, plus a hard disk with 40 MB of storage. The KAYPRO 286i AT-style keyboard features the new 101-key layout with separate cursor control, numeric keypad, and 12 programmable function keys.

Perhaps the nicest surprise about the KAYPRO 286i/C is the suggested retail price of \$3995
* Prices are subject to variation
You won't find distinctive metal construction, 10-MHz processing, and free name-brand software that includes WordStar Professional Release 4

in any other AT-type computer. Other company's extras are Kaypro standard features.



The KAYPRO 286i Model C features...



80286, 10-MHz Microprocessor.



An internal hard disk drive with 40 MB of storage.



Enhanced 101-key IBM PC/AT-style keyboard with security keylock.



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Bundled software includes WordStar Professional Release 4.

Trademarks: 286i, Kaypro Corporation; IBM, AT International Business Machines; WordStar Professional Release 4, MicroPro International.



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and how automatic most of the process is.

A company called Inovatic also showed an OCR program called ReadStar II+ for the IBM and the Macintosh. Although I was unable to see this in operation, its specifications are even better than those of SMaRT STaRT.

Bitstream can be reached in the US on (617) 497 6222; Aldus, is on (206) 628 2352; Inovatic is on (703) 522 3053; and Advanced Recognition Technologies is on (201) 487 3440.

Owen Linderholm

Error correction: it's just a storm in a teacup

Some time before March but after December is over, all the arguments about whether you should buy a modem with or without error correction will become a lot less urgent when DataStorm releases its newest version of ProComm — ProComm Plus. This is the first general comms program to include the two main error correction standards for normal communications.

Note that this is the real thing — not just a download protocol like Kermit or Xmodem, but error-free transmission of every keystroke you type at a terminal.

There are two rival error-correcting systems fighting for the position of standard in the market — Microcom's Network Protocol (MNP) versus the X.25 standard LAP.

That much, I've mentioned in recent news items. What is new is the fact that ProComm will include both systems, and without requiring a special modem.

Until recently, the market has assumed that error correction was something you built into the modem.

Microcom (naturally) built MNP versions into its own modem. So too did its rival, US Robotics, which then went one better by building a modem that was less prone to error in the first place — the high-speed Courier HST.

That modem runs at 9600 bits per second. (It will also listen to modems working at standard 2400 and 1200bps, by the way.) It is catching on fast — it's the one which US Robotics is selling at half price to anyone who wants to set up a bulletin board. By contrast to those MNP protocol models, there is the Hayes high-speed series, launched in June 1987, and now available in America. They have the LAP protocol, version B (not D) which is different, and which is more like the standard the X.25 people are trying to establish.

Enter DataStorm, a company which has something of a reputation in comms circles, not all good.

On the plus side, ProComm version 2.4.2 — known as two four two — is widely recognised as the best program to use for downloading software from bulletin boards. It includes the Kermit system of binary file transfer, and has the high-speed Superkermit version of that. It also has 'relaxed' Xmodem (relaxed means it sends acknowledgements out of synch with the blocks, as with Superkermit) and if only people understood its programming language, we'd probably all use it.

On the negative side, the reputation of version 2.3 and earlier ones has left a bad taste in the mouth of many users. In a few words, it often didn't work.

Also, for simple unusability, the language which you use to automate ProComm sessions stands proud, only slightly behind the 'manual' which is a masterpiece of opacity, and probably the one which gave rise to the definition of 'encryption' as a 'powerful computer algorithm for taking simple text and generating a users' manual'.

All of this wouldn't have mattered much, but for the fact that ProComm is shareware. The company asked users to test it free, but to pay a registration fee if they kept it.

Comms users are notorious-

ly mean about software, tending to think of it as something they have worked to get. Coupled with the lack of reliability of ProComm's earlier versions, this meant that DataStorm didn't get rich.

Angrily, the company has now decided not to make ProComm Plus shareware. Instead, it will cost \$US70. There will be a free cut-down version which will destroy itself after several sessions.

This should soon be ready, and registered users will by now have been offered a cut-price upgrade to Plus
Guy Kewney

Siemens has the right answer

For the last three years, we have heard that CD read/write storage devices were ready to be launched. But Kodak/Verbatim introduced its 3.5in system over two years ago and it is *still* not available. Hitachi showed its 5 $\frac{1}{4}$ in 550Mbyte system as early as 1985, and that system too is not yet ready for commercial use.

But, one of Europe's leading companies is about to introduce a super fast hard disk that could challenge the whole CD read/write market. The Siemens 777Mbyte 5 $\frac{1}{4}$ in hard disk should be able to meet the needs of most small business users. To back up a disk drive like this on standard 360k floppy disks would require 2158 diskettes and take up to 71 hours.

Most hard disk manufacturers have been inching up to the 360Mbyte devices, but this 777Mbyte drive is the largest 5 $\frac{1}{4}$ in hard disk ever developed.

At last November's Comdex show, CD read/write vendors tried to play down the Siemens announcement and reaffirm that their products could be out by the middle of 1988. They rightly claim that their 5 $\frac{1}{4}$ in disks hold 550Mbytes of *removable* information, thus allowing the same drive to be used to access as many 550Mbyte

disks as you want.

The Siemens product is shipping, however, while CD read/write is still only talked about. Those familiar with the problems of commercial CD read/write say we may not see this technology perfected until early 1990.

Tim Bajarin

Apple begins Mac rewrite

Apple Computer is rewriting the entire Macintosh operating system to take advantage of most major computing environments, Apple CEO John Scully told an industry conference last month.

"We are looking to make it more uniform and robust . . . to connect Macs to minis and mainframe computers," he added. "It would be foolish for Apple not to connect to SAA [IBM's proprietary Systems Application Architecture], OSI [Operating Systems Interface] and the DEC world through Ethernet. We're betting it will be a multi-vendor world and that Apple will be one of the key players."

In his keynote address at Personal Computing: The 1988 Outlook, Mr Sculley revealed for the first time fledgling efforts at Apple to create a specification for a future generation of the Macintosh operating system.

"It's a major task to rewrite the Mac OS," he said. "We're now in the process of doing that. And we expect it to take three or four years."

Sources close to Apple's Advanced Product Division, however, admitted they are still having heated discussions about what features the product might have, adding that there is considerable debate within the company over how Apple should migrate its operating system into more advanced versions over coming years. The company is proceeding exceedingly cautiously, the sources said.

At the conference, Mr Sculley talked about the future of networking communications



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at Apple as an essential part of the company's new rewrite of the operating system.

"But this will be more than connectivity," he said. "In the 1990s, we will have a new networking and communications platform on top of the existing Macintosh platform." The new operating system, Mr Sculley hinted, will contain a basic database framework that's expected to resemble the company's recently released HyperCard product and currently goes by the code-name, Navigator.

In addition, Mr Sculley said, Apple is developing the capability to make extensive use of expert-system programs that rely on rules and artificial-intelligence techniques to make the computer capable of 'learning' a user's working style.

Because of the extent of rewriting that these changes require, the problem faced by Apple will be similar to that faced by IBM and Microsoft in the company's recent change from PC-DOS to OS/2.

"The challenge is to provide some level of compatibility for your existing family of applications, while providing enough power and functionality to allow a whole new collection of operations to flourish," said Steve Ballmer, a spokesman for Microsoft. "There are three essential questions that Apple will have to face: can we run existing code or the same programs just as they are; can we easily port existing programs over to the new environment; and is it a very, very big job to do this rewriting?"

The two pivotal changes in the Mac operating system are likely to involve providing concurrent multi-tasking and 'demand-page' virtual memory, which is the ability of a network system to use any available memory anywhere in the system as RAM.

Providing demand-page virtual memory may be the thornier problem, since the original Macintosh operating

system used a 24-bit address scheme (in its 32-bit address spaces) that absolutely limits addressable memory to 16Mbytes, according to several Macintosh application developers.

Wholesale rewriting of applications, they said, may be inevitable.

Apple to deliver Unix for Mac II

Apple Computer's first Unix-based operating system for the Macintosh II, A/UX, will be shipped in the first quarter of this year, according to Apple officials.

Introduced nine months ago and originally promised for delivery before the end of 1987, A/UX is a System V implementation of Unix that includes the 4.2 BSD extensions, which are chiefly used in the academic Unix community, according to Apple.

Positioned at first by Apple for scientific and technical computing, A/UX includes software tools that allow developers to customise their applications for the Mac's graphical interface.

Now, however, Apple has broadened the focus of A/UX to include business applications such as office automation and desktop publishing, an Apple spokeswoman said.

Specifically, applications for A/UX will address document processing and 2-D and 3-D computer-aided design and manufacturing (CAD/CAM) applications, the spokeswoman said. One vendor that expects to release an A/UX-specific application is Interleaf, which developed the Interleaf Electronic Publishing System, a high-end page-layout and document-preparation system. Apple sources declined to disclose what other Mac programs will be ported from the Mac's current operating system to A/UX.

Final pricing, licensing and distribution of A/UX are still undetermined. However, sources close to Apple said users will be able to purchase A/UX, which encom-

passes some 40Mbytes of code, for less than \$US1500.

Sources speculated that Apple may choose to release A/UX on February 9 to coincide with a speech scheduled to be delivered by Apple CEO John Sculley at the Unix trade show, Uniform, in the US.

Novell reveals dual OS/2 plan

Novell last month announced two methods for providing OS/2 support over its NetWare network-operating system.

Novell will support the IBM OS/2 Standard Edition with NetWare Requestor, a \$US50 software module which allows an OS/2 workstation to interact with a NetWare server. The Requestor is expected to be available here by the middle of this year.

The second option is a NetWare Applications Coprocessor, scheduled to follow the release of IBM's OS/2 Extended Edition. It will provide support for OS/2 server-based applications, which the Requestor alone cannot do.

The coprocessor will be available for both PS/2 and AT-based servers, Novell officials said. Both the Requestor and the Coprocessor require NetWare version 2.1, which Novell began shipping last month.

"All of this should allow us to provide the same level of

compatibility with OS/2 as we have with DOS in the past," said Craig Burton, Novell's senior vice president of corporate development.

In Novell's scheme, any OS/2 Standard Edition workstation using the Requestor can coexist on a NetWare LAN with DOS workstations, take advantage of NetWare services such as network security, fault tolerance and file handling and run both DOS and OS/2 applications, he said.

Novell's applications coprocessor off-loads the handling of OS/2 server-based applications from NetWare, providing broad compatibility without degrading network performance. When the coprocessor is used, the Requestor will oversee the distribution of application requests to the coprocessor and the sharing of server resources, such as hard-disk access, between NetWare and the application.

"Our compatibility with OS/2 was made possible with help from IBM," said Darell Miller, Novell's vice president of corporate marketing.

"We are supporting the protocols that IBM has said they will support," Mr Miller explained. "They have said they will support NetBIOS today, and later APPC [Advanced Program-to-Program Communications] for network communications. We will follow them."

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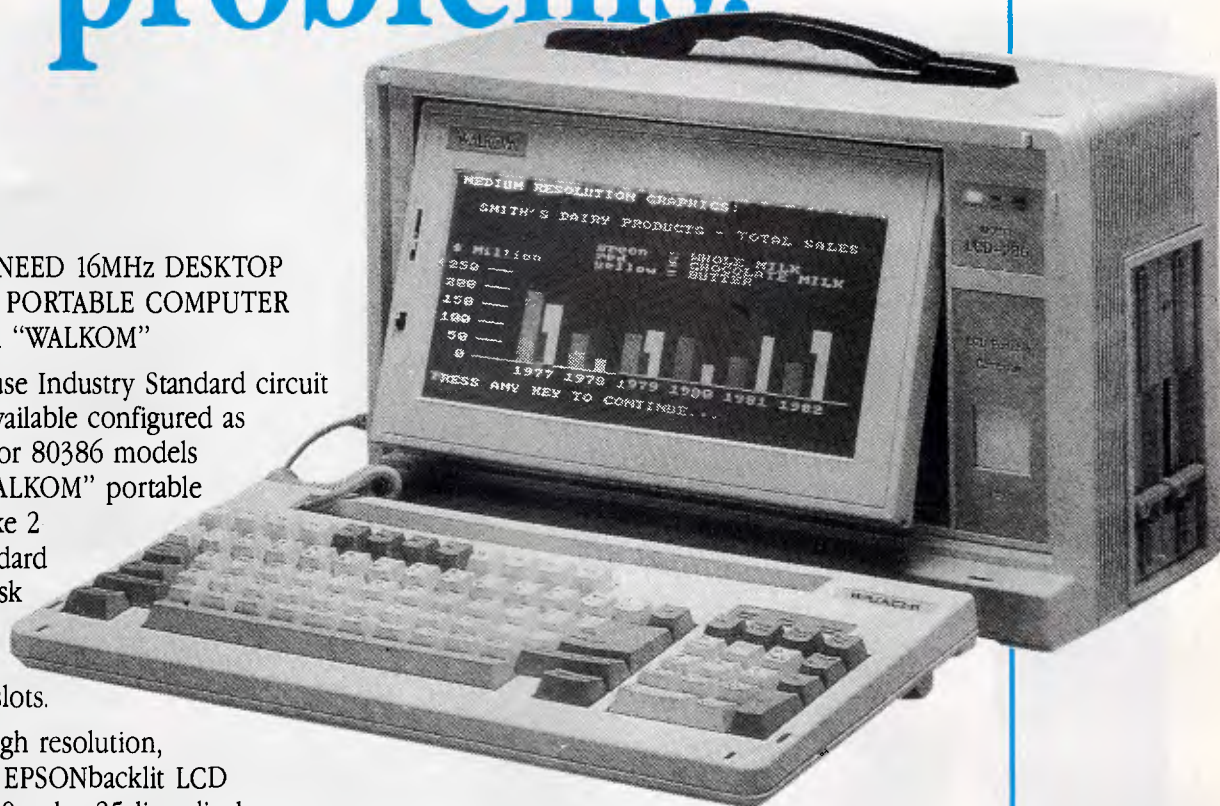
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eaZy pc

Zenith Data Systems has produced a neat little desktop unit called the eaZy pc. But the machine's non-standard disk size and its lack of growth potential give some cause for concern. Martin Wren-Hilton examines its place in the home market.



BENCHTEST

Zenith Data Systems is perhaps best known for its range of PC-compatible laptops including the Z-183 and the Z-181. To date, however, the company has not shown much impact in the desktop market despite a broad range of offerings from the Intel 8088-based Z-159 to the recently announced Z-386. With the eaZy pc (sic), Zenith is aiming to attack the Amstrad market.

Four things distinguish the eaZy pc from other machines: its diminutive size, its sharp display, its quiet operation and its lack of standard PC expansion slots. The machine comes in three models, each one with different storage capacities.

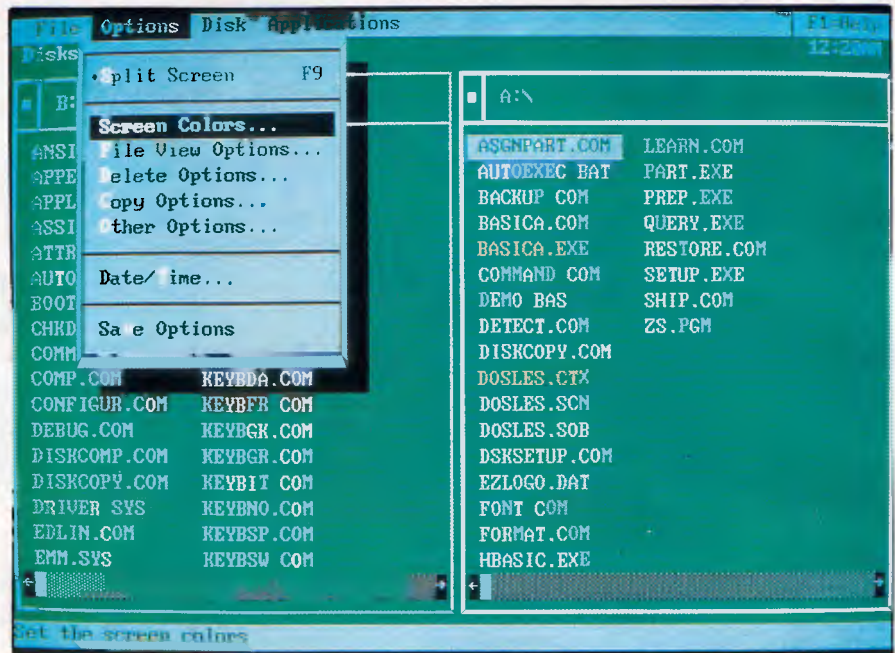
Hardware

The eaZy pc looks neat. A crisp paper-white monochrome monitor is permanently attached to the processor box by its swivelling base. You can't separate the two, and it would be unwise to attempt to do so as the monitor contains the power supply for the system. On the left-hand side of the monitor are two small knobs for altering the contrast and brilliance of the display, while the 3.5in disk drives are on the right-hand side. This unusual arrangement is normally found only on laptops; and it makes the insertion of disks awkward — you can't easily see what is going into where — and has the only advantage of allowing the keyboard to be pushed up against the front of the machine on cramped desks.

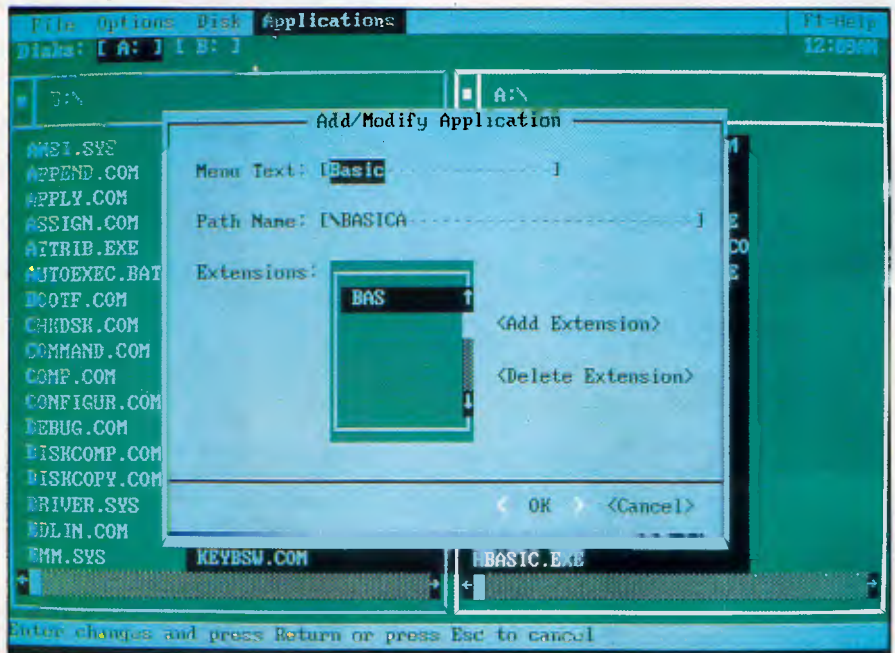
On the back of the eaZy pc are three ports: one for a Zenith mouse, one for a parallel printer and one for expansion. The expansion port is interesting as it is the only means of adding extras to the machine. There are no internal expansion slots, and the only internal option is a real-time clock which must be fitted by the dealer. Lack of expansion is the biggest single drawback to the eaZy pc.

Opening up the box — a procedure that is not recommended, as there are no user-serviceable parts inside — is a bit tricky. Because the monitor and processor box are inseparable, getting inside requires some manual dexterity. Lying the machine 'face down', with the glass screen on a work surface, proved to be the easier way. Four screws hold the base of the processor box to the upper half.

Inside, two large metal shields reduce any electromagnetic emissions. The one on the left covers the disk drives while the one on the right conceals the motherboard. Taking this off (having removed the loudspeaker) reveals the processor, memory and support chips.



MS-DOS Manager, though text-based, emulates a number of functions of MS-Windows including a 'point and shoot' approach to launching applications and file management



Applications can be installed on a menu and filename extensions can be linked to them. In this way, clicking on a document can automatically open a word processor

The eaZy pc is driven by an Intel 8088-compatible processor — the NEC V40 running at 7.14MHz. That makes it faster than the original IBM PC, and on a par with most low-cost PC clones. There is no option for running the machine at 4.77MHz (the speed of the original IBM PC). This feature is found

on many PC-compatibles for the purpose of running certain copy-protected software, although it is no longer such an important issue as this method of copy-protection is seldom used.

For reasons that I cannot fathom, Zenith chose not to include a socket for an 8087 coprocessor. This expensive

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BENCHTEST

mathematic chip is a great boon when using programs such as Lotus 1-2-3 which have been designed to take advantage of it.

On the motherboard are the CGA (Colour Graphics Adaptor) compatible chips and the disk controller, as well as 512k of RAM. The overall standard of construction is high and the eaZy pc seems well-built — unlike *some* cheap PC clones.

One thing that makes the eaZy pc very pleasant to use is the complete lack of noise (due to the absence of a cooling fan). Despite the Amstrad fan fiasco, I am sure that the eaZy pc doesn't need one. It uses cool running CMOS chips and has ventilation slits all over the top of the processor box.

As mentioned above, the eaZy pc comes in three models — the EZ-1, the EZ-2 and (you guessed it) the EZ-3 — with the only difference being storage capacity. EZ-1 has a single 720k 3.5in disk drive, while EZ-2 has two. For applications where greater capacity and increased speed are required, the EZ-3 has a single 720k 3.5in disk drive and a 20Mbyte hard disk. For the purposes of this Benchtest, I examined the EZ-2.

In theory, 3.5in disks have several advantages over other types of disks. With twice the capacity of the industry standard 360k 5¹/₄ disks, and occupy-

ing less space, 3.5in disks will doubtless become a standard of the future; and there's the crunch. In practice, 3.5in disks are a bit of an anomaly: the software sitting on most dealers' shelves is in 5¹/₄in only and Zenith doesn't offer an external 5¹/₄in to make life any easier.

Of course, you could always buy the combined 128k RAM/modem/serial port and use a serial cable with

'On paper, the eaZy pc's disk drives should be as fast or faster than their 5¹/₄in counterparts. In transferring data, they probably are, but starting up they seem to take forever.'

software such as PCXFER — but it is rather like cracking walnuts with a sledgehammer.

If you're considering purchasing the eaZy pc, think carefully whether you could exist in a 3.5in world while most people live in a 5¹/₄in world. If you, or a

friend, already have a PC-compatible with the larger drives, how will you exchange files?

On paper, the eaZy pc's disk drives should be as fast or faster than their 5¹/₄in counterparts. In transferring data, they probably are, but starting up they seem to take forever. This is common to all 3.5in drives, and is not just peculiar to Zenith's.

Zenith *has* indicated that kits will be made available to upgrade from EZ-1 and EZ-2 to EZ-3, although no prices were available at the time of going to press.

The power switch for the eaZy pc is located on the back of the display. Spending hours behind many computer screens can be an eye-watering experience. Not so with the eaZy pc. Its crisp white-on-black display is among the nicest around. With a 256KHz scan rate, this 14in monitor is very pleasant to use. The glass surface has been treated to reduce eye-strain caused by unwanted reflections of light sources and contrast, and brilliance controls allow the display to be altered according to either conditions or your preferences.

The graphics adaptor built into the eaZy pc is CGA-compatible (as far as software is concerned), representing different colours with grey shades. In text mode, characters are formed in 8x16 graphics cells which makes the screen much easier to read than conventional CGA display systems (such as the Amstrad PC1512) where text characters are formed in 8x8 graphics cells.

Similarly, the graphics mode is also an improvement over conventional CGAs. Like the IBM Personal System/2, each line of graphics is scanned twice, giving the clarity of a 640x400 resolution from 640x200 pixels.

Coming back to my previous concerns about expandability, the biggest drawback of the eaZy pc's display and graphics is the lack of growth potential. There is no way of changing to a colour monitor or increasing the resolution beyond 640x200 at a later date. (The same complaint has been levelled at the Amstrad PC1512.)

The review machine was an American model, so it came with an American 84-key keyboard. The layout includes 10 function keys on the left and an integrated numeric/cursor control keypad on the right. I found the eaZy pc keyboard acceptably good with the key 'click' being produced by the machine's internal loudspeaker. For comfort, the typing angle can be altered to one of two positions and LEDs are provided to

Technical specifications

Processor:	NEC V40 (Intel 8088-compatible) running at 7.14MHz
RAM:	512k
ROM:	32k containing BIOS
Mass storage:	EZ-1: one 720k 3.5in disk drive EZ-2: two 720k 3.5in disk drives EZ-3: one 720k 3.5in disk drive and one 20Mbyte hard disk drive
Keyboard:	84 keys: 10 function keys, 57 alphanumeric keys, 17 keypad keys
Monitor:	14in monochrome, white on black, 25KHz horizontal scan rate
Display modes:	Text mode (8x16 pixels giving 400 scan lines, 16 grey shades). CGA-compatible graphics mode (640x200 double scanned to 400 scan lines, two grey shades)
Standard interfaces:	Parallel printer port, Zenith mouse port
External expansion:	Zenith proprietary expansion port for either a 128k RAM module or a 128k RAM module with a modem and a serial port
Internal expansion:	Real-time clock (fitted by dealer)
Size:	35cmx33cmx33cm
Weight:	EZ-1: 12.6kg, EZ-2: 13kg, EZ-3: 17.2kg
Bundled software:	Tutorial, MS-DOS Manager
Operating system:	MS-DOS 3.20

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BENCHTEST



Twin 3.5in floppy drives, mouse and parallel ports are the minimal external access points available. The expansion port allows for the addition of a serial port and/or modem

show the status of NumLock and Caps-Lock keys.

When using a word processor or navigating through a spreadsheet, the speed of the cursor can be a hindrance on most PC-compatibles. A neat program called Cruise Control from

Revolution Software in the States gets round this problem by accelerating the cursor up to a decent speed.

However, the eaZy pc gets bonus points by including just such a feature in the firmware. Even at the MS-DOS command prompt A>, the cursor ac-

In perspective

Zenith's eaZy pc is very much a low-end machine, aimed at the home market, and is *somewhat* competitively priced with other PC compatibles. Comparisons will doubtless be made with the monochrome Amstrad PC1512, of which the latter compares favourably in terms of price (a single-drive, monochrome PC1512 sells for around \$1499 — a saving of around \$250), but the screen on the eaZy pc is much clearer in both text and graphics modes, it shows 400 scan lines — a great relief for the eyes.

As far as an entry-level IBM PC compatible goes, the Zenith may seem overpriced considering that it's possible to buy a Taiwanese clone for around \$1000 or even less, (refer to APC October, El Cheapo PCs) which can provide similar specifications, (albeit an obscure brand name and probably lower screen resolution) and expansion slots for future growth.

The question of disk sizes is a difficult one. In VCR terminology the 5 $\frac{1}{4}$ in disks can be thought of as the VHS of the computer world, with 3.5in being like Betamax (smaller, more technically advanced and not as popular). Ironically, both 3.5in disks and Betamax were invented by the same people, the Japanese giant, Sony.

Both the Amstrad and the Zenith have 512k RAM as standard, expandable to 640k. The Zenith is smaller and quieter, but lacks the expansion slots, and that is its greatest weakness. It also lacks a socket for an 8087 mathematics coprocessor that boosts the speed of applications such as Lotus 1-2-3.

The fact that the eaZy pc crashed when attempting to run WordPerfect Executive gave some cause for concern, although all other software seemed to work just fine.

Microsoft's MS-DOS Manager, as bundled with the eaZy pc, is a nice way to get acquainted with the machine. All-in-all, the eaZy pc is a well-polished, if a little unusual, PC-compatible.

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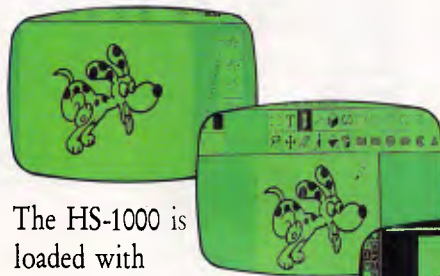
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BENCHTEST

Benchmarks

Intmath	5.22
Realmath	5.11
Triglog	38.72
Textscrn	80.30
Grafscrn	28.86
Store	24.06

All timings in seconds. For a full explanation of the APC Benchmarks, see the November 1986 issue.

celerates the longer you hold a key down. In most application programs this should prove a real boon, but I hope that the code in the BIOS firmware doesn't conflict with any software that intercepts the keyboard directly. It didn't on any software I tested.

It is worth remembering that a new 101-key keyboard, as provided with the IBM Personal System/2, is now becoming the new industry standard, although most low-end machines such as the eaZy pc have the smaller keyboard.

Zenith is offering four options for the

eaZy pc — a mouse, a real-time clock, a 128k RAM module and a combined 128k RAM module with a modem and serial port. The real-time clock must be fitted by a dealer, while the other two modules plug into the expansion connector on the back of the processor box. According to Zenith, the modem is Hayes-compatible.

The 128k RAM module boosts memory to 640k and the combined 128k/modem/serial port module gives you a 9-pin serial port. Here are three things to bear in mind:

- If you want a serial port, you have to buy the modem and extra RAM.
- The serial port uses the AT-style 9-pin D connector.
- If you buy the 128k RAM module, you can't add a serial port or modem later.

Clearly, leaving out the industry-standard PC expansion slots from inside the box has made it smaller, but it's quite a price to pay. It means that the eaZy pc can never be hooked up to a network, can't use LIM expanded memory adaptors, can't be used as a 3278 or 5251 terminal and can't take any third-party expansion devices. For many applications, particularly those

within companies where comms is an important issue, the eaZy pc is a no-hoper.

For domestic use, the eaZy pc could be a winner. It is low-priced, small, quiet and self-contained — all important attributes in the home.

Software

For the first time, Microsoft's MS-DOS Manager comes bundled with this machine. Two 3.5in disks are shipped with the eaZy pc — one contains MS-DOS 3.20 and the MS-DOS Manager, while the other has set-up programs, a tutorial and GW-Basic.

MS-DOS Manager is a friendly front end, much like Microsoft Windows. Unlike Windows, it is character-based only, so does not support the more advanced graphics features of Windows. Also, it does not support multi-tasking or 'cutting and pasting' between applications. What it does is simply show the current directory on the screen, and makes mundane file shunting and deleting a little easier. It looks pretty and is easy to use.

At the top of the screen are the four pull-down menu headings, as well as the current time. Pressing the 'Alt' key

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activates the menus that can be selected by either pressing the high-lighted letter (like Microsoft Windows 2) or by using the cursor keys. The main window shows the current drive and directory. Changing drives is as simple as pressing Ctrl-A or Ctrl-B, and running an application involves moving the cursor to the desired program and pressing Enter. Messages of guidance are shown at the bottom of the screen to help you select the appropriate choices.

I have one minor niggle about MS-DOS Manager. When going through the directory, the screen is completely redrawn for each line scrolled and creates a noticeable and irritating flicker.

The setup programs make backups of the two disks, as well as perform other things such as parking the head of the hard disk on model EZ-3. Also on the second disk is a simple tutorial and GW-Basic for writing your own programs.

For compatibility, I ran Microsoft Works, WordStar 4.0 and WordPerfect Executive. Surprisingly, WordPerfect Executive did not run. After loading, it printed a short, garbled message before crashing the machine. The

moral? Test all software on your own machine before buying the program; but if this is not possible, get assurances from your dealer that the software will run correctly — tell him at the time of purchase that you intend to run the software on a Zenith eaZy pc.

I would have run more exhaustive software-compatibility tests, but for the fact that I ran up against the 'disk' problem — all my software is on 5 $\frac{1}{4}$ in disks and Zenith provides no tools to aid the transition.

Documentation

Zenith's eaZy pc comes with three slim but comprehensive guides and a thicker MS-DOS manual. The three slim guides are: the *Owner's Manual*, which leads you through setting the machine up; the *MS-DOS Quick Reference*; and the *MS-DOS Manager*. The thicker MS-DOS manual gives a detailed breakdown of each command, and all four publications are well laid out.

Prices

The eaZy pc, (considering its brand name) is competitively priced: the EZ-1

costs \$1753, the EZ-2 costs \$2030 and the EZ-3 costs \$2861.

Prices for optional extras were not available at the time of going to press.

Conclusion

With a built-in monochrome display and very limited expansion potential, the eaZy pc resembles a laptop PC-compatible — except that it is *not* portable. For lightweight applications such as dedicated word processing, the eaZy pc is ideal. For heavyweight processing, especially with disk-intensive programs such as databases, the eaZy pc begins to slow down. Graphics are very clear, but too low a resolution for serious graphics work.

Is it easy as the name would imply? Well, setting up the hardware was very straightforward. It is, quite literally, a matter of 'plug in and go'. For first-time PC users and for businessmen and women who want a PC at home, the eaZy pc is worthy of serious consideration.

END

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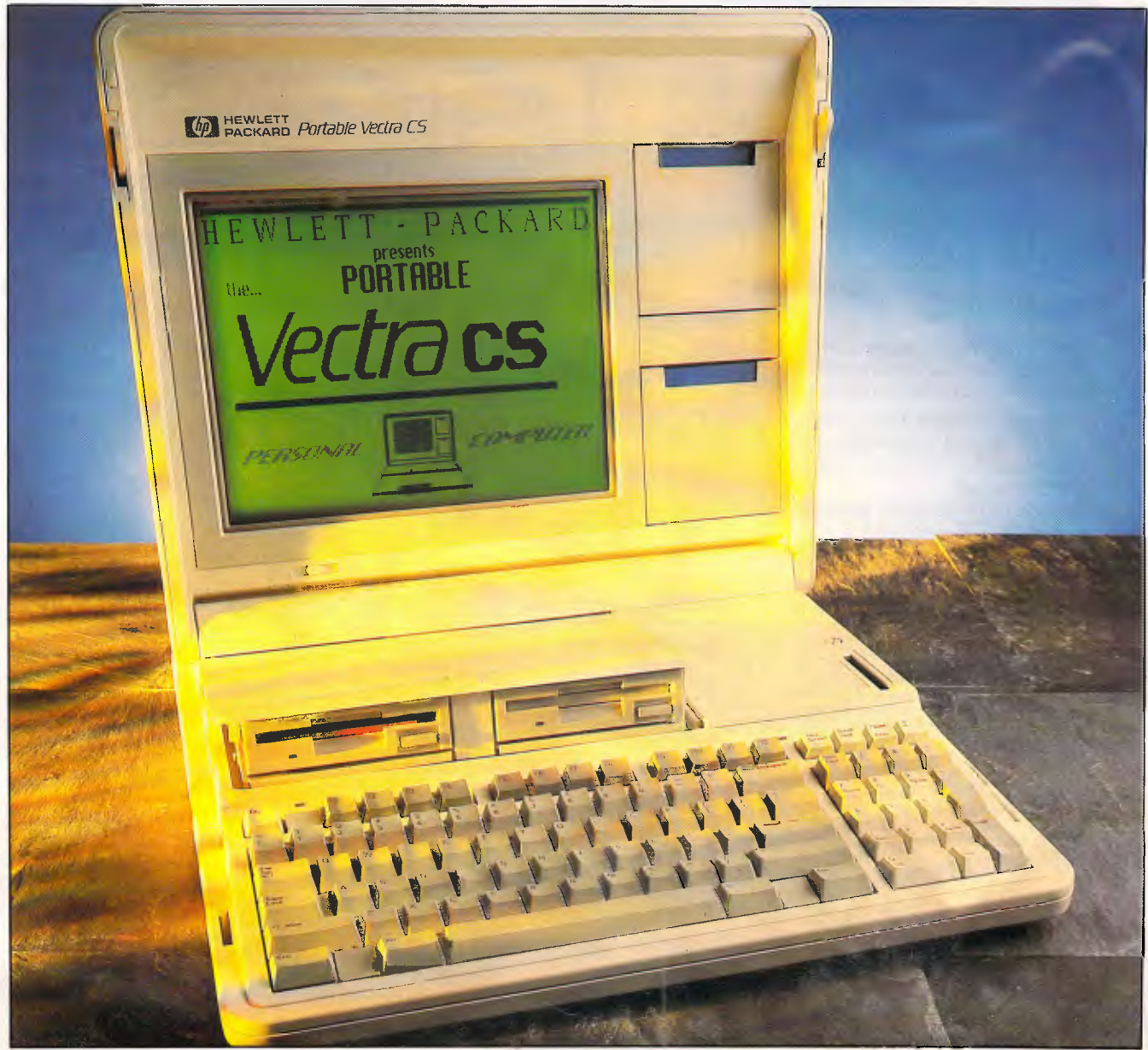
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HP Portable Vectra CS

Another accessory for the high-flying executive's Porsche Turbo, or a workhorse for the masses? Martin Wren-Hilton goes for a stroll with the Hewlett-Packard Portable Vectra CS.



My grocer looked decidedly worried. The lady who did his stocktaking now had a partner. Catapulting herself into the 1980s, she now brought with her a mysterious box to bring digital precision to his accounts. I had wandered into the shop to pick up some Camembert, not expecting to find an 80286-powered PC on the cheese counter — but there it was, processing the stock figures for the year, a Toshiba T3100.

Prior to this incident, I had often wondered what sort of person would have any use for a *portable* personal computer. Workaholics? Exhibitionists? I have an XT at the office and that's where it stays. When I leave the office, I leave behind the XT and all work-related thoughts. Not being one to be overtaken by technology, I must admit that about two years ago I bought a Tandy 100, thinking how wonderful it would be to knock out a few articles in the garden and the odd note or two on the train. The trouble was, when I was in the garden, the last thing I wanted to do was work, and when I was on the train I couldn't concentrate because everybody would stare at me.

But the sales figures prove it — portable PCs are appearing with amazing — and alarming — regularity. Scarcely a month goes by without a new crop of machines being announced, so obviously many people are finding more and more uses for portable PCs.

When the HP Portable Vectra CS arrived, I must admit that I was *rather* sceptical about how useful the machine would be. It seemed too big for a portable and initially I wasn't impressed with the screen — having been spoiled by using a colleague's Zenith Z181 for some time. Both the Zenith and the HP use the latest 'supertwist' LCDs but Zenith's is backlit and is renowned for its quality.

Hewlett-Packard is best known for its high precision and high price. Built like a Volvo, and with a price tag of almost \$5000, the Portable Vectra is no exception. But what do you get for that much money?

Hardware

The Portable Vectra looks like a slim, white briefcase and opens in a similar manner — by lying the unit on one side and pushing two catches apart. Between the two sliding catches is the handle which pops out when depressed on either end. Nice engineering, HP.

The top half of the case opens like a clam shell to reveal a large off-yellow LCD display, two disk storage boxes and the 92-key keyboard. A sliding catch be-



The PCB within the Portable Vectra CS is incredibly well-engineered. The four expansion slots are identical electronically to IBM PC slots but are physically smaller

tween the F4 and F5 keys on the top of the keyboard holds the two disk drives down until released. To the right of the disk drives is the removable battery pack which neatly blends in with the design of the machine.

To the right of the '-' key on the numeric keypad is the power switch. Push it up once and the machine comes on. Push it up once more and it is off. Being recessed from the rest of the keyboard, it would be almost impossible to switch the machine off accidentally, which is a good job, because unlike some other portables (the Toshiba T1200 and the IBM PC Convertible, for example) the memory is cleared when the machine powers down. Actually, the T1200 and the Convertible do as well, but they also have a standby mode in which power to the RAM is maintained — leaving the box in a state of suspended animation.

Keeping things ticking over is an 80C86-compatible microprocessor. This chip is CMOS (Complimentary Metal Oxide Semiconductor) equivalent of the 8086, as featured in the IBM Personal System/2 Model 30 and the Amstrad PC1640. Running at a respectable 7.16MHz, it turns in a good set of Benchmark results (see 'Benchmarks' box). An optional 8087 mathematics coprocessor may be fitted later. Not only has the processor been manufactured with CMOS technology but so have most

of the components inside the box. Why CMOS? CMOS components require much less power than their standard equivalents — giving longer battery life and running cool so that no fan is needed.

Two versions of the Portable Vectra are available — the Portable Vectra CS that is the subject of this Benchtest and the Portable Vectra CS Model 20. Whereas the former has two 3.5in 1.44Mbyte disk drives, the latter has one disk drive and one 20Mbyte hard disk. Otherwise, the features are the same.

With a total storage capacity of 2.88Mbytes, the floppy disk-only model should satisfy most requirements — and the battery lasts for longer than in the hard-disk version. Presently, most portable PCs feature 720k drives, but compatibility should pose no problems as the 1.44Mbyte drives can read, write and correctly format the 720k disks. Physically, the only difference between the 1.44Mbyte disk and the 720k disk is that the former has a small notch on the opposite side of the disk to the write protect hole.

Hewlett-Packard's disk drives are unusual in that they require the small notch to be present in order to format disks with a 1.44Mbyte capacity. Other manufacturers, including IBM with its Personal System/2 models 50, 60, and 80, do not need the notch, so can format any old 3.5in disk as though it were a

high-capacity disk. The obvious advantage of this is a great price saving on the media, although data is more likely to become corrupted even if the cheap disk has been formatted correctly.

With 1.44Mbyte disks, it should be possible to install software as though it were going onto a hard disk — they hold as much as four conventional 360k 5¹/₄in disks.

In practice, the drives operated silently and flawlessly. Although they pop up for insertion and removal, the drives both seemed to operate okay when down. It looks neater when they're down.

The machine which started the portable computer philosophy, the Osborne, and its PC-compatible follower, the Compaq Portable, both featured 5in CRT displays. This added to their cumbersome nature — the Compaq weighed in at an arm-stretching 14kg: Screen technology has, thankfully, advanced since then. The first generation of battery-powered laptops featured dark-grey on light-grey LCD screens that must have provided some good business for opticians.

Fortunately, LCD technology has come a long way since then. The Portable Vectra features a healthy-sized 12in supertwist blue-on-green display. It's called supertwist because the crystals are twisted through 270 degrees or so, rather than 90 degrees. The added twist improves contrast considerably.

Overall screen resolution is 640x400. Text mode shows characters in an 8x16 box, adding to the legibility. Graphics mode is through CGA emulation. Despite all this, I found the display not difficult, but unpleasant to read in all but optimum lighting conditions. Admittedly, there is a contrast control under the screen, and the whole top half of the case can be tilted from 0 degrees to 170 degrees. Even so, I wasn't impressed. It was all too easy to lose track of where the cursor was and certain colours (as represented in shades of blue) looked terrible. Red was produced by lowering the contrast and using a stipple pattern. The result also flickered, giving me the impression that the Portable Vectra is at its best when used in black-on-white mode. For some reason, one pixel near the top of the screen was always on when the machine was on. Hewlett-Packard realises this as well, and is presently researching newer, better technologies including EL (electroluminescent) and backlit LCDs.

For extended use in an office environment, the top half of the case (with the LCD screen) can be removed. On the back of the Portable Vectra is a display port which may be used to attach an external monitor. This may be

Technical specifications

Processor:	80C86-compatible, running at 7.16MHz with 0 wait states
RAM (system):	640k
RAM (display):	32k
ROM:	64k containing BIOS
Mass storage:	Portable Vectra CS — two 1.44Mbyte 3.5in disk drives Portable Vectra CS Model 20 — one 1.44Mbyte 3.5in disk drive and one 20Mbyte hard disk drive
Keyboard:	92 keys comprising 12 function keys, 63 alphanumeric keys, 17 keypad keys
Monitor:	Detachable 12in supertwist LCD
Display modes:	Text mode (8x16 pixels giving 400 lines) and CGA graphics emulation mode
Standard interfaces:	parallel printer port, display adaptor
Expansion:	three internal Hewlett-Packard expansion slots
Size:	41.9cms x 35.3cms x 8.8cms
Weight:	7.9kg (Portable Vectra CS)
Bundled software:	PAM, File Manager, Multiple Character Set Support
OS:	MS-DOS 3.20

monochrome, colour or enhanced colour. I tried the last two, and although the colour display worked fine, the enhanced colour display wasn't so good. White-on-black text characters had pink specks in the characters and when large blocks of colour were shown, the display distorted slightly. Some work needed there. HP.

Even when attached to an enhanced colour display, only CGA emulation was available. I suppose the provision of EGA support would be asking too much.

Redirecting the display output to an external monitor is effected by one of two methods. You can either use the setup program, or you can remove the battery pack and turn the rotating switch at the bottom of the case.

Portables have notoriously inadequate keyboards. Not so the Portable Vectra. Although the feel was acceptable (but not up to IBM's high standards), the size and positioning were excellent. 12 function keys across the top are laid out in a fashion similar to the new enhanced

In perspective

Prices have dropped, speeds have increased and memories have grown in the highly competitive portable market.

The first decision you should make is — do you need to run PC software, or will an 'electronic notepad' machine suffice? The second category is frequently cheap, diskless and really portable. It includes the Tandy 102 (with built-in, 300-baud modem) at \$999 and the diminutive Psion Organiser II (excellent for portable data entry) at \$595.

If you really need the power of a portable PC, you should take a close look at the Data General One/Model 2T, the fast NEC Multispeed — which is also available with an electroluminescent display, the hard-disk Sharp PC-1700, the Toshiba T1100, and the sparkling (but slow) Zenith Z181. These all come in the \$3000-\$4000 price range.

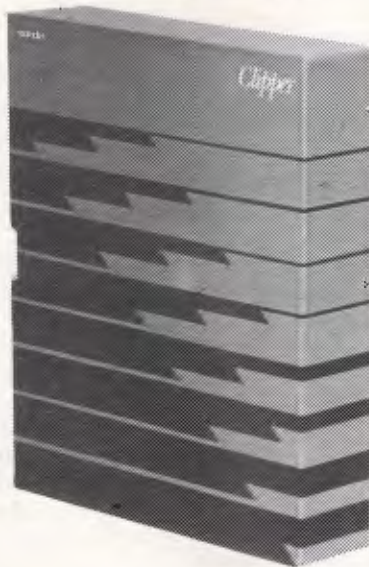
Towards the lower end of the market, is the Bondwell 8 for around \$2000.

By comparison, the Hewlett-Packard is among the best built and is the only one with 1.44Mbyte 3.5in disk drives. It is also one of the heaviest — a factor that may need to be taken into consideration, depending upon your application. The NEC Multispeed takes the prize for the fastest, while the Zenith Z181 has by far the most legible display.

One thing to watch out for — a CMOS version of the 80286 microprocessor has recently been announced, which will be used in the next generation of OS/2 compatible portables. Watch this space.

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keyboard standard. To the right is a neat numeric keypad which doubles as a cursor control pad.

Keys F, J and 5 on the numeric keypad are slightly more indented than the rest — useful for touch-typists and no inconvenience for the rest of us. Lights are provided for Caps Lock, Num Lock, Scroll Lock and a funny key that seems unique to this keyboard. The lights are located at the top of the keyboard (not in the keys, as would be more useful), and no indication is given as to which is which.

As is now becoming more commonplace, the Portable Vectra comes with a full 640k of RAM. Just to speed things up, it operates with 0 wait states (like the IBM Personal System/2 Model 30), and just to conserve battery power, it's all CMOS.

The hefty 6-volt lead acid battery powers the Portable Vectra for an amazing 10 hours according to Hewlett-Packard. Model 20 offers up to four hours use from a full charge — still reasonable for a hard disk portable. Recharging takes 12 hours and an LCD 'charge meter' built into the removable battery pack gives a guide as to how long you can continue working. As I am writing now, the machine has been on for three hours, accessing one disk occasionally, and the battery meter hasn't shifted from the 90 to 100 per cent mark. Impressive.

More and more devices nowadays rely on Nickel Cadmium (NiCad) battery power. So, as the deficiencies of NiCads have become more apparent, manufacturers have turned their attention to lead acid batteries.

Sony provides lead acid battery packs with its Discman portable compact disc player. Each battery is provided with a warning telling the user that the battery can be used in any position, but must be charged horizontally to avoid leaks. (When a lead acid battery leaks, sulphuric acid comes out.) No such warnings are provided with the Portable Vectra, and Hewlett-Packard is unsure about the issue. Being cautious, I always charge the Portable Vectra lying down (the computer, not me, that is).

The power supply that comes with the Portable Vectra plugs straight into the battery pack through a hole in the side of the case. You can use the machine while charging and in the event of the mains power failing, the battery takes over. Extra batteries are available from Hewlett-Packard, which may be charged straight from the power supply. They don't need to be installed in the machine to recharge. The dual disk model probably doesn't need it, but one may be useful for the hard-disk Model 20, whose

battery life is less than half that of the dual-disk machine.

Apart from the display port, there is a standard parallel printer port on the back of the machine. This is actually on an adaptor card, along with the display circuitry, which occupies one of the four expansion slots in the base, at the back of the machine. In the United States, HP is offering three options — a combined 2Mbyte EMS expanded memory with a serial port, a 1200-baud modem and a

'...you should expect a truly outstanding machine, and in many respects the Portable Vectra lives up to the mark...'

2400-baud modem. In Australia, HP will be offering two modems: a 1200-baud (300/1200bps and 1200/75bps) and a 2400 baud modem which also includes the above speeds. Both modems are currently undergoing Telecom approval, and should be available in late January and March respectively.

Up to 6Mbytes of LIM EMS memory may be added to the Portable Vectra and up to 4Mbytes to the Model 20. The Model 20's hard disk adaptor occupies a second slot in that model, leaving just two free. Recently, the Lotus/Intel/Microsoft triumvirate has released version 4.0 of EMS. The Portable Vectra's desk-top cousin has version 3.2 EMS cards available, so check with your dealer as to which EMS version you are getting.

Adaptor cards are easily fitted by the user. Six screws hold the bottom of the case together, and remove to reveal the Hewlett-Packard expansion slots. Although the rear brackets look similar to those found on the IBM PC, the Portable

Vectra does not accept standard PC expansion cards.

It is doubtful that any third party manufacturers will produce adaptor cards for the Portable Vectra, due to the relatively small market for this particular machine. Just to help anyone who is contemplating adding their own devices into the Portable Vectra, the edge connector pins are all clearly identified inside the case.

Looking inside the case reveals two things — the quality of HP's manufacturing (no wire patches in sight) and the diminutive size of the main circuit board. There is only a handful of surface-mounted components on the board, which is barely larger than a standard PC adaptor card. Having removed the whole display unit, the hefty battery, the bottom half of the case and the only adaptor card in my machine, I couldn't help wondering why the Portable Vectra was so heavy. It seems that most of the weight is in the disk drives and their supports.

System software

When the Portable Vectra is switched on for the very first time, a clock and a question-mark appear on the screen. According to the setup guide, this means that the Setup program has to be run to initialise the time and date. This only needs doing when either the battery is completely flat (an unlikely condition) or the battery is removed.

The Setup program also allows you to redirect the screen output and adjust the colour mapping (that is, what colour appears as what shade of blue).

One feature that I could find no real use for was the alarm. Once set, it switches the machine on at a specified time, although it doesn't switch it off. What use is that?

Also on the Setup disk is a tutorial covering some of the real fundamentals of computing. There is no way to exit from the Setup disk (why?), so you have to re-boot to get to MS-DOS.

Apart from MS-DOS and the Setup disk, you get PAM, the Program Application Manager and something called File Manager. PAM is a DOS shell, and I assume that the intention for it was to aid beginners. Frankly, it's useless and badly designed. Learning MS-DOS from the command line makes more sense. Firstly, it means that users can easily transfer to other MS-DOS machines (those without PAM) and secondly, PAM uses ridiculous key strokes. If you need a friendly 'front end', use Microsoft Windows. It's more intuitive and it's a standard.

Benchmarks

Intmath	2.97secs
Realmath	2.86secs
Triglog	24.00secs
Textscrn	58.44secs
Grafscrn	16.09secs
Store	12.30secs

For a full explanation of the APC Benchmarks, see the November 1986 issue.

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BENCHTEST

File Manager, I can only presume, was designed by the same team that created PAM. Need I say more?

Finally, to cap this bundle of amazing software there is the Multiple Character Set Support (MCSS) program. Don't confuse this with the recently introduced multiple Code Pages in PC-DOS 3.3. All this utility does is help sort out the tangle created by Hewlett-Packard's insistence on using a non-IBM standard character set in its printers.

HP's printers feature a character set (Roman8) which is similar to IBM's for text and numbers, but for character values of greater than 127, the differences become apparent. Anyone who has tried to interface a Hewlett-Packard printer to an IBM PC will know what I mean. The MCSS program simply installs a device driver which does the necessary translation for you.

Documentation

In true HP fashion, the documentation is good. A slim spiral-bound manual explains the basics of the Portable Vectra hardware. Two large manuals, designed to accompany the whole Vectra family, explain MS-DOS 3.2 in detail and the horrible PAM and File Manager.

The fact that the two larger manuals have not been customised for the Portable Vectra is a pity. References to 360k disks and 1.2Mbyte disks do not help beginners, especially when the Portable Vectra supports neither.

Prices

The HP Portable Vectra with twin 3.5in disk drives will cost \$4986; and the hard disk Model 20 will sell for \$7200.

Conclusion

The HP Portable Vectra is one of the most expensive battery-powered laptops available. Its keyboard is a decent size, and the screen is large, but only of acceptable quality. The battery life (at least on the basic Portable Vectra) is outstanding and the speed is middle-of-the-road.

For this money you should expect a truly outstanding machine, and in many respects the Portable Vectra lives up to the mark, but there are some rough edges. Once HP has ironed these out, the Portable Vectra will be in the same league as most of the company's products — classy and dependable.

END

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Tandy 1400 LT

Considering an MS-DOS takeaway? The 1400 LT is Tandy's rather late arrival into the portable laptop market, whose ingredients comprise all the basics to be found in its many competitors. Martin Wren-Hilton looked for its specialities.



BENCHTEST



Tandy has provided a non-IBM-compatible expansion slot on the back of the 1400 LT, but it doesn't intend to produce cards for it

Portable computers, it has to be said, compromise function for portability. Battery technology is such that you could never hope to find a portable machine which offers the speed and flexibility of its desktop cousin. Size is another consideration, which affects screen size, keyboard size and room for internal expansion.

In designing the 1400 LT (for 'Lap Top', I presume), Tandy engineers have struck a balance between function and portability that they believe will satisfy most of the people, most of the time. In many respects this is a 'me too' machine, offering a similar specification to many laptops currently on the market: 640k of RAM available to the user, two 3.5in disk drives and a backlit LCD screen.

But, when buying a Tandy machine, you are buying a product which is backed by a massive nationwide service organisation — and all the benefits both real and perceived that go with it.

Hardware

Physically, the 1400 LT is about the

same size as a small executive briefcase. At the top of the case, under the keyboard, a hinged handle pulls out of its recess, providing you with a means to haul the machine around. Weighing in at 5.7kg, I would rate the 1400 LT as 'relatively' portable; that is, you don't need to take a course of steroids prior to purchase, unlike some other non-MS-DOS portables such as the Tandy 102.

Lifting the screen into a usable position involves pressing two catches while lifting the screen. The backlit LCD screen can be tilted back and forth to suit different lighting conditions. A degree of friction prevents the screen from leaning back of its own accord, but forward movement is a little too free for my liking. On more than one occasion, the display lurched forward at great speed, nearly trapping my fingers and bringing back childhood memories of painful piano lessons.

Beneath the screen are two small 3.5in disk drives, each capable of storing twice the capacity of ordinary 5 $\frac{1}{4}$ in disks — 720k. Despite the popularity of the 5 $\frac{1}{4}$ in medium, these smaller disks

are becoming the new standard, partly because the IBM Personal System/2 features 3.5in disks. In the long term that may not be such a bad thing, because the new-size disks are more convenient, have a greater capacity and consume far less electricity (an important factor for portable computers).

The biggest barrier to the acceptance of portable computers has been: (a) availability of new software in this format; and (b) provision of tools allowing both sizes to co-exist happily. On the first point, many software houses provide both sizes of disk within the program package, and those that don't usually allow a free replacement. And with respect to the second point, Tandy provides an external disk drive connector on the back of the 1400 LT. Unfortunately, no external drives are available from Tandy yet, although the company does expect to sell them in the near future.

I have stated that 640k of RAM is available to the user. This is true, although the Tandy 1400 LT actually contains 768k of RAM. The extra 128k is con-

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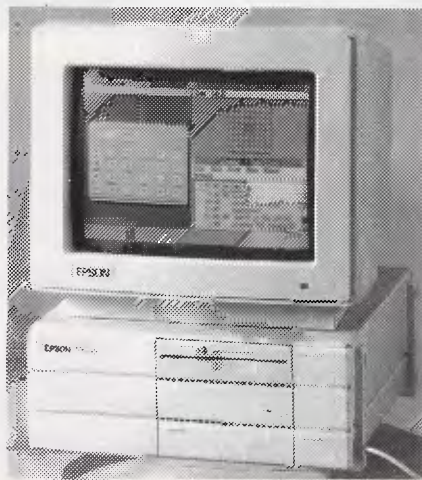
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BENCHTEST

figured as a RAM disk (drive C:) by a device driver when the machine is first booted.

A rocker switch on the right-hand side brings the 1400 LT to life, firing the V20 microprocessor into action. The V20 running at 7.16MHz, is NEC's equivalent of the Intel 8088. The differences between the two are minor, and only affect the performance of certain instructions which run faster on the NEC chip. Having said that, though, the Tandy turned in a set of relatively unimpressive Benchtest results (see box).

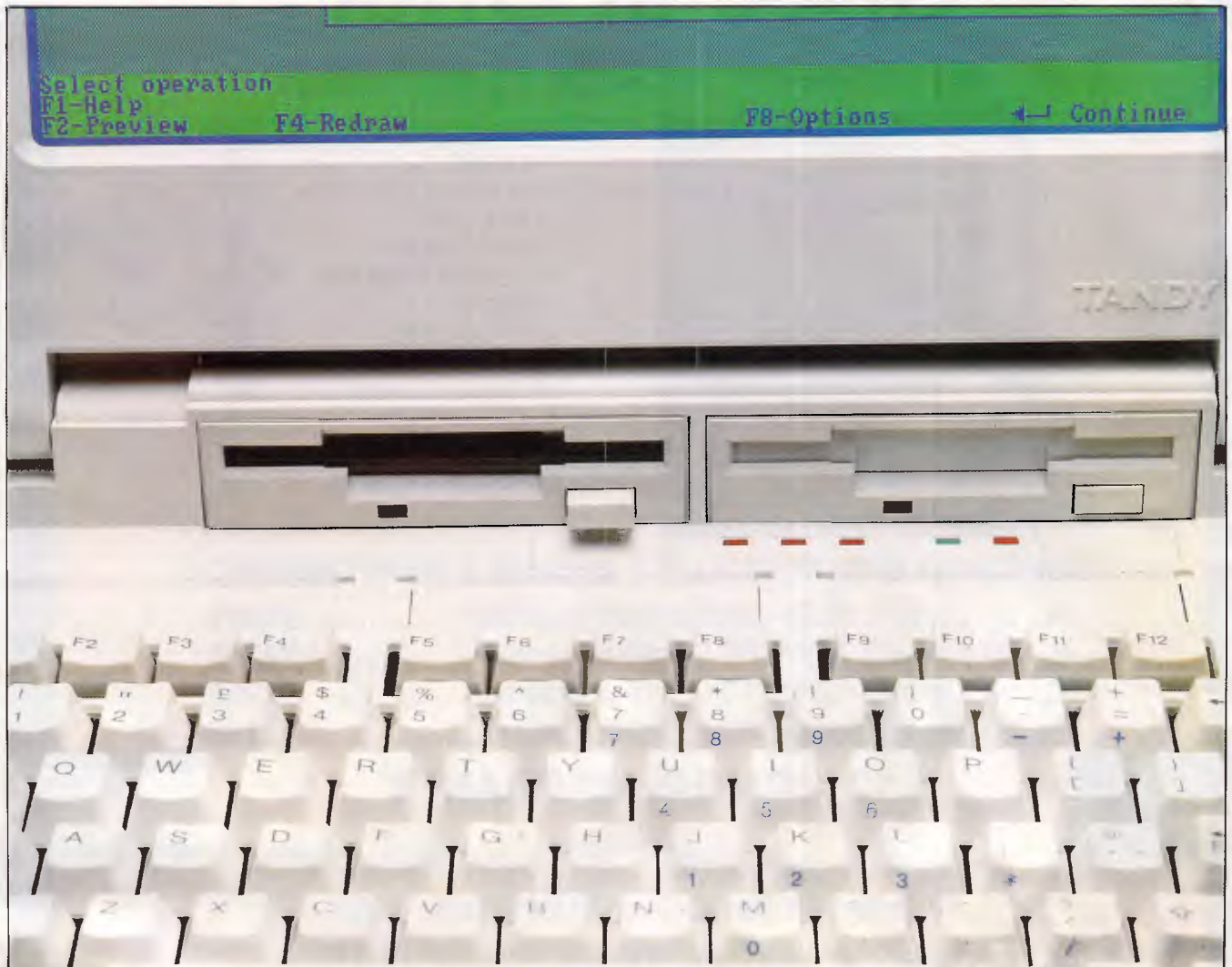
To find out what else of interest there is inside the 1400 LT, and in the best interests of investigative journalism, I attempted to get the lid off the box. No luck. Removing the eight screws which are conveniently marked by arrows resulted in no movement whatsoever. Various other screws hold the motherboard to the bottom of the case.

No-one I spoke to at Tandy knew how to take the lid off, although I was assured that there was nothing out of the ordinary inside. One method suggested to me by a Tandy engineer almost broke the screen supports. From what I could see, peering through two expansion holes at the back of the box, the motherboard has been manufactured using conventional pin-through-hole technology, rather than the trendy Surface Mount Technology (SMT) used in a number of portable PCs. SMT crams more components into a much smaller space, which has the added advantage of reducing power consumption.

The screen, which has always been a sticking point when it comes to the widespread acceptance of portable computers, very nearly gets top marks. For general use, the clarity and contrast (which is adjustable) are superb — equalling the Zenith 181 which is famed

for its screen. However, I would make three points about the 1400 LT's screen: on the review machine, 18 pixels on the screen were permanently switched on; the screen hummed — not a lot, but it was noticeable; and (this applies not just to the Tandy, but to all LCD screens) the shades of blue which are used to emulate CGA colours serve no useful purpose. LCD technology requires good contrast to improve legibility. The shades of blue (which represent colours other than white) are produced by reducing the contrast of the pixels in question, which in turn reduces legibility.

For graphics applications, the 1400 LT's 640x200 resolution may be too coarse, although no LCD screen is yet in common use with a higher resolution. Overall, I liked the quality of the screen. In many ways, I preferred the LCD to using the 1400 LT with a desktop display, which is easily con-



The 1400 LT's keyboard is a comfortable, quiet, 76-key unit, but a larger keyboard may be plugged in for extensive use

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In perspective

Tandy's previous portable best-seller, the non-MS-DOS Model 100, and its successor, the Model 102, have found favour with many journalists and reporters, although the much larger 1400 LT is hardly suited to note-taking. Machines in the under-\$2000 category include the Bondwell 8 (\$2000), NEC 8031 (\$795), and the Psion Organiser (\$595).

On features, the Tandy 1400 LT is pitched directly against machines such as the NEC Multispeed, the Zenith 181, and the Data General One/Model 2T, all of which are quite a bit more expensive than the 1400 LT.

Where Tandy scores particularly highly is in the service and back-up available through its nationwide dealer network.

nected via an RGB connector on the back of the machine. Also on the back is a socket for connecting to a composite monitor.

Another area in which portable computers frequently show their weakness, compared with desktop PCs is the keyboard. Here the 1400 LT scored highly with a comfortable 76-key keyboard. It lacks the positive click of some keyboards, but if the machine is to be used in public places, this can only be of benefit to innocent bystanders.

There are 12 function keys across the top of the keyboard, all of which are slightly smaller than the rest of the keys. If you intend to use the keyboard for extensive periods of time, and wish to use a larger keyboard with a dedicated numeric keypad and cursor control keypad, then a second keyboard may be plugged into the back of the Tandy. I feel that this would be an extravagance, though, as the maximum screen resolu-

tion of this machine (640x200) is not high enough for the extended use that would warrant a second keyboard.

Indicators below the B: drive are provided for Caps Lock, Num Lock and Scroll Lock. Next to these indicators are ones marked Standby (more about this later) and Low Batt, showing that the battery needs recharging. According to Tandy, under 'normal conditions' (whatever they may be) the battery lasts for four hours before it needs recharging. When the battery loses power, the Low Batt light illuminates and a short tone is heard. The machine may still be used until five continuous tones are played and the Low Batt light flashes. If this should happen to you, save any unfinished work and switch the machine off, because you only have three minutes' power left.

Heavy disk use helps to shorten the battery life, so the 128k RAM drive should be used wherever possible. As far as you — and any software running

in the 1400 LT — is concerned, the RAM disk looks just like a very small, very fast disk drive. But, you must save the contents of the RAM disk onto a floppy disk before you switch off the machine, as the contents of the RAM disk are volatile.

The internal clock draws its power from a different internal battery so the time and date remain correct once set, not only when the machine is switched off, but when the main rechargeable pack is removed.

The power pack may be removed from the 1400 LT by sliding back a cover on the top of the machine and unclipping the battery terminals. This would be useful if you knew that you needed to use the machine for a long period of time, without being near a wall socket into which you could plug the mains adaptor.

To help conserve battery power, a utility program that comes with the 1400 LT switches the screen off when the machine is not in use, and switches the Standby light on to show that the machine has not been turned off completely. The length of time that it waits before this happens can be determined by the user, by pressing a 'hot-key' combination of Ctrl-Alt-Ins. (As some of you will doubtless have already thought, this is perhaps not the wisest of choices because the similar Ctrl-Alt-Del combination is used to reset the machine).

Still, when you press Ctrl-Alt-Ins, the 'Tandy 1400 LT Set Up Menu' appears. This screen allows you not only to select the time required to pass before the machine goes to sleep, but also choose between the LCD and an external monitor; the built-in keyboard and an external keyboard; the RS232 port and an internal modem; a direct modem and an acoustic coupler; internal and external screen controllers; and 7.16MHz and 4.77MHz microprocessor clock speed.

Technical specifications

Processor:	NEC V20 (Intel 8088 equivalent)
RAM:	768k, 640k accessible by MS-DOS
ROM:	16k containing BIOS
Mass storage:	Two 720k 3.5in disk drives
Keyboard:	76 keys, including 12 function keys
Monitor:	Backlit supertwist LCD
Display modes:	Text mode (8x8 pixels giving 200 lines); CGA graphics emulation mode (640x200)
Standard interfaces:	Parallel printer port, serial port with AT-style connector, RGB display connector, composite video output, external keyboard, external disk drive
Expansion:	One internal proprietary expansion slot; optional internal modem
Size:	36.8cmx31.7cmx8.8cm
Weight:	5.7kg
Operating system:	MS-DOS 3.20

Benchmarks

Intmath	3.84secs
Realmath	5.27secs
Triglog	14.72secs
Textscrn	46.91secs
Grafscrn	20.71secs
Store	17.36secs

For a full explanation of the APC Benchmarks, see the November 1986 issue.

BENCHTEST

Expansion

On the back of the Tandy, under a lift-up plastic strip, are a parallel printer port, an RGB monitor connector, a composite video socket, a DB9 serial interface connector, an external disk connector and the external keyboard socket. Internally, a V21/V22 Tandy modem may be fitted, and there is a slot which looks like it might accommodate a proprietary Tandy expansion card. This expansion slot is a derivative of the IBM PC expansion slot, but the two are not physically compatible. Tandy is currently trying to source an internal 20Mbyte hard disk to occupy this slot.

System software

The software supplied with the Tandy 1400 LT is MS-DOS 3.20, and Deskmate, an integrated package which contains a word processor, spreadsheet, File (a database program), a Telecom-communications program, Calendar (a personal diary/notebook), and Mail (an electronic mail facility).

Documentation

The manuals for the 1400 LT are brief and to the point: two small, spiral-bound volumes, one covering the hardware, and the other explaining the ins and outs of MS-DOS. Although they are competent, as one might expect from a major manufacturer like Tandy, they don't go into much detail.

Price

The Tandy 1400 LT is available from Tandy stores for \$3299. The external disk drive and internal modem should be available by late January. No prices for these were available at the time of going to press.

Conclusion

It would appear that Tandy has entered the PC-compatible laptop market somewhat late in the day, although the 1400 LT is a very competent machine. My only criticism would be regarding the lack of general-purpose PC expansion slots, although plenty of ports are provided on the back of the machine.

Assuming that the problem I had with the LCD screen were peculiar to the review machine only, and that the Tandy engineers can, if necessary, get inside the box for maintenance, then the 1400 LT can be considered to be a serious competitor.

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SCREENTEST

Quattro

The race is on for a fully-qualified successor to Lotus 1-2-3 in the spreadsheet market, and Borland has now entered the fray with Quattro and its highly adaptable — and expandable — 1-2-3 compatible facilities. Anthony Meier checks its form.

Borland International, the innovative low-cost software house, has launched its first spreadsheet, Quattro, into a fiercely competitive market, hot on the heels of Microsoft's Excel. Quattro is well-armed to compete, however, with a low price tag and significant performance advantages over Lotus 1-2-3.

Quattro has a spreadsheet, graphics, sophisticated macros and database facilities. The spreadsheet had 8192 rows and 256 columns, and offers an excellent range of features. If the number of spreadsheet functions provided are any sort of guide for comparing Quattro to 1-2-3, Quattro has 100 while 1-2-3 has 89. Quattro's editing and basic spreadsheeting operations work in the same way as those in 1-2-3, and any 1-2-3 user should find Quattro easy to use. The 'F2' function key lets you edit the current cell's contents, for example.

While not being a 1-2-3 clone, Quattro has a unique, adaptable user interface, and the menu tree and other features can be made Lotus-compatible if desired. In addition, Quattro can save and retrieve Lotus files and execute Lotus macros.

The package includes an already-set-up file that automatically reconfigures Quattro's defaults on start-up, including the menu tree, to behave like 1-2-3. Thus, you can load Quattro as a Lotus 1-2-3 compatible by typing Q123 instead of Q on the DOS command line.

Quattro's most interesting feature is its add-in facility, an environment created specially for external add-ins. This

facility lets you load up to eight add-in programs, like slot-in boards, to enhance the program's capabilities. Borland supplies two add-in programs for starters, Menu Builder and Transcript, to use in this open-architecture environment, and the program manual suggests that experienced programmers should write and run their own add-ins. There is no add-in language supplied with the pack-

Functions comparison

	Lotus 1-2-3	Quattro
Maths/Trig	17	19
Statistical	7	7
String/Text	18	21
Logical&Misc	18	23
Financial	11	11
Date/Time	11	12
Database	7	7
	89	100

age, so the average user will not be able to do this. But programmers take note — add-ins may start to appear from various software houses in the next year or so.

Quattro runs on the IBM PC, XT, AT and compatibles, and requires a graphics capability if you want to be able to view graphs on the screen. I reviewed Quattro on an AT compatible machine with a 20Mbyte hard disk and high-

resolution colour screen, which showed the graphs off to great effect.

Quattro comes on three disks: the first contains the Quattro files; the second, the help file, device drivers and graph fonts; and the third, the Transcript and Menu Builder add-ins and various other utilities.

Installing the package was a simple operation. I copied the (non copy-protected) files from the disks supplied to the hard disk and loaded the main program from the hard disk by typing 'Q' on the DOS command line. Quattro automatically detected the type of screen I was using.

The program presents you with a clean screen showing the standard, blank spreadsheet. Only one spreadsheet can be loaded at any time, but it can be split into two windows, horizontally or vertically. The 'F6' function key is used to switch between these windows. The main menu is accessed by pressing the slash '/' key, and is displayed in a pop-up window like a SideKick accessory at the right-hand side of the screen. You can move through the menu options with the cursor keys or jump to the one you want by hitting its first-letter key. This displays a sub-menu in place of the main menu — only one menu is usually shown at any time. An explanation of the currently-selected menu option is always given at the top of the screen.

The menus are intelligent in that they can remember the last option you chose and select that option automatically as the default for the next time

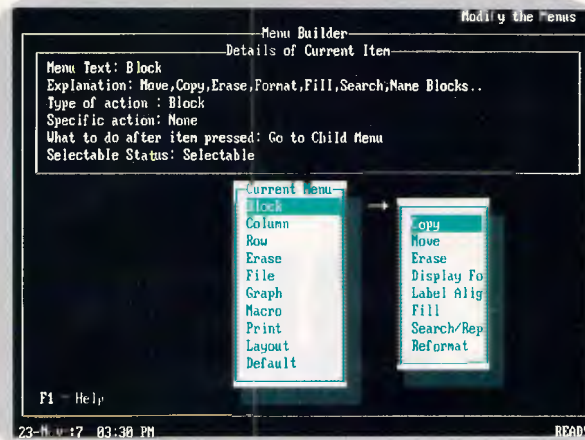
you summon them. I liked this feature very much as it let me repeat a path through the menu tree rapidly by just hitting the 'Return' key repeatedly. I am sure that after spending some time with the package, you could do this without looking at the menus. Pressing the 'Esc' key has the reverse effect. This intelligent menu feature saved me a considerable amount of time when I was creating graphs and needed to use the menu tree frequently to try different presentation options.

Another useful menu feature, the 'Keep Wide' option, lets you display menus as wide instead of narrow so that they can show the settings, if any, associated with the commands. If you have defined a database block, for example, as B1 to G76, the 'Block' command on the database menu will read as 'Block B1..G76' instead of just 'Block'. This feature is a great help when you are working with different settings: it lets you see at a glance what the settings are at any time and informs you immediately whether you need to change them or not. This feature saved me a lot of confusion and time during my Quattro sessions.

Pressing the Esc key backs you out of what you are doing: if you are in a sub-menu, it takes you to the previous menu. Pressing it again takes you a step further back, and so on, letting you out of mistakes before they are recorded. There is no 'undo' feature in Quattro, however, to let you reverse a command you have already entered. If you need an undo facility, you must run the Transcript add-in supplied before you start working — this contains an 'Undo Last Command' feature.

Pressing the 'F1' function key summons instant, context-sensitive help at any time. The help screens are very useful indeed and are more convenient to use than the manual when you are sitting at the computer.

The 'F3' function key is used to access one of Quattro's special features, 'choice lists'. Pressing F3 summons a choice list of block (and cell) names you have defined. Pressing 'Shift-F3' summons a choice list of macro command categories, and pressing 'Alt-F3' summons a choice list of all the Quattro 3 functions. The choice lists remind you of which options are available and can be used to automatically enter a selected item into a selected cell, as in a 'copy and paste' operation. All you need to do is select the item you want with the cursor keys, and press 'Enter'; the item is then automatically entered at the cursor position. This saves you having to type in the name of the item you want and



Menus can be modified to show, at different levels, the user's own preferred commands. Commands can be added to or deleted from a specific menu, and the structure of the whole tree can be re-arranged. A Lotus 1-2-3 menu tree is provided with the Quattro package but other emulations can be created

eliminates the possibility of associated typing errors.

Quattro lets you name cells and blocks of cells easily, and refer to names instead of references in formulae. The choice list feature makes it particularly convenient to use names since it keeps track of all names, can list them for you, and can be used to paste these names in whenever you need them. It is generally easier to remember names than cell references, and there is less chance of making errors when using names rather than references. You can also move a named cell block to a new location without having to change the cell reference.

Quattro has a wide range of numeric and time & date formatting options, and has zero suppression and cell-protection facilities. It also has a useful 'Hidden Format' option that lets you 'hide' individual cells. This suppresses the display of the cell contents and makes the cell appear blank. When a cell hidden in this way is selected, however, the contents appear on the status line (Quattro's 'descriptor' line). This feature is useful for removing superfluous cell contents from sight to make the spreadsheet look tidy. The 'Column Hide' option can also be used but works on whole columns in the usual way, reducing the column width to zero and moving the right-hand column to the left to close up the gap.

Quattro has an interesting 'Block Reformat' command for formatting groups of long text entries on the spreadsheet, which can be useful if you want to make notes in a spreadsheet model, for example. First, you enter your text into a series of adjacent cells in a column. Each cell can take a maximum of 240 characters, so you must break

and start in the next cell down if you exceed this limit. Then you give the Block Reformat command, specifying the block of cells within which you want the text to be contained (word-wrapped). The text will then be reformatted automatically to fit into the block you specify, spreading down to occupy as many rows as it needs — as if it had been word-wrapped to fit. There is no automatic word-wrap facility as you type, however.

I found the package very pleasant to use. The user interface was very friendly and the program responded smoothly and fast to all my commands. A week's use proved it to be also robust and reliable.

Add-ins

Quattro's add-in facility lets you load, run or unload up to eight add-ins at any time within the main program. The add-ins loaded in Quattro at any time sit in system memory and are displayed on the add-ins menu. As has been mentioned, the two add-ins supplied with the package are Menu Builder and Transcript.

Menu Builder allows you to reconfigure the menu structure (or menu tree) in virtually any way you want. You can rename commands, move commands from one menu to another, change menus, change the menu tree, or create your own menu tree.

Quattro itself has a 'Menu Tree' feature which lets you use two menu trees at any time — a main menu tree, and an 'alternate' one to switch to occasionally. You might want to use an alternate menu tree when you are using a particular spreadsheet application that only requires a limited set of commands, to save time. The Menu Tree feature also



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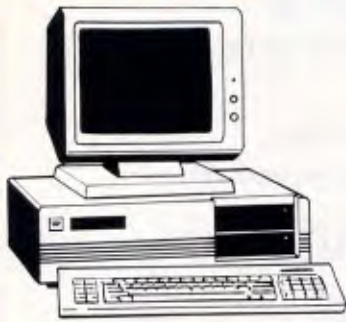
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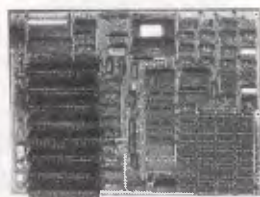
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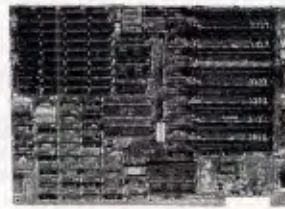
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- 8 Expansion slots

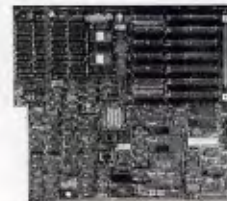
X18030 (excl RAM) **\$195**
X18031 (incl 640K RAM) **\$375**



10 MHz XT* TURBO MOTHERBOARD

- Increase the performance of your sluggish
XT* approximately four times with this
super fast motherboard.
- BOBB-2 running at 10 MHz, no wait state
 - Turbo/Normal selectable
 - 640K fitted
 - 8 Expansion slots
 - 4 Channel DMA
 - Keyboard port

Excluding RAM .. **\$255**
Including RAM .. **\$425**



6/10 MHz AT* MAIN BOARD

- 6/10 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.
- 80286-10 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**

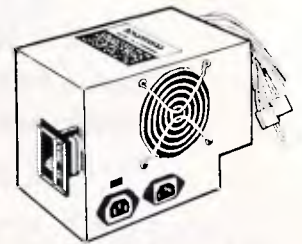
BABY AT* MOTHERBOARD (WITHOUT MEMORY)

- 6/10 MHz system clock with zero 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**

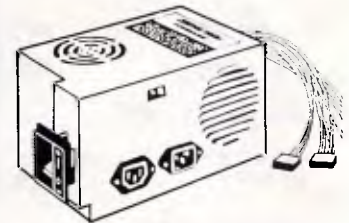
SEMICONDUCTORS

Description	19	10+
V-20 8MHz	\$19.95	\$17.95
V-30	\$39.95	\$34.95
41256	\$6.95	\$6.50
4164	\$3.95	\$2.95



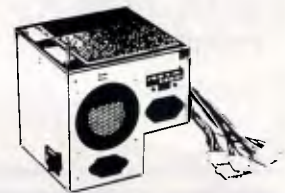
150W SWITCH MODE POWER SUPPLY FOR IBM* PC*/XT* & COMPATIBLE

DC OUTPUT: +5/13A, -5V/0.5A
+12V/4.5A -12V/0.5A
Cat. X11096 **\$149**



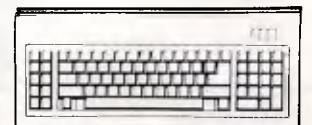
200W SWITCH MODE POWER SUPPLY FOR IBM* AT* & COMPATIBLE

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**



"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?

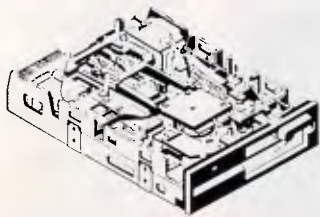
Cat. X12020 **\$109**

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**



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**

20 M/BYTE HARD DISK

Tandon, including DTC controller card, 12 month warranty. IBM* compatible.

X20010 .. **ONLY \$595**

40 M/BYTE HARD DISK

Seagate, 12 month warranty. IBM* compatible.

● For technical details phone Mark Stevens on (03) 543 7877

..... **ONLY \$895**

80 M/BYTE HARD DISK

Seagate, 12 month warranty. IBM* compatible.

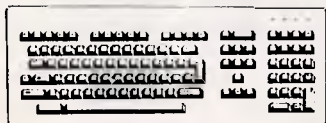
● For technical details phone Mark Stevens on (03) 543 7877

..... **ONLY \$2,695**

DTC HARD DISK CONTROLLER CARDS

X180 (XT) **\$195**

X18140 (AT) **\$295**



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 Word, Fast Repeat, Line Feed, Pause, Clear Screen, Reset.

Cat. X12022 **\$125**



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 **\$149**

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**



16 BIT FLOPPY DISK DRIVE CONTROLLER CARD

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

X18005 (2 Drives) . **\$54**

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**



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**

2 M/BYTE RAM CARD

Plugs straight into BUS ports on motherboard. XT* compatible. RAM not included.

X18052 (Excl.RAM) **\$199**

PRINTER CARD

This card features a parallel interface for Centronics printers such as the Epson RX-80, 100, and other similar printers. Included is printer data port, printer control port, and printer status port.

Cat. X18017 ... **\$37.50**



COLOUR GRAPHICS & PRINTER CARD

This combination card features printer and monitor interface. It has 1 parallel printer port, composite colour, RGB CTC outputs as well as composite monochrome video output with display buffer.

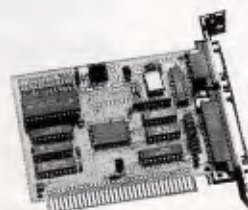
Colour:

Text Mode: 40 columns x 25 rows.
Graphics: 320 x 200

Monochrome:

Text Mode: 80 columns x 25 rows.
Graphics: 640 x 200

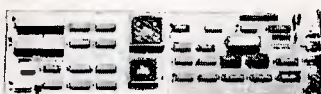
Cat. X18010 **\$129**



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**



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 straight 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**

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**



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

MELBOURNE: 48 A Beckett St.
Phone (03) 663 6151

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Mail Order Hotline: 008 33 5757
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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.

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*Denotes registered trademarks of their respective owners





Quality "is not just the quality of the products -that's shallow thinking- but the quality of service and the quality of the mode of doing business"

MONTEREY International Corp. was founded in 1977 by eight electrical engineers. We are now dedicated to the original design, production, and marketing of high-performance 286- and 386-based solutions. Production includes state-of-the-art computers and keyboards. Plans for 1988 call for the expansion of existing lines as well as the debuts of a PS/2 compatible system and keyboard.

Resources include 185 employees (originally 10), as well as two 6,000 sq. meter factories. CPU production now runs at 5,000 pieces while keyboard production stands at 40,000 pieces per month, respectively. Other resources include trading arms for the import of high-end computer components and finished products from the best companies in Western Europe, North America, and Japan, as well as a branch in San Jose and liaison office in Rotterdam.

Under maxims demanding the highest quality, price competitive, and Prompt delivery standards for MONTEREY's "M" brand computers, aggressive management has led to a more-than doubling of capital, and sales of US\$22 million in 1987.



MONTEREY International Corp.

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Telex: 25171 MONTEREY Phone: 886-2-5917138 Fax: 886-2-5931075

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MS-11 SPIRIT 88

MS-21 MINI 286

MONITORS ONLY \$129



SAMSUNG 12" 20MHZ COMPOSITE MONITOR ONLY \$129

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)	\$129
X14516	(AMBER)	\$129

10 OR MORE ONLY \$119⁹⁸



SAMSUNG 12" TTL/COMPOSITE MONITOR ONLY \$179

FEATURES....

- At least 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/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)	\$179



SAMSUNG 12" FLAT SCREEN COMPOSITE MONITOR ONLY \$179

FEATURES....

- Flat, high contrast, non-glare 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)	\$179
X14512	(AMBER)	\$179



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 50Hz

Dimensions: 308(W) x 297(H) x 307(L)mm

Weight: 7.3Kg

Shipping weight: 8.3Kg

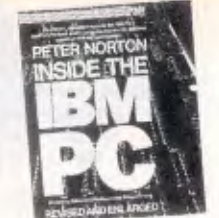
Cat.No.	Description	Price
X14500	(GREEN)	\$189
X14502	(AMBER)	\$189



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**



INSIDE THE IBM PC
(Revised and expanded edition)
Peter Norton

The 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

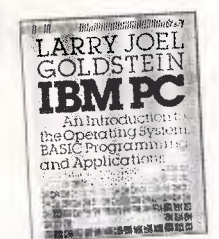
B20080 **\$44.95**



CANON A-50 PRINTER

- Serial Impact Dot Matrix
- 80 C.P.S.
- Near Letter Quality Mode
- 1.4K Buffer

Cat. C20045 **\$595**



IBM PC
An introduction to the operating system, Basic programming, and applications.

IBM PC
An introduction to the operating system, Basic programming, and applications. Features include a thorough explanation of the MS DOS and PC DOS operating systems, a "hands-on" approach to BASIC programming, chapters on memory, printer graphics, flow charting, file handling, games, screen graphics and sound.

B20020 **\$39.95**



CPA-80 PRINTER
Dot matrix, 100 C.P.S. **only \$345**



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



MAIL ORDER HOTLINE
008 335757 (TOLL FREE)
LOCAL: 543 7877



RITRON 2 MONITORS

Stylish monitors available in green or amber displays and featuring swivel base that tilts forward and back 30 degrees and swivels right to left 60 degrees!

SPECIFICATIONS:

CRT DISPLAY SIZE: 12 inches non-glare 90 degree deflection

INPUT SIGNAL: 1.0 - 2.5V p-p composite video signal.

INPUT IMPEDANCE: Normal 75 ohm, high approx. 50K ohm

INPUT TERMINALS: RCA phone jack

RISE AND FALL TIME: Less than 25 us

VIDEO BANDWIDTH: 20MHz

Corner: 800 lines

Geometric distortion: 2% or less

Linearity: less than 2%

CONTROLS: Front: Power On/Off, brightness, contrast

Rear: Vertical hold, Horizontal hold, Vertical line, Vertical size

Green Cat. X14508. **Normally \$235**
Amber Cat. X14508. **Normally \$239**
ONLY \$169



THOMSON EGA MONITOR

Top quality high resolution EGA monitors with a space-age design.

SPECIFICATIONS:

CRT: 14 inch (360mm) diagonal, 90 degree deflection.

Display Size: 245(H) x 180(V)mm

Phosphor: P22, non glare, tinted screen.

Dot Pitch: 0.31mm

Video Bandwidth: 18 MHz

Resolution: 15.75KHz - 640 x 200
21.85KHz 640 x 350

Input Signals:
1. RGBI - positive, H(+), V(+)
2. RrGgBbI - positive, H(+), V(+)

input impedance: TTL Level (330 ohms)

Dual Scanning Frequency:
Horizontal: 15.75 KHz or 21.85 KHz ± 10Hz
Vertical: 50 - 60 Hz

Connector: 9 pin, D-type

Size: 312(H) x 363(L) x 380(W)mm

Weight: 10.9 Kg (Net)

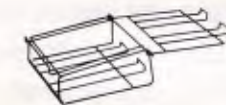
X14525 **\$895**



DELUXE PRINTER STAND

- Restores order to your work area without occupying extra space.
- Feeds and reloads paper under the printer automatically.
- Adjustable paper deflectors ensure smooth flow of paper
- Made of moulded plastic
- Suitable for most printers

C21058 (80 column) **\$69.95**



PRINTER STANDS

- Restores order to your work area.
- Conveniently stacks paper printout in document tray automatically
- Made of black plastic coated steel
- Suitable for most printers
- Excellent value at these prices!

C21054 (80 column) **\$29.95**
C21056 (132 column) **\$39.95**



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



COPY HOLDER (YU-H33)

- Copy area 9 1/2" x 11"
- Sliding line guide
- Flat metal base

C21060 **\$39.95**



KEYBOARD DUST COVER & COPY HOLDER

- Combines two functions in one set.
- Flexible clamp can be attached to most brands of keyboards
- Made of clear acrylic plastic.
- Overall size: 449 x 180mm

C21064 **\$29.95**



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: 342(H) x 362(W) x 421(D)mm

Weight: 11.6kg

Cat. X14530 **\$695**



COMPUTER PAPER

Quality paper at a low price! 2,500 sheets of 80 gsm bond paper

Cat. C21003 11 x 9 1/2" **\$49.95**
Cat. C21005 15 x 11" **\$67.95**

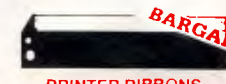


PASCAL PRIMER

-Mittell Write, David Fox

If you are learning programming or have dabbled in the popular language BASIC and wish to learn the capabilities of Pascal, this book is definitely written for you. Written and illustrated with a touch of humour, the informative text describes Pascal program structure, Pascal variables, Pascal procedures, and many other features. There are chapters on decision making statements, numeric functions, string functions, arrays and sets, and much more. The eight appendices present facts about the advantages and disadvantages of Pascal, components of a Pascal system, interfacing assembly language routines, and other useful information.

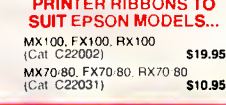
Cat.B21120 **\$34.95**



PRINTER RIBBONS

CP80, BX80, DP80, BX100, MB100

ALL A CRAZY LOW \$9.95



PRINTER RIBBONS TO SUIT EPSON MODELS...

MX100, F.X100, RX100 (Cat. C22002) **\$19.95**
MX70-80, FX70-80, RX70-80 (Cat. C22003) **\$10.95**



HEAD CLEANER DISKS

It only takes a minute amount of dust, dirt or magnetic oxide particles on your drive heads to cause problems: errors, downtime or an expensive service call. Regular use of a head cleaner will keep your drive free of trouble causing dirt and help keep your system up and running. These disk cleaners are simple to use, and include cleaning solution and instructions.

CAT.No.	SIZE	PRICE
C12560	3 1/2"	\$6.95
C12555	5 1/4"	\$6.95
C12851	8"	\$14.95

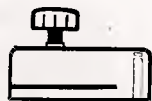
SEND DATA DIRECT CONNECT MODEM

- CCITT V21 300 baud full duplex
 - CCITT V23 1200/75
 - Bell 103 300 Full duplex
 - Bell 202 1200 Half duplex
 - Auto answer
 - 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)



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



DISK NOTCHER

Converts 5 1/4" single sided floppy disks to double sided by placing an appropriate notch in the floppy disk jacket.

C21070 \$9.95



VERBATIM DISK SPECIALS!

All prices 10 disk boxes!

Description	1-9 boxes	10+ boxes
3 1/2" 1S/2D	\$44.95	\$42.95
3 1/2" 2S/2D	\$46.95	\$43.95
5 1/4" 1S/2D	\$22.00	\$21.00
5 1/4" 2S/2D	\$26.00	\$24.00
5 1/4" 2S/4D	\$75.00	\$70.00
5 1/4" 2S/HD	\$42.95	\$41.00

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Jumper Wires: 20 tinned end pieces.
Power: Interface power.
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the space bar) and watch it being executed in slow motion on the spreadsheet; or set a breakpoint that freezes a macro at a specified stage so that you can check the logic of your macro in sections. It also lets you view or 'trace' changes of up to four specified cells during the execution of a macro. Pressing Shift-F8 sets the program in 'debug' mode, and pressing the slash key in this mode summons the main debug menu. These debugging tools can be of great help when building complex macros.

In Quattro you can execute Lotus 1-2-3 macros, and in Lotus 1-2-3 you can execute Quattro macros. Therefore, a 1-2-3 user changing to Quattro can bring across all the macros he has developed. Both packages can be used side by side if required.

Saving & retrieving files

The 'File Xtract' command can be used to save part of a spreadsheet as a separate spreadsheet file, leaving the original spreadsheet unaltered. You can save the spreadsheet cells as either formulae or values, and you can use this feature to split a large spreadsheet model into smaller, more manageable

bits. The 'File Combine' command does the reverse: it lets you copy all or part of an existing spreadsheet file on disk into any area of the current spreadsheet. When performing this operation there are three options available to you:

'The user interface was very friendly and the program responded smoothly and fast to all my commands'.

- you can replace current cell contents with the new spreadsheet cells;
- you can add the values of the new cells to those in the current cells; and
- you can subtract the new values from the current values.

When you save a file, you can protect it from unauthorised access by encrypting it with a password. That password must then be supplied at a later stage in order to retrieve the file. If you forget the password there is no easy way to retrieve the file, unfortunately, so if you are using a password it is advisable to

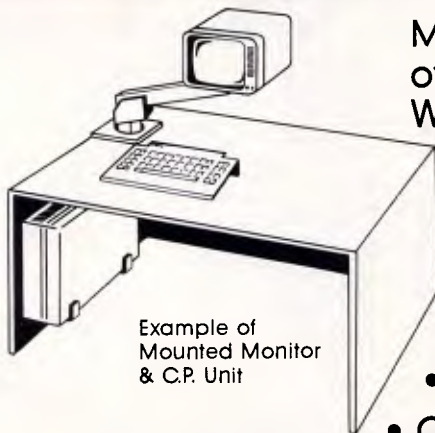
write the password down somewhere and keep it in a safe place. When you save a file with a password, Quattro asks you to type the password in twice to make sure you haven't made any accidental typing errors, which is a very good idea. Quattro can retrieve files encrypted by 1-2-3 if you supply the right password, but 1-2-3 cannot open files encrypted by Quattro's default method. If you want 1-2-3 to read Quattro-encrypted files, you must assign a .WK1 extension to the file, in which case Quattro will use an encryption method that can be decrypted by 1-2-3.

Quattro can save and retrieve files in several formats — Lotus 1-2-3 versions 1A, 2.0 and Educational, Lotus Symphony, dBase II and III, and Paradox — depending on the extension you assign to the file when you save it

Quattro can also import ASCII text files and 'comma' and 'quote' delimited files. When an ASCII text file is imported, each line of the text file becomes a label, and the whole text file becomes a single column of labels. When you import a comma or a quote delimited file, the delimiters divide the text into columns.

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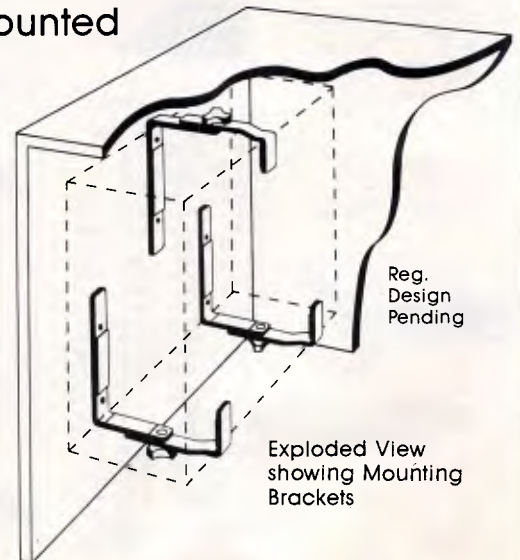
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feature that can be used to break down long cell labels into individual cell-sized bits — for example, to create the fields in a database. You might want to parse a long name in a single column of cells to turn it into a first name and a surname occupying two columns instead. You can set up 'format lines' to tell the program in detail how to parse any given text. These can tell the program what area to parse and where to copy the parsed data to. The format lines are positioned above the information they act on in the spreadsheet and contain the parsing instructions. More than one format line can be used to parse a block of data, and each individual format line can be easily modified, giving you a high degree of control.

You can save a spreadsheet as an ASCII text file by using the 'Print File' command.

Graphics

Quattro has impressive graphics facilities. It has 10 types of graph to choose from, and lets you customise each detail of a graph to get it looking just the way you want. The ten types are: Line, Bar, 3D Bar, XY, Stacked Bar,

Pie, Area, Rotated Bar, Markers, and combined Lines and Markers. For any of these types you can customise the grid pattern, fill patterns and colours, and change the titles, legends, lettering size and font. There are 11 fonts to choose from, which should be more than enough for the needs of most users. I was disappointed to find that the font options were not available for use in the spreadsheet itself, however. Despite the sophistication of the graphing facilities, creating and customising graphs is a very easy task.

You can view a graph at any time by using the 'View' command or by pressing the 'F10' function key. Graphs can be saved in 1-2-3 format or in a EPS (PostScript) file format that you can use with a word processor which supports PostScript. In this way, it should be possible to produce high-quality graphs in reports printed with a laser printer.

The 'Advanced' menu

Quattro has a special 'Advanced' menu that contains features to let you perform various advanced mathematical and statistical analyses of blocks of data in your spreadsheet. The Advanced menu contains the following commands: 'What-If', 'Frequency', 'Matrix' and 'Regression', as well as 'Database' which lets you access Quattro's database facilities.

Printing

Quattro's printing facilities are powerful yet easy to use. You can print any block of cells on the spreadsheet, and specify any rows to be printed as headings at the top of each page. Likewise, you can specify any column or columns to be printed as headings at the left-hand side of each page. The 'Page Layout' option lets you set your margins and page length, page break instructions, and headers and footers. Headers and footers are limited to one line of text and a maximum of 240 characters, but you can include a couple of very useful items. A '#' symbol enters the page numbers automatically; and a '@' symbol enters the current date, as supplied by the system clock.

There is a very useful 'Print Format' command which lets you print 'As Displayed' or 'Cell Formulae'. Choosing Cell Formulae provides a list of cell contents and formatting details for any block of cells. This can be used for making notes on cells and also for documenting a complete spreadsheet model.

You can print to disk instead of to the printer, and an ASCII text file will be

created. You can then print this from DOS if you want to. Although there are many printing options, I could not find a sideways printing option.

Quattro supports a wide range of printers including laser printers and Apple's LaserWriter. The 'Setup String' command lets you create and store a setup string that is sent to your printer automatically each time you use the printer. The setup string gives your printer specific print instructions about such things as line spacing, print mode and font.

What is very interesting is that you can embed setup strings within your spreadsheet. In fact, you can embed more than one setup string in your spreadsheet and, in this way, print different parts of the spreadsheet with different effects on the same page. You could use bold for the headings, for example, and revert to a normal typeface for the rest of the text.

Documentation

The Quattro package comes with three manuals in large paperback-book format: *Getting Started With Quattro*, the *Quattro User's Guide* and the *Quattro Reference Guide*. Only the latter two were ready in time for my review, and these were very well-written and explained.

Conclusion

Quattro is a pleasant-to-use, powerful spreadsheet with very useful add-in expansion potential. Both the program manuals and the online help are very good, and make the package easy to learn and use for a beginner. 1-2-3 users should certainly have no problems learning how to use the package. It can be made Lotus-compatible if desired and can integrate into 1-2-3 environments easily because it can use 1-2-3 files and macros. It can also offer 1-2-3 users many additional features.

On the negative side, Quattro can't accommodate multiple spreadsheets onscreen, can't link spreadsheets, and doesn't have the range of functions that Excel provides. However, it does have useful features that Excel *doesn't* provide, like the add-in facility, the Menu Builder and Transcript add-ins, debugging tools and intelligent menus.

All in all, Quattro is a professional and slick package. And, at \$335 it is value for money.

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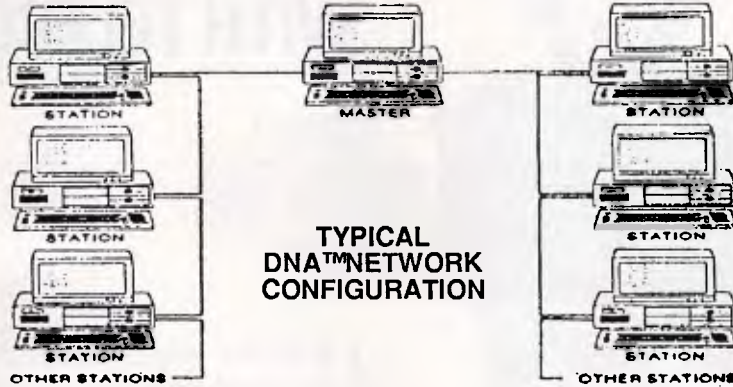
As a hardware and software solution, users can share mass storage, printers and plotters and multi-user software. Several methods of file and record locking are implemented.

DNA NETWORKS /PRODUCT II

allows a maximum number of 64 workstations on a single cluster. The DNA Networks/Product II Network consists of a half size board which is installed into a PC. The communication link is twisted pair cable with a maximum distance of 5,000 foot. The Network software is loaded as a device driver within DOS which provides easy installation and transparency to the end-user.

INSTALLATION takes approximately twenty minutes for a two user network. The hardware requires placement in an available slot within the computers, running the twisted-pair cable between the computers and connecting the cable to the boards. Software installation consists of running a two minute installation at each and re-boot personal computers.

THE MASTER (File Server) of the Network can be any IBM compatible microcomputer. The master is not dedicated to performing the file serving function. It can be used as a workstation. The Network will support any



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patible microcomputer. The PC itself can have any form of local mass storage device or local printing device. The workstation can also be a floppyless unit, booting up across the network.

THE UNIQUE attribute of the DNA Networks/Product II is that once installed, the end-user does not need to learn additional commands. As an example, network commands can be embedded within batch files which automatically spool for the user, send printed documents to the print queue + print the document. All these features can be implemented within menu programs thereby making the

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RELIABILITY is one of DNA Networks/Product II's most important qualities. DNA Networks Inc. has worked very hard to establish DNA Networks/Product II as the most transparent local area network on the market today. As a result, DNA Product II is easy to install and uncomplicated to use. We continue to research industry improvements to maintain a constant awareness of hardware and software advances.

SUPPORT is a commitment which we extend to the buyers of DNA Product II products through the technical support group. The services may include telephone technical support, dealer training (when available).

SPECIFICATIONS

- Hardware: IBM-AT,XT,PC, PS/2 AND COMPATIBLES
- Compatibility: (call to determine if compatible is on the approval list).
- Software: PC/MS DOS 2.0 to the most current release.
- Compatibility: Hierarchical with workstations polling (Daisy-chain connection).
- Performance: Transfer rate up to 2.5 megabits per second.
- Architecture: Hierarchical with workstations polling (Daisy-chain connection).
- Cable: Shielded twisted-pair, maximum length 5,000 feet.
- User Stations: 1 to 64 workstations (including floppyless capability).
- Network Master: Any computer with a mass storage device and printer ports; master can be used as a workstation.
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- File and Record Locking: DOS 3.x, DNA Networks/Product II File and Record Locking, NETBIOS, and optional Novell File Record Locking Emulation.
- Features: Log-on with Password Security, Message Switching, Enhanced DOS Features, and Network Diagnostics.
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(Specifications are subject to change).

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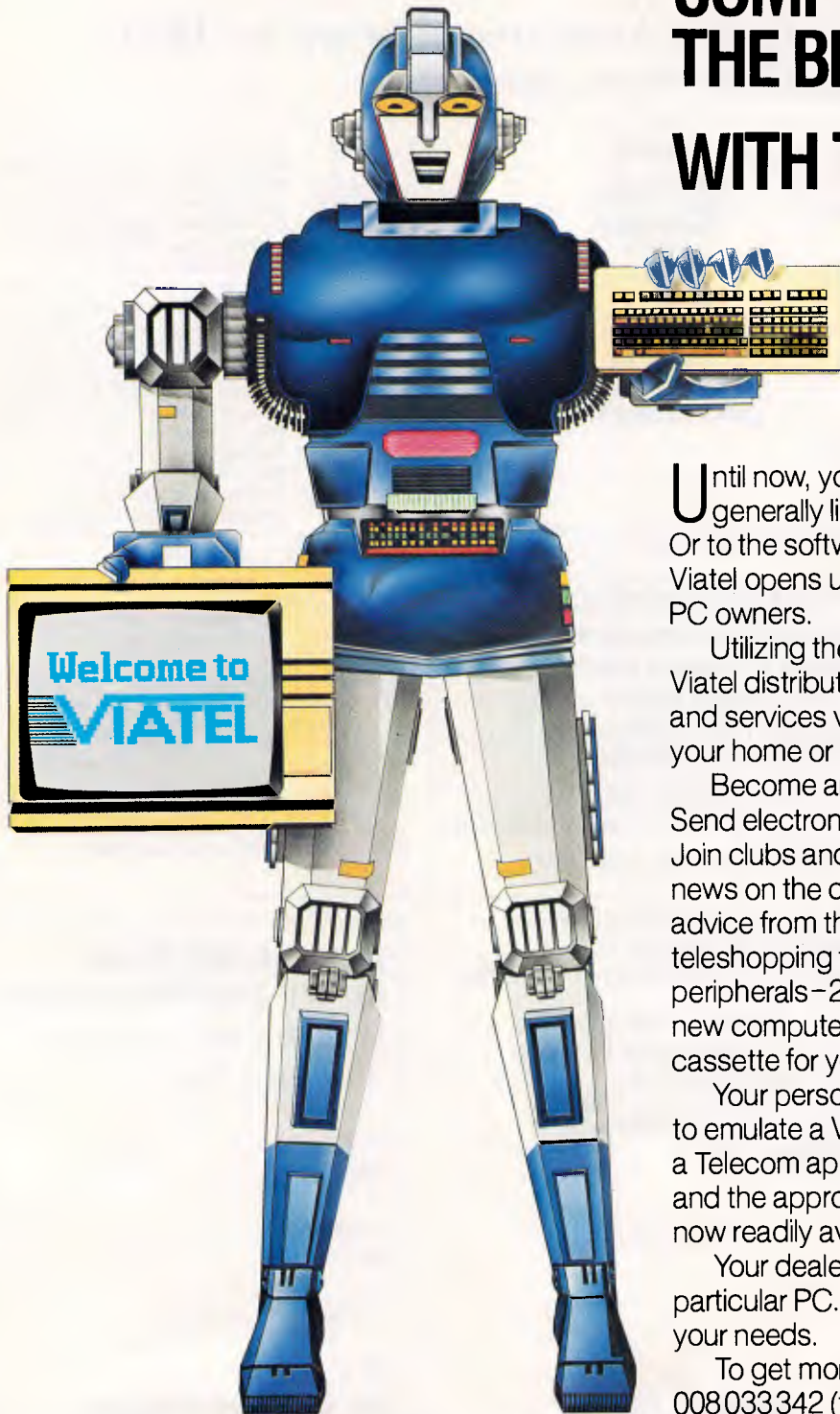
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dBase Mac

Looking for an excuse to buy a Macintosh? Here's a good one: the dBase Mac relational database, which uses a graphical approach to file relationships and looks, on paper, to be a heavyweight contender in the Mac database stakes. But it has a speed limit. Nick Walker watched it in action.

There's no doubting it — dBase III is a heavyweight database generator. Whatever database you intend to create, the chances are that dBase III can do it, but at a cost. Creating a database in dBase III is hard work — even a relatively modest database takes its toll in time, sweat and tears. Nevertheless, dBase III soldiers on as the best-selling database since sliced bread just because it is so capable and well-understood.

For those who want to harness the power of dBase but have been intimidated by its unfriendliness, there could now be an alternative — dBase Mac. True, if you don't have an Apple Macintosh, you'll have to buy one, but just think of all the time you'll save using the Macintosh's friendly environment.

Ever since Ashton-Tate announced its intention to produce dBase Mac, I have been asked three questions:

- will existing dBase III programmers be able to transfer painlessly to dBase Mac;
- does it make dBase programming so easy that it's worth buying a Mac;
- how does it compare with other Macintosh databases?

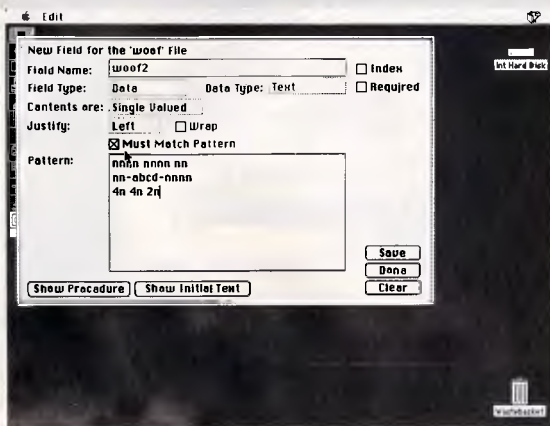
I will attempt to answer these questions during the course of this review.

Certainly, Ashton-Tate makes bold claims for dBase Mac — the packaging proclaims: 'First relational database to use Mac interface'. Blyth and Odessa, producers of Mac relational databases for the last three years, might disagree, however.

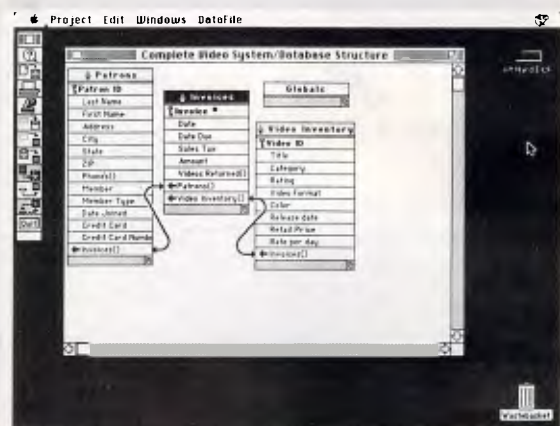
Overview

dBase Mac is a fully-relational database which uses a graphical display of each file and its fields to show the relationship between them. Each record within a file must have roughly the same structure, but a single field can have multiple occurrences and still work correctly. All text fields are automatically of variable length (meaning that each field only uses the amount of space it actually needs).

Excellent use is made of the Macintosh interface throughout the program. Frequently-used files can be fully indexed for fast access or permanent ordering, and there is never any need for re-indexing. Multiple 'views' of the files give an impressive collection of sorts and selec-



The default data entry screen adjusts automatically according to what data type you specify. Here, the pattern-match box has appeared in response to entering text in the data field



The database structure window lists all the fields of each file within a project. Dragging any one field name to another will set up a relational file structure

tions. The reporting facilities are good but do not include a letterwriter — you must link to a word processor such as MacWrite for that. Most importantly, dBase Mac allows you to create your own turnkey database applications.

For those readers interested in facts and figures, I've compiled the major constraints and capabilities of dBase Mac in the table alongside. It can be seen from this information that, on paper, dBase Mac looks like a very capable database indeed. The only constraint that might cause problems is the limit of 32,000 records per file, and there are ways around that.

File creation & indexing

Each dBase Mac application is contained within a 'project' which relates all the data files, reports and views together. To create a new application, you select 'New' from the 'Project' menu. The opening screen of a new project consists of a re-sizeable window known as a Database Structure window, which shows all the data files associated with a project and the fields within each data file. It is from here that you create new data files.

To create a new file, you select 'New' from the 'Data Field' menu. A window then prompts you for a file name and allows you to assign a password for security. This automatically takes you through to a screen to define the key field — the field that uniquely identifies a record. All fields, including the key field, are specified in the same manner. For each field entered you can: specify the

field name, the field type (key, data, formula or pointers) on the data type; add an internal index on field; insist on an entry in field; single or multi-valued contents; text justification; word-wrap for text

'There doesn't seem to be any relationship between dBase III and dBase Mac internal file formats . . . there is no way of transferring files back to dBase II or dBase III.'

fields; and a pattern which the field must match.

A lot of these options take you through to further set-up screens to define information peculiar to that type of field — that is, the arithmetic expression for a calculation field. One particularly nice feature is the style of the pop-up menus used when selecting from a fixed list of options. For example, clicking the mouse on the 'Data Type' box will pop-up a menu over that box with a list of all the possible data types. This feature was used extensively on the original Smalltalk systems which spawned the Macintosh, and it really is a joy to use.

The specified field can hold seven types of data via a pop-up menu: text, numbers, dates, times, logical values, a choice from a group of possible items,

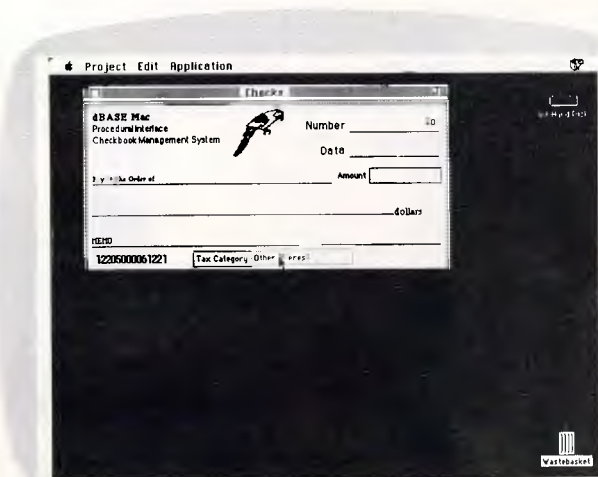
and graphic images. The pattern-matching facilities for text fields are particularly impressive and allow you to, for example, validate Mosman phone numbers by entering '3n 4n' for three numbers followed by four numbers. Practically any combination of characters — even embedded strings — can be specified in this manner.

All the expected numeric field options are available: formatting, currencies, initial values and ranges. The most interesting numeric field option is the ability to post a numeric system anywhere else within the project, which is useful for running totals when browsing through a file. There are 15 options for data format and eight for time, the latter including such esoteric options as 'seconds from midnight'.

Logical fields have two possible states, and the two values can be user-defined or selected from the usual list of Yes/No, 1/0 and True/False. Choice fields allow you to specify a list and make selections from it, and the full range of Macintosh facilities — check boxes, radio boxes, and so on — are available for displaying a choice field.

The seventh type of field on the Data Type menu is for graphics. A graphics field can store a bit-mapped image stored in Mac-Paint format or Mac-Draw PICT format. Ashton-Tate supplies a special desk accessory called 'Picture This' which 'grabs' pictures while dBase Mac is running. Graphics images can be scaled and cropped as required.

Indexes can be added either internally as part of the field definition or as an external file. An internal index significantly increases the size of the file and is only



One of the most innovative features of dBase Mac is the pop-up menu. This screen shows a pop-up menu being utilised by a user-generated application



For some people the ability to incorporate MacPaint and Mac-Draw images into a data file will outweigh all other features of dBase Mac. Scaling and cropping can be performed

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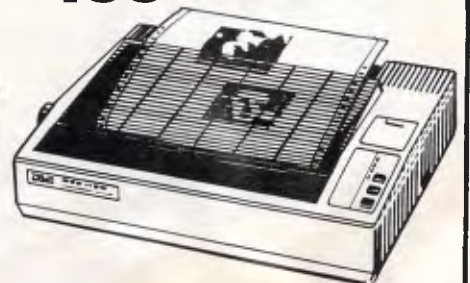
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for use in sort and select operations. An external index file also speeds up the process of sorting and selecting, and can be used as a common field bridge between two related files.

External index files are created by dragging a field into an empty area of the 'Database Structure' window. It was when I first attempted to do this that I confirmed what I had suspected from the onset of this review — dBase Mac is interminably slow. Creating an index file from a simple 200-record file took approximately four minutes. True, creating an index does improve speed, but only to such an extent that it becomes equivalent to other Mac databases without an index.

No restriction is placed on the number of index fields or files but each must consist of one complete field. There seems to be no provision for sub-field or linked fields. Indexes are, however, automatically updated — which saves you from the tedious process of periodically re-indexing.

Perhaps the most innovative feature of dBase Mac, for those not wishing to get involved in programming, is the ease with which relational databases can be created. A data file relationship is shown in the Database Structure window as a line between two files, and establishing a relationship is as simple as dragging the field across to the related field. dBase Mac allows you to establish two-way relationships by dragging one field to another, or one-way relationships by dragging a field to the title bar of another file. With a two-way relationship, either file can look up records in the other; a one-way relationship allows the first file

Constraints & capabilities of dBase Mac

Max file size	Limited only by disk space
Max record size	32,000 bytes
Max field size	32,000 bytes
Max single-valued text field or multi-valued field entry	255 bytes
Max number of fields per record	32,000
Special disk format	Yes
Links to ASCII files	Yes
Data types	Text, Number, Date, Time, Logical, Choices and Graphic
Max number of sort fields	7
Fixed record length	No
Fixed record structure	No
Amend record structure	Yes
Number data files open	30
Max key length (chars, fields)	255.1
Import file types	dBase Mac, dBase II, dBase III, dBase III+, ASCII
Numerical precision	19 digits
Procedure size	15k or 2400 lines (but you're a poor programmer if you use more than 35 lines per procedure)

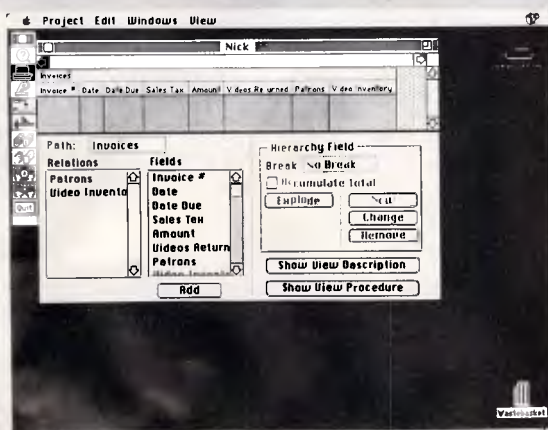
to look up records in the second. Double-headed arrows are used to indicate two-way relationships and single-headed arrows for one-way relationships.

Data entry & updating

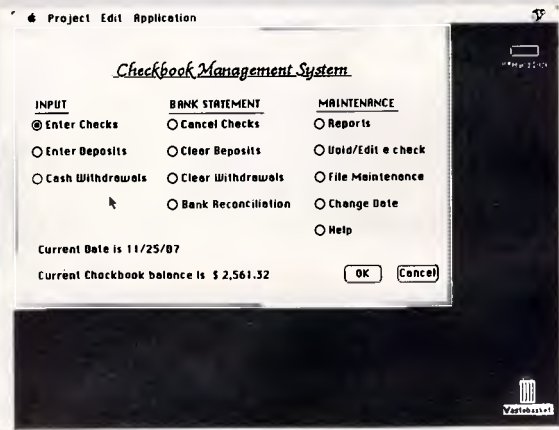
A variety of methods of data entry are provided with dBase Mac, all operating through views. The quickest way to begin entering data is to select 'New View' from the 'Windows' menu and to

select 'Quick Create' from this option screen. This takes you through to a columnar list of fields with space to enter data. Of course, for finished applications you will want to create a customised form for data entry, and dBase Mac has excellent facilities for doing this.

Instead of clicking Quick Create, selecting 'Custom View' will take you through to a screen known as the 'hierarchy definition screen'. Despite its pompous name, this simply defines the order in which



The layout screen for view design is divided into three areas: the drawing tools palette on the left; and the hierarchical list of fields and the drawing area in the main window



The two areas at the bottom of this view are tablets. Clicking on an entry on the left-hand tablet will activate the appropriate tablet on the right

SCREENTEST

dBase Mac will retrieve records from a file or, more importantly, a group of files. From these files, it is possible to specify the fields required in your view.

After defining the necessary fields, you are taken through to the 'Layout View' screen. The upper portion of this screen contains the fields you have selected; the lower half is a drawing area on which to lay out the view, and can be re-sized to fill the full-screen.

Along the left-hand side of the screen is an icon strip containing the usual painting and drawing tools for designing the screen. The designing procedure now involves dragging the fields from the upper-half of the screen and positioning them below. Any re-sizing and re-positioning can be done in the standard Macintosh manner and a background can be 'painted' onto the screen.

Although views can consist of more than one screen, dBase Mac has an innovative feature which helps when there is a lot of data to be displayed. A 'tablet' is an area of screen that can be made to 'pop up' when certain conditions are met. For example, a certain food menu could be made to pop up, depending on whether you entered 'lunch' or 'dinner' in a selected field.

Tablets can also be used for sensitive data: for example, a salary field is only displayed to people who can supply the proper identification in another field. Tablets can contain the same information as a custom data input form, including push-buttons, radio buttons, graphics and check boxes.

Selection & sorting

Views can, of course, also be used for viewing selections and sorts. There is no limit to the number of fields that can be specified in a single sort, and a sorting progress dialogue box helps to relieve the boredom as dBase Mac trudges

through a file. Apart from its sorting facilities, dBase Mac has a fine collection of selection criteria. The range of conditions provided includes the usual relational operators such as 'greater than', 'not equal', and so on, plus wild-cards for single characters and strings. Selective retrieval is noticeably faster for index fields but is still markedly unimpressive.

When using dBase Mac, it is possible to specify most commands in two ways — from the pull-down menus, or via a

'... for a first release of a Macintosh product, it is remarkably bug-free. If only Ashton-Tate could sort out the speed problems ...'

vertical bar of icons known as the 'palette'. The palette can be moved and closed in the same way as most Macintosh windows but cannot be obscured by other windows or re-sized. dBase Mac has four palette sets, and the set displayed depends on the activity you are performing at the time. If a menu command is dimmed, its corresponding icon is also dimmed. Particularly useful is dBase Mac's ability to add items and remove items to palette windows to reflect the operations you most commonly perform. You can even re-draw the standard icons if they are not satisfactory.

Printed reports

Before going into depth about creating reports using dBase Mac, it is worth mentioning the other printing options

which help database creation and development. Any pre-defined view can be turned into a printed report by specifying its size to correspond with your chosen printer paper. This makes printing on labels particularly easy. To aid application development, dBase Mac has options for printing a copy of the file structures, field definitions and whole database structures.

dBase Mac provides several features for the creation of high-quality reports. Although you can use any view to generate a report, columnar reports are most commonly-used because they make it easy to accommodate page breaks and totals. Page breaks and blank-line breaks can be added to any printed report.

You can set a total to appear in a printed report for any field that is displayed. If no break point has been set in the field, only totals appear. If the field has a break, the printed report shows both totals and sub-totals.

Using the relational database features and multi-valued fields, it is possible to present hierarchical information within the same file. dBase Mac automatically recognises a hierarchical file and will print an 'exploded parts list' type of report (a report that shows a complete breakdown of records and sub-records).

The basic idea is that records within a file may be related to other records within the same file. A classic example of this type of inter-dependency is genealogy: each record in a family tree would include fields which point to that person's immediate relatives. An example in the business world would be a motor car spare parts distributor. The report for an individual car could work down through the main assemblies and sub-assemblies until the report comes to the last, indivisible part.

All the standard printing facilities are provided in dBase Mac, including headers and footers. There is no easy facility for the production of standard letters, but the links with popular Macintosh word processors such as MacWrite are good.

Tailoring & programming

A great deal of customisation can be achieved without getting your hands dirty and writing dBase Mac code. However, to automate more complex tasks or produce standalone applications, dBase Mac has a full programming language, and it is in the area of programming that the greatest advances have been made.

The programming language is modular and has a distinctly object-orientated feel

```
IF NOT {Video Inventory°Invoices} IN "Video Inventory" THEN
  ALERT ("Sorry, Video Number" : {Video Inventory°Invoices} :
    " is not on file.",NOTE)
  SETNEXTFIELD ({Video Inventory°Invoices})
ELSE
  ACCEPT
  {Sales Tax°Invoices} = {Sales Tax°Invoices} +
    ({Rate Per Day°Video Inventory°Invoices} * .06)

  {Amount°Unvoices} = {Amount°Invoices} +
    ({Rate Per Day°Video Inventory°Invoices} * 1.06)
  REDISPLAY ({Invoices})
END
```

An example of a commented dBase Mac listing

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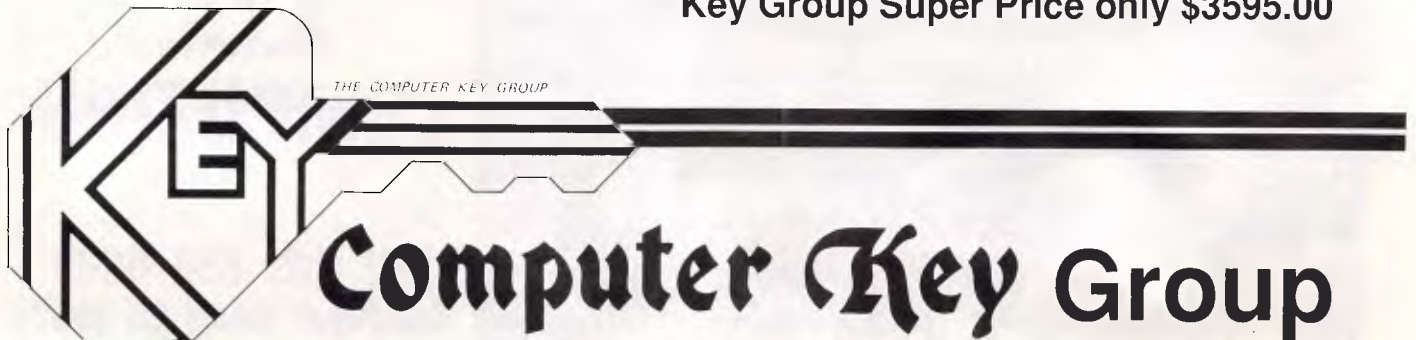


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to it. Programming is done via procedures that are assigned either to a field, a file or a view. This makes it much easier to ensure that a procedure only affects the data it is designed to and has no unwanted side-effects. If you want to get data out of a procedure, it has to be explicitly passed out.

Suppose, for example, that you wanted to validate items of data before printing a report. Instead of writing one complex program to check all the data, you would attach a procedure to each field which checks the data as it is entered. Your procedure is then much easier to understand, easier to test, and can be attached to that field in any report.

Procedures can also be used for more advanced functions such as creating dialogue boxes to aid a novice user, or even redefining the entire menu to create a complete and secure standalone application.

Writing procedures in dBase Mac usually consists of choosing commands and functions from pop-up menus and selecting files and fields from list boxes. You can also type in the procedure in the traditional manner from the keyboard.

There are five types of procedure, some or all of which are available depending on where you intend to attach the procedure. The five procedure types are: 'pre-processor', 'post-processor', 'new record', 'delete record', and 'write record'.

You can attach a **pre-processor** to a view or a field within a view. Pre-processor procedures are performed whenever the view is opened, becomes visible or is performed. You can attach a **post-processor** procedure to a view, a field in

a file or a field in a view. A post-processor procedure is performed whenever a view is closed, a different value is assigned to a field, data is transferred into a file, or the field is initialised with a default value.

New-record procedures control the addition of new records to a database. A new-record procedure is performed, as you might expect, whenever a new record is added to a file. Similarly, **delete-record** procedures become active whenever a record is deleted manually or by some automated method.

Finally, **write-record** procedures become active whenever 'Enter' is pressed in a data entry screen or when dBase Mac encounters a 'write' command.

There is no compiling to be done or execution point to be specified in dBase Mac. Procedures are automatically invoked when the work you are doing reaches the file, field or view to which the procedure is attached. At first it might not be apparent why you would need the five types of procedures, but they really do make programming much easier. For example, you can create a delete-record procedure that produces a dialogue box which checks whether the user has sufficient authority to delete a record. That procedure remains autonomous to any other part of the system and is invoked only when an attempt is made to delete the record.

Lack of space prevents me from discussing the full range of dBase Mac commands here, but suffice it to say that they total over 100 and include control of all the Macintosh's capabilities. Even features unique to dBase Mac, such as pop-up menus and tablets, can easily be

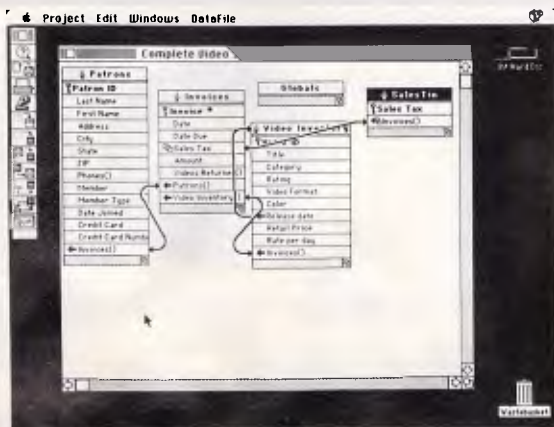
incorporated into applications developed under dBase III. For those familiar with dBase III programming, there is some similarity in the command names; but, apart from this, the well-structured nature of dBase Mac and its superior controls makes it a far more powerful programming environment.

To create a new procedure, you first find the point at which the field, view or record was defined and click the button marked 'Show Procedure'. This takes you through to a screen with a window for the text, a pop-up menu to select the procedure type, a scrolling list of fields, and pop-up menus for all the available commands broken into four groups — Control, Math, String and Other. The procedure can be entered either straight from the keyboard or via the pop-up menus and field selection lists. A commented example dBase Mac listing showing most of the program's features is shown in the box.

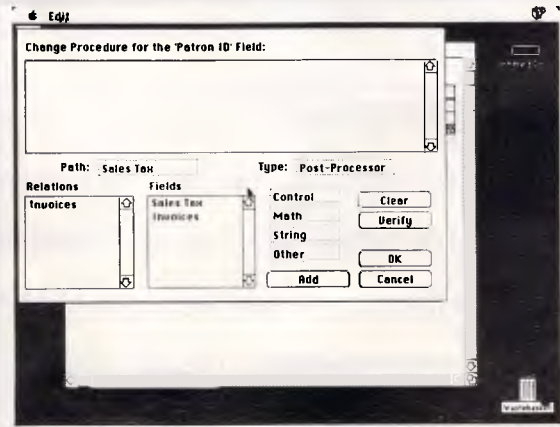
Links with outside

As you might expect, dBase can import data files from dBase II and dBase III on the PC with relative ease. After transferring the file via serial ports, it is just a matter of selecting the file format from the import data screen and the file appears in dBase Mac format. The one exception is the variable-length memo field of dBase III; the only way to deal with this is to re-define the field as a fixed-length text field under dBase III, then export the file.

There doesn't seem to be any relationship between dBase III and dBase Mac internal file formats, considering the time



The diversity of file relations in dBase Mac: a one-way relationship, a two-way relationship, an index relationship, and a one-way relationship from a file to itself



The dialogue box for procedure creation allows you to enter all the relevant text via the six pop-up menus and the field list box, without touching the keyboard



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it takes to load a file. Because dBase Mac uses variable-length fields, there is no way of transferring files back to dBase II or dBase III.

Although the manuals don't mention it, there is provision for the translation of dBase III program files within dBase Mac. This worked fine on a 250-line dBase III program, but bombed spectacularly when faced with my 6000-line patient-booking system. A manual devoted to exchanging files describes the transfer process for the following databases and spreadsheets: Business Filevision, Excel, Helix and Double Helix, Jazz, Microsoft File, Multiplan, Omnis 3, PFS:File and Reflex. Transferring files between these programs is a lot more convoluted than transferring dBase files and requires the creation of a special 'transfer' view, but at least it is possible and well-documented.

Documentation

dBase Mac comes with four manuals, a quick-reference-guide poster, and an on-disk tutorial which, for some reason, will not run on the Mac II. The four manuals are: *Getting Started*, *Learning dBase*

Mac, *Using dBase Mac and Exchanging Files With dBase Mac*. Illustrations and examples are plentiful throughout all four manuals, which makes it easy to use them as tutorials. As a reference source, however, all four books are generally poor, especially as the indexes are incomplete.

The thickest manual of the four is *Using dBase Mac*, and it is this that you will find yourself referring to most. Its approach is to explain each feature in turn, and then give an example of how to do the task. What it lacks, however, is the hard, detailed facts that you need when you encounter a problem.

The on-disk tutorial is at a very introductory level and needs viewing only once to establish some basic dBase Mac concepts. Some example files are included with dBase Mac, although they only demonstrate just how slow the system is.

Conclusion

dBase Mac makes the maximum use of the Macintosh's capabilities, but there are two major problems opposing its success. Firstly, it is incredibly slow, typi-

cally taking three times longer to perform a task on the 68000 Mac than a similar operation would take on a PC — and the PC version is considered slow.

The second problem is one that Ashton-Tate can do nothing about: Apple has released a product called Hypercard (reviewed in *APC*, December 1987) and it costs only \$99. Hypercard is much faster than dBase III, offers fantastic customisation and increased versatility. Certainly, for the lighter database application such as the cheque-book manager system, Hypercard is far superior to dBase Mac. Setting up a heavyweight relational database would certainly be easier under dBase Mac, but then it would be so slow in use.

Overall, I was impressed with the capabilities of dBase Mac and, for a first release of a Macintosh product, it is remarkably bug-free. If only Ashton-Tate could sort out the speed problems, it would be a very worthy contender in the heavyweight Macintosh database market.

END

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Analysing data from all angles

3-D spreadsheets can put page after page of linked data at your fingertips. William H Stewart, Mike Falkner and Vincent Puglia assess the benefits of an added dimension and take a look at two of the current offerings.

Some of the most recent and interesting challengers to 1-2-3 are the multi-dimensional spreadsheets — spreadsheets that add depth to the familiar matrix of cells and rows. Programs such as Boeing Calc and TM/1, can give you multiple spreadsheets — spreadsheets that reference each other and that can be read like pages in an electronic book, with each page adding detail and dimensions to the page preceding it. Javelin Plus offers various 'views' of the data (see the accompanying box 'Javelin Plus: the spreadsheet alternative').

A number of traditional spreadsheets — VP-Planner and even 1-2-3 — give you the ability to link spreadsheets through a series of special commands. As with cells in traditional spreadsheets, cells in multi-dimensional spreadsheets are referred to by their address. But these add page numbers. With Lotus 1-2-3, the address of the cell in the upper left-hand corner of the spreadsheet is simply A1. In Boeing Calc, the address of the cell in the upper left-hand corner of the seventh page is 7A1.

Three-dimensional spreadsheets tend to be more compact in design. Pages that support a final worksheet product in traditional spreadsheets must be distributed around the flat environment. In a multi-dimensional spreadsheet, all supporting work areas can

reside below the final product where you can easily reference them if you need to. Reviewing and managing the underlying data is less exhausting.

In the past, multi-dimensional problems had to be massaged, sculpted, or moulded by brute-force cybernetics to be examined in a traditional worksheet. Consider a typical budget. In a traditional spreadsheet,

'Three-dimensional spreadsheets give you the ability to link cells in one spreadsheet with cells in another in a single package.'

you'd either cram more detail than you would like into a master worksheet or deal with multiple worksheets and labour over the data and formulae that had to be duplicated. In a 3-D spreadsheet, the first page (or the final page depending on how it's viewed) could contain the total annual budget by category. Each underlying page might represent a month or some other period. Data and formulae in a cell on the first page would be linked to cells

on succeeding pages so that changes made in one level of the worksheet would ripple through the entire product.

Different views

Boeing Calc will allow you to view your budget a page at a time. You can also rotate slices of the cube so that you can simultaneously view all periods for a particular category.

The same budget in a 2-D spreadsheet would show categories of income or expense down the side and the months of the year spread across the top. That format isn't bad. It's served us well for some time now. But 3-D spreadsheets represent a frontier for pioneering analysts who see new levels of rippling recalcs as their manifest destiny. This new software gives us flexibility and possibilities we've never known before. As users find ways to put that mix to work, applications for 3-D spreadsheets are certain to grow.

Lotus recognised the appeal of this flexibility when, with HAL, it gave us the ability to link cells in one spreadsheet with cells in another — updating one cell updates the other automatically. Three-dimensional spreadsheets give you those capabilities in a single package. But among the packages reviewed here we found that power

and flexibility could come at the expense of other features. Boeing Calc, for instance, has no graphics abilities. If you want graphics, you can buy Boeing Graph for \$984.50. The 3-D spreadsheets deliver all the analytical ability of their 2-D predecessors. They are well worth the time you'll spend building and browsing through their pages. The more adventuresome among you may like these spreadsheets enough to buy one.

Boeing Calc

Boeing Calc, a \$984.50 program from Boeing Computer Services, is an unusually large 3-D spreadsheet similar to 1-2-3. Boeing Calc reads and writes 1-2-3 and Symphony worksheets and executes commands in Lotus-like ways. Boeing Calc occupies about 415k of RAM, but unlike with 1-2-3, memory is not a consideration when working with large spreadsheets. In Boeing Calc, spreadsheets are called Workpads and are maintained in memory until the shell reserved within RAM is full. Then Boeing Calc creates a temporary file on disk to store the overflow.

Because Boeing Calc uses virtual memory, it is capable of creating huge Workpads — 16,000 rows by 16,000 columns by 16,000 pages. The Workpad is limited by the disk space available and the 32Mbytes of disk space addressable by DOS.

Copying and moving a range of cells is slower in Boeing Calc and other multi-dimensional spreadsheets than it is in 1-2-3. The large 3-D environments also slow performance on number-crunching tasks, partly because of the complexity of the formula relationships the programs deal with. Waiting on the program can be tedious, but if you need multi-dimensionality, it may be a worthwhile trade-off.

The multi-dimensional spreadsheets looked at here generally take different approaches when creating multi-dimensionality.

Our performance tests were designed to compare the 2-D capabilities of the packages reviewed here. So, to get a feel for Boeing Calc's speed and file size requirements in the third dimension, we translated into Boeing Calc a basic budget worksheet created in 1-2-3. This budget was contained in a range of 36 columns by 126 rows. Using commands much like 1-2-3's, we copied the range to 12 underlying pages. Once the Copy command was invoked, there was plenty of time to sit back and relax. Copying the two-

Lies, damned lies . . .

Spreadsheets are wonderful tools. So many businesses now depend on them so completely that it's hard to remember the bad old days when we did things by hand. But the spreadsheet that is your trusted friend when you quantify the past may be your worst enemy when you predict the future.

Spreadsheets were designed to help people do repetitive arithmetic. Record keeping and accounting are a lot easier when a computer does the mathematics. But before long, people started using spreadsheets to play what-if games and to build forecasting models. The day of the cheap computer projection had arrived. Now anyone with a PC and a little imagination can do sophisticated forecasting that used to be possible only with mainframes.

Forecasting fever has gripped corporate Australia. Not even the fast-trackers can now walk into the boss's office with nothing but an idea; they have to have a fistful of numbers. In some offices, you can hardly order a new coffee machine without running a three-year costs/benefits analysis. All business decisions, large or small, must be put to the numbers test. Make a few assumptions, build them into a model, and let 'er rip!

In large companies, projections are run by specialists who may know something about forecasting. But in small companies, they're done by amateurs. All of us have some notion of whether an assumption is plausible, but how many 1-2-3 or SuperCalc users know anything about probability? Do they know whether forecast results will be more accurate or less accurate as they increase the number of variables? Have they any idea how to gauge the accuracy of their results? Probably not.

But the beauty of spreadsheet forecasting is that technical competence doesn't matter. Spreadsheets have done away with the 'objective' forecast. Since anyone can now do projections, who's going to wait for an independent expert to do one? It's the person who cares most about a project — its most ardent supporter — who now does the projection.

Is he going to do a coolly unbiased forecast? Of course not. He probably thought up the project; he loves it like an only child. His projection is not going to be an aid to objective decision-making it's going to be a lawyer's brief. A lot of spreadsheet 'forecasts' are thus not forecasts at all. They're justifications for something somebody has already decided to do.

The trick is to build a forecasting model backwards. The forecaster knows what the results of the projection have to be: fat profits. So he tweaks the assumptions and tunes the variables until the 'forecast' looks plausible and gives the right results. With creative fiddling, any project can be made to look profitable. Accountants have always been able to cook the books after the fact; now you can cook them in advance.

Some people are fooled by this. They don't understand that letting an advocate run a projection is like letting a criminal write a law. They don't realise that speculative assumptions can't produce results correct to the fourth decimal place. Even if they do, they may think they have to go along with the ritual of

dimensional spreadsheet onto the 12 underlying pages simply created two-dimensional spreadsheets on each receiving page.

The copy process did not create a formula relationship between pages, but it did adjust formulae to indicate on which page you would find them. However, when moving a range of cells from a working two-dimensional page to other pages, Boeing Calc created formula relationships to maintain the mathematical integrity of the spreadsheet.

Mass storage

Saving all this to a file required a

remarkable 616k of disk storage. It is interesting that the 1-2-3 file that was the starting point for this experiment required 34k. If Lotus's HAL had been used to link the 1234k files, it would have required about 406k of disk space. You have to link the worksheet in 1-2-3, however. Boeing Calc automatically makes the links.

Recalculating every change you make in a large Workpad can be time consuming. The program provides for manual recalculation using the F9 key, just as 1-2-3 does. A Range command assists by offering the ability to recalculate a specified range of cells. This speeds things up considerably because Boeing Calc doesn't have to

numerical analysis. It's with columns of figures that we offer up our prayers to the gods of capitalism.

Looking at the downside

At the same time — and more usefully — not even the most tendentious forecaster can completely ignore costs, losses, competition, or bad debts. He may finesse the unpleasantness with an artful choice of assumptions, but at least he has to think about it. And that may be the sole value of most projections: forecasters must identify costs in order to be taken seriously. They may then go on to eliminate them by sleight of hand, but they've had to worry about them.

There's another nasty issue that spreadsheet forecasters don't like to talk about: mistakes. A persuasive forecast has lots of variables — the more the better. A large number of variables makes it look as though the forecaster thought of everything, at the same time that it gives him many more ways to fudge the results. But even apart from fudging, handling multiple variables can be fiendishly complicated. The more numbers a forecaster has to juggle, the more he's likely to drop. The computer won't every make a mistake, but he will.

Many mistakes are never found. Once a model has more than a dozen or so variables, it's too complicated to trouble-shoot just by working backwards from results. Somebody has to go over the whole thing, formula by formula, to make sure everything's right. That's such an awful bore that hardly anyone does it. Spreadsheet auditing programs make this chore much, much easier, but since their sales are only a fraction of 1-2-3's it's a good guess that few people are using them. These programs also cannot spot faulty logic. Only smart, patient people can do that.

There are businesses, like banking or accounting, that live on tedious, error-prone arithmetic. They have come up with formal procedures to catch mistakes. Amateur forecasting is even more prone to error, but it hasn't developed any standards of accuracy and probably never will.

A spreadsheet program and a microcomputer are powerful tools that can be used for great good. But if you're not careful, these same tools can be used against you. So the next time someone hands you a projection, be sure to ask a few questions.

Find out who built the model. Chances are it was someone with a vested interest. If the model is at all complicated, find out how carefully it's been checked. Has anybody but the original forecaster looked it over? If no one has, it's probably got mistakes. Finally, you should pay more attention to costs than to revenues. Revenues are mostly fantasy, but costs can be estimated. Make sure they're realistic.

Whatever you do, don't assume that just because somebody used a computer, the results are somehow unassailable. As Benjamin Disraeli pointed out long ago, there are lies, damned lies — and computer projections.

Jared Taylor

search all dimensions for formulae to evaluate.

You can move from page to page by first setting the Page mode to Pad mode with the F4 key. When in Pad mode, the PgUp and PgDn keys scroll through the third dimension. The first movement through the third dimension requires a disk access to pull the page you want into memory. Once you scroll all 12 pages, moving around all dimensions is as easy as in the two-dimensional products.

Translating 1-2-3 files is easy with the /File Import command. You can translate files from 1-2-3 (Releases 1A and 2), Symphony, ASCII, and .DIF formats. Except for 1-2-3

macros, the translated spreadsheets are completely operational within Boeing Calc.

Boeing Calc doesn't have keyboard macros. Instead you get command files, which are started with the command /Environment Macro Keep. This starts recording subsequent keystrokes for storage in a file named by the user. The command file is executed by invoking the command /Environment Macro Use.

At the time of going to press, version 4.0 of Boeing Calc was announced. The new version incorporates support for Local Area Networks (IBM Token Ring compatible), which allows users to share information in a common

Workpad, and also provides multi-level security. As already mentioned, Boeing Calc has no graphing abilities. Instead, Boeing offers Boeing Graph (version 4.0 also just released and supports EGA and Hercules cards), which seamlessly imports Boeing Calc, or other spreadsheet data, for use in graphs that are truly three dimensional, unlike the two-dimensional graphs you get in 3-D perspective with programs such as Microsoft Chart. Boeing Graph version 4.0 sells for the same price as Boeing Calc (\$984.50), and upgrades from version 3.0 for both products are free if purchased after August 10, 1987, or cost \$286 if purchased prior to this date.

Even with its deficiencies (no keyboard macro language or graphing abilities and its inability to name cell ranges) Boeing Calc is a good multi-dimensional spreadsheet. Its translation capabilities are flexible and its documentation is helpful and easy to read and understand. Any 1-2-3 user will have little trouble adapting to the third dimension, and, at \$984.50, it is excellent value.

William H Stewart

TM/1

With eight dimensions and a tabular database management system to organize and analyse data, Sinper Corporation's TM/1 (Table Manager/1) delivers much more than what most of us have learned to expect from spreadsheets. This high-end spreadsheet, though it's been on the market for over a year, hasn't received much public attention. We're not sure why. Its power and flexibility do not come cheap but, even at its price of \$US795, it is an excellent investment in spreadsheet firepower.

The concept behind TM/1 may be difficult to grasp, but its everyday use is relatively easy. You see all of its available options and functions at the bottom of the screen. Help screens are indexed for easy searching, but they are not context sensitive and they do not supply many practical examples. When they do, the examples are often wordy or confusing.

Like traditional spreadsheet packages, TM/1 gives you a large worksheet area (9999 by 9999 cells), a number of functions, plus macro commands and keywords for those who want to automate their daily tasks. It also lets you work with a split screen, import data from other packages, and utilise a math coprocessor if you have one. TM/1 is driven by function keys

CHECKOUT

3-D Spreadsheets

List price	Javelin Plus	Boeing Calc	TM/1
	—	\$984.50	\$US795.00
SIZE AND SPEED			
Max. no of columns and rows in work area	Unlimited	16,000 x 16,000	9999 x 9999
Max. no. of characters in cell/range name	255/0	250/0*	72/0*
Range of column widths	1-40	1-74	1-72
Has sparse memory matrix to conserve RAM	●	●	●
Database can be larger than spreadsheet	○	N/A	●
Uses expanded memory	●	○	○
Uses math coprocessor	●	●	●
FUNCTIONS AND FORMULAE			
No. of math/logic/financial functions	17/5/9	17/7/14	9/3/5
No. of date and time functions	43 [†]	11	14 [†]
No. of statistical string functions	15/0	7/18	7/13
No. of logical and arithmetic operators	13	17	14
MACRO CAPABILITIES			
Has learn mode for macros	●	●	●
Can run 1-2-3 macros	○	○	○
Macros reside in worksheet/library	●/○	○/○‡	●/●
MISCELLANEOUS			
No. of split screens	2	None	2
Split screens scroll/format independently	●/○	○/○	●/○
Cursor keys enter cell data	●	●	●
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	8	None [#]	8
Has context-sensitive help	●	●	○
Does recalc in logic order	○	●	●

● Yes. ○ No. N/A Not applicable * Program does not use ranges. † Date only. ‡ Program does not use macros. # Uses separate program to produce graphs.

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Netcomm Automodem 21/23	358	420
Netcomm Automodem 123	602	707
Netcomm Automodem 1234	731	858
Netcomm In Modem	299	351
Netcomm 123 In Modem	575	675
Netcomm 1234 In Modem	760	893

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Serial Port Card.....	45	52
Hyperam EMS Board (XT/512KB) ..	417	490
VEGA Deluxe VGA	599	700
Hercules Incolor	660	775
Rampage/EGA/AT (512K).....	1132	1330
HyperAce 286 (10MHz)	550	645
Everex Auto Switch (EGA)	240	282

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Seagate 42MB inc Controller	830	975
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Mountain Drivecard 50MB inc Controller	1190	1398
Seagate 20MB not inc Cont	365	429
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dBase III+ (Premium Pack)	725	850
Clipper Compiler	730	858
RapidFile.....	399	468
Mace Utilities (V. 4.1)	135	158
Turbo Pascal (8087/BCD)	135	156
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1615 (,0) : Menu
 Commands: **Workpad** Range Copy Move Data File Print Environment System Quit
 Workpad: Global Insert Delete Mark Width Erase Titles Status

E	F	G	H	I	J
1	12 Jul 87				
3	INCOME		FEDERAL	STATE	
5	WAGES, SALARIES, ETC		\$161,000	\$161,000	
6	Interest		1,635	1635	
7	Dividends		2,000	2000	
8	Refunds of State and local income tax		609	609	
9	Business income or loss (Incl. Farm)		4,609	4609	
10	Capitol gain or (loss)		0	0	
11	Supplemental gains or (losses)		0	0	
12	Rents, Royalties, Partnerships, Etc.		0	0	
13	Other Taxable Income		0	0	
15	Total Income		169,933	169,933	
17	ADJUSTMENTS TO INCOME				
19	Employee business expenses		(643)	(643)	
20	Payments to an IRA		0	0	

WHSTXPLN.PAD Cursor: Page [1A1 to 1AL213]

Boeing Calc provides a powerful 3-D work environment and is easy for 1-2-3 veterans to learn. It reads and writes active 1-2-3 and Symphony worksheets and has a command structure very similar to that of 1-2-3

that are explained in a menu bar at the bottom of the screen.

Tabular data

Unlike traditional spreadsheet packages, TM/1 maintains data in tables and formulae within worksheets. TM/1's worksheets can reference and manipulate any element within the tables. This table management feature, combined with TM/1's multi-dimensionality, lets you design more-flexible applications into your spreadsheet by letting you create one application for more than one set of data, as well as change data without altering the model and vice versa.

Because traditional spreadsheet packages glue the data to the cells, power users usually end up with either a large model that duplicates data or a number of smaller models that require continual reconciliation. Traditional spreadsheets also give you a worksheet area limited to two criteria, such as months and expenses, so tracking something like department budgets requires you to set up identical worksheets in different areas. If you want to make a global change in expenses, you must make the change in each of the separate worksheets.

TM/1 avoids these problems. Its multi-dimensionality lets you create

one worksheet that can apply to all departments. Since the data is maintained in tables and a table is defined in terms of dimensions, you can construct an application to view how much money was spent in a given month by a given department for a given purpose in a given year, then check that figure against the amount of money that was actually budgeted for that same situation, as well as the amount that was spent in previous years. You can do this analysis with traditional worksheets, but only with a lot of linking: shoehorning, cross-referencing, data and formula duplication, and data lookups.

In TM/1, you define the dimensions, assign them to a table, enter or import data, and design the worksheet ap-

At a glance

Boeing Calc, Version 3.00E

Supplier: Business Model Systems

Tel: (03) 51 1572

Price: \$984.50

Requires: 512k RAM, hard disk drive, DOS 2.0 or later.

In short: A slow but large and powerful 3-D spreadsheet with a 1-2-3-like command structure. Not copy protected.

Pick of the bunch

While 3-D spreadsheets give you obvious advantages over 2-D spreadsheets, as a group they lack some of the 2-D spreadsheets' finesse. Sinper Corporation's TM/1 is the most powerful and versatile of the multi-dimensional analysis tools. It gives you up to eight dimensions in a single table and lets you access data from as many as 60 different tables at once. If you're used to 1-2-3's style, TM/1's style may take some getting used to, which may explain TM/1's modest acceptance. But as multi-dimensionality becomes more familiar to users, TM/1's advanced features become easier to grasp and easier to use.

If you simply must have a spreadsheet that resembles 1-2-3 with a third dimension added, Boeing Calc should fit the bill, although it's not as elegant in three dimensions as 1-2-3 and Silk are in two.

Finally, Javelin Plus bears scrutiny if you're heavily involved in time-series analysis and don't care that the tool you're using little resembles a 2-D or 3-D spreadsheet. Javelin is a wonderful supplement to, not a replacement for, traditional spreadsheets.

plications. You define a dimension by listing its elements (January, Office Supplies, and so forth) and its characteristics (calculated or weighted). You define the dimensions it includes: a budget table, for example could include years, months, expenses, and departments. You can include a dimension in more than one table. You then enter, import, or calculate your data from within a worksheet.

Because TM/1 does not lock data into a cell, figures can be referenced from more than one worksheet and, if you update one, all the related tables will be affected. Simply by adding or deleting dimensions, you can also reconfigure tables without losing data.

Formula commands

You can use element names as worksheet labels in TM/1 by adding one of three commands to the cell's formula. The DB command lets you import the figures to your spreadsheet or export them to your database. The DFIRST command copies the first element of a given dimension into a cell, and the DNEXT command imports the

CHECKOUT

rest. Combine this multi-dimensionality with range pointing, and you can use the same worksheet for different projects.

For example, you could write a formula to access the data within a table, leave the actual element name in one cell, and then point to it. So, by labelling your rows and columns with the expenses and time dimensions, the same worksheet serves multiple uses.

1-2-3 veterans may find TM/1 disconcerting at first because it makes them design functional tables and appropriate worksheets. If you prefer, you can use just the worksheet module. But if you do that, you might as well stick to 1-2-3 because you won't be using the program's capabilities.

TM/1's method of labelling cells is also unfamiliar. In place of the familiar standard of using letters for columns and numbers for rows, TM/1 uses only numbers and orders them by row/column instead of column/row. As a result, cell A20 in 1-2-3 is [20,1] in TM/1. (A Sinper spokesman, however, said the company plans to release a version that

C	1	2	3	4
	DIVISION	EXPENSES	LOCS	MONTHS
	ADMINISTRATION	SALARY	*LIN*	*COL*
1	ADMINISTRATION	SALARY	MANHATTAN	JAN
2	SUPPORT	COMMISSIONS	LONG ISLAND	FEB
3	RESEARCH & DEVELOPMENT	BENEFITS	WESTCHESTER	MAR
4	MANUFACTURING	PAYROLL TAXES	NEW YORK	1ST-QTR
5	SALES	INCENTIVES	FORT LEE	APR
6	ADVERTISING	OFFICE SUPPLY	ELIZABETH	MAY
7	MARKETING	RENT	NEW JERSEY	JUN
8		LEGAL	STAMFORD	2ND-QTR
9		ACCOUNTING	TRI-STATE	JUL
10		TOTAL	AVERAGE	AUG
11				SEP
12				3RD-QTR
13				OCT
14				NOV
15				DEC
16				4TH-QTR
17				YEAR
18				
19				
20				

TABLE: TEST
 10data 2positn 3lines 4columns 5dsave 6outabl 7print

TM/1 lets you define multi-dimensional tables and view their components. Locations and month dimensions are defined here as columns and rows, while Division and Expenses are localised to specific entries. As a result, the data shows Administration's Salaries for all locations and months

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will let you switch to the old standard if that's what you want.) Finally, while TM/1 supports huge spreadsheets, its default worksheet area is only 20 columns by 40 rows. You will have to insert the additional columns and rows when needed.

But TM/1's differences can also be very attractive. The program lets you designate secondary paths to locate files and will allow you to build applications as large as 32Mbytes. You

can also define a default path for paging files located in virtual memory, and then you can address data by a name rather than by a cell location — 1985 April Sales rather than BZ279. TM/1 imports .WKS, .DIF, dBase, and ASCII (comma delimited and fixed length) files and supplies 69 functions for mathematics, trigonometry, statistics, string manipulation, finance, lookups, and time and date calculations.

Its macro language includes 41 keywords and commands for automating keystrokes, executing subroutines, requesting user input, issuing error messages, selecting dimensions, retrieving and storing variables, seeking goals, and executing AUTOEXEC worksheets. Although the macros are kept in worksheets, you can link them.

Sinper seems to have overlooked nothing in developing TM/1. The only disappointments you're likely to find here are in the help screens and in its graphics capability. Graphics are displayed in black and white, but in just two dimensions, a shame considering the program's multi-dimensionality.

TM/1 is a powerful and flexible system, and anyone in need of serious spreadsheet analysis should definitely investigate it.

Vincent Puglia

At a glance

TM/1

Supplier: Sinper Corporation

8901 Tonnel Avenue

North Bergen, NJ 07047, USA

Tel: (201) 662 7999 (201) 822 1596

Currently no Australian distributor

List Price: \$US795 plus \$20 shipping.

Requires: 256k RAM, two disk drives, DOS 2.0 or later.

In short: An eight-dimensional spreadsheet program that uses table management to keep data and formula separate. TM/1 is perfect for anyone who uses a spreadsheet for more than a few simple calculations. Not copy protected.



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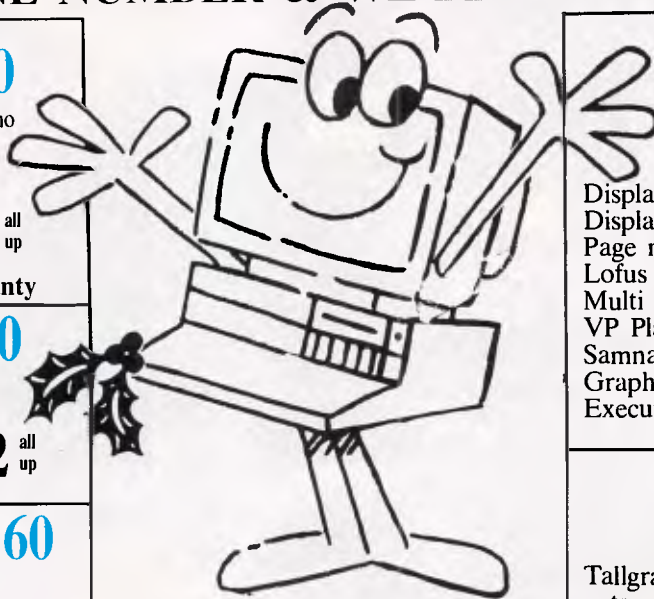
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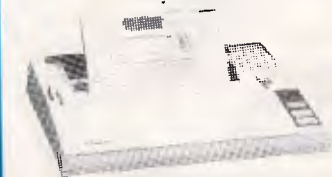
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Javelin Plus: The spreadsheet alternative

Javelin Plus, a new version of the modelling package from Javelin Software Corporation, is not a typical spreadsheet. In fact, it's really not a spreadsheet at all. Ever since its debut in 1985, the Javelin package has been touted as a serious business analysis tool that bucks the traditional 1-2-3 approach.

Released in May, Javelin Plus offers more than 75 new features not included in the traditional Javelin program. Javelin Software is continuing to support both programs. The earlier Javelin, Version 1.1, sells for \$469. The Plus version contains new graphs, 'snap and building blocks' (a separate disk containing specific working models for such things as what-if projections and multiple regressions), date variables, a facility that operates as a database, and a template model for mailing lists that can sort by city, postcode, and so on.

To understand Javelin, you've got to throw away your preconceived ideas about spreadsheets. Models built in Javelin are made up of variable names instead of rows and columns. These variables can be constants, a series of data elements, or part of an equation that relates variables to other variables. You can create your model from the top down by defining the equations first or from the bottom up by entering data first and creating the equations later.

No true dimensions

Javelin is not a true multi-dimensional spreadsheet, but it bears a much closer resemblance to one than it does to traditional spreadsheets. It presents everything on the screen in one of ten 'views'. The screen is split into two windows in which any of the ten views can be shown. Formulae and values are entered on the top line of the screen, and messages are shown on the second line. The Slash key (/) reveals eight pull-down menus that provide a variety of commands to manipulate each view. As in 1-2-3, commands can be selected with cursor movement keys or by typing the first letter of each choice. Some commands require either a second pull-down menu that overlays the first or a data entry screen where various options can be set.

You usually start your model with the Formulae and Diagram views. The Formulae view shows the equations

```

Formulas for all variables:
cash=ZPREU(cash)+net profit
cost of sales=sales *0.6
gross profit=sales - cost of sales
interest=0.1*(ZPREU(cash)+cash)/2
net profit=gross profit+interest
sales = ◀ Monthly data: July 1987 - October 1987 ▶
    
```

sales = ◀ Monthly data: July 1987 - October 1987 ▶

Jul 1987	10000	Mar 1988	.....	Nov 1988	.....
Aug 1987	20000	Apr 1988	.....	Dec 1988	.....
Sep 1987	30000	May 1988	.....	Jan 1989	.....
Oct 1987	40000	Jun 1988	.....	Feb 1989	.....
Nov 1987	.....	Jul 1988	.....	Mar 1989	.....
Dec 1987	.....	Aug 1988	.....	Apr 1989	.....
Jan 1988	.....	Sep 1988	.....	May 1989	.....
Feb 1988	.....	Oct 1988	.....	Jun 1989	.....

mike.MDL 48K READY

In Javelin Plus, variables are entered as English words. Variables can be related to other variables, or they can be loaded with data in the Table view, as shown in the window at the bottom of the screen

that you have entered for each model relationship. For example, you could enter GROSS PROFIT = SALES - COST OF GOODS, and Javelin would show the formula on the screen along with a line showing SALES and COST OF GOODS as undefined. In the Diagram view, Javelin shows SALES and COST OF GOODS connected by lines, pointing to GROSS PROFIT, with the formula displayed below it. With both of these views displayed, you can see all the elements making up the model, as well as a pictorial view of the model.

At some point, you must enter some

data in the model; the Table view facilitates this process. Javelin assumes that most data is related to some period of time, and the Table view displays a screen with dates followed by prompts for data. The time periods can be changed from monthly to daily, weekly, quarterly, or yearly; you can also choose a customised time period or no time relation at all. Once you set up the starting date, it is very easy to fill the model with data. There is no limit to the number of time periods, and Javelin expands automatically to accommodate more data.

Once the information has been entered, you can use the Chart view to display the data as a chart with the date along the X-axis and the amounts along the Y-axis. Instead of being just a static view, the Chart view allows you to cursor over to a data point or cursor up or down to change the value of the data and then watch the model change in the other window after you calculate it. The Quick Graph view is much like the Chart view. You can display and enter data points by using cursor movement keys in a line chart. However, the Quick Graph uses the entire screen, and you can't watch other elements of the model change.

Javelin's commands, like those in 1-2-3, help you manipulate and control the model. The Define command

At a glance

Javelin Plus

Supplier: Sourceware

Tel: (02) 411 5711

Price: Not available

Requires: 512k RAM, two disk drives (5¹/₄ or 3.5in), DOS 2.0 or later. Graphs can be displayed on the screen if a graphics card is present.

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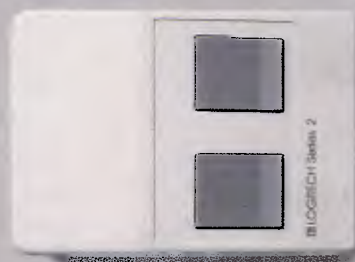
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CHECKOUT

controls settings, default formats, and the characteristics of variables and views, while the Clear commands remove variables and views from the model. The View commands determine the view that will display in each window, and the Window commands control the number of windows (one or two) and their size. Worksheet commands change the look of the spreadsheet and allow you to copy data, import and export files, sort, and define variables.

Many views

Often, a spreadsheet grows quite large, and it is helpful to document the model. Javelin's Notes view allows you to attach free-form notes to any variable in the model. In addition, the Errors view helps you quickly resolve logic problems in the model by displaying all variables that haven't been defined or that have a date conflict.

The Worksheet view brings back the familiar look of 1-2-3. A border area on the left is reserved for any of the variable names shown in the Formulae view. Dates are then entered along the top, and Javelin automatically displays the data matching the intersection of the rows and columns. You can create many worksheets with one model showing only those formulae and dates that you want to show.

Once you have your data in place, you can use the Graph view to create one of eight graph types, including line, bar, stacked bar, pie, and X-Y charts. Graph settings are entered into a settings screen in which you assign variables, labels, legends, and scale. Printing is done from within Javelin with the /Print Graph command.

Javelin can import and export a variety of file formats including .WKS/.WRK/.WK1, .DIF, SYLK, and .PRN. However, Javelin only reads and writes text and numbers, not formulae, so don't expect to convert all of your 1-2-3 spreadsheets with just a /File command.

In addition, Javelin suggests that you split your spreadsheet file into three separate files and import the variable names first, the column headings next, and then the data to save memory. It may just be easier to re-enter the spreadsheet.

The Macro view gives you much the same capabilities as 1-2-3 macros have. Keystrokes are entered into the view, and cursor movements and commands are preceded by an at-sign (@). You can create menus, branch, test conditions, ask for input,

and store remarks. The Macro views are given a name and are executed by hitting Alt-F7 and then entering the view name. If the view has a single character name, Alt and that character will execute it.

The Print command simply sends the current view to the printer. You can control margins, insert headers and footers, and use setup strings to change the printer characteristics. The same command prints graphs, spreadsheets, and all the other views to the printer, screen, or a disk file.

The database feature seems forced into the design of the overall package, but it gets the job done. Records are stored as rows with the same row name listed down the border on the left. The column headings are the field names, and you must define a custom period with no base date to suppress the automatic time-series headings. You can include database information in your model, by creating variables that sort data and select records based on criteria.

Javelin is a complex package, and its documentation doesn't do it justice. The reference manual contains all the basic information, and it includes many good examples of screens and commands. However, it covers most items briefly, and you often have to switch back and forth between sections to solve a problem.

Specialised functions

The package contains many options and possesses many capabilities. Javelin is a powerful analysis tool that can handle formulae quickly and display the output in many different views. More than 100 specialised functions perform just about any kind of task that you might need.

Because of its complexity, it's a tough package to master. If you switch from it to 1-2-3, you won't be able to import much data from your spreadsheets, so you will have to start over. You will need close to 500k just to load the program, so memory-resident pro-grams like SideKick could crash your system. If Javelin is what you want, an AT with an EMS board is a good idea.

Javelin Plus won't replace your spreadsheet for doing quick-and-simple tasks. However, it is a powerful, self-documenting, graphical analysis tool that makes it easier to define and evaluate complex time-series models.

Mike Falkner

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**Glenn Hart, PC Magazine
May 12, 1987, Page 36.**

"The overall efficiency of my computer system was significantly improved."

**William G. Harrington,
The National Law Journal
June 29, 1987, Page 14.**

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First words

Previously used to develop — among other things — the Apple Macintosh, Smalltalk has now made the transition from mainframe to micro. In the first of a four-part series, Carl Phillips describes the comprehensive elegance of this programming environment.

The Smalltalk programming system has existed, in one form or another, for around 15 years. Developed at the Xerox Palo Alto Research Centre during the 1970s and early 1980s, Smalltalk's influence is well-known. The Apple Macintosh and the modern windowing systems such as GEM and Windows owe a lot to developments in Smalltalk. However, the influence and ideas of Smalltalk 'the programming language' are less well-known — at least outside the programming language research community.

Smalltalk is based on a small set of innovative and powerful ideas, consistently applied throughout a large software system. The end result is a programming language and environment of considerable elegance and power. One organisation offering training courses in Smalltalk will help its pupils to develop a six-month programming project in the one-month course duration. Reliable, robust implementations of Smalltalk are now available for many computer systems including the IBM PC and similar machines. An accompanying box gives details of how owners of IBM-compatible, Atari ST, Acorn Archimedes and Apple Macintosh machines can obtain a copy of Smalltalk to accompany this series.

Even if you have no interest in learning Smalltalk *per se*, studying the Smalltalk system pays dividends. In developing Smalltalk, its designers ignored — or chose to disregard — much of the established wisdom, conventions and folklore of language design. Like Lisp, Occam or Prolog, Smalltalk goes its own way. Learning to view the computing universe Smalltalk-style teaches a different ap-

proach to programming that can give new and valuable insights into programming problems.

Many of the ideas, such as windows and icons, which were present in Smalltalk 10-12 years ago, are now

slowly permeating their way into the mainstream computing business.

Often, the results are inadequate and ersatz derivations. Smalltalk still points the way to how many things *should* be done, and it remains the premier object-

Common Smalltalk

There are three Smalltalk dialects in common use:

Xerox Smalltalk-80

Xerox Smalltalk-80 is the result of the original Xerox research project. It is a programming language plus an interactive windowing environment — bit-mapped graphics, windows, pop-up menus, mice — the works, plus an extensible integrated programming environment with text editor, incremental compiler, debugger, source code browsers, sample applications and a large library of re-usable code. Commercial Xerox Smalltalk implementations exist for the IBM AT, the Apple Macintosh, Xerox, Sun and Tektronix workstations and similar systems.

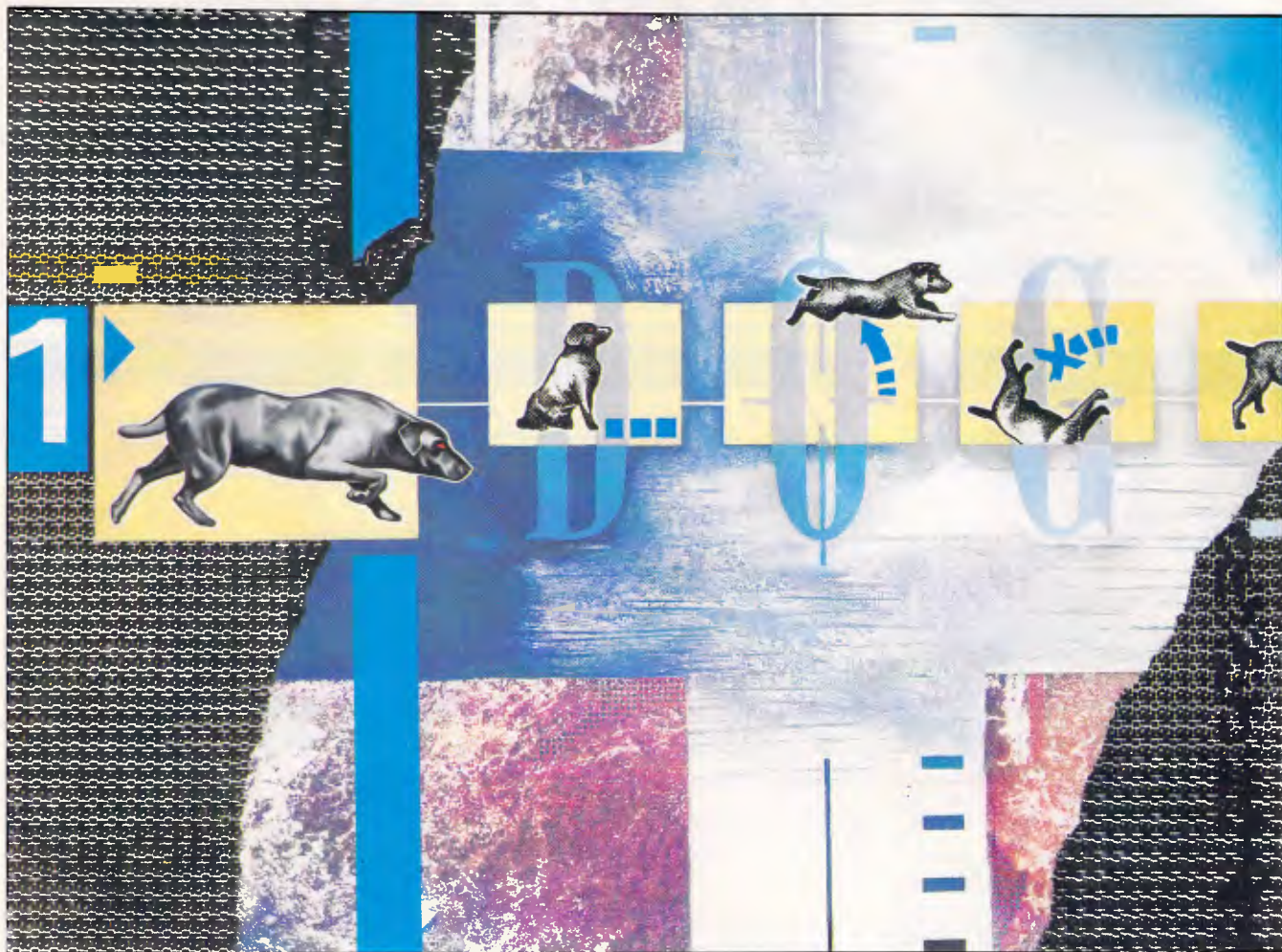
Smalltalk/V

Smalltalk/V is a re-implementation of Xerox Smalltalk by DigiTalk Inc, based on the published Xerox descriptions of the language. It is smaller than the Xerox offering and better suited to the IBM PC. Except for minor syntactic differences, Smalltalk/V is substantially compatible with Xerox Smalltalk and code can be moved, with reasonable ease, between the two.

Little Smalltalk

Little Smalltalk was developed by Dr Tim Budd (originally at the University of Arizona, but now at the University of Oregon) as a research vehicle for teaching the principles of Smalltalk. Like the 'Tiny Basics' on personal computers of yesteryear, Little Smalltalk is a highly cut-down version of 'real' Smalltalk. It lacks the interactive programming environment and many of the more sophisticated language features. It is not a production programming environment and wasn't designed to be.

However, it *does* capture the essence of Smalltalk programming, and is a great introduction to the language for those people who want to experiment. Thanks to Tim's considerable generosity, Little Smalltalk is in the public domain (so the price is right) and comes complete with C source code. Little Smalltalk places much more modest demands on hardware than real Smalltalk and can be easily moved from system to system. APC has made arrangements to make Little Smalltalk available to readers — for a minimal charge — for the IBM PC/AT MS-DOS environment, VAX Unix, the Acorn Archimedes and Atari ST (see the 'Smalltalk is cheap' box).



orientated programming language at a time when many people are claiming that object-orientated programming is one of the few effective ways of making programming more productive.

Programming in Smalltalk is great fun. Smalltalk makes it possible to get programs working in a fraction of the time it would take in more conventional languages such as C or Pascal. A Smalltalk programmer can express an idea or algorithm in a few lines of Smalltalk code that would take pages and pages of Pascal, Modula 2, Ada or C. Every programmer can use tools that make life easier — Smalltalk is one of the best.

Distinguishing features

- **Extensibility** Smalltalk is an extensible language. You extend and mould its built-in facilities to match the problems you are working with. There is no distinction between the programming language, applications programs, and an operating system. Smalltalk's design encourages the re-use of existing code — even in situations its

authors did not anticipate at the time they wrote it.

Designers of programming languages talk of the 'semantic gap' — the vast, gaping void that can exist between the ideas and concepts of the problem you are trying to solve and the means of expressing those ideas and concepts in a computer programming language. In Smalltalk programs, this gap is minimised.

- **Adaptability** Smalltalk is easily customised. If you don't like the behaviour of part of the system, or even part of the language, you can change it. The vast majority of the Smalltalk system is written in Smalltalk. The bulk of the source code is usually available online and can be easily perused, re-used or modified.

Since one of the goals of the original Xerox research was to investigate programming-language design, Smalltalk allows the language to be extended with new constructs, or fundamental changes made to how the system operates, from within a running Smalltalk system.

- **Exploratory programming** Like many interactive systems, Smalltalk supports exploratory programming. You can

develop, test and refine small pieces of code in isolation, make changes immediately, and incorporate the results of such experiments into the system.

The freedom to experiment and quickly recover from mistakes is one of the distinguishing characteristics of any high-quality programming environment. A Smalltalk system lets you enter an experimental chunk of code, execute it, debug it and fix it, all in less time than it takes to exit the screen editor and invoke a C compiler on a typical system.

- **Memory management** Like Lisp, Smalltalk manages memory automatically for the programmer. Smalltalk objects (the fundamental entities in Smalltalk programming) come and go at high speed. The programmer is relieved of the burden of remembering to have to allocate and deallocate chunks of memory explicitly.

Learning to program

The first rule of learning to program in Smalltalk is to suspend disbelief. Smalltalk has an unusual syntax. The first major step in learning how to

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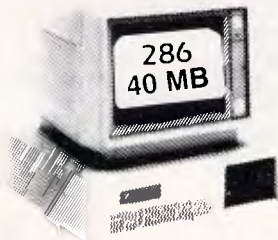
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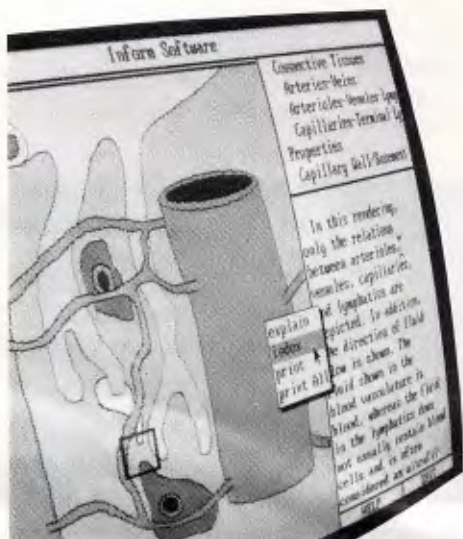
▲ You can find Smalltalk/V in space.

On a project commissioned by NASA, Dr. Christine Mitchell at the Georgia Institute of Technology, chose to use Smalltalk/V as an integral part of a new man-machine interface. The application, written in Smalltalk, continually monitors the commands of the Satellite Network Operator, the state-of-the-network and the overall mission plans. To NASA, Smalltalk/V means real-time. Real OOPS. Real results.



▲ Smalltalk/V is even tracking white-tail deer in Georgia.

Dr. Lee Graham, a National Park Service ecologist chose Smalltalk/V to write an application to help manage the white-tail deer population on the Barrier Islands of Georgia. Dr. Graham found that Smalltalk/V, with its visual interface and class structure, is a perfect tool to graphically simulate the complex, ecological interactions of natural systems.

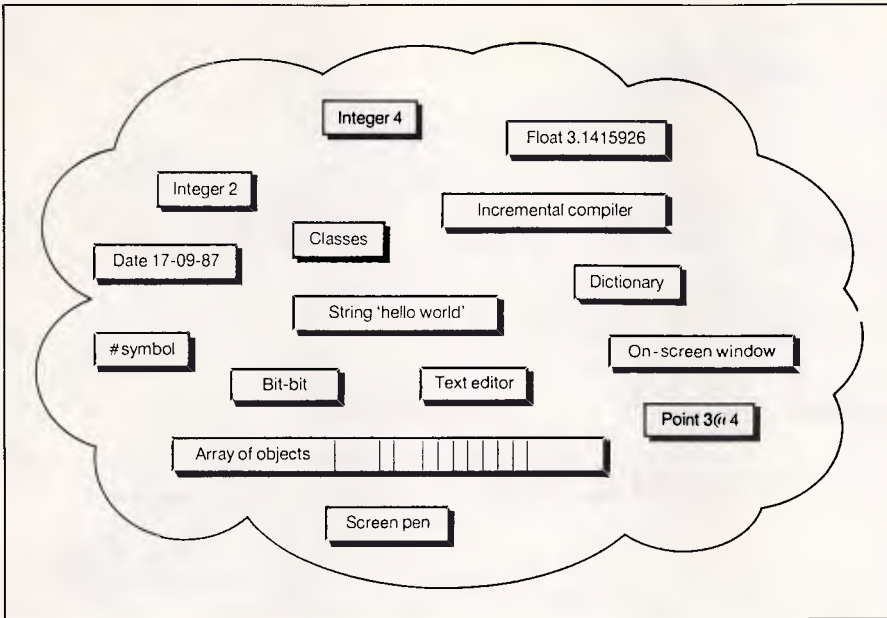


◀ In an emergency room in Vancouver, it's saving lives through animation.

What if a medical textbook could come to life? What if it could show the effects emergency treatment might have on patients? And do it all through moving pictures? These thoughts led Folkstone Design, Edge Training & Consulting, and Inform Software in Vancouver, to create the first animated, interactive textbook for emergency room technicians and in-training paramedics. They found Smalltalk/V could easily facilitate a combination of text, colour graphics and animation to illustrate various physical processes and the results of medical intervention.

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Everything in the Smalltalk universe is an object, from an integer to the compiler

program in Smalltalk is to stop regarding the apparently meaningless collection of semi English-like expressions on the page as random mystical incantations and instead as statements in a programming language. The problems are no greater than mastering the syntax of Lisp, APL or Forth and, like the adherents of those languages, most Smalltalkers argue that the syntax is one of the strengths of the language. Most beginners disagree, however.

Smalltalk's major redeeming features lie in its simplicity and consistency. When you have mastered the relatively small number of rules and have gained a certain familiarity, it is a straightforward language both to read and write. Its major problem is that it bears little resemblance to conventional programming languages such as Basic, C or Pascal.

Smalltalk uses unusual terminology to describe its fundamental concepts. Unfortunately, many of these terms have other meanings to people well-versed in different aspects of computing. 'Object', 'message' and 'instance' can all mean different things to the operating system designer than they do to the Smalltalk programmer. The famous dictum from Lewis Carroll's *Alice in Wonderland* of: 'When I say a word it means exactly what I want it to say — nothing more and nothing less' is particularly appropriate when applied to learning Smalltalk. Forget what you *think* the word means — concentrate on its Smalltalk meaning.

Despite its name, Smalltalk is not necessarily small — the full Xerox Smalltalk system is a very rich environ-

ment. While you can pick up the fundamental ideas behind Smalltalk in a few hours, mastery of all aspects of the system takes time. This long learning curve, plus the heavy demands a full Smalltalk can put on the hardware, are perhaps the primary reasons why there are still relatively few Smalltalk programmers around.

When initially learning Smalltalk, concentrate on the ideas at the centre of the language and don't be overwhelmed by its apparent complexity. The investment in learning about the system is repaid handsomely when you start using Smalltalk to solve real problems.

If you know (and love) one or two conventional programming languages such as C, Pascal or Basic, much of Smalltalk will seem quite alien at first. Don't try to figure out how things are implemented. When introducing new Smalltalk concepts in this series, I'll try to explain them in terms of conventional programming language constructs so that you keep a place to stand. However, there can be significant differences between the Smalltalk interpretation and a conventional interpretation, and any apparent surface similarity is often superficial. What's going on under the hood is quite different: in some cases, it can be better to forget what you know about existing languages and start again from scratch.

Just to add to the fun, some Smalltalk concepts are sufficiently different that I'm not going to explain them fully first time through. If you're already far enough into Smalltalk to notice that I'm skirting some issues or bending the truth a little, please bear with me — all will be

revealed in the course of this series!

As always, the best way to learn any programming language is to use it. Buy yourself a Smalltalk implementation and you can use it to read and write Smalltalk programs. Smalltalk systems come with large amounts of source code. Look at it and try to figure out how things work. Experiment by modifying the code. You learn more from making mistakes and generating errors than getting the syntax right first time. Learning any new programming language is frustrating until the point when it ceases to be alien and starts to be rewarding.

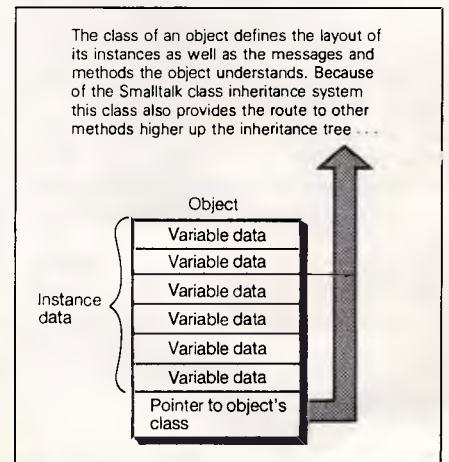
Before you can begin to learn Smalltalk 'the language', you have to come to grips with Smalltalk 'the programming environment'. If you have a Smalltalk system in front of you, now would be a good time to put down this article and fire it up.

Consult the documentation that comes with your particular Smalltalk. Learn how to start up the Smalltalk system, create a workspace window (Little Smalltalk doesn't have windows so this step is easy), type in and edit an expression, evaluate it, and regain control if something goes wrong. Finally, learn how to exit Smalltalk, perhaps saving the work you have done, and return gracefully to the operating system.

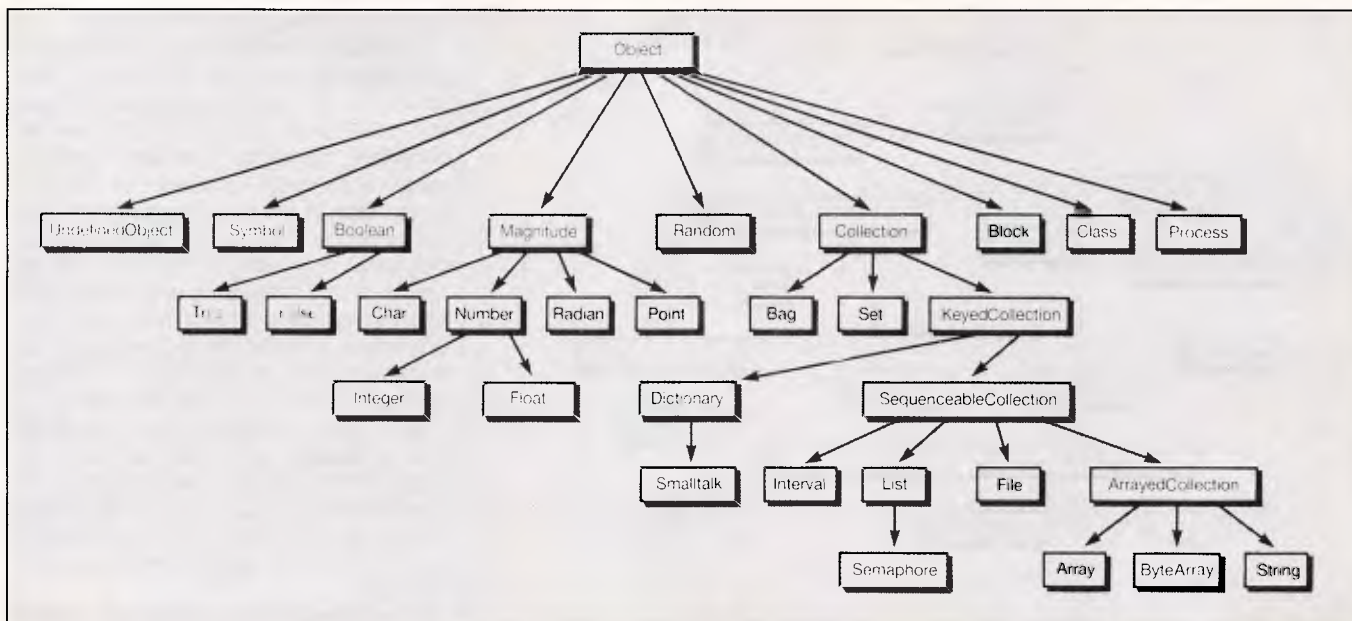
If you don't have a Smalltalk system yet don't worry — the preceding hurdles await you.

Principles

The fundamental component of the Smalltalk system is called the 'object'. Objects are used to represent all parts of the Smalltalk universe, and can communicate by sending messages requesting other objects to carry out particular operations for them. As a result of mes-



The Smalltalk object



The standard classes provided by Little Smalltalk. A full Xerox Smalltalk is considerably larger

sage-sending, procedures (Smalltalk calls them 'methods') are executed, variables changed and values returned — computing is undertaken.

Message-sending is the only way things happen in Smalltalk. It is a uniform mechanism that replaces multiple extraneous implementations of what are essentially the same ideas applied slightly differently in Pascal or C. Message-sending replaces, for example, calling a procedure or function, applying a built-in operator to some operands, conditional execution based on tests, or creating new examples of some built-in or abstract data type.

Objects represent everything in the system — from the humble integer, character, Boolean or floating-point number through conventional data structures such as strings, arrays, stacks or linked lists, to the Smalltalk compiler and entire range of applications programs. There is no distinction between the smallest and largest components of the system — they are *all* objects. The Smalltalk interpreter manages the creation and deletion of objects in memory automatically according to the dictates of the executing program.

An object is a container which holds data in named variables called 'instance variables'. An object also has a reference to the set of procedures (methods) which can manipulate that data. The instance variables of an object are private to the object and can only be accessed or manipulated by these methods. No other object can access or manipulate the contents of another object's instance variables, except as a

by-product of sending a message to that object.

Some Smalltalk objects can be represented literally:

45.3 — a floating-point number

'Hello World' — a string

-3 — an integer

#aSymbol — a symbol that is unique in the system

\$c — a character

16rffff — a hexadecimal number

'Smalltalk . . . teaches a different approach to programming that can give new and valuable insights into programming problems.'

[x | ^(x*2)] — a block of Smalltalk code

#(1 2 3 \$F 'Apple') — an array of objects

4@21 — a point object with x coordinate 4, y coordinate 21

Some objects have no literal representation but are created with statements:

aDate := Date today — create a date object that represents today's date and assign it to the variable 'aDate'

Rectangle fromUser — get the user to indicate a graphical rectangle using the mouse, and create a new rectangle object that represents it

names := OrderedCollection new — create a new OrderedCollection object and assign it to the variable names

A message is a request for an object to perform a task by carrying out one of its methods. Along with the name of a message (called the 'selector') an object can send an optional set of arguments to an object. Sending a message is akin to a subroutine or function call in Basic or C. However, there is a crucial difference: the object which *receives* the message (called the 'receiver') is free to decide for itself how it responds to the message. The object which *sends* the message has no knowledge about what methods and variables are changed in the process.

Think of an object as a little specialist computer. Its instance variables are its memory, and the set of messages it undertakes are its instruction set.

Some sample messages to objects:

45.3 sin — calculate the sign of 45.3

'Hello world' at: 3 — get element 3 of the string 'Hello World'

addressBook includes: 'Charles Smith' — does the object referenced by the variable addressBook (an OrderedCollection — see above) include the string 'Charles Smith'?

'Hello World' at: 7 put: \$w — at element 7 of the string object, put the character w

2 + 3 — ask the object that represents the integer 2 to add the integer object 3 to itself

The messages the object will understand (its instruction set) vary depending

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10. TOTAL EMPLOYEES IN YOUR COMPANY AT THIS LOCATION? _____

11. WHICH BRACKET BEST FITS YOUR DP DEPT. BUDGET AT THIS LOCATION?
 A. \$0 - 99,000 C. \$500 - 999,000 E. \$2.5M - 4.9M
 B. \$100 - 499,000 D. \$1M - 2.49M F. \$5M+

12. WHAT TYPE OF EQUIPMENT DOES YOUR COMPANY USE? MAKE QUANTITY

A. <input type="checkbox"/> MAINFRAME (show principal make)	_____	_____
B. <input type="checkbox"/> MINI COMPUTERS	_____	_____
C. <input type="checkbox"/> PERSONAL COMPUTERS	_____	_____
D. <input type="checkbox"/> LAN (LOCAL AREA NETWORKS)	_____	_____
E. <input type="checkbox"/> PC-NETWORK	_____	_____
F. <input type="checkbox"/> INTELLIGENT TERMINALS	_____	_____
G. <input type="checkbox"/> WORD PROCESSORS	_____	_____
H. <input type="checkbox"/> PACKAGED SOFTWARE	_____	_____
J. <input type="checkbox"/> MAINFRAME NETWORK	_____	_____
K. <input type="checkbox"/> MINI COMPUTER NETWORK	_____	_____
L. <input type="checkbox"/> WAN (WIDE AREA NETWORK)	_____	_____

13. ARE YOU A VOLUME BUYER* OF PCs AND PC EQUIPMENT (*Defined as purchasing over 4 PCs per annum)?

- YES PLEASE INDICATE QUANTITY BELOW EACH MODEL
 NO PLEASE INDICATE QUANTITY YOU PLAN TO PURCHASE

MANUFACTURERS NAME/ NAME/MODEL	CURRENTLY OWNED QUANTITY	PLAN TO PURCHASE		
		0-12 months quantity	13-24 months quantity	25-36 months quantity
A. IBM PC & PC XT				
B. IBM AT				
C. PS/2 - MODEL 30 (8086)				
D. PS/2 - MODEL 50, 60 (80286)				
E. PS/2 - MODEL 80 (80386)				
F. LAPTOPS (IBM OR COMPATIBLE)				
G. IBM (MODELS NOT LISTED ABOVE)				
H. IBM COMPATIBLES/CLONES				
J. MACINTOSH				

14. THE PERSONAL (MICRO) COMPUTERS PURCHASED BY MY COMPANY ARE FOR:
 A. INTERNAL USE B. RESALE C. OTHER (PLEASE SPECIFY) _____

15. IF YOU ARE A COMPUTER CONSULTANT, HOW MANY IBM OR COMPATIBLE PCs DO YOUR CLIENTS PURCHASE THROUGH YOUR RECOMMENDATIONS PER YEAR? _____

16. IF YOU ARE A COMPUTER SUPPLIER/RETAILER HOW MANY IBM OR COMPATIBLE PCs DO YOU SELL PER YEAR? _____

17. HOW ARE PERSONAL COMPUTERS, PERIPHERALS AND SOFTWARE NORMALLY OBTAINED FOR THIS LOCATION?

	COMPUTERS	PERIPHERALS	S/W
1. DIRECT FROM MANUF./MANUF. REP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. RETAIL COMPUTER STORE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. SYSTEMS HOUSE/OEM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. MAIL ORDER HOUSE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. COMPUTER WHOLESALE/DEALER	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. IN-HOUSE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. OTHER	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. CONSULTANT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. WHAT IS THE COMMUNICATIONS CAPABILITY FOR WHICH THESE PCs ARE USED.

- A. COMMUNICATE WITH REMOTE TIME SHARING DATABASE
 B. COMMUNICATE WITH INTERNAL MAINFRAME OR MINI COMPUTERS
 C. USED IN LOCAL AREA NETWORK
 D. DOWN LOAD DATA FROM MAINFRAME OR REMOTE SERVICE
 E. VOICE/DATA
 F. OTHER (please specify) _____

19. WHAT APPLICATIONS ARE THESE PCs USED FOR:

- (Tick all that apply)
- | | | |
|---|---|--|
| A. <input type="checkbox"/> ACCOUNTING | H. <input type="checkbox"/> FINANCIAL/PLANNERS/SPREADSHEETS | P. <input type="checkbox"/> PROCESS CONTROL |
| B. <input type="checkbox"/> COMMUNICATIONS | J. <input type="checkbox"/> GRAPHIC DESIGN | Q. <input type="checkbox"/> SCIENTIFIC OR ENGINEERING APPLICATIONS |
| C. <input type="checkbox"/> DATABASE MANAGEMENT | K. <input type="checkbox"/> PERSONAL TIME MANAGEMENT | R. <input type="checkbox"/> STATISTICAL ANALYSIS |
| D. <input type="checkbox"/> DATA INPUT/ANALYSIS | L. <input type="checkbox"/> PORTFOLIO MANAGEMENT | S. <input type="checkbox"/> TAX CALCULATION OR PLANNING |
| E. <input type="checkbox"/> EDUCATION | M. <input type="checkbox"/> PROGRAMMING | T. <input type="checkbox"/> WORD PROCESSING |
| F. <input type="checkbox"/> ELECTRONIC MAIL | N. <input type="checkbox"/> PROJECT MANAGEMENT | U. <input type="checkbox"/> OTHER |
| G. <input type="checkbox"/> DESKTOP PUBLISHING | | |

20. DO YOU ACQUIRE/SPECIFY OR RECOMMEND ANY OF THE PRODUCTS OR SERVICES BELOW?

- | | | | |
|--|---|--|---|
| <input type="checkbox"/> YES | <input type="checkbox"/> NO | F. <input type="checkbox"/> COLOUR MONITOR | J. <input type="checkbox"/> DATABASE MANAGERS |
| 1. COMPUTERS | G. <input type="checkbox"/> MONOCHROME DISPLAYS | K. <input type="checkbox"/> PROGRAM DEVELOPERS/GENERATOR TOOLS | |
| A. <input type="checkbox"/> MAINFRAMES | H. <input type="checkbox"/> HARD DISKS | L. <input type="checkbox"/> GRAPHICS | |
| B. <input type="checkbox"/> MINI COMPUTERS | J. <input type="checkbox"/> TAPE BACKUP SYSTEMS | M. <input type="checkbox"/> DESKTOP PUBLISHING | |
| C. <input type="checkbox"/> PERSONAL COMPUTERS | K. <input type="checkbox"/> PLOTTERS/CHARTING DEVICES | N. <input type="checkbox"/> UTILITIES | |
| 2. CONNECTIVITY | L. <input type="checkbox"/> SCANNERS | P. <input type="checkbox"/> CAD/CAM | |
| A. <input type="checkbox"/> LOCAL AREA NETWORKS | 4. ADD-ON BOARDS | 6. OUTSIDE SERVICES | |
| B. <input type="checkbox"/> MICRO/MINI/MAINFRAME LINKS | A. <input type="checkbox"/> MEMORY BOARDS | A. <input type="checkbox"/> MAINTENANCE | |
| C. <input type="checkbox"/> MODEMS | B. <input type="checkbox"/> GRAPHICS BOARDS | B. <input type="checkbox"/> EDUCATION/TRAINING | |
| D. <input type="checkbox"/> COMMUNICATIONS PORT SOFTWARE | C. <input type="checkbox"/> CPU COMPATIBILITY CARDS | C. <input type="checkbox"/> SOFTWARE/SYSTEMS DESIGN | |
| E. <input type="checkbox"/> COMMUNICATIONS SOFTWARE | 5. SOFTWARE PACKAGES | D. <input type="checkbox"/> REMOTE COMPUTING | |
| F. <input type="checkbox"/> TERMINAL EMULATORS | A. <input type="checkbox"/> ACCOUNTING | E. <input type="checkbox"/> DATABASE SERVICES | |
| G. <input type="checkbox"/> VOICE/DATA | B. <input type="checkbox"/> ORDER ENTRY/INVENTORY | F. <input type="checkbox"/> OTHER | |
| 3. PERIPHERAL EQUIPMENT | C. <input type="checkbox"/> PAYROLL | 7. OTHER | |
| A. <input type="checkbox"/> LASER PRINTER | D. <input type="checkbox"/> TIME PULLING | A. <input type="checkbox"/> DISKETTES | |
| B. <input type="checkbox"/> LETTER QUALITY PRINTER | E. <input type="checkbox"/> FINANCIAL/PLANNERS/SPREADSHEETS | B. <input type="checkbox"/> STOCK PAPER | |
| C. <input type="checkbox"/> DOT MATRIX PRINTER | | C. <input type="checkbox"/> FORMS AND OTHER CONSUMABLES | |
| D. <input type="checkbox"/> GRAPHICS PRINTER | | D. <input type="checkbox"/> FURNITURE | |
| E. <input type="checkbox"/> HIGH SPEED PRINTER | | | |

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THE NATIONAL NEWSPAPER OF IBM STANDARD MICRO-COMPUTING.

A sample Smalltalk class

This is a (very) simple example of what an entire Smalltalk class definition which corresponds to a simple program might look like. Written in Little Smalltalk, it is a definition of Class Person designed to store various bits of information about people. Comments are in double quotes.

```
Class Person :Object          "Class Person is a subclass of Object"
| name age jobStatus |      "Person objects have 3 instance variables
                             named name, age and jobStatus"

[
  name          "Define a method that responds 'name' selector"
  ^name        "Return the name instance variable"
  name: aString "Set the name variable of Person to be aString"
  name := aString

  age          "Return the age of the person"
  ^age
  age := anInteger
  age := anInteger "Set the age instance of a Person to anInteger"

  job          "Return the job a person does"
  ^jobStatus
  job: aSymbol
  jobStatus := aSymbol
]
```

To create and use person objects:

```
| aPerson anotherPerson |
aPerson := Person new.          "Creates a person object"
aPerson name: 'Henry Smith'.    "Set the name to Henry Smith"
aPerson age: 55                 "Set the age to 55"
aPerson jobs: Emanager.        "Set the job"

anotherPerson := Person new.
anotherPerson name: 'Susan York'.
anotherPerson age: 22

aPerson age
55

anotherPerson name
'Susan York'

aPerson age < 40
False
```

on what type of entity the object represents. Objects representing integers or floating-point numbers respond to arithmetic messages such as '+' '-' 'sqrt' or 'negate'. Objects which represent arrays respond to messages such as 'at:' and

'put:', which access their elements; 'size', which returns their size; and so on. Objects which represent rectangles on the screen respond to messages asking them to display themselves, move or update their contents. Objects which

Smalltalk is cheap

APC has negotiated a special deal with Software Express which will enable our readers to follow the 'Teach Yourself Smalltalk' series at a reasonable cost.

For owners of an IBM compatible, an Acorn Archimedes or an Atari ST, Little Smalltalk is available for \$15 for the disk and minimal documentation. All versions of Little Smalltalk will be supplied with the original C source code and example programs.

Smalltalk/V, the highly recommended graphical Smalltalk programming environment for IBM compatibles with at least 512k of RAM and two floppy disk drives, is available for \$165 including full documentation. A free copy of Little Smalltalk will also be supplied with Smalltalk/V.

All prices include tax and postage & packing. Cheques should be made payable to 'Software Express', 48 A'Beckett Street, Melbourne Vic 3000.

Homework

- (1) Instruct your Smalltalk system to print 'Hello World'.
- (2) Try out some of the simple expressions in the 'sample' box opposite on a real Smalltalk system.
- (3) What might the following Smalltalk expressions do?
 'Now is the winter' at: 12 put: \$W
 10 factorial
 65 asCharacter
 today := Date today

represent compilers take strings in a source language and return the translated code.

The closest analogy to an object in a language such as C would be that an object is a structure with a set of named fields, plus a look-up table of pointers to functions equivalent to an object's methods and their selectors. When a message is sent, the selector is used to search the array of function pointers. If a matching function is found, it is executed with the arguments sent along with the selector.

Objects which represent the same kind of entity are grouped together into classes. Each object in the system is a member of some class — an 'instance' of a class in Smalltalk.

The class of an object stores the information that is common to all of its instances. It holds the table of methods — called the 'method dictionary' — which all instances of that object will call on to respond to messages. It also determines the number of instance variables that a particular instance will have, and their names. The class of an object therefore determines what kind of component an object represents and what can be done to and with it.

Consider the simple expression '3+4'. The C programmer would say that the operator '+' obtains two integer arguments and will return the value 7. The Smalltalk programmer would view the same expression as the object which represents the integer: 3 receives a message consisting of the selector '+' with the argument 4. The end result is the integer object which represents 7. In C, the statement 'sqrt(45.0)' calls the function 'sqrt' with the floating-point argument 45.0. The appropriate square root will be returned as a floating-point number.

The equivalent Smalltalk statement would be '45.0 sqrt'. The interpretation of this would be to send the object which represents the floating-point number 45.0 the message 'sqrt'. The object



The Computer Trader

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40Mb Hardcard	\$1699	Hyper EGA	\$499
20Mb Hardcard	\$1310	Specials	
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Speed		Epson PC/HD, inc monitor	\$1665
Hyperace 286 Plus (10MHz)	\$695	Intel Above Board XT (512K)	\$610

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TUTORIAL

which represents the appropriate float-point number would be returned.

In C, the statement 'max(3,4)' calls the function 'max' with two integers, 3 and 4. The larger of the two integers (hopefully 4) would be returned.

The equivalent Smalltalk expression would be '3 max: 4' which is interpreted as: send the object which represents the integer 3 a message with 'max:' as the selector, and the object which represents the integer 4 as the argument. The object that represents the larger of the two integers would be returned.

Class inheritance

In order to save space and re-use information, classes are grouped into a tree structure. Objects which are instances of classes further down the tree inherit the layout of variables and methods of their parent classes. In practice, this is not as complicated as it sounds. An accompanying box shows the class tree for the built-in classes of Little Smalltalk. Instances of classes such as Integer have the methods and variables defined by their class definition — Class Integer plus Class Number, Class Magnitude, and Class Object.

If a message is received and the Smalltalk interpreter is unable to find a matching method in the class of the object, then the interpreter will look in the method dictionary of the parent class for a matching message and method. If it is successful, the message and method will be executed with the arguments to the message. If not, the process is repeated in the parent class of the parent class and so on.

This continues until the interpreter is searching the method dictionary of the class at the top of the tree (Class Object). If the matching method isn't in there, you've got yourself an error message.

Inheritance is the fundamental mechanism for code re-use in Smalltalk and is very powerful. Any message defined in Class Object, for example, will be understood by any object in the system of whatever class. This can be used to implement a 'print' method. Whenever you send the message selector 'print' to any Smalltalk object, it will respond with an appropriate visual manifestation of itself:

3 print

would print 3

(OrderedCollection new with: 5 with:

'Hello World') print might print 'an OrderedCollection(5'Hello World')'

END

Series continued next month.

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Our MS-DOS games disks have a CGA emulator so that usually those with Hercules' boards can play. In only a few cases is the colour graphics board essential, and these instances are indicated.

Utilities which refer to use with Wordstar are usually not suitable for the Amstrad 1512/1640 version of Wordstar.

MS-DOS

GAMES

Disk No.

M1001: INTERACTIVE GAMES. Includes a graphic, conversational and intelligent adventure game as well as a Star-Trek adventure and a surprise called Bouncing Baby.

M1002: FIFTEEN PASCAL GAMES with source. There is also a musician program so that you learn about music while you write songs.

M1003: ADVENTURE. You guessed it, the original classic written in C with source code. Text-based.

M1004: SELECTED BASIC GAMES. More than 20 games, including Blackjack, Catch88, Eliza, Meteor and Pacman.

M1005: SUPER COMPILED GAMES. Eight arcade games for those with colour graphics adaptor. Very absorbing. Includes Pango, Gold, Pyramid, 3-Demon, etc.

M1006: CHESS. Several extensive versions of this well-written game are on the disk. Easy to use, with good documentation and attractive graphics. The brilliant performer Mychess has been added to this disk. It sold commercially and took part in tournaments.

M1007: GAME/EDUCATION. PIANO GAME. Allows you to compose music at the keyboard and playback songs on the disk. Good graphics. Requires IBM or close compatible.

M1008: SELECTED FAMILY FUN GAMES. 2 flight simulators, music generator, excellent pacgirl, space wars, etc.

M1009: PALM READING. Clever, highly entertaining program in Basic, with graphics and provides a printout.

M1010: HOROSCOPE. For those interested in astrology. Gives diagrammatic representation of the stars, with extensive calculations and a printout. Basic source code is provided and could easily be extended to give lengthier analysis, etc.

M1011: MONOPOLY. Now contains several versions of this popular board game, with American and English settings. Hours of fun.

M1012: GAMBLING GAMES. One-armed Bandit, Poker, Blackjack, Roulette, Backgammon. etc.

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M1016+: MOVIE DATABASE. Contains details of nearly 2000 movies which are available on videotape. Search by title, rating, cast members, writer, director, etc. 2 disks. The 2nd disk was recently added. Those who already have disk 1 may order disk 2 separately.

M1017: PINBALL GAMES (1). Contains three fascinating games of varying degrees of difficulty. Engrossing.

M1018: SOLUTIONS TO ADVENTURE GAMES. Special collection of hints to solve games such as ZORK I, II, III, Hitchhikers, Starcross, Deadline, Witness, Mask of the Sun, Serpents Star, Dark Crystal, Planetfall, The Enchanters, Death in the Caribbean, Infidel, and Seastalker.

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M1023: GREAT BASIC GAMES. More than a dozen specially selected games written in Basic, including Wizard, Xwing, Combat, Mars, Racecar, CIA.

M1024: PHRASE CRAZE. An entertaining quiz-type game which asks part of a phrase and requires you to complete it. Highly regarded.

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M1026: 5 TEXT ADVENTURE GAMES — of different types, including a murder mystery, horror, pirate, etc.

M1027: SUPER HANGMAN — Highly acclaimed version that has larger vocabulary than most and includes quotations, riddles and music. Fascinating and educational.

M1028: SUPER COMPILED GAMES (3) — Another excellent selection, of compiled games ready to run. Includes Flightmare, Solitaire, Jumpjoe and more.

M1029: LANDING PARTY — You select the crew (Friends, movie stars, etc) which is stranded on a planet searching for energy crystals. The adventure confronts you with different situations and characters.

M1030: PROVOCATIVE PICTURES (1) — A collection of hi-res digitized graphics, in the tradition of naughty pin-ups.

M1031: WILLY THE WORM — This is a high quality game which allows you to build your own game board.

M1032: GREAT BASIC GAMES (3). A very entertaining selection which includes Boogers!, Fun, Rieman, Godcreat, Pirate, Temple, and more.

M1033: SUPER COMPILED GAMES (4). A super collection of arcade-type games, including Astro, Chase, Crisis, Dilemma, Mazel, Q-Bert, etc.

M1034: TRIVIA (3). Another quiz in this tradition. Includes categories for TV shows, Science, Star Trek, Words, Astronomy and General.

M1035: MORE DUNGEONS, MORE DRAGONS. An excellent example of the magic and monsters genre, which allows you to choose from a variety of roles, skills, and weapons.

M1036: MAHJONG. An outstanding program from Australia of the Chinese card game. Has good graphics. It works with mono or colour. Can be addictive.

M1037: SOCCER POOLS AND TATTS LOTTO. If you are familiar with soccer pools and bingo you'll have a good idea of what's included here. The computer guides your choice of numbers with its analysis. See also M1057.

M1038: TAROT CARDS AND I CHING. There are two very good forecasting type programs on this disk. For the Tarot, the computer will offer a well-presented reading. For the I Ching, it "casts" coins or yarrow sticks and you'll need the I Ching book to interpret the results.

M1039: JOKES AND INSULTS. Harmless practical jokes conducted on computer users. Surprises with some pretty heavy insults on the screen.

M1040: YACHTING SIMULATION. This is the yachting equivalent of flight simulator and involves quite a bit of strategic play. It contains Bermuda Triangle Sailing (with obstacles and strange happenings).

M1041: GAMES OF STRATEGY (1). Match wits with several skillfully designed simulation games. Includes a series of Naval Battles (based on real events), a Big Truck Haulage Business, and the Stock Market.

M1042: GAMES OF STRATEGY (2). Has Golf Tee (which allows you to vary your stroke/swing), Scatter (a logic game of locating atoms), Entrap, and Backgammon.

M1043: PROVOCATIVE PICTURES (2). Pin-up type posters to enliven the office. Mostly nude and semi-nude. Intended for printing and needs an Epson compatible printer.

M1044: MARTIAL ARTS. Match your skills against all sorts of villains and dangers.

M1045: EGA GAME. Has a conflict-type game especially for those with the enhanced graphics board. Contains Risk, a world domination game.

M1046: SUPER COMPILED GAMES (5) are special selections ready to run. Includes Risk (World Domination), Beast, Rockets, Subchase, etc.

M1047: SUPER COMPILED GAMES (6). With Wheel of Fortune, Forest Fire, Zoarre Dungeons (good adventure), Quarterback (football).

M1048: GOLDEN WOMBAT. A fine British text adventure involving a search for the Great Lost Empire and its sundry mysteries.

M1049: MURDER MYSTERY. Puzzle your way through suspects and clues — before YOU are done for.

M1050: SUPER COMPILED GAMES (7). With Polymaze, Landmine, Drain, Elevator, Eliza (machine code version), Starwars. Ready to run.

M1051: 50 BASIC GAMES. Includes a Star Trek, Swarm (bees), Baseball, Hobbit, Blackfr13, Antonyms, many more.

M1052: GAMES OF STRATEGY (3). Take on the challenge of Air Traffic Control, Interbridge Construction, and Global Thermonuclear War.

M1053: GAMES FOR 8'S AND UNDER. Special selection for the young'uns. 13 games, including a design your own secret adventure, meteor, paratrooper, digger, more. Some games require Basic.

M1054: ADVENTURES. Includes IBMADV, wherein a government agent infiltrates IBM headquarters, as well as Castle of Hornadette, which requires you to invade a castle to find a secret formula. Text based.

M1055: PINBALL GAMES (2). Very good graphics and an absorbing arcade game. Has Centre Fielder, Cyclops, Flume, Magic, Pin. Needs CGA.

M1056: CHINESE CHECKERS. A well designed board game with good graphics.

M1057: LOTTO MASTER. Based on choice of six numbers out of 40. Set up to indicate numbers where you have more chance of winning bigger prizes, etc. Examines past results and guides your choice. (eg many people avoid number 13, so its inclusion may result in larger winnings).

M1058: COMPOSER. A graphics based music editor. You can even see the notes on the screen. The program allows you to compose, edit, save and play your composition.

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 the professional circuit.

M1061: ADULT GAMES — Bonzo games include strip poker and adult trivia.

M1062: PINBALL GAMES (3). Super Collection with good graphics. Has Blackbox, Chute, Double, Star, Zipper. Needs CGA.

M1063: SPACE RESCUE & QUANTOIDS ADVENTURE. Quantoids is a comprehensive and sophisticated game. Your enemy are graduates of business schools who threaten to infect the universe with their unimaginative methods.

M1064: ADULT JOKES. LAFF is a collection of witty, funny and often blue jokes.

M1065: TEST YOUR ESP. Could be used seriously or in fun. The computer shuffles and displays one of 25 cards with special symbols.

M1066: CROSSWORD SOLVER. Helps you find those elusive words in crosswords.

M1067: BRIDGE. Bridgepal is a comprehensive and well-designed game to sharpen your play. Helps you to learn, practise or just enjoy playing.

M1068: ADULT GAMES. STRIP POKER. A comprehensive version in Basic. Hold onto your belt.

M1069: ADULT SLIDE SHOW. Automated display of girlie pics. Entertaining but not suitable for children.

M1070: PROVOCATIVE PICTURES (3). A collection of seductive girlie pics transferred from the Macintosh environment, plus some entertaining, animated graphics.

M1071: KARKOTH ADVENTURE. A sword and sorcery type adventure on a grand scale. Search for the magic sword. Choose qualities and roles for your character. Cast spells, use magic.

M1072: LARN ADVENTURE. This is a very good Hack-like adventure game. Interactive, involving, with dungeons and dragons-type action.

M1073: CARD GAMES. A collection of some of the best – Bridge, Canasta, Draw Poker, and Hearts.

M1074: SPACE CONFLICT. You are in charge of security on a spaceship. The Labbits want to break out of their cage into the food storage area. The invisible Voldrons also want to reach the storage area. Your mission? Stop them.

M1075: EAMON ADVENTURES. Two adventures on one disk. Battle against monsters and other dangers. "Cronum's Castle" and "Lord of the Underland" require the master disk on M0121+ to play these games.

M1076: DICE GAME. Addictive game for up to 15 players, utilising varying strategies. Good for novice to expert and will entertain you for hours. Turbo Pascal source is provided.

M1077: BIBLICAL CHARACTERS. A game which requires you to identify characters from the bible on the basis of clues given.

UTILITIES

M2001: UTILITIES. These are essential for your collection and include file maintenance superstars like SWEEP and WASH as well as library and squeeze/unsqueeze programs. Lots of them.

M2002: UTILITIES WITH ASSEMBLER/DISASSEMBLER. Has a ramdisk program, print while you work spooler, wordstar converter, as well as assembler/disassembler.

M2003: UTILITIES. Make life easier for yourself with programs like Util, Z, Vtype, ST, Protect, Unprotect.

M2004: UTILITIES. Ultra Utilities can unerase files, patch, optimise Basic source code, generate Basic code for custom data bases, and more.

M2005: SELECTED UTILITIES. Dozens of highly useful utilities, with documentation, compiled and ready to go. Includes Autodex (super file manager), Membrain (ramdisk) Squeeze and Unsqueeze, Directory Printer, calendar, File Finder (great for hard-disk), Keyboard Definer, etc.

M2006: UTILITIES FOR PERSONAL MANAGEMENT. Similar to Side-Kick, these are background utilities that provide calculator, notepad/editor, phone index, alarm clock, calendar, printer controls, typewriter simulator, window access to directory, display/remove/copy/rename files, etc.

M2007+ : UNPROTECTION METHODS (1). Hints and programs that help you to back-up a variety (dozens of them) of copy protected programs. 3 disk set.. See also M2060.

M2008 SECURITY CODING. Well-documented program that goes beyond passwords – Encrypts your files to deny unauthorised access.

M2009: DISK LIBRARIAN. A collection of some of the best programs available for cataloguing your disks and keeping track of files. Provides an alphabetical master list, etc, of all files located, elusive ones, etc.

M2010: POPULAR BASIC UTILITIES. A menu-driven set of about 50 utilities written in Basic – alpha/hex conversion, calculator, cash payments, interest calcs, word-processor, label printer, printer control, to-do list, random no. generator and many more.

M2011: DISK DOCTOR COLLECTION. Some of the best debugging and file repair programs around. Includes Jaz, Easy-Zap, Diskit, etc. OK for hard disks too.

M2012: HARD DISK UTILITIES. A special collection of utilities from more than two-dozen other disks. For cataloguing, sorting, backing up, changing file attributes, etc.

M2013: MULTI-TASKING SHELL. On this disk we have TWO excellent Dos shells which allow you to operate and execute from a menu system – Dosamatic and Still River Shell. Interrupt tasks and switch to other programs. Enjoy a superior work environment.

M2014: CP/M EMULATION. Run CP/M software on your PC! Well documented and source coding is provided. A second emulator has been added to this disk, which is much faster for those who have the V20 or V30 chips (suits running of 8080 code).

M2015: SUPER DISK CATALOGUER. This is a superior capacity disk cataloguer that will put order into your files, print listings, locate files, give directory printouts, etc.

M2016: MENU SYSTEMS. A collection of some of the best menu generating programs we could find. Run your programs from menus that you create. Includes Sysmenu, Automenu and Ezmenu.

M2017: DVORAK KEYBOARD. The standard qwerty keyboard was designed to be inefficient because of early slow, mechanical typewriter keys. The DVORAK layout was designed for greater efficiency.

M2018: MEMORY PROMPT. A memory-resident utility that prompts you with the correct syntax for DOS commands, BASICA, Turbo Pascal, Debug and Edlin.

M2019: EXTENDED DOS UTILITIES. A collection of substitute utilities with more features than those normally accompanying DOS. Has good file find, print controller, alarm, directory lister, cover printer, etc.

M2020: "C" TOOLS. A collection of Unix-like software tools to browse, darken, dump, compare, merge, page, print, delete, format text, etc. Has GREP. Most have "C" source code also.

M2021: UNIX COMMAND SHELL – Have you been wanting to control your programs with commands similar to those available in Unix?

M2022: TShell DOS-MANAGEMENT – Provides an efficient environment for managing your operating system. Also has help screens.

M2023: BATCH LANGUAGE ENHANCEMENT. DOS's "batch" capability is similar to a language, with nouns and verbs to automatically combine (batch) and execute commands. This program gives you more features and control when creating bat files and modifying them. It's menu-driven and has extensive documentation on disk.

M2024: CODE BREAKER for those with an interest in deciphering codes/ciphers, this is a useful analytical aid.

M2025+ : DOS EXTENSIONS – A two disk set of enhancements for the command of Dos. The first disk contains documentation; the second has the executable programs. Contents are similar to those of your operating system, with more features. For instance, Copy command accepts multiple statements on a line.

M2026: CALTECH UTILITIES – A special collection which includes memory-resident cut and paste, printer commands, pop-up tables, graphics characters, bad sector fix, hex file editor, directory utilities, ansi.sys replacement, echo replacement, and more.

M2027 + : EXCEPTIONAL FILE AND DOS UTILITIES. A two disk collection of many powerful tools – such as fast format, alarm clock, disk wipe, display colour as shades of gray, file sorter, text reader, line counter, read squeezed library files, create files from memory, digital clock display, dos syntax reference, cursor speed-up, create secretaries, etc.

M2028 + : ENHANCED CONSOLE DRIVER. Many time and convenience features which improve efficiency by giving you more control over keyboard and screen. Two disks.

M2029: DART'S DOS UTILITIES. A collection of Dos enhancements that mostly have assembler source code provided, for move, word count, updates, etc.

M2030: SYSTEM SNOOPER. Has a collection of device drivers, utility tutorials, marks bad blocks, diagnostics, redirects output, and more.

M2031: STRATFORD UTILITIES. Has a demon for backing up some difficult programs, replaces joystick commands with cursor control, etc.

M2032: M2032. NANOVISION UTILITIES. Converts text files to com files for self-display, memory-resident page, visual file-deletion.

M2033: SELECTED MENU SYSTEMS. Has two approaches to creation of your own menus, with 10 options per menu, sub-menus. Makes program access friendlier.

M2034: DISK CATALOGUER. Suits multiple file control by arranging different databases for word processors, games, etc. Searches, sorts, prints directories.

M2035: MORE HARD DISK UTILITIES. Well worth having. we've collected some of the latest and most useful programs for optimising disk usage, undeleting, etc.

M2036: PC SPEED-UP. Inexpensive way of getting more out of your hardware. Diagrams need Epson compatible printer.

M2037: MANAGING MEMORY RESIDENT UTILITIES. If you are inclined to use more than one resident utility at a time you may find some clashes. These programs show you what is happening in memory.

M2038: DIAGNOSTIC AND TESTING UTILITIES. Extensive collection to test and report on performance of equipment and software.

M2040: HARD DISK MENU SYSTEMS. Easy and comprehensive. Excellent choices for managing files. Includes HDMII.

M2041: BAYLEY UTILITIES. A number of utilities, including a mail facility for those who share the computer with others, wish to log computer time, more.

M2042: EGA UTILITIES. Dozens of useful utilities that help you to make better use of the screen – change colours, borders, lines, etc.

M2043: SPECIAL COLLECTION UTILITIES. With Nsweep (genuine), PC-Sweep, add line feed to ascii file, hard disk directory, adjust margins on Epson printer, etc.

M2044: DOS SHELL – DISK NAVIGATOR. One of the later generation aids for simplifying the use of operating commands.

M2045 + : SIDEKICK-LIKE RESIDENT UTILITIES. Calculator, note pad, data base, appointments calendar, cut & paste, term communications. 2 disks. Easy, powerful. Homepage.

M2046: HOT UTILITIES. Superior directory, system stats, diskcheck, file find, etc. For colour screen.

M2047: MACINTOSH EMULATOR. Doesn't run Mac programs but provides a DOS shell like the Mac's. Great to watch and use.

M2048: PAL FOR SIDEKICK. Enhances the appointment-calendar use of Sidekick. Includes Personal Appointment Locator and a resident alarm clock.

M2049: SUPERIOR DESK-TOP UTILITY. Right Hand Man includes key macros, note pad, typewriter, windows, data export, full-screen editor, appointments calendar, alarm, ASCII table, calculator, address file, Dos functions, file editor.

M2050: TRINITY & THRASHER. Thrasher tests for the optimum number of buffers for your config.sys file. Trinity provides branching within Dos batch processing and will display operator instructions.

M2051: VIDEO/MONITOR UTILITIES. Special collection includes set screen colours from menu, blank monitor, define cursor size, put clock in corner, change screen fonts, scroll back, toggle mono/colour screens, capture screen into file, more.

M2052: COLLECTED UTILITIES (1). A range of small, useful programs. Virtual printer to disk, unlock protected basic, small text editor, hex file converter, capturing printer output, etc.

M2053: COLLECTED UTILITIES (2). Includes Shortcut (single keystroke memory-resident front end for Dos), recent version of List, reset step rate for drives, disk cache utility (reduces disk access), etc.

M2054: COLLECTED UTILITIES (3). The major programs on this disk are Pmenu3, a memory resident printer control for Epson compatibles; Patch, which allows you to change memory as if it were a disk file; PC-Banner, a menu-driven quality large letter printer; and Kylock, which locks the keyboard from others.

M2055 + : QDOS ENHANCED DOS. They say that once you've tried using this new operating environment you'll never go back to the vanilla version of Dos. 2 disks.

M2056: MUSTANG UTILITIES. Contains 3 quality programs: Will print multiple copies of a single label, or single labels each with a new address, up to 6 labels across; very good menu-driven mortgage analysis program; and a database for organising and cataloguing your disk file collection.

M2057: CACHE & SPEEDPRINT BUFFER. Microcache uses advanced virtual memory techniques which shares memory between cache and speedprint buffer. It monitors use of disk drives, allows rapid data transfer, increases speed of processing, disk access and printing. Memory-resident version for AT and PC. Uses 70k – 200k buffer.

M2058: WRITING TOOL FOR THE HANDICAPPED. Uses a single switch entry principle for entering text. Simplifies the process of typing characters and carrying out complicated text handling functions which on a conventional keyboard would be too complex for the handicapped user. For those with severe motor disabilities. H-Key.

M2059: UNPROTECTION METHODS (2). Describes how to backup a variety of copy protected programs, such as Javelin and Printshop etc. See also M2007 +.

M2060: HARD DISK TEST UTILITY. Gives your hard disk a close examination for reliability, corrupt sectors, etc. Comprehensive.

WORD PROCESSING

M3001: WORD PROCESSOR. Considered at least as good as the commercial programs. Contains PC-Write, 2.55 plus extensive manuals. For editing, formatting, etc.

M3002: TYPING TUTOR. Improve your skill at the keyboard. Several fine programs have been assembled on this disk.

M3003: MULTI-FONT WRITER. An incredible word-processing package that shows on-screen and prints out scientific notation, Greek letters, gothic, italics, etc. Recommended.

M3004: COMPUTER-AIDED INSTRUCTION. Design lessons with the aid of your computer. With extensive documentation.

M3005: WORD-PROCESSOR with in-built calculator and modem communications facility for transfer of files, etc.

M3006: FORMATTER FOR PLAYWRIGHTS. Type your manuscript with your usual word-processor (eg, PC-Write or Wordstar) and then print it out using this formatter, which provides a script-style print-out for screenplays, teleplays, etc.

M3007: SPELLING CHECKER. Our 1988 version. SpellCheck. Works with most word processors. We've again added thousands of new words to it, including business and computer terms. The best low-cost checker you'll find.

M3008: OUTLINER FOR WORD PROCESSING. Considered by many to be the best outliner/ideas processor available. Is fast, can be memory resident, has windows, excellent printing features, etc. PC-Outline.

M3009: FORM LETTERS. Examples of the most commonly-used business letters — overdue accounts, apologies, credit, layoff, account acceptance, thank you, invitation response, and many more.

M3010: PRINTER AND TEXT UTILITIES. Includes memory-resident Note Pad and Cut and Paste. Also Index System for text files including Wordstar, and Epson printer Control that sets printer and provides foreign characters.

M3011: STYLE ANALYSER. Examines text that you've written and suggests ways that you can improve written expression. (M51)

M3012+ : POWERFUL WORD PROCESSING. With many features such as split screen, windows, macros, footnotes, indexing, mail-merge, programming language and laserjet drive. Two disk set. Extensive documentation. NYWord.

M3013: PRINT QUALITY ENHANCER. Image Print allows you to use standard dot matrix printer for high quality printing and formatting.

M3014: SIDEWRITER. Will generate printed output sideways to fit wide reports onto a page for you.

M3015: SUPER KEY-DEFINERS. Reduce the amount of writing that you do by creating macros that can insert blocks of text with a single keystroke. Two programs (Hot Key and Soft Touch) will allow more efficient writing.

M3016+ : WORDSTAR UTILITIES. A special collection of utilities that expand the power of Wordstar and make it easier for you to use. Insert alternative characters such as the Greek alphabet; custom-design character sets; produce tables of contents and indexes; strip and alter text; number paragraphs; redefine function keys, etc. 2 disks. Not suitable for Amstrad 1512/1640 version of Wordstar.

M3017: PRINTING PREVIEW. Many word processors do not show you the end product on the screen. This previewer lets you see what you'll be getting before you print.

M3018: DIAGRAM AND TEXT EDITOR — If your needs combine text with simple diagrams, then this editor is for you. It takes special advantage of full-screen control.

M3019: PROGRAMMER'S EDITOR. Blackbeard is a fine choice for source code editing in structured languages. It can also be memory resident. Has built-in documentation you can call up as required.

M3020: EXCELLENT WORDSTAR COMPATIBLE WORD PROCESSOR. Galaxy is one of the best we've seen. Easy to use; clear screens showing commands; has built in windows and cut/paste; is compatible with Wordstar commands (if you wish); works from a menu or function keys or commands.

M3021: QUALITY PRINTING ON DOT MATRIX PRINTERS. More than that, LQ has multiple fonts (typefaces) which include Courier, Greek, Helvetica, Palatino, Roman, Italics.

M3022: BEGINNER'S WORD PROCESSOR. Qwerty has many sophisticated features, is easy to use and has a built-in tutorial which teaches you how to do word processing.

M3023: REFERENCE REFORMATTER. If you write articles with references added, you'll be aware that publications will often have different requirements. RefRe will change the layout of list of references to suit the requirements of the publication.

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. Can enter your own articles for practice.

M3026: EGA/CGA WORDPROCESSING. A many featured program that makes extensive use of coloured screens. Delight to use. Sail.

M3027+ : 1.5 MEGABYTE ENGLISH DICTIONARY. Squeezed onto two disks. If you are building or enhancing your dictionary this is worth consideration. Listed in ASCII. Needs hard disk.

M3028: FANCY PRINTING FOR WORDSTAR. Access many special characters, change line spacing, do sub/superscript, etc.

M3029: PC-WRITE SPECIAL ENHANCEMENTS. Uses Macros to enhance the key command structure for easier and faster use.

M3030: ONE-PAGE WORD PROCESSING. Suits preparation of flyers, notices. Contains Page-One.

M3031: SCREEN GRAPHICS FOR WORD PROCESSING. Super Graph3 is a word processor with the ability to enter any of the 256 ASCII characters by using function keys. Is excellent for creating menus, or for charts, graphs, fancy lines on screens, etc.

M3032: MERGE FACILITY. Letterwriter keeps track of names/addresses and merges them for letters, adds date from computer, prints target address, prints complimentary close, merges text from file, numbers pages, etc.

M3033: SUPER FOG INDEX. Maxi-Read is a style analyser with a difference. It evaluates readability and complexity of sentences. Provides several measures and comparisons.

M3044: VERSATILE PRINTER SETUP. Provides printer controls for IBM, Epson, Okidata, Gemini, NEC and Laserjet. A sophisticated printer controller with wide application.

M3035: PRINTER UTILITIES COLLECTION. Resident printer setups and other utilities, including box graphics, printer margins, disk directory labels, justifying on dot matrix, screen dump, print upper ASCII, multiple font quality printing, etc for Epson compatibles.

GRAPHICS

M4001: SELECTED GRAPHICS. A selection of some of the best programs in the public domain, including an extensive picture-graphics set of commercial standard. Some require Basic but the main program does not.

M4002: SLIDE PRESENTATION. Prepare transparencies for overhead slide projector. Great for illustrating your next talk.

M4003: GRAPHICS. Extensive Basic program to generate screen graphics. Allows you to plot line-drawing figures. There is also a sketch program for drawing with a joystick. Requires a colour monitor. A mono version of the first program requires Hercules card.

M4004: GRAPHICS. Several major graphics programs — all in Basic. Mostly a coloured monitor is required. Includes easel-type drawing with a light-pen, and a graphing program using x, y, and co-ordinates. Other programs will do pie-charts, histograms, fit curves, etc.

M4005: SPRITE GRAPHICS. Lets you create sprite characters from a set of coloured pixels for your programs. It is self-documenting and contains a sample file. Allows you to display the figure in one step.

M4006: EXTENDED FONT CHARACTERS. PC-FONT is a utility for Epson-compatible printers that will print all of the printable characters of MS-DOS character set — including block graphics, engineering and scientific, foreign languages, etc. Have solid underline and vertical lines. Gives more professional output.

M4007+ : COMPUTER-AIDED DESIGN. Powerful control over drawing, graphics, printing and slide show. For easy creation and editing of graphics screens. Two disks. Key Draw. Also has CGA emulator for Hercules boards.

M4009+ : BUSINESS GRAPHICS. A two disk set called Draftsman which provides special display features to improve the presentation of reports, including datagraphs and slide shows. 2 disks. Imports from Lotus 123, etc.

M4010: TURBO FONT DESIGNER. Design other patterns in place of those contained in the ASCII set. Makes it easier to design special characters, letters, etc. Especially for Turbo Pascal programming.

M4011: GRAPHICS ICON/CHARACTER CREATOR. Especially suits creation of symbols and logo-type characters. Contains Icon-master.

M4012: TALK ILLUSTRATOR. "Present" is an easy-to-use program which provides lettering and other special features for slide presentation.

M4013: PAINT GRAPHICS — A comprehensive "paint" program for medium and high resolution graphics that can also be printed. Uses slabs of colour, shading etc, for its effects. Requires coloured monitor.

M4014+ : COMPUTER-AIDED DESIGN. Sophisticated system that works with mono or colour. We've added a CGA emulator so those with Hercules boards can use the program. Dancad3d will give 2 or 3-D presentation, do complex drawing, print sharp lines for mechanical drawings, illustration, and animate parts of a drawing on screen so you can see interacting parts. Very professional. Specify whether you want 512k or 640k version. We've squeezed 4 disks on to 2.

M4015: FULL FEATURED PAINT PACKAGE. Rainbow has pull-down windows, icons, hi-res, 4 colours. Special shading. Needs colour monitor.

M4016+ : GRAPHICAL ANALYSIS. Inputs data directly or from DBASEIII. Does statistical analyses, reports, line and pie charts. 2 disks. Kwikstat.

M4017: Has been re-numbered M3030.

M4018+ : PRINTED CIRCUIT BOARD DESIGNER. A design robot for origination of exacting graphic engineering. Designed for printed circuit layout. Droege. Two disks. Evaluation copy.

M4019: FORM DESIGNER. Probably the best available for designing your forms layout. Suits invoices, order forms, letter heads. EZ-Form.

M4020: DESIGN GRAPHICS. Altmira will draw pictures, lines, circles, boxes, change size, rotate it, move it, copy it, produce boxes, fill boxes, give dashed lines, dots, vectors, arcs, polygons, vertical hatching, change background colour, etc. Only cursor control required. Needs CGA but will work on mono screen. Better with colour screen. Suits logos, posters, cards, planning a garden, maps, floor plans, or just for making beautiful pictures.

M4021: DATA PLOTTING ANALYSIS: This is a graphically oriented analysis tool that processes data files as if they were continuous functions. It shows your data on a line plot graph and would be useful to scientists, engineers, business men, those tracking stock market movements, etc. Danal. Needs 8087 coprocessor.

M4022: EGA GRAPHICS. 3 dimensional, wire frame modelling. Move, tip, scale, rotate. Image-3D. See M4026 for CGA version.

M4023: BUSINESS GRAPHICS. For pie/bar charts, graphs, comparisons. Easy to use. Express Graph.

M4024: PAINT GRAPHICS FOR MONO/HERCULES. Good facilities and you don't need colour. Finger Paint has patterned shading, backgrounds, etc.

M4025: SCREEN CAPTURE UTILITIES. Grabs colour, b/w, graphics, etc. A professional printing aid.

M4026: 3D-WIRE FRAME GRAPHICS. Image-3D enables you to design, view, and edit 3D objects. Menu driven. Can move, scale, rotate, tip your image. Can draw on three planes and select degree of rotation. Portions of screen can be enlarged for viewing and image size can be changed, moved or elongated. Sample drawings are on disk. This is CGA version. for EGA version see M4022.

LANGUAGES

M9001: BASICA/GWBASIC COMPATIBLE INTERPRETER with interpreter. Runs programs written in industry standard Basic. Suits PC compatibles.

M5001: FORTH. This is F83, the latest standard, with built-in editor, compiler, etc.

M5002: SMALL C. Ron Cains compiler for those interested in learning the C language. See also M5046.

M5003: XLISP. An experimental language with object-oriented extension capability. Used in artificial intelligence programming, etc. (CPM-80 version also on hand.)

M5004: PROLOG. Like Lisp (Xlisp) this language is widely used in artificial intelligence programming. Extensive documentation.

M5005: PASCAL. One of the most popular languages for general programming. Well-documented. A very good choice for learning to program. Visible Pascal.

M5006: SCREEN DESIGNER. An easy to use interactive screen designer to assist you with your program. Requires colour monitor.

M5007: SCREEN DESIGN AID. Allows you to design the appearance of your program on the screen and then records the design in obj. Files that can be linked when compiling programs. Suits colour or mono.

M5008: BASIC AID. A multifunctional utility for those writing in Basic which will compress a program, remove remarks, separate multiple statements, generate cross-references on variables and reserved words. Will also cross-reference all references to a specific line by a goto, gosub, etc. Shows variables and lines of code not referenced.

M5009: SPECIAL BASIC AIDS (1). Assists you to write better Basic programs, with callable assembler routines, demonstration of Basic graphics commands, a utility to convert Basic to Fortran and more.

M5010: SPECIAL BASIC AIDS (2). A further selection to check lines for errors; provide routines for user interface; commonly used peeks, pokes and subroutines; a utility which shows time spent in execution by different parts of a program, and much more. See also M9001 (EDUCATION).

M5011+ : TURBO PASCAL LIBRARY — SET 1. Special set of routines, aids and utilities for programming in Turbo Pascal. 7 Disks. Includes source for: draw circles, change cursor, read sectors, change sectors, disk size, error messages, details about equipment, test for files existence, d/write file attributes, amount free space, catch key strokes, get dot patterns, create titles, set directory path, take integer, check for colour/mono, rename, pass parameters, pop full screens, draw rectangles, anagrams, create mazes, enter decimal/receive hexadecimal, create animation in text mode, music composer, save/restore registers, format program listings, asynchronous communication, disk catalogue, manipulate dates, data entry, read keyboard, window management.

M5012+ : TURBO PASCAL LIBRARY — SET 2. Special set of routines, aids and utilities from Turbo User Group for programming in Turbo Pascal. 6 Disks. Includes source for: convert Basic data files into pascal data files, direct screen writing, quick sort, display available memory for variables, text file sort, link list of directory entries, time elapsed, hexdump of any variable, managing memory resident programs, string manipulation, allow other programs to run within a turbo program, map memory allocation, file squeeze/unsqueeze — more.

M5013+ : C LANGUAGE LIBRARY. Special set of routines, aids and utilities for programming in C. 6 disks. Includes source code for: encrypt/decrypt, screen generator for DBASEII, replace tabs with space, translate character strings, word/line count, terminal emulation, compiler/linker batch files, grep for Lattice C and C86, disk I/O routines, interface to serial port, CRC error check, file transfer coding for Kermit protocol, combine files, random number generator, set parameters for Epson printers, squeeze/unsqueeze text files, change display mode, print files with page nos., type squeezed files, cross reference coding, open/read/write. Much more.

M5014 + : ARTIFICIAL INTELLIGENCE. These disks contain TWO Expert System Shells – ESIE and EXPERT. They help you to design a system that will gather information and make a recommendation. Two disks.

M5015 + : BASIC. This is Snocrest Basic, a two-disk set that contains a real Basic interpreter with manual. Also suits a multi-user system.

M5017: SPRITES AND ANIMATION FOR TURBO PASCAL. Source code and instruction for adding animation/sprites to your programs.

M5018: BASIC AIDS (3). Has special programs to remove numbers from your Basic programs and to restore them.

M5019: TURBO TOOLS. A collection of numerous small Turbo Pascal programs that illustrated the book "Complete Turbo Pascal". Some highly useful utilities plus examples of routines you can include in your own programs.

M5020 + : CROSS COMPILER. A very sophisticated compiler for experienced programmers. A universal cross-compiler that allows translation from one language to another. Contains Regular Expression Compiler. Two disk set.

M5021: SCREEN GENERATOR. PC-Input is a new aid for designing screens in Basic. Has lots of nice features that help you improve the screen appearance of your programs.

M5022: WINDOWS FOR BASIC & "C" – This is a collection of functions that give windowing capability to your programs. Has special cursor control and string/character display as well as border drawing. Very fast effects.

M5023: Z80 CROSS ASSEMBLER. New version that lets you write and compile CP/M programs on the PC.

M5024: TOOLS FOR TURBO PASCAL – Valuable tools for the programmer – convert and manipulate dates, display, edit and validate data entry fields and lots more.

M5025: TURBO PASCAL DEBUGGER – An Interactive debug with pop-up help, formatters etc. Invaluable.

M5026: MACRO ASSEMBLER – Many have been waiting for this. If you didn't get a good macro assembler with your operating system, this one is a fine choice. Also has debug.

M5027 + : TURBO PASCAL ROUTINES. Source code for programmers. Many hi-res routines and demos, some 3-D graphics also, book index preparation programs, and dozens more. 4 disks.

M5028 + : ASSEMBLER ROUTINES/UTILITIES. 3 disks with dozens of time-saving routines, teaching examples and aids. Deals mainly with the systems environment of your computer, such as error display, de-fragmentation for scattered files, control the amount of memory used by DOS, etc.

M5029: BASIC SUBROUTINES LIBRARY. Lots of essential routines like Quicksort, Readir, create and save screens; many more.

M5030 + : TURBO PASCAL SELECTION. 3 disks with source code for windows, pass 64k limit, time/date, copy, format, interrupts, spell check, editor, random nos. etc.

M5031: CROSS ASSEMBLER FOR APPLE. Creates code for 6502 processor. Can be modified to generate code for other processors.

M5032: SCREEN GENERATOR FOR TURBO PASCAL. Produces code for input and help screens. Will also do coding for DBASEIII.

M5033: TURBO PASCAL ROUTINES FOR HERCULES GRAPHICS. Has source coding for Pascal programmers. We've also added two special utilities to this disk which will allow those with Hercules Graphics Boards to run programs designed to run with the Colour Graphics Board. These are of special value to those wanting to run programs like games and graphics programs. These utilities are already compiled to run. (One uses 640 x 200 graphics screen and the other uses 320 x 200.)

M5034: MINI-ADA. Substantial subset of major new language. Pascal and Basic source code and disassembler. Requires Turbo Pascal for best use.

M5035: ZBASIC COMPILER. Fast, easy to use version, with editor and examples on disk.

M5036: TURBO PASCAL CROSS-REFERENCER. Lists, beautifies, cross-references source code.

M5037: ICON – A programming language similar to Snobol.

M5038: EXPERT SYSTEM SHELL. The IMP Shell contains utilities to develop, test and run new expert systems. For rule-based, backward chaining systems. Very fast. Well described in a book available from Prentice-Hall. Written in Turbo Prolog and the source is provided.

M8007: SCREEN GENERATOR FOR DBASEIII. See this entry under Databases for more information.

M5039: FLOW CHART DESIGNER. For designing systems and programs. Needs colour monitor. PC-Flow.

M5040: BASIC CALL ROUTINES. Includes a variety of Whizzard screen I/O routines that can be called from within Basic. Also various assembly routines and a Basic accelerated print routine.

M5041: TURBO PASCAL SCREEN GENERATOR. For painting data entry screens, open and close windows with borders, control data entry and create pull down menus. Produces code for use in your programs. The source code routines are also provided on the disk. Minigen.

M5042: APPLE CROSS-ASSEMBLER (2). (Also see M5031) The Psuedo-Sam version that allows you to construct 6502 code on your PC for transfer to a 6502 system for use.

M5043: PASCAL TO C CONVERTER. P2C converts many Pascal structures to their C equivalent, including simple assignment and comparison statements; variable, type and label declarations, enumerated types, and procedure and function declarations and instances.

M5044: C SYNTAX CHECKER. CCHECK checks C programs for correctly matching brackets of all kinds, including quotes and comment brackets, indentation of matching brackets; looks for symptoms of typical errors, etc.

M5045: TURBO PASCAL-TYPE COMPILER. This is a major subset of the Turbo compiler, containing all but the I/O routines. Good learning aid. Contains Facilis.

M5046: C LANGUAGE INTERPRETER + C WINDOWING TOOLS. Also has maths subroutines, screen I/O, system functions, C cross-referencer, Unix-type cut and paste, function key redefinition, etc. See also M5002.

M5047 + : 32 BIT FORTH COMPILER. A 5 disk set with a comprehensive version of BBL Forth, including documentation, tutorial, and source code.

M5048: ASSEMBLER AND TUTORIAL. Very good introduction to Assembler Language programming as Chasm has many features and accompanying text is designed with learners in mind. Does not do macros.

COMMUNICATIONS

M6001: COMMUNICATION, MODEMS. Two major communication programs – Qmodem and Kermit. Lots of bells and whistles.

M6002: COMMUNICATIONS. SINGLE-USER BULLETIN BOARD. Source included. Set up your own message service.

M6003 + : BULLETIN BOARD. RBBS. A very popular system for those wanting to operate a bulletin board. Well-documented. In compiled Basic with source code. Two disk set.

M6004: COMMUNICATIONS – PC-TALK 111. A very popular modem communications program. Excellent documentation and Basic source coding provided.

M6005: TERMINAL EMULATION of several different terminals plus the ability to act as a mini BBS. Also includes these file transfer methods: Xmodems, modem 7 batch, ymodem batch, telelink, kermi, and ASCII. Menu-driven and can link to main-frames. With screen editing. (M106) Emulates VT52 and VT100.

M6006: BULLETIN BOARD LISTING. A comprehensive list of Australian Bulletin Boards. Text files are available in a variety of disk formats for CP/M also.

M6007: COMMUNICATION – QMODEM. A popular program for modems. Has installation program. For communicating with bulletin boards.

M6008: COMMUNICATION – KERMIT. A recent version of this well-known program for communication with bulletin boards and other computers.

M6010: PROCMM. A many-featured Modem Comms program that is receiving wide critical acclaim overseas. Very professional.

M6011: COMMUNICATION UTILITIES – New version with compression/decompression tools, RS232 tutorial, etc. These supplementary tools are useful for Qmodem, Procomm, Kermit, PC Talk, etc., and assist you in transferring files by modem.

M6013+: ELECTRONIC BULLETIN BOARD. PC-BOARD is considered to be very fast and efficient. Excellent documentation, extra utilities for analysing board usage, configuration, etc. 2 disks.

M6014: SUPER NEW COMMUNICATIONS – TELIX. Powerful, yet easy to use, menu-driven. For contacting bulletin boards. Many features.

M6015: TERMINAL EMULATOR. Suits VT52, VT100, VT102. Has a substantial documentation file.

M6016: PRESTEL/VIATEL COMPATIBLE COMMUNICATIONS program for contacting these bulletin boards. Supports split baud rate (1200/75). Contains English and Australian programs.

M6017: MINIHOST BULLETIN BOARD. Suits message service system for small business and for sending files. Has security level clearance.

M6018: MEMORY-RESIDENT COMMUNICATIONS. For dialling or transferring files in the background without tying up the computer system. Similar to multi-tasking. Up to 9600 baud, binary or text files, Xmodem protocol, queues files, prompts when communication is made. Invisible Link.

M6019: EMULATION FOR VT220 TERMINAL. Includes a facility for capturing incoming data stream and saving to disk. Shareware version has limited facility for uploading and downloading files.

BUSINESS/CALCULATION

M7001: GENERAL LEDGER ACCOUNTING. A small-business recording system. Highly regarded. Produces excellent reports. Also has compiled package modules for general ledger, journal, cash receipts and payments, trial balance, chart of accounts, printing, etc. Easy to use. Double entry system. Prints cheques. Data can also be read by Lotus 123.

M7002: SPREADSHEET CALC. A comprehensive program for budgeting, projects, "What if" calcs etc. Good documentation on disk. Suit home, school, small science/engineering/accounting uses. Requires enhanced graphics board, such as Hercules Board, or colour monitor. Free Calc. Vers 2. Has been substantially up-graded.

M7003: INVESTMENT RECORD SYSTEM. See how your money grows and how to keep track of it. Puts order into your finances and keeps track of costs, income, profits, losses, etc. Requires Lotus 1-2-3.

M7004: STOCK MARKET ANALYSIS. Special aids to help you "think and grow rich". For managing and evaluating portfolios and prospects. Written in Basic.

M7005: GOAL/TIME MANAGEMENT. Improving personal organisation and goal accomplishment. Arranges information, prompts for action.

M7006: STATISTICAL ANALYSIS: EPISTAT. More than two dozen related Basic programs for analysis including Chi square, Linear regression, Fisher, Binomial, Analysis of Variance, Histogram, Poisson, Correlation, etc. We've also added a compiled program for multiple correlation.

M7007: SPREADSHEET: EXPRESS CALC. Formerly known as PC-CALC. This version is from Expressware and is in keeping with the high standard that they adopt for their products (See also File Express. Express Graph is also on hand.) Has extensive documentation on disk. A two disk set that we've squeezed on to one.

M7008+: INTEGRATED PACKAGE. A three disk set of a comprehensive program. Has Fortran and compiled versions with documentation. 3 disks. Accesses word processor/spreadsheet/database/graphics. Analyticalc. Requires hard disk. For experienced computer users.

M7009: 1-2-3 UTILITIES. Highly regarded collection of utilities that enhance the operations of Lotus 1-2-3. A multi-function utility that assists with use of Lotus 1-2-3. Provides an ascii text generator, printer control, Prokey-type template, useful macro programs, and more! A gem.

M7010: MATHS & STATS. An extensive collection of programs in Basic. Similar to M7006 but has fewer of the less-used statistics functions and a host of useful maths programs – integration, binomial/quadratic/simultaneous equations, etc. programs are menu-driven.

M7011+: 1-2-3 WORKSHEETS. Comprehensive special set of worksheets, aids and utilities for Lotus 1-2-3. 8 disks. (Does not include M7009.) Includes: switch between worksheets, statistical analysis, depreciation, net present value, profitability and breakeven analysis, cash flow and rate of return, linear regression, documents formulas, prepares data for import, address label macros, technical notes, menus, financial analysis, amortisation, portfolio analysis, notepad, calendar, enhanced printer control, rental property analysis, trend analysis, much more.

M7012: BUSINESS EMULATION. Examine alternatives for better results in manufacture, marketing, advertising, sales, finance purchasing, labour relations, personnel, banking and financial planning. Lightning: an evaluation copy.

M7013+: DEBTORS BILLING. A comprehensive system for maintaining debtors' records, issuing notices and analyses, etc. Two disk set.

M7014+: FARM MANAGEMENT. A useful collection of decision/analysis tools. Includes computations for gestation and feeding, harvest and yields, livestock diets, budgeting, loan calculation, and more. 3 disk set. Needs Basic.

M7015: PROJECT MANAGEMENT. For construction and other projects. Will handle 1000 tasks and does critical path analysis, cash flow, bar charts, cost reports, etc. with subcontractors. Menu-driven, easy to use. Requires Basic.

M7016: STOCK CHARTING SYSTEM. Records highs, lows, volumes, moving averages of stock market prices and charting for you. Requires Basic.

M7018: PROJECT QUOTATION. Prepare quotations for projects, combining materials, parts, labour, profit margins, etc.

M7020+: STATISTICAL TOOLS. A two disk set of utilities that determines sample sizes and confidence intervals, randomisation tests, generates randomisation plans, calculates various distributions, and much more!

M7021+: LOTUS UTILITIES AND WORKSHEETS. A two disk set for printing formulae, installing EGA, preparing text for input into worksheets, setting up 640K virtual memory, installing on hard disk, etc. Has worksheets for trend lines, interest calculation, printing special characters, calc loans, managing portfolios and rental property, etc.

M7022+ : INCOME AND EXPENSE TRACKER. Records input of operations and has a reporting system with many nice features that shows you how much you are spending and whether there is anything left for you! Two disks.

M7023+ : SINGLE ENTRY ACCOUNTING - If you don't feel comfortable with double-entry this is a simpler approach that will handle general ledger, accounts receivable, accounts payable, inventory, payroll and depreciation. PC Accountant. It has good documentation. Two disk set.

M7024+ : PAYROLL SYSTEM. Flexible, easy to use, adjustable rates. 2 disks. Good documentation.

M7025+ : LOTUS 123 UTILITIES AND WORKSHEETS. A two disk set that includes a file link - front end that allows easier access to worksheets. The set also includes worksheets for cheque book, loan instalments, mailing list maintenance, time management, printer utilities, financial applications, etc.

M7026+ : SYMPHONY TIPS AND WORKSHEETS - A special set of six disks which include tips on using word processor, importing multiplan data, using sidekick; applications for banking, insurance and medical; also 5 year business plans; loan; mailing list, cheque book macros; biorhythms, graphics, telephone redial, disk labels, and lots more. 6 disks.

M7027: PROJECT MANAGEMENT - Gantt Charts - Produces presentation-quality Gantt Charts, transparencies, drives a video projector, displays project status and more.

M7028: MANAGING MONEY - Earning an income is only part of the task. This disk helps you to keep some of it and assists in making your capital grow. Includes Time and Money plus some very good analytical tools.

M7029: INTEGRATED ACCOUNTING. General ledger, Cash Book, Debtors, Payroll, etc - all on one disk. Excellent system. Not available in Australia and New Zealand.

M7030: CALCULATOR COLLECTION: A special collection, including Equator (Maths/Finance/Physics); programmable; many digit calcs, etc.

M7031: PERSONAL FINANCE MANAGER. Manages cheque and credit card a/cs, savings, purchases, withdrawals, interest, budgets.

M7032: SMALL BUSINESS SELECTION. Some special programs that we've gathered: a small spreadsheet, mail list manager, print controller, typewriter emulator, text reader, word processor, & UK accounting system for income/expenditure/reports - all on one disk!

M7033+ : SALES MANAGEMENT. Controls list of prospects, manages sales, order processing, job costing, profit analysis, labels, letters. Needs hard disk. 3 disks.

M7034+ : BUDGETING. Keeps track of estimated expenses, actual, variances. For hard disk. 2 disks.

M7035: OPTIMAL DECISION MAKING. Linear programming with spreadsheet style data editor. Play with variable in your search for the optimal solution. Contains Gulp.

M7036: PHARMACY SYSTEM. Prints contents on labels. Allows you to maintain a database of up to 2000 ingredients.

M7037+ : MARKET RESEARCH ANALYSIS. Analyses results of surveys and public opinion polls. 25 variables, 50 data columns, 9 values per variable. SST. 2 disks.

M7038: EMPLOYEE PERSONALITY PROFILES. Lets you develop benchmarks/standards for employment requirements.

M7039: REAL ESTATE PROPERTY SALES. RES stores info re properties, sales, agents, commissions. Gives reports. Menu-driven, easy to use. Will also delete all closed sales at year end.

M7040: 123 COMPATIBLE SPREADSHEET. Also does graphs, pie charts. 52 x 200 cells. Aseasyas.

M7041: MEMORY-RESIDENT SPREADSHEET. Full featured. At hand when you want it. Sits in memory until you call it up to insert table of figures into text, etc. Instacalc. Disk also contains Resicalc, a super memory -resident calculator.

M7042+ : BILLINGS FOR SERVICES (Professions, trades, etc.). Soar gives costs, mailing lists, invoices; controls debtors, merges files. A quality program that's easy to use. Powerful reporting. 2 disks.

M7043: INTEGRATED SPREADSHEET/EDITOR. On one disk. Effective combination from Alan. Two programs from same author that are compatible.

M7044+ : CONTRACT BID ESTIMATING. Five disk set of a powerful program for calculating costs, margins, progress and final estimates. Esti-Bid is flexible and easy to use. needs hard disk.

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. PC-Till.

M7048: PURCHASE ORDER SYSTEM. Keeps track of orders, goods received, quantities, prices, suppliers.

M7049: PERSONAL FINANCE ANALYST. Examines your monetary/assets situation and makes projections for planning.

M7050: STOCK EXCHANGE ANALYSIS (2). Keeps track of investments, reads reports, calculates rates of return, present values, costs, percentage gains & losses, produces files for investments under consideration for evaluation, etc. Needs Basic. Uvester.

M7051: SPREADSHEET WITH BUILT-IN WORD PROCESSOR. Turbo Calc has 90 x 256 cells, bar graphs, protected fields, comprehensive features, including sorts, imports of many programs (including 123).

M7052+ : PROPERTY MANAGEMENT. This is the DbaseIII (and Clipper) version of M8005: Keeps track of tenanted properties, charts, prints reports, keeps track of payments. 2 disks.

M7053: ALGEBRAIC CALCULATOR. PFSA is fast and can work with large expressions. Written in Fortran and compiled. Can use either integer or real arithmetic. Needs 300k ram. Handles polynomial expressions and binomial expansions.

DATABASE MANAGEMENT

M8001+ : DATA BASE MANAGEMENT - PC-FILE PLUS. Son of PC-File III with many good features and recent enhancements. File manager, which also does calculations. Suitable for sales, inventory, personnel, mailing lists - even as a cash book! Will total columns. Two disks.

M8001A: PC-GRAPH to graph data produced by PC-File.

M8002+ : DBASE 11/111 APPLICATIONS. Extensive group of Dbase applications, program extensions and algorithms. Includes cheque program, mail management, inventory control, budgeting and accounting, memo maker, phone index, menu drive, typewriter simulation, depreciation, automatic formatting, search for duplicate entries, general ledger, runtime decoder, graphics and other utilities. Set of 5 disks.

M8003+ : FAMILY TREE/GENEALOGY. Extensive program in Basic for recording, tracing, grouping, printing, etc., family relationships. 2 disks. Also, we've added an important utility to assist with organising notes.

M8004: DATA BASE MANAGEMENT - DBMS. A relational data base program that allows you to have more than one file open at a time - draw information from different areas. Nicely documented. Does not do calculations.

M8005: DBASE II – PROPERTY MANAGEMENT. Manages rental investment properties, charts, prints reports, keeps track of payments. Will also run under CP/M. Just change extension in name to suit CP/M version of DBASEII. For DbaseII version see M7052+.

M8006+: DATA BASE SPREAD SHEET. Comprehensive, with "expert system" query facility. Store as a data base and perform spreadsheet calculations. 2 disk set. Compiled Basic, with source and manual. 2 disks.

M8007: DBASEIII SCREEN/CODE GENERATOR. Greatly reduces the amount of programming you need to do. Much of the coding is generated to include in your own program.

M8008: FORMS AND REPORTS. Several programs to generate forms and report information contained in data bases. There is one compatible with PC-File also.

M8009+: FILE EXPRESS – SUPER DATA BASE MANAGER. New version that allows 120 fields, 16 million records, fast sorting, fields anywhere on the screen, calculations. Suits sales/stocks/mailling/personnel/payroll. Will calculate, print invoices, labels, etc. Compatible with PC-file. Good documentation plus help screens. Highly recommended. 2 disks.

M8010: MAILING LIST MANAGER. Well-documented programs that allow you to add, edit, sort and print mailing labels for all members or selected groups.

M8011+: RBASE-TYPE DATABASE. A three disk set of a powerful, sophisticated database management program (PC-RIM Relational Management Information System). Operates as standalone system in both menu and command modes or will drive application programs. Has natural language query system. Extensive documentation and help files. Needs hard disk.

M8012: LABEL PRINTING. A collection of special programs that allows you to print labels for all sorts of uses, as well as control mailing lists. Includes Label Maker and others.

M8014: INSTANT RECALL. A memory-resident database that lets you record and access information without leaving your main program. Happily cohabits with most other programs.

M8015: RETAIL INVENTORY STOCK CONTROL. A menu-driven very fast system for keeping inventories up to date. Suits business that supplies products or parts. This version works on twin floppy drives only. Author has a hard disk version.

M8016: MAIL MANAGER FOR MULTIMATE. Menu-driven label producer. Lists created can be accessed by Multimate, merged with forms etc.

M8017: PRODUCTION DATABASE. Keeps track of suppliers, materials requirements, product costs, etc. UK system. "Parts".

M8018+: DBASEIII COMPATIBLE DATABASE MANAGER. Wampum has a high degree of compatibility with its more famous (and expensive) relative. The author aimed at providing the same functions and the ability to run the same files. As he had the advantage of appearing later, some would say he did a better job. Capable of major or small tasks. Will also print reports and labels from DBASEIII+ files. Highly recommended. Not copy protected. Two disks. The documentation occupies all of the second disk.

M8019: DBASEIII UTILITIES (1). Add colour, printer control codes, compress/decompress, menu front end, show data flow, read file structure, more.

M8020: DBASEIII UTILITIES (2). Weighted Retrieval. New view of data based on your selection criteria. Attach relative importance to factors, such as price, muddy track, personality requirements, demographic and geographic criteria, etc.

M8021: DBASEIII UTILITIES (3). Add-ons and utilities. Compiled, with source code. Display header info, port addresses, date entry, count comments, encryption, view files, strip characters, more.

M8022: HOME INVENTORY. Keep a record of your possessions as a safeguard against fire and theft. Also provides a record for insurance and executorship purposes.

M8023: NAMEPAL – DATABASE & MAIL SYSTEM. Comprehensive yet easy to use for keeping track of important prospects.

M8024: OZZI-MAIL. A special mailing database designed for Australian conditions. Includes postcodes and common abbreviations, which are spelt out in full on the envelope and postcode added.

M8025: MEMORY-BASED DATA MANAGER. Sidefile can manipulate small data bases and lists, do small editing, up to 1000 records. Uses ASCII files. Does adding, deleting, listing, sorting, printing, finding, replacing, merging, changes field widths, totals fields, splits and combines files, etc.

M8026: NETWORKED DATABASE. Dex/Net monitors and maintains rolaxed ("card-file") like entries in a local area network (LAN) based or standalone environment. Keeps track of names/addresses and similar information. Needs Dos 3.1 or higher.

EDUCATION

M3004: COMPUTER-AIDED INSTRUCTION. Design lessons with the aid of your computer. Has extensive documentation.

M9001: GWBASIC/BASICA COMPATIBLE INTERPRETER & BASIC TUTORIAL. If you didn't get an industry-standard Basic with your machine (eg Amstrad 1512) this shareware version (P-Basic) is an excellent substitute. You'll need it for running many programs. The disk also contains a tutorial showing how to program in Basic. On-screen demonstration and explanation.

M9002: MACRO-ASSEMBLER TUTORIAL. How to write in assembly language. Steps to becoming assembler-literate. Intended for beginners to machine-level writing.

M9003: MATHS TUTOR. A Basic program that suits primary classes. Has six grades of arithmetic training.

M9004: PC-TUTOR. Learn more about the operation of your computer, the important commands, etc.

M9005+: SPELLING AND VOCABULARY. Suits high school. Contains 7500 words, but not the most common 4000 – the next most commonly used words. Compiled with Basic source code included. 4 disk set. American spelling can be changed.

M9006: HISTORY EDUCATION. A Basic educational game that teaches history. An adventure approach that wins/loses gold, has time warps etc. American conditions but questions can be changed.

M9007: SECONDARY MATHEMATICS. A collection of Basic programs that instructs in trig / complex functions / line equations / area calculation / formula conversion / multiplication / quadri / subtraction / imperial-metric conversion / slopes / co-ordinates / logarithmic functions / determinates / function points, etc.

M9008+: "C" TUTOR – A two disk set that contains a comprehensive and easily followed course in the "C" programming language. Includes tutorial text and source code for examples. Requires two drives. Suitable for those with prior experience in programming.

M9009+: PASCAL TUTOR – A two disk set that suits both the novice and experienced programmer, with references to Generic and Turbo Pascal. Contains the text and source code for examples. Good instruction in structured programming. Effective use requires a Pascal Compiler.

M9010: INTRODUCTION TO BASIC PROGRAMMING WITH GAMES – There is a well written tutorial on basic, plus number games, anagram puzzles, and a simple word processor. Programs are in Basic source code. Needs 2 disk drives.

M9011: TEACHERS GRADEBOOK — Keeping track of test marks and providing comparisons and reports.

M9012: ANSWER CHECKER. This program compares words, sentences, terms, definitions, questions and answers.

M9013: STRUCTURED PROGRAMMING TUTORIAL AND AID. Tutorial on structured programming with a working tool for designing and documenting the structure of Turbo Pascal programs.

M9014: MATHEMATICS LEARNING GAME — a fascinating way for primary children to learn their numbers. a fun game approach. Calculate the correct answer before the problem falls into a bucket. Funnels & Buckets.

M9015: FOREIGN LANGUAGE TUTORIAL. Has instructions for French, German, Italian, Spanish and Hebrew.

M9016: LOTUS 1-2-3 TUTORIAL. Advanced techniques for developing spreadsheet skills. Requires 123 compatible spreadsheet program. See M7040 if you don't have Lotus 123.

M9017: DOS TIPS AND HINTS. Collection of advice on printing, screen, keyboard, colour, batching, booting, AT keyboard, etc.

M9018: EDUCATIONAL GAMES FOR PRESCHOOLERS. Fun with words, letters and numbers.

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. Also evaluates.

M9022 + : MODULAR2 TUTORIAL. 2 disks that teach you how to program in this important new language.

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.

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. Special attention to the conjugation of verbs.

M9027: SECONDARY MATHS (2). Compiled, with Pascal source. Equations, lines, triangles, Ohm's Law, Parallel Circuits.

M9028: SPANISH LANGUAGE EDUCATIONAL GAME. A version of Hangman which requires answers of words and phrases in Spanish. A stimulating way to learn. (Make too many mistakes and you get hanged!)

GENERAL, HEALTH, ETC.

M9501: DIETER'S FRIEND. A nutrition analysis program that provides details of 27 nutrients in different foods, etc. and compares your daily intake with recommended allowances. Also produces graphs. Requires Basic. Evaluation copy (Good analysis but limited printing facility).

M9502: SPORTING ADMINISTRATION. PC-SPORT is another fine Australian contribution and is especially helpful to those running sporting events who need to keep track of scores and results, match opponents, print reports, etc.

M9503 + : BIBLICAL QUOTES — A two disk set of 14800 cross-references to 7956 verses of the New Testament. Has built-in editor for preparing lectures, letters, sermons, essays, etc.

M9504 + : RECIPE MANAGEMENT. Contains hundreds of recipes and it has excellent search facilities so that you can find what you want. It's also possible to add your own recipes to the file. 2 disks.

M9505: WORLD FACTS AND FIGURES. Details of population, per capita income, capitals, geographic area, births, deaths, etc. for each country.

M9506: NUTRITIONAL MEAL PLANNING. Plan varied meals, nutrition, identify substitutes, add variety to your meals, evaluate recipes.

M9508: GOLF SCORER. Keeps track of scores, putts, courses. Shows progress and averages. Needs Basic.

M9510: COMPUTER DEMONSTRATION PACKAGE. Suits computer retailers as it gives a demonstration of the system or provides a layout of a package. Includes a Screen Formatter, Demo Maker, and a Demo Run which executes it all.

M9511: PERPETUAL DIARY. Plan ahead for appointments, events, birthdays. Print reports. Extensive. Needs Basic.

M9512: GOURMET PIE RECIPES. Some of the most tantalising and delicious pies known. This disk is complete but serves as an introduction to a series of recipes for all kinds of food that have been collected from the best books available.

M9513: LIFESTYLE AND HEALTH ANALYSIS. A group of programs that give results from different areas: Personality assessment, biorhythms, heart disease risk, alcohol screening and life expectancy.

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.

M9516: ELECTRIC COOKBOOK. A recipe (or other ingredients) management program that is menu driven and allows you to enter your own ingredients, alter, find, print, sort, and display recipes.

CONTRIBUTING TO OUR LIBRARY

We are always looking for new contributions to our software library. To help those who are thinking of submitting programs, we offer the following hints and suggestions.

- 1 Make sure that your program has original features not to be found in similar programs already available. For instance, there are many mail-management programs. However, not many can handle the sorting of British postcodes, which combine both letters and numbers. Usual sorting is either numeric or alphabetic.*
- 2 Avoid treading well-travelled ground. There is a glut of word-processors, menu-systems, Dos front-ends (file management), and games resembling Space Invaders, Pacman, and Dungeons & Dragons. It pays to break new ground. We are currently getting lots of recipe programs, so new contributions in this area need special features.*
- 3 Look for fertile new territory. For instance there is a lot of interest in Desk-Top Publishing, so there is still a need for 'simple' word-processors that have strong graphics features, such as the ability to produce large typefaces, use multi-columns on a page, print different styles of typefaces (fonts), have access to foreign characters, borders and lines for screens, etc.*
- 4 Check the disk before you send it to us. It's amazing how often a disk is never released or is simply delayed in its release because our copy just didn't work, or there was a faulty sector on the original disk so we couldn't copy it, etc.*
- 5 Make sure there is adequate documentation on the disk and that it includes mention of your registration fee.*
- 6 Have your documentation checked with a spelling checker. Try M3007 if you don't already have one. An otherwise good program can be ruined by documentation that contains typing mistakes and spelling errors. Faulty documentation means that the submitted disk is set aside until someone has time to spend making these corrections. In the meantime we receive contributions that require little of our time, so they get processed, included in our catalogue, and distributed much sooner.*

SUMMARY OF RECENT ADDITIONS TO THIS CATALOGUE

(Fuller details are given in the catalogue)

M1016+: MOVIE DATABASE.

This is now a two disk set.

M1068: STRIP POKER.

An exciting way pass an hour or two.

M1069: SLIDE SHOW - GIRLIE SLIDES.

Automated and entertaining. Not for kids.

M1070: MORE PROVOCATIVE PICTURES (3).

Mac graphics and some animated pics.

M1071: KARKOTH ADVENTURE.

Sword and sorcery in a grand style.

M1072: LARN'S ADVENTURE.

A good dungeons and dragons epic.

M1073: CARD GAMES.

Bridge, Canasta, Draw Poker, Hearts.

M1074: SPACE CONFLICT.

You v Labbits and Voldrons in outer space.

M1075: EAMON ADVENTURES.

Cronum's Castle/Lord of the Underland.

M1076: DICE GAME.

Addictive, fun game. Suits groups.

M1077: BIBLICAL CHARACTERS.

Guessing game based on clues that are given.

M2048: PAL FOR SIDEKICK.

Enhances SK's appointments, includes alarm clock.

M2049: RIGHT HAND MAN.

Top desk utility with loads of features.

M2050: TRINITY & THRASHER.

Optimise buffer command; branch within batches.

M2051: VIDEO/MONITOR UTILITIES.

Host of useful files to improve efficiency.

M2052: COLLECTED UTILITIES. (1)

Small text edit, hex convert, virt print, unprot.

M2053: COLLECTED UTILITIES. (2)

Cache, Shortcut, new List, change step rate, etc.

M2054: COLLECTED UTILITIES. (3)

PC-Banner, PMenu, Lock Keyboard.

M2055+: QDOS SHELL.

Operating System enhance. More features, control.

M2056: MUSTANG UTILITIES.

Superior label print, mortgage analysis, catalog.

M2057: SUPER BUFFER AND SPEED PRINT.

Cache for disk access and spooler for print.

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Does fast calculations and large expressions.

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Entertaining, educational game of word guessing.

M9516: ELECTRIC COOKBOOK.

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We include source coding where possible. The programs are documented or the instructions are built in to the program. Disks are formatted for MS-DOS ver 2 or greater. 360K 5¼" and 3½" disks.

Programs are intended for IBM-PC or close compatibles (such as Amstrad 1512). If Basic is specified then Basic or GWBasic (or our shareware compatible version on M9001) is required, not Basic2. Basic is required if an asterisk is shown alongside the name.

We have added a CGA emulator to our disks so that those with Hercules boards can also play.

GAMES

G1: ACQB. Arm Chair Quarterback is a football strategy game. Rules are explained. You provide wits, the computer action.

G2: AFGHANISTAN. War Game with choice of weapons and roles.

G3: ANTONYMS.* Word game that challenges you to find the opposite of nominated words. Source provided.

G4: ASTRO. Dodging enemy ships and meteors. Well animated. Suit all ages.

G5: BABY. Guesome but popular Kong-type game. Climb levels whilst avoiding the falling babies.

G6: BACKGAMMON. A good version of this popular board game.

G7: BASEBALL.* Match play with strategic choices of play for pitching, hitting.

G8: BEAST. Marauding beasts chase you through a hi-res maze.

G9: BIORHYTHM.* Prints chart of emotional, mental, physical biorhythms.

G10: BLACKFR13.* Investment simulation. Try to increase value of portfolio without going broke.

G11: BLACKJACK. Good version of this popular card game.

G12: BLUESBOX.* Easy to use song composer.

G13: BRICKS. Quick moving game where you hit a ball against a wall to demolish it. Like playing squash against the computer.

G14: BUGSI Centipede creature hunts you through the forest. When you fire and hit it, the creature multiplies! Fast game.

G15: CATCH 88.* Sky is raining letters and numbers. Catch them by correctly matching.

G16: CHASE. You're in a high voltage maze, chased by robots. Compiled with Pascal source code.

G17: CHESS.* Well designed, good board on screen.

G18: CIA.* Adventure with spies and other sinister doings.

G19: CIVILWAR.* Tactical simulation based on actual battles in Civil War.

G20: CRISIS. You're our last hope to save the world from alien invaders.

G20A: DIGGER. Fun to play. Good graphics as digger digs tunnels for gold/emeralds while hungry creatures hunt for digger.

G21: DILEMMA. You have to outguess your opponent. Cooperate or oppose?

G22: DOTS.* Board strategy game against the computer, joining dots with lines.

G23: DSK. Disk Crash. As a floppy disk you have to avoid the falling magnets.

G24: DRAIN. Joke program which causes computer to pretend it's awash and needs to drain.

G27: ELECTION.* Simulates candidate campaigning, raising funds, giving speeches. Good choices win points.

G28: ELEVATOR. You're at the bottom of a series of elevator shafts. Try to reach top without getting clobbered by elevator.

G29: ELI.* Animated cartoon depicting the adventures of Eli.

G30: ELIZA. Classic Psychiatrist game where the computer counsels you. Compiled version.

G31: ENCOUNTE.* Space encounter of the unfriendly kind. Good battle.

G32: ENTRAP. Othello board-type game, cleverly designed, good graphics.

G33: FIRE. Forest fire is raging and you have limited resources to combat. Will you lose the forest? What is your strategy?

G34: FLIGHTMARE. You are a pilot for Omegans against marauding vendals.

G35: FOOTBALL.* Tactical play in a footy simulation.

G36: FORTUNE. Wheel of fortune. Spin the wheel and win prizes or be penalised. More than one can play.

G37: FROG. Frog tries to cross road to safety and avoid being splattered by traffic.

G38: FUN.* Fun with numbers. It helps to understand a little algebra to solve the problems.

G39: GEOGRAPHY. Educational game that tests you on cities, capitals, countries, etc.

G40: PC-GOLF. Very well presented. Takes into account handicaps, clubs, swing, choice of three courses.

G41: GRIME. Hi-res fight against those nasty grimes that threaten to attach and overwhelm.

G42: HANGMAN.* Correctly spell the mystery word before the computer hangs your image.

G43: HANOI.* Transfer disks from one pile to another. Requires thought.

G44: HOBBIT.* Adventure. Hobbit thief tries to steal from the wizard's castle.

G45: HORNADETTE. Adventure. Invading the Castle and find the secret formula.

G46: IBMADV. Adventure. Government agent infiltrates IBM headquarters.

G47: IQUEEN.* Board game based on chess and using only queens.

G48: JUMPJOE. Mad robots chase Joe through rooms and past obstacles on space station.

G49: KONG. Climb the structures against falling objects and other dangers.

G50: LANDER.* Try to land a spacecraft against gravity, adjusting rocket thrust. Good sound and graphics.

G51: LANDMINE. The enemy has buried mines and you have to reach headquarters — preferably intact.

G52: LIFE2. Enter details of bacteria colonies and they breed, generating patterns on the screen.

G53: LOCUST. Withdrawn.

G54: MARS ESCAPE.* Adventure. Your mission is to escape from Mars.

G55: MAZE1. Mazes with different degrees of difficulty. Good graphics.

G56: METEOR.* Erase solid blocks before the constantly falling meteors hit you.

G57: MEMBRANE.* Chemistry game. You are a cell membrane. Learn about cell behaviour.

G58: MUSICIAN. Compose songs, music. Helps you to compose on the screen and play back.

G59: OIL. Offshore Drilling Simulation. Organise resources to strike oil or go broke.

G59A: PACMAN. Classic where you are in a maze hunting treasure while the monsters hunt you. Different levels of play.

G60: PANGO. Attempts to clear bees in a field by stunning or squashing with blocks.

G61: PARATROOPER. Fight off the paratroopers who keep landing until they can overwhelm.

G62: PINBALL. Good screen effects let you play this arcade type game with the cursor keys.

G63: PIRATE.* Adventure set on a pirate ship.

G64: PITFALL. Fast moving flight through valley or pit. Good screen effects. Needs fast reflexes to avoid walls and other dangers.

G65: POKER. Card game. Several can play or just you against the computer.

G66: POKER MACHINE. (ONE ARMED BANDIT). Try to line up the reels for your win.

G67: POLYMAZE. Computer generates hexagonal mazes and will demonstrate how to solve them.

G68: PRESCH.* Spelling and number games for small children.

PROVOCATIVE PINUPS: These are intended for printing. Hang alongside last month's sales figures (or whatever).

G69: CALENDAR GIRL.

G70: JEZABEL.

G71: DAWN.

G72: DEILILAH.

PROVOCATIVE SCREEN PICS: These are animated screen pictures.

G73: RECLINING NUDE.

G74: STRIP.

G75: PYRAMID. Fast moving game where you step onto cubes to avoid bouncing rocks and creatures.

G76: QBERT. Bert & the Snake. Jump from one tile to another pursued by the snake and falling fruit.

G77: RACECAR.* You race the computer on racetrack controlling speed, braking, etc.

G78: RAIN. Challenging pinball game that has very good graphics and cursor control.

G79: ROCKETS. Fascinating, fast, hi-res game of space battle.

G80: ROULETTE. Gambling simulation using screen version of a roulette wheel. Cheaper than going to a real casino.

G81: SCATTER. Logic puzzle. Fire a laser to determine whereabouts of 10 atoms in a box.

G82: SEAWOLF.* Valliant submarine commander attempts to sink the invasion fleet with his torpedoes.

G83: SECRET ADVENTURE.* Create your own adventure. For small children. Answer questions about rooms and monsters and it generates a game for you.

G84: SKYTREK. Comprehensive strategy game of the Startrek type.

G85: SLOTMACHINE.* Poker Machine game that can be played by all ages. Animated.

G86: SOLITAIRE. Card game that shows you the draw and you work out where to place each card.

G87: SPACEWARS. Nicely presented Starwars type of game with many factors to consider.

G88: SPACEVADERS. Race across the screen shooting them down. Good graphics.

G89: STARLANE.* Interstellar Trading. Space Monopoly where you try to build an empire.

G90: STOCKMARKET. Simulation game where you try to amass your fortune in stocks and shares.

G91: SQUARE.* Like Tic Tac Toe but more combinations with dots on larger board.

G92: SUBCHASE. You're in a destroyer on patrol trying to destroy subs swarming below.

G93: SWARMS.* Attack of the killer bees! BeeWars?

G94: TANK.* Two tank commanders slug it out.

G95: TRADE.* Star trading by intergalactic merchant. The ultimate travelling salesman.

G96: WIZARD.* Adventure in the Wizard's castle against monsters, aifs, hobbits, dwarf, etc.

G97: WOMBAT.* Generates questions for mental arithmetic. Suits primary children.

G98: WEATHER.* Answer questions about conditions of last two days and it will attempt to forecast tomorrow's weather.

G99: XWING. Very good version of starwars-type game where you are pitted against Darth Vader and the Death Star space station.

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32	33	34	35	36	37	38	39
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56	57	58	59	59A	60	61	62
63	64	65	66	67	68	69	70
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Australia and New Zealand offices also have catalogues for Apple II and Commodore 64.

New Zealand has a further catalogue for the Commodore Amiga.

Many of the programmes offered are contributed to our library as "Shareware". In such cases, the author allows low cost distribution and includes on the disk a request that satisfied users send him a "registration fee", usually a relatively small amount compared to the usual cost of commercial programmes. Naturally, it is in the author's interest to make the user happy with the quality of the product, to encourage contributions. The standard of product offered is thus usually very high, with many of the authors either professional programmers or advanced amateurs.

We have tried to choose programmes as machine independent as possible and provide source code where available. In many cases, Shareware authors will not release source code although it is more commonly available for public domain software and for CP/M.

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QuickKeys

CE Software has produced a utility to allow end-users virtually unlimited ability to add command key equivalents to applications. Steven Bobker explains.

The mouse made the Mac. The interface would not have been possible without some method of positioning the cursor other than the keyboard method of older and less efficient computers.

But the mouse isn't always the best way to go. Fortunately, the Mac's designers were aware of that. While they didn't provide the cursor, they did allow what are called command key equivalents. That is, a menu choice (or other action) occurs when you press the command (or cloverleaf) key along with one or more other keys.

Power users soon discovered how useful these command key equivalents were and devised ways of adding more of them to their programs. Whole programs were offered to let less advanced users easily install command key equivalents wherever they wanted to.

There were (and are) some problems with command key equivalents. Some programs never look for them. A good example of that is MacWrite, which accepts command key equivalents perfectly as long as a document window is open. Close that window, however, and MacWrite refuses to accept any command key equivalents.

Another problem area has been telecommunications programs. The problem lies not in the programs themselves, but in the way that software running on remote computers interprets the command key equivalents you type.

Here's a simple example: You've set your telecom program up to save when-

ever you type COMMAND-S. Now, let's assume you're connected to an online information service and you want to save whatever is selected on the screen. So you type COMMAND-S. And suddenly the system stops sending you information! That's because it (and many other telecommunications software packages) understands Command-S as the Stop Sending command.

Some Mac programs (for example, Red Ryder) get around that situation by sending their command key equivalents with the Option key used in place of the Command key. That works, but is somewhat awkward and not particularly intuitive. Other programs (such as Smartcom II) simply don't allow command key equivalents, thus robbing them of some of their usefulness and functionality.

Since command key equivalents are so useful, there have been many solutions. Several commercial, public domain and shareware programs have included features that let them send the counterparts of command key equivalents. Lofty Becker has created a whole series of keyboard remapping utilities (one is available in the US on Volume 2 of *Quick and Dirty Utilities* by Dreams of the Phoenix, the rest are split between shareware and the public domain). Still, the perfect solution wasn't there. Some of these programs were downright nasty, some didn't do quite enough, and some had sporadic problems and had to be used with inordinate care. None was particularly transparent.

That's all changed. The solution is

available now. It's QuickKeys from CE Software. If you use command key equivalents more than once a day, you owe it to yourself to look at QuickKeys.

QuickKeys requires at least 512k of RAM, and either the 128k ROM (in the Mac 512E and Mac Plus) or the Mac II or SE 256k ROM. It will not run on a 128k Mac or on a 512k Mac that still has the original 64k ROM. You'll also need to be running System 4.1 (or higher). That's because QuickKeys is implemented as a resource of type cdev and cdevs don't work with earlier Systems.

Installing QuickKeys and its companion DialogKeys is very simple. If you are using a hard disk, you simply drag the programs into the System folder on the hard disk and restart the Mac. Life is slightly more complicated for those not fortunate enough to have a hard disk. In that case, you have to put QuickKeys and DialogKeys in the System folder on each of your System disks. No special steps are involved, though.

If you have a third party keyboard be sure to also drag over the special INIT file for it. Without the INIT, third-party keyboards may not work properly. The INIT is small and totally transparent after it's dragged into place.

Once the programs are in place, simply restart your Mac. You'll notice the small QuickKeys and DialogKeys icons appear during the process. That's your confirmation that both programs loaded correctly.

As a first step, run the companion program Quick Access. This is

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CHECKOUT

QuickKeys' off-line editor. Here you can look at, edit and load all of the many keysets already provided on the disk. Select the appropriate set or sets and load them. You'll always have a Universal set loaded and you can load keysets for specific applications. The application-specific keysets can either be a set you have created from scratch or a set taken or modified from one of the many provided. Don't worry too much about overlapping assignments between the Universal keyset and an application-specific keyset. In those cases, QuickKeys will assume that the application-specific assignment is more important and it will take precedence over the Universal set assignment.

Everything is now ready for action. To see what's available to you, press OPTION-COMMAND-SPACEBAR. The QuickKeys Reference Card will fill your screen. A good idea the first time you see this card is to immediately press COMMAND-SHIFT-3, creating a screen image of the card. You can then print the card out. If you're hooked up to an ImageWriter, you can press COMMAND-SHIFT-4 and have what's shown on the screen print out directly.

Take a few moments to study the Reference Card. Each item has three distinct parts. The first part is the key or combination of keys that you are to press. Symbols in square brackets indicate keys on the numeric keypad, if you have one. And the keys that are marked F1, F2 and so on are function keys on the extended keyboards. The middle icon shows you what sort of QuickKey this item is. The final part of the item is a quick and (hopefully) totally obvious description of what this particular QuickKey does. Run through the list of actions. You'll probably find some that you never will use. Make a note of them so you can get rid of them later. Think of what else you might want to add.

Now it's time to edit the list. Pull down the Apple menu and select the Control Panel. When it appears, select the QuickKeys icon from the scrollable list on the left side. If the icon is not visible when you open the DA, scroll down to

it. As soon as you select the icon the rest of the Control Panel window will show the QuickKeys work area. The Define menu is the most important menu. Here is where you'll create the powerful combinations that make QuickKeys so useful.

Doing what can be done

There are eleven major types of QuickKeys. From the top of the Define menu, they are called: Text, File, Menu/DA, Alias, Clicks, Sequences, Buttons, Mousies, Specials, Date/Time and FKEYs.

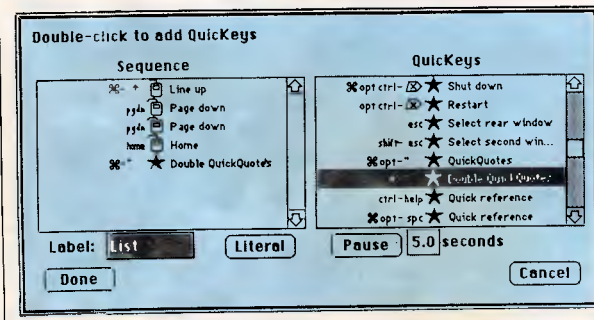
Text items are simply that. You are presented with a dialog box in which you can type any desired text, including Returns and special characters such as

'The Define menu is the most important menu. Here is where you'll create the powerful combinations that make QuickKeys so useful.'

the Command key (although that requires a special symbol). The only thing to watch out for is that you must avoid using the key combination that you will use to define this QuickKey in the text. If you do that you will send your Mac into a loop, effectively freezing it and forcing you to restart it.

This item can also be used to select DA and other menu choices. That's handy because some programs (MORE, for example) hide the menu bar when DAs are open.

The File item lets you launch any application or document. These are safe launches, where the current application is issued a correct QUIT command, thus giving you a chance to save work already done. File QuickKeys are very useful, but must be removed and reinstalled if you back up your hard disk or move



This is the dialog box you'll use to build sequences. The list on the left side is a nonsense sequence built of keys that are already installed in QuickKeys

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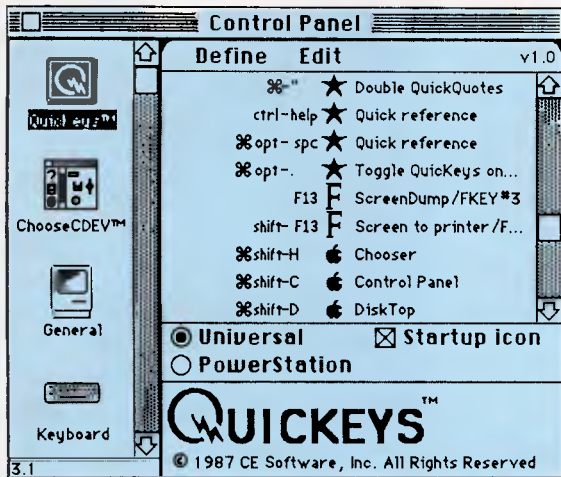
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CHECKOUT



The QuicKeys Control Panel. Select the QuicKeys icon from the list at the left to bring this up. This is where you'll do most of your assigning

the application or program. That's because they store file locations by means of internal Mac ID numbers that change when files are moved. Since almost everything they do can also be done with either the Text or Menu/DA items, use File items sparingly. You'll have fewer problems that way.

The Menu/DA item is usually the most useful option for new users. It lets you

assign any key combination to any menu item including those such as fonts and DAs where you normally cannot assign permanent key combinations. This item also lets you make more rational sense of the things that Microsoft calls menus and that look like menus but aren't real Mac menus. You can now assign the key combinations you want to them, too. The only restric-

tion to this item is that the item must be available; that is not dimmed or greyed.

QuicKeys looks for the actual name of the menu choice, not a relative position in a menu. Thus, you can add or delete fonts or DAs and QuicKeys will still find the right line.

Alias is simply that. It lets one keystroke take on the action of another. This is great for lefties who wish to shift some keys to the right (or left) side of the keyboard.

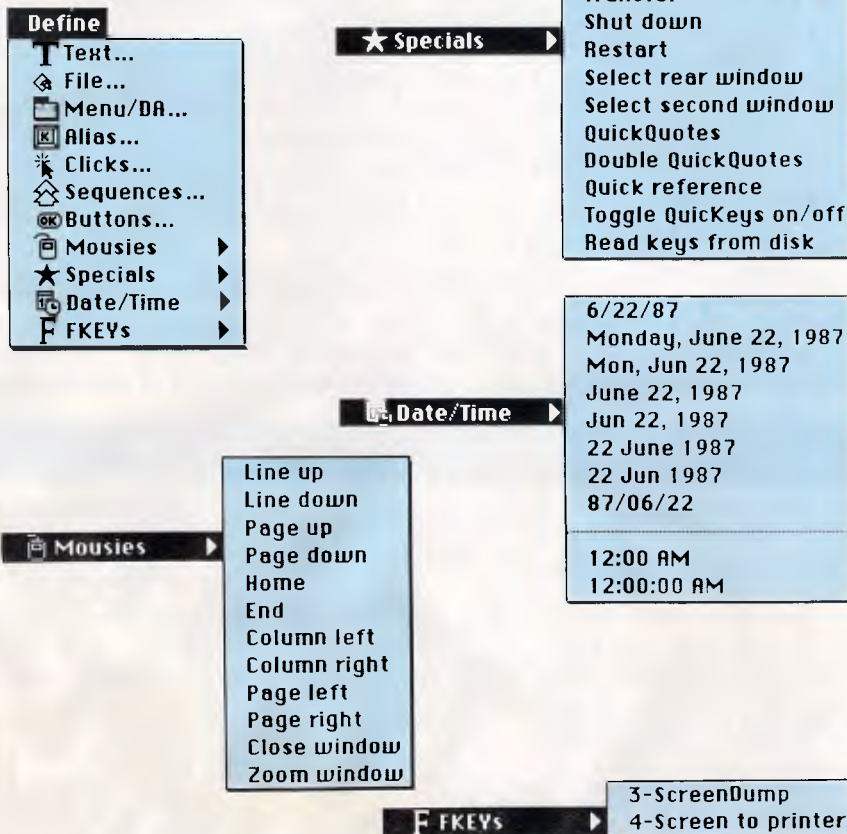
What you'll typically use this feature for is to make interfaces truly consistent on all your applications. Let's say you use COMMAND-S as the Save command in most programs. Normally you couldn't do that in MacWrite because MacWrite already uses COMMAND-S for Shadow style. Simple define an alias so that COMMAND-S saves your work. It doesn't matter that MacWrite has its own COMMAND-S because QuicKeys keystrokes take precedence over application keystrokes.

The Clicks item has a bonus. Not only can you define mouse click actions, but also drag actions. When you start to define a click, the menu bar is replaced by some instructions. All you need do is put the cursor where you want it and click the mouse button. You can also do a drag at this point. Starting and stopping positions will be remembered.

The dialog box that controls these actions will also let you name the action (handy for making up Sequences later) or finely edit the positions you selected with the mouse. You also have to make a choice when this dialog is open. There are some radio buttons marked Screen and Mouse Position. If Screen is selected the action always takes place at the exact same place on the screen. If Mouse Position is selected, then the action takes place relative to where the cursor was when you selected this QuicKey. When opting for Mouse Position you must also let QuicKeys know where the 0,0 reference point on your screen is. Simply click to indicate it.

Sequences are used to automate multi-step tasks by grouping many keystrokes into a single keystroke. This item is at the same time the easiest to use and most powerful item on the Define menu. All that you need remember is that there is currently a limit of thirty QuicKeys in each sequence and that you can not use sequences within sequences.

The actual sequence can be made up entirely of other, predefined QuicKeys or you can mix in literal text and timed pauses. This choice can let you do such things as create log-on macros (not great, but workable ones) for telecom-



The Define menu and its submenus. This is where the action is created

CHECKOUT

Description:

Click Relative to:
 Screen
 Mouse position

Drag Relative to:
 Screen
 Mouse position

Document Document

X= Y= X= Y=

Specify window:

Click(s)

Editing your clicks (and drags) is accomplished via this dialog box. You have extremely precise control of position. The Click(s) box at the lower left lets you specify whether an action requires a single, double or triple click. You can use this to change actions requiring a double click to single click actions

The Quick Access menu. This application serves as an off-line editor for Quickkeys

File

New...	⌘N
Open...	⌘O
Close	
Save	⌘S
Save as...	
Duplicate	⌘D
Install set into QuickKeys	
Read set from QuickKeys	
Print...	⌘P
Page Setup...	
Configure DialogKeys...	
UnInstall Program sets...	⌘U
Quit	⌘Q

munications programs that lack them (MacTerminal, for instance) or type the word QuickKeys in italics every time you press the slash key on your numeric keypad. It's great for writers who must work to a format.

Mac applications are constantly asking you to click on this button or that button. Some dialogs (the place you're most likely, other than HyperCard, to find buttons) have default choices. Sometimes they even show you what the default choice is (moving it as necessary). QuickKeys make the process surer. Select this choice and carefully type the exact name of the button in the resulting dialog. Then either click OK or use your QuickKey that does that. A Mousie is an action that normally requires both a mouse movement and a click. They're similar to what can be done using the Click choice, but easier to do with this item.

When the item is selected, a submenu appears (usually to the right, but pos-

sible to the left if space is tight). The submenu shows the 12 possible Mousie actions. Simply slide your cursor over and pick the one want.

Specials are useful actions that are somewhat hard to define using the other tools and that don't really fit any category. The submenu for this item has ten choices, ranging from Shut Down to Toggle QuickKeys On/Off. QuickQuotes (and Double QuickQuotes) are what many of us call Smart Quotes, those nicely curved quotation marks and apostrophes normally invoked by OPTION and OPTION-SHIFT LEFT and RIGHT BRACKET. QuickKeys will look at the context and correctly assign either the opening or closing mark.

Date/Time offers two formats for the current time and eight formats for the current date. These are selected from yet another submenu. The top three items may have a slightly different format depending on which country the System has been localised for.

For example, you may get 6.22.87 instead of 6/22/87. However, what you see is what you'll get.

If your Mac is standing at attention as you type and displays 24-hour or military time, that's what will be inserted when you use this choice. At ease.

The final item on the Define menu gives you easy access to any and all installed FKEYs (they have to be installed in the System). All the installed FKEYs will appear in a submenu. Just pick the one you want. Remember that 1 and 2 are reserved for ejecting disks (0 is also used for that purpose on two-drive SEs).

The key to dialog boxes

The separate DialogKeys INIT that was referred to earlier works only in open dialog boxes. Instead of having to use

Extended keyboard template

One of the sample (and very useful) keysets provided with QuickKeys

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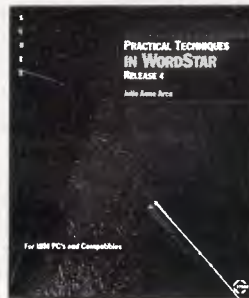
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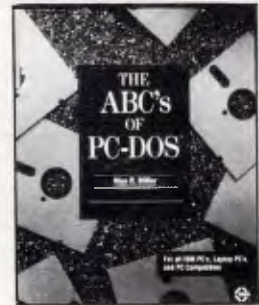
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the mouse to move to the area you want, you now have the option of moving anywhere in an open dialog without taking your fingers off the keys. As DialogKeys comes, these are your options:

COMMAND-SPACE-BAR, ENTER, or RETURN are the same as clicking your mouse button; COMMAND-TAB will move you forward to the next available button in the dialog; and COMMAND-SHIFT-TAB will move back one button. You can use Quick Access to modify any or all of these settings or to add any other key combination for each possibility.

Off-line helper

QuickKeys is very powerful, but still needs help now and then. Manipulating the many keysets that come on the disk is easier from this standalone application. Quick Access is the place to do extensive modifying of keysets and is also the place to explore the many keysets that come with QuickKeys.

Quick Access is also used for removing and installing keysets. It has powerful printing features and can not only print full keysets (to serve as reference sheets) but can also print predefined blank keyboard templates that you can then fill out as you create new key assignments. The one requirement for running Quick Access is that you have QuickKeys installed and running.

Drawbacks

QuickKeys almost always works flawlessly and transparently. About the only problem I've encountered is that Sequences can be a touch slow playing back. It's important to give them a

Networks and all that

QuickKeys works well with AppleTalk and AppleShare. It also is happy with Switcher. There might be some problems with this version with MultiFinder, which was just released at press time. It should be possible to use QuickKeys with MultiFinder, but only time will tell.

TOPS users may also have some problems. If the QuickKeys icon doesn't appear when the Mac is started, the QuickKeys code may not have loaded. That can happen if the TOPS installer has been used on the System file. The installer wipes out the ability to have INIT resources in cdev files, which is exactly what QuickKeys is.

Here's a solution. You or your network administrator should use ResEdit to copy the INIT31 resource from an untouched System 4.1 into the System on your disk, replacing the INIT31 there.

chance to do their act. You can (and I sometimes do) resume typing before a Sequence is complete. This can lead to unintended results. While I've never caused myself anything but annoyance by resuming typing too soon (by the way, we're talking fractions of seconds here, not whole seconds or longer), there's the possibility of doing something you'll regret. I'd like to see QuickKeys check out the keyboard (buffering your keystrokes, of course) when a Sequence is being performed.

Here are some other things that you should know, especially if all doesn't seem to be going well. QuickKeys is disabled when the mouse button is held down. During that period of time you can type anything you want and it will be passed to the application, even if it would normally be intercepted and acted on by QuickKeys. Do this if you have defined a character as a QuickKey and have to use it in your work.

When the Control Panel DA is open, QuickKeys is disabled. That makes

sense, since this is where you define your QuickKeys.

Some programs deliberately disable screen dumps and FKEYs (sometimes for good reasons, sometimes for no apparent reason at all). In those cases, as a safety measure, QuickKeys disables itself.

Conclusion

QuickKeys is an integral part of the Mac system. Apple should have produced an application like this long ago. Fortunately, there are companies like CE Software and programmers like Don Brown who can rectify Apple's shortcomings. QuickKeys is absolutely necessary if you have any brand or type of extended keyboard, and extremely useful no matter which keyboard you use, even the first Mac keyboard. Give your mouse a break.

END

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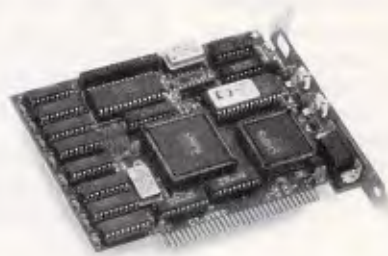
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SCREENTEST

Archimedes PC Emulator

PC emulators are not new, but so far they have had limited success in their job of enabling your chosen micro to run PC-compatible software. Simon Jones unveils Acorn's PC Emulator package for the Archimedes range of micros to see how it performs in action.

At a recent PC show, Acorn proudly displayed its PC 'Emulator' package for the Archimedes range of computers, which is claimed to allow packages written for the IBM PC to run on an Archimedes. Acorn was demonstrating the Emulator running dBase III plus and Lotus 1-2-3. As I only managed a quick glance at the Emulator at that time, I was pleased to get the opportunity to examine the product at close quarters. Having seen other attempts at PC compatibility, such as pc ditto (reviewed in *APC*, October) I was sceptical to say the least.

The Archimedes carries on the Acorn tradition, having a lot in common with the BBC Micro and the BBC Master series. Indeed, the Archimedes will run most of the 'well-behaved' software written for the BBC computers. However, the Archimedes and the BBC micros differ radically in the CPU they use and the amount of RAM available.

Based on Acorn's RISC processor, the Archimedes 440 is *blindingly* fast and, with 4Mbytes of memory, it is not short of space — a problem which caused the downfall of the BBC Micros. All Archimedes machines come with ADFS, Acorn's Advanced Disk Filing System.

This uses a hierarchical directory structure much like MS-DOS, but, unfortunately, many of the command words in ADFS

are used to perform opposite functions to those in MS-DOS. This is more than a little confusing if you are constantly switch-



SCREENTEST

ing between PC applications and Archimedes ones.

One other minor irritation that springs to mind is that, while the Archimedes has a keyboard laid out like IBM's AT-E, its use of the backspace key is confusing. The keyboard has 12 function keys across the top, a numeric keypad on the far right and a cluster of cursor keys and miscellaneous keys between the main group and the numerics. The backspace key [↵] is where you would expect it to be at the top right of the main keyboard. But, for some reason, the Archimedes uses the key marked 'Delete', found in the cursor cluster, to do the work that Backspace ought to do.

I think Acorn could have done better here. The AT-E keyboard layout is one of the better ones of recent years, and it's a pity that the backspace key does not perform the same function as on the PC keyboard. This is the case on the Archimedes keyboard but — lo and behold — in the PC emulator, both the backspace and the delete keys work as they should. Backspace deletes the character to the left of the cursor and the Delete key deletes the character at the cursor.

The Emulator package came on two 3.5in floppy disks. These contained the

Emulator software and a copy of MS-DOS 3.21.

The programs were tested on a prototype Archimedes 440 and a production model 310. The 440 version of the Archimedes has 4Mbytes of RAM and a 20Mbyte hard disk, making a very impressive beast indeed. I particularly wanted to try the emulator on the 440 to see how it worked with the hard disk. As the 440 is not yet available, I was supplied with a pre-production machine. The 310 is available now. It has 1Mbyte of RAM and one floppy disk drive. You cannot run the Emulator on a machine with less than 1Mbyte of RAM.

With 1Mbyte of memory, only 384k can be used for your PC programs. Acorn claims that when Arthur version 1.2 is ready (Arthur is the rather quaint name Acorn has given to the operating system of the Archimedes) you should have 512k available for PC programs. The Archimedes takes some of the remaining memory for the screen map, some for its operating system, while the Emulator program itself uses 186k. On a machine with 4Mbytes, however, a full 640k is available for the PC programs.

MS-DOS can't be held on the same disk as the Emulator programs because the

Archimedes uses a different disk format to MS-DOS. Archimedes disks hold 800k of data while 3.5in MS-DOS disks hold just 720k. There is no provision for the 1.44Mbyte standard of IBM's PS/2 models 50, 60 & 80. Those machines can, however, write 720k disks and all software distributed on 3.5in disks will be in 720k format.

If you want to transport data from 5¼in MS-DOS disks to 3.5in MS-DOS disks, then you're going to have to buy an add-on drive or a serial cable and some communications software. As far as I know there isn't an add-on drive available for the Archimedes yet, but there are plenty of adverts about for 3.5in add-on for PCs. A third alternative is to send your disks away to a company who will do the conversion for you. This is useful for one-off jobs but not really practical for everyday use.

Installation

To start the Emulator on a machine with only floppy drives, you put the Emulator disk in one of the drives and type 'PC.EMULATE'. The program loads and then counts through the available memory to see how much it can use for

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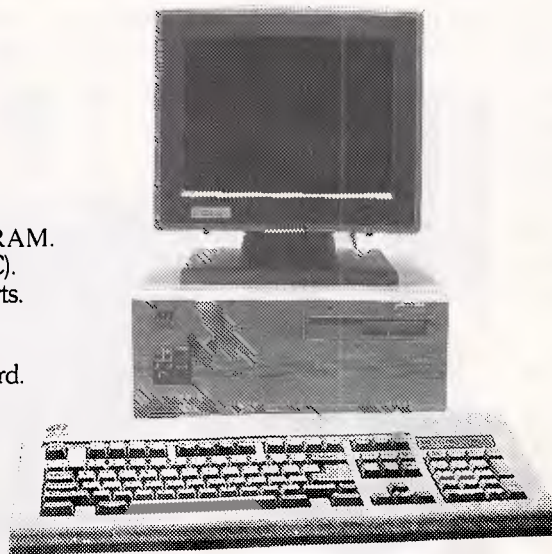
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Technology

Running Norton Advanced Utilities SI (Sysinfo) gave the following results:

Copyright Notice : (C) ACORN 1987
 Operating System : DOS 3.21
 Main Processor : Intel 80188
 Co-processor : None
 Video Display Adaptor : CGA
 Current Video Mode : Text, 80x25 Colour
 Available Disk Drives : 3, A: — C:
 Serial Ports : 1
 Parallel Ports : 1

DOS Reports 640k of memory:
 58k used by DOS and resident programs
 582k available

A search for active memory finds:
 640k of main memory (0000-A000)
 16k display memory (B800-BC00)

Computing index (CI) : 0.8
 Disk Index (DI) : 36.9
 Performance Index (PI) : 12.8

Compare these figures to those for a standard PC/AT clone:

Computing Index (CI) : 7.7
 Disk Index (DI) : 1.6
 Performance Index (PI) : 5.6

The performance index is meant to be an overall indicator of the speed of the machine being tested. It's not a very good indicator for the Archimedes as its meagre performance for the computing index shows much more than the phenomenal hard disk access speed.

Running PC-Tools System Information gave the following results:

The BIOS Programs are dated — 22/07/87
 Operating system — DOS 3.21
 Number of logical disk drives — 5
 Logical disk drive letter range — A thru E
 Serial Ports — 1
 Parallel Ports — 1
 CPU Type — 0 8188
 Relative speed (orig PC = 100%) — 215%
 Maths co-processor — No
 User programs are loaded at paragraph — 1F42
 Memory used by DOS and resident progs — 59808
 Memory available for user programs — 595552
 Total memory reported by DOS — 640k
 PC Tools has found total memory to be — 640k
 Colour Graphics Adaptor present

PC programs. The Emulator then prompts you to insert the MS-DOS boot disk. Once MS-DOS has been loaded you are presented with the familiar A> prompt — and the Archimedes is magically transformed into a PC.

CONFIG.SYS and AUTOEXEC.BAT files work as you would expect them to and, if you include the ANSI.SYS device

driver in the CONFIG.SYS file, you have full control over, for example, the prompt and screen colour. The screen display thinks it's an IBM-compatible CGA card and gives 80x25 text and graphics in 16 colours but cannot cope with blinking text, making the background brighter instead. This seems like a sensible option until an application decides to show some text as

blinking white on cyan. The Emulator will interpret this as white on bright cyan, making the background text virtually illegible.

Another small point is that the colour brown is displayed as a murky sort of yellow, but then, IBM insists that its 'yellow' is in fact bright brown. You cannot set the border colour either. The screen on an Archimedes is usually 32 lines deep, but the PC Emulator uses only the middle 25 of them. This makes the display much wider than it is high and could be a problem if you wanted to draw circles, for example, as they would come out squashed!

The package comes with a small program to install the Emulator programs in a directory on the hard disk and reserve 10Mbytes for PC files. If, like me, you don't have 10Mbytes free on your hard disk, or you don't want to give half of your disk over to PC files, you can edit this Basic program to reserve less space. The program has enough comments in it to work out what is happening and change the amount of space to be reserved. There are warnings about sticking to an integer multiple of the cluster size, but if you use nice, easy figures like 2.5 or 5Mbytes, you can't go far wrong.

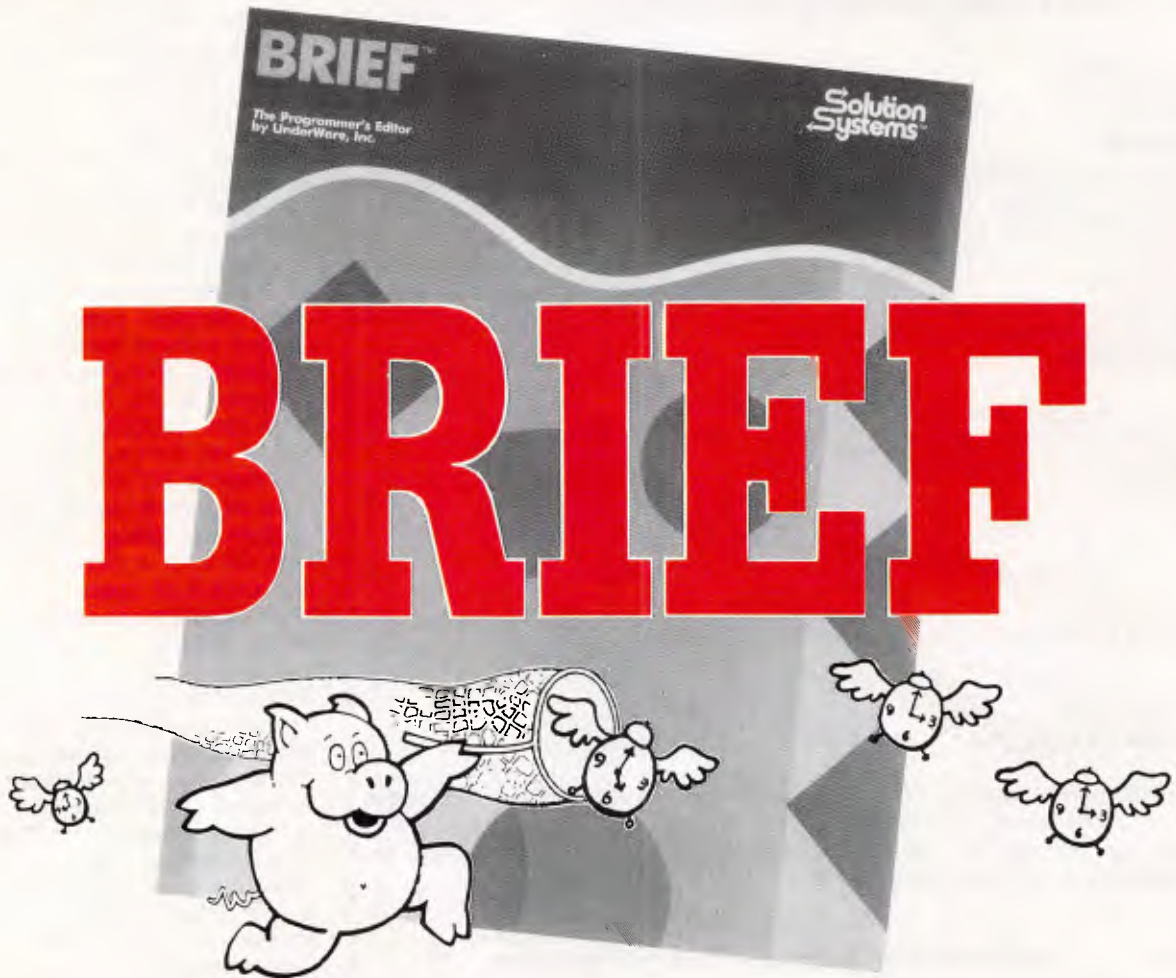
I encountered an extra problem with the installation in that, although I had 5Mbytes free, it was not all in the same place. The Advanced Disk Filing System insists that all files are held in contiguous blocks. When I ran the installation program, it failed to find a free space big enough to put the 5Mbyte partition in. The program stopped with an error report saying 'Compaction Required'. 'Compact' is an ADFS utility which shuffles files about on a disk to bring all the free space together. It works very quickly and without problems.

After I had run Compact, the installation routine worked and I was left with a directory called PC on the hard disk of the Archimedes. This directory contained three files, EMULATE, ROM and DRIVEC. EMULATE is the main PC Emulator program and ROM is the Archimedes version of the BIOS chip on a PC. (The BIOS is the Basic Input Output System and is at the core of what makes a PC a PC.) Both these programs are written in ARM assembler.

The third file, called DRIVEC, is the PC Emulator's part of the hard disk. To MS-DOS it looks like a complete hard disk drive and functions just like one, only very fast. (See 'Technology' box).

Next, the PC partition must be described and MS-DOS installed on it. These steps are done from MS-DOS so the emulator must be loaded again. The MS-DOS disk that came with the emulator contains all the DOS utility programs. One of these is called FDISK and is used to describe

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DOS partitions. There is also a batch file called HDINSTALL which will format the DOS partition and copy all the utility files into it. This process only takes a minute or two and then you no longer need the floppy disks to start the Emulator.

Typing PC.EMULATE from the Arthur prompt will run the emulator program. When it asks for the MS-DOS disk, you simply press the space bar and it looks first at the floppy drive and, finding no disk present, looks on the hard disk to find the operating system.

In use

In use the Archimedes PC Emulator program gives quite acceptable performance if you don't want to go too fast. While the hard disk access is extremely fast, the computing speed is only average and the screen display speed is slow. With some applications the disparity between the different speeds is more marked than others. With programs such as PC Outline you get performance on a par with that of a cheap PC clone. With dBase III Plus you tend to notice, when requesting a record from a file, that the disk drive light blips on for a fraction of a second and the screen display takes about five seconds to complete. But dBase III Plus does not have a fast screen display, even on an 80286 machine.

Most applications will probably run with acceptable speed providing you don't want to drive them too hard; I even had GEM up and running. GEM Desktop Publisher and GEM Draw Plus both performed faultlessly, if a little slowly. Very few programs presented any problems at all. Communications packages such as ChitChat and ProComm can both drive an external modem, through the Archimedes' serial port, at up to 2400 baud. The serial port has a nine-pin D-connector as on most ATs. Turbo Pascal and GWBasic both worked well. PC Tools and X-Tree, two hard disk organiser packages, both coped with the Emulator's hard disk arrangement. Even memory resident programs like SideKick and device drivers such as RAMDrive worked, and DESQview performed multi-tasking quite happily. The only program I really had any problems with was WordPerfect Executive.

WordPerfect Executive is a suite of programs from the WordPerfect Corporation, designed for busy executives and their portable computers. It contains a spreadsheet, appointment calendar, address book, calculator and a cut-down version of the famous WordPerfect word processor. Every part of the suite worked

without a hitch — except for the word processor. This would load OK but would freeze at the first touch of a key. Very frustrating. Acorn put this down to the machine being a pre-production model Archimedes. The same fault manifested itself on the model 310, though, which was a proper, finished version. Acorn said that this was because there wasn't enough free memory on the 310.

I did have some interesting problems with the mouse and wondered if the PC emulator would be clever enough to interpret calls to a mouse driver and redirect them to the mouse on the Archimedes. After all, the Archimedes comes with a mouse as standard; it would be silly to have to do without it when running the machine as a PC.

My first attempt did not raise much hope. An apparently standard Microsoft mouse driver, MOUSE.COM, crashed the emulated PC. MOUSE.SYS fared no better when installed as a device driver in the CONFIG.SYS file. I tried again with another version of MOUSE.COM. Acorn assured me that it would work; it didn't. In frustration I rebooted the Archimedes and restarted the emulator. MOUSE.COM loaded without a hitch and, on starting GEM, I had a mouse-driven pointer. Hooray!

My elation was short-lived. The pointer would only move within the centre portion of the screen, it would not go to the far left or right of the screen. This meant that the menus on the left were inaccessible. Even worse, the area that the pointer would move in shifted slowly over to the right. After a couple of minutes, the pointer was confined to the far right quarter of the screen. Something was decidedly wrong.

Acorn reiterated the opinion that the problem was with the prototype machine I was using. Acorn has MOUSE.COM working on its machines and is having talks with Microsoft about distributing the program as part of the emulator package.

Documentation

The installation leaflet supplied with the Emulator was a photocopy of what will be shipped in the final version. It consists of seven A5 pages. One page of Introduction is followed by a page on installation, three pages on MS-DOS commands and a final section on how to install the Emulator on a hard disk. Finally a short list of useful books on MS-DOS and PCs is given.

Conclusion

The PC Emulator program does make

an Archimedes look remarkably like a PC. There is a wealth of software available for PCs now, and if you need to run PC programs occasionally on your Archimedes, then this is the way to do it. There really are very few compatibility problems, but, as always, if you want the Emulator to run a particular piece of software, get the dealer to show you it running before handing over your money.

Admittedly, the Emulator is a little on the slow side. But if its speed you're after, then perhaps a proper PC would be better for you. "Ah!" said the nice man from Acorn, "There'll be an 80186 co-processor card out for the Archimedes soon. When that arrives, it promises to be a winner," he said.

END

No official price for the PC Emulator has yet been set by the distributor, Barson Computers. We anticipate that it will sell for around \$280. Barson Computers is at 335 Johnston Street Abbotsford 3067, Tel: (03) 419 3033

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Exchanging data dynamically

Microsoft's DDE protocol enables the flexible exchange of data between DDE-supporting applications running under Windows. Does it represent the end of integrated software as we know it? Robert Schifreen examines its attractions for software developers and users alike.

When the first version of Windows started shipping to customers, users were generally impressed. This new system allowed them to use graphics-oriented programs that could be controlled by a mouse and which shared a common user interface. What was especially exciting was that users were now able to run *more* than one program at a time, which was something that plain MS-DOS could not do on its own. As well as being able to multi-task, programs could also talk to each other: word processors could send data to spreadsheets, databases could send records to word processors, and graphics packages could send graphs to word processors.

Software developers, seeing the world of integration opening up, were clearly *not* happy. They had looked closely at all the software that would talk to each other, and noticed that each package had something in common. It came from Microsoft.

So the developers got out their cheque books and ordered the Windows Toolkit, which is what you need if you want to write graphics-based applications that run under Windows in a multi-tasking way. Lo and behold, the toolkit manual describes a system called a clipboard, which allows you to send images between applications. Conspicuous by its total absence was any information,

however, on the way that Microsoft's own applications talked to each other, and how Windows managed all this communication.

With the recent launch of Windows version 2.0 (and Windows 386), Microsoft announced Dynamic Data Exchange, or DDE for short. The important word here is 'announced', as the system had been available to a limited extent within Windows 1.x from the start, but only Microsoft knew how to access it.

Now, though, the system is open to everyone. It is, in Microsoft's own words, a public, open system, available to all software developers to enable them to write applications under Windows (and, when it cometh, Presentation Manager) that talk to each other.

Until the Windows 2.0 toolkits become available, information on the subject of DDE is scarce, which is a shame, as DDE could become vitally important to users and developers alike in the office of the future.

This article explains what DDE is and what it can do. The information was gleaned from technical people within Microsoft, and from various internal Microsoft documents, normally used to brief technical staff and distributors. You don't need to be able to program under Windows to read it, however, as I've steered well clear of using the jargon that has grown up around the system.

After reading it, though, you may well want to learn about Windows.

Messages

DDE is *not* a program. Neither is it a piece of hardware. It is simply a protocol — a set of rules for the flexible exchange of data which Microsoft hopes will be adopted by all software developers who write Windows applications.

Windows is a message-passing operating system (as explained in APC's September preview of OS/2) and DDE is a subset of the Windows messages, using message numbers marked officially in version 1 as reserved for future expansion.

Briefly, a message-passing operating system works like this. Every time something happens in the system — for example, a key being pressed, a mouse being moved, an option being selected from a menu, and so on — a message is generated. This message is a piece of data containing fields describing what happened, why it happened, which application it happened in, and so on. The message is then placed on the message stack.

The heart of any properly-written Windows application (bearded, sandal-clad programmers call them 'apps') is a main loop which retrieves the top message from the stack and acts on it ap-

appropriately. If the program were a word processor, for example, the sort of messages it would receive would be:

- a) a key has been pressed, so echo it on the screen and add it to the file being edited;
- b) the mouse has been moved upwards, so scroll the screen;
- c) the window in which the program is running has been corrupted by another program, and needs redrawing;
- d) the user has terminated the program, so finish;
- e) the user has iconised the program, so put it at the bottom of the screen as an icon. Continue running in the background, processing any messages directed at this particular program but ignore, for example, keyboard messages as it is no longer the foreground task.

Messages are sent round the system both by applications, and by Windows itself. An application can, and does, call its own subroutines by sending messages to itself.

Who sends messages?

DDE is normally used by one Windows application to talk to another. Each of the applications in the conversation must be active; that is, it must be running. However, it does not have to be the current foreground task. It's quite possible for an application to be designed purely as a DDE server; that is, it runs as an icon on the screen, and does not interact with the user at all. It can, though, perform certain tasks when another application sends it a DDE message to tell it what to do. The possibilities here are enormous, though I don't know of any useful DDE servers that have yet been written. There is a demo one supplied with Excel, which feeds ever changing numbers into a spreadsheet to simulate real-time data acquisition in a financial application.

The two applications exchanging data do not have to be different. Because Windows allows multi-tasking, it is quite possible for two copies of, say, Windows Write to be running, and to converse with each other via DDE.

When a windows application is running, and analysing messages, it simply rejects any that it cannot deal with by setting various flags and passing the message back to windows or to another application. For an application to support DDE, it means including subroutines in the application to deal with incoming DDE messages properly. There are nine DDE-related messages in total.

The names I've used below are the full message names as used by Windows. The WM indicates a Windows Message

(as opposed to, say, MM for Mouse Message).

WM_DDE_INITIATE

The 'Initiate' message is sent from one application to another, to start a conversation. It is similar to opening a file in a high-level language.

Each DDE conversation is between two parties — no more and no less — though *more* than one conversation can be happening at a time.

Included in the message are three pieces of information: firstly, the name of the application from which the message is sent; secondly, the name of the data file upon which operations are to be performed (for example, the name of the word-processing document to be accessed — the 'topic'); and, thirdly, the field within the specified topic, known as

'DDE is normally used by one windows application to talk to another. Each of the applications in the conversation must be active; that is, it must be running.'

the item. If no particular topic or item is required, these can be left blank. An example of an Initiate message might be to ask for a word-processing document to be opened and accessed.

All applications receiving the Initiate message then inform the sender whether they are capable of accessing the required document. This is discovered by examining the document's extension to decide whether it is one that can be handled.

The Initiate message is sent in a way that makes it visible to all applications currently running. It is not so much a question of 'Can application x send me data y?', but 'Which application out there is capable of supplying me with data y?'

WM_DDE_ACK

When an executing application sees an Initiate message, it has to check if that message is relevant to itself. If it is, it sends an 'Ack' (acknowledgment) message back to the sender.

The Ack message also includes a number of status bytes, which the application uses to tell the sender whether it is capable of initiating a conversation, whether it is busy, and so on.

WM_DDE_TERMINATE

The 'Terminate' message is sent by one participant in a DDE conversation to say that it is terminating the data exchange. If you're used to programming in high-level languages such as Basic, then the Terminate message is similar to closing a file. Either party in the conversation can issue the Terminate message — not just the application that initiated the conversation in the first place.

WM_DDE_REQUEST

Having opened communications channels and buffers via the Initiate command, applications can now send data back and forth. The 'Request' message is sent by one application to request some data from another.

In addition to the name of the sender, the message contains two other pieces of information. Firstly, the format in which it wants the data, and, secondly, the actual piece of data it wants (which could be a paragraph of text, a graph, a range of cells from a spreadsheet, and so on). The format is a CF number, which identifies a number of what are called 'Clipboard Formats'. These are standard data structures used within windows, which I'll describe in more detail below.

WM_DDE_DATA

In response to a 'Data' message, an application can do one of three things. If it is not set up to support DDE, it will send back a message saying so (or will just ignore the message). If it can support DDE, but is busy, it will again send an appropriate message. Both of these messages will be of the Ack type, as described above, with bits set to indicate why the request will not be complied with. If the application wants to send back the requested data, it uses the Data message.

In the simplest case (avoiding Windows jargon) the message will contain two things: firstly, a pointer to say where the data is (the actual data is not sent within the message), and, secondly, a number to indicate which CF format the data is in. When an application requests data from Microsoft Excel, for example, that data (the location of which is returned in the Data message) will be found to be in plain ASCII format.

Extra status bits can be set in the Data message to give additional information to the application that will receive the data. You can, for example, request that an Ack is sent after the data has been processed, or that the data must not be corrupted by the application which receives it.

PROGRAMMING

WM_DDE_ADVISE

'Advise' is a special form of the Request message and is sent by one application to another, to request that a piece of data be sent whenever its value changes. For example a dedicated DDE server could be written that calls up Viatel every half hour to download the latest share prices. A spreadsheet would then issue an 'Advise' message to the server, so that it could be kept up to date if any of the values on which it is operating change.

Even more useful, a DDE server could act as an interface between a company mainframe and a user's PC. If a manager is working out budgets on his desktop PC, a 'hot link' could be added to a spreadsheet that would, for example, automatically look up last month's sales figures from the mainframe and put it into the spreadsheet. Not only would this ensure that the spreadsheet was always up to date, but it would confine confidential data to the mainframe.

As with Request, the data requested (or rather a pointer to it) by an Advise message is also sent back through a Data message. A bit in the Data message is set or cleared, to indicate whether the data is the subject of a Request or Advise message.

WM_DDE_UNADVISE

'Unadvise' is the opposite of Advise. It is sent by the sender of an Advise message, to indicate that it no longer needs to be advised of changes in a particular data item. The application that had been previously sending the data would then acknowledge this with an Ack, as a guarantee that no further data will be sent.

WM_DDE_POKE

An application will not normally receive any DDE data unless it specifically requests it with the Request or Advise message. There may be times, though, when you want to send data to an application that hasn't requested it. The 'Poke' message is used to do this. Even though this message sends unsolicited messages, it cannot be used unless the Initiate message has first been used to open a channel of communications.

Equally, it will not be read unless the application to which it is addressed examines the message stack.

In all other respects, a Poke message is similar to a standard Data message. It contains a pointer to the data, plus an indicator to show which format it is in.

WM_DDE_EXECUTE

'Execute' lets you send a command to another application for execution, and is



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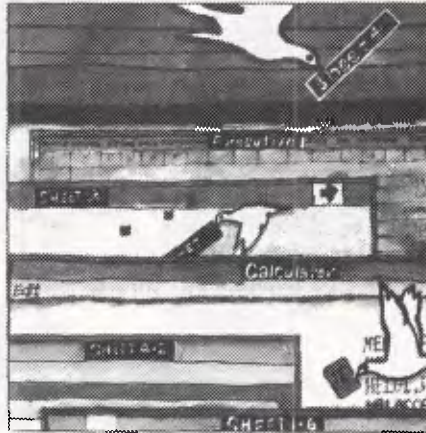
the power behind DDE. Not only can you send a single command but also, if the target application supports it, the name of a macro to be executed.

If the application you want to talk to is not currently active, it's possible to send an Execute message to Windows itself, asking for the application to be launched.

One problem springs immediately to mind before you go away and start writing wonderful DDE servers for every application in sight. Every participant application in a DDE conversation has to be currently executing — which means you're going to need much more than 640k of RAM to do anything fancy. IBM has publicly stated that when OS/2 arrives you'll need 4Mbytes of RAM to take full advantage of the system, and I can't see why Windows on an AT clone will need any less. The only exception to this is if you were to run multiple copies of a single application, as opposed to lots of different applications. In the former case, Windows (all versions) is clever enough to just load one copy of the application's code into RAM, though naturally each gets its own data area.

Message types

When a Windows application wants to send a message of any sort — be it a DDE message or otherwise — there are two possible ways of doing it. Each is a function call, as is everything within Windows and OS/2. The two calls are 'SendMessage' and 'PostMessage'. The SendMessage call puts the message in the message stack, or queue, where every application that is currently executing can find it. The Postmessage call, on the other hand, delivers the message to a specified application only. Windows uses both methods to deliver DDE messages. The Initiate and Ack messages



are sent via SendMessage, because every application needs to examine the message, see where it comes from, and decide whether any action needs to be taken. All other DDE messages are sent via PostMessage, as they are only of interest to one particular application.

The System topic

An Initiate message opens a channel between two windows applications. In addition to containing the name of the application to which it is addressed, the Initiate message contains a topic and item. For an application that operates on data files, such as a spreadsheet or database, the topic will be a file name and the item will point to part of that file.

However, programmers who build applications supporting DDE are 'encouraged' to support a special topic called 'System'. In such a case, an application would send an Initiate message with a topic of System and, depending on the value of item, certain information would be sent back. Supporting the System topic allows applications to inter-rogate each other to find out a number of

useful pieces of information, according to which item is requested. The items which Microsoft suggests you support include:

Systems This returns a list of all other items supported under the System topic.

Topics This returns a list of topics which the application supports. This list would be constantly changing, as it would include, for example, any data files that the application currently had open.

Status This gives an indication of the application's current status.

Formats This delivers a list of the CF formats in which the application is capable of returning data in response to a Request or Advise message.

DDE vs The Clipboard

Excluding messages themselves, there are two ways that applications within Windows can exchange data: Clipboard, and DDE. It's helpful to outline the major differences between the two.

- Transfers to and from the Clipboard are initiated by the user, via options from a menu in the application. DDE transfer is done between two applications, often without permission from, or even knowledge of, the user.
- In the case of the Clipboard, the two applications sharing data do not need to be active at the same time. The first application can leave data in the Clipboard, and the second can come along later and see what is there (rather like electronic mail). With DDE, a conversation takes place between two specific applications, each of which must be aware of the other and must be active.
- Only one Clipboard transaction can be done at a time. As soon as the Clipboard contains data it must be used or discarded before any more is sent. If additional data is sent, the first lot will be overwritten.
- Only one application can have control of the Clipboard at any one time. To place data in the Clipboard, the application has to gain control of it, by continually trying to open it until it succeeds. As long as the system's limit handles (files) is not exceeded, a number of DDE transfers may be active at one time.

Data formats

The Windows clipboard understands five different data formats. DDE supports all of these, plus a further four which were introduced for the first time with the announcement of DDE. Any of these can be used within DDE — the one being used is indicated by a format

Further information

Sybex publishes an excellent book called *A Programmer's Guide To Windows*. This covers all aspects of writing a Windows application, including DDE and data formats, and is worth every cent of its \$56.95 cover price. Sybex books are available from Methven on (02) 887 0177.

Quartz is a database package that runs (only) under Windows. It's produced by Blyth Software, and distributed here by Busiware on (02) 211 1266.

Microsoft produces three documents about DDE, which are normally used to brief technical staff and distributors. They are *DDE Introduction*, *DDE Protocol Definition* and *DDE Rules of the Road*. Bribing your dealer to get hold of these 24 pages is well worth considering.

If your dealer won't help, however, you may have to shell out for the *Microsoft Windows Software Development Kit* at \$590. This is the official documentation on writing Windows applications, and is essential as it contains the toolkit and library routines on disk as well.

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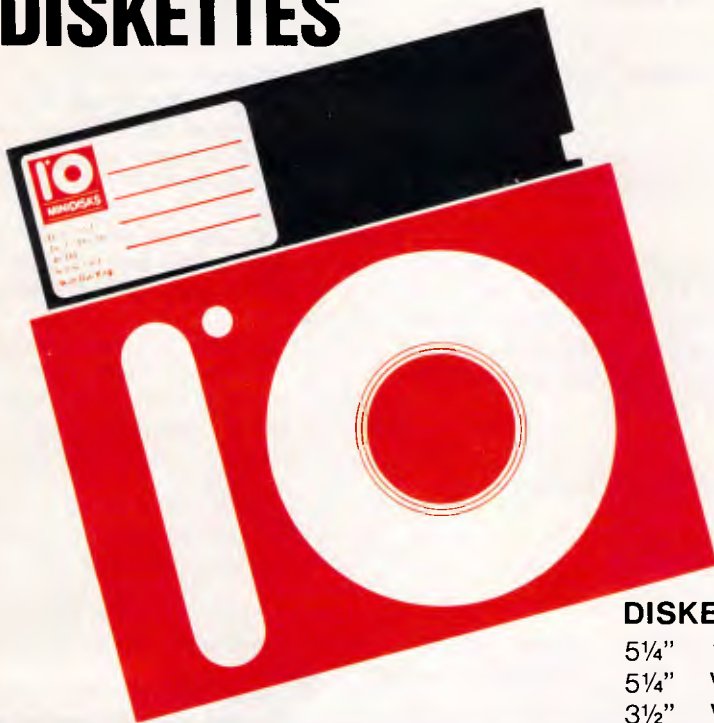


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number in the WM_DDE_DATA message. Via a Request or Advise message, an application informs another which format it wants the data in. Normally, the required format will be the one which best suits its needs. For example, a word processor will want pure text returned, not a bitmap image. If an application sends a message back to the word processor (using Ack with a special bit set) saying that it does not support that format, the sender 'steps down' until they find a format they can both agree on.

I'll explain each format briefly, as Microsoft still has no definitive list and explanation of them all.

CF_TEXT

Plain ASCII text, with a carriage return and line feed at the end of each line.

CF_BITMAP

Bit image data. Basically, a stream of binary information representing the state of a block of pixels.

CF_METAFILEPICT

The definition of an object. Instead of specifying the actual bits which make up the picture, a metafile contains just the

instructions for drawing the object, enabling the system (screen, dot-matrix printer, laser printer) to reproduce the object to its best ability.

CF_SYLK

Microsoft's Symbolic Link Format.

CF_DIF

Data Interchange Format, as used by Software Arts' products, like TK! Solver.

CF_RTF

First of the new file formats. RTF stands for Rich Text Format, which allows not just for plain text, but information about the text. Using this format, word processors can transfer not just text, but formatting information too.

CF_WK1

Lotus 1-2-3 (release 1A) format.

CF_BIFF

Microsoft Excel format.

CF_CSV

Comma-separated variable format. ASCII values (text or numbers) are separated by commas, instead of by padding all records out to a fixed length. Extremely useful in database applications.

Who uses DDE?

The full specification of DDE has only recently been announced, and is still evolving. I know of only two working demonstrations, one of which was knocked up by a 'techie' at Microsoft and is supplied with Excel, while the other was produced with Actor, a tool for writing Windows applications.

Blyth Software has DDE support available for its Quartz database but has chosen not to include it in the current version as the company does not feel obliged to educate the market as to the huge benefits of DDE. Once Microsoft has done this, then DDE will be available in Quartz.

In the field of commercial software, only Microsoft Excel uses DDE to its full advantage. Normally, it responds properly to incoming DDE messages, which means that any application can request data from it. It also supports the System topic. If the Excel user would rather not tie the system up with DDE traffic, a menu option allows for the user to tell Excel not to respond to DDE messages at all.

Conclusion

To the user, DDE has the potential of

being a godsend. No more will the average hard disk be cluttered with data in a dozen different formats, as well as enough applications software to read them all.

To the software developer, though, DDE poses problems. Firstly, any DDE application has to run under Windows. Writing a Windows application is nothing like writing in a single-tasking environment under plain MS-DOS. Just because most Windows applications are written in C, nothing could be further from the truth to say that a C programmer will find it easy to start writing for Windows.

Windows is slow, and even Windows 2 is not as fast as MS-DOS. With everything running in graphics mode, even the simple task of displaying a file on the screen takes a lot more work. When the system is having to run four programs at a time, each of which wants to set up lots of DDE conversations, *and* use the Clipboard, *and* access the disk drive anything but a 386-based machine with at least 4Mbytes of RAM (and preferably a disk cache too) will be slow to the point of irritation.

If a software developer does write an application under Windows, there's nothing to say that DDE *has* to be supported. If the developer's lazy or, as will probably be the case, wants to get the product out sooner rather than later, the application can simply be made to ignore all DDE_INITIATE messages, and neither send nor receive data in this way.

Considering that DDE was totally undocumented in Windows 1.x, it's unlikely that the whole story has been divulged even now. It would be naive to think that Microsoft won't keep some of the more juicy features of the system all for itself.

Will DDE replace the concept of integrated software packages like Symphony, Ability and Smart? It's certainly possible. The problem with buying an integrated package is that, in order to get four applications capable of talking among themselves and freely exchanging data, you can't pick and choose. If package X gives you a fantastic word processor and spreadsheet, but a very limited database, it's hard luck. With DDE, you won't have to worry. You will be able to choose the database, spreadsheet, word processor and graphics package that you like best, and be confident that, if each supports DDE, the level of integration will be as good as, if not better than, that provided by a dedicated integrated software package.

At the end of the day, DDE is nothing more than a set of rules. And we all know rules are made for ***!

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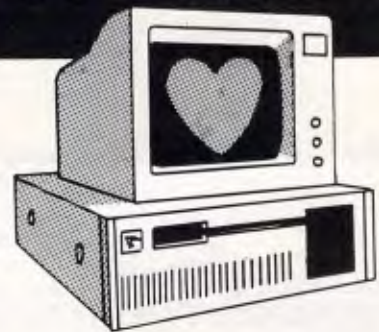
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Capturing your printer output

Tom Kihlken explains how PRN2FILE lets you capture the printer output from programs and DOS commands such as Ctrl-PrtSc and Shift-PrtSc into a file which you can edit with your word processor.

While there's no substitute for the hard-copy printout you can put on the boss's desk, there are times when you'd like to print to a file instead. If you have an important letter ready to go but the office laser printer is attached to another machine, the sensible thing would be to spool your document onto disk, then take it over to the other machine and print it later. Although some of the more sophisticated word processors allow you to redirect printer output to a file, most don't.

Again, while the DOS Ctrl-PrtSc command lets you echo your output to a printer, and Shift-PrtSc does the same for a screenful, neither of these lets you save that printer output to a file that you can edit with your word processor before printing.

That's exactly what PRN2FILE does. PRN2FILE is a resident program that lets you redirect printer output to a file of your choice. The most logical way to load it is through your AUTOEXEC.BAT file; in any event, it should be installed before any other print utilities, such as the DOS MODE command or a print spooler. The complete syntax is

```
PRN2FILE [d:][path]filename [/Pn] [/Bn] [/U]
```

You specify the filename to which you want your printer output redirected. If

you omit the drive and path, the current drive and directory will be used. Successive 'print' tasks will be appended to the same file unless you choose to change the filename. You can change it, or disable redirection entirely, simply by running PRN2FILE again. Each successive time, the current target file for redirection

'You can even use PRN2FILE to redirect printer output to a fictitious printer, by specifying /P2 when you have only one printer.'

is displayed. To deactivate redirection, just omit the filename completely. Your printer can then be used normally. When redirection is turned off, the filename PRN is shown, indicating that the real printer is being used.

Three optional parameters are used to indicate the printer number (/Pn), to specify the buffer size (/Bn) in kilobytes, and to uninstall (/U) the program. These optional switches may be entered in any order, but you must use single spaces and not any of the other common

delimiters (commas, et al.) to separate the options.

The /P parameter is used to indicate the number of the printer you want redirected. You may specify a value from 1 to 3. In most cases, the default value of 1 (DOS uses LPT1 exclusively) should suffice. If you have multiple printers, however, you can specify which one you would like to have redirected and then use the other normally. You can even use PRN2FILE to redirect printer output to a fictitious printer, by specifying /P2 when you have only one printer attached, for example. Only one printer is redirected at a time. However, you can change which one is redirected by again typing PRN2FILE with the new parameter.

Buffer size is specified with the /B option. This option can be specified only the very first time PRN2FILE is run; it is ignored on successive runs. For most requirements, the default of 4k is quite adequate, but if you're going to be doing some heavy-duty printing, a larger buffer may be needed. (If the buffer isn't big enough, the message 'Buffer Overflow' will appear in your output file). It may take some experimentation to determine the required size. As a general rule, specify the largest file you will print. Using a buffer larger than necessary wastes memory, but if you've got

memory to burn, go ahead with the maximum of 64k. Any documents larger than that are always broken down internally into chunks of 64k or less.

The Uninstall option (/U) allows you to remove PRN2FILE from memory. With its standard buffer size, PRN2FILE commandeers about 5.9k of RAM. Since most modern machines sport 640k or more, this should present no problem. If any other resident programs were installed after PRN2FILE, however, the uninstall may not be successful. You could end up with an island of free memory that is essentially useless for running other programs. (After loading your favourite utilities, you can run PCMAP [refer APC August] to determine the amount of memory remaining for applications programs). Further, if another program chains into it, PRN2FILE can't be released at all. The Uninstall routine detects such problems and prints an error message if all is not well, but in any case, no

harm is done. When/U is being used, any other parameters are ignored.

Once installed, PRN2FILE waits for data to be sent to the printer. Each character aimed at the printer is inserted into an internal buffer, and as the buffer fills its contents are written to the file. Because of this, you'll notice the file remains empty until at least 1024 characters are accumulated. The buffer is then emptied and the process continues. The buffer is also flushed automatically five seconds after the last character is printed. If for some reason you think some of your output is still in the buffer, running PRN2FILE again ensures that the buffer will be flushed to disk. This delayed flushing of the buffer may seem strange, but it's due to the character nature of the printer. I'll discuss this further below, when discussing the way printers work. In practice it shouldn't be a problem as long as you recognise it as a normal procedure.

If you edit a file of data that was meant

for the printer, you may notice strings of odd-looking characters that are not part of the text. These codes are used to control the printer and are normally not seen. Word processors are notorious for using these escape codes to access printer features such as compressed mode, emphasised type, or margin settings. If you intend to print the file later, you should leave them unchanged, even if they make the file hard to read.

PRN2FILE does have a couple of limitations you should be aware of. The most troublesome problem manifests itself only when large quantities of data are dumped to the printer at once. If the buffer used to spool your printed output is not large enough, an overflow occurs. The solution is to use the /B option to create a larger buffer, then try again.

Another caution about disk errors is in order. PRN2FILE is programmed to ignore errors such as a full disk or bad media. To implement a complete error recovery scheme is beyond the scope of

```

; PRN2FILE.ASM - A resident program which redirects printer output.
; SYNTAX: PRN2FILE d:path:filename.ext [/Pn] [/Bn] [/U]
; 1) Run PRN2FILE with the desired filename to activate it.
; 2) Run it again with no filename to turn off redirection.
; 3) Run it with a different filename to change destination file.
; 4) Use /P to designate the printer number (defaults to 1)
; 5) Use /B to enter buffer size in K bytes (defaults to 4)
; 6) Use /U to uninstall the program

CSEG          SEGMENT
              ASSUME  CS:CSEG,DS:NOTHING

              ORG    100H    ;Beginning for .COM programs
START:        JMP  INITIALIZE ;initialization code is at end

; Data area used by this program

COPYRIGHT    DB      "PRN2FILE 1.0 (c) 1987 Ziff Communications Co.$",1AH
PROGRAMMER   DB      "Tom Kihlken"
REDIRECT_MESS DB      "LPT"
PRN_NUM      DB      "1 Redirected to: $"
BAD_FILENAME DB      "Invalid filename.$"
BAD_PARAM    DB      "Usage: PRN2FILE [path][filename][/Pn][/Bn][/U]$"
BAD_ALLOC    DB      "Memory Allocation Error.$"
BAD_UNINSTALL DB     "Cannot Uninstall.$"
PRN_TXT      DB      "PRN$"
CRLF         DB      13,10,"$"
ERR_MESSAGE  DB      13,10,"*Buffer overflow*",13,10
MESS_LENGTH  EQU     $ - OFFSET ERR_MESSAGE

OLDINT08     DD      ? ;old timer tick interrupt vector
OLDINT17     DD      ? ;old printer output vector
OLDINT21     DD      ? ;old dos function interrupt vector
OLDINT28     DD      ? ;old dos waiting interrupt vector
DOS_FLAG     DD      ? ;dos busy flag
SWITCH       DB      0 ;on/off switch for redirecting printer
TIMEOUT      DW      0 ;holds timeout counter to flush buffer
INSTALLED_SEG DW     0 ;segment location of installed copy
WRITE_FLAG   DB      0 ;indicates buffer should be written
PRINTER_NUM  DW      0 ;Default to first parallel printer
BUFF_POINTER DW      0 ;Pointer to next space in buffer
BUFF_SIZE    DW      4 ;Size of buffer
BUFF_SEGMENT DW      0 ;Segment address of buffer
TIME_TO_WRITE EQU    499H ;Flush buffer when this full

; Interrupt 17 routine. (BIOS printer output)
; if output is to the selected printer and switch is on then redirect
; the character into a file.

NEWINT17     PROC    FAR
              ASSUME DS:NOTHING, ES:NOTHING

              CMP    DX,CS:PRINTER_NUM ;is this the selected printer?
              JNE    IGNORE ;if not, let bios handle it
              CMP    CS:SWITCH,1 ;is redirection turned on?
              JE     REDIRECT_IT ;if on, take jump

              IGNORE:
              JMP    CS:OLDINT17 ;Jump to the bios routine

              REDIRECT_IT:

```

continues . . .

PRN2FILE.ASM: the assembly language source code for PRN2FILE.COM

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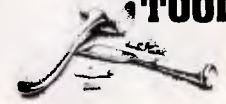
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PRODUCTIVITY

```

NEWINT21    PROC    FAR
            ASSUME DS:NOTHING, ES:NOTHING

            PUSHF    ;Save the callers flags
            CMP     CS:WRITE_FLAG,1 ;Buffer need to be written?
            JNE     DONT_WRITE    ;If not, then just return
            PUSH    DS
            PUSH    BX
            LDS     BX,CS:DOS_FLAG ;Get location of DOS flag
            CMP     BYTE PTR [BX],0 ;Is DOS busy flag set?
            POP     BX
            POP     DS
            JNE     DONT_WRITE    ;If busy, do nothing
            CALL    WRITE_TO_FILE ;Empty the buffer now

DONT_WRITE:
            OR      AH,AH         ;Doing function zero?
            JNE     NOT_ZERO
            MOV     AX,4C00H     ;If yes, change it to 4Ch

NOT_ZERO:
            CMP     AH,40H       ;Writing to a device?
            JNE     NOT_PRINTER ;If not, just continue
            CMP     BX,4         ;Writing to the printer handi-?
            JNE     NOT_PRINTER ;If not, just continue
            CMP     CS:SWITCH,1 ;Is redirection on?
            JE      PRINT_IT     ;If yes, then redirect it

NOT_PRINTER:
            POPF    ;Recover flags from stack
            CLI
            JMP     CS:OLDINT21  ;Do the DOS function

; Emulate print string function by invoking INT 17h

PRINT_IT:
            STI     ;Reenable interrupts
            CLD     ;String moves forward

            PUSH    CX           ;Save these registers
            PUSH    DX
            PUSH    SI

            MOV     SI,DX        ;Get pointer to string
            MOV     DX,PRINTER_NUM ;Selected printer ID in DX
            JCXZ   END_LOOP     ;Skip loop if count is zero

PRINT_LOOP:
            LODSB    ;Load next character from string
            MOV     AH,00H      ;Print character function
            INT     17H        ;BIOS print
            LOOP   PRINT_LOOP   ;Loop through whole string

END_LOOP:
            POP     SI
            POP     DX
            POP     CX

            MOV     AX,CX       ;All bytes were output
            POPF    ;Restore the callers flags
            CLC     ;Return success status
            STI     ;Reenable interrupts
            RET     2          ;Return with current flags

NEWINT21    ENDP
    
```

; This copies the buffer contents to a file. It should only be called
; when dos is in a reentrant condition. All registers are preserved

```

WRITE_TO_FILE PROC    NEAR
            ASSUME DS:NOTHING, ES:NOTHING

            PUSH    AX           ;Save registers we need to use
            PUSH    BX
            PUSH    CX
            PUSH    DX
            PUSH    DS
            PUSH    ES

            PUSH    CS
            POP     DS           ;Set DS to code segment
            ASSUME DS:CSEG     ;Tell assembler DS is CSEG
            MOV     WRITE_FLAG,0 ;Clear write request flag
            MOV     AX,3524H    ;Get dos critical error vector
            CALL    DOS_FUNCTION ;Do the dos function
            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
            CALL    DOS_FUNCTION ;Do the dos function

; 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.

            CMP     BUFF_POINTER,0 ;Anything in the buffer?
            JE      REP_VECTOR    ;If not, no nothing
            MOV     DX,OFFSET FILENAME ;Point to filename
            MOV     AX,3D02H     ;Dos function to open file
            CALL    DOS_FUNCTION ;Do the dos function
    
```

```

            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
            CALL    DOS_FUNCTION ;Do the dos function
            JC      CLOSE_FILE  ;On any error, take jump
            JMP     SHORT WRITE_FILE

FILE_NOT_FOUND:
            CMP     AX,2        ;Was it file not found error?
            JNE     REP_VECTOR  ;If not, just quit
            MOV     CX,0020H    ;Attribute for new file
            MOV     AH,3CH      ;Create file for writing
            CALL    DOS_FUNCTION ;Do the dos function
            JC      CLOSE_FILE  ;On any error, take jump

WRITE_FILE:
            MOV     BX,AX       ;Save handle in BX also
            MOV     DX,0        ;Point to buffer
            MOV     CX,BUFF_POINTER ;Number of chars in buffer
            MOV     AH,4BH      ;Dos write to a device function
            PUSH    DS
            MOV     DS,BUFF_SEGMENT ;Point to buffer segment
            CALL    DOS_FUNCTION ;Do the dos function
            POP     DS
            JC      CLOSE_FILE  ;On any error, take jump
            CMP     CX,AX       ;Was everything written
            JNE     CLOSE_FILE  ;If not, it was an error
            CMP     CX,BUFF_SIZE ;Was buffer full?
            JNE     CLOSE_FILE  ;If not everything is OK

            MOV     DX,OFFSET ERR_MESSAGE ;Insert the error message
            MOV     CX,MESS_LENGTH
            MOV     AH,4BH      ;Dos write to file function
            CALL    DOS_FUNCTION ;Do the dos function

CLOSE_FILE:
            MOV     AH,3EH      ;Dos function to close the file
            CALL    DOS_FUNCTION ;Do the dos function

REP_VECTOR:
            MOV     BUFF_POINTER,0 ;Indicate buffer is empty
            POP     DS         ;Recover int 24h vector from stack
            POP     DX
            MOV     AX,2524H    ;Restore critical error vector
            CALL    DOS_FUNCTION ;Do the dos function
            ASSUME DS:NOTHING ;Restore all registers
            POP     ES
            POP     DS
            POP     DX
            POP     CX
            POP     BX
            POP     AX
            RET

WRITE_TO_FILE ENDP
    
```

; This routine emulates an INT 21 by calling the dos interrupt address

```

DOS_FUNCTION PROC    NEAR
            ASSUME DS:NOTHING, ES:NOTHING

            PUSHF    ;Save the processor flags
            CLI     ;Clear interrupt enable bit
            CALL    CS:OLDINT21 ;Executes the interrupt procedure
            STI     ;Enable further interrupts
            RET     ;And return to calling routine

DOS_FUNCTION ENDP
    
```

; New interrupt 24h (critical dos error). This interrupt is only in
; effect when writing to the disk. It is required to suppress the
; 'Abort, Retry, Ignore' message. All fatal disk errors are ignored.

```

NEWINT24    PROC    FAR
            ASSUME DS:NOTHING, ES:NOTHING

            STI     ;Turn interrupts back on
            XOR     AL,AL       ;Tells dos to ignore the error
            MOV     CS:SWITCH,AL ;Turn off logging of output
            IRET    ;And return to dos

NEWINT24    ENDP
    
```

; New interrupt 28h (DOS idle). Check to see if write_flag is set to
; one. If it is, then flush the buffer

```

NEWINT28    PROC    FAR
            ASSUME DS:NOTHING, ES:NOTHING

            STI
            CMP     CS:WRITE_FLAG,0 ;Buffer need to be written?
            JE      DO_NOTHING    ;If not, just continue
            CALL    WRITE_TO_FILE ;Empty the buffer

DO_NOTHING:
            JMP     CS:OLDINT20   ;Continue with old interrupt

NEWINT28    ENDP
    
```

continues ...

this utility. In the event of an error, the buffer contents are lost without warning. So if your file doesn't appear as expected, be sure to check the disk first.

Getting PRN2FILE
Both the assembler source code and a Basic program that will create

PRN2FILE.COM are listed elsewhere in this article (see PRN2FILE.ASM and PRN2FILE.BAS). As an alternative to keyboard entry, both of these files and a

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```

; Here is the code used to initialize prn2file.com. First determine
; if prn2file is already installed. If it is, just copy new parameters
; into the resident programs data area, otherwise save old vectors
; and replace with new ones. The output buffer will later overlay
; this code to conserve memory.

```

```

INITIALIZE:
    ASSUME CS:CSEG, DS:CSEG, ES:NOTHING

    MDV   DX,OFFSET COPYRIGHT
    CALL  STRING_CRLF ;Display the string

; Search for a previously installed copy of prn2file

    NOT   WORD PTR START ;Modify to avoid false match
    XOR   BX,BX           ;Start search at segment zero
    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    NOT_INSTALLED
    MOV   SI,OFFSET START ;Setup to compare strings
    MOV   DI,SI
    MOV   CX,16           ;16 bytes must match
    REP   CMPSB           ;Compare DS:SI to ES:DI
    OR    CX,CX
    JNZ  NEXT_SEGMENT    ;If no match, try next segment
    ES:SWITCH,1          ;Turn redirection on
    MOV   DX,ES:PRINTER_NUM ;Retrieve old printer number
    MOV   DS:PRINTER_NUM,DX ;Save it here
    MOV   AH,1            ;Initialize the resident copy
    INT   17H             ;To flush it's buffer
    ADD   DL,31H          ;Convert printer num to ascii
    MOV   PRN_NUM,DL     ;Put it into the message area

NOT_INSTALLED:
    MOV   INSTALLED_SEG,ES
    PUSH  CS
    POP   ES              ;Set ES to this segment
    ASSUME ES:CSEG
    CMP   BYTE PTR DS:[0000],0 ;Anything entered?
    JE    NO_PARAMS      ;If not, take jump

PARSE:
    MOV   AL,"/"          ;Look for a slash
    CALL  LOAD_PARAMS
    REPNE SCASB           ;Scan for slashes
    JCXZ PARSE_DONE      ;Quit when no more slashes
    MOV   AL,[DI]         ;Get the parameter
    MOV   WORD PTR [DI-1],2020H ;Erase the slash and letter
    OR    AL,32           ;convert to lower case
    CMP   AL,"p"         ;Is it the "p" parameter
    JE    SLASH_P
    CMP   AL,"b"         ;Is it the "b" parameter
    JE    SLASH_B
    CMP   AL,"u"         ;Is it the "u" parameter
    JE    SLASH_U

INVALID_PARAM:
    MOV   DX,OFFSET BAD_PARAM ;Point to error message
    JMP   ERR_EXIT

SLASH_U:
    JMP   UNINSTALL      ;slash "u" means uninstall it

SLASH_B:
    MOV   BUFF_SIZE,0    ;zero buff size for accumulator

NEXT_DIGIT:
    MOV   AX,BUFF_SIZE   ;Get current buff size
    MUL  BL,10           ;Times 10 for next digit.
    INC  DI              ;Point to next digit.
    MOV  BL,[DI]         ;And get the next one
    SUB  BL,30H          ;Convert it to binary
    JC   PARSE           ;If not a digit, keep parsing
    CMP  BL,9
    JA  PARSE           ;if not a digit, keep parsing
    MOV  BYTE PTR [DI]," " ;Erase character from command
    KOR  BH,BH
    ADD  AX,BX           ;Add in this digit
    MOV  BUFF_SIZE,AX    ;And save the new total
    JMP  NEXT_DIGIT

SLASH_P:
    INC  DI              ;Point to the printer number
    MOV  AL,[DI]
    MOV  BYTE PTR [DI]," " ;Erase this char from command
    MOV  PRN_NUM,AL      ;Put it in the message area
    SUB  AL,31H          ;convert it to printer number
    XOR  AH,AH           ;Make it a word
    CMP  AL,3           ;Printer id must be less than 4
    JAE  INVALID_PARAM  ;if it isn't, take jump
    MOV  PRINTER_NUM,AX ;store the parameter
    JMP  PARSE           ;Look for more parameters

NO_PARAMS:
    MOV  DX,OFFSET REDIRECT_MESS ;Point to message
    MOV  AH,9            ;Display the string of text
    INT  21H            ;Using DOS display function
    MOV  DX,OFFSET PRN_TXT ;Point to "PRN"
    CALL STRING_CRLF    ;Display the string
    MOV  AL,0           ;turn off redirection switch
    JMP  CHECK_FOR_INSTALL

PARSE_DONE:
    CMP  BUFF_SIZE,1    ;Buff must be at least 1K

```

```

    JB   INVALID_PARAM  ;If not, exit with error
    CMP  BUFF_SIZE,64   ;Check for maximum buff size
    JA   INVALID_PARAM  ;If above, exit with error
    MOV  AL," "         ;Look for spaces
    CALL LOAD_PARAMS
    REPE SCASB           ;Scan for non-space character
    JCXZ NO_PARAMS      ;Any letters found?

    CMP  BYTE PTR [DI]," " ;Has a drive specified?
    JNE  GET_DEF_DRIVE  ;If not, get the default drive
    DEC  DI              ;Now DI points to first letter
    MOV  AL,[DI]        ;Get drive letter in AL
    MOV  WORD PTR [DI],2020H ;Erase the drive and color.
    JMP  STORE_DRIVE

GET_DEF_DRIVE:
    MOV  AH,19H         ;Get default drive
    INT  21H
    ADD  AL,65          ;Convert integer drive to asc:

STORE_DRIVE:
    MOV  AH," "         ;AL has drive, AH has colon
    MOV  WORD PTR FILENAME,AX ;Store drive and colon
    MOV  AL," \"        ;Look for a backslash
    MOV  FILENAME+2,AL  ;Add a backslash to filename
    CALL LOAD_PARAMS
    REPNE SCASB         ;Scan for a backslash
    JCXZ GET_DEF_PATH  ;If no path, use current path
    MOV  DI,OFFSET FILENAME+7 ;Location to store path
    JMP  STORE_PATH

GET_DEF_PATH:
    MOV  DL,FILENAME    ;Selected drive letter
    AND  DL,11011111B   ;Convert it to upper case
    SUB  DL,64          ;Convert it to integer
    MOV  SI,OFFSET FILENAME+3 ;Put current path at SI
    MOV  DI,SI          ;Save this for search later
    MOV  AH,47H        ;DOS get current directory
    INT  21H
    JC   BAD_NAME_EXIT  ;Exit if invalid drive
    MOV  AL,0           ;Look for end of path
    CMP  [DI],AL        ;Was there any path?
    JE   STORE_PATH
    MOV  CX,64          ;Maximum number of bytes in path
    REPNE SCASB         ;Scan for end of path string
    MOV  BYTE PTR [DI-1]," \" ;Add the trailing backslash:

STORE_PATH:
    PUSH DI             ;Save location to append path
    MOV  AL," "         ;Look for blank spaces
    CALL LOAD_PARAMS
    REPE SCASB         ;Scan for non-blank character
    MOV  SI,DI
    DEC  SI              ;This is first letter of path
    POP  DI              ;Get back location to append

COPY_PATH:
    LODSB
    CMP  AL," "         ;Get next char of path
    JE   VERIFY_NAME    ;Is it a blank?
    CMP  AL,13          ;Is it a carriage return?
    JE   VERIFY_NAME    ;If yes, its the last char
    STOSB
    JMP  COPY_PATH     ;Copy until end of path found

VERIFY_NAME:
    PUSH DI             ;Save end of string location
    MOV  BYTE PTR [DI],"S" ;Mark eos for dos display
    MOV  DX,OFFSET REDIRECT_MESS ;Point to message
    MOV  AH,9            ;Display the string of text
    INT  21H            ;Using dos display function
    MOV  DX,OFFSET FILENAME ;Point to filename for display
    CALL STRING_CRLF    ;Display the string
    POP  DI
    MOV  BYTE PTR [DI],0 ;Now make it an ascii string
    MOV  DX,OFFSET FILENAME ;Dx points to the filename
    MOV  AX,3D00H        ;Open this file for reading
    INT  21H
    JC   OPEN_ERR       ;Error may indicate not found

CLOSE_IT:
    MOV  BX,AX          ;Get the handle into BX
    MOV  AH,3EH         ;Close the file
    INT  21H
    JMP  FILENAME_OK

OPEN_ERR:
    MOV  CX,0070H       ;Attribute for new file
    MOV  AH,3CH         ;create file for writing
    INT  21H            ;Dos function to create file
    JNC  CLOSE_IT      ;If no error, just close it

BAD_NAME_EXIT:
    MOV  DX,OFFSET BAD_FILENAME

ERR_EXIT:
    CALL STRING_CRLF    ;Display the string
    INT  28H           ;Just exit to dos

FILENAME_OK:
    MOV  ES,INSTALLED_SEG ;Point to installed program
    PUSH DS:PRINTER_NUM ;This moves the new printer
    POP  ES:PRINTER_NUM ;number to the resident copy
    MOV  DI,OFFSET FILENAME ;Setup to copy the filename
    MOV  SI,DI
    MOV  CX,128         ;Copy entire file specification:
    MOVSB
    REP  MOVSB          ;String move instruction
    MOV  AL,1           ;Turn redirection on

CHECK_FOR_INSTALL:
    MOV  CX,CS

```

continues ...

complete, ready-to-run PRN2FILE.COM file are available for download from Microtex on Telecom's Viatel (page *6663#), or by sending a blank formatted

disk with a stamped self-addressed packet to 'PRN2FILE', c/- APC, 124 Castlereagh Street, Sydney 2000. Before looking at how redirection

works, let's see how programs normally use the printer. Most of us are already familiar with higher-level commands such as the DOS PRINT command. But

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```

CMP     CX,INSTALLED_SEG
MOV     ES,INSTALLED_SEG
MOV     ES:SWITCH,AL      ;store the new on/off switch
JE      INSTALL           ;if not installed yet, do it now
INT     20H               ;otherwise terminate
    
```

This subroutine displays a string followed by a CR and LF

```

STRING_CRLF  PROC     NEAR

MOV     AH,9              ;Display the string of text
INT     21H              ;Using dos display function
MOV     DX,OFFSET CRLF   ;Now point to CR/LF characters
MOV     AH,9              ;Send the CR and LF
INT     21H
RET

STRING_CRLF  ENDP
    
```

This subroutine sets DI to the command line and CX to the byte count

```

LOAD_PARAMS  PROC     NEAR

MOV     DI,80H           ;Point to parameter area
MOV     CL,CS:[DI]       ;Get number of chars into CL
XOR     CH,CH            ;Make it a word
INC     DI                ;Point to first character
CLD                     ;String search forward
RET

LOAD_PARAMS  ENDP
    
```

This code does the actual installation by storing the existing
interrupt vectors and replacing them with the new ones.
Then allocate memory for the buffer. Exit and remain resident.

```

INSTALL:      ASSUME  DS:CSEG, ES:CSEG

MOV     BX,OFFSET END_OF_CODE ;Get end of resident code
ADD     BX,15
MOV     CL,4              ;Shift by 4 to divide by 16
SHR     BX,CL             ;This converts to paragraphs
MOV     AH,4AH           ;Modify memory block
INT     21H              ;Dos setblock function call
JNC     ALLOCATE_BUFFER   ;if it worked ok, then continue

ALLOC_ERROR:  MOV     DX,OFFSET BAD_ALLOC ;Err message for bad allocation
JMP     ERR_EXIT         ;Display message and exit

ALLOCATE_BUFFER:
MOV     BX,BUFF_SIZE     ;Buffer size in K bytes
MOV     CL,6              ;Shift by 6 to get paragraphs
SHL     BX,CL            ;Bufferize is in paragraphs
MOV     AH,4BH           ;Dos allocate memory
INT     21H
JC      ALLOC_ERROR      ;if allocation error, take jump
MOV     BUFF_SEGMENT,AX  ;Save the segment for the buffer

MOV     AX,BUFF_SIZE     ;Buffer size in K bytes
MOV     CL,10             ;Shift by 10 to get bytes
SHL     AX,CL
OR      AX,AX            ;Is buff_size=0 (64K)?
JNZ     SIZE_OK
DEC     AX                ;if yes, make it FFFFh

SIZE_OK:     MOV     BUFF_SIZE,AX ;Now buff_size is in bytes

ASSUME  ES:NOTHING
MOV     AH,34H           ;Get dos busy flag location
INT     21H
MOV     WORD PTR [DOS_FLAG],BX ;Store flag address
MOV     WORD PTR [DOS_FLAG+2],ES

MOV     AX,3508H         ;Get timer interrupt vector
INT     21H
MOV     WORD PTR [OLDINT88],BX
MOV     WORD PTR [OLDINT88+2],ES
MOV     DX,OFFSET NEWINT88
MOV     AX,2588H
INT     21H              ;Dos function to change vector

MOV     AX,3517H         ;Get printer interrupt vector
INT     21H
MOV     WORD PTR [OLDINT17],BX
MOV     WORD PTR [OLDINT17+2],ES
MOV     DX,OFFSET NEWINT17
MOV     AX,2517H
INT     21H              ;Dos function to change vector

MOV     AX,3521H         ;Get dos function vector
INT     21H
MOV     WORD PTR [OLDINT21],BX
MOV     WORD PTR [OLDINT21+2],ES
MOV     DX,OFFSET NEWINT21
MOV     AX,2521H
INT     21H              ;Dos function to change vector
    
```

```

MOV     AX,3528H         ;Get dos waiting vector
INT     21H
MOV     WORD PTR [OLDINT28],BX
MOV     WORD PTR [OLDINT28+2],ES
MOV     DX,OFFSET NEWINT28
MOV     AX,2528H
INT     21H              ;Dos function to change vector
    
```

Deallocate our copy of the environment. Exit using interrupt 27h
(TSR). This leaves code and space for buffer resident.

```

MOV     AX,DS:[002CH]   ;Get segment of environment
MOV     ES,AX           ;Put it into ES
MOV     AH,49H         ;Release allocated memory
INT     21H
MOV     DX,(OFFSET END_OF_CODE - OFFSET CSEG + 15)SHR 4
MOV     AX,1100H
INT     21H              ;Terminate and stay resident
    
```

This procedure removes PRN2FILE from memory by replacing the vectors
and releasing the memory used for the code and buffer.

```

UNINSTALL:   ASSUME  DS:CSEG, ES:NOTHING

MOV     AL,08H          ;Check the timer interrupt
CALL    CHECK_SEG      ;If changed, can't uninstall
JNE     CANT_UNINSTALL
MOV     AL,17H          ;Check the printer interrupt
CALL    CHECK_SEG      ;If changed, can't uninstall
JNE     CANT_UNINSTALL

MOV     AL,21H          ;Check dos interrupt
CALL    CHECK_SEG      ;If changed, can't uninstall
JNE     CANT_UNINSTALL

MOV     AL,28H          ;Check dos idle interrupt
CALL    CHECK_SEG      ;If changed, can't uninstall
JNE     CANT_UNINSTALL

MOV     ES,INSTALLED_SEG
ASSUME  DS:NOTHING, ES:NOTHING

LDS     DX,ES:OLDINT88 ;Get original vector
MOV     AX,2508H
INT     21H              ;Dos function to change vector

LDS     DX,ES:OLDINT17 ;Get original vector
MOV     AX,2517H
INT     21H              ;Dos function to change vector

LDS     DX,ES:OLDINT21 ;Get original vector
MOV     AX,2521H
INT     21H              ;Dos function to change vector

LDS     DX,ES:OLDINT28 ;Get original vector
MOV     AX,2528H
INT     21H              ;Dos function to change vector

MOV     ES,ES:BUFF_SEGMENT ;Get segment of buffer
MOV     AH,49H          ;Free its allocated memory
INT     21H
JC      RELEASE_ERR     ;If error, take jump

MOV     ES,INSTALLED_SEG ;The resident program segment
NOT     WORD PTR ES:START
MOV     AH,49H          ;Free its allocated memory
INT     21H
JC      RELEASE_ERR     ;If error, take jump
MOV     AX,4C88H
INT     21H              ;Exit to dos

RELEASE_ERR:  MOV     DX,OFFSET BAD_ALLOC ;Memory allocation error
JMP     ERR_EXIT       ;Exit with error message

CANT_UNINSTALL:
MOV     DX,OFFSET BAD_UNINSTALL ;Point to error message
JMP     ERR_EXIT       ;Exit with error message
    
```

This subroutine checks to see if an interrupt vector points to the
installed program segment. Returns with ZF=1 if it does.

```

CHECK_SEG  PROC     NEAR

MOV     AH,35H          ;Get the vector
INT     21H              ;Dos function to get the vector
MOV     AX,ES
CMP     AX,INSTALLED_SEG ;Is it the installed segment?
RET

CHECK_SEG  ENDP

FILENAME   LABEL  BYTE ;File name will go here
END_OF_CODE =      $ + 128 ;Allow 128 bytes for it

CSEG      ENDS
END       START
    
```

end

we need to look at the more fundamental operation of the device.

A printer may be addressed at any of three levels, which I'll call machine,

BIOS, and DOS. Exactly which method is used by any particular program is difficult to determine, though typically programs that use the highest level

(DOS) are the most versatile and well behaved. The lower levels are used when maximum speed is required, even at the sacrifice of compatibility.

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PRN2FILE can redirect output at either the BIOS or DOS level, but any output done at the machine level can't be redirected. Detecting printer output at the machine-code level would require special hardware to intercept the I/O requests. Now let's see how each of these methods works.

Machine-level printing

At the lowest level, simple machine instructions (such as IN and OUT) are used. These powerful commands directly control the electrical signals that are applied to the pins of the parallel port interface. A series of 8 data bits and a handful of control signals are used to communicate directly with the printer.

To transmit a character, you first wait until the printer indicates that it's ready to receive data. You do this by using an IN instruction to read the printer status from pin 11. When a not-busy signal is received, the data can be placed on the data lines with the OUT instruction. Next, a strobe signal is sent, which instructs the printer to read the byte. The strobe is generated by setting pin 1 high, then immediately resetting it low.

Writing this type of hardware device driver is not for the faint hearted. Critical timing rules must be followed precisely. Furthermore, when addressing ports directly, you must contend with the differences among the various types of hardware available. Because of these limitations, few programs elect to use this method. Besides, the code required to access the printer is available in BIOS.

Printing by BIOS

Using the computer's Basic Input/Output System (BIOS) is the next step up in ease of use. The BIOS is a set of procedures contained in read-only memory (ROM) that handle the details of dealing with touchy hardware. The standard IBM PC BIOS includes support for the keyboard, floppy disks, display, printer, and a few other devices. Using BIOS is easy. It's completely documented in the IBM *Technical Reference* manual, which even provides the BIOS source code. Studying it thoroughly will give you a full understanding of the internal workings of your PC (as well as a case of permanently crossed eyes).

The BIOS services are all accessed with software interrupts. Interrupt 17h is used for printer control. The following three functions are provided:

Function 0	Print a character
Function 1	Reset the printer
Function 2	Obtain the printer status

To print a character using the BIOS, you

put the data in register AL and a zero in AH, and then issue interrupt 17h. It seems so easy you'd think it would be the method of choice. Many programs do in fact issue BIOS calls directly. As long as — but only as long as — the computer has an 'IBM compatible' BIOS, this technique works fine. But the most sophisticated way to print is to use DOS.

Printing with DOS services

DOS provides printing services similar to the BIOS. The advantage in using DOS is that it provides device-independent printer functions. This means that a DOS print function will work on any DOS machine. Other advantages include the ability to print entire strings rather than a single character. DOS also processes errors with the familiar 'Abort, Retry, Ignore' message. DOS functions are requested with software interrupt 21h. There are two print functions available. Function 5 is used when a single character is to be printed. Function 40h is the 'write to device' function and can print up to 64k of text at a slug. When using this function to write to the printer, the handle is set to 4, ie, to the predefined DOS print device.

I've several times mentioned printing one character at a time. Printers are 'character devices', ie, they are capable of processing only one byte at a time. To print an entire page requires separately printing letter after letter. If you think about that the next time you print a lengthy report, you'll begin to appreciate the amount of work your computer does for you.

Disk drives, on the other hand, are 'block devices'. They handle data in chunks. (DOS uses a block size of 512 bytes). This is an important factor for PRN2FILE, since it must take data from a character device and send it to a block device.

The buffer

Gathering up a block of data is a natural job for a buffer. Buffers are used extensively in systems programming as a temporary holding area for data. They come in all sizes and shapes (such as straight and circular). The buffer used by PRN2FILE is a simple straight buffer with a capacity of 4096 bytes (or as specified by/B). The buffer is a segment of computer memory that temporarily holds characters waiting to be written to the disk. The pointer `BUFF_POINTER` is used to hold the location of the next empty position. Each byte that is to be printed is entered in the buffer, where it

remains until enough are gathered to warrant a disk write. Then the entire buffer is written to the file with a single command. If each byte were written to the disk by itself, an intolerably high number of disk accesses would result.

Determining the buffer size for a program such as PRN2FILE is always a trade-off. On the one hand, the smaller you make it, the quicker it fills and requires disk accesses. Making it larger, on the otherhand, consumes memory that is then unavailable for other programs. Resident programs should always use as little memory as possible.

Next to size, the most important factor to consider concerns the way the buffer is emptied. The typical way of using a buffer is to fill it completely, then empty it and start over. PRN2FILE is different. It empties its buffer whenever it contains more than 1024 bytes. The reason is that emptying the buffer must be coordinated with other tasks in which the computer is involved. If we waited until the buffer was full before asking DOS to write the file, it might easily happen that DOS was tied up doing something else at that moment. In this event, since the buffer couldn't hold any more data, bytes would be lost. By flushing the buffer long before it fills completely, we minimise the chance of this happening. In the rare circumstance of an overflow, PRN2FILE signals the error by inserting the message "Buffer Overflow" in the file.

Which way to the printer?

We've seen how printers and buffers work. Now consider the task of bypassing the printer and rerouting its data into a file. The obvious problem is to determine when and what characters are being printed. Since the BIOS and DOS printer service routines are invoked by interrupts, that's actually very simple. Remember, we said only programs that use either BIOS or DOS will work with PRN2FILE (this includes nearly all commercial software).

The locations of all interrupt service routines are stored in the interrupt vector table. You can judge the importance of this table by the fact that it's the very first thing stored in the computer's memory. Changing these interrupt vectors is a simple process, and it's at the heart of most resident utilities. When you change vectors, the original vector is obtained and recorded for future use by the resident program. The segment and offset of the new procedure are then copied into the table. Following are the interrupt vectors used by PRN2FILE, and among these INT 17h is obviously of the greatest interest.

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```

100 REM -- BASIC PROGRAM TO CREATE PRN2FILE.COM
110 OPEN "PRN2FILE.COM" AS #1 LEN = 1
120 FIELD #1,1 AS A$
130 CHECKSUM = 0
140 FOR I = 1 TO 174
150   LINESUM = 0
155   PRINT "-";
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 = 138948 THEN PRINT "Successful Completion!" : END
280 PRINT "COM file is not valid!" : END
290 DATA 233, 136, 2, 80, 82, 78, 50, 70, 731
300 DATA 73, 76, 69, 32, 49, 46, 48, 32, 425
310 DATA 40, 99, 41, 32, 49, 57, 56, 55, 429
320 DATA 32, 90, 105, 102, 102, 32, 67, 111, 641
330 DATA 109, 109, 117, 110, 105, 99, 97, 116, 862
340 DATA 105, 111, 110, 115, 32, 67, 111, 46, 697
350 DATA 36, 26, 84, 111, 109, 32, 75, 105, 578
360 DATA 104, 108, 107, 101, 110, 76, 80, 84, 770
370 DATA 49, 32, 82, 101, 100, 105, 114, 101, 684
380 DATA 99, 116, 101, 100, 32, 116, 111, 58, 733
390 DATA 32, 36, 73, 110, 118, 97, 108, 105, 679
400 DATA 108, 32, 102, 105, 108, 101, 110, 97, 755
410 DATA 109, 101, 46, 36, 85, 115, 97, 103, 692
420 DATA 101, 50, 32, 80, 82, 78, 50, 70, 551
430 DATA 73, 76, 69, 32, 91, 112, 97, 116, 666
440 DATA 104, 93, 91, 102, 105, 108, 101, 110, 814
450 DATA 97, 109, 101, 93, 91, 47, 80, 110, 728
460 DATA 93, 91, 47, 66, 110, 110, 93, 91, 781
470 DATA 47, 85, 93, 36, 77, 101, 109, 111, 659
480 DATA 114, 121, 32, 65, 108, 108, 111, 99, 758
490 DATA 97, 116, 105, 111, 110, 32, 69, 114, 754
500 DATA 114, 111, 114, 46, 36, 67, 97, 110, 695
510 DATA 110, 111, 116, 32, 85, 110, 105, 110, 779
520 DATA 115, 116, 97, 108, 108, 46, 36, 80, 786
530 DATA 82, 78, 36, 13, 10, 36, 13, 10, 278
540 DATA 42, 66, 117, 102, 102, 101, 114, 32, 678
550 DATA 79, 118, 101, 114, 102, 108, 111, 119, 852
560 DATA 42, 13, 10, 0, 0, 0, 0, 65
570 DATA 0, 0, 0, 0, 0, 0, 0, 0
580 DATA 0, 0, 0, 0, 0, 0, 0, 0
590 DATA 0, 0, 0, 0, 0, 0, 0, 0

```

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600 DATA 0, 4, 0, 0, 0, 46, 59, 22, 131
610 DATA 245, 1, 117, 0, 46, 128, 62, 239, 846
620 DATA 1, 1, 116, 5, 46, 255, 46, 223, 693
630 DATA 1, 251, 46, 199, 6, 240, 1, 91, 835
640 DATA 0, 86, 120, 252, 1, 116, 37, 10, 630
650 DATA 228, 117, 56, 46, 139, 54, 247, 1, 888
660 DATA 46, 59, 54, 249, 1, 116, 44, 30, 599
670 DATA 46, 142, 30, 251, 1, 136, 4, 31, 641
680 DATA 70, 46, 137, 54, 247, 1, 129, 254, 938
690 DATA 0, 4, 124, 23, 46, 198, 6, 244, 645
700 DATA 1, 1, 30, 83, 46, 197, 30, 235, 623
710 DATA 1, 128, 63, 0, 91, 31, 117, 3, 434
720 DATA 232, 122, 0, 94, 100, 144, 207, 156, 1135
730 DATA 46, 255, 30, 219, 1, 46, 255, 14, 866
740 DATA 240, 1, 117, 14, 46, 131, 62, 247, 858
750 DATA 1, 0, 116, 6, 46, 198, 6, 244, 617
760 DATA 1, 1, 207, 156, 46, 128, 62, 244, 845
770 DATA 1, 1, 117, 17, 30, 83, 46, 197, 492
780 DATA 30, 235, 1, 128, 63, 0, 91, 31, 579
790 DATA 117, 3, 232, 64, 0, 10, 228, 117, 771
800 DATA 3, 184, 0, 76, 128, 252, 64, 117, 824
810 DATA 13, 131, 251, 4, 117, 8, 46, 128, 698
820 DATA 62, 239, 1, 1, 116, 7, 157, 250, 833
830 DATA 46, 255, 46, 227, 1, 251, 252, 81, 1159
840 DATA 82, 86, 139, 242, 46, 139, 22, 245, 1001
850 DATA 1, 227, 7, 172, 100, 0, 285, 23, 815
860 DATA 226, 249, 94, 90, 89, 139, 193, 157, 1237
870 DATA 248, 251, 202, 2, 0, 80, 83, 81, 947
880 DATA 82, 30, 6, 14, 31, 198, 6, 244, 611
890 DATA 1, 0, 104, 36, 53, 232, 129, 0, 635
900 DATA 83, 6, 106, 114, 3, 104, 36, 37, 649
910 DATA 232, 118, 0, 131, 62, 247, 1, 0, 791
920 DATA 116, 90, 106, 106, 6, 104, 2, 61, 751
930 DATA 232, 102, 0, 114, 16, 139, 216, 51, 870
940 DATA 201, 51, 210, 104, 2, 66, 232, 80, 1034
950 DATA 0, 114, 60, 235, 17, 61, 2, 0, 489
960 DATA 117, 58, 105, 32, 0, 100, 60, 232, 864
970 DATA 71, 0, 114, 43, 139, 216, 106, 0, 769
980 DATA 0, 139, 14, 247, 1, 100, 64, 30, 675
990 DATA 142, 30, 251, 1, 232, 50, 0, 31, 737
1000 DATA 114, 21, 59, 200, 117, 17, 59, 14, 601
1010 DATA 249, 1, 117, 11, 106, 198, 1, 105, 948
1020 DATA 21, 0, 100, 64, 232, 26, 0, 100, 703
1030 DATA 62, 232, 21, 0, 199, 6, 247, 1, 768
1040 DATA 0, 0, 31, 90, 104, 36, 37, 232, 610
1050 DATA 7, 0, 7, 31, 90, 89, 91, 88, 403
1060 DATA 195, 156, 250, 46, 255, 30, 227, 1, 1160
1070 DATA 251, 195, 251, 50, 192, 46, 162, 239, 1386
1080 DATA 1, 207, 251, 46, 128, 62, 244, 1, 940
1090 DATA 0, 116, 3, 232, 79, 255, 46, 255, 986

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continues . . .

PRN2FILE.BAS: a Basic program that will create PRN2FILE.COM automatically

- INT 08h Hardware Timer Tick
- INT 17h BIOS printer functions
- INT 21h DOS functions
- INT 24h DOS severe error handler
- INT 28h DOS not busy signal

The vector for interrupt 17H is set to the procedure labelled NEWINT17. When redirection is in effect, this routine processes all printer functions for the selected printer. If more than one printer is present, calls to the other printers are passed on to the BIOS for normal processing. Similarly, when redirection is disabled, all requests are forwarded to the BIOS. Passing control to the BIOS is done with a far JMP to the address that was saved from the initial vector. Since the return address on the stack is unaltered, the BIOS routine will return direct-

ly to the application program that made the print request.

When a character is redirected into the buffer, the interrupt is processed completely and is not passed to BIOS. The standard rules for interrupts must be followed to emulate the BIOS. On entry, register AL contains the character to be printed and DX holds the printer number. On return, all registers except AH must be preserved. Register AH should contain the printer status. The diagram 'Printer Return Status Byte' contains the bit assignments for this status byte. A 1 in any position indicates presence of the condition. Since there is no real printer involved, an artificial status code is returned. The value 90H signals printer 'not busy' and

'selected', meaning the print operation was successful.

We've already seen why a buffer is required. To add to the buffer, we first obtain the pointer to the next empty position in the buffer. Then a check is made to see if the buffer is already full. Unchecked, overfilling the buffer would result in writing in memory that doesn't belong to PRN2FILE, the consequence of which is usually a locked machine. Therefore, if the buffer does overflow, the character that was to be printed must be discarded.

In the normal case, when the buffer is not full, the character is stored and the pointer is advanced to the next position. The pointer is again tested to determine if there are at least 1024 bytes in the buffer. If so, it's time to attempt to write to the disk. Setting WRITE_FLAG to 1 signals this need.

Before charging ahead with disk I/O, however, we must determine if DOS is already in the middle of another task. Unfortunately, DOS can handle only one function call at a time. Violating this rule is another sure way to crash the system. The undocumented DOS busy flag is used to determine if DOS is busy. If this

Printer Return Status Byte

7	6	5	4	3	2	1	0
NOT BUSY	ACKNOWLEDGE	OUT OF PAPER	SELECT	I/O ERROR	UNUSED	UNUSED	TIME OUT

PRODUCTIVITY

1100 DATA	46,	231,	1,	186,	3,	1,	232,	156,	856	1570 DATA	205,	32,	142,	6,	242,	1,	255,	54,	937
1110 DATA	1,	247,	22,	0,	1,	51,	219,	140,	681	1580 DATA	245,	1,	38,	143,	6,	245,	1,	191,	878
1120 DATA	200,	67,	59,	195,	142,	195,	116,	40,	1014	1590 DATA	106,	6,	139,	247,	105,	128,	0,	243,	1054
1130 DATA	190,	0,	1,	139,	254,	185,	16,	0,	785	1600 DATA	164,	176,	1,	148,	201,	59,	14,	242,	997
1140 DATA	243,	166,	11,	201,	117,	235,	38,	198,	1289	1610 DATA	1,	142,	6,	242,	1,	38,	162,	239,	831
1150 DATA	6,	239,	1,	1,	38,	139,	22,	245,	691	1620 DATA	1,	116,	25,	205,	32,	180,	9,	205,	773
1160 DATA	1,	137,	22,	245,	1,	180,	1,	285,	792	1630 DATA	33,	186,	195,	1,	180,	9,	205,	33,	842
1170 DATA	23,	128,	194,	49,	136,	22,	64,	1,	617	1640 DATA	195,	191,	128,	0,	46,	138,	13,	59,	761
1180 DATA	140,	6,	242,	1,	14,	7,	128,	62,	600	1650 DATA	237,	71,	252,	195,	187,	234,	6,	131,	1313
1190 DATA	80,	0,	0,	116,	99,	176,	47,	232,	750	1660 DATA	195,	15,	177,	4,	211,	235,	180,	74,	1091
1200 DATA	95,	1,	242,	174,	227,	100,	138,	5,	990	1670 DATA	205,	33,	115,	5,	186,	148,	1,	235,	928
1210 DATA	199,	69,	255,	32,	32,	12,	32,	69,	691	1680 DATA	164,	139,	30,	249,	1,	177,	6,	211,	977
1220 DATA	112,	116,	55,	60,	98,	116,	13,	68,	630	1690 DATA	227,	180,	72,	205,	33,	114,	237,	163,	1231
1230 DATA	117,	116,	6,	186,	100,	1,	233,	4,	763	1700 DATA	251,	1,	161,	249,	1,	177,	10,	211,	1861
1240 DATA	1,	233,	238,	1,	199,	6,	249,	1,	928	1710 DATA	224,	11,	192,	117,	1,	72,	163,	249,	1029
1250 DATA	0,	0,	161,	249,	1,	179,	10,	246,	846	1720 DATA	1,	180,	52,	295,	33,	137,	30,	235,	873
1260 DATA	227,	71,	138,	29,	128,	235,	48,	114,	990	1730 DATA	1,	140,	6,	237,	1,	184,	8,	53,	630
1270 DATA	196,	128,	251,	9,	119,	191,	198,	5,	1097	1740 DATA	205,	33,	137,	30,	219,	1,	140,	6,	771
1280 DATA	32,	50,	255,	3,	195,	163,	249,	1,	948	1750 DATA	221,	1,	186,	95,	2,	184,	0,	37,	734
1290 DATA	235,	224,	71,	138,	5,	198,	5,	32,	908	1760 DATA	205,	33,	184,	23,	53,	205,	33,	137,	873
1300 DATA	162,	64,	1,	44,	49,	50,	220,	60,	658	1770 DATA	30,	223,	1,	140,	6,	225,	1,	186,	812
1310 DATA	3,	115,	192,	163,	245,	1,	235,	157,	1111	1780 DATA	253,	1,	184,	23,	37,	205,	33,	184,	920
1320 DATA	186,	61,	1,	180,	9,	205,	33,	186,	861	1790 DATA	33,	53,	205,	33,	137,	30,	227,	1,	719
1330 DATA	191,	1,	232,	232,	0,	176,	0,	233,	1065	1800 DATA	140,	6,	229,	1,	186,	123,	2,	184,	871
1340 DATA	209,	0,	131,	62,	249,	1,	1,	114,	767	1810 DATA	33,	37,	205,	33,	184,	40,	53,	205,	790
1350 DATA	162,	131,	62,	249,	1,	64,	119,	155,	943	1820 DATA	33,	137,	30,	231,	1,	140,	6,	233,	811
1360 DATA	176,	32,	232,	220,	0,	243,	174,	227,	1304	1830 DATA	1,	186,	122,	3,	184,	40,	37,	205,	778
1370 DATA	215,	128,	61,	50,	117,	10,	79,	138,	806	1840 DATA	33,	161,	44,	0,	142,	192,	180,	73,	825
1380 DATA	5,	199,	5,	32,	32,	235,	7,	144,	659	1850 DATA	285,	33,	186,	111,	0,	184,	0,	49,	768
1390 DATA	180,	25,	205,	33,	4,	65,	180,	58,	750	1860 DATA	285,	33,	176,	8,	232,	111,	0,	117,	882
1400 DATA	163,	106,	6,	176,	92,	162,	100,	6,	819	1870 DATA	183,	176,	23,	232,	104,	0,	117,	96,	851
1410 DATA	232,	102,	0,	242,	174,	227,	6,	191,	1254	1880 DATA	176,	33,	232,	97,	0,	117,	89,	176,	920
1420 DATA	108,	6,	235,	37,	144,	138,	22,	106,	796	1890 DATA	40,	232,	90,	0,	117,	82,	142,	6,	709
1430 DATA	6,	128,	226,	223,	128,	234,	64,	190,	1199	1900 DATA	242,	1,	38,	197,	22,	219,	1,	184,	904
1440 DATA	109,	6,	139,	254,	180,	71,	205,	33,	997	1910 DATA	0,	37,	205,	33,	30,	197,	22,	223,	763
1450 DATA	114,	88,	176,	0,	56,	5,	116,	9,	564	1920 DATA	1,	184,	23,	37,	205,	33,	30,	197,	718
1460 DATA	185,	64,	0,	242,	174,	198,	69,	255,	1187	1930 DATA	22,	227,	1,	184,	33,	37,	205,	33,	742
1470 DATA	92,	87,	176,	32,	232,	130,	0,	243,	992	1940 DATA	38,	197,	22,	231,	1,	184,	40,	37,	750
1480 DATA	174,	139,	247,	78,	95,	172,	60,	32,	997	1950 DATA	285,	33,	38,	142,	6,	251,	1,	180,	856
1490 DATA	116,	7,	60,	13,	116,	3,	170,	235,	720	1960 DATA	73,	285,	33,	114,	21,	46,	142,	6,	640
1500 DATA	244,	87,	198,	5,	36,	186,	61,	1,	818	1970 DATA	242,	1,	38,	247,	22,	0,	1,	180,	731
1510 DATA	180,	9,	205,	33,	186,	106,	6,	232,	957	1980 DATA	73,	285,	33,	114,	5,	184,	0,	76,	690
1520 DATA	83,	0,	95,	198,	5,	0,	186,	106,	673	1990 DATA	285,	33,	186,	148,	1,	233,	165,	254,	1225
1530 DATA	6,	184,	0,	61,	205,	33,	114,	9,	612	2000 DATA	186,	173,	1,	233,	159,	254,	180,	53,	1239
1540 DATA	139,	216,	180,	62,	205,	33,	235,	19,	1080	2010 DATA	285,	33,	140,	192,	46,	59,	6,	242,	923
1550 DATA	144,	185,	32,	0,	180,	60,	205,	33,	839	2020 DATA	1,	195,	0,	0,	0,	0,	0,	0,	196
1560 DATA	115,	238,	186,	82,	1,	232,	45,	0,	899										

end

flag is not zero, then DOS is active and the buffer can't be flushed yet. To prevent an overflow on the next character, the buffer must be made large enough to handle this common occurrence.

All three print functions must be implemented in order to emulate the BIOS interrupt 17h routine fully. When a printer reset is requested (function 1), WRITE_FLAG is set to 1, which causes the buffer to be flushed. A printer reset is performed each time PRN2FILE is run. A printer status request (function 2) is serviced by always returning the value 90h, which indicates the printer is ready.

To ensure that a full buffer gets flushed at the earliest opportunity, interrupts 21h and 28h constantly monitor the buffer status. Every time that each of these interrupts completes, it checks the value of WRITE_FLAG. If it's equal to 1, then a call to WRITE_FILE is made. This ensures that the buffer is flushed as soon as possible.

When interrupt 21h is intercepted, it's important to preserve the flags register by PUSHing and POPping. Most interrupt routines return with an IRET instruction, which restores the caller's flags from the stack (the INT instruction will have placed them there). But INT 21h signals error conditions by returning with the carry flag set. To manipulate the carry flag, therefore, NEWINT21 uses a RET 2 instruction. This does a FAR return and

then discards the flags on the stack. The other bits in the flags word must be returned unchanged, however; to do this, they are PUSHed before any other instructions are executed. Now the flags can be used as needed as long as they are POPped before returning.

The mechanics of writing to a file are straightforward. The subroutine WRITE_TO_FILE contains the instructions to do it. It immediately sets WRITE_FLAG back to zero to prevent itself from being called again. Then the file is opened. If a 'file not found' error is returned, a second call is needed to create the file. The file pointer can then be advanced to the end of file. This vital step is needed to avoid overwriting existing data in the file. The entire buffer contents are written using the DOS block write procedure (function 40h of interrupt 21h). If the buffer is completely full (an abnormal condition), the error message is also written to the file. The file is then closed and the buffer pointer reset to the first byte of the buffer.

Special provisions must be made for disk errors. Normally DOS signals these errors with its famous 'Abort, Retry, Ignore' prompt. For a resident program, this just won't do. For one thing, the screen would get littered with the message. Another problem is that you just can't gracefully abort from within a resident program. The solution is to replace

the severe error routine (INT24h) with one that ignores all errors. After the file is safely written, the original INT 24h vector is restored.

Buffer time-outs

After using PRN2FILE you'll quickly become familiar with the buffered nature of the program. To demonstrate it, turn on redirection and print a few lines of something. Then *immediately* do a directory of the destination file. You'll probably notice it is still empty. The reason is that the printed data is still in the buffer. One way to remedy this is to run PRN2FILE again. This always flushes the buffer. I've added a second method, however, which is more convenient. Approximately five seconds after the last character is printed, the buffer is automatically flushed. Redirection then proceeds as normal. This feature works best with programs that make frequent DOS function calls (most do).

To make time-outs work requires setting a counter each time a character is printed. Since the timer ticks 18.2 times each second, an initial value of 91 is used for a five-second time-out. On each tick of the internal clock, the counter is decremented (this is the reason for chaining into interrupt 8). If the counter reaches zero, WRITE_FLAG is set to 1 to indicate that the buffer should be writ-

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ten at the next opportunity. If another character is printed before the flush time is reached, the counter is again set to 91. When printing is continuous, the flush time is never reached. Only after printing stops does a time-out occur.

Getting it loaded

In the beginning all programs are created equal. What makes resident programs special is how they terminate. Normally, when programs finish, they are overlaid in memory by the next program. To keep them resident, you must instruct the operating system to preserve the memory. DOS provides special exit routines for this. They are accessed with either function 31h of interrupt 21h or interrupt 27h, and they allow you to specify the amount of code that must stay resident.

Resident programs are generally written in two parts: a portion that must stay resident and a transient portion. The resident part is located at the beginning of the file and the transient part last. When this format is used, the transient part can be released when the program terminates. In the case of PRN2FILE, however, the transient portion also remains resident. This is to simplify the

process of allocating memory for the buffer. Since we've described how most of the resident part works, let's look at the transient part.

The first step is to display the copyright notice. Next, a search is made of the computer's memory for a previously installed copy of PRN2FILE. It's necessary (and desirable) to install the program only once per session. The ability to determine whether the program was already installed is therefore a key step.

'The parameters can be entered in any order without needing complex logic to separate them.'

When the program is run again to change a parameter (such as the designation filename or printer number), the segment of the resident copy is determined and saved.

If a resident copy of PRN2FILE is detected, an additional step is required. Since the resident buffer may still contain some data left over from its last use, it must be emptied. If we failed to do this before changing the target filename, we

could end up with a confusing mess, as data destined for the old file could end up in the new file. The easiest way to flush the buffer is to use the 'initialise printer' function call. The resident copy of PRN2FILE intercepts the function call and interprets it as a command to empty the buffer.

The command line is now parsed for any specified parameters. DOS conveniently places any command line parameters at offset 81h in the Program Segment Prefix (PSP) and indicates the length of the string at offset 80h. The scan string instruction (SCASB) is perfect for locating any slashes (ASCII 2Fh). If any are found, the next character should be either B,P, or U. If other letters are found, an error message is printed and the program terminates.

The /P and /B parameters are quite simple, so let's look instead at how Uninstall works. Remember, the two things that make a resident program resident are having memory allocated to it and showing its presence in the interrupt vector table. To uninstall, we must undo these two steps. Getting out of the interrupt table is either simple or impossible. It's simple if the vectors we set are still there. In that case, we just put back the original vectors that were recorded

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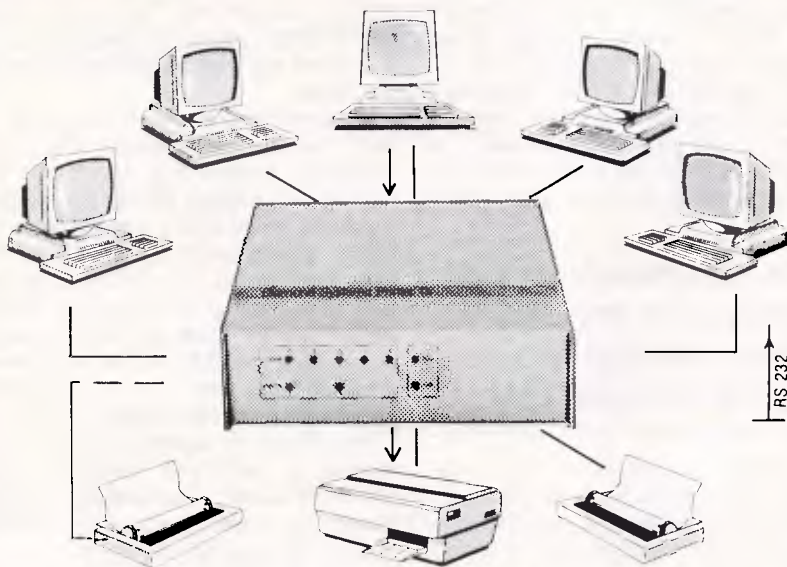
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during the install. But if another resident program has chained itself into one of the *same* vectors, we have no way of knowing what the new vector should be. If this happens, the 'Cannot Uninstall' message is displayed. With the vector table restored, we relinquish the two memory segments that comprised the code and buffer. Then we take the normal exit to DOS, leaving not a trace of the once-resident program remaining.

To avoid confusing parameters (such as /P2) with the filename, each one is erased from the command string as it is processed. To erase letters, they are simply replaced with spaces. When command parsing is complete, only the filename remains. This handy trick has the additional advantage that the parameters can be entered in any order without the need for complex logic to separate them.

Parsing the filename takes three steps. First, we determine if a drive letter were specified. Again the SCASB instruction is used, this time to locate the first letter of the filename. When the scan completes, register DI will point to a colon if a drive were entered. The drive letter is then copied to the file specification string. Like the parameters, the drive is then erased from the command. If no drive were found, we use DOS function 19h to obtain the default drive.

The second step is to look for a path in the command string. This time we scan for a backslash. If one is found, the remaining path and filename are transferred to the file specification. Otherwise, the default path for the selected drive is obtained using function 47h.

Last, the remaining filename is copied. At the end of the completed string we add a null character (ASCII 0) to conform with the DOS convention that calls for an ASCII Z termination for filenames. The filename is also displayed on the screen at this time (using DOS function 9) to complete the redirection message.

Now we've got a filename. But is it a valid filename? If not — and we're not all perfect typists — then PRN2FILE can't do a thing. You could use a series of tests and compare instructions to confirm the syntax, but I decided instead to use a simple but foolproof method: just ask DOS to OPEN the file. If an error code is returned, then the name must be bad. When this happens, the error message 'Invalid filename' is displayed and the program terminates. If the OPEN is successful, then the file is immediately closed and we can continue. (Actually, if the OPEN fails, a CREATE is also attempted since the OPEN will fail if the file doesn't exist).

PRODUCTIVITY

The next steps are required to transfer the new command parameters to the resident copy of the program. Two things must be copied: the printer number and the filename. The segment address of the already-resident copy has been determined by the search. The values are easily moved by setting the DS and ES registers to the current and preinstalled code segments. The printer number can be transferred by PUSHing it with the DS register and POPing it with the ES register. To move the filename, the move string instruction (MOVSB) is used. Register CX contains the byte count, which is 128. This moves more data than necessary, but the code is more compact.

The last steps are performed only if this is the very first time the program has been run. Memory must be allocated for the buffer space. Since DOS always allocates all available memory for every program, we first release what we don't need. Then the buffer size (label BUFF_SIZE), which is in kilobytes, is converted into paragraphs by shifting it left six times (one k is 1024 bytes, ie, 64 paragraphs, ie, 6 left shifts).

After allocating a segment for the buffer, we again rotate BUFF_SIZE by a count of 10 to convert it to bytes. BUFF_SIZE can

then be used by PRN2FILE as a marker for the buffer's end.

A funny thing happens if a full 64k buffer is specified. After BUFF_SIZE is converted to bytes, it becomes zero! The

'To tell DOS we're finished but not to erase us from memory is as easy as saying 'INT21h.'

reason is simple. The largest integer that can be represented by a 16-bit word is just one less than 64k (or 65535). When /B64 is entered, BUFF_SIZE is set to FFFFh (the largest possible value), so you'll actually get short-changed by 1 byte.

The location of the DOS busy flag must now be determined using 34h. It's needed each time a disk write is called for to make sure DOS isn't otherwise engaged. The flag is set by DOS itself to indicate when DOS is in an uninterruptible state. Though this function remains undocumented to this day, it forms a key part of many resident utilities that must access the disk.

Stealing interrupts is the name of the

game for resident programs. The initial value of each of the four required vectors (8h, 17h, 21h, and 28h) is recorded in the data area. These are then replaced with the routines NEWINT08, NEWINT17, NEWINT21, and NEWINT28. DOS provides the services that aid and abet such thefts.

To finish the installation, the memory block allocated for the environment copy is released. It's of no value to PRN2FILE, and releasing it allows DOS to reuse it. To tell DOS we're finished for now but not to erase the resident code from memory is then as easy as saying 'INT21h'. Thereafter, all programs will be loaded higher in memory so as not to interfere with the resident ones.

Originally, it appeared that PRN2FILE could be a very short program. After all, 'Redirect the printer output' is easy to say. As it turned out, programming around the limitations imposed by the fact that DOS (in current versions) is not a multi-tasking operating system required quite a bit of code. Over half the program's 1386 bytes are required to address this issue alone. Still, whenever you find you want to save printer output to a file, you'll be glad you added PRN2FILE to your utilities collection.

END

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Stephen Applebaum witnesses a warped idea of feminism and decides that the oldies are the goodies in this month's review of the best games.

The (un)fairer sex

Title: Plundered Hearts
Computer: IBM PC; Apple II Series; Macintosh; Commodore 64/128; Amiga
Supplier: Imagineering
Price: All systems \$79, except for Commodore 64/128, \$59.95.

Infocom claims that it produced Plundered Hearts, one of its latest text adventures, in response to letters received from women calling for a scenario that reflected their attitudes and interests. The result is not only the first adventure from a major software house to feature a female protagonist, but must surely also be one of the few to have been written solely by a woman, Amy Briggs.

But even though Plundered Hearts apparently has the credentials to appeal to a predominantly female audience, it is not, I suspect, the game those women had in mind when they wrote to Infocom. Amy Briggs has pastiched Mills and Boon and characterised her heroine in the way men like to present women: she is beautiful, vulnerable but not helpless, and liable to forget *everything* when confronted by Mr Right.

How many adventures can you recall where the male lead jeopardises his mission because he lets his hormones, rather than his brain, dictate his actions? And why should this be the case in an adventure purportedly written for women?

In Plundered Hearts, the heroine swoons with delight each time the male interest swaggers into view; keeping her out of his octopus-like grip long enough to complete her mission is a major preoccupation. Surely women aspire to things other than being carried off by a hulking male, the likes of which stopped evolving somewhere between simians and homo sapiens. But, Amy Briggs is a woman, and this, apparently, is what she thinks members of her sex desire. (If you are a woman reading this review, I apologise for the way women are depicted in some of the following extracts. They are, however, Amy Briggs' words, not mine.)

Plundered Hearts is set in the balmy West Indies of the 17th century. You play a young ingenue, travelling aboard a ship bound for St Sinistra where, in a

house owned by the unscrupulous Jean Lafond, your grizzled father lies dying from a rare, wasting disease. Everyone (well, almost) hopes that your presence on St Sinistra will encourage your father to fight off his illness.

However, there are people who would stop you reaching him — Jean Lafond being one of them. His motives for inviting you to St Sinistra are far from honourable.

Even before the action proper begins, Amy Briggs has her heroine — that is, you — caught in the clutches of an unnamed, but perfectly formed, seaman, whose eyes 'rake over your inadequately dressed body, the damp chemise clinging to your legs and heaving bosom.' Before long, 'his mouth is on yours, lips parted, demanding, and you arch into his kiss . . .' Sizzling stuff.

All this has very little whatsoever to do with the main story since, when the game does actually start, you are aboard the Lafond Deux which is being attacked by pirates. One of these pirates throws you into a cabin and promises to make you the crew's plaything, after the *melée* on deck has subsided.

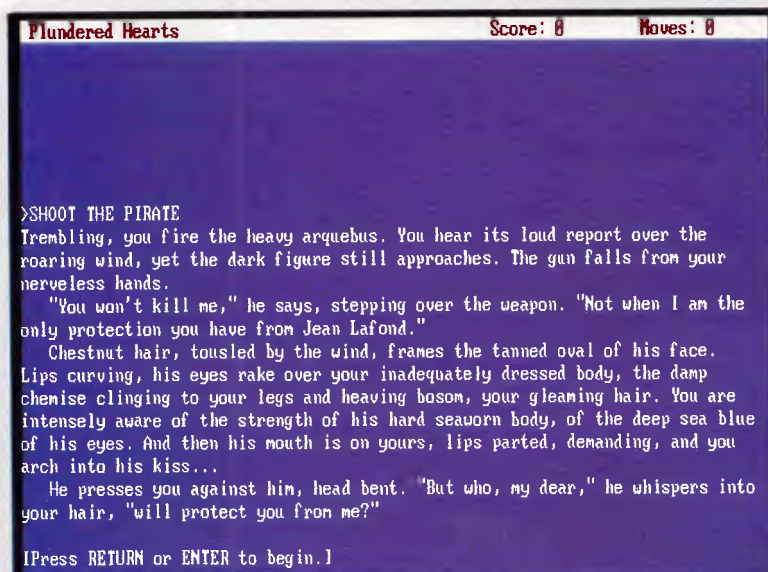
Quicker than you can say 'sexual harassment', in barges a rather repulsive-looking sailor shouting 'Me name's

Andy Crulley, and ladies learn to love me.' Just when all seems lost, who should appear but Captain Nicholas Jamison, aka The Falcon, whose manly features turn your legs to jelly and somewhat predictably cause you to swoon. Could *he* be Mr Right? You bet he is.

Jamison, you soon discover, has been sent to protect you from Lafond by your father. And, as in all the best romance novellas and TV soaps, has his own reasons for wanting to meet Lafond — in this case to take revenge for the murder of his brother.

More of the action in Plundered Hearts takes place aboard Jamison's ship and in Lafond's house on St Sinistra, and the latter location features a superb ball scene. Amy Briggs' atmospheric evocation of the ball is so convincing that you find yourself drawn into the action until you are no longer a mere onlooker. Her description brings to life the smell of the women's perfumes, and you can almost hear the frou-frou of their dresses as they promenade blithely around the ballroom in time with the orchestra.

Plundered Hearts contains large sections of purely descriptive prose, since it was written to emulate a romantic novel. In this sense the game is a success, but I doubt whether adventure purists will



enjoy it as these prosaics amount to long interludes of inactivity for the player.

Although her writing is lively and skillful, Amy Briggs should have tried to strike a better balance between the amount of descriptive text and periods of activity in the game — viz, the parts of the game where the player has to perform some form of action.

She might also have considered cutting out some of the slush. Things like

'Tender is his kiss, soft his lips as his body presses hard against you. You drown in the tide of your passion, swept like the sea against the rocks of the shore' can become extremely tiresome if spread too thickly.

As *Plundered Hearts* is an Infocom game, it is hardly a surprise to find that not only is a disk included, but also a number of freebies. These include a small velvet reticule, with the name of

the adventure embossed on it in silver; a letter from Jean Lafond; and a 50 guinea note, as used on *St Sinistra*.

Plundered Hearts is an interesting and, on the whole, successful experiment.

Amy Briggs has not quite done for romance what Dave Lebling did for horror in *The Lurking Horror*, but she at least provides an interesting, though somewhat dubious, alternative to the normal adventure scenario.

A cut above the rest

Title: *The Sentinel*

Computer: Atari ST; Commodore 64/128; Amstrad

Supplier: ISD

Prices: \$49.99(ST); or \$34.99 (C-64); \$34.99 (Amstrad)

Sometimes, due to circumstances beyond my control, I fail to include in *After Dark* a game which, because of its quality and innovation, deserves coverage. When this happens, instead of going back to the original, I often wait for a new version; simply because, by the time the review is published, the first one has become *passé*. Thus, after a long wait, I at last bring to these pages the ST version of *The Sentinel*, a brilliant and uniquely refreshing game of strategy.

The Sentinel is a power struggle in the truest sense, as it involves a fight for the lion's share of a planet's energy (there are in fact 10,000 different 'worlds' to conquer).

Each world is presided over by the Sentinel — a she-creature who survives by sapping a planet's energy. Your role is that of a lowly synthoid, programmed to roam the universe delivering planets from the Sentinel's evil stare. However, you are alone in this venture, whereas the Sentinel has at her disposal hordes of Sentries and Meanies.

During play, you see your surroundings through the synthoid's eyes. Using the keyboard or mouse, you can scan your surroundings in any direction. Rotating the synthoid causes the screen to pan, revealing the surrounding land. Trees and boulders proliferate across every planet and provide the major sources of energy for yourself and the Sentinel.

Energy is the prize in *The Sentinel*. As a synthoid, you are able to assimilate the energy latent in trees and boulders; this is used to produce new synthoids, or to create trees and boulders, the strategic potential of which is enormous. Energy must be absorbed before new forms can be created because, as in the real world, energy cannot be

created or destroyed but only turned into another form.

Like everything else in this extraordinary game, the Sentinel can be transformed into pure energy through a process of absorption — if she doesn't absorb you first. The idea, therefore, is to move your synthoid into a position from where you can see the Sentinel, absorb her and then hyperspace to a new world. If this sounds easy, the Sentinel always inhabits the highest location on a planet, which means that you must first find a relatively high spot and then pile boulder upon boulder until you are high enough to zap her.

To move about a planet, you point to a square and then press a key or click the mouse, depending on the control device you are using. This not only moves you but actually creates a new synthoid. If you look back after moving, you will see the shell of the old synthoid standing at the location from where you moved.

Mountains and valleys provide refuge from the Sentinel's withering stare; she rotates constantly, enervating anything that falls along her line of vision. When you are spotted by either the Sentinel or one of her cronies, your energy falls until you move to a safe position out of sight.

If, at any time, you cannot move because the land immediately surrounding you is too high, you can hyperspace to another position on the landscape. Whereabouts you emerge from hyperspace is entirely up to the computer, and you could find yourself landed in full view of the Sentinel.

Depleted energy is replaced in multiples of one, two, three or four, depending on whether you absorb a tree or a Meanie, a boulder, a synthoid or a Sentry, or a Sentinel respectively. As the game is subject to the law of the 'conservation of energy', it follows that if a Synthoid provides three units of energy, it must also take the same amount to create one. Therefore, if your energy level falls below three units, it is impossible to move — in which case you can wait to be absorbed by the Sentinel, or mercifully restart the game from scratch.

Despite standing on the highest point on a planet, the Sentinel is not always visible because of the mountain ranges which characterise the geography of the various planets. To give you a chance, Firebird has installed a 'cheat' option on the Atari's HELP key. When this is pressed, the display changes to a bird's-eye view of the current world, showing your position in relation to the Sentinel.

The Sentinel has been around for some time now but remains one of the most original games I have seen to date. This version for the Atari ST has everything: excellent graphics, good gameplay, and a scenario so deceptively simple that you could not hope to appreciate the subtle strategy involved until you have played the game.

The Sentinel is, without a doubt, a classic and one of the few games I would advise all ST owners fed up with arcade shoot-'em-ups to buy on spec: you won't regret it.



END



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Bug in the range function

There is a bug in the way 1-2-3 handles certain ranges with the @functions.

When you expand a single-cell range into a multiple-cell range, the @function may lose the range name completely. This is best illustrated by an example.

First, create a worksheet that looks like the first screen in Fig 1. The formulae in line 5 are displayed as text, but enter them as formulae. Set the global column width to about 18. Now give the name RANGE1 to the range A1..A3 and the name RANGE2 to cell B1. Next put the formula @count(range1) in cell A6 and the formula @count(range2) in cell B6. Format the range A5..B6 to text (/Range Format Text) so you will be able to see how the formulae change. Finally, put the formula +A5 in cell A8 and copy it to the range A8..B9, so you can see the values of the formulae in A5..B6. You should end up with a spreadsheet that looks like the second screen.

Now comes the surprise: Redefine RANGE1, changing its contents from A1..A3 to A1. Change the definition of RANGE2 from B1 to B1..B3. What you get is the third screen in Fig 1, which is certainly not what you expected. Column A is fine, but the @count formulae in column B have lost RANGE2 as their argument and now refer only to B1. RANGE2 is supposed to include B1..B3, not just a single cell. If you put a number in cell B2, the @count values in cells B8 and B9 don't change to 2, as they would if the formulae in B5 and B6 really referred to RANGE2.

It's not only the @count function that drops the range name. Any time you expand a single-cell range name into a multiple-cell range name, all @function arguments that had the single-cell range name are converted incorrectly to the actual original single-cell address (in this case B1). So don't ever use /Range Name Create (or Delete), you'll also get a list of range names in the control panel. Here, too, if you hit F3 you'll get a full-screen display of names. Now if you hit F3 again, you can toggle between full-screen and control-panel displays. This is one more nice feature that slipped past the documentation writers — JT.

fectly valid for new references to it, though. If you enter a new @count(range2) formula somewhere in the third screen, it will refer to cells B1..B3 as it should.

There are more surprises. Goto cell A5 and hit Edit (F2), but don't hit Enter or an arrow key. The argument in the formula is a single-cell range, A1..A1, which is supposed to be impossible. (If you can show me any other way to get the argument of a function to appear as A1..A1, I'll eat my hat.) Hit Esc to leave A5 as it was. If you now expand RANGE1 back to include A1..A3, you'll

see that A5 and A6 don't dump the range name from the argument and give you a reference to a single cell, as the formulae in B5 and B6 did. That's because of that A1..A1 argument. If you had gone to A5 and hit Edit (F2) and then Enter, you would have collapsed the argument to A1, and the expansion of RANGE1 would have given you the same muddled error I mentioned earlier.

K Gaza

Both Releases 1A and 2.0 have the same nasty bug. Fortunately, most of us don't often have to expand a single-cell range — JT.

Getting to a range

A lot of people realise that if you hit the Goto (F5) key in 1-2-3 and then hit the Name (F3) key, you'll get a display of spreadsheet range names in the display panel. But look what happens if you hit F3 twice: you get all of your range names in a full-screen display. Highlight the range name you want, hit Enter, and go right to the range.

M Durbin

You'd think Lotus would document a handy fact like that, but I couldn't find it described anywhere. If you use /Range Name Create (or Delete), you'll also get a list of range names in the control panel. Here, too, if you hit F3 you'll get a full-screen display of names. Now if you hit F3 again, you can toggle between full-screen and control-panel displays. This is one more nice feature that slipped past the documentation writers — JT.

The finishing touch

Flush-left dBase programs run faster than indented code because the dBase interpreter reads every byte before processing the line. But if you have to go back later to change something, the flush-left coding is a nightmare to read. The FINISH.PRG, shown in Fig 2, solves this dilemma: you can use it to strip indents on finished programs or put them back again later.

	A	B
1	5	1
2	10	
3	15	
4		
5	@COUNT(A1..A3)	@COUNT(B1)
6		
7		
8		
9		

(FIRST SCREEN)

	A	B
1	5	1
2	10	
3	15	
4		
5	@COUNT(RANGE1)	@COUNT(RANGE2)
6	@COUNT(RANGE1)	@COUNT(RANGE2)
7		
8	3	1
9	3	1

(SECOND SCREEN)

	A	B
1	5	1
2	10	
3	15	
4		
5	@COUNT(RANGE1)	@COUNT(B1)
6	@COUNT(RANGE1)	@COUNT(B1)
7		
8	1	1
9	1	1

(THIRD SCREEN)

Fig 1 Inconsistencies in 1-2-3's range function

TJ'S WORKSHOP

Before using FINISH.PRG, you must create a scratch file, TEMP.DBF, containing only one field: line, character type, width 80. FINISH.PRG begins by asking you to specify the filenames of the source and output programs (don't add the .PRG extension — it's done for you). You may use the same filename if you wish. Next, tell FINISH whether you wish to strip or re-indent.

The program begins by ZAPPING TEMP.DBF to remove any previous records and then appends the incoming program file into TEMP.DBF. Because your program is in ASCII text, the SDF switch is used. In effect, TEMP.DBF becomes a temporary database with one record for each program command line. After processing, each record is output to an ASCII text file using dBase's SET ALTERNATE TO command. Note that I have commented out the SET CONSOLE ON/OFF lines for maximum speed. Just remove the * if you want to display the output as it is produced.

The outer DO WHILE loop processes one record (code line) at a time. The inner DO WHILE indexes right one byte at a time until it finds the first nonspace, then outputs the line starting at that byte.

The indenting routine looks for dBase keywords that require indentation. When these are found at the start of a line, a memvar ('tab') is either 'pushed' or 'popped' by one. The value of tab times a constant ('incr') is the total in-

dent, and the SPACE() function is used to concatenate this indent onto the front of each line. I've used a value of 2 for this constant, but you can set it to your own taste.

The indent routine can also be used as a simple debugging tool. If a program has any open loops, extraneous ifs, Endifs, etc, the output will show obvious indentation errors. It would be rather easy to modify FINISH.PRG to detect and flag these errors.

J Mack

I took the liberty of revising Mr Mack's program for dBase III Plus to take advantage of the new LTRIM() function. If you have not upgraded to III Plus, two modifications will be needed. First, the LTRIMs in the re-indent section can be removed altogether — the tradeoff is that the re-indenting fails if your source file is not, in fact, flush-left to start with. Second, in the stripper, replace the simple LTRIM output line with the following loop:

```
ref=1
DO WHIL SUBS(line,ref,1)=' ';
  .AND. ref<LEN(TRIM(line))
  ref=ref+1
ENDD
? TRIM(SUBS(line,ref))
```

(Note: we have broken the above DO WHILE into two lines to fit the magazine's margins. To avoid a syntax

```
*** FINISH.PRG
CLEA
SET SAFE OFF
ACCE 'Enter input filename ' TO infil
ACCE 'Enter output filename ' TO outfil
WAIT '<S> Strip, <I> Indent ' TO which
IF .NOT. FILE('temp.dbf') .OR.;
  .NOT. FILE('infil.prg')
  ? "Error: file not found"+CHR(7)
  CANCEL
ENDIF
?
? "Working...Please standby"+CHR(10)
USE temp
* temp.dbf has 1 field: Line,C,80
CAP
APPE FROM &infil.prg SDF
SET TALK OFF
GO TOP
SET ALTE TO &outfil.prg
SET ALTE ON
*SET CONS OFF

IF UPPE(which)="S"
  * Strip:
  DO WHIL .NOT. EOF()
    ? LTRIM(TRIM(line))
    SKIP
  ENDDO
ELSE
  *Re-indent:
```

```
incr=2
tab=0
DO WHIL .NOT. EOF()
  rec=LTRIM(UPPE(line))
  IF .NOT. (LEN(rec)=0.OR.rec="")
    DO CASE
      CASE SUBS(rec,1,4)$"ENDI,ENDD,ENDC"
        tab=tab-1
      CASE SUBS(rec,1,4)$"ELSE,OTHE,CASE"
        ? SPAC((tab-1)*incr);
          +LTRIM(TRIM(line))
      SKIP
    LOOP
  ENDCASE
ENDIF
? SPAC(tab*incr)+LTRIM(TRIM(line))
IF rec="IF " .OR. rec="DO WHIL";
  .OR. rec="DO CASE"
  tab=tab+1
ENDIF
SKIP
ENDDO
ENDIF

*SET CONS ON
SET ALTE TO
SET TALK ON
SET SAFE ON
USE
? CHR(10)+'Finished.'+CHR(7)
```

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Fig 2 You can run dBase programs through FINISH.PRG either to strip indents and comments or to re-indent them later



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```

PROC recycle
PRIV fno,cfno,fname
PARA fno
cfno=1
DO WHILE cfno<=fno
  fname=FIELD(cfno)
  DO CASE
  CASE TYPE(fname)="C"
    REPL &fname WITH " "
  CASE TYPE(fname)="N"
    REPL &fname WITH 0
  CASE TYPE(fname)="L"
    REPL &fname WITH .F.
  CASE TYPE(fname)="D"
    REPL &fname WITH CTOD("")
  ENDCASE
  cfno=cfno+1
ENDDO

```

Fig 3 A dBase procedure for recycling deleted records

error when running it, remove the semi-colon and combine the two lines into one — Ed.)

Additional variations are possible. Since the purpose of re-indenting the program is to work on it, you could print it out at the same time by adding SET PRINT ON next to the SET CONS OFF command. (Remember then to SET PRINT OFF at the end.) For fastest dBase execution, the stripper could be modified to remove blank lines by surrounding the inner DO WHILE loop with

IF LEN(TRIM(line))>0...ENDIF

Code lines commented out with an "*" could be stripped by surrounding the output line with

IF .NOT. LTRIM(line)="*" ...ENDIF

in dBase III Plus, or with

IF .NOT.SUBS(line,ref,1)="*" ...ENDIF

in dBase III.

If you're using dBase II, you'll have to replace the output lines, which use the SPACE() function, with DO WHILE loops.

One final caution: if you use program lines longer than 80 characters, you must increase the width of the field 'line' in TEMP.DBF. Otherwise the lines get truncated — BS.

Otherkey

One of WordPerfect's best-kept secrets on the IBM PC is that you can access a number of its functions with Alt-key combinations. For a touch typist, most of

these alternatives permit faster editing than do the normal function-key commands. Your hands do not leave the alphanumeric rows nearly as often, and in some cases the Alt-keys require fewer keystrokes.

Since the WordPerfect manual mentions none of these, I compiled 'Key Combinations for WordPerfect' by trail and error. Therefore, the list may be incomplete. However, all the key combinations do work perfectly in WordPerfect 4.1 and 4.2, and on PC compatibles from three different manufacturers that I regularly use. The left-hand column gives the alternate key combination, while the right-hand column lists the function and the regular keystrokes.

I Richmond

Key combinations for WordPerfect

Editing Functions:

- Alt-1 = Cancel/Undelete (F1)
- Alt-2 = Subscript (Shft-F1-2)
- Ctrl-2 = Superscript (Shft-F1-1)
- Alt-3 = Directory (F5)
- Alt-4 = Print Format (Alt-F8)
- Alt-5 = Spell-checker (Ctrl-F2)
- Alt-6 = Define Macro (Ctrl-F10)
- Ctrl-6 = Execute Macro (Alt-F10)
- Alt-7 = Retrieve Document (Shft-F10)
- Alt-8 = Save Document (F10)
- Alt-9 = Move/Retrieve Text (Ctrl-F4)
- Alt-0 = Block On/Off (Alt-F4)

Cursor Movement/Delete Text:

- Ctrl-X = Cursor Right (Right Arrow)
- Ctrl-Y = Cursor Left (Left Arrow)
- Ctrl-W = Cursor Up (Up Arrow)
- Ctrl-Z = Cursor Down (Down Arrow)
- Ctrl-I = Insert Tab (Tab)
- Ctrl-J = Hard Return (Enter)
- Ctrl-K = Delete to end of line (Ctrl-End)
- Ctrl-L = Delete to end of page (Ctrl-PgDn)

For the most part, these key assignments are left over from WP, Version 3. They are handy, without a doubt. But don't get too dependent on them — there's no guarantee they'll work in the next version — NR.

Recycling

I have found the idea of recycling dBase records so useful that I made a generic

routine for emptying out the contents of a previously used record.

The code in Fig 3 assumes you have already verified that all fields should be cleared for the record to be recycled. Note that you pass one parameter (the number of fields) when the procedure is called, so the syntax is

Do recycle WITH <field count>

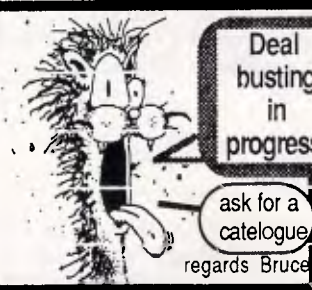
Though the generic procedure is slower than hard-wiring the REPLACE statements, it is certainly easier, especially if you have many fields to replace.

L Ellenbecker

Recycling is much faster than deleting, packing, reindexing, and appending. If you're using dBase, however, Mr Ellenbecker's procedure is rather slow — on my Compaq 286, it took 5 seconds to clear out a 50-field record (1500 bytes in length). The procedure becomes much more practical in faster programs, such as FoxBase or Clipper — BS.

Creating graphics screens

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graphics and short games for my kids but get impatient with all the trial and error that's usually required. I wrote DRAW.BAS (Fig 4) for the IBM PC to let me quickly create graphics screens, draw lines and circles, and plot points. Besides serving as an 'Etch A Sketch' type program, DRAW.BAS also creates a Basic program file to reproduce the various commands that were entered. By merging the generated code into your programs, the graphic image may be recreated using a single GOSUB command.

R Staus

DRAW.BAS accepts a number of commands that allow you to draw lines and circles. The arrow keys move the cursor in single-pixel increments around the screen, and the Shift-Arrow keys go in steps of ten. To begin drawing a line at the current cursor position, type an L. Then move to where the line is to end and press E. Circles are created by placing the cursor at the centre and typing C, and then putting the cursor at the radius and pressing R. The Plus and Minus keys mark and unmark individual points, respectively.

With only a few changes this program could do a lot more; for example, function keys could be used to choose colours, and regular character keys could be used to enter text. SCREEN 9 will work only with an EGA video adaptor — change it to SCREEN 2 for a CGA — EW.

Handles

The MS-DOS 3.1 manual says you may have up to 255 files open at one time by changing the FILES=xx statement in the CONFIG.SYS. However, any one process can really only open at most 20 files, and DOS takes over five of those.

DOS puts a copy of the pointer to the file handle table and an integer containing the size of the table into the Program Segment Prefix (PSP) at offset 32 Hex. Hence you can increase the number of files open at one time by using the following strategy:

1. Allocate space for your own file handle table.
2. Fill your table with DOS's flag for unused handles (OFF Hex).
3. Copy DOS's file handle table into your own table.
4. Set the PSP's table size to the size of your table.
5. Set the PSP's table pointer to point to your table.

Fig 5 is a program demonstrating this technique.

Turbo Pascal has a seldom-used direc-

```

5 ***** DRAW.BAS
10 CLS : OPEN "O", #1,"FILE.BAS"                                'OUTPUT FILE
15 N = 10                                                         'N IS STARTING LINE NUMBER
20 PRINT #1, STR$(N) " SCREEN 9"
30 MX = 720 : MY = 348 : AY = .705                               'MAX X,Y
40 A = 7 : P = -1 : C$ = " " : L$ = " " : R$ = " "
50 SCREEN 9 : X = MX / 2 : Y = MY / 2
60 A$ = INKEY$
70 A = -7 * (A = 0) : PRESET (X, Y), A                          'BLINKING CURSER
80 IF L$ <> " " THEN PSET(LX, LY), A
90 IF R$ <> " " THEN PSET(RX, RY), A
100 FOR I = 0 TO 200 : NEXT
110 IF A$ = " " GOTO 60
120 IF A$ = CHR$(27) THEN SCREEN 0 : CLOSE : END                'ESC
130 IF A$ = CHR$(0) + "H" THEN DX = 0 : DY = -AY : GOTO 290    'UP
140 IF A$ = CHR$(0) + "K" THEN DX = -1 : DY = 0 : GOTO 290    'LEFT
150 IF A$ = CHR$(0) + "M" THEN DX = 1 : DY = 0 : GOTO 290     'RIGHT
160 IF A$ = CHR$(0) + "P" THEN DX = 0 : DY = AY : GOTO 290    'DOWN
170 IF A$ = "8" THEN DX = 0 : DY = -10 * AY : GOTO 290        'UP 10
180 IF A$ = "4" THEN DX = -10 : DY = 0 : GOTO 290            'LEFT 10
190 IF A$ = "6" THEN DX = 10 : DY = 0 : GOTO 290             'RIGHT 10
200 IF A$ = "2" THEN DX = 0 : DY = 10 * AY : GOTO 290        'DOWN 10
210 IF A$ = "L" OR A$ = "1" GOTO 330                          'START LINE
220 IF A$ = "E" OR A$ = "e" GOTO 340                          'END LINE
230 IF A$ = "R" OR A$ = "r" GOTO 360                          'RADIUS
240 IF A$ = "C" OR A$ = "c" GOTO 370                          'CENTER OF CIRCLE
250 IF A$ = "+" THEN N = N + 10 : GOTO 420                    'ADD POINT
260 IF A$ = "-" THEN N = N + 10 : GOTO 440                    'ERASE POINT
270 IF A$ = CHR$(0) + "G" THEN DX = -1 * X : DY = -1 * Y : GOTO 290 'HOME
280 IF A$ = CHR$(0) + "O" THEN DX = -1 * X + MX/2 : DY = -1 * Y + MY/2 'CENTER
290 IF P = 1 THEN PSET(X, Y) ELSE PRESET(X, Y)
300 Y = Y + DY : IF Y < 0 THEN Y = 0 ELSE IF Y > MY THEN Y = MY
310 X = X + DX : IF X < 0 THEN X = 0 ELSE IF X > MX THEN X = MX
320 P = POINT(X, Y) * 2 - 1 : GOTO 60
330 L$ = " LINE(" + STR$(X) + ", " + STR$(Y) + ")" : LX = X : LY = Y : GOTO 60
340 N = N + 10 : PRINT #1, STR$(N) L$ "-" (" STR$(X) ", " STR$(Y) ")"
350 LINE(LX, LY) - (X, Y) : L$ = " " : GOTO 60
360 R$ = " " : RX = X : RY = Y : IF C$ = " " GOTO 60 ELSE GOTO 390
370 C$ = " CIRCLE(" + STR$(X) + ", " + STR$(Y) : CX = X : CY = Y
380 IF R$ = " " GOTO 60
390 R = SQR((RX - CX) * (RX - CX) + (RY - CY) * (RY - CY) * 2)
400 N = N + 10 : PRINT #1, STR$(N) C$ " " R$ STR$(R) : CIRCLE(CX, CY), R
410 R$ = " " : C$ = " " : GOTO 60
420 PRINT #1, STR$(N) " PSET(" STR$(X) ", " STR$(Y) ")"        'SET
430 P = -1 * P : GOTO 60
440 PRINT #1, STR$(N) " PRESET(" STR$(X) ", " STR$(Y) ")"      'REMOVE
450 P = -1 * P : GOTO 60

```

Fig 4 A graphics drawing program that also generates Basic programs

tive that specifies the number of files that may be open at one time. At the beginning of your program, use the F directive with the desired number of files.

Borland's Database Toolbox B+ tree routines use separate files for each indexed field in a record. This means that the number of indexed fields per record is limited to the number of files you can open at one time. Using this little trick will let you use lots of indexes for complicated databases.

For the duration of your program, you can open as many files as you specified in your table up to a maximum of 255. This works with PC DOS 3.1 but does not seem to work with MS-DOS 2.11. This might be due to DOS storing the address of the file handle table at a different location in the PSP. This is just a guess, though.

R Horton

I added an example program that

creates the directory 'TEMP' and writes 75 empty files in that directory. Do note that in order to successfully run this program, you must compile it to a .COM file first. And, of course, you must change the FILES= line in your CONFIG.SYS file and reboot — NR.

1-2-3 video drivers on a LAN

One of the biggest problems I have managing our Novell network is giving users the correct video drivers for programs like Lotus 1-2-3. The users on my network might log in to the network on a PC with a colour card one time and then log in on a machine equipped with a Hercules monochrome graphics display card the next time. This makes it impossible to map the drives containing the video drivers to the user's ID.

```

{SK-}
PROGRAM handles;
(* MUST be compiled to .COM file! *)
($F25); (* Tell Turbo how many files you want to open *)
CONST
handles_desired = 75;
(* the number of file handles you want available at one time *)
actual_files = 73;
(* file less than the number of handles -- DOS uses five *)

VAR
Sample : ARRAY[1:actual_files] OF Text;
N : Integer;
handle_table : ARRAY[1:handles_desired] OF Byte;
(* the low file handle table which DOS will use, each handle is 1 byte *)

PROCEDURE FILE_HANDLE_ZAP;
TYPE
PSP_type = RECORD
max_handles,      {32H} { max handles, set by }
                  { 'FILES=xx' in config.sys }
table_off,        {34H} { offset of file handle table }
table_seg : Integer; {36H} { segment of file handle table }
END;
VAR
PSP : PSP_type ABSOLUTE Cseg; { in the code segment }
i : Byte;
p : ^byte;
BEGIN
p := Ptr(PSP.table_seg, PSP.table_off);
FillChar(handle_table, handles_desired, $FF);
(* DOS uses FFh to indicate an unused handle. *)

```

```

WITH PSP DO
BEGIN
writeln(Max_Handles, ' handles were available');
IF max_handles > 20 THEN
Move(p, handle_table, 20)
ELSE Move(p, handle_table, max_handles);
max_handles := handles_desired;
table_off := ofs(handle_table); { set the pointer to point to }
table_seg := Seg(handle_table); { your table }
writeln(Max_Handles, ' handles now available');
END;

END;
{ file_handle_zap }

FUNCTION Handle_of(VAR F) : Integer;
VAR I : Integer ABSOLUTE F;
BEGIN
handle_of := 1;
END;

BEGIN
($I-) ChDir('TEMP'); { $I+ }
(*Check for presence of "TEMP" directory by attempting to ChDir to it*)
IF IOResult <> 0 THEN MKDir('TEMP');
(*IF the attempt failed, then create the directory "TEMP"*)
File_Handle_Zap;
FOR N := 1 To 75 DO
BEGIN
Assign(Sampl[N], 'temp\SAMPLE.'+Char((N DIV 10)+48)+Char((N MOD 10)+48));
Rewrite(Sampl[N]);
WriteLn(N, ' files opened -- handle is ', handle_of(sampl[N]));
END;
END.

```

Fig 5 How to open more than 15 files in Turbo Pascal

The next logical alternative is to map the drive containing the video drivers based on the video adaptor inside the PC itself. I wrote the following Basic program (Fig 6) that checks for the presence of a Compaq PC colour/monographics adaptor, an enhanced graphics adaptor, a colour graphics adaptor, a Hercules monographics adaptor, or an IBM monochrome adaptor and alerts the network to provide the correct 1-2-3 drivers. The user's log-in script creates two virtual drives containing 1-2-3 program files.

The first drive contains the actual 1-2-3 program without any drivers, and the second contains a dummy driver directory. The drivers for the particular video adaptor are mapped to this dummy directory by the Basic program. Since both are search drives (Novell's equivalent of a PATH statement in DOS), the program will load from the first search drive and find the drivers that match the video adaptor in that PC on the other search drive. In my case, the path of the Lotus directory is

SYS:PROGRAM\LOTUS

and the path of the dummy directory is

SYS:PROGRAM\LOTUS\DRV

This dummy directory is remapped by the program to

SYS:PROGRAM\LOTUS\XXX

with XXX being one of the following variables:

- MNO = Monochrome drivers
- CPQ = Compaq drivers
- CLR = Colour drivers
- EGA = Enhanced graphics drivers
- HRC = Hercules drivers

Line 150 goes out to the Novell workstation shell and remaps the search drive based on which of the above three-character video adaptor abbreviations is loaded in MON\$. The Y.DAT file is needed because NetWare asks if you really wish to remap the search drive and the response is Y. All you need in the Y.DAT file is a Y and a carriage return. The >> NUL: in line 150 keeps this exchange off the user's screen.

Lines 20 to 30 pass variables to the subroutine in line 170 to check memory location FFFE:000A for the string COMPAQ. If it finds it, the program sets MON\$ to CPQ and then goes to line 150.

Lines 40 to 50 pass the variables to the subroutine to check memory location C000:001E for the string IBM. If it finds it, the program sets MON\$ to EGA and then goes to line 150.

Lines 60 to 80 read a byte from port

```

10 CLS:LOCATE 1,1,0
20 DTSG=&HFFFE:DTA$="COMPAQ":DLC=&HA:GOSUB 170
30 IF DTA$=DTARD$ THEN 110
40 DTSG=&HC000:DTA$="IBM":DLC=&H1E:GOSUB 170
50 IF DTA$=DTARD$ THEN GOTO 130
60 BFST=(INP(&H3BA)AND &H80)
70 FOR I=1 TO 75:BSND=(INP(&H3BA)AND &H80)
80 IF BSND<>BFST THEN GOTO 140 ELSE NEXT I
90 DEF SEG=0:IF (PEEK(&H410)AND &H30)<>&H30 THEN GOTO 120
100 MON$="MNO":GOTO 150
110 MON$="CPQ":GOTO 150
120 MON$="CLR":GOTO 150
130 MON$="EGA":GOTO 150
140 MON$="HRC"
150 SHELL "MAP V:=SYS:PROGRAM\LOTUS\"+"MON$+" < Y.DAT >> NUL:"
160 END
170 DTARD$="":DEF SEG=DTSG:FOR I=1 TO LEN(DTA$)
180 RD=PEEK((DLC-1)+I):DTARD$=DTARD$+CHR$(RD)
190 NEXT I:DEF SEG:RETURN

```

Fig 6 A Basic program that checks for the presence of a Compaq PC colour/monographics adaptor, an enhanced graphics adaptor, a colour graphics adaptor, a Hercules monographics adaptor, or an IBM monochrome adaptor and alerts the network to provide the correct 1-2-3 drivers

3BA (Hercules video retrace) and isolate bit 7. Then they do a FOR/NEXT loop while comparing the first byte read with subsequent bytes. If they are different, the program exits the loop and sets MON\$ to HRC. You might need to increase the length of the FOR/NEXT loop, depending on the speed of your PC. A value of 100 works with 6MHz ATs. Values lower than 75 cause the program to select a monochrome adaptor automatically.

Line 90 checks for a colour adaptor. This is taken out of the IBM Basic 3.0 manual with minor changes made to check for the colour adaptor. If the statement is true, the program sets MON\$ to CLR and goes to line 150. If all else fails and the program gets to line 100, then the program declares that a mono adaptor is in use, sets MON\$ to MNO, and goes to line 150.

Lines 170 to 190 take the variables from lines 20 and 40; read from memory the address DTSG (data segment), the DLC (data location), and a number of bytes determined by DTA\$ (data to be read) and DTARDS\$ (data read from memory), and then return.

I hope that others who have PCs with different video adaptors scattered about their network find this program useful. Line 150 can be modified to send multiple commands to DOS or to send commands for other networking programs.

A Perez

Relative cells in macros

Anyone who used to work with a mainframe program called Foresight and has since moved to 1-2-3 misses the ability to refer to a relative cell address in a macro. In Foresight, for example, you could write a macro to do something in a cell three columns to the right or two rows up from the cursor. In 1-2-3 or Symphony, while you can do this in a macro, it's cumbersome. You have to move the cursor with {down 4}, for example, which takes time. It's especially time-consuming if you find that you have to move the cursor out of the current window.

With Release 2.0 of 1-2-3, however, you can write a concatenated string formula using the @cellpointer function to produce relative cell addressing. The first formula in Fig 7 appears in the spreadsheet as the macro command {goto}D11~, if the cursor is in cell B11. It simply moves the cursor two cells to the right of wherever it is when the macro runs.

The second long formula results in a macro command that enters the label Hello! in the cell to the left of the cursor.

When the cursor is in cell B11 . . .

```

+="{goto}"&@CHAR(64+@CELLPOINTER("col")+2)&@STRING(@CELLPOINTER("row"),0)&"~"
. . . appears in spreadsheets as: {goto}D11~

+="{let " &@CHAR(64+@CELLPOINTER("col")-1)&@STRING(@CELLPOINTER("row"),0)&"",Hello!}"
. . . appears in spreadsheets as: {let A11,Hello!}

@MID(@CELLPOINTER("address"),1,@IF(@CELLPOINTER("col")<=26,1,2))
    
```

Fig 7 String formulae that allow relative cell references in macros

In each case, the relationship of the referenced cell to the cursor is established by the +2 or -1 in the formula after @cellpointer("col"). With formulae like this, your macros can operate on cells at a consistent remove from the cursor.

F Quental

Anything that reduces or speeds up cursor movement will make macros run faster. The second macro is especially helpful because the cursor doesn't move at all. It could double or triple the speed of some routines, especially when the cell into which you want to enter a label is off the screen. You can, of course, adjust the row reference as well as the column reference by adding +3 or -4, for example, after the ('row'). These adjustments can then be references to cells containing numbers rather than the numbers themselves. This way, you could change the relation of the referenced cell as necessary. Remember to recalc your macro formula when you move the cursor, because @cellpointer doesn't update automatically.

One limitation of Mr Quental's method is that the column references won't work in columns AA and beyond. This is because his formulae give you the character equivalent of a column number, not a column letter, and there's no ASCII number for AA, AB, etc. I have therefore included a third formula in Fig 7, which you can substitute for the column references in Mr Quental's formulae. This, however, can't take a plus or minus value, so the cell you reference has to be in the same column as the cursor . . .

Microsoft Excel solves this problem by letting you make relative references directly in macros — JT.

Zero-suppression bug

The /Worksheet Global Zero Yes command in 1-2-3 prevents display of results of formulae that evaluate to zero.

This feature can make some worksheets look better, but it harbours a subtle bug.

With zero suppression on, enter a formula like 33-33, which evaluates to zero. Though the formula is present in the cell, there will be no display. Now hit F2 (Edit) and F9 (Calc). This normally turns a formula into a value, but not in this case. The display remains blank, since the result of the formula is still zero, but the underlying formula, 33-33, remains unchanged. This is not helpful, but there's worse.

It sometimes happens that you want to update values in a spreadsheet by immediate addition or subtraction. If you had the number 33 in a cell and wanted to add 12 to it, you could go to that cell, hit F2, type +12, and hit F9 <Enter>. The number immediately changes to 45. This works whether zero suppression is on or off. However, with zero suppression on, a change of this kind that results in a value of zero won't work. If, for example, you wanted to subtract 33 from a cell containing the value 33, you could go to the cell, hit F2, type -33, and hit F9. Instead of waiting for you to hit Enter, 1-2-3 returns you to the ready state with the original value of 33 unchanged. What should be zero is still 33. If zero suppression is turned off, the operation will work normally.

If you do this manually, you may or may not notice that the resulting value is incorrect. If the procedure is carried out by a macro, you'll never know what went wrong.

E Young

*Another obscure bug in the world's number one program. With zero suppression turned on, 1-2-3 fails to turn a formula that evaluates to zero into a value, no matter what arithmetic operation you use to change the value to zero. If, for example, you appended *0 to the number 33 and hit F9, you'd get exactly the same results as appending -33. Likewise, if you have a value of zero already and append something like /25, any change that results in an evaluation*

TJ'S WORKSHOP

to zero gets wiped out when you hit F9 in Edit mode.

Fortunately the /Range Value command correctly turns formulae that evaluate to zero into values, whether zero suppression is on or off — JT.

Thank you, IBM

The new DOS, Version 3.3, does not include the EXE2BIN.EXE program that was on every previous DOS disk. Instead, IBM sells the program separately, at an extra cost, with the DOS Technical Reference. Worse, the DOS 3.2 EXE2BIN program that many 3.3 users still have handy won't run under DOS 3.3, since it contains a tiny routine to make sure you're using it with DOS 3.2 only.

Fortunately, it's simple to patch the DOS 3.2 EXE2BIN.EXE so that it runs under Version 3.3. Just get into DOS and type in the following commands:

```
REN EXE2BIN.EXE E
DEBUG E
E 30D 73
W
Q
```

REN E EXE2BIN.EXE

The EXE2BIN.EXE routine that checks for the DOS version looks like this:

```
MOV AH,30
INT 21
XCHG AH,AL
CMP AX,0314
JZ 0320
```

Changing the byte at address 30D from 74 to 73 turns the JZ instruction into a JNB instruction, which lets the routine work if it finds a version of DOS 3.2 or higher.

A Dror

IBM also left all the DEBUG documentation out of the DOS 3.3 manual, and replaced it with a lot of gobbledygook about loading foreign fonts into the IBM laptop computer screen. (Of course, you can always take the DEBUG section out of your old DOS 3.2 manual and insert it in the newer one.)

This patch does the job. But while the unpatched 3.2 version of EXE2BIN won't work under 3.3, the versions supplied with 3.1 and 3.0 will, so you could use them instead — PS.

FullPaint

The best way to keep track of your art disks is to print out picture catalogues of each disk. MacPaint has a very nice print catalogue feature to do just that. The illustrations are small, but detailed enough so that you can see what's there. Unfortunately, that feature is missing in FullPaint. Here's a way to remedy that situation and create FullPaint catalogues.

You'll need either a copy of MacPaint on your hard disk or a MacPaint startup disk. You should also have a blank MacPaint document (they're only 2k) on each FullPaint art storage disk.

Then either launch MacPaint, if you're using a hard disk and print your catalogues or, if you don't have a hard disk, follow these steps:

1. Eject your FullPaint startup disk.
2. Insert your MacPaint startup disk. If necessary, put the blank MacPaint document (create it by selecting NEW and then immediately Saving it) on your storage disks.
3. Open the blank MacPaint document.
4. Select PRINT CATALOG.

U Fischer

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Word 3.0X

● Here's a better way to count words in Word 3.0 and 3.01 for the Mac.

Make a copy of your document and use that, as this procedure will Change the document. Select CHANGE from the Search menu. Enter ^w (the white spaces) in the Find What box and ^n (end-of-line marks) in the change To box, then choose CHANGE ALL. When this operation is complete you'll find the number of changes (which is very nearly the number of words) in the lower left corner.

If, by mistake, you do this on your original document, all the words will be arranged in a column. Save the situation by closing the document and clicking NO when the dialog box asks if you want to save the changes.

W Wedin

● Here's a good way to see how big (in k) your Word 3.0X files are. This method works without having to return to the Finder.

Start by saving the document. Then close its window and choose DELETE from the File menu (if you don't see Delete, that means you're in Short menus and must change to Full or Normal menus). Select the document you wish to see the size of from the list. The size will be shown under the buttons. This size is rounded down to the nearest kilobyte. (That's different from the Finder, which displays the size to the nearest k rounded up; and GetInfo which shows the exact size in bytes. Here's an example: the file is actually 9728 bytes long. GetInfo will show that number or 9.5k; the View option of the Finder will show 10k; and the Delete dialog will show 9k.)

Remember to hit the Cancel button after you check the size.

M Jasienski

● Word 3.01 has several features that are only accessible through the use of special key combinations. These features normally never appear in menus. Yet, working with the program would often be simpler if they did.

Let's take the example of Insert Page-Break. The only way (normally) to access this feature is to type Shift-Enter.

Here's how to make this feature a menu choice. Start with a blank document. Be sure you are in Full Menus mode. Type Shift-Enter to produce a forced page break. Select the dotted line that results by clicking in the Selection bar (the column at the left of the screen where the cursor points north-east instead of northwest). Then choose GLOSSARY from the Edit menu. Type in a descriptive name, such as 'PageBreak', and click on the DEFINE button. Next, press Option-Command-+ (plus sign) and click on the name PAGEBREAK in the glossary list. A Work menu will be created (or added to, if you already have one), in which the new glossary entry will be found. Now whenever you want to insert a page break, just go to the Work menu and select one.

This method will work with the other key combinations Word forces you to memorise. These include:

Section Mark
Command Enter
End-of-Line Mark
Shift-Return
Optional Hyphen
Command — (hyphen)

Nonbreaking Hyphen

Command-~ (tilde)

D Goodger

PageMaker 2.0

● PageMaker 2.0a for the Mac will launch more quickly if you put the contents of the Hyphenation and Defaults folder directly into your System folder. PageMaker looks for the contents of the Hyphenation and Defaults folder one folder at a time. If you're working from a fairly fragmented hard disk these files can be broken up and placed throughout the disk. They must be searched for. The search seems to start in the Systems folder.

P Greenberg

● Getting even line spacing can be very difficult if your text frequently uses the Symbol font. It doesn't matter whether Auto-leading is turned on or off. Here's an example of what happens. If 13-point spacing is specified in a mostly Helvetica document, then a single Symbol font character will lower the entire line it's in by three points, so then 16 points separate it from the line above and 10 points from the line below. If either the line above or the line also has a Symbol font character, then the spacing in that direction will be correct — but the problem will ripple through and appear at the first Symbol-free line!

The spacing problem can't be solved by manually re-leading lines. Text blocks can be readjusted manually, but that's a frustrating, eye-boggling job. However, there is a simple solution. Simply select a blank space in each line that doesn't have a Symbol character to Symbol. There'll be no visible change in the appearance of the line except that

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now it will be uniformly spaced with respect to the lines above and below it.
R Brown

HyperCard

- When using the Polygon tool, it is not necessary to complete each polygon by clicking where you started drawing the polygon. If you are in the Fill mode, you can complete the polygon and fill it by typing any alphanumeric key. Outline mode acts differently. When you type an alphanumeric key in that mode, the polygon lines stop where you last clicked the mouse. These methods work in MacPaint, also.

M Kauffman

- The message box is always there, even when it's not visible. Just blind type your message, such as 'open resedit' or 'go home'. Don't worry about getting the capitals right, but be sure you put spaces where they belong. Using this technique can get you out of a jam, such as when you use Recent to go to a card which you then discover has no menu or working buttons.

R Kenyon

- A good way to learn HyperCard scripting is to take apart other scripts. If you write a stack that includes text fields that use particular fonts, you can ensure that they will appear in your chosen font no matter what fonts other end users have available in their System. Using ResEdit, copy the FONT ID number of the font you want to lock in from the System file. Then paste this ID number into the FONT file in the stack you want that font used in. Even if there weren't a FONT file to begin with, pasting in the FONT ID will create one.

Now when others open your stack, the fonts included within that stack appear in the text menu in HyperCard, along with the System fonts. You no longer have to worry about your stack using the default fonts and not looking the way you had planned it. Remember that FONTS (and SNDs) take up large amounts of space in a stack.

B Henry

- It's easy to see where all the buttons are, including hidden and transparent buttons that have been painted over, on a HyperCard card. All you have to do is press the Command and Option keys at the same time. All buttons will be outlined with a dotted line.

G Johnson

- If you have a keyboard with cursor arrows, you can easily move through stacks. You need not use the browse icon or the arrow buttons. Instead, press the cursor key in the direction you want to go. This only works, however, if the

arrow buttons are on the card.

The down cursor key serves the same purpose as the escape button, allowing you to see all the previously viewed cards in reverse order. And the up cursor key always takes you to the Home stack.

R Williams

Mac Excel

Here's a super quick way to enter the current date in an Excel spreadsheet, even if you don't remember it. Simply select any unformatted cell, hold down the Command and Shift keys and type a minus or hyphen. This puts the current date (or at least what your Mac is set to) in the selected cell in 'mm/dd/yy' format.

B McDowell

Beyond LEN(254)

The maximum dBase command line length is 254 characters. This is usually sufficient but not always — especially with lengthy logical expressions. When this occurs, it is sometimes possible to 'divide and conquer'.

For example, in the IF . . . ENDIF structure below, an impossible command line length of over 350 characters is required.

```
IF Lname=mname .AND. Fname=mfname;
  .AND. Address=address .AND. City=mcity;
  .AND. Zip=mzip .AND. Date=mdate;
  .AND. (Account=maccount .OR. iflook);
  .AND. CREDIT->Maxcredit<mcredit;
  .AND. RATE->Interest=minterest;
  .AND. (SALES->Amount<mamount;
  .OR. SALES->Amount<sale_aver);
  .AND. (Cost=mcost .OR. Cost<Cost_aver;
  .OR. Cost=0)
  * do commands for TRUE
ELSE
  * do commands for FALSE
ENDIF
```

The word-around is to break the condition into smaller parts (each with less than 254 characters), evaluate them separately, then do the IF test:

```
STOR Lname=mname .AND. Fname=mfname;
  .AND. Address=address .AND. City=mcity;
  .AND. Zip=mzip .AND. Date=mdate;
  .AND. (Account=maccount .OR. iflook);
  TO cond1
```

```
STOR CREDIT->Maxcredit<mcredit;
  .AND. RATE->Interest=minterest;
  .AND. (SALES->Amount<mamount;
  .OR. SALES->Amount<sale_aver);
  .AND. (Cost=mcost .OR. Cost<Cost_aver;
  .OR. Cost=0) TO cond2
```

```
IF cond1 .AND. cond2
  * do commands for TRUE
ELSE
  * do commands for FALSE
ENDIF
```

Another nice idea for initialising logical expressions is to replace

```
IF 100>X
  LOGIC=.T.
ELSE
  LOGIC=.F.
ENDIF
```

with the much simpler

```
logic=100>x
```

It's almost always better to process one line of code than five.

A Queen

If you have the unenviable job of writing logic statements that are so long they sound like (and are about as clear as) a politician's speech, Mr Queen's 'divide-and-conquer' approach is just the ticket. Of course, like a politician, it won't move as fast when making a decision.

His second idea can lead to an unusual line of code. Suppose you have a name file with a field called 'sex', 1 byte long, containing either 'M' or 'F'. If you are currently positioned on the record for Dorothy, you can STORE a logic variable with this syntax:

```
. logicvar=sex="F"
```

It's remarkable that dBase allows the two equal signs in the same expression, but when entered, dBase evaluates it — BS.

Encrypting files

I work on a hard disk system that is accessible to a number of users. I thought it would be nice if I could leave my files on it and yet have their contents safe from prying eyes. I started thinking about data encryption and came up with a scheme that is simple to implement, yet difficult to break. It's fast and works on any type of file.

It works on the principle that if you exclusive-OR (XOR) a data byte, A, with a key byte, K, you end up with a new value, B, that's different from A as long as the key is nonzero. By XORing byte B with key K, you get the original value of byte A back again.

If you XOR the key with each byte in a file, you have changed the file from plain-text to unreadable cipher-text. However, just using a single byte for the key isn't very secure. Someone who knows how you encrypted your file has to try at most 256 different keys to recover the original plain-text.

So instead of using just a single byte for the key, my algorithm uses a key phrase that you specify. The CRYPTO program in (Fig 8) XORs each byte in the plain-text with the corresponding byte in the key. It XORs plain-text byte 1


```

PROGRAM CRYPTO;
CONST
  MaxInBuffer = 16384;
VAR
  buffer : ARRAY[1..MaxInBuffer] OF Byte;
  I, KeyLen, ActualRead : Integer;
  InputFile      : FILE;
  InputFileName, Key   : STRING[255];
BEGIN
  IF ParamCount < 2 THEN
    BEGIN
      WriteLn('SYNTAX:  CRYPTO <Filename> <keyword>');
      WriteLn('Keyword can be a phrase -- as many words as you can fit. ');
      WriteLn('E.g.  "CRYPTO ALICE.DAT Just the place for a Snark"');
      Halt;
    END;

    InputFileName := ParamStr(1);
    Assign(InputFile, InputFileName);
    {$I-} Reset(InputFile, 1); {$I+}
    IF IOresult <> 0 THEN
      BEGIN
        WriteLn('#7, 'FILE ', InputFileName, ' does not exist!');
        Halt;
      END;

      Key := '';
      FOR I := 2 to ParamCount DO
        Key := key + ParamStr(I);

      KeyLen := Length(Key);

      REPEAT
        BlockRead(InputFile, Buffer, MaxInBuffer, ActualRead);
        FOR I := 1 TO ActualRead DO
          Buffer[I] := Buffer[I] XOR Ord(Key[Succ(Pred(I) MOD KeyLen)]);
        LongSeek(InputFile, LongFilePos(InputFile)-ActualRead);
        BlockWrite(InputFile, Buffer, ActualRead);
      UNTIL Eof(InputFile);
      Close(InputFile);
    END.
  
```

Fig 8 An XOR-encryption program in Turbo Pascal

with key byte 1, plain-text byte 2 with key byte 2, and so on. When it runs out of keys, it starts again with key byte 1. This process continues until all the bytes in the plain-text file are encrypted. To encrypt a file, just type

CRYPTO InputFile key

where InputFile is the name of the file you wish to encrypt. The key phrase can be as long as the command line allows. CRYPTO will rewrite the encrypted file using the same name as the original, so be sure to remember the key.

To reverse the process and decrypt your

file, you simply use the same command line.

The XOR encryption program I've shown here is intended to demonstrate how easy it is to have a fairly high level of data security. While I'm sure that the chaps at ASIO crack stuff like this in their lunch hour, it should provide more than adequate security against the casual snooper.

A Moore

This type of encrypting scheme doesn't actually require a computer, and similar methods have been implemented using code pads for centuries.

Having a quick utility to perform the operation for you, however, is infinitely preferable. If you must encrypt large numbers of files with different keys, you should consider creating a single text file listing each file key pair. After encrypting this file, you'll have only one key to remember — NR.

Making screen negatives

The routine in Fig 9 inverts hi-res page 1 on an Apple II. That is, it turns off every pixel that is on and vice-versa. It is particularly useful for those who dump graphics screens to a printer. It can also be good for making 'negatives' of Print Shop graphics. Simply load the graphic by typing 'BLOAD graphicname, A\$2000', run my program, and then save the graphic back to disk with 'BSAVE new name, A\$2000,L\$240.

A Fields

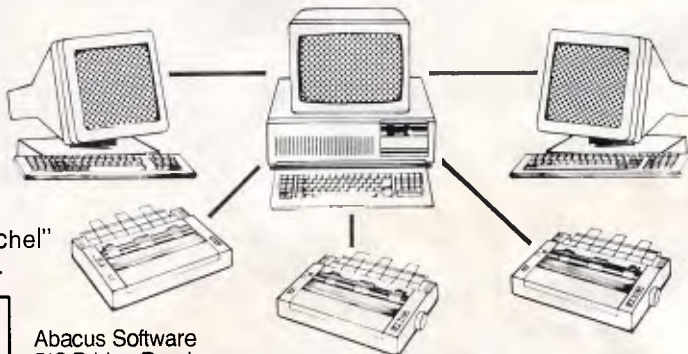
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```
10 FOR J=768 TO 793: READ X: POKE J,X: NEXT: CALL 768
20 DATA 160,0,132,60,169,32,133,61,177,60,73,255,145
30 DATA 60,200,208,247,230,61,165,61,41,31,208,239,96
```

Fig 9 A program for inverting hi-res screen 1

```
100 PRINT : PRINT "INSERT YOUR DISK. THEN PRESS RETURN.";
110 GET X$: IF X$ = CHR$(27) OR X$ = CHR$(3) THEN END
120 D$ = CHR$(4): PRINT : PRINT D$"PREFIX": INPUT V$
130 PRINT D$"OPEN";V$,TDIR": PRINT D$"READ";V$
140 INPUT L1$: INPUT L2$: INPUT L3$
150 PRINT L1$: PRINT L3$: GOTO 180
160 L$ = LEFT$(F$,1): IF L$ = "*" THEN L$ = ":"
170 PRINT "|"; MID$(F$,18,3);L$;MID$(F$,2,15);:N = N + 1
180 INPUT F$: IF LEN(F$) THEN 160
190 INPUT L4$:B$ = LEFT$(L4$,20):IF PEEK(1403) THEN PRINT
200 PRINT : PRINT D$"CLOSE": PRINT B$:"FILES: ";N
```

Fig 10 Producing a wide listing of filenames

tory on an Apple II, CAT or CATALOG produces a display that quickly scrolls off the screen — frustrating if you want

to scan through all the filenames to find one in particular or to see which ones you can delete. The listing in Fig 10

provides a simple remedy, a program that produces a listing of filenames in a wide format. Each file takes up 20 character positions, allowing a display of up to 40 files on a 40-column screen and up to 80 files on an 80-column screen.

The listing includes the type of file, a symbol if the file is locked (not an asterisk but a colon, for readability), as well as the filename itself. You also get a count of the number of files. When the program asks you to press Return in order to continue, you can press Escape or Control-C if you want to quit instead.

L Manelis

A route to compatibility

Here's a tip for GS users trying to boot older Apple II programs. If you're having trouble booting a program, first try adjusting the speed to Normal (using the Control Panel).

If that doesn't fix the problem, try setting Display Columns to 40 instead of 80.

J Ezor

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DIY breakout box

This month Steve Withers presents an alternative to a commercially bought breakout box for RS232 communications, and a full listing of BBSs Australia wide.

Anyone who works with RS232 interfaces soon feels the need for a breakout box. These gadgets make it easy — well, easier — to figure out the wiring you need when a straight-through cable won't do the job. This can occur if you want to transfer files between two systems with a direct link for maximum speed.

The biggest drawback with commercial breakout boxes is the cost. Last time I checked prices, it was easy to spend over \$150, and they are probably more expensive now. That kind of price is easy to justify when time is money, but I'm going to describe an alternative that costs around \$11. I won't claim that it is as convenient as a commercial unit, but if you only need a breakout box occasionally you should find this unit suitable.

What you need is one DB25 plug, one DB25 socket, one 12-way terminal block, one red LED, one green LED, one 470 ohm resistor, and about two metres of wire. They are all available from Dick Smith Electronics, and I imagine Tandy or any other electronics shop.

Start by cutting 16 pieces of wire, each 10cm long. Solder a piece of wire to each of pins 2,3,4,5,6,7,8 and 20 of the plug, and then repeat the process for the socket. Now use the terminal block to connect the corresponding pins on the plug and socket. This gives you a straight-through lead, but it only takes a few moments to rearrange the wires to give the configuration you need.

The next step is to connect the LEDs that will be used to determine whether a particular pin is carrying a high or low signal. The negative leads of the LEDs are usually shorter, but may be marked by the flat spot on the LED body. Install the LEDs and the resistor as shown in Fig 1. Make sure the two negative leads don't touch.

Finally, connect pieces of wire around

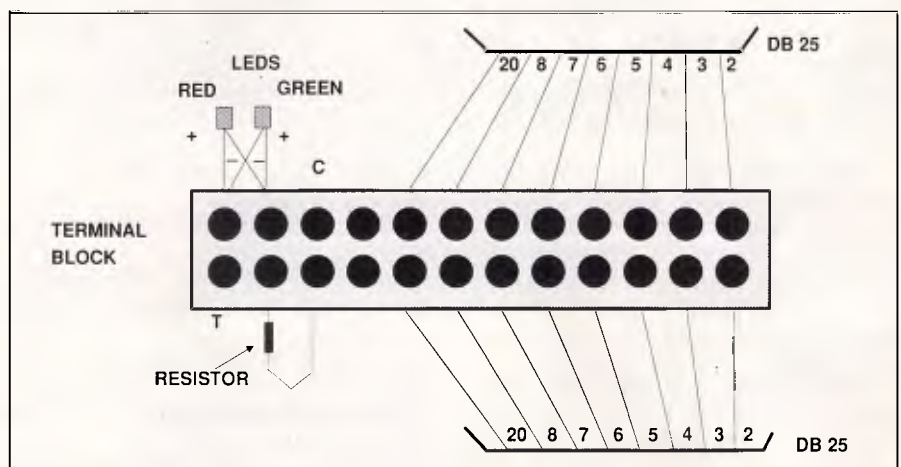


Fig 1 Schematic diagram of the DIY breakout box

15cm to the terminals marked 'C' and 'T' in the diagram. These are your test leads, so it would be worth tinning the free ends. You use the LEDs by touching the 'C' lead to the pin 7 terminal (ground) and the 'T' lead to the pin under investigation. If the red LED comes on, the pin is positive; if the green one lights up, it's negative.

If my arithmetic is correct, you should be left with 10cm of wire, which is enough to use as a jumper if you need to connect a couple of pins.

Having constructed the breakout box, how do you use it? The best advice I can give is that you read *The RS232 Solution* by Joe Campbell (Sybex). This book presents a thorough step-by-step guide to connecting RS232 devices. If you can't get hold of it, the basic idea is to use the LEDs to indicate the state of pins 2 and 3 on each device. If the devices seem to be the same, you'll need to reverse the links between pins 2 and 3 (ie 2 to 3, and 3 to 2). Then you look at the control lines (4,5,6,8, and 20) to see what they are doing, and try to figure out which combination will make

things work. I know that doesn't sound very helpful, but you wouldn't expect me to explain in a couple of paragraphs a process that Campbell describes in a hundred pages, would you? Once you understand the nominal function of the five control lines, you'll find that logical thinking plus a little experience gives the desired result.

OS/2

While many — perhaps most — MS-DOS programs are supposed to run in OS/2's 'compatibility box', there is an important exception. IBM has warned that DOS communications programs will not work under OS/2. My guess is that we will see a few quick and dirty parts of existing programs, followed by the appearance of completely new packages that take advantage of the operating system.

Telecom charges

As this column was being prepared, Telecom stated its intention to imple-

ment timed local calls. About the only good things in the announcement were that data calls will not be singled out, and that there is still time to bring pressure to bear in favour of the existing charging system.

Systems

The number of boards continues to rise. These are around 15 per cent more in this month's list than in the July 1987 issue of *APC*. Although several boards are now defunct, the new arrivals more than compensate.

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- First Nice MIDiline #2** (02) 868 4836. P. Andrew Khoo. Midnight-4am daily. V22, V22bis, Bell 103. FidoNet 711/805.
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- Tesseract** (02) 651 1404. MV. John Hastwell-Batten. 24 hours daily. V21, V22, V22bis, V23.
- TNT Shuttle** (02) 281 2476. MV. Paul Birch. V21, V22, V22bis. V23. Bell 103, 212.

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Your Computer (02) 669 1385. MV. Andy Farkas. 24 hours daily. FidoNet 712/622.
Zeta (02) 627 4177. MV. Nick Andrew. 24 hours weekdays, 7pm-7am weekends. V21, V22, V22bis, V23, Bell 103, 212. FidoNet 713/602.
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Comm Link (043) 41 3135. MV. 'Nuggets'. 24 hours daily. V21, V22, V23, Bell 103, 212.
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Griffith Computer Association BBS P. (069) 62 7272. Greg Bodger. Ringback system. Program downloading.
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Commodore User Group (ACT) (062) 810 847. MV. James Hacker. 24 hours daily.
Data-Link (062) 99 1543. MV. Fred Flintstone. 24 hours daily.
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PC Exchange (062) 58 1406. MV. Phil Harding. 24 hours daily. V21, V22, V22bis, V23.

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AUSOM MacSIG (03) 435 9152. P. 24 hours daily. V21, V22, V22bis, V23.
BERT (03) 602 1552. P. Resource Data. 24 hours daily. Also (03) 670 7371 for V23/videotex.
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Eastcom (03) 288 0775. P. Maurice Halkier. FidoNet 630/312.
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ment Maloney. 24 hours daily. V21, V22, V22bis, V23. Bell 103 & 212A. FidoNet.
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Teletex Connection (03) 470 6827. P. Darren Sapwell. 6am-10pm daily. V23 Videotex only.
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Ultimate C64 (03) 735 5551. Mike Kabilke. 24 hours daily. V21, V22, V22bis, V23.
Videotext/4000 (03) 741 3295. P. Luke

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MIN-NET (054) 41 3013. MV. Mal Fields. 24 hours daily. Enquiries to (054) 43 2589 during business hours ONLY.

Mousetext (059) 42 5528. P. Glen McBride. 10am-10pm daily. V23.

Omegatex (052) 22 1670. Mark Gregson. 7pm-2am daily. V23 videotex.

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AMPAK (07) 263 7070. MV. Brian Wendt and John Bews. 24 hours daily. V21, V22, V22bis. V23. Bell 103, 212, packet radio.

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Apple-Q Node 2 (07) 800 4660. Kelvin Saggars. 9.30-5.30pm weekdays (weekend hours to be advised). V21,

V22, V23.

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Sun City (077) 74 1552. MV. Tony Smith. V21, V22, V22bis, V23. FidoNet 640/702.

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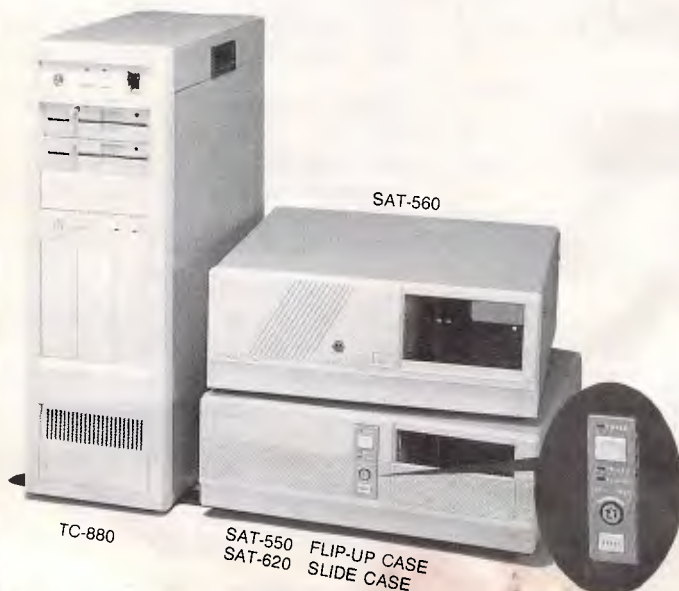
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TAS

Tassie Bread Board System (003) 26 4248. MV. Ian Campbell. 24 hours daily. V21, V22, V22bis, V23. FidoNet 630/310.

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 Glenhantly Road, Elwood, Vic 3184 or to Viatel mailbox 0633000030.

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:

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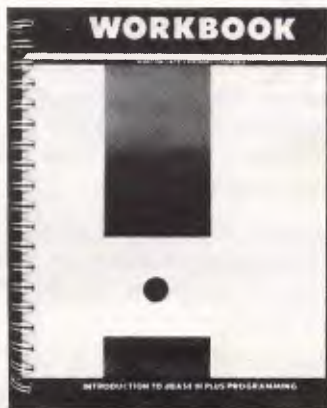


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Under the spotlight this month come books on the Apple Mac, Xerox's Ventura and dBase III Plus. Our reviewers sort out the good, the bad and the worthless buys.



Introduction to dBase III Plus Programming

Authors: Ashton-Tate Training Department

Publisher: Ashton-Tate/McGraw-Hill-

Price: NA

There are two good ways to learn programming: one is by experience and the other is by having an experienced person to guide you. This teach-yourself workbook, prepared by Ashton-Tate's own training department, appears to offer the best of both worlds.

It's written and published by the company that wrote dBase III Plus — so the authors should know what they're talking about — and provides a gentle introduction to one of the more complex areas of any database system — its inbuilt programming language.

Right from the start, the book makes it clear just at whom it is aimed. It will teach you to write programs to access and maintain a database '... in such a way that an employee who knows nothing about dBase III Plus can enter and locate data and produce reports by following simple onscreen instructions and pressing the appropriate keys.'

This book is a follow-up to an earlier one about using dBase III Plus. This first book covers the creation and maintenance of a database, indexing, sorting and creating a command file. Although it's not essential to have completed, or even seen, the earlier course, you are

advised that, unless you know these subjects, you will find it difficult to jump in at the deep end and start programming.

Having started by explaining the benefits of using programs at all, the first pages guide you through entering (and editing, if you get it wrong) a simple program to print out the records in a database. By the end of the book, you will have designed a complete inventory system for a fictitious company, debugged it, created custom input and output screens, and included error trapping in case the operator makes a mistake when using the program.

This book, along with the example programs on the bundled disk, provides a good introduction to dBase III Plus programming. It is aimed at someone in a company's computing department who is setting up systems to be used by other employees. As such, it assumes that the reader is not totally new to programming in some high-level language, even if not specifically a dBase command language.

There's a lot of waffle and non-essential information in here, but someone who perseveres and works through the complete course, including the exercises, should find the effort amply rewarded. You can even send off to Ashton-Tate for a certificate after you've completed the course.

Roger Dalton

Inside Xerox Ventura Publisher

Authors: James Cavuoto and Jesse Berst

Publisher: Micro Publishing/available from Megavision on (02) 957 5797

Price: \$39.95

Here's a cookbook with a difference: 328 pages of mouth watering hors d'oeuvres for the power Ventura enthusiast. *Inside Ventura Publisher* is not a primer for the ab-initio desktop publishing student. Rather, it's a smorgasboard of tips, hints, warnings, do's and don'ts on how to extract the maximum possible performance



out of a very powerful package. This is the sort of book that should be read first-ly from cover to cover, with one hand on the mouse. After that initial read, you'll want to keep it close by, since a nicely laid out table of contents and a comprehensive index make it an ideal reference manual.

The authors provide a very complete discussion of the powerful pre-formatting capability of Ventura. This is a technique where much of the page layout can be done right back at the text editing stage, using a word processor and monospaced character monitor. It may seem strange that a book about desktop publishing describes a non-WYSIWYG route to page composition. There is a clear message here however, that creative use of *all* of the tools available is the key to efficient publishing. One of Ventura's strengths is that there is always a choice of several different solutions to the same problem and this book provides a good insight in how to determine the best option available.

The book describes a neat solution to a Ventura deficiency — generating spot colour separations, and is particularly strong in its discussion of scanners, graphics, and compatible drawing programs. In the truly esoteric department, is a description of a completely undocumented diagnostic facility for examining Ventura's memory usage. If you click on 'Publisher', and then click on the word 'Ventura', you get an on-screen

display of current memory allocation.

Any criticisms? On the content side, none; since this is a very valuable and very complete guide to a complex product. On the presentation side, the authors could have spent a little more effort in practicing what they preach. This book has truly some of the ugliest drop caps that have ever appeared in print. And finally, when you're paying top price for a top publication such as this, you'd think that they could have at least had it phototypeset. It's somewhat distressing to see 300dpi laserwriter output finding its way into the quality book market.

Who should read *Inside Ventura Publisher*? If you're a Ventura user who still prefers a slow double click setting on your mouse, then you had better stick to quiches and the Ventura user manual for the time being. But if you've already mastered Ventura's keyboard and menus, you'll find *Inside Ventura Publisher* a rich and complete guide to producing quality publications with all the savvy of an experienced trade typesetter.

Brian Anderson



The Macintosh Bible

Authors: Dale Coleman and Arthur Naiman

Publisher: Australian TV Tempo Publishing Company

Price: \$65 (including two updates)

When you buy an Apple Macintosh you get a user friendly computer and a user friendly manual. In fact, the manual is too user friendly, in that, while it gets you using the Mac quickly enough, it leaves so much unsaid that a good percentage of the machine's facilities go to waste.

Watching a power user at work shows the huge number of shortcuts available. Learning them is a matter of talking to other Mac users, or buying a book such as *The Macintosh Bible*.

Published in the US, it is now in its fifth printing and still getting rave reviews. As

an added feature, the price also includes two updates.

The title says it all. This is a book with just about every trick, tip and shortcut to do with the Macintosh and Macintosh Plus you could want. Sadly, the edition reviewed was written before the release of the Mac II and SE, but most tips apply to every Mac.

The four sections of the book deal with systems software and utilities, popular applications, printers and peripherals and purchasing. Fortunately, though the authors are Mac fanatics, they are not so fanatical as to be blind to shortcomings of the machine. They are quite willing to point out bad buys and features.

The format is straightforward, with tips arranged in each section and marked at the side of the page with various icons — shortcut, bargain, very bad feature and very hot tips. It is a book to browse through, although the index will help you find specific topics quickly.

Some of the tips are well known, but every user is guaranteed to find out something about his or her Macintosh that will aid productivity.

In the applications area, the products dealt with are MacWrite, MS Word, Excel, Multiplan, MS File, Helix, Over-View, MacPaint, MacDraw, FullPaint, MacTerminal, Red Ryder, PageMaker and Ready, Set, Go. As the book was written in early 1987, some of these applications have been upgraded. Hopefully the free updates to the book will remedy the problem of timeliness.

Public domain software is given plenty of space too — a boon if you have been wondering what all those mysterious programs on bulletin boards are for. At the back of the book, there is a list of US suppliers. That's not much use to Aussie readers.

The key section is the one on systems software and utilities. This is packed full of tips on making more of the Mac interface and will make the Mac users lot far happier.

The section on purchasing has recommendations for many applications, from graphics to games. Again, it is a year out of date, but newcomers to the Mac will appreciate the guidance.

The book rounds up with a glossary of terms. All that is missing for the Mac aficionado is material of a technical nature, such as what error codes mean. Other books are available that have this information.

In short, *The Macintosh Bible* belongs beside every Macintosh. It will make you more productive, less frustrated and get you to the level of a power user very quickly.

Kester Cranswick

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dBase III Plus Programming: Tips & Techniques

Authors: Cary N Prague & James E Hammitt

Publisher: Ashton-Tate/McGraw-Hill

Price: \$46.95

dBase III is not the most friendly database generator to use and the manuals included with the product are

even less friendly. Probably the most difficult aspect of using dBase III is adding the finishing touches to make the database easy and enjoyable to use.

This book attempts to help in that area. The authors, Cary Prague and James Hammitt, are experienced dBase programmers and *dBase III Plus Programming* offers some of their work for use in your dBase programs; the detailed descriptions that accompany



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every dBase listing to make it easy to modify the routines for your own system.

The book begins with a lengthy chapter on the differences between dBase III and dBase III Plus, most of which is devoted to the Ashton-Tate 'easy to use' dBase front-end — Assist.

Although the authors do their best to cover the features of Assist, it is obvious that they don't use it. The overriding message of chapter one is that 'Real programmers don't use Assist' and you will never get the most out of dBase until you start using the programming language.

From here onwards, *dBase III Plus Programming* really starts to prove interesting. Despite being aimed at existing users of dBase III, the authors devote a lot of space to consideration before creating a database under it. This includes descriptions of normalisation, structured database design, data dictionaries and the user interface. I was particularly pleased to see that the authors acknowledged a situation in which dBase III wouldn't be the perfect product to use, considering that this book is published by Ashton-Tate!

The rest of the book sums up the collected discoveries of the authors after many months of dBase III programming. Among the most interesting were: a routine for creating graphs under dBase III; a search program that will work off phonetics if no perfect match is found; how to create a system tutorial for new users of your system; and an algorithm for generating large letters on the screen up to full screen size.

Overall, then, this book is a must for all dBase III programmers. My only questions are: Why doesn't Ashton-Tate bundle this book with dBase III? And why wasn't it available a year ago when I was wading through the convoluted dBase programming manual?

Barbara Gaskell



You don't have to be a mathematical wizard to read and understand 'Numbers'. All you need to know is basic arithmetic, while Mike Mudge explains the behaviour of a simple sequence of positive integers

There is no need for mathematical background beyond that of addition, multiplication and division this month. So, come on everyone, read a little further, and then carry out some experiments for yourselves . . . and do write and tell me the results of your experiments.

Will the sequence (shown in Fig 1) defined algebraically by the formulae: $x_0 = 1$, $x_1 = 2$, $(n + 1)x_{n+1} = x_n(x_n + n)$ for n greater than or equal to 1 always yield an integer? Notice that the values of x_n increase quite rapidly, $x_6 = 154$, $x_7 = 3520$, $x_8 = 1551880$, $x_9 = 267593772160$. . . But what about x_{43} ?

The corresponding sequence with squares replaced by cubes has been reported on by Boyd and Alf van der Poorten with a suggestion that integers are generated certainly as far as x_{89} , although complete analysis is not known to the author.

If, however, fourth or higher powers are used in the sequence it is believed that no results have been published.

Alf van der Poorten asks what is going on in the case of the squares displayed above. Readers are invited to answer this question and to extend the investigation to higher powers as suggested, or indeed in any other way that they feel appropriate.

Submissions containing attempts at this problem, together with general thoughts on empirical number theory using a personal computer, may be sent to Mike Mudge, C/- APC, 124 Castlereagh Street, Sydney 2000, to arrive by 15 February 1988.

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 stamped addressed envelope is provided.

Review: The left factorial function (July 1987)

The first problem was the least popular: Slavic has used a computer to establish

$$\begin{aligned}
 x_0 &= 1, \\
 x_1 &= \frac{1 + 1^2}{1} = 2 \\
 x_2 &= \frac{1 + 1^2 + 2^2}{2} = 3 \\
 x_3 &= \frac{1 + 1^2 + 2^2 + 3^2}{3} = 5 \\
 x_4 &= \frac{1 + 1^2 + 2^2 + 3^2 + 5^2}{4} = 10 \\
 x_5 &= \frac{1 + 1^2 + 2^2 + 3^2 + 5^2 + 10^2}{5} = 28
 \end{aligned}$$

Fig 1 A possible sequence of integers

that \ln is not exactly divisible by n for $3 \leq n \leq 1000$. Wagstaff verified that the highest common factor of \ln and $n!$ is 2 for $n \leq 50000$.

Interested readers are referred to:

- *A note of the left factorial function* by L Carlitz (Math Balkanica, volume 5 (1975) pages 37-42); and
- *On some new left factorial propositions* by Duro Kurepa (Math Balkanica, volume 4 (1974) pages 383-386; *Mathematical Reviews*, volume 58, number 10716).

The second problem, based upon a paper in *Mathematics of Computation*, volume 46, number 174, April 1986, pages 715-716 by Mok-Kong Shen produced many extensive replies. None of these solutions included the 'numbers having 6043 digits or more' mentioned in the paper!

The additional solutions 93527, 228727 and 373457 requested were readily obtained.

Shen's paper establishes that each of the congruences: $2^{n-k_i} \equiv 1 \pmod{n}$ $i = 0, 1, 2, \dots$ where $k_0 = 2$ and $k_{i+1} = 2^{k_i} - 1$ has infinitely many solutions n .

After much thought, this month's prizewinner is Frank Webster who programmed in Basic and Assembly language.

It should be observed that several very detailed theoretical submissions were received accompanied by well-docu-

mented computation. It was felt, however, that the submission of Frank Webster was the 'best' within the subjective criteria and the general aims of the 'Numbers' column.

It is hoped that non-prizewinners will continue to show an interest in the application of computing to number theory and encourage friends to share this interest!

Mike Mudge welcomes correspondence on any subject within the areas of number theory and other computational mathematics. Particularly welcome are suggestions, either general or specific, for future 'Numbers' articles; all letters will be answered in due course.

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Tel: 252 8063-5

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USER GROUPS

Below is a list of updates and additions to the full User Group listing which is available on request. Please send a SSA envelope to 'User Groups', APC, 124 Castlereagh Street, Sydney 2000.

NSW

CLUES, the C Language Users and Enthusiasts Society, meets on the first Tuesday of each month (except January), at the Microsoft premises, 1/17 Rodborough Road, Frenchs' Forest.

For more details contact Jim Sharples,

CLUES, PO Box 594, Dee Why NSW 2099, or telephone (02) 958 4705.

Qld

The venue and meeting time for the Queensland CP/M User Group has been changed. The new venue, (formerly Queensland University), is Newmarket

State High School, Science Block, Banks Street, Newmarket (Brisbane), and the meetings are now held on the third, (formerly last) Sunday of each month, commencing at approximately 1pm. For more information contact Mr G Davy, Queensland CP/M User Group, PO Box 1025, Milton Qld 4064.

END

LAZING AROUND

Brainteasers courtesy of JJ Clessa

Quickie

No prizes, no answer published, but you can easily check if you have a bible (Matthew 16:23) — you may be surprised if you do.

To whom did Jesus say 'Get thee behind me . . .'?

Prize puzzle

Mary, Sally and Jane share the same birthday, although their ages are different. In fact, at this year's birthday party it was realised that:

- Three times Mary's age plus Sally's age equal twice Jane's age.
- Twice the cube of Jane's age is equal to three times the cube of Mary's age plus the cube of Sally's age.

There are no common factors between any of the three ages. What are the ages?

Solutions on postcards or backs of envelopes only to reach APC, Lazing Around January, 124 Castlereagh

Street, Sydney 2000, no later than 30 January.

October prize puzzle

Tougher than usual this month — although we did give a clue by advising lateral thinking.

The answer is: $(\frac{41}{6})^2$
When 20 is added, $(\frac{49}{6})^2$ is the result;

When 20 is subtracted, $(\frac{31}{6})$ is the result.

There's no need to resort to base 12 arithmetic or use complex numbers, as most entrants did. The winning card came from Mr B Quill of Carlton, NSW. Congratulations Mr Quill your prize is on its way.

To all the rest, keep puzzling.

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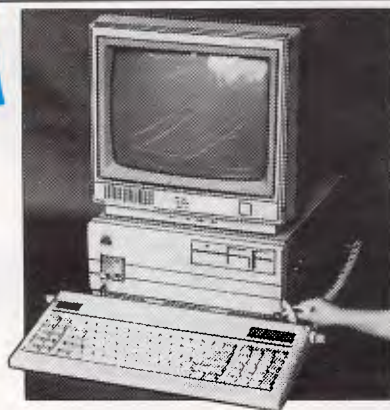
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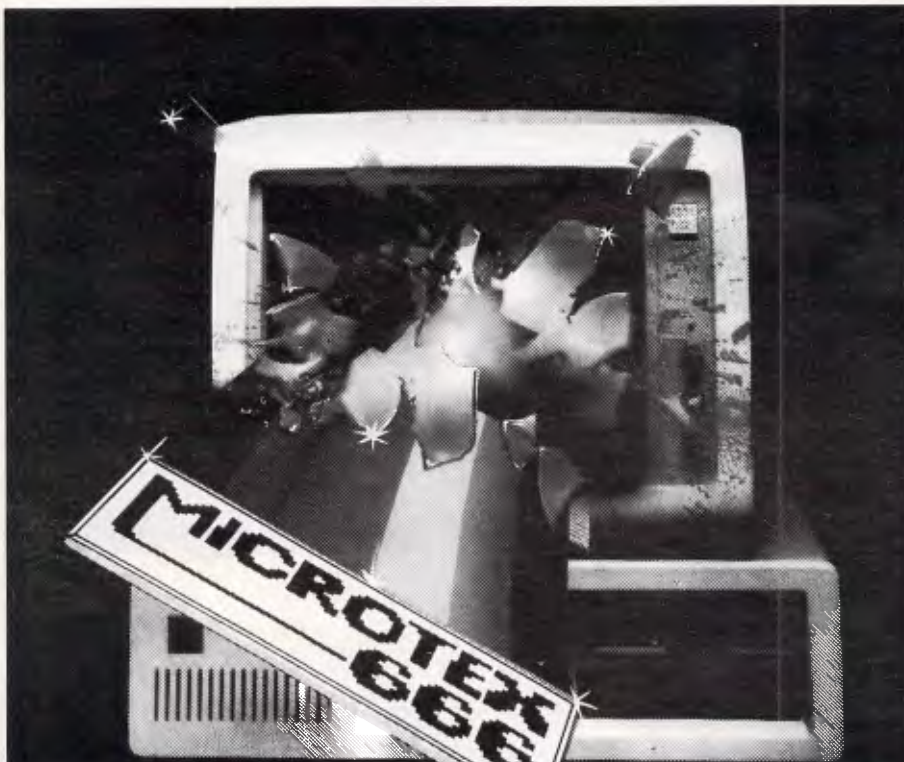
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