MULTI-USER STRATEGIES

HARDWARE
- IBM PS/2 Model 30
- Epson's laser printer
- Macintosh SE

SOFTWARE
- WordStar 4
- A-T's Rapid File
- Aldus PC Pagemaker
The secret of Borland's success is "Quality, Speed, Power, & Price"

We're one of the biggest software companies in the world—and we got that way by making "Quality, Speed, Power, & Price" essential characteristics of every Borland software program. Look for Borland software—then look no further.

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Traveling SideKick*
It's the electronic organizer for this electronic age. Neither you nor your secretary need to face 1887 with old-fashioned 1887 diaries. Traveling SideKick has everything they have—and a lot more. (Unlike busy old diaries, Traveling Sidekick doesn’t “expire” at the end of ’87, because it’s electronic and good for ’88, ’89, ’90 and on and on and on.) It’s a professional binder, a software program, and a report generator—a modern business tool that prints your ever-changing appointments in daily/weekly/monthly/yearly form. If your schedule changes hourly, Traveling SideKick handles the changes instantly.) Whether you use your own personal computer or have someone’s help with that, Traveling SideKick is the smart new way to take your computer with you—without taking your computer with you. Minimum memory: 256K.

Turbo Lightning*
Solves All Your Spelling Problems!
While you use SideKick, Reflex, Lotus 1-2-3®, and most popular programs, Turbo Lightning proofreads as you write! If you misspell a word, Turbo Lightning will beep at you instantly, and suggest a correction for the word you just misspelled. Press one key, and the misspelled word is immediately replaced by the correct word. And if you've ever stuck for a word, Turbo Lightning’s thesaurus is there with instant alternatives. Minimum memory: 256K.

Lightning Word Wizard*
Technical Reference Manual For Turbo Lightning!
An important addition to Turbo Lightning, Lighting Word Wizard includes fascinating and challenging word games like "Akerue" (try reading that backwards), "That’s Rite," "CodeCracker," "CrossSolver," "MixUp," and "FixUp," to name some of them. Lightning Word Wizard introduces you to the "nuts and bolts" of Turbo Lightning technology, and gives you more than 20 different-calls to the Lightning engine. Minimum memory: 256K.

Turbo Prolong™
Our new Turbo Prolong has drawn rave reviews—which we think are well deserved—because Turbo Prolong brings 5th-generation language and supercomputer power to your IBM PC and compatibles. Turbo Prolong is a high-speed compiler for the artificial intelligence language, Prolong, which is probably one of the most powerful programming languages ever conceived. We made a worldwide impact with Turbo Pascal, and you can expect the same results and revolution from Turbo Prolong, the natural language of Artificial Intelligence. Minimum memory: 384K.

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No matter what business you're in, if you use Lotus 1-2-3* or dBASE® you need Reflex and the new Reflex Workshop to give you all the tools and views to see what your numbers mean. The new Reflex 1.1 with expanded memory support allows you to manage huge databases of up to 8 megabytes of RAM, 32,000 records, and 250 fields per record with " Reflex Lightning Speed." The Reflex Workshop gives you a wide range of analytical tools written for specific applications like Finance/Accounting, Administration, Sales and Marketing, and Production and Operations. You can use the tools "as is" or modify them to suit your business needs. Minimum memory: 384K.

SuperKey*
Turns 1000 Keystrokes Into 1!
If you use SideKick, you need SuperKey. They're designed to work together—and work for you. SuperKey's an amazing keyboard enhancer for your IBM PC and compatibles. With easy-to-write macros, you and SuperKey can turn 1000 keystrokes into 1. Minimum memory: 128K.

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Includes a library of graphics routines for Turbo Pascal programs. Lets even beginning programmers create high-resolution graphics with an IBM® Hercules,* or compatible graphics adapter. Our Turbo Graphix Toolbox includes all the tools you'll ever need for complex business graphics, easy windowing, and storing screen images to memory. It comes complete with source code, ready to compile. Minimum memory: 192K.

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Minimum memory: 128K.

* Minimum memory: 192K.

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A technical look at Turbo Basic

- Full recursion supported
- Standard IEEE floating-point format
- Floating-point support, with full 8087 (math coprocessor) integration. Software emulation if no 8087 present
- Program size limited only by available memory (no 64K limitation)
- EGA and CGA support
- Access to local, static, and global variables
- Full integration of the compiler, editor, and executable program, with separate windows for editing, messages, tracing, and execution
- Compile, run-time, and I/O errors place you in the source code where error occurred
- New long integer (32-bit) data type
- Full 60-bit precision
- Full pull-down menus
- Full window management

Free spreadsheet included, complete with source code!

Yes, we've included MicroCalc our sample spreadsheet editor, complete with source code, so that you can get started right away with a "real program." You can compile and run it "as is," or modify it.

For the IBM® PC. If BASIC taught you how to walk, Turbo Basic will teach you how to run!

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- A technical look at Turbo Basic
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- Floating-point support, with full 8087 (math coprocessor) integration. Software emulation if no 8087 present
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- Full window management

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MULTI-USER STRATEGIES

The latest generation of 80386- and 68020-based micros provides hardware power in abundance for multi-user computing. But what about the software? In this special section we look at the leading operating systems — Unix, Concurrent DOS, Pick and BOS — and assess their strengths and weaknesses.

COVER FEATURE

ZENITH Z-386
While the world waits for IBM’s 386 micro, other manufacturers continue to plug the gap with their own offerings. Steve Malone tries out Zenith’s latest machine.

IBM PS/2 MODEL 30
Last month we looked at the theory of the new IBM's; this month Glyn Moody puts the first model through a full hands-on bench test.

EPSON GQ-3500
Ian Stobie finds out whether Epson’s eagerly awaited first laser will repeat the company’s success with dot-matrix machines.

MACINTOSH SE
An in-depth look by Carol Hammond at Apple's open Macintosh.

ALDUS PC PAGEMAKER
The top DTP package on the Mac is now out in the PC version, running under Windows: it could point the way for future OS/2 packages.

MICROCHART PLUS
Steve Malone reports on the capabilities of a mid-range presentation Graphics program.

WORDSTAR 4
Susan Curran looks at the extra features now on offer to the WordStar-using multitudes.

RAPID FILE
New packages from Ashton-Tate are always an event. Mike Lewis finds out whether this mid-range database was worth the wait.

CONSUMABLES
Buying a micro is a big one-off cost but running expenses can mount too. Carol Hammond looks at how to get the best deal for floppies, paper, ribbons and the rest.

CHIP WARS
The dispute over cheap Japanese chips has highlighted the vulnerability of European micro makers. Steve Malone fills in the background.

AFTER OS/2
Ian Stobie reports on how the software houses are coming to terms with the new operating system.

ADD-ON BOARDS
We pick 10 ways to titivate your micro.

INSIDE

Zenith Z-386 A challenger for the Deskpro 386 — page 42.

PC Pagemaker Aldus DTP goes IBM — page 56.

IBM PS/2 We look at the Model 30 — page 44.


REGULARS

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Decision time for ICL

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Getting to grips with Grep

COMMS LINK
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Software clones

ASK PC
Can you read from microfiche?

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You are in for an exhilarating experience! Our new and most powerful model, the Z-386, brings supermicro performance to the desktop PC.

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The world's leading manufacturer of PC compatibles

Zenith Data Systems 'the quiet giant'

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DECISION TIME FOR ICL

try this quiz. Name a major international computer manufacturer, with a turnover measured in billions of dollars, which has increased its sales for each of the last three years by around 10 percent. This company's profits went up by 27 percent last year; it now holds around half of the U.K. multi-user micro market and about 18 percent in Europe. A clue: its name consists of three initials.

The answer, of course, is not IBM — which suffered a fall in profits last year and hardly figures in the multi-user micro arena at all. Surprisingly, the company in question is our very own dapper ICL. Two questions suggest themselves. Is ICL's welcome success likely to be sustained? And how should the company proceed to build on it?

At first glance, ICL is not an obvious candidate for steady growth in today's fickle markets. For a start, it has a pretty odd portfolio of products. It possesses neither the unity of DEC's Vax family, nor the awesome, if somewhat incoherent, breadth of IBM's array of products. Instead, it has adopted a mix 'n' match approach, filling a slot here, and colonising a niche there.

ICL's bottom-end machines are symptomatic of this. The pick of the bunch has to the One Per Desk work station — an original concept matured by a woefully inadequate implementation. The idea was to bring together computers and communications in a single neat unit for the manager's desk. At the time of the launch, ICL was confident that this brilliant insight into the nature of executive working would take the world by storm, rendering other PCs obsolete. Unfortunately, things did not quite work out like that. The wonder is not that the One Per Desk bombed so comprehensively, but that it is allowed to linger on, as a constant reproach to the company.

Perhaps as a corrective to this wildly visionary product, ICL's other low-end machine is about as conservative as you can get. The multi-user Quattro system is based around an 8088 chip and was grossly underpowered and old-fashioned even when it was launched. Its successor — the DRS-300 series, reviewed a year ago in Practical Computing — is better designed, particularly as far as upgrades are concerned. Presumably, it forms the basis of ICL's considerable current success in the British and European multi-user markets.

One reason why ICL seems to have done so well with this motley crew is that far from attempting to offer a consistent, integrated range of products, the company has concentrated increasings on providing carefully tailored solutions to well-defined vertical markets, working closely with OEMs and VARs. This has worked well so far, but there is still some doubt for concern.

Until recently, ICL has avoided any head-on confrontation with rival manufacturers in the sphere of the dominant DOS architecture. The company would doubtless put this down to sound strategy; cynics might see it as a bad case of cold feet. Be that as it may, ICL has now decided belatedly to enter the DOS world. It has unveiled a version of its DRS multi-user series called the DRS Professional Workstation — the DRS PWS. Unlike its sibling products, this is a single-user machine but a multi-tasking one.

A part from apparently going against ICL's previous strategy for the lower end of the computer market, the most worrying thing about this new product is the operating systems it will use: MS-DOS 4. Just about every other manufacturer has passed this system over as a complete no-hoper. The appearance of MS-DOS 3.3 and OS/2 confirms the totally inconsequential nature of the product, which must cast some doubt on whether ICL really does have a coherent strategy in this area. If it does not, its successes could evaporate as other manufacturers move in and take over.

However, all is not lost. Just as ICL appears to be losing its nerve, and following a path which everyone else had agreed years ago was a dead end, IBM has kindly stepped in and made such questions irrelevant. The launch of the PS/2 range has made it quite clear that we are entering the second phase of business micros. With the new standard comes ICL's big chance.

Hitherto, it has spurned the mainstream corporate micro market and left business users to buy their standard PC compatibles from elsewhere. This is despite the fact that a misguided sense of patriotism might well have caused them to buy the ICL kit, had it been available. It seems likely that only the bigger companies, like Compaq and Olivetti, will be able to clone the new PS/2 quickly and easily. ICL would be well placed to join that elite club. If it has not already put in an order for the PS/2 Model 50 machine — which uses the mysterious Micro Channel — it should do so immediately, and then gets its research teams busy. Along the way, it might even knock together linking programs to ICL mainframes to complement those which IBM will be offering for its own machines. By its recent successes, ICL has proved it can be a big fish in a small pond, the key question is whether it can manage the same trick in the big pond.

5 YEARS AGO...

A new British microcomputer has been launched, aimed at the top end of the personal-computer market. The M-Three is the latest offering from LSI Computers of Woking in Surrey. The machine is Z-80 based, has 64K RAM, two double-density mini-floppy drives, a VDU with 1,920-character green phosphor display and a full-function keyboard. The keyboard has 14 programmable function keys, and a numeric pad making a total of 109 keys.

M-Three is equipped with a CP/M operating system and is programmable in Basic and Cobol. There is also a range of applications software available from LSI computers. The complete package costs less than £3,000 without software, or £3,500 with one LSI software application included for small-business users.
Olivetti's new M15. The desk top computer for people without desk tops.

If, like our antiquated architect, you're a businessman who spends a lot of time out in the field, you're sure to welcome the arrival of the new Olivetti M15.

A lightweight computer with heavyweight capabilities.

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Twin integrated 31/2" disk drives, with the capacity to transfer data and programmes to and from an external 51/4" drive.

A full 101/2" tiltable screen - larger than any other portable. (With normal monitor proportions, to prevent picture distortion.)

And, of course, the standard MS-DOS operating system - making the M15 fully compatible with industry software and hardware.

So you can run all the programmes you've got in the office, out of the office.

The M15 has a dual power supply - 6 hour rechargeable batteries, or mains.

A detachable keyboard - so you don't have to have the whole thing on your lap.

And to round the package off, the computer comes complete with its own holdall. And the service and back-up you'd expect from Europe's leading PC manufacturer.

What you might not expect is the extremely competitive price!

For more information, simply send off the coupon, or talk to your local dealer.

*CI355 excluding VAT for the complete system.*

To: Carol White, British Olivetti Limited, Olivetti House, 86-88 Upper Richmond Road, London SW15 2UR. 01-785 6666. I'll be out of the office soon. Please send me details of the Olivetti M15 computer.

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How to make sure your Printer doesn’t slow your PC down.

Without a Megabuffer your Printer can slow down the rate your PC outputs to the rate your Printer prints. Turning a 5 minute print file into half-an-hour. Which means that the PC can be out of action for long periods. Merely outputting. With a Megabuffer the PC outputs at its top speed into the Megabuffer memory, the PC is then released for further work, and the Printer prints at its own rate from the Megabuffer memory.

• Allows you to use your PC more
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• Compatible with most computers, printers and plotters: IBM & compatibles, AMSTRAD, HP ACT, SHARP, EPSON, CALCOMP and many more • Can cut PC output time to one sixth or less.
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Full range of memory sizes for every application: 64K £160, 128K £216, 256K £278, 512K £388, 1MB £556.

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Eliminate miles of spaghetti and all those ‘I’ and ‘X’ switches with a simple Megaswitch which allows your PC to instantly connect to a selection of printers and plotters.

MEGASWITCH AS — Serial Data Selector
• Single unit multiplexer and demultiplexer • 2K data buffer • RS-232 and RS-422 versions • Can operate as RS-232/RS-422 converter • Diagnostic output • Megabuffer compatible
• Multiplexer — Ideal for printer sharing, 4 inputs and 2 outputs.
• Can automatically select any channel supplying data
• Demultiplexer — Ideal for driving several different printers from a PC. 2 inputs and 4 outputs

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MEGASWITCH AP — Parallel Data Selector
• Connects any of 4 inputs to either/bOTH of 2 outputs
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投入使用

Desk-top publishing continues to be one of the hot areas at the moment. We look at Harvard Professional Publisher: will it live up to the high standards of the company’s other products? Plus a review of Webster’s New World Writer, a word processor designed specially for writers rather than secretaries.

Hardware

Although it was announced some months ago, the Apricot 386 machine is only just coming through in quantity now. Was it worth the wait, and how will it fare against the 80386 machines — including IBM’s — already out there?

Features

Superconductors seem to be bringing science fiction into the realm of fact. We examine the implications for computers and for business. Plus another look at the Data Protection Act: has it failed?

Special Section

Laser Printers

A few years ago lasers were luxuries; today it seems that everyone is launching one or buying one. We examine the latest developments, and find out how fast laser printers really are.

Top 10

Utilities

We survey the candidates for every micro user’s software toolbox.
We steamed it.

We shook it.

For further information ring (0800) 400443.
To get to your office, the Vectra has to go through hell.

How can we be so sure our Vectra computer won’t let you down? Because we asked Lloyd’s Register of Shipping to give it a going over.

Lloyd’s test all kinds of equipment for seaworthiness. They believe a computer should be able to round the Cape, reach the Pole and spend a week in the Doldrums.

Which is why they tested the Hewlett-Packard Vectra as if lives depended on it.

First, they left it in a temperature of 55°C for 100 hours. Then they lowered the temperature to -25°C for 16 hours. In the next test they again raised the temperature to 55°C but this time with a humidity of 95%.

They also rolled the Vectra each side of the vertical, they vibrated it for two hours and they fluctuated and interrupted the voltage and frequency.

The results, we think, will surprise you.

Apart from suggesting we should secure the capacitors and resistor more firmly, Lloyd’s gave us a clean bill of health.

For those on dry land, the message is clear. If the Vectra can cope with life at sea, it should find office life plain sailing.
HEWLETT-PACKARD NETWORK OPTIONS

HEWLETT-PACKARD has announced a range of extensions to its Advancenet networking system. The new networks are intended to provide a wide range of business solutions based around the X-25 protocols.

The company is offering five new networks, each one tailored to a specific business requirement. The major announcement is of a new area network (WAN) based around X-25 and intended to cover an entire company. The significance of X-25 is that it is an internationally accepted standard for network communications which has been adopted by a wide range of manufacturers. Hence the network is able to communicate with a number of otherwise incompatible computers.

The second of the new products is specifically designed for use by sales and service departments. The network aims to provide access to central processing and local centres. He says that the network is able to cope with a variety of different access methods, including dial-up and X-25 private and public networks.

The Business to Office product is for departmental networks. Local groups in an HP Starlan cluster can be linked together via a backbone network. Away from the office, Hewlett-Packard has designed two networks specifically for the manufacturing process. The Computer Integrated Manufacturing (CIM) network is configured to orchestrate the various controllers and systems installed on the factory floor.

The final network is aimed at design engineers. The Engineering Network is intended to transfer information between Unix-based cluster work stations, although it will also provide some support for proprietary operating systems, such as those from IBM and DEC.

To support the new set of networks, Hewlett-Packard has released a number of new products. They include the X-25 Private Packet Network, an X-25 Multiplexor and a Buffered Repeater.

The company is also offering several services to support the new products. Network Prepare helps customers integrate the network with their existing hardware, while NetSure is a scheme for contract maintenance.

Further details from Hewlett-Packard Ltd, Enquiry Section, Eskdale Road, Wimnesh Triangle, Wokingham, Berkshire RG11 5DZ. Telephone: (0734) 696622.

Parallel processing comes to ATs

MICRO-MARKETING has introduced what is claimed to be the world's first parallel-processing plug-in device for the PC/AT. The IQ-188 is a microcomputer on a board which shares the tasks of the host machine.

The board holds an 80188 processor running at 7.5MHz, a hard-disc controller, 256K of RAM and two high-speed RS-232 ports. The RAM is expandable to 1Mbyte and is mapped directly into the AT's address space.

The company claims that the IQ-188 is capable of sorting a flat file in the background while simultaneously recalculating a Lotus spreadsheet.

The IQ-188 costs $1,775 for the 256K model, rising to $1,970 for the 1Mbyte version. Sterling prices vary with the dollar rate. Further information is available from Micro-Marketing (Electronics), Unit 4, Soho Mills Industrial Estate, Wooburn Green, High Wycombe, Buckinghamshire HP10 0PF. Telephone: (0628) 29222.

Awesome boost for hard discs

A NEW hard-disc sub-system from CSSL Inc. is claimed to improve dramatically the performance of the PC/AT hard disc. The new product, to be called the Awesome I/O card, is expected to cost $595.

The Awesome card uses two basic methods of tackling the problem of the I/O bottleneck at the hard disc. The first is to store compacted form.

Data is also retrieved far faster in compacted form.

The second method involves the use of data-compaction techniques and cluster compaction. The company claims this increases the disc capacity by at least 50 percent. Data is also retrieved far faster in compacted form.

For more details contact CSSL, 909 Electric Avenue, Seal Beach, CA 90740, USA. Telephone: (US area code 213) 493-2741.
Victor removable hard-disc modules

VICTOR TECHNOLOGY has improved its range of PC/AT-compatible computers with the launch of the VPC-III. The new machine features the ability to accommodate a second removable hard disc and a flat-screen display.

The removable hard disc, known as the Add-Pak, uses 3.5in. 30Mbyte discs. It is housed in a pull-down flap to the side of the conventional mass-storage devices.

Prices for the VPC-III range start at £2,499 for the 20Mbyte hard-disc machine with monochrome display, rising to £3,999 for a machine equipped with a 40Mbyte hard disc and an EGA display. The Add-Pak disc drives cost £499 each.

For further information contact Victor Technologies (UK), Unit 1, Valley Centre, Gordon Road, High Wycombe, Buckinghamshire HP13 6EQ. Telephone: (0494) 430661.

Word Perfect for portables

AN INTEGRATED package aimed specifically at business users with lap-top portable computers such as the Toshiba T-1100 or Zenith Z-181 is being introduced by Word Perfect Corporation. Called Word Perfect Executive, the new package incorporates a spreadsheet and other functions in addition to word processing.

To make the software more suitable for batterypeowered use, disc accesses are kept to a minimum. The word processor is a cut-down version of the full Word Perfect, and includes a 50,000-word spelling checker. The spreadsheet has the ability to handle Lotus files, and includes limited database and charting functions. Appointment calendar and alarm pop-ups are also included, along with a simple database and a phone directory.

The package costs £199 on either 3.5in. or 5in. discs. Contact Sentinel Software, Wellington House, New Zealand Avenue, Walton-on-Thames, Surrey KT12 1PY. Telephone: (0932) 231164.

CHANGE OF DIRECTION FOR DIGITAL RESEARCH

IN A move which could herald a shift away from its traditional territory, Digital Research (DR) has launched two significant packages: a desktop publishing program and a word processor. Gem Desktop Publisher goes on sale immediately at a cost of £295. This pricing means that it is aimed at the bottom end of the DTP market, at users who do not require all the features offered by Aldus and Ventura, but who still want to go a step beyond ordinary word processing. DR hopes it will appeal not so much to the home market but to corporate users put off by the unaffordable complexity of the more expensive products.

Gem 1st Word Plus, which goes on sale at the same time, is a bought-in product, acquired on a worldwide basis from GST, a Cambridge-based software house. GST keeps the rights to versions for the Atari ST and other non-IBM compatible machines.

Most users will pay £149.95 plus VAT for Gem 1st Word Plus, getting Gem Paint and the Gem Desktop Publisher's automatically wraps text round pictures.

Desktop bundle in free. Amstrad PC-1512 users will only have to pay £79.95, including VAT; according to DR this is because they already have the two other Gem programs.

Gem 1st Word Plus is a very Macintosh-like word processor. It makes full use of Gem features, allowing you to have up to four documents open at a time, and to browse and copy text between them. Mail-merging and a 40,000-word spelling checker are included, as well as the ability to incorporate image files.

In the past Digital Research has always been associated with operating-system and language products. It is the company responsible for CP/M, and more recently for Concurrent DOS and...

HARDWARE SHORTS

- NCR has reduced the prices of its Unix-based Tower supermicros by 7.5 percent. The entry-level machine now costs £4,320. Details on 01-725 8337.
- ICCT has introduced the All Card 286, a 16-bit version of its Allcard. The entry-level version without any memory chips installed costs £595. Further information from 01-248 8895.
- The Cipher 1525-CT is a 25Mbyte tape streamer for the Amstrad PC-1512. It is available from First Software. Phone: (0256) 463344.
- Video Seven has announced an upgrade for its Vega Deluxe card, which can now support IBM's new Video Graphics Array (VGA) display. Details are available on (0706) 217744.
- The Reel One 20Mbyte tape streamer has been designed to fit into the external floppy-disc drive of the Toshiba portables. For details phone: (045382) 3611.

SOFTWARE
PRESENTATION SOFTWARE CHOICE GROWS

Three strong presentation-graphics packages are about to come on to the market. Two of them are established products, the third is new.

Harvard Presentation Graphics is one of the UK's best-selling packages of this type. The new version is called Harvard Graphics and goes on sale in the summer. It is expected to cost slightly more than the £295 being asked for the current version.

New features include a symbol library and an improved free-running carousel-type display. The number of chart types has been boosted, and three-dimensional effects are now available.

Contact Software Publishing Europe, 85-87 Jermyn Street, London SW1Y 6JD. Telephone: 01-839 3864.

Boeing Graph is a new colour version of Perspective, a more specialised presentation package. Perspective's claim to fame is that you can use it to produce three-dimensional effects, as well as flat charts. Part of the Boeing Company has done a deal with Three-D Graphics, the program's originator, to jointly produce Boeing Graph. It goes on sale here later this month, priced at under £400.

Much of Boeing Graph's appeal comes from the fact that you can rotate and zoom the images along any axis, producing stunning effects. New features include more chart types, and support for more printers and file formats. Boeing Graph should be available almost immediately, priced at under £100. Contact Personas, Unit 1, Silverglade Business Park, Leatherhead Road, Chessington, Surrey KT9 2NQ. Telephone: (03727) 29611.

VP-Graphics is the latest offering from Adam Osborne's Paperback Software range. The VP products are usually very good value for money, and VP-Graphics will probably be no exception. You can import ASCII, Pct or DIF files from elsewhere or enter data directly into the package. Along with a wide range of data-driven chart types, VP-Graphics has a large selection of drawing tools inside the package.

VP-Graphics goes on sale later this month. Contact Newsprint Software, 200 North Service Road, Brentwood, Essex CM14 4SG. Telephone: (0277) 220573.

STOPLOCK IV is a menu-driven hard-disc security system aimed mainly at large corporate PC or AT users. The £510 product takes the form of an expansion card rather than disc software, as this makes it harder to tamper with. Users get access to the system by typing in a valid ID followed by a password, after that everything works as it would normally.

Stoplock can be set up to support up to 32 different users, all with different file-access rights. The system also has a real-time clock for logging and controlling access times, and supports automatic file encryption, permanent file erase, and extensive audit trail and reporting facilities. These features are all controlled through software built on to the card.

The company launching the product is PC Security, The Old Court House, Trinity Road, Marlow, Buckinghamshire SL7 3AN. Telephone: (0628) 890390.

Inmac's software products

Inmac has entered the software field for the first time with two pop-up programs for Lotus 1-2-3. The most interesting is Inword, a full-feature word-processing program costing £68. It lets you link spreadsheet data into documents dynamically; it can also be used to prepare personalised form letters and mailing labels from Lotus data.

Noteworthy costs £54. It lets you attach explanatory notes to the cells in your spreadsheet, allowing up to 6K of text per cell. Like Inword, it was written by Funk Software in the US, and uses the facilities Lotus provides within 1-2-3 version 2 to hook third-party products into the package.

Inmac, one of the largest computer consumable companies in the UK, sells direct to the public. One of the welcome effects of this kind of company getting involved in software distribution may be to improve purchase terms for end-users. Inmac is offering both products with a 30 day carriage-paid money-back trial period and a 12 month guarantee.

Contact Inmac (UK), Westerley Point, Market Street, Bracknell, Berkshire RG12 1EW. Telephone: (0344) 424333.

Hard-disc file-security software

STOPLOCK IV is a menu-driven hard-disc security system aimed mainly at large corporate PC or AT users. The £510 product takes the form of an expansion card rather than disc software, as this makes it harder to tamper with. Users get access to the system by typing in a valid ID followed by a password, after that everything works as it would normally.

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The company launching the product is PC Security, The Old Court House, Trinity Road, Marlow, Buckinghamshire SL7 3AN. Telephone: (0628) 890390.

SOFTWARE SHORTS

- Xerox has released version 1.1 of Ventura Publisher. Enhancements include faster printing, automatic kerning, anglicised hyphenation, and considerably expanded facilities for importing graphics. Contact Rand Xerox on (0895) 51133.

- Psion have released a Lotus-compatible spreadsheet and comms software for its tiny Organiser II hand-held computer. The spreadsheet, which costs £39.95 including VAT, can handle WKS, WRL and DIF files. Used together with the £59.95 comms program it lets you download, manipulate, then upload Lotus files from your own PC. Details from Psion on 01-723 9408.

- Project-management software is not as widely used here as in the US, because few people understand the underlying discipline. Project Helper sets out to change this: it is both a tutorial program and a small project-planning package capable of handling projects with about 100 activities. It packages £78.25 from Parkway Computer Consultants, telephone (0707) 371616.

- dPops is an £30 add-on for dBase III Plus. It lets you output things like instructions, help or error messages in windows which pop up over the ordinary dBase display. Contact Camel Services on (0865) 512675.

- Multiword is a new word-processing and mailing package which links through to the Multisoft range of accounting software. The single-user MS-DOS version costs £390; it is also available under Xenix. Contact MultiSoft Systems on (0420) 85572.

- TrendText/Expert is latest in the Microtrend range of word-processing packages. Features include extensive mail-merge and a spelling checker. The price is £349. More details from Microtrend on (0423) 711878.

- Wordracer, Acorn's is a simplified PC version of a word processor which also runs on Vax and Prime minis. The advantage of using the £200 package is that you can transfer documents both ways. Contact Doric Computer Systems on (0292) 52288.

(continued from previous page)
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For more details and a list of IBM Authorised Dealers, contact Wendy Castle at The National Enquiry Centre, IBM United Kingdom Limited, 414 Chiswick High Road, London W4 5TF. Or telephone 01-995 7700 during working hours.

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APPLE TO LAUNCH A SOFTWARE COMPANY

APPLE COMPUTER INC. has announced plans to create an independent software company to develop, publish and market applications software for Macintosh and Apple II micros. According to Apple, the new company will market applications software currently published by Apple, but under its own private label. It will also publish software developed by third parties while developing some applications itself.

The new company will initially be a wholly owned subsidiary of Apple, but will probably become independent of its parent within a year. Apple intends to retain a minority share ownership.

An Apple spokeswoman said that the company was formed to stimulate further activity in the software field. Apple itself will become more like a traditional computer manufacturer, concentrating on hardware, peripherals, systems software and commodities products.

Initially the change will have little effect in the UK. But as the new company starts to distribute applications packages like Appleworks, Applewriter, Macpaint, Macwrite and Macterminal, Apple UK will cease to stock them. Apple will redeploy staff currently employed in developing, marketing and distributing applications software to work in different areas within Apple.

For more details contact Apple UK, Eastman Way, Hemel Hempstead, Hertfordshire HP2 7HQ. Telephone: (0442) 60244.

European mobile telephone system

BRITAIN, France, West Germany and Italy have agreed on a standard for a Pan-European mobile telephone system. The four countries will join forces to develop a European digital cellular-radio network, which they hope will be in commercial use by 1991. The network will use a narrow-band system.

This is good news for micro users, since not only will people be able to use the same mobile telephone in the UK and Europe, they will also be able to use the same modem. The digital network will also allow for faster data transmission than is possible with modems currently in use. Modems could eventually disappear altogether if phones begin to incorporate a digital data socket into which micros can make a direct connection.

For more information contact British Telecom, 81 Newgate Street, London EC1A 7AJ. Telephone: 01-726 4444.

Database directories

A NEW series of directories of international databases has been launched. The first of them, called Business-line Finance, gives details of over 300 on-line services worldwide that provide information on financial topics.

Business-line Company Information contains entries for over 200 on-line services, covering areas such as company profiles, company accounts and manufacturing output, business opportunities and company products, along with bankruptcies and defaults.

The Business-line Management, Marketing and Administration directory lists over 200 on-line services covering topics like personnel management, marketing strategies, audience research, conferences and administration.

Each title costs £85. New editions are published every six months and discounts are available for annual subscribers. For more information contact Euromonitor Publications, 87-88 Turnmill Street, London EC1M 5QU. Telephone: 01-251 8024.

Microsoft's bid for OS-9 rejected

THE SOFT CENTRE, UK distributor for Microsway Systems Corp., recently confirmed American rumour that Microsoft has been trying to buy up Microware and that the bid was rejected. Vice-president of Microware, Andy Ball, said that Microsoft's main motive was to get its hands on the OS-9 operating system. OS-9 has been chosen by Philips and Sony as the software standard for the new Compact Disc Interactive (CDI) players.

Microsoft announced its commitment to the CD-ROM text/software standard last year. At the same time Philips and Sony announced the new CDI format, which provides for several levels of audio and video information. The CDI standard defines a filing structure, operating system, microprocessor and associated interactive support software for using compact discs for interactive data, audio and visual recording and retrieval.

For more details contact The Soft Centre, Software House, Burr Street, Luton, Bedfordshire LU2 0HN. Phone: (0582) 405511.
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**IBM**

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<td>(640k RAM 2 x 360k Disk)</td>
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<td>PC AT X</td>
<td>(512k RAM 1Mb + 30Mb Disk)</td>
<td>£2975.00</td>
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All prices include Keyboard, Monitor & DOS

8087 Chip £195.00  80287 Chip £295.00  AT 360k Disk £145.00

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**TOSHIBA**

**Lap Top Computers**

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<td>(256k RAM, 3½/2 720k Disk, 80C88 Co-pro, DOS 2.1)</td>
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<td>T1100 Plus</td>
<td>(640k RAM, 2 x 3½/2 720k Disks, DOS 3.2, and A/C Adapter-Charger &amp; Carrying Case)</td>
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**OLIVETTI**

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All prices include Keyboard, Monitor & DOS

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All prices include cable

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**EX-RENTAL EQUIPMENT**

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<td>Princeton EGA monitor 12&quot;</td>
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<td>Mountain Hardcard 20Mb</td>
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<td>QUAD EGA (short)</td>
<td>£229.00</td>
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<tr>
<td>Paradise AutoSwitch EGA</td>
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<tr>
<td>AST Rampage 512k for AT</td>
<td>£428.00</td>
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</tbody>
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GETTING TO GRIPS WITH GREP

FOR STRING SEARCHING UNIX HAS THE POWERFUL GREP PROGRAM. NOW THERE IS ALSO AN EQUIVALENT UTILITY THAT RUNS UNDER DOS.

Most micro users know that their word processor's Find and Replace function — and its equivalent in other software — can be a great productivity booster. I use it all the time to correct persistent spelling mistakes, expand abbreviations, and make other global changes to a file of text. But people migrating down from mainframes and minis often find this feature surprisingly primitive compared to the more powerful versions they are used to. Unix folk in particular are disappointed not to find anything equivalent to the Grep utility.

In Unix, searching a file for a given piece of text is a far more elevated affair. It is based on the powerful concept of regular expressions, which with a little ingenuity and imagination can be made to do things that would otherwise be impossible without recourse to programming. Given the undoubted usefulness of regular expressions, it is surprising that they are only just beginning to appear in PC software.

At heart, a regular expression is simply a string of characters that you wish to search for. You might come across it in a text editor or database, where it would form the target for a Find command, or in a program like Grep which searches any number of files for a target expression, outputting either the matching lines, the non-matching lines, or a range. So would therefore be another way of searching for either soft or software.

Another Unix speciality is the character class, denoted by square brackets. These brackets can contain either a list of characters or a range. So would match any letter. A circumflex has the effect of negating the class:

`[^abc]`

would match "barn", "born", and "burn", while

`[^A-Za-z]`

would match any number and nothing else.

For example, the expression

```
Chapter[0-9]
```

would match the word "chapter" followed by anything except a digit.

More features of regular expressions are listed in the box. For really useful work, they can be combined in many interesting ways. For example, the expression

```
[0-9][0-9]S
```

would find any line containing a two-digit number and nothing else.

In Unix, regular expressions seem to crop up all the time. Their main application is in the Grep family of utilities, which can search files for a target expression, outputting either the matching lines, the non-matching lines, a count of the matching lines or just the names of the files. So far, very little of this has percolated down to the world of MS-DOS and the IBM PC. The best implementation I know of regular expressions on the PC is in a program called RPL, which is part of the Turbo Power Programmers' Utilities. It is available, priced at £85, from In Touch, Fairfield House, Brynhyfryd, Caerphilly, Mid-Glamorgan CF8 2QQ; telephone (0222) 882334.

Turbo Power is an extremely useful package. Although it is mainly aimed at Turbo Pascal programmers, many of its functions, including RPL, will appeal to a wider audience. No programming knowledge is needed to use them. It includes a powerful directory lister, a difference finder and a tool for automating operations across subdirectories. It also has a Pascal pretty printer, a structure analyser and an execution profiler.

RPL's implementation of regular expressions goes further than Unix's. The main differences are shown in the table below. Unlike Grep, it also allows for the replacement of expressions, or parts of them, by other expressions. To achieve this, you use braces to delimit the part of the expression that is to be replaced. This is called a tag, and you can have up to nine tags in one expression.

As a simple example, the expression

```
[Chapter\{(Section\}\}[0-9]-9\{0-9]\s
```

would find any line containing "chapter" or "section" as the first word, followed by one space and a digit. The word Chapter or Section is tagged, so it is eligible for substitution by whatever is specified in the replacement expression.

Each tag can have a corresponding replacement expression. The simplest consists of a Backslash followed by the tag number: this would cause only the tagged

---

**OPERATORS FOR REGULAR EXPRESSIONS**

<table>
<thead>
<tr>
<th>Unix</th>
<th>RPL</th>
</tr>
</thead>
<tbody>
<tr>
<td>\</td>
<td>Concatenation; no symbol. Matches two adjacent characters</td>
</tr>
<tr>
<td>#</td>
<td>Alternation. Matches term on either side</td>
</tr>
<tr>
<td>+</td>
<td>Closure. Matches 0 or more occurrences of preceding term</td>
</tr>
<tr>
<td>*</td>
<td>Matches any single character except Newline</td>
</tr>
<tr>
<td>?</td>
<td>Matches 0 or more occurrences of any character</td>
</tr>
<tr>
<td>+</td>
<td>Matches 1 or more occurrences of preceding term</td>
</tr>
<tr>
<td>?</td>
<td>Matches 0 or 1 occurrence of preceding term</td>
</tr>
<tr>
<td>$</td>
<td>Matches the start of a line</td>
</tr>
<tr>
<td>$</td>
<td>Matches the end of a line</td>
</tr>
<tr>
<td>[ ]</td>
<td>Delimits a character class</td>
</tr>
<tr>
<td>[ ]</td>
<td>Delimits a negative character class</td>
</tr>
<tr>
<td>\</td>
<td>Interprets next character literally</td>
</tr>
<tr>
<td>{ }</td>
<td>Delimits a tag; RPL only</td>
</tr>
<tr>
<td>\s</td>
<td>Matches a space; RPL only. Similarly, \t is Tab, \n is Newline, etc.</td>
</tr>
</tbody>
</table>
text to be output, all other characters in the selected lines being dropped. Another simple replacement expression is \z, which converts the tag to a null string, thus causing the specified text to be deleted.

However, RPL's regular expressions can get vastly more complicated than this. In fact, the system is sufficiently powerful to be regarded as a very concise special-purpose programming language. Programs in this language can be written as command-line parameters to the RPL interpreter, or they can be put into separate files. These files have the extension Pat. They are limited to 255 characters plus comments, but this is more than enough for the sort of applications for which RPL is intended.

A number of Pat files are included with the Turbo Power package, and some further examples are shown in the listing on this page. Without the help of the comments — which are by definition any text that appears after the first line of each file — it would be difficult for a casual reader to work out what they do. So it is worth taking a closer look at how they work.

Consider for example the following RPL program:

```plaintext
-m{[^ \s]+}[^ \s*=*\s]-\s-
```

The -m and -r commands introduce the regular expressions for matching and replacing respectively. The match expression works like this: start at the beginning of a line (-); match one or more instance of any character (?*); match exactly one instance of any non-space character ([^\s]); and match any or all spaces (\s*).

The result of all this is simply to select for output all lines except those that are empty or contain only spaces. However, the presence of the braces means that all the text in the selected lines, with the exception of any trailing spaces, is tagged. The replace string consists of the tagged text. You end up with a very short program for removing empty lines and trailing spaces from any text file.

It only remains to tell the program the names of its input and output files. RPL is a filter, so input and output are specified by I/O redirection. If the above program was held in a file named Strip.Pat, it would be run with a command something like:

```
rpl -f strip < oldfile > newfile
```

where the -f option indicates the name of the Pat file.

The snag with utilities like Grep and RPL is that they are batch-orientated. They are designed to work with entire files or sets of files, without user intervention. It would be much more useful if somebody would incorporate the concept of regular expressions in an interactive environment such as a word processor or database. Any offers?

---

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BY JACK SCHOFIELD

GOLD GROWS UP

AS TELECOM GOLD ATTRACTIONS MORE USERS IT IS ALSO ACQUIRING NEW SERVICES AND IMPROVED METHODS OF ACCESS

Five years old in April, and Telecom Gold is still growing fast, both in the number of users and the facilities it offers. When you read this, the number of UK users should be around 80,000 and the number on the Dialcom system worldwide will be over 250,000. Italy is now up and running, Finland has just signed up for the system, and Dialcom itself — the US-based parent company bought by British Telecom from ITT last year — has moved to a smart new corporate headquarters in Rockville, Maryland.

The many new users are probably less committed than the pioneers, and will need better documentation than those of us who started even two or three years ago. Help is here in a new booklet by Surya, called Electronic Mail — A Guide for Humans. New Info files are going up, and Telecom Gold is in the process of producing a series of small prompt cards which give guidelines on how to use the system. These cards are similar to those already issued for World Reporter and the Official Ailine Guide. Also, a new issue of the Dialcom software is having its last bugs fixed.

Among the new databases, Justis is now available from the Network for Law group, while for educational users there is a gateway to the Open University’s ECTIS from system 01, The Times Network Systems (TTNS). Last year TTNS was very successful with helping people find places in polytechnics via its PCAS admissions database; this year the universities will be joining in with UCCA data. In fact, the entire higher-education admissions procedure could be run via Telecom Gold.

Of course, there are still millions of people without electronic mailboxes. But they can still communicate with the in crowd, as long as they have access to a telex machine. The growth of this traffic was revealed in May when Monodata, Telecom Gold’s telex bureau, lifted a glass of champagne to celebrate the 500,000th telex.

The Comco system is based on a small card reader which you must insert between your micro and the modem, so you cannot use it with internal modems. Into this reader you insert the smart card, dial the number, hit a full stop and two Returns, and the system puts you straight through to your Telecom Gold computer.

The Bull CP-8 smart card has 4K of memory which holds the user’s codes, specifies the chosen network user address (NUA) and the language for prompts, etc, and carries credit for between 200 and 3,200 call charge units. One unit is 50 Swiss centimes — about 20 pence — which buys one connection or 100 seconds of connect time in Europe. The value of a card can be from about £40 to £640; cards can be reloaded, but must be renewed annually. Of course, you also have to pay the cost of the phone call to the nearest Comco node, which will ideally be a local one.

Comco is currently installing Pads in the phone systems of various national telecoms authorities. So far, it offers nodes in London, Paris, Geneva and Amsterdam. Pads are due imminently in Germany and Hong Kong, with Belgium, Australia, Norway, Canada and the US promised. Comco says a CCITT-standard Pad — that is, a European not a Bell-type American Pad — will be opened in the US this year. Once you have called a Comco Pad, your data is routed straight over the international X-25 packet-switched network to the address specified on the card.

There are obvious advantages to this system for European travellers. There is no need to go through the hassle of getting a temporary ID for the local data network, and you do not have to use a long-distance voice line to call London. There is no need to worry about money, as the card is pre-paid. You do not have to learn how to use unfamiliar networks, or try to follow prompts in a foreign language. You can use the same reader and card in several countries, and even if Comco does not have a Pad in the one you are in, there is probably one closer and cheaper than London.

Because all the network connections are made automatically, you can even send ham-fisted Luddites out with a portable micro and a Comco system, with every expectation that they will be able to log on to their mailbox. If problems do occur, there is on-line help available from a computer located at the head office in Switzerland.

There are also a few drawbacks. First you have to pay a fair amount up front: £295 for the reader and £52 for a basic card. Secondly, it really requires the use of a 300 baud acoustic coupler with your lap- portable, though this is probably the most realistic option anyway. Thirdly, each card will only call one NUA: so if I wanted to call one of the Guardian’s GUA boxes on Sys 79 as well as my own JNL box on Sys 83, I would have to get two cards to do it. Admittedly this is not likely to be a problem for most people; businesses tend to have multiple boxes on the same system.

Fourthly and last, the Comco card reader is yet another thing to carry around. As someone who is in frequent danger of tipping over sideways from the combined weight of lap-portable micro, coupler, tape, note-books, camera and lenses, etc., this is something I could do without. Ideally, the reader should be built into a lap-portable micro like the Tandy 102, also allowing you to use the built-in modem either directly or via acoustic cups. Of course, the major problem with ideal solutions is that no one ever wants to pay for them.

Comco’s UK agent is Ben Woolf, who is on Telecom Gold 81:BSD001; telephone 01-387 7792. You can also contact the Comco head office direct on Telecom Gold 84:TXTO47; telephone (010 41 21) 365105.

On the whole the Comco smart card system should be of value to regular travelers, or to businesses with less frequent travellers who can share an outfit. The system might also be used for access to databases — but see my article in the March issue for the problems involved. There are several databases I would like to use infrequently, without having to pay dozens of small bills in foreign currencies. But it ought to be possible to use a single pre-payment card like the Comco system — or something similar — to access several databases via a menu, with all the ID and prompt problems taken care of. Worth a thought?
### TOP 20 DESKTOP PUBLISHING SYSTEMS AT TOP 20 PRICES

**DTP COMPLETE SYSTEMS**

<table>
<thead>
<tr>
<th>Model</th>
<th>Retail Price</th>
<th>Our Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMSTRAD PC1512</td>
<td>3889</td>
<td>3258</td>
</tr>
<tr>
<td>10Mb Mono Computer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SENSRTONICS LASER PRINTER SOFTWARE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MACKINTOSH 512K COMPUTER LASER WRITER PRINTER PAGEMAKER SOFTWARE</td>
<td>7490</td>
<td>5995</td>
</tr>
<tr>
<td>IBM PCX/T compatible TURBO SYSTEM ADD ON CANON CX + 2MB LASER CARD 1.25Mb VENTURA SOFTWARE</td>
<td>3734</td>
<td>2864</td>
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<td>2195</td>
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<tr>
<td>CANON LBB-8 All</td>
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<tr>
<td>XEROX VENTURA IBM</td>
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<td>669</td>
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</table>

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A MAD, MAD SEMICONDUCTOR WORLD

JAPANESE MANUFACTURERS' ENTHUSIASM FOR PRODUCING THEIR OWN CHIPS COULD RESULT IN HEAVY U.S. TARIFFS THAT COULD SEVERELY AFFECT BOTH US AND UK COMPANIES.

Happy times have returned to Silicon Valley, according to Gordon Moore, Chairman of Intel, who has just reported the company's first quarterly profit since 1985. Yes, the roller-coaster fortunes of the semiconductor industry are about to go into boom mode again, following a three-year bust period which has been blamed largely on over-optimism about the world's appetite for personal computers.

The world, it seems, has now caught up with the optimistic forecasts of 1984, and has started to trade in its eight-bit micro-computers and first-generation PCs for the delights of high-resolution graphics, 32-bit processors and laser printers. The semiconductor industry's prime indicator of health is the so-called 'book-to-bill' ratio, which describes the trend in order intake compared with current shipments. It is now climbing well above unity, and those California smiles are gleaming again.

But hang on — what's this? A fair percentage of those new orders now pouring into US chip manufacturers are coming from — can this be true? — Japan. Japanese electronic-equipment manufacturers have suddenly become determined to buy all their semiconductors in the US instead of making their own, or buying only from other Japanese companies. It seems that these Japanese chips will play cricket if only we explain the rules. Now everybody is happy and fair play has triumphed once again. Perhaps they would buy some British chips if we asked them nicely.

But what innocents we are when it comes to world trade. The canny Japanese are, of course, bent on dominating world markets in as many commodities as possible: cars, watches, cameras, televisions, photocopiers, computers and semiconductors. Fair enough, there is no law against that. Unfortunately, a few local difficulties were caused when the US realised that its semiconductor-manufacturing industry was about to go down the tube.

The US semiconductor industry put pressure on the US government to do something and gave dire warnings of approaching military impotence if this vital US industry were allowed to fail. The Japanese were accused of dumping memory and microprocessor devices on the US market at prices which were well below cost. This was a justified accusation, but the situation could well have become self-correcting when the Japanese suppliers eventually grew tired of subsidising US equipment manufacturers.

A gung-ho response was called for, however, and the tough US negotiators eventually persuaded the Japanese government to prevail upon Japanese companies to raise their prices. One result of this was that Japanese semiconductor companies became more profitable and were assured of continued existence. Another was that the profits of US equipment manufacturers slumped as they became less competitive against cheaper, imported Japanese equipment.

The higher margins also made it economically viable for the Japanese to sell their cheaper chips to third parties, who could then sell them on to the US at a shade under the official rate, or build them into cheap equipment to sell there.

The agreement which triggered all this off, the US-Japanese Semiconductor Trade Pact, was signed in the summer of 1986 and has had a dismal failure. In January, for example, Japan's shipments of semiconductors were up by 46 percent compared with the previous year. Shipments to the US were up by only 11 percent — a modest increase — but sales to other Asian countries were up by a massive 114 percent. There are no prizes for guessing where most of those devices ended up.

In the US, equipment manufacturers are incensed. The agreement has effectively established a cartel, setting prices that are artificially higher than what the market would normally pay. Japanese companies are reaping windfall profits from US buyers and are still able to dump their surpluses on other countries. These equipment manufacturers may soon be forced to move their manufacturing operations to other countries, to take advantage of the cheap chips now denied them in the US. Unfortunately, the agreement did nothing to reduce the overproduction in Japan which is at the heart of the problem.

Clearly, gentlemanly agreements were not going to work and so dirty tricks were considered. You may remember the French managed to wring useful concessions from the Japanese when faced with a flood of Japanese video recorders. They simply instituted a regulation which required all video recorders, regardless of origin, to be imported through the single tiny customs establishment at Poitiers. For some unfathomable reason, they forgot to increase the customs staff at Poitiers, with the result that the influx of Japanese videos was reduced to a trickle.

No doubt the US rejected this ploy because their equipment manufacturers actually rely on being able to use Japanese chips. Drastic action was called for, however, and so the ultimate sanction of trade tariffs was invoked. If the Japanese do not mend their ways — by reducing manufacturing capacity and by starting to use more US chips, for example — then the US intends to impose $300 million of tariffs on Japanese electronic equipment — not chips — that it imports.

Shortly after the US announcement, the Japanese Ministry of International Trade and Industry (MITI) started to crack down on Japanese semiconductor manufacturers. MITI has set production quotas for Japanese plants, both in Japan and overseas, and has decreed that export licences are now required for all semiconductor shipments worth more than a few pounds. Finally, and perhaps most significantly, MITI has prevailed upon Japanese semiconductor users to buy all the devices they can from the US. Being a well-disciplined crowd, the equipment manufacturers have responded magnificently, placing huge orders with US chip suppliers, pushing up the book-to-bill ratio.

But I have a feeling that very few of those semiconductor orders now being placed with the US will ever result in actual sales. The idea is to show how willing Japan is to co-operate, so that anyone continuing to talk of tariffs is obviously a bit of a bad egg. Once the US relents, I would be surprised if those orders did not melt away.

But suppose the US sticks to its guns and does apply the tariffs? Already hundreds of US manufacturers who have come to rely on Japanese chips are feeling the pinch. Even the mighty Digital Equipment (DEC) has reported that it has a shortage of one-third of a million DRAM chips.

Protests are also likely from the the UK, where Japanese chip-fabrication plants have been established. The quotas applied by MITI apply to them too and I suppose layoffs might be the result. Texas Instruments has taken the fight to Japan's doorstep by building factories there, so it too will now be restricted by quotas, and it will no doubt be adding to the growing chorus of complaints against the US tariff action.

Encouraged by the strong US action, we Brits have now joined in with a spirited complaint about the discrimination against Cable and Wireless in the Japanese telecommunications market. Sanctions against Japanese banking interests have been threatened and the City is terrified of potential Japanese reprisals. It must be spring!
One good idea leads to another.
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*Screenshots are from the original Arcade game.
I am considering buying the colour version of the Amstrad PC-1512 with two floppy drives. I would like to know if the IBM full-size 10Mbyte fixed disc will fit into the machine, and if so whether the power supply will be adequate to operate it. I have written to Amstrad, but all I got in return was some glossy brochures.

S HOLDEN

A It is most unlikely that a standard full-height IBM drive will fit in the Amstrad 1512 computer since this machine was designed to have two half-height drives side by side. There should, however, be no difficulty in replacing one of the two half-height floppy drives with a half-height fixed disc. However, the prices for the Amstrad 1512 range are very competitive, and you will have a job to better them by putting together bits and pieces for yourself.

Q I use WordStar, where the cursor is a flashing block, on an Olivetti M-24, where the DOS cursor is a flashing underline. I would like to know how to change the WordStar cursor into a non-flashing reverse video or underline character. Could you help?

JEAN MILES

A Like most major applications programs, WordStar produces its own cursor, which may therefore be a different shape than that used by DOS. In WordStar version 3.4 the installation program has a menu called Other WordStar features. From here you can choose the Screen Graphics Characters option to change the cursor size, in effect allowing you to change the cursor from an underline to a solid block.

There is nothing in the on-line documentation that will turn off the blinking, nor do I know of any location or mnemonic to patch it to do so.

If you find the blinking cursor distracting, you can alter two time delays and change the rate at which it blinks.

Before changing these delays, make a backup copy of WordStar. Then run Install or Wininstall, and at the question "Are modifications complete?" type + to get to the cursor routine. Examine the contents stored at the location DEl1, which controls the short time delay used for the On portion of the cursor blink, and DEl2, which controls the medium time delay used for the Off part of the cursor blink cycle. Experiment with different values, and see if you like it better.

Q Through cleaning, the platen on my plotter has lost its electrostatic ability. Is there a paint or spray which will rejuvenate it, as a new one costs appreciably over £100?

T I TETLEY-JONES

A We assume your plotter uses an electrostatic charge to hold the paper firmly to the platen and thus stop the paper from sliding when the pens are moved. This is not the same as an electrostatic plotter, which uses electrostatic charges to direct ink on to the paper.

On plotters like yours the sheet of paper in effect forms one of the plates of a capacitor, the other plate being inside the plotter. When electrically charged, the plates of a capacitor attract each other and it is this attraction that holds the paper firmly on the platen so that it cannot slip. It is thus vital that the platen should be a good electrical insulator.

In your attempts to clean the platen, it is quite possible that you have left some of the cleaner behind, and have thus left the platen mildly conductive. If this is the case, you may be able to remedy it. Clean the platen again using a sponge and a weak solution of clear warm water and soap. Only rub gently, then rinse the platen thoroughly with clear water to remove the soap completely; a trace of soap may be sufficient to make it conductive.

Remove excess water and let it dry for a few hours. The platen should then hold the paper firmly. If this does not work the platen is probably useless, so you could progress to more desperate measures. Try spraying the platen with a non-conductive paint — that is, one which does not contain any metallic compounds like lead oxide, titanium dioxide or aluminium. A cellulose paint might just work.

Q I have WordStar version 3.30 which I use on a Sanyo MBC-555 with an Epson LX-80 printer. The underline toggle, ^PS, as it is set up only gives me an intermittent underline instead of a continuous one. I would therefore like to change the code which ^PS sends to the printer.

J B SPARROW

A The WordStar underline function ^PS only underlines words, not the spaces between them. The simplest way to obtain continuous underlining is to use the WordStar ^PS feature to turn underlining on and off and to type underline characters between the words.

WordStar does not send a control character or Escape character sequence to the printer when it finds ^PS in a file being printed. Instead it expands the line being printed by adding underline characters. Exactly how it does this depends on which printer the program has been installed for. WordStar executes ^PY — which is the Change Colour command — in a totally different manner. When the first ^PY is encountered, the Change to Red sequence is sent to the printer; the next ^PY causes the Change to Black sequence to be sent to the printer. WordStar can adapt this command so that it activates the Underline command that is built into Epson printers. Instead of the Change to Red sequence you should patch your copy of WordStar with

1Bhex 2Dhex 01hex to turn underlining on, and in place of the Change to Black sequence enter

1Dhex 2Dhex 00hex to turn it off again.

The ^PY command is then toggle underlining on and off.

You will find a wealth of information on patching WordStar for Epson printers in our article on page 117 of the March 1986 issue of Practical Computing.

In "Ask PC"

John and Timothy Lee answer questions on any area of serious microcomputing. If you have a nagging problem, write to us, marking "ASK PC" clearly on the top left-hand corner of the envelope. Letters should contain one question only. We cannot guarantee a personal reply, but to be considered your letter must include your name and address together with a stamped addressed envelope. Answers to the most representative questions of general interest will be published in these pages.
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For a limited period, the Atari 520 STM is even more of a knockout than usual. We’re offering it for just £449.95 (inc. VAT) complete with SF354 disk drive, SM125 mono monitor,* a mouse worth £24.95 and 1st Word, worth £49.95.

So as well as saving you from the enemy, the 520 STM will also save you £184. You’d better hurry though, because it won’t be long before our stocks are wiped out.

*Offer includes mono monitor. The 520STM plugs into a standard colour TV.
On speed alone this AT clone is up with the best, but will compatibility problems prove the downfall of them all?

Undaunted by IBM’s pre-emptive strike, the clone manufacturers continue with the flood of 80386-based AT compatibles. While British companies have been circumspect with their products, many of the US-based manufacturers see IBM’s divergence from the standard and the late delivery dates as an error they are ready to capitalise on.

The Zenith Z-386 was previewed at the Which Computer? Show in February. It became one of the stars of the show with a tour de force graphics display that was ably assisted by a Turbo-PGA card that Zenith had quietly slipped in. The very same machine was provided by Zenith for review, although sadly the Turbo-PGA had been removed. The review model was fitted with a 1.2 Mbyte floppy-disc drive and a 40Mbyte hard disc.

The machine comes in the hulking three-box format that we have become used to with the AT and its clones. However, the keyboard provided was of the old PC type, with 10 function keys and a combined cursor-control and numeric keypad. Zenith informed us that the production models will come equipped with the new enhanced keyboard, similar to the layout used with later versions of the AT and with the PS/2 range. The AT/E keyboard originally provided with the machine had managed to get broken on its travels.

The enhanced colour monitor provided with the review system will be an optional extra for purchasers. The monitor is unusual in having a switch on the front which allows you to select a white, amber or green display when working in monochrome mode. Although we can understand the reason behind this switch, we found it a bit pointless — and a positive disadvantage if you are using colour.

The front of the main system unit follows the standard AT design. On the left-hand side is a keyboard lock, along with LEDs indicating power and hard-disc activity. On the opposite side is a 1.2Mbyte 5.25in. floppy-disc drive. Adjacent to the floppy there is a plastic slot covering the housing for a second optional disc drive.

On the right-hand side of the machine there is a grille for the transformer fan, and round the back there are the I/O ports for 10 expansion slots. The keyboard socket is also on the back, as is the power input and an odd 80mm. by 95mm. removable plate. The people at Zenith’s UK arm say they have no idea what this panel might be used for, but hinted darkly at the number of machines that Zenith sells to the Pentagon. The military will doubtless be pleased at the robustness of the machine. Six screws have to be removed before you get inside — two on the back and two on each side.

When we finally got to the guts of the Z-386 it was noticeable how warm it had become in the hour or so we had been running it. The reason behind this was obvious when you took a close look at the architecture. Zenith has adopted a backplane construction, which means that almost all the components have to be installed on
IBM, have taken the opposite tack to Zenith. On their recent machines the I/O and other ports which were formerly housed in expansion slots are fitted to the motherboard. They thus consume less power, and the machines are consequently fitted with lower-power transformers.

The hard disc and floppy disc are both half-height devices. As an AT is half as high again as a PC, this should leave room for a possible six storage systems. Further examination of the inside of the Z-386 confirmed something else we suspected: the metal shield on the front of the outer casing limits you to the two drives in the front, plus hard discs. Most people will be quite happy with this arrangement, but there is a minority of power users who would like a hard disc, two floppy's and a tape streamer. This the Z-386 is unable to provide.

Most of the space inside the system box is occupied by the ten full-length expansion slots. There are two eight-bit slots, two 16-bit slots and six 32-bit slots. In common with those of most other 80386-based AT compatibles, the buses have been rigged to run at different speeds. Thus the eight-bit slots run at 4.777MHz with one wait state; the 16-bit slots run at 8MHz and the 32-bit slots at the full 16MHz, both with no wait states. The necessary duplex circuitry is built on to the motherboard.

Zenith, like other manufacturers, has developed its own architecture for the 32-bit slots. Now that it is apparent there is not going to be an IBM standard to follow, the various compatible manufacturers really ought to get together and set a standard 32-bit bus architecture. The likes of AST and Orchid are not going to want to produce a dozen different versions of the same board just to suit the compatible manufacturers. If they don't hang together on this one, IBM will hang them separately.

In the review machine, five slots were being used. A Paradise EGA card occupied one of the eight-bit slots and the disc controller board took up a 16-bit slot. Three 32-bit slots were used by daughter cards: the main processor card, a memory card containing 1Mbyte of RAM and an I/O card. The processor card held the 80386 CPU running at 16MHz along with assorted logic and support chips. On the finished models there will be an option to alter the clock speed between 16MHz, 8MHz and 4.777MHz by pressing the Ctrl, Alt and Enter keys. There are sockets for both 80387 and 80287 maths co-processors. An interface is also provided for a static-RAM cache memory — something between 32K and 96K will eventually be available.

The second 32-bit card inside the computer is a general-purpose I/O sub-system. It is equipped with the serial and parallel output ports on the outside of the machine as well as the DMA controller and two 32-bit slots. The 1Mbyte of RAM supplied as standard on the Z-386 is fitted on the final 32-bit card. Zenith has followed Compaq's lead in this respect and used static-column RAM to boost performance.

The wisdom of this decision is borne out by the Basic Benchmarks. The Z-386 breezed home in an average time of 1.86 seconds, putting it in second place behind the IBM Model 80 at 1.83 seconds and in front of the Compaq Deskpro 386 at 1.89. Incidentally, by the time you read this, the placings may have changed. Compaq is said to be somewhat miffed at being overtaken by IBM, and is rumoured to be tuning the Deskpro 386 so that it can regain pole position.

The Disc Benchmarks were almost as impressive. The hard disc came home in 32.4 seconds — once again slightly behind the IBM Model 80, but not much. The floppy-disc timing was a respectable 208 seconds. But despite the speed, it was apparent that there was something wrong with the disc setup. On power-up, the machine hung around for a couple of minutes before deciding to read the disc, and even then it came up with an error message. The computer seemed to think that there was an additional floppy-disc drive. We tried using Zenith's Setup and DSKSetup, but none of the facilities provided would persuade the computer to go straight to the hard disc. This fault seemed to have a follow-through effect on our software trials. When we attempted to load Sidekick, the computer continually generated a disc-read error. The same disc ran on a Deskpro 386 with no problem. On the other hand, Word — a program we had trouble with last month on the Kaypro 386 — booted with no problem. Lotus 1-2-3 worked in CGA mode, although attempting to generate a graph in EGA mode resulted in multi-coloured snow.

CONCLUSIONS

The Zenith Z-386 is a reasonably priced entrant in the power-user stakes. The backplane design requires more power than most machines, but a hefty power-supply unit is built in and we had no problems running the machine.

Along with the 80386 AT-compatible microprocessors, Zenith really ought to be formulating an agreed standard for the 32-bit bus.

The machine is very fast, although not quite as fast as the IBM Model 80. With the disc drives, although hopefully this problem will be fixed on the production machines.
IBM PS/2 MODEL 30
WHO NEEDS IT?
By Glyn Moody

It looks like one of the new IBM family, but beneath the skin this elegant and well-built machine is more like a high-performance upgrade of the original PC.

SPECIFICATION
CPU: 8086 running at 8MHz
RAM: 640K as standard
ROM: 64K BIOS and Basic
Mass storage: two 720K 3.5in. floppy-disc drives, or combination of one 720K floppy and one 20Mbyte hard disc
Keyboard: standard IBM layout with 12 function keys, separate cursor keys and numeric keypad
Display: MCGA resolution offering 630 x 480 pixels with two colours or two levels of grey; 320 x 200 pixels with 256 colours or 64 shades of grey; 80 x 25 characters in 16 colours or grey shades with eight- by 16-pixel character matrix
Software in price: Basic
Hardware expansion: optional 200Mbyte optical disc drive
Size: 406mm. (16in.) x 398mm. (15.6in.) by 101mm. (4in.)
Weight: 7.1kg
Price: £1,106 for twin-floppy Model 30-002; £1,559 for 20Mbyte hard-disc Model 30-021; keyboard £189, monitors from £201, DOS 3.3 £70, mouse £60
Manufacturer: made in the UK by IBM
UK supplier: IBM UK Ltd, National Enquiry Centre, 414 Chiswick High Road, London W4 5TF. Telephone: 01-995 7700
Available: now

Improved graphics, 3.5in. discs and a more stylish appearance set the PS/2 Model 30 apart from its predecessors.
The first thing which needs to be said about the initial release of the new IBM Personal System/2 series is that the Model 30 is not really part of that new generation. True, it uses 3.5in. discs and shares a similar casing, but it lacks the key elements of the Micro Channel and the new graphics standard. Furthermore, it will not be able to run the commercially crucial non-OS/2 operating system. In effect, the Model 30 is a repackaging of the basic PC. As such it provides some interesting insights into IBM’s approach to this new series.

Superficially, the differences between the new and old PCs are striking. The main system box has a low profile with rather more character to the styling of the front. The on-off switch is placed here for the first time, so you will no longer need to go scabbling around the side for it. On the right-hand side of the Model 30/021 hard-disc system we reviewed there was a lock that secures the system.

At the back there are again a number of obvious changes. On the left is the power cable and in the middle two new DIN sockets—one for the keyboard, the other for the optional Microsoft mouse. The new socket is different from the old keyboard connector, which means that you cannot transfer your old PC keyboard to the Model 30 without some messy surgery on the cable. The ports from any expansion cards that may be fitted now emerge horizontally rather than vertically, a change necessitated by the new slim-line approach. Underneath the expansion slots are the video output and the parallel port. The serial port is to the left. All these ports are now directly on the motherboard and are included as standard in the price; previously they were located on additional cards.

Unlike the earlier PC and AT, the Model 30 has a plastic casing with a metallised interior. The thought which has gone into the design is evident, even down to the way you remove the cover from the machine. Although IBM has not yet gone for what is probably the most sensible solution—hinged casing which tilts up—it has nonetheless improved on its earlier design. Where before you had to remove screws and pull the cover forwards and up, the Model 30 has four screws at the side of the machine which do not drop out and fall on the floor, but remain captive in the casing once it is open. A flimsy plastic brace is used to support it. Inserting expansion cards the proper way into this vertical card proved much harder than with the old design, and is likely to lead to frayed tempers.

The rest of the construction shows a more high-tech approach. Since much of the video and disc-controller circuitry is on the motherboard, the interior is blissfully free of connectors. The main 8086 chip is next to the power supply, along with an empty socket for the 8087 maths co-processor. The RAM chips are of the single in-line module variety; there is 640K of RAM as standard. Also noticeable are the large square custom chips dotted around the board, as well as the Inmos chip used for colour graphics. A couple of jumper leads were visible on the board.

In use the Model 30 comes across as a quality machine. The keyboard has a good feel—though not up to the original PC version in terms of robustness—and the machine can support graphics that make the old PC’s colours look sick. The Model 30 uses the Multicolour Graphics Array (MCGA), which IBM says works with most software written for the existing CGA. The fact that the new top-of-the-range Video Graphics Array (VGA) is not an option on the Model 30 is a further indication that this machine is not designed as an integral part of the PS/2 series. The display monitor on the review machine was the 9513, one of the four new models launched with the PS/2. It is not possible to use the older monitors with the Model 30. The new monitor has tilt and swivel as standard; the image is steady, and we experienced none of the annoying snow found with the older display adapter.

Running the Basic benchmarks, the machine turned in an acceptable 6.4 seconds; that makes it faster than an AT, and even faster than an Amstrad. The discs are similarly impressive; the hard disc gave a figure of 87 seconds and the floppy around 288 seconds. Compare this with 254 seconds and 742 seconds respectively for the original IBM PC and you can see the great strides IBM has made.

Prices for the Model 30 start at £1,106 excluding keyboard, monitor and DOS, positioning it well above the average clone. The advanced assembly techniques used on IBM’s automated production line means that unit costs are low, leaving considerable scope for dropping prices. This also means that clone makers will find it harder to copy the details of the Model 30—though quite why they would want to anyway is not clear. In fact, it is not really clear why exactly would want the machine for any purpose. Assuming the Model 50 arrives on time—and there is no reason to doubt that IBM will stick to its timetable—it is likely to become the standard PS/2 machine for business. It will be able to run most old DOS programs, plus the Eldorado of new OS/2 software once they come through. The Micro Channel will play host to all kinds of intelligent add-in cards that were inconceivable on the older PC or Model 30, and there will be the potential to boost colour graphics.

If it is straight DOS packages that you will be running, there are going to be some tremendous bargains in the PC and AT world in the coming months. Mainstream manufacturers will gradually discount on their lines as they introduce their own answers to PS/2. Meanwhile the clone makers will be forced to intensify their efforts to win market share in this increasingly competitive sector. Unlike the Compaq and Olivetti of this world, they do not have the resources to come up quickly with compatibles to the new series.

One likely explanation for the Model 30 is that it is designed to cater for the American education market. The pricing would be about right—though it would be too high for this country—and the combination of a neat unit with a speedy processor and available discs would be attractive. It could also serve as a terminal—though so could even cheaper PCs. For the general market the machine is something of a curiosity. To be sure, there is nothing wrong with it, but neither is there really enough right with it to justify buying it instead of the full-blown Personal System/2 which will follow in due course.

**CONCLUSIONS**

- **The Personal System/2 Model 30** is an 8086-based machine which shares many of the features with the others in the PS/2 family.
- **The optional Micro Channel and VGA option** and cannot use OS/2. As a result, it logically forms part of the PC family rather than the PS/2.
- **The Model 30 is fast**, both in terms of processing and disc; IBM’s sales and promotion techniques should mean that it is highly reliable too.
- **Given its mixed parentage**, it is hard to see who should buy it. Better to wait for the later PS/2 models or stick with straight PCs.
Epson makes virtually every other sort of printer and dominates the dot-matrix market, but this is its first laser.

The arrival of the GQ-3500 is an important event, as Epson dominates broad swathes of the printer market. It is Epson's first laser printer, and the inevitable high-profile Epson marketing campaign should generate a good deal of interest in this machine and laser printers in general. The GQ-3500 goes on sale immediately at a very competitive price of £1,795. This positions it at the bottom end of the laser market, in direct competition with top-end daisywheel and matrix printers.

The machine is very compact. At 35lb, it weighs just half as much as the typical first-generation laser printers such as the Canon A1 and the Hewlett-Packard Laserjet. It is also lighter and less bulky than the latest Hewlett-Packard machine, the 50lb Laserjet II. This difference is important; you can reasonably expect to get the Epson laser printer on to the same desk as an AT and still leave room for work, which is not the case with the first-generation machines.

Internally the GQ-3500 is based around a new laser engine from Ricoh. This engine is an exception; when you turn the machine on a faint starts up, but the hum is no louder than that from an AT. During actual printing it makes louder humming and whirring.

Apart from small size, the main advantage of using the Ricoh engine is that it is relatively economical in the consumables it uses. Running costs work out at 2.3p a page, not counting the paper itself, based on the toner and drum-life figures quoted by Epson.

The overall styling of the machine is good. The deeply sculpted top functions as a paper output tray. A second output tray folds down on the left-hand side of the machine. The one on top is used when you want the paper to emerge face down; this preserves the sequence of the pages in long documents. The tray on the side is for when you want the output face up, so you can read it as it comes out of the machine. I preferred to keep the machine as compact as possible by leaving the side tray folded up out of the way most of the time; if you never use it you could just remove it.

The paper input tray on the right-hand side of the machine holds about 150 sheets of A4 paper. If you need more, Epson will be offering a second input tray which will go underneath the machine. The price of this option has not been finalised, but it is known that this tray will hold 250 sheets.

You can use paper in various sizes down to around A5 in the standard input tray. Envelopes and transparency film are best fed in manually, one at a time.

One of the big advantages of laser printers compared to older types of machine is that they are very quiet. The GQ-3500 is no exception; when you turn the machine on a fan starts up, but the hum is no louder than that from an AT. During actual printing it makes louder humming and whirring.

With the auxiliary output tray not in use or removed, the GQ-3500 is exceptionally compact.
MEASURING SPEED

Speed figures from all printer manufacturers are apt to be misleading, and this is particularly the case with laser printers. The speed of a laser is usually quoted in pages per minute, but you are only ever likely to get near the quoted figure when printing repeat copies of the same page, or when running out very long documents. We therefore now put printers through our own tests.

The GQ-3500 is nominally rated at six pages per minute, but as expected it comes out slower on our test at slightly under four. For comparison, we found that the new HP Laserjet II, rated officially at eight pages a minute, came out at around five. Our standard text files are short: the sample letters and listings are each three pages long, the spreadsheet two. With longer documents you get a higher average speed. This review, for example, which is a 14-page document when printed double-spaced on A4, took us 2 minutes 35 seconds on the Epson machine, which corresponds to an average of 5.4 pages a minute.

With laser printers outputting text only, the speed is not affected much by how the printed page is laid out or how full the page is. With most other types of printer this factor has a major bearing on the speed, which is why we give separate figures for printing out different sorts of material. Most of the variation in the figures for the Epson laser can be attributed simply to the length of the documents, so they should not be taken too seriously.

Epson GQ-3500
This is Courier

Epson GQ-3500
This is Modern Proportional

Epson GQ-3500
This is EDP, a small fount good for drafts and spreadsheets

The three built-in founts. Printing is at 300 dots per inch, so output quality is well up to normal laser-printer standards.

All laser printers take a long time to do the first page of any document, however much text is on it. The GQ-3500 takes 23 seconds to print a page with a single A on it. This is actually quite quick by laser standards; the more expensive new HP Laserjet II only manages one second better.

As you increase the amount of text on the page, the time does not go up appreciably until you start printing images that incorporate graphics. Graphics always takes longer than text on a laser, and the speed chart reproduced here took 51 seconds. By installing the optional memory upgrade you would improve the quality of the image, but printing it out would take longer still.

<table>
<thead>
<tr>
<th>Speed in pages per minute with Practical Computing test data</th>
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<tbody>
<tr>
<td>Letters</td>
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This is EDP, a small fount good for drafts and spreadsheets.
With its new-found ability to accept expansion cards, the SE could help ease the Mac family out of the ghetto and into the wider world.

Since Apple launched the Macintosh in 1984 the machine has appeared in many guises. The original 128K Mac was joined by the 512K version, which in turn superseded by the Mac Plus. The Mac SE - the "SE" stands for System Expansion - is the latest upgrade. It differs from its predecessors in accepting expansion cards — although only one at a time — making this Mac open to the outside world.

The Mac SE looks very much like the Mac Plus. Give or take a few millimetres, it is the same height, depth and width. The brightness control knob is in the same place and it has the same 9in. monochrome screen. The casing is finished in a new off-white shade that Apple calls "Platinum", which makes the old-style Macs look grubby in comparison. Depending on what disc drive you have installed, the Mac SE may be a few pounds heavier than its predecessor.

The most obvious difference is that the SE has two disc drives instead of one. One 800K 3.5in. floppy drive comes as standard; the second drive can be either a second floppy drive or a 20Mbyte hard disc. When the upper position is taken up by a hard disc the slot is covered by a piece of plastic, complete with indicator light. If you want the internal hard disc and a second floppy drive as well you can buy the stand-alone 800K Apple 3.5 Drive.

More changes are apparent at the back of the machine. From left to right lie two Apple Desktop Bus connectors, an SCSI port, two RS-232 ports and a sound port. Above them lie an expansion connector, the power input socket and an On/Off switch. The expansion connector is covered by a piece of plastic when not in use. You flip it out to expose the Mac's innards to the outside world and feed through any internal expansion card cables. Above and to the right of the expansion connector lies the outlet to a fan — a new addition to the Mac — which is barely audible in a normal office.

You can connect both the mouse and the keyboard via the Desktop Bus connectors; alternatively you can Daisy-chain the mouse and keyboard via the Desktop Bus connectors; add a second floppy drive as well as your hard disc and a second floppy drive. The Apple SE has two disc drives instead of one. One 800K 3.5in. floppy drive comes as standard; the second drive can be either a second floppy drive or a 20Mbyte hard disc. When the upper position is taken up by a hard disc the slot is covered by a piece of plastic, complete with indicator light. If you want the internal hard disc and a second floppy drive as well you can buy the stand-alone 800K Apple 3.5 Drive.

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You can connect both the mouse and the keyboard via the Desktop Bus connectors; alternatively you can Daisy-chain the mouse to the keyboard. You can attach the mouse to either the left or the right connector, whichever is the more convenient. The mouse itself is lighter and flatter than the old Mac mouse. It also slopes slightly, making a more comfortable rest for your hand.

The keyboard has undergone a number of changes too. The basic model, the Standard Apple Keyboard, is like that found on the Apple II GS. An alternative keyboard, called the Extended Apple Keyboard, is available for those who want something more IBM-like. The Extended Keyboard resembles the now standard IBM layout, with 105 keys including 15 function keys — a new departure for the Mac and an indication of its move towards the IBM world — a cursor pad and a numeric pad. It costs £165.

The Standard Keyboard is flatter and wider than the unit provided with the Mac Plus. The keys have moved around as well. An Escape key is situated at the top left, while at the top right a Delete key has replaced Backspace. The Return key has not moved, but Shift now takes up the space of two keys. To the left of the space bar lie the Caps Lock, Option, Apple and Backslash keys. The Shift, Control and Tab keys are placed one above the other on the left of the keyboard. You can use the Apple key instead of the mouse to choose commands from the menu.

A large new key at the top of the keyboard is called the Reset key: at present it does nothing, though when the same keyboard is used with the Apple II GS it does reset the system. As with old-style Macs an optional programmer's switch clips on to the left side of the machine. One of its two buttons resets the machine while the other acts as an interrupt switch.

The Mac SE still runs a basic 68000 CPU at 8MHz, but Apple claims that its performance has been enhanced by around 10 percent to 25 percent over previous machines. Apple claims that this improvement arises from its use of gate arrays; 19 chips have been squeezed on to a single chip. The Mac SE seemed faster in operation than the Mac Plus, and our benchmark tests confirm this subjective impression. Benchmarking the Mac is an awkward task since there are no standard benchmark routines to run. We tested it out by timing how long it took to load and save a typical file, using the internal floppy and hard discs of the Mac Plus and the Mac SE.

When it came to running old Mac applications the SE did not exhibit any compatibility problems, and ran whatever we gave it. Packages we tried included MacWrite, Write Now, Reflex, Jazz and Just Text.

The most significant innovation on the Mac SE is its expansion slot. But while IBM machines are truly open to the user you have to get an Apple dealer to remove the casing of the machine and install an expansion card. This seems rather silly. Not only is it time-consuming to have to get someone else to do the job for you, it can also be expensive. You might have to pay around £35 an hour if you ask your dealer to install a card you have acquired from another source. Even if you are prepared to invalidate your war-
Above: A lot is packed into the limited space inside the SE.

Right: The 256Kbit RAMs can be replaced by larger chips to boost the memory.

Below: The Mac SE's motherboard.

...rarity by opening the case yourself, you may still run into problems. You need a long-handled screwdriver to cope with the Mac's unusual five-point star screws. If Apple really does want to let users expand the Mac and encourage third-party manufacturers to devise add-ons for it, the company really should make it easier for users to get inside and install their cards.

The inside of the Mac SE is more crowded even than the Mac Plus, with the new fan and hard disc all taking up scarce space. The hard disc is mounted above the floppy disc, and below that there is space for expansion-card cables. The motherboard lies right at the bottom of the machine.

On previous Macs the battery for the clock was accessible from outside the machine, but on the SE it is mounted on the motherboard. It is said to have a life expectancy of seven years. The Euro-DIN bus used by the expansion cards is accessed through a 3 x 32-pin connector and ties in directly to the full bus of the 68000. This allows add-ons to take full control of the machine or carry out functions independently of the main processor. The hard disc and floppy-disc drive plug straight into the motherboard. Expansion cards lie face-to-face with the motherboard.

Memory chips are mounted on cards which plug into single in-line memory module (SIMM) slots. There are four such slots which take little cards tilted at an angle to the motherboard; on the standard SE each card carries eight 256Kbit chips, making a total of 1Mbyte. Memory can be increased by swapping in new chips. Apple offers 1Mbyte cards, allowing memory to be upgraded to 4Mbyte.

There have been a number of alterations to the Mac's Finder, which has now progressed to version 5.4. An Access Privileges option is now available from the Apple menu to allow users of the Appleshare file-server software to regulate access to certain files and folders. The Get Info option gives additional details about where files and folders are, along with when they were created and last modified.

The Control Panel allows you to change the desk-top pattern, rate of cursor blinking, speaker volume and RAM cache just as on earlier Macs. In addition you can now use the Control Panel to change the menu blinking rate and date, and choose whether you want a 12-hour or 24-hour clock.

The Apple menu has a new option labelled Find File, which you use to find any folder or file on a disc. If you choose Find File, a box appears in which you key in the name or part of the name of the folder or file you are searching for. Matching names are displayed in turn; you click on any that you are interested in, and Find File displays information about when it was created, when it was last modified, its size and how to get to it.

The Chooser has also changed. You can now use it not only to select printers and modems, but also to indicate whether you have a network connected to Appletalk. If your network has zones, the Chooser lets you scan them for the devices they contain. The Special menu has an addition too in the form of Restart. This option ejects any inserted discs, saving any necessary information first, and then restarts the Mac SE.

Learning how to use the Mac SE is made reasonably painless by the clearly presented information in the manual, which includes helpful screen dumps throughout. The Guided Tour on the hard disc takes you in hand-holding fashion through the basics of using a mouse and pull-down menus. The System Tools application on the hard disc contains an Update folder, which gives details of late changes not included in the printed documentation. The manual comes with a booklet called the Macintosh Utilities User's Guide. It describes six utility programs, but only people well used to using a micro are likely to resort to them. They include Find File, Hard Disk Backup and Disk First Aid.

CONCLUSIONS

The Macintosh came of age as a business machine with the Mac Plus; the Mac SE is faster and more powerful and has more features of benefit to business users.

Those wanting to compare the worlds of IBM and Apple will have to wait for the Mac II to give Apple a fair showing.

Apple has made gestures towards opening up the Mac but access to the SE's single slot is too difficult for it to be called an open architecture. However, the Mac SE offers data compatibility with MS-DOS, as well as links to Ethernet and hence to Unix; this should widen its potential appeal.
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The ST 520 is a powerful computer that is perfect for those who need a lot of power and flexibility. It comes with a high-resolution graphics card, allowing you to create beautiful graphics and images. The ST 520 also supports a wide range of software packages, including word processing, spreadsheets, and databases, making it a versatile tool for both personal and business use.

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**ST 5205**

The ST 5205 is a powerful computer that is perfect for those who need a lot of power and flexibility. It comes with a high-resolution graphics card, allowing you to create beautiful graphics and images. The ST 5205 also supports a wide range of software packages, including word processing, spreadsheets, and databases, making it a versatile tool for both personal and business use.

**ST 5300**

The ST 5300 is a powerful computer that is perfect for those who need a lot of power and flexibility. It comes with a high-resolution graphics card, allowing you to create beautiful graphics and images. The ST 5300 also supports a wide range of software packages, including word processing, spreadsheets, and databases, making it a versatile tool for both personal and business use.

**ST 5305**

The ST 5305 is a powerful computer that is perfect for those who need a lot of power and flexibility. It comes with a high-resolution graphics card, allowing you to create beautiful graphics and images. The ST 5305 also supports a wide range of software packages, including word processing, spreadsheets, and databases, making it a versatile tool for both personal and business use.

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CLAM is available for most micros with PC/MS DOS version 2.0 or later. These include the IBM PC and all compatibles. CLAM costs £148 + VAT for a single user licence. Site and corporate licences are available. Existing MENUGEN users may upgrade to CLAM for £110 + VAT.

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CLAM may be purchased from MICROFT TECHNOLOGY LTD, The Old Powerhouse, Kew Gardens Station, Kew, Surrey TW9 3PS or from most dealers. To order or obtain further information telephone 01-948 8255.

MAIN FEATURES

1. All data held on a hard or floppy disk or a network can be kept secure from unauthorised access.
2. Security is by default and is failsafe. Once CLAM has been set up the user does not have to take any positive action to secure data.
3. Access to all activities can be controlled via user defined menus within CLAM.
4. Each user is given a user name and password. These determine which menu options the user will see and which files he or she may use. Each user needs to remember only one password.
5. Protected files are kept in a permanently encrypted form on the disk. Even if there is a power or hardware failure the data will never be readable by an unauthorised user.
6. The algorithm that encrypts all files and subdirectories uses the individual CLAM serial number in its key. One copy of CLAM cannot therefore access files or subdirectories encrypted by another copy.

THE DATA PROTECTOR

There are now over 10,000 users of Microsoft products worldwide.
When Aldus launched its desk-top publishing package on the Mac it had the field to itself, but the PC version is up against some stiff competition from more modern software.

Pagemaker appears within Windows, complete with menu and scroll bars.

Aldus coined the phrase "desk-top publishing" (DTP), and the combination of Aldus Pagemaker, the Macintosh and the Apple Laserwriter is what really created the DTP market. Since we reviewed the original version for the Mac back in January 1986, Aldus has gone on to sell 50,000 copies of Pagemaker worldwide and it is now considered to be the industry standard. The appearance of a PC version of the package is something many people have been waiting for, especially those reluctant to opt for DTP on a Mac.

The arrival of PC Pagemaker is important because of its exploitation of Microsoft Windows to provide a Mac-like user interface, and because Aldus probably hopes to repeat its success on the Mac in the PC market. Its use of Windows has become of even greater interest since the announcement of OS/2. Many people may be keen to look at the package, not just as an example of a DTP package, but also as an indication of the shape of things to come.

How Windows is displayed on your screen depends on how you have installed your system. If, like us, you have a run-time version of Pagemaker with Windows then you will only have access to those features included with Pagemaker. If you have a separate full version of Windows on your system you will be able to use all of its features. This means you will be able to run Pagemaker in one window and a different Windows application in another.

Documents can be displayed as a spread or at up to twice appearing size.

Selecting Open from the File menu calls up a listing of the current sub-directory.

Each Pagemaker window is divided into several areas. The System menu box lies at the top left corner of the screen, rather like the Apple menu on the Mac. To the right lies a title bar to show the name of the current file. Underneath lies the menu bar, which lists the names of the pull-down menus: File, Edit, Options, Page, Type, Lines and Shades. Scroll bars lying to the right and bottom of the screen allow you to scroll through a window or dialogue box. Finally, the size box to resize the window lives at the top right corner of the screen. The scroll bars can be removed to give you more room on-screen if you wish — something you cannot do on the Mac.

If you are used to using a Mac, the transition to Pagemaker and its use of windows is absolutely painless. The scroll bars work in the same way. You cut, paste and edit the same way. The menus pull down and pop back up once a selection is made, as they would on the Mac. An egg-timer icon, like the Mac’s watch icon, tells you to wait while operations are being performed. You click on your mouse in a similar fashion; you can use the keyboard if you wish, but this is not easy when using a DTP package.

When you read or save a file, Pagemaker displays a Mac-like dialogue box in which you can specify a file name. This is not as straightforward as on the Mac, where you can choose any name you like. The dialogue box contains a list of file names, drive icons and directories you can choose from, plus a blank text box where you can type in a file name acceptable to DOS. It is here that
Obviously in our version of Pagemaker we could not zoom and move windows around, but as it was the only application running under Windows this did not matter. We were unable to use the MS-DOS Executive window for the same reason. If you install Windows separately, you can carry out DOS commands such as copying and deleting files by choosing commands from one of the three MS-DOS Executive menus without having to close Pagemaker and return to the DOS prompt.

Worthy as Pagemaker's use of Windows may be, this alone is unlikely to sell many copies. Developers and users may be keen to see what Pagemaker looks like, as a raster to OS/2, but even then the version of Windows incorporated in Pagemaker is 1.3, not the new version. Aldus will, of course, have to win sales on its product's merits as a DTP package, and its performance in this area is rather disappointing.

One of the reasons Pagemaker became the industry standard is that it was there first. It took personal computers into a new area and allowed users to combine word-processed text and graphics in a form fit for publication. Things have moved on a long way since then, and despite the PC version of Pagemaker being a great improvement on the original Mac version, it seems run-of-the-mill compared to packages such as Xpress on the Mac and Ventura Publisher on the IBM PC. It is as though Aldus has spent personal computers into a new area and allowed users to combine word-processed text and graphics in a form fit for publication. Things have moved on a long way since then, and despite the PC version of Pagemaker being a great improvement on the original Mac version, it seems run-of-the-mill compared to packages such as Xpress on the Mac and Ventura Publisher on the IBM PC. It is as though Aldus has spent

**VERDICT**

- **Performance:**
  - Poor
  - Average
  - Good
  - Excellent

- **Ease of use:**
  - Poor
  - Average
  - Good
  - Excellent

- **Documentation:**
  - Poor
  - Average
  - Good
  - Excellent

- **Value for money:**
  - Poor
  - Average
  - Good
  - Excellent

- **Windows makes it easy to use, but already looking dated.**

VALUES

- **POOR**
- **AVERAGE**
- **GOOD**
- **EXCELLENT**

---

**SPECIFICATION**

**Description:** WYSIWYG page makeup program with built-in word processor and run-time version of Microsoft Windows

**Hardware required:** IBM PC/AT or compatible with at least 512K RAM, 10MB hard disc, IBM EGA or Hercules Graphics Card; Microsoft Windows compatible mouse; Postscript-compatible output device or printer supported by Microsoft Windows, such as HP Laserjet

**Copy protection:** master disc required to print

**Price:** £549

**Publisher:** Aldus of Seattle, WA

**UK supplier:** Aldus (UK), Craigrook Castle, Craigrook Road, Edinburgh EH4 3UH. Telephone: 031-336 1727

**Available:** now

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**SOFTWARE REVIEW**

Using the Options menu, you can include rulers, guides and column guides, and choose different corner shapes for boxes. By choosing preferences from the Edit menu you can select what unit of measurement you want to use: inches, millimetres, picas, points or ciceros. Column guides allow you to choose how many columns you want to a page and what gutter width you want.

You can view your page at actual size or at 50 percent, 75 percent or 200 percent of actual size. You change the size using the Page menu. You can also have your page or part of it in the window, which will give you a rough idea of what your final pages look like and can be used for entering large chunks of text. This option is, however, useless for detailed work, since it renders illegible anything except large headlines.

Files can be imported from Microsoft Word, Word, Word Perfect, Multimate, WordStar 3.3 and IBM Display Write 3. Graphics can be imported from the usual IBM paint-type programs and scanners as well as from Autocad and EPS-format files.

Icons representing pages appear at the bottom of the screen, with the current page highlighted. Two Windows Windows are labelled L and R. These are the master pages, which you can set up as grids for your other pages to follow. Anything you want repeated on every page - like running heads, logos and suchlike - you set up on the master page. However, you cannot apply global settings to items so that all headlines appear in a certain type size and style, as you can, for example, in Ventura Publisher. Automatic features like these are...
SOFTWARE REVIEW

(continued from previous page)

particularly useful when handling long documents.

You can insert and remove pages using the Page menu. Pagemaker will renumber pages as necessary, and reposition text and graphics to accommodate differences between the inside and outside margins where appropriate. But Pagemaker does not generate continuation lines automatically, nor does it have the facility to generate an index or table of contents. Pagemaker is page-oriented and is not as suited to handling long, heavily formatted documents as some of the more sophisticated word processors like Lotus Manuscript, or DTP packages like Ventura Publisher.

Compared with other packages, Pagemaker seems to require more layout work on the part of the user and does less work for you automatically. For example, when you import text using the Place command, a text icon appears, which you position where you want. The text flows into the column, stopping when it ends or, if it is a long file, at the bottom of the column. If the text does spill over the bottom of the column, a line appears at either end of the text, with a tab at each end. The bottom tab will have a + sign indicating there is more to come. This is like the original Pagemaker, to get the text to flow into the next column you have to click on the tab so that the text icon re-appears. You move it to the point where you want the text to continue from and enter it again. The whole procedure accurately mimics the real-life paste-up operation, but we have been spoilt by DTP packages which allow text to flow automatically from one column to the next, wrapping round graphics as it does. Pagemaker seems pretty laborious by comparison.

Wrapping text around graphics also proves to be a chore. Just as a paste-up artist would pick up a scalpel and cut up every line to fit it around an awkward shape, so in Pagemaker you have to hit Return at the end of a line to stop it from running over a graphic. Not only would doing this automatically save time, it would also produce a tidier result, as the program could be set to leave the same amount of space between text and graphics all the way round.

WORD PROCESSING

Pagemaker's word-processing capability is fairly rudimentary. There is no search and replace, though there is a 100,000-word dictionary. Doing headlines, in particular, proved tiresome. I could not make a text box to span two columns, but instead had to type out the headline on the pasteboard area surrounding the page and select that text block, using the pointer tool. I then had to drag a corner handle of the text block until the headline was the width I wanted, and place it in the position required.

Obviously, by the time pages are being laid out, most of the word processing has already been done elsewhere and the files imported are in a fairly finished form. Nevertheless, headlines are a major part of most publications and I did not expect to have to go to the Advanced Techniques part of the user manual to find out how to do two-column headlines.

The manual itself was adequate, but as with all large packages, finding your way around the documentation can prove difficult. There are numerous cross references to other parts of the manual, and in this case to the Microsoft Windows User's Guide too.

CONCLUSIONS

Pagemaker is still a reliable DTP package, which, thanks to its use of Windows, is easy to use. Unfortunately for Pagemaker the DTP market has matured a lot over the past 18 months, which makes some of its features appear clumsy.

It does not handle long documents as well as some of its rivals on the IBM PC; sophisticated word processors such as Lotus Manuscript and Write Now will force it towards requiring more sophisticated features, which DTP packages like Xpress on the Mac already have.

Pagemaker may have the edge over some of its rivals in the OS/2 packages race because of its implementation of Windows, but it will have to maintain its lead by adding more features and improving its handling of long documents.

Aldus may succeed in pushing Pagemaker to the top of the pile because of the strength of its reputation and its alliances with other manufacturers. Aldus and Microsoft have a joint dealer-training scheme in the UK, while Applecotic is offering a ready-to-go Pagemaker-based system. Pagemaker could yet become the Lotus 1-2-3 of the DTP world.
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**30mb Hard Disk**

- **FilmQ**
  - M24 Base Unit
  - 30mb Hard Disk
Compsoft's general-purpose graphing package is looking for a niche between the complex heavyweights and the ultra-cheap small-business programs.

Mid-priced presentation-graphics programs are thin on the ground, as activity in the genre has traditionally been concentrated at the two extremes, rather than in the middle. At the top end are the advanced, high-performance packages such as Harvard Presentation Graphics and VCN Concorde. Programs like Gem Graph, at the bottom end of the range, are intended mainly for the small-business user who occasionally wants to knock up a simple presentation chart. In between there is an obvious niche for a modestly priced program which can nevertheless produce a wide and varied selection of graphs and charts. Microchart Plus claims to be just such a package.

Most presentation-graphics packages have a formidable installation menu offering any number of display types, printers and plotters. We were therefore surprised to discover that Microchart Plus supports only a modest selection of displays and output devices. The display menu, for example, only offers IBM monochrome graphics, CGA and Hercules graphics. There is no mention of EGA mode.

The manual does refer to the EGA card, but suggests that owners might install the card to display monochrome graphics, as this offers a better resolution. In this case, the manual is absolutely right; including colour reduces the resolution drastically, and makes all but the largest text annotations unreadable.

We encountered a similar problem with printer installation. Laser printers, with their capability for high-resolution graphics, generally produce the best presentation documents. We therefore intended to install a Mannesmann-Tally 910 laser printer for use with the package, but unfortunately Microchart Plus has no drivers for any laser printers at all. It simply provides you with a list of fairly standard dot-matrix machines. We ended up installing our laser printer as though it were an Epson FX dot-matrix, which seemed a bit of a waste.

The selection of plotters supported by the package is more generous, covering a variety of Hewlett-Packard and other systems. When we spoke to Compsoft, Microchart's distributor, we were told that the company was aware of the deficiencies in the display and printer drivers. Compsoft says it is working on a driver for the EGA and is considering including laser-printer drivers.

The program is run from a series of menus and function keys. I found the various methods of moving the cursor around the screen confusing. The machine used for the review was fitted with the new-style AT keyboard with a numeric keypad and separate cursor cluster; sometimes the program responded to the cursor cluster and sometimes it would only accept input from the numeric keypad.

Life is made even more complicated because in some of the sub-menus you must move the cursor by pressing the space bar, while a cursor within a data chart can be moved only by means of the shifted numeric keys, and in another instance the Tab key is used to move the cursor to the left. It was only after some practice that we got the hang of when to use which combination. The program accelerates training in this regard by the Pavlovian method of issuing a loud beep every time you hit the wrong key; it is very effective and you soon learn. Meanwhile we found ourselves wishing that Microchart supported a mouse.

From the main menu you can load both datasets, set the parameters for the two files and specify the graph type. We were loaded in Graph mode, rather than having to call another command first, but the programmers in their wisdom decided against it.

At the bottom of the Graph screen is another grid, known as the Dataset. It is here that you select your options for the finished graph. You name each series in the Dataset key column, and in this menu you move from one row to the next by pressing Return. In addition to the Dataset key, each column has a default value which appears after each Return. The type of Graph chosen is displayed alongside the Dataset key. Possible types include all the usual formats such as scatter, pie, bar and line charts.

Other columns available from the Dataset menu allow the user to set the parameters for
The Dataset screen overlaid on a table of raw data.

Setting up titles for one of the active frames.

Changes with the minimum of fuss.

example, once a row of settings has been
displayed directly. Whizzing around the spreadsheet
using the arrow keys on the numeric keypad
columns you can mark a block of data by
in the From and To columns of the work-
enough, the main title of each graph is not
for each frame can be assigned a label or title
further using a series of pull-down menus.
the same menus are also available from the
Data screen. As well as graph-editing
functions they contain general functions,
such as the facility to retrieve furthur charts
and data from disc and return to the data
The H-Axis menu sets the horizontal axis
of the chart to record calendner months or
plain numbers; it can also be left blank.
Using the Scales menu allows you to set a
pre-defined limit on the size of the chart, or
leave it to be set automatically by the
computer. The horizontal and vertical axes
for each frame can be assigned a label or title
in a sub-menu on the Data screen. Strangely
enough, the main title of each graph is not
set under this menu but under the Notes
menu that is to be found further along the
top bar.

It is the Format menu which has the most
direct bearing on the chart, as it contains a
large number of commands that alter the
basic chart defaults and generally prettify the
graph. From this menu you can set the
tyles of the graph — for example, by
altering which kind of pattern is used to fill
the bars and pies. As is common with this
kind of presentation-graphics program, a
separate side menu shows examples of the
various kinds of pattern that are available.
An arrow superimposed on this menu can be
moved around using the cursor keys to select
the pattern you want. Once again we wished
we had a mouse when using this facility.

The size of the text is also selected from
the format menu. You scroll through a
selection of sample type that is displayed in
different sizes. We would have preferred to
have been given a selection of point sizes, as
this would have provided a more precise
guide. You make a separate selection from
the format menu for the four sizes used for
the Dataset labels, titles, notes, etc. Sub-
menus are also available to allow you to set
the text in italics and to choose standard or
bold styles for the lettering.

Microchart Plus appears not to have its
own built-in print utility; instead it simply
dumps the contents of the screen to the
printer. Together with the lack of proper
EGA support, this means that the resolution
of its graphs is poor. As the prime purpose
of a presentation-graphics package is to pro-
vide attractive illustrations of data, this is a
serious defect. Even at maximum resolution
the text is rough and jagged, and any
attempt to jazz up the chart suffers because
of it.

CONCLUSIONS

Microchart Plus is a mid-range presentation-
grahics program aimed at the small to
medium-sized business.

The program lacks a number of installation
options that it should be possible to take for
granted in a modern piece of software. The
lack of support for up-to-date display formats
affects the final result badly.

The program has a confusing number of
ways of moving a cursor around the screen.
On the new-style AT keyboard the package
seems to have problems with its cursor-control
functions.

While the package offers a wide range of
options for creating different styles of graph,
these features are vitiated by the poor quality
of the final output, which is simply too rough to
be acceptable in a modern presentation-
grahics program.
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WORDSTAR PROFESSIONAL 4.0
OLD-TIMER

By Susan Curran

Unlike its other recent packages, Micropro's latest release retains the character that users of the original WordStar have learned to love - or hate.

Only two or three years ago WordStar was indisputably the leading business word processor, with a massive installed user base and a high reputation. In those days it looked virtually unassailable - too well entrenched ever to be replaced by different programs. Now things are different. Micropro has been proved wrong in believing that established WordStar users would graduate automatically to its newer and quite different programs, WordStar 2000 and Easy.

While the original WordStar languished without a real update for years, Microsoft Word, Word Perfect, Multimate and several other programs all forged ahead. And rightly so: the newcomers are more powerful and easier to use. By last year, only the ignorant, or existing WordStar users too scared to tackle learning a second program, were buying WordStar.

Now Micropro has changed tack and produced WordStar 4.0, which is a proper update of the real WordStar. It includes several features that have been lifted straight from New Word, the WordStar clone which Micropro recently bought. There are also a number of other new features designed to bring the program back into serious contention for the top spot in the word-processor market.

The Professional version of WordStar 4.0 includes mail-merging and a combined spelling checker and thesaurus. It comes on six unprotected floppy discs, including tutorial and instructions on how to use them, with a newly written manual. WordStar manuals were once a byword for unreadability, and though they have improved over the years this one is still barely up to par. The text is clear enough, but the layout is cramped and it is not easy to find topics quickly. It is spiral bound with soft covers and does not look particularly durable.

Like the versions which have gone before, the new WordStar powers-up with a main menu and disc directory. The rather scrappy layout is unchanged: the directory, though alphabetical, does not give dates of file creation, let alone any more expansive details. Also, you have to type the name of a file in full in order to access, copy or delete it. In no way does this rate as a proper file-management facility. The main menu is not accessible while a document is being edited - though many features on it are - and you have to save a document and exit from it before printing any or all of it.

The editing screen has the familiar help menu at the top; they can be suppressed, or called up only when required. There is also full in-context help on a range of commands. Certain commands are available from the function keys, and you can reassign function keys from their defaults if you wish. A function-key menu at the bottom of the screen lists two alternate functions for each key. This menu can be suppressed, but only through the installation program. When both of the menus are on-screen - as they are by default - no less than 13 lines of the screen are taken up by system information, leaving only 11 lines for the text window. There is also a column of code symbols down the side of the screen. Some permanent on-screen help is reasonable enough, but does anybody really want this much?

As before, WordStar defaults to reproducing all printer-control key sequences on-screen; for example, underlining is marked by a 'S before and after the text, as well as by proper underlining on-screen. You can suppress the control codes to view the final layout, but when the codes are unsuppressed they do clutter the screen, as do the dot commands that define many aspects of document layout. WordStar is still far from a clean-screen program.

Margins can now be amended by dot commands that become part of the text file. Thus

.LM 10
sets the left margin at column 10. As an alternative you can use Control-O menu commands, which change the current ruler settings but leave no other trace in the file.

There is even a third method of changing format, lifted from New Word, in which you embed ruler lines in the text. This option alone would have been reasonably satisfactory, but giving users three choices - which work quite differently from each other and in ways which interact awkwardly - invites confusion for old and new users.

(continued on page 69)
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WordStar powers-up with the opening menu (left). The default editing screen (right) displays function-key assignments along with old-style help information.

**WORDSTAR PROFESSIONAL 4.0**

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Though much improved, still recognisably WordStar.

WordStar is a whole era behind Microsoft, and its start-up is slow, even for committed WordStar users. Though much improved, still recognizable as WordStar.

Conclusions

WordStar 4.0 is a very real advance on version 3.3, and for committed WordStar users it could be worth buying.

The basic WordStar concepts are now outdated, and at times this version’s updated functions sit awkwardly with their original equivalents. As a result, the program is not easy to learn.

There is still no windowing and no dual-document capability, and a few holes remain in the command structure. There is also very little support for advanced hardware.

Though adequate, WordStar Professional 4.0 is not an outstanding program by top-level standards.
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RAPID FILE
OFF-THE-PEG DATABASE

By Mike Lewis

While dBase is still the standard full-blown database package, Ashton-Tate is complementing it with a ready-to-go filing program more suitable for the occasional user.

Ashton-Tate's Rapid File is a filing program that manages to avoid the complexities of a full database system, while still providing something beyond a simplistic cardbox-type package. It deals strictly with one file at a time, and is aimed squarely at the new or occasional user. However, it has enough power to cope with some fairly demanding applications. It is also very neatly packaged, with an unusually good user interface.

Its most striking feature is that it looks more like a spreadsheet than a database. It works by holding data in the form of a table, with rows corresponding to records and columns corresponding to fields. Setting up a file is simply a matter of typing new column headings. To add a new record you just enter data in the next free row.

Rapid File's designers clearly understand that the spreadsheet concept is easily learned, and have borrowed a lot of ideas from this area. Thus you can move a pointer from cell to cell, change column widths and formats, enter formulae into cells and so on.

In fact you can go further by making Rapid File closely mimic the user interface of Lotus 1-2-3. By default, Rapid File's operations are controlled by pull-down menus. But they can be replaced by a Lotus-style top-line menu in which many of the commands are identical to those of 1-2-3. For example, 'FR will retrieve a file in both packages. Even the function keys are similar, with f2, for instance, being used to edit a cell.

One implication of this is that fields do not have to be of fixed length. The amount of data visible at any time depends on the width of its column, which can be altered at will. The actual entry and editing of data is carried out in a window at the foot of the screen. The result is a more efficient use of disc space, especially where the contents of fields are highly variable.

By the same token, fields do not need to have rigid data types. You can specify that a column is to contain text, numbers or dates, but this is an aid to formatting rather than a way of controlling the file's contents. There is nothing stopping you entering, say, the word "nil" in an otherwise numeric field.

Formatting options include the usual currency or accounting styles for numeric data, and European or American for dates. A less common feature, which could be useful for displaying long blocks of text, is the ability to alter the height of a cell as well as its width. None of these formatting options actually modifies the data, only the way the user views it.

As well as the various ways of changing the appearance of data, Rapid File provides a number of options for sorting and selection. You can sort the file simply by entering the sort keys in a special form, called from the menu. The file can be sorted on any number of fields, in any combination of ascending and descending.

Similarly, you can apply selection criteria to the file. Again, this is done by entering the details in a form. When you return to the main table, the up and down arrow keys move the cell pointer only to the selected records. More usefully, you can hide all non-selected records, or perform global changes and deletions on the selected ones.

Alternatively, you can manually tag any record by moving the pointer to the record and pressing f5. This is useful where the user knows which records are to be selected but cannot easily express the reasons for the selection as formal criteria.

One of Rapid File's strongest features is its reporting. There are three ways of producing reports. The easiest is a straight listing of the table, invoked directly from the print menu. Even this simple printout can be customised to a large extent, since it always reflects the current layout, including format settings, column widths and selection criteria.

The second report format is the quick report. This requires a little more effort, since the layout has to be specified in some detail. It is essentially a columnar listing, with optional totalling and subtotalling on groups of records.

Finally, there is the custom report, which is similar in concept but gives much greater flexibility in the arrangement of fields and text. Further customisation is possible via an option menu, which is used to specify margins, titles, headers, footers, page

(continued on next page)
SOFTWARE REVIEW

lengths, and spacing between records. It can also send Escape sequences prior to printing. Once set, these options apply to all three types of report.

However, there is more to Rapid File's reporting than just producing printouts. When you design a quick or custom report you are not merely working with an abstract layout, but rather with an instance of an actual report, based on the current values in the file. You can browse through the design and alter the underlying values. The important point is that such changes are reflected in the original file. This means that reports can be used to provide different ways of viewing and working with a file. It is this which gives Rapid File much of its power.

You can take this idea a step further by combining data with a text file which has been created with Rapid File's memo writer. The memo writer is a reasonably serviceable word processor that has two specific uses within Rapid File. One of them is to stretch an ordinary cell beyond its usual limit of 254 characters. If you press F4 while you are editing a cell, Rapid File moves its contents to a text file and invokes the memo writer. You can now enter further text, to a limit of 64K. When you leave the memo writer the file is linked to the original cell. It is a bit like the memo field in dBase III, except that here the memos are used as and when needed, rather than for all instances of a given field.

The memo writer's other use is to create mail-merge documents. This involves inserting variable fields into fixed text. As with the reporting functions, you work with the actual data from the currently selected records. You can create a stack of, say, personalised letters, then flip through them on the screen, adjusting the contents of individual letters prior to printing. Very few WP or mail-merge packages give this degree of fine tuning. The memo writer can also be invoked directly from the DOS prompt and used independently of the main filing system.

Rapid File supports keyboard macros, import and export, and extensive customisation. You can transfer files to and from dBase, 1-2-3 and the PFS family, and from several other packages via the comma-delimited format. The customiser allows you to alter the appearance and colours of the screen, the initial memo writer settings, the printer defaults and quite a lot more.

CONCLUSIONS

Rapid File is a filing system of medium complexity. It sits about halfway between the simple flat filers and the heavyweight databases. It should meet the filing and reporting needs of all but the most demanding user. The user interface is especially good. A first-time user should have little difficulty getting to grips with this program.

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<thead>
<tr>
<th>Program</th>
<th>Price</th>
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<tr>
<td>Cash Trader</td>
<td>99.95</td>
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<tr>
<td>Cash Trader with Analysers</td>
<td>149.95</td>
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<td>Evaluation Cash Trader</td>
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<td>QBC Combined Business Pack</td>
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<td>Evaluation QBC Suite</td>
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<td>Shoebox</td>
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<td>Cashier - Evaluation Copy</td>
<td>49.95</td>
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Securing the Supply Lines

Without a regular supply of paper, discs and ribbons your precious computer system will grind to a halt. Carol Hammond looks at the best purchasing strategies.

Consumables are important. They are important to users because they are the life blood that keeps a micro productive; without a reliable source of readily available supplies a business could be paralysed. The floppy discs, ribbons, paper and other paraphernalia that feed your micro are important to manufacturers and dealers too; for them, consumables help to maintain loyalty and contact with customers. As hardware prices fall, so consumables become more important as an additional source of revenue, and micro-computer supplies are certainly big business.

Market-research company Frost & Sullivan estimates that in the US small companies spend $5,000 per annum on micro supplies, and medium-size companies spend $10,000 to $50,000. Large companies usually have a contract with a supplier for all their computer supplies.

The Practical Computing readers we contacted told us that the main criteria they use to judge consumables are price, reliability and availability. These factors in turn determined where they bought their supplies. We found that people are less likely to shop for supplies with their dealer or a manufacturer. This is largely because dealers and manufacturers do not generally stock a wide range of supplies at competitive prices; if they stock consumables at all they do so more as a service to the customer than as part of a money-making business.

Some users favour mail-order suppliers like Inmac because they offer a good delivery service. You can typically order goods by telephone, fax, telex, post or in person; your order can then be delivered as early as the next morning, or within a few days by parcel post. Inmac offers a computer-rescue service, where it will guarantee to deliver supplies within hours. Such a service obviously bumps up the price. Bulk purchasers may be able to negotiate a price for large quantities, or take out an annual supplies agreement. A yearly agreement can be to purchase a certain number of supplies or spend a specified sum to receive a discount in return.

Most people we spoke to opted for computer-supplies specialists and office-equipment suppliers for most of their requirements. When it comes to paper, some go direct to the traditional paper merchants, while others got listing paper through another department within their company which used mainframes and was obviously able to get a bulk deal.

Office-equipment suppliers are a popular option, since users can purchase all their supplies from one source. The readers we spoke to tended to go to different suppliers for different products in order to get a good price. It pays to shop around: the prices you pay and the service you get vary enormously. According to market-research company Romtec, computer consumables can be 15 percent cheaper from office-equipment dealers than from microcomputer dealers.

Floppy-disc prices in particular tend to vary dramatically. Romtec claims that discounts can be as much as 20 percent on purchases of five or more boxes. The people we spoke to confirmed this: some were able to get floppies discounted by as much as 25 percent and would try to get a further reduction. If you are offered a lower price than that quoted by your usual supplier it is certainly worth going back to see if you can strike a deal. This approach is quite likely to succeed since many suppliers use direct telephone sales to develop their business. You may also find it worthwhile to ring round a selection of suppliers every few months for a quote. The bigger and more regular your order, the more power you wield.

Some suppliers, especially smaller ones, may prefer to have less business and a higher profit margin rather than more business and low profit margins, and so will not cut prices. To make up for hefty price-cutting most suppliers will have to cut services elsewhere — say on delivery times or the variety of products stocked. You may be able to strike a deal which does not involve the supplier slashing prices. One reader we spoke to does not get a discount on floppy discs, but the supplier puts the company's logo on them free of charge, which looks good and reduces the chances of pilfering.

Price is important, but a reliable supplier may be worth sticking to even if you can buy more cheaply elsewhere. You should take into account how convenient it is to order from and pay your supplier too. For example, one reader we spoke to sticks with his existing supplier partly because of an established fax system. Transactions are...
simple and speedy because invoices and quotations can be signed and faxed across without delay.

A reliable delivery service may be of particular importance for certain commodities. Listing paper takes up a lot of room, and if storage space is limited you may want to keep stocks low and rely instead on frequent deliveries. On the other hand, printer ribbons take up little room and do not have to be frequently replaced, so here you can afford to be more finicky over their price.

Floppy discs are an area in which we found readers tended to opt for quality rather than price. Clearly, the more data you put on to disc, and the more important that data is, the more valuable your disc becomes. With a megabyte of data and more now routinely stored on a single disc, users are primarily concerned that the discs they use are reliable. Discs with reinforced hubs resist wear and tear; discs coated with lubricants are less susceptible to friction from drive heads and pressure pads; discs made from high-grade plastics are able to withstand sudden changes in temperature or humidity without distortion, and are flexible enough not to become brittle and flake.

We found that buyers are able to negotiate a price for floppy discs. At present it is estimated that there is 30 percent worldwide excess of production capacity for floppy discs. Manufacturers have to double their capacity just to maintain their position as capacity is more in line with demand. It is estimated that the price-cutting and free-offers war is set to continue until the weaker manufacturers are pushed out and manufacturing capacity is more in line with demand. The type of software and hardware used affects paper and printer supplies too. Market research done in the US leads Frost & Sullivan to predict that non-impact models will continue to increase, but those that remain are likely to be more standardised and faster. But Frost & Sullivan sees printer-element sales increasing as more people use micros and their attached printers, and as the printers themselves are worked more intensively.

Frost & Sullivan foresees that plain paper will show a strong growth in sales to account for 99 percent of paper sales by 1990, with a tendency towards cut sheets rather than continuous stationery. Although plain-paper printers cost more than thermal printers, plain paper works out cheaper than the treated paper required in thermal printers, so the overall purchase and operating cost is near that of thermal printers. Thermal paper also tends to smudge easily and show fingerprints when handled, and it becomes brittle with age.

When it comes to choosing paper there is little to differentiate one brand from the next; there are only refinements according to people’s taste. Some people prefer fanfold paper with a clean tear-off edge for high-quality work, bespoke multi-part forms for special jobs, and so on. The users we spoke to felt that the main consideration when choosing paper was that it did not curl or wrinkle and cause a jam. This depends on the moisture content of the paper, and is therefore as much a result of where the paper is kept as anything else.

One thing emerges clearly: consumables are a buyer’s market, and the market research figures indicate that this will continue. Obviously, as technology advances and sophisticated products like optical discs become the order of the day, prices will increase. But at present, standard items look set to fall in price — and long may it continue.
**Chip Wars**

Steve Malone analyses what the US-Japan trade dispute will mean for micro users.

Worldwide concern is being expressed over the imposition of tariffs by the United States against a range of goods coming from Japan. A host of economic Cassandras are predicting the imminent collapse of the global trading system — and there is no doubt that the American moves have serious implications for the world economy.

But what will this do to the industry most directly affected by the measures — the computer business? The components at the centre of the dispute are 256K DRAMs and EPROMs, and these devices are central to the development and manufacture of almost every part of a modern computer system.

The dispute began last autumn, when US trade officials met with their Japanese counterparts to discuss allegations of chip-dumping made by the US semiconductor industry. The Americans charged the Japanese with selling components around the world for less than their manufacturing cost. At the beginning of September the United States and Japan signed a document in which the Japanese government agreed to halt the dumping of semiconductors on the world market.
Further talks were held in January of this year, following US complaints that the Japanese were not complying with the agreement. The US Commerce Department had found that DRAMs were being sold on the world market at 59 percent of what it called the fair price, while EPROMs were being dumped at 63 percent of the fair price. The American delegation warned Japanese representatives that there would be retaliation if dumping was not halted within 30 days and if US sales to the Japanese market did not improve within 60 days.

At the end of March the US acted. President Reagan announced a range of tariffs on Japanese goods entering the United States which would effectively double their price. Among the Japanese exports earmarked for retaliation were disc drives, communication satellites, calculators, televisions and conductor chips in third country markets and which would effectively double their price.

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Among the Japanese exports earmarked for retaliation were disc drives, communication satellites, calculators, televisions and — strangely enough — x-ray film. Zenith was one of the corporations which welcomed the moves. In a statement the company said: "Zenith fully supports the Administration's trade sanctions against Japanese TV and computer makers. Considering the breadth of Japan's unfair trade practices in recent years, these tariffs are actually modest in scope. We hope these sanctions will lead to an overall fair-trade program."

Zenith Electronics is typical of the American companies which have a strong interest in the enforcement of sanctions, even though many of its products — the Z-181 portatile is one example — are made in Japan. The corporation lost $10 million last year, due largely to a $37 million deficit incurred by the TV and VCR division. This is the sector of the American electronics industry that has been the worst hit by the Japanese assault.

As one of the "third countries" referred to in President Reagan's speech, Britain is in an ambiguous position. While there is anxiety among the semiconductor manufacturers about the possible effects of dumping, the computer manufacturers have lately taken advantage of cheap chips. They have now started to worry about the possibility that component costs will rise.

British semiconductor manufacturers do not make 256Kbit DRAMs, so they are not directly affected by the current dispute. But fearing that the present round of dumping could be the prelude to something worse, they have decided to join in a Pan-European effort to prevent a deluge of cheap components.

Richard Bullock of the Electronic Component Industry Federation said: "We think the Americans have got themselves into a frightful tangle in first applying the tariffs and then trying to police them. The European approach is better; it is to apply to the European Commission for anti-dumping duties to be imposed, which are allowed for under the rules of the General Agreement on Tariffs and Trade (GATT)."

"The European Electronics Components Manufacturers' Association (EECA) has applied to the Commission for anti-dumping duties to be imposed. It is to provide evidence of dumping and the effect it has on local producers in France, Germany and Italy. We are supporting EECA by contributing to the costs of its application because if the dumping isn't stopped, we don't know where it will end."

"The official position of the EEC is more cautious, although it is equally alarmed at future prospects. EEC spokesman Robert Elphick commented: "We find it sad that this has happened, but if the Japanese and Americans get together we don't want the hosepipe turned on us."

While the European semiconductor industry prepares to take its case to the European Commission, the US sanctions are already beginning to have an effect. The Japanese government has proposed that all future exports of semiconductors above $30 should be passed to the Ministry for International Trade and Industry (MITI) for a licence. This will obviously produce a dreadful bottleneck in exports of semiconductors to the rest of the world. It will affect even US companies such as Motorola and Texas Instruments which have production facilities in Japan.

The Japanese proposals have already caused a shortage in the supply of DRAM chips and a rise in their price. Apricot is one of the largest manufacturers of microcomputers in Britain, and it is already beginning to feel the pinch. Jes Dorrell, the general marketing manager, told Practical Computing: "We have already seen an increase of 10 percent in 256Kbit DRAMs, although we believe that, in the long term, free-market forces will prevail. The US and Japan do not operate in isolation — we all work in a global industry."

"But in the short term there are going to be certain implications for supply and price. At the moment we have a plentiful supply of these chips and we hold about three to four months' supply. To put this in perspective, about 10 to 15 percent by value of our range are Japanese components."

Certainly there are signs that large Japanese semiconductor companies are looking at ways in which they might circumvent their government's restrictions. There are reports that some firms are shipping large quantities of wafers — which are not subject to export licences — to their plants around the world. It seems that Japanese manufacturers will simply move their production elsewhere.

Over the next few months there is not likely to be any dramatic increase in price as most manufacturers, like Apricot, have contracts for components to be supplied at a fixed rate. The crunch will come when these contracts have to be renegotiated. Mike Lloyd, Production Manager at Research Machines, told us: "What's causing the most confusion is the situation with MITI. We've had to plan for second sources — including Korean suppliers, who are gearing up their production. The indications are that there are some price increases, but we won't see the impact until we renegotiate."

Prices in the shops will not rise tomorrow, but a long-term upward trend in the price of semiconductor components could have serious implications for some companies. Those which have low profit margins are particularly susceptible to price increases from their suppliers. Until the US and European semiconductor companies recover enough to compete with the Japanese on equal terms, it seems the end-user will pay through higher prices.


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OS/2

We now know what the operating system for the main top-end business machines will be for the foreseeable future: OS/2. With IBM and virtually every major hardware manufacturer except Apple putting itself behind it, nothing short of extreme consumer apathy can stop it.

However, not everyone is wildly enthusiastic about OS/2, and some scepticism remains as to whether users really will be prepared to migrate across from MS-DOS. Which is, in any case likely to remain the pre-eminent operating system for low-end users. Many corporate users may end up going no farther than Microsoft Windows, which is a kind of halfway house.

OS/2 is unlikely to be available to end-users before the spring of 1988. The first release of the toolkit for OS/2 software developers should be available this year, in August or September, with upgrades coming through steadily thereafter as more of OS/2's key benefits are completed. This schedule means that major new software applications which make use of OS/2's more advanced features are very unlikely to come through until about two years from now.

Microsoft Windows, on the other hand, is available now. Visually, it has a similar user interface to OS/2. It also shares one of the key benefits of OS/2 - its multi-tasking. A new version, Windows 2, which will have an identical visual interface to OS/2, is scheduled for release in the third quarter of this year. Windows 2 will also offer proper memory management for the current generation of 286-based machine, as well as support for the new IBM Personal System/2 machines.

DIFFERENCE OF SCALE

The key features of OS/2 are shown in the box overleaf. Several of these benefits are already available within the Windows world, but Microsoft seems likely to add more OS/2 features to Windows as it develops for them. The real key difference between the two operating systems is one of scale: OS/2 provides independence — as well as a more limited kind of multi-tasking. A new version, Windows 2, which will have an identical visual interface to OS/2, is scheduled for release in the third quarter of this year. Windows 2 will also offer proper memory management for the current generation of 286-based machines, as well as support for the new IBM Personal System/2 machines.

At least on the early release of OS/2, memory management is a still a bit of a botch. OS/2 does not provide a straightforward and clean linear address space. For the time being, data and programs still have to be divided into 64K segments, even on 80386-based machines.

This is primarily a problem for software developers, who will have to write their way around the problem. OS/2 could have helped them more, and in two or three years some future full 80386 version of OS/2 will probably solve the problem. But the Mac can do it now; OS/2 is not the state-of-the-art operating system it is made out to be. Multi-tasking may turn out to be more of a benefit for the vendor than the customer. It does little for the typical PC user, and few applications will make much use of it. But it is pretty well essential for good communications through to mainframes. The stress on multi-tasking in OS/2 looks very like part of an IBM strategy to woo the traditional DP manager. IBM's goal would be to say to the DP manager: "Look, you can have control again."

But even this is probably a bit of a con. Applications which would sensibly allow the central computer department to validate, audit and consolidate data from a mass of PC spreadsheets users are probably several years away. Even then they are likely to be prohibitively expensive for the extra benefit they bring. It is all a bit of a dream, though it is a dream of control which may appeal to some users.

Where OS/2 is really taking a hammering, but the moment, is its user interface to OS/2. It has a similar version without Presentation Manager, the Windows-like user interface, and OS/2's memory management will be less than perfect for several years to come.

The real question is why it took IBM and Microsoft so long to produce OS/2. The two companies have a joint development agreement which involves the programs which would contribute to the design and development effort and both possess marketing rights to the final result. The suspicion is that the arrangement held Microsoft back. As John Page of Software Publishing points out, the really crucial thing that both developers and users wanted was a solution to the memory problems of MS-DOS. Multi-tasking was on hardly anyone's priority list, except IBM's.

But much of the effort in developing OS/2 must have gone into multi-tasking, which is a complicated thing to implement properly. The end result is that OS/2 will arrive with a sub-optimal memory-management system, too late to help many users with their current operating system. John Page to Page, "They've done a 1984 memory-management system in a 1987 OS." We could have been given decent memory management sooner.

This is not to say that IBM or Microsoft have been remiss or incompetent — quite the opposite, especially in IBM's case. IBM's real problem is how to sell its new PC manufacturers, and OS/2 stands to help achieve that goal. The company's strength has always lain in its strong relationship with central DP departments. OS/2 provides a clear way of cementing that alliance in the PC area. Machines like the Macintosh will look less desirable to companies with a highly centralised purchasing structure, as now they fit less well into an IBM-influenced grand plan.

All IBM's talk about Systems Application Architecture (SAA) fits into this rather Machiavellian view of the purpose behind OS/2. SAA is a group of standards covering things like the user interface and communications protocols for IBM's three main strategic product lines: the PS/2 micros, System 3X minis and System 370 architecture mainframes. OS/2 is a key part of SAA, and the first to be fully defined.

STANDARDS

OS/2 and the Micro Channel Architecture of the new PS/2 machines should be taken together in this context. If users really do embrace these standards, then IBM will have succeeded in hooking them on an architecture which requires IBM kit when they get to the mini level. The heavy re-vamping of the System 3X range to fit it into SAA that is going on at the moment certainly makes this plausible.

OS/2's graphic interface will probably do users good. After all, training is becoming a major burden as more and more people — many of them inevitably less enthusiastic than the early pioneers — are given computers to use. MS-DOS was quite unsuitable for such people. Under OS/2, applications from different manufacturers

PRACTICAL COMPUTING July 1987
KEY FEATURES OF OS/2

MEMORY LIMIT LIFTED The 640K memory limit which has irked MS-DOS users for so long disappears. In the initial releases of OS/2 you will be able to use up to 16-byte of RAM: this is the amount that can be directly addressed by the 80286 chip. In later releases, this will go up to 1Gbyte for people who have got 80386-based hardware.

VIRTUAL-MEMORY MANAGEMENT From the outset, OS/2 users will be able to assume they have much more RAM fitted to their system than they really do. This is because OS/2 has a virtual-memory management capability. Provided you have enough hard-disc space you can carry on as if you have up to 1Gbyte of RAM installed on your system. OS/2 will swap chunks of program or data to or from disc automatically to achieve this. Buying lots of real RAM will only be necessary if you want more speed.

MULTI-TASKING OS/2 is a truly multi-tasking operating system, something that MS-DOS is not. This means that all the kludges that were essential to make pop-ups, comms and networking software work properly under MS-DOS are no longer necessary. It also means you can have several major applications loaded up in memory at the same time, and instantly switch between them. OS/2 will make it possible to run certain kinds of task in the background while you do something else on-screen. Suitable tasks are compiling, sorting, or sending or receiving a file across a comms link.

FILE LIMIT OFF The old limit of 20 files open at a time is raised to 255. While this does not affect the typical user, it should make it a good deal easier to port mini and mainframe applications down on to PCs.

GRAPHIC INTERFACE The MS-DOS prompt and command line disappear. OS/2's user interface, called the Presentation Manager, is closely based on Microsoft Windows. You control the system by selecting items from pull-down menus or pointing to symbols on the screen, using either the keyboard or a mouse pointing device. OS/2 applications run in resizable windows on the screen, which you can overlap or copy data between. This is all familiar stuff to Macintosh users, but with OS/2 it should finally come in from the margins to the centre of corporate computing.

CACHEING STANDARD The Buffers command of MS-DOS provided only a very limited cacheing mechanism. OS/2 automatically makes use of available memory to boost disc performance by cacheing disc accesses in a much more powerful way. This should speed things up considerably.

DYNAMIC DATA LINKS In addition to providing the user with a clipboard for moving data between different applications manually, OS/2's combination of virtual memory, multi-tasking and a set of agreed data formats will allow software developers to implement powerful automatic data links between packages. Several applications can be resident and running in memory at the same time, and they can all access the same data if required. For example, you could hold reference data in a spreadsheet formula which in fact resides in a database. The software could then do the database extraction for you without requiring any further intervention. Integration of separate programs such as spreadsheet, database, graphics and word processor should be easier to achieve.

DEVICE INDEPENDENCE Getting peripheral hardware such as screens or printers to work should be a good deal simpler than under MS-DOS. OS/2 isolates application programs from the details of the hardware. The software necessary to support a lump of hardware is written as a free-standing driver to OS/2 conventions; when you install the device it is incorporated into OS/2. This is a once-and-for-all process, so you do not have to indulge in detailed tinkering in each application.

(continued from previous page)

should all look more similar and work in a more similar way, so they should consequently be easier to learn.

Of course, some users do not like the mouse, but OS/2 cannot be faulted here. Microsoft has taken great pains to redesign the original Windows interface so it will work well without a mouse. All the menu options, for instance, have a unique letter somewhere in the word underlined. For example, Minimise would probably be distinguished from Maximise by underlining the I and the X respectively. If you are using a keyboard you can then type I or X in this example to choose between them instead of pointing with the mouse.

ADAPTING TO OS/2

Among those least enthusiastic about the user interface are some software developers, especially companies that have made a big selling point of their own user interface. With OS/2 this means of differentiating products appears to become less effective. It also means that the companies who will probably have to support two versions of most products — one for OS/2 or Windows-equipped PC users, and another for the large number of existing users who have neither. However, since the Windows side of OS/2 is likely to prove popular with users, it is hard to see anyone resisting for long. And on the Macintosh, where all programs have always looked pretty similar, it is still not hard for users to sort out the programs which use the interface conventions well from those that do it badly.

One big surprise of OS/2 is that it still has the 32Mbyte disc volume size limit of MS-DOS. This means that if you have a large hard disc you will still need to divide it up into several independent nominal drives. Within the context of OS/2's enthusiasm for mainframe links and optical discs, it is potentially a greater inconvenience, since you will not be able to map very large data sets straight to a disc.

The 32K limit persists because all the file-allocation table (FAT) arithmetic in OS/2 is still 16-bit. Within a 16-bit number, 64K is the largest quantity you can represent; the typical hard disc has sectors of 512K, so you end up with a 32Mbyte limit. The FAT arithmetic has presumably been ported straight across from MS-DOS. This kind of code is heavily optimised for speed and therefore impenetrable; a rewrite would not be a fun task. Both Microsoft and IBM say the limit is likely to come off in some future release of OS/2, though nobody is mentioning any dates. But until something is done about it OS/2 really cannot claim to be a 32-bit operating system.

But as far as users are concerned the main problem with OS/2 is that it is not here yet, and it is impossible to assess it properly until it is. Meanwhile the Windows bandwagon is starting to roll, with many software houses now rewriting their packages to support Microsoft's Windows. They will then be in a good position to move to OS/2 if necessary, but they can still service much of their existing MS-DOS market.

For all the reservations that one might have about OS/2 it will have a radical effect on the next generation of applications software. Spreadsheet performance will be improved by the ability to multi-task. Busting the 640K limit will probably benefit only power spreadsheet users in the short term, as few users are really pushing up against the limits of worksheet size with current products. But more intelligent user interfaces need the extra memory; at the moment Lotus's Hal for 1-2-3 requires something like an Above Board, and this is the type of product that is likely to take off with the new O/S. Multi-tasking will allow spreadsheets to recalculate at the same time as interacting with the user.

All the major spreadsheet companies are working on OS/2 versions of their products. Lotus appears to be heavily committed to OS/2, and will be developing a product code-named 1-2-3/G, which will exploit the visual user interface to the full. Lotus also believes in the idea of a link between local spreadsheets running on micros and the corporate mainframe. It will be developing both a mainframe version of 1-2-3 and database products to support this link.
Above: MS-DOS applications run independently of each other. To move data between them you generally have to create a temporary file, then exit one application and start another.

Below: With OS/2 you can have several applications all actively working on the same data. There is no need to exit an application to transfer data.

Microsoft itself will shortly be announcing Excel, which is expected to be available under Windows this year and under OS/2 as soon as the full version of the operating system becomes available. Judging by the performance of Excel on the Macintosh, it should be a very impressive program. Excel is probably the only spreadsheet with both the marketing clout and the necessary performance to have a hope of dislodging Lotus 1-2-3 from its leading position.

DESKTOP PUBLISHING

Desktop publishing (DTP) is custom-made for the new operating system. It is both memory hungry and disk intensive, so it will benefit from the extra address space and quicker disc access. But the key advantage for software companies writing DTP applications is device independence. OS/2 can be left to take care of screen and printer support, so DTP developers will not continually have to rewrite their code to take advantage of the latest output hardware. However, you have the advantage with Windows as much as with OS/2.

Of course, many existing desk-top publishing packages do not use Windows, so the initial development effort to write for OS/2 will be substantial. Significantly, Xerox is having Ventura Publisher rewritten to run under Windows and OS/2; at present it is a Macintosh user interface. Aldus PC PageMaker, the other main candidate for leader-

WINNERS AND LOSERS

MICROSOFT Whatever happens, Microsoft cannot lose. If OS/2 is a flop — in other words, if only the biggest and most true-blue of corporates adopt it — Microsoft will still do well out of Windows. All the publicity surrounding OS/2 will have the effect of making people take Windows seriously, as it has the same interface; they may then stick with it. It seems probable that Microsoft will reverse-engineer features taken from OS/2 into future releases of Windows. It is important to remember that Microsoft has not aligned itself with IBM to the extent of submerging its own interests. The two companies will still be competing with different versions of Unix, and will offer different network software solutions.

LOTUS Lotus also has a joint development agreement with IBM, but the outcome looks less certain than in Microsoft's case. Lotus is particularly impressed by the multi-tasking and data-interchange aspects of OS/2. All its major products — including the Freelance graphics package, the Manuscript word processor and 1-2-3 — will integrate together in a modular way. This is a very good move for users. Lotus is the key company in IBM's mainframe-to-micro link strategy. Lotus is developing the mainframe version of 1-2-3, which will be the application; it will sell the idea to the corporates if anything will. Lotus and IBM are also working on SQL-based database software. The significance of SQL is that it provides the interchange format which will allow micro users controllable access to mainframe data. This is a very ambitious piece of work, and it is impossible to say yet how users will respond to it. If all this effort leads to Lotus diverting effort from its bread-and-butter market of the stand-alone micro spreadsheet, where it is under increasing pressure from both clone and original products, it will turn out to be a mistake. But the chances are that the link with IBM will enhance Lotus's prestige enough to keep its pricey products selling successfully against the clones, and Lotus will probably remain a winner.

DIGITAL RESEARCH With IBM now firmly attached to Microsoft, other system software companies are likely to be most seriously affected. Despite confidently writing off OS/2 as "vapourware" in the immediate aftermath of the launch, Digital Research is likely to be damaged by it. DR's low-end Gem operating system, currently bundled with the Amstrad PC, can continue unaffected, but OS/2 is likely to cripple prospects for DR's flagship operating system, Concurrent DOS, at least on standalone systems. Digital Research has just launched a new £295 desk-top publishing package, Gem Desktop Publisher, along with a word processor it has bought in from another software house. This may herald a major change of direction for the company towards applications software.

NOVELL Novell could also be in some difficulty. In numerous versions, its Netware product currently dominates the network operating-system market. Its problem is not so much that IBM and Microsoft have both unveiled their own new LAN solutions; Novell has been able to live with things of that kind in the past. The real difficulty is that Novell's network software emulates MS-DOS, rather than hooking into it. To rewrite it to work properly with OS/2 will be a very considerable job. Novell has certainly lost out with OS/2.

APPLE On the face of it, OS/2 looks like dreadful news for Apple: with OS/2 IBM has stolen its clothes. However, Apple's chance lies in the big delay before real OS/2 applications arrive. IBM and Microsoft have validated all the concepts of the Macintosh user interface that has hitherto been so mistrusted by the big corporates. If Apple is any good at selling itself, it could end up a surprise winner.

screen fonts OS/2 will offer these facilities, but again Windows will do. In the longer term, the full multi-tasking of OS/2 may prove very useful for word processing. The word-processed report is often the natural end product of work done in many other sorts of packages, so good data links are essential. Multi-tasking capabilities can help provide better database facilities for mail merging, or providing more effective links to separate database packages. Spell checking is also well-suited for execution as a concurrent task.

Like desk-top publishing, the heavy-weight CAD and presentation graphics applications are likely to be rewritten to make use of the features of OS/2. Graphics (continued on next page)
applications push screens and printers to their limits, so device independence is likely to be the main benefit. Full OS/2 should increase the number to be the main benefit. Full OS/2 versions of their limits, so device independence is likely

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as it brings order to a previously very chaotic presentation.

Pop-up programs will have to be completely rewritten if they are to run outside the compatibility box, or even at the same time as applications running outside the compatibility box. Borland has already announced that Sidekick will be available as a full OS/2 application, and other publishers are likely to follow suit.

OS/2 is not all bad news for pop-up developers. With the operating system in control, they will no longer have to worry about making the programs compatible with other pop-ups. The user can forget about things like order of loading. OS/2 provides full access to the keyboard state — not just the ASCII value of the key pressed, but its physical position, whether it was Shifted and even the exact time of depression. This means the hot-key principle can still be used. Saving and restoring the screen state should be a lot easier to code. If anything, OS/2 should increase the number of programs that use the pop-up principle, as it brings order to a previously very chaotic part of the PC world.

The protection offered by OS/2 is a big step forward for communications programs and LAN software. All such programs are likely to be rewritten to run as full OS/2 applications. OS/2's full priority-scheduled multi-tasking is a feature of great power and sophistication that will be highly useful to software developers. Things like print spooling and monitoring an electronic mailbox become very much more attractive.

Much of the work can be done on a low priority in idle microseconds, without detracting from the performance of your main task.

COMMUNICATIONS

Some conns applications are very time-critical. For example, you want your system to respond fast to signals during a high-speed file transfer. Here OS/2's ability to assign different priorities to different tasks is very helpful, allowing active conns programs to be given the highest priority.

Databases can benefit from OS/2 in much the same way as spreadsheets. Performance can be enhanced by rewriting database software to make use of multi-tasking; background sorting is an obvious way to save time. More friendly but memory-hungry user interfaces are likely to follow. Microrim with Rbase and Borland user interfaces are likely to follow in due course. Microrim with Rbase and Borland with Reflex are going for full OS/2 compatibility.

Where database developers can really get working now is on advanced multi-user databases. Lack of clarification of IBM's LAN strategy has held back work in this area. From the specifications of the new LAN, conns and operating system products it looks quite possible for the work of running a database to be distributed across a net, and for different operating systems to communicate in a co-operative way. A suite of database software could, for instance, allow users to get data transparently from one or more file servers, with Unix actually managing access to the data. Meanwhile a matching program on each work station could provide a friendly front end using OS/2's Presentation Manager. The key here is, again, OS/2's ability to multi-task. A separate OS/2 task would be running below the user's level of awareness to manage the link into the Unix network.

Integrated software, which enjoyed a brief period in vogue three or four years ago, may be set to make a comeback. The main reason people did not like integrated packages in the past was that they were so very slow. But with extra memory and better use of discs, as well as more powerful machines, speed should be less of a problem. This time round, integration is likely to take modular form, with separate packages for each major user task communicating dynamically among themselves. People may prefer to continue buying less all-embracing applications, simply because they are easier to learn, but OS/2's improved facilities for data transfer and the more standard user interface it imposes should make ad hoc integration by the user much simpler.

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Polanka Video Limited
Unit X5 · Acton Business Centre
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Every year it seems the prophets of Unix have proclaimed that "this is the year". Just as regularly the year goes by with another shower of DOS-based applications, and Unix is again left waiting in the wings. The rest of the industry can therefore be forgiven for ignoring the latest proclamations of Unix's advent as a major force in the business market.

Yet 1987 might truly prove to be the year that Unix supplies evidence that it is to be taken seriously as a mainstream microcomputer operating system. Several new factors have emerged in the last few months to lead to this conclusion. Some are coincidental while others have been engineered, but together they have given significant momentum to multi-user microcomputer systems in general and Unix in particular.

The first pointer is not to do with software but with hardware. For years now, one of the prime criticisms levelled at multi-user systems as compared with networked microcomputers is that sharing the processor between a number of users leads to an unacceptable deterioration in the service provided by the system to each terminal. The development of 32-bit microprocessors such as the Intel 80386 and the Motorola 68020 will largely silence this criticism. We take a look at one of the multi-user upgrades to the Compaq Deskpro 386 on page 91.

The second factor that has emerged in the past year has been the attitude of the hardware manufacturers. Cajoled and bullied by government agencies from Washington to Brussels, all the major builders of micros and minis now offer Unix on their machines, at least as an option. The most public demonstration of this is the X/Open initiative. As we explained in the May issue of Practical Computing, this is a group encompassing 11 companies who have come together to formulate a standard version of Unix. Each member has implemented an agreed subset of Unix on a range of mini and supermicro machines. X/Open has standardized around Posix, which is the IEEE version of AT&T's System V Unix and is therefore independent of any particular manufacturer.

The final factor that has emerged is perhaps the most significant. AT&T, Microsoft, the Santa Cruz Operation and Interactive Software - which are already the four leading Unix suppliers - have announced that they intend to develop a common version. Short of a large user base crying out for products this is the strongest possible incentive for software houses to write Unix applications. Not only have all the major players in the Unix market joined to form a standard, the existence of a single version of the operating system eliminates costly porting and verification procedures. We look at the implications of this standard edition version of Unix on page 30.

Although the smart money is on Unix to become the standard multi-user operating system, there are other products still in the race. The continuing absence of a multi-user version of MS-DOS or OS/2 leaves the field wide open for other manufacturers to come up with a multi-user operating system for the industry-standard microcomputer architecture. Perhaps the best known of the alternatives is Digital Research's Concurrent DOS, which we examine on page 92.

For the end-user who is familiar with MS-DOS, Concurrent DOS has a lot of attractions. To begin with, DR's offering has over the years become increasingly compatible with MS-DOS. As a result a wide range of applications - the lifeblood of any operating system - have been able to run under Concurrent DOS without modification. A number of Concurrent DOS commands work in exactly the same way as their MS-DOS equivalents, so users need less retraining.

Concurrent DOS offers multi-tasking as well as multi-user capabilities. A number of OEMs have been tempted by these features to offer Concurrent DOS as the operating system for Intel-based multi-user systems although there are several technical drawbacks to this approach. Most of them arise from the fact that many MS-DOS applications are written for single-user operation on stand-alone micros. They therefore take the sort of liberties with the operating system and the hardware that are not possible with a multi-user multi-tasking system.

Even worse, from Digital Research's point of view, many of these applications - Auto-

(continued on next page)
MULTI-USER STRATEGIES

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cad, Lotus 1-2-3 and Sidekick, for example — are leaders in their field. Concurrent DOS has therefore been left with well-behaved but outdated products like WordStar and Supercalc II.

The dark horse in the multi-user race is Pick, which we look at on page 93. On the face of it Pick is the answer to an application writer’s prayer. It is fast, adaptable and friendly, and anyone with a little knowledge of Pick could bolt together a customized multi-user environment for an end-user in a few hours.

Pick is an ideal operating system for databases and similar applications. It grew out of a stock-control system for use by personnel with little or no knowledge of computers, and was custom built with that in mind. Many of Pick’s features correspond closely with the kind of architecture you might expect to see in a database manager application. It also has its own built-in version of Basic tailored to work closely with the structures of the operating system.

The drawbacks to the system are painfully evident. Few people have heard of Pick and few have seen its capabilities. You can get Pick to run on the IBM PC, but there are precious few applications written for it. Pick is in the position now that Unix was a decade ago: heard of, available on a range of machines but barely relevant to the mainstream business market. What Pick lacks is the kind of corporate backing that Unix has. The major supplier of Pick, McDonnell Douglas, seems to lack the kind of commitment the system needs.

Finally, on page 96 we look at Business Operating Software (BOS). This British-designed suite of programs was originally taken from a mainframe series of packages. Although lacking many of the frills of other systems, what BOS has as an advantage is that its applications can run across a varied range of microcomputers. It therefore has some attractions for large business users, as it allow them to upgrade their hardware while maintaining their software investment. Its disadvantages, like those of Pick, are the lack of strong backing and a shortage of applications software.

Unlike stand-alone micros, multi-user systems are not usually installed by the end-user. The overwhelming majority of multi-user systems are set up by dealers or value-added resellers who are called in to solve a particular problem. The end-user neither knows nor cares what the basic operating system is: all he or she wants is a working application. The winning operating system in the multi-user arena will therefore be the one that attracts the best applications and the most thorough support.

The move towards multi-user systems is a sign of the increasing maturity of the micro-computer industry. It is further evidence of the blurring of the barriers between the various types of computer as micros take on the role that maincomputers have held for a generation — that of the departmental machine serving a number of users connected to the company data processing system.

UNIX

Steve Malone explains the origins of Unix and looks at the recent developments which have established it as the premier multi-user operating system.

Now that a head of steam is building up behind Unix, the players and strategic alliances which will carry it into the 1990s are beginning to emerge. Not surprisingly, the companies now taking their positions in the network of manufacturers, distributors, support teams and standards bodies are those that have been in the Unix business for many years.

One such company is Sphinx Ltd. It was formed in May 1983 by Pamela Gray and Dominic Dunlop, who were among the first to see that Unix had a worthwhile future. But the trouble with being a pioneer is that you don’t have many people around to sell products to, and it was not until 1986 that the founders’ faith in Unix began to pay off. The company reported an annual turnover last year of £2.5 million and currently employs 60 people.

Sphinx has been instrumental in setting up the International Consortium for Unix Software (ICUS), a Pan-European group of dealers and distributors. ICUS members plan to co-operate in distributing Unix products, support and services throughout the various countries in which they are represented. ICUS also intends to organise bulk-purchasing arrangements with software houses, particularly those in the US.

Sphinx is naturally bullish about the future of Unix. Ben Salama, the company’s Technical Director, told us: ‘‘The arguments that went on two years ago about whether Unix is friendly or not or whether it’s better or worse than Pick are irrelevant. The fact is that Unix has been adopted by all the major manufacturers.’’

Of course, what suits the manufacturers may not necessarily suit the end-users — that is, if Unix is the system they have to grapple with. In practice, Unix is being installed in an increasing number of sites without the end-users realizing what operating system they are using. Chris Leek is Sales and Marketing Director of Pegasus, author of the most widely used microcomputer accounts package. He observed: ‘‘Xenix is not the beast it’s made out to be. The end-users want something to run their accounts, and we have to provide a solution. They don’t care what the operating system is’’.

This experience is borne out by other Unix industry insiders. The Santa Cruz Operation has been in the business of providing Unix-based solutions since 1979, and now claims to be the world’s largest vendor of microcomputer-based multi-user software. Jim Wilt, the company’s Vice-President for worldwide sales and marketing commented: ‘‘The purchasing decision for a multi-user system is usually made by a value-added reseller. The user is looking to solve a problem and doesn’t care whether it is Unix or DOS underneath. He just goes to the dealer and says ‘Solve my problem.’’’

Unix may be the manufacturers’ and dealers’ choice, but what kind of advantages does the system offer the end-user? Ben Salama says: ‘‘The significance of what Unix is achieving is that it is doing for multi-user systems what MS-DOS did at the low end. It is addressing the issue — from the user’s point of view — of how to avoid a situation where they say ‘We’ve got half a million word-processing files which need to be converted to run on the new hardware.’ People get locked into the old code; 20 years ago everyone said Fortran was dead, but it’s still

CHILD OF MA BELL

Most people agree that Unix is an operating system with a future, but what about its past? Like a number of innovations in computing, Unix originated in Bell Laboratories. It was developed in 1969 by Dennis Ritchie and Ken Thompson, who found themselves working on a DEC PDP-7 without an operating system. Naturally enough, they decided to write one, which they called Unix — a name designed to draw comparison with the Multics operating system of the time.

In 1973, the original assembly-language source code for the operating system was rewritten in C, a language which was also invented by Dennis Ritchie. As a result, C became the natural language of Unix — an association which remains today. Bell Labs began introducing the system within its own organisation around 1974, at the same time incorporating extra features to make it more popular in the wider computer industry.

There are now two main versions of Unix out in the field. System III is a non-machine-specific version of the system which includes the Programmers’ Work Bench and support for 32-bit machines such as the Vax. System V Unix is basically the same but with some modifications developed by the University of California at Berkeley.

The microcomputer industry-standard version of Unix is Microsoft’s Xenix. Microsoft licensed this version from AT&T in 1979 and gained permission to make the necessary alterations to render it more approachable for the business user. Xenix is available across the range of Intel processors and on most 16-bit processors, including the 68000.
At the end there will be one product — it is likely to be called MS-Unix — which we are hoping to deliver in the first quarter of 1988. At present we are building Xenix to the point where it can go through the verification suite and come out the other end as Unix.

DAVID SMITH, MICROSOFT

around. What Unix offers is a route for users which allows them to maintain their investment.

The ability to change your hardware while maintaining the investment in software is the central premise behind the X/OPEN group. To put its worthy theories into practice, the X/OPEN group has commissioned Sphinx to set up its portability centre. This specially organised suite of machines and services is intended to allow software houses to compile source code for Posix on the various machines which come under the wing of X/OPEN.

Salama explained how the portability centre will operate. "It will be an environment for all X/OPEN members with all the facilities and skilled staff to allow software houses to port their applications. Our experience is that it is not a trivial business to port software."

In the United States, even more momentous events have been taking place. By far the most important is the recent joint announcement by AT&T and Microsoft which commits the two companies to developing a standard version of Unix for the Intel 80386 processor. The new version will be called Unix — a fact which is far from trivial.

Unix is a trademark of AT&T, which in the past has jealously guarded its rights to the name. Previously, if an OEM bought the source code from AT&T and changed the code in any way, it could not be called Unix. Therefore when Microsoft licensed Unix and tailored it to the business environment, it had to be called something else.

Dave Smith, Microsoft’s resident Xenix guru in Britain, explained the background to the announcement. "We had problems convincing people that Xenix really was Unix System V. About 18 months ago AT&T came up with a verification suite, which people said we hadn’t Passed. But it should be understood that the verification suite is huge, covering everything from the mainframes and minis down to micros. We passed verification for our end of the market. We are System V compatible at the PC end.

"We found that AT&T was doing a port to the 386 and so were we, so it made sense for us to combine our efforts. At the end there is going to be one product — the feeling at the moment is that it’s going to be called MS-Unix — which we are hoping to deliver in the first quarter of 1988. At present we are building Xenix to the point where it can go through the verification suite and come out the other end as Unix."

The version of Unix-386 currently being developed by Microsoft will become the standard version. But this does not mean that in future all copies of Unix-386 will be identical. Microsoft will sell licences to the operating system, which will be customised by OEMs for their own particular market. All the changes will be in the user interface. Software houses, on the other hand, will write to the kernel, which will be identical in all cases.

The Santa Cruz Operation (SCO) is Microsoft’s second source for Xenix, as well as being its retail outlet. SCO has specialised in creating value-added versions of Xenix with additional drivers and functionality not provided by the basic product. The company claims that at the moment it sells in the region of 400 Xenix licences in the UK each month. Considering that SCO estimates worldwide monthly sales to be between 2,000 and 2,500 licences, the UK is undoubtedly one of the largest markets for Xenix.

The SCO version of the unified Unix will contain additional device drivers, an improved system administrator and a graphics library. It will also provide support for a range of different peripherals, such as laser printers. The unified Unix will not be available until next year. At the moment, both SCO and Microsoft are working on a version of Xenix for the PS/2 range, which they hope will become available this autumn.

Meanwhile IBM has announced that it is to provide Aix — its own version of Unix — for the PS/2 machines. In typical fashion IBM is remaining tight-lipped about the kind of features that Aix will contain, and is not likely to make an announcement until the end of the year. Only then will Microsoft and SCO be able to make a judgement on the effect IBM’s intervention will have on sales of their own product.

The arguments that went on about Unix two years ago are irrelevant. The fact is that Unix has been adopted by all the major manufacturers. It is doing for multi-user systems what MS-DOS did at the low end. Unix offers a route for users which allows them to maintain their investment.

BEN SALAMA, SPHINX

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MULTI-USER STRATEGIES

Unix Software

Unix may be the system of the future. But end-users want to know whether applications are available that will improve office productivity. Steve Malone takes a look at some of the Unix software now on the market.

LYRIX 5.0

As Microsoft's major retail outlet for Xenix, the Santa Cruz Operation has a large say in the future direction of the operating system and the applications that go with it. Lyrix is SCO's word-processing package, and it runs not only under Microsoft's Xenix but also under IBM's version of the operating system. It was, in fact, the IBM version that we used for this review.

Lyrix requires a minimum of 384K of RAM and 1Mbyte of disc space. The installation procedure will seem somewhat arcane to anyone unfamiliar with Unix, but the manual provides a step-by-step guide, and most people should be able to get Lyrix up and running in 10 minutes or so.

Lyrix is a menu-driven program. The opening screen provides a list of the main options, from which you can choose to edit a document, list files in the current directory, use electronic mail or perform file-management tasks. You choose selections either by pressing the first letter of the appropriate command or by scrolling through the list of options with the arrow keys and selecting the highlighted option.

The Edit option presents you with a list of files in the current directory; selecting one of them or typing in a new file name moves you on to the Edit screen. At this point you begin to appreciate the benefits of having an operating system that works in Protected mode on a PC/AT: the computer response is lightning-fast.

In line with Unix's austere image, the Lyrix Edit screen is fairly bare. A single status line at the top of the screen shows the file name, page length, page number and cursor position. Immediately beneath it is the ruler line showing tab and margin positions.

The basic editing commands of Lyrix are primitive compared with the user-friendly features of modern DOS-based packages. The program makes extensive use of Escape and Control command sequences to perform most of the editing functions. Even worse, the characters chosen do not always bear an obvious relation to their function. The command to move to the top of the screen command is Ctrl-T and to the bottom is Ctrl-B, while to save a file you use Ctrl-X.

The Escape characters also take a little getting used to, partly because you press the Escape and alphanumeric keys in sequence, not simultaneously. For example, help is invoked by pressing Escape followed by h; pressing both together generates an error message. Even odder are some other commands like the block move. You mark a block by pressing Escape twice — once for the beginning of the block and again for the end. Pasting a block is then performed by pressing Escape and *.

SPECIFICATIONS

LYRIX 5.0

Description: word-processing application
Hardware required: IBM PC/AT with 384K RAM and hard disc
Unix versions: SCO Xenix V or IBM PC Xenix version 1 or 2
Copy protection: none
Price: £595
Publisher: Santa Cruz Operation Inc. 400 Encinal Street, PO Box 1900, Santa Cruz, California 95061, USA.
Telephone: (US area code 408) 425-7722

UK distributors: Sphinx, Tetra Business Systems
Available: now

INFORMIX, SQL

Description: relational database-management program
Hardware required: IBM PC/AT or compatible with 512K RAM, 40 Mbyte hard disc
Unix versions: SCO Xenix V or IBM PC/Xenix version 1 or 2
Copy protection: none
Price: £1,575 including one-machine licence
Publisher: Relational Database Systems Inc., 4100 Bohannon Drive, Menlo Park, California 94025
UK distributor: Sphinx
Available: now

SCO PROFESSIONAL

Description: integrated spreadsheet, graphics and database program
Hardware required: IBM PC/AT or compatible with hard disc and 1Mbyte of RAM; maths co-processor recommended
Unix versions: SCO Xenix 286 3.0/System V or equivalent
Copy protection: none
Price: £795
Publisher: Santa Cruz Operation Inc., 400 Encinal Street, PO Box 1900, Santa Cruz, California 95061, USA.
Telephone: (US area code 408) 425-7722
UK distributors: Sphinx, Tetra Business Systems
Available: now

UK DISTRIBUTORS

Sphinx: 43-53 Moorbridge Road, Maidenhead, Berkshire SL6 3PL. Telephone: (0628) 75343
Level V Distribution: Ashford House, Darley Dale, Matlock, Derby DE4 3BF. Telephone: (0629) 73321
Tetra Business Systems: Unit 5, Foundation House, Norrey's Drive, Maidenhead, Berkshire SL6 4BX
MULTI-USER STRATEGIES

The reason for this apparent madness lies in the multi-user nature of the software. Programs designed to run as a multi-user application has to accommodate a wide variety of terminals, not all of which will have function keys and cursor keys. As with the old CP/M programs, the programmers have to use a common subset of keys.

The extensive use of Control and Escape characters might lead you to believe that you are dealing with some mutated version of WordStar. This feeling is encouraged by the fact that Lyrix requires you to use a Reformat command when resetting margins within a document. While the use of Control keys is an understandable necessity, the need to reformat manually is not. SCO says that version 6.0 of the program, expected at the end of this year will adjust to margin settings automatically.

Lyrix also contains WordStar-like dot commands, which are used mostly for messages to be sent to the printer to format a document. For example, dot commands are used to set the number of lines in a footnote, force a page break and merge files at print time. Formatting itself is performed via the Print and Mailmerge menu. Before the document is sent to the printer it is possible to format it, using either the Viewprint or Mailmerge sub-menus.

From the Viewprint menu, the user can, among other things, generate a table of contents and reset the margins. The Mailmerge menu, as its name suggests, allows the document to be merged with a list of names and addresses for mailshots and other distribution. Lyrix can use a range of local and remote printers, and from the main menu you can transmit documents as electronic mail.

For a word-processing package the term “multi-user” is a bit of a misnomer; it is hard to imagine any situation where two people would want to work on the same document at once. What the user wants is a program that can be called up from a number of different terminals. For this mode of working Lyrix is adequate, and it should appeal to those familiar with WordStar. However it is an indisputably old-fashioned application has to accommodate a wide variety of terminals, not all of which will have function keys and cursor keys. As with the old CP/M programs, the programmers have to use a common subset of keys.

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MULTI-USER STRATEGIES

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One such program is Santa Cruz's SCO Professional. Although it is entirely Unix-based, it has been designed to perform in exactly the same manner as Lotus 1-2-3. SCO's installation systems try to ensure that setting up the system on your hard disc is trouble-free: you simply copy the Install program across and run it. From then on, the program automatically copies the relevant files and prompts you for the appropriate disc.

A brief examination of SCO Professional's facilities, all the standard Lotus 1-2-3 commands worked as they should. Data is typed in at the command line on the top of the screen and appears in the appropriate cell when you press Return. The list of commands appears when you press the / key. The graphing function works exactly as if it would if the program were 1-2-3 proper. Our only quibble was that SCO did not add any extra functionality to the basic 1-2-3 features and interface. But then a simple clone is probably all that users want.

The lightning-fast response we became accustomed to when running other Unix applications seems to have been lost when it comes to SCO Professional. There is a distinct delay between pressing a key and the execution of the command, although once the command has been executed the display appears as fast as ever.

Santa Cruz says that by reconfiguring the system you can read Lotus WKS and Symphony files directly into SCO Professional. There is a terminal, a graphics device, a Unix device or a DOS device. By setting the DOS device as A you can read DOS files from the floppy-disk drives.

A spreadsheet is not likely to be used for transaction processing. The nearest you are going to get is consolidating several work-sheets into one. The real significance of SCO Professional lies in its 1-2-3 compatability. Such is the dominance of Lotus 1-2-3 in the DOS universe that the credibility of Unix in the business community is bound to be given a boost by a compatible package.

INFORMIX SQL

One of the most valuable applications on a multi-user system is the database manager, since databases lend themselves particularly well to the kind of transaction processing provided by the multi-user layout. A typical system might contain four clerks, each one updating records. With a single processor handling all the terminals, clerks, each one updating records. With a sequential and orderly fashion, with each clerk using an entirely up-to-date list.

It identifies a well-defined niche where it may survive for a while yet.

CONCURRENT DOS

Digital Research already has a multi-user operating system, but can it survive the onslaught from Unix? Glynn Moody identifies a well-defined niche where it may survive for a while yet.

Digital Research presents a sad picture of a company once indisputably number one finding itself being ever more firmly relegated to the number two position. Its CP/M operating system dominated eight-bit micros as thoroughly as MS-DOS does 16-bit machines, but for most of today's business micro users it is no more than a memory - that if. The launch of OS/2 plus the moves of IBM's Lotus 1-2-3 micro strategy based around that product seems likely to seal the fate of Digital Research in the mainstream business market.

And yet all is not gloom. Forced by circumstances to accept this state of affairs, Digital Research has set about colonising some of the less obvious niche markets which it may yet unearthed by Microsoft. For example there is the little-known Flexos operating system, designed exclusively for computer integrated manufacture (CIM) which seems to be increasingly successful in this area. IBM itself has signed an agreement with Digital Research for the use of Flexos. By channelling its resources into such burgeoning areas, Digital Research may well find that it can exist quite happily outside the world of DOS.

An even more striking success is Concurrent DOS, of which some 250,000 copies have been sold worldwide. As the diagram opposite shows, the evolution of this product has been long and convoluted. It was designed to offer full PC-DOS compatibility along with some tasty extras to seduce people away from Microsoft. Early versions of Concurrent DOS were distinctly wobbly, though later ones seem stable and acceptable. Digital Research speaks of 90-plus percent of PC-DOS programs working under its operating system.

The main bells and whistles offered by Concurrent DOS were multi-tasking and - most importantly - a multi-user capability. Digital Research sees the latter element as concurrent DOS's greatest strength. Whatever the virtues or otherwise of MS-DOS, it has never claimed any kind of multi-user capability - except possibly in the shadowy MS-DOS 4 product, which now seems likely to be eclipsed totally by OS/2. Digital Research has capitalised on this, and majored on the multi-user potential of Concurrent DOS.
This approach certainly seems to have paid off. According to figures from Digital Research, ICL captured 47 percent of the UK multi-user market in 1986, all of it with machines that use Concurrent DOS. Several other manufacturers also use this operating system, giving it 50 percent of the market.

The multi-user market is worth around £100 million overall. The winning strategy seems to be to offer DOS capability in a multi-user environment. These two features neatly define a particular market segment that is, for the moment, more or less immune from attack by rival operating systems.

In an office where there are no more than 10 users, personal-computer software will probably be a desired option. It is not one that is really available on a fully fledged Unix machine, which would in any case be something of an overkill solution. Concurrent DOS offers a neat compromise, retaining a useful level of DOS compatibility so that people may continue to use Word Perfect and dBase III, or whatever their favourites may be. In addition it offers an office-level solution to customer accounts or whatever.

Next though this picture may be, it does mean that Concurrent DOS is firmly locked into a rather tightly defined sector of the market. The number of offices which fit this bill is rather limited, and likely to shrink as time goes on. If Unix eventually acquires the capability of running DOS applications as a task, the attraction of Concurrent DOS will be much reduced. Similarly, as the Unix market takes off, good, low-cost applications with DOS-like front ends will start to come through, tipping the balance further in Unix's favour, even for small systems. Perhaps the only enduring obstacle to Unix's success in the small-business work group is its inherent complexity and the need for a system manager.

Paradoxically, Digital Research sees significant opportunities in Microsoft and IBM's announcement of OS/2. The emphasis is on the word 'announcement': Digital Research believes that the strung-out timetable for the availability of the various components of DOS — the kernel, the Presentation Manager and finally the applications — should give it a two-year window in which to make significant sales to frustrated PS/2 users.

Digital Research bases its optimism on the near fit of Concurrent DOS's features with those promised for OS/2. It already has multi-tasking, and furthermore it can multi-task with existing DOS applications; there is no need to wait for programs that have been specially written for OS/2. By contrast OS/2 will only be able to handle one such old-style DOS program at a time. Concurrent DOS has an extended-memory capability, and very shortly there will be a version which utilises the full power of the 80386 chip. Microsoft is not even saying when its 80386 version of OS/2 will be coming through. Clearly it will be some considerable time after the first 80286 version of OS/2 hits the streets — itself well into next year.

Concurrent DOS possesses very real advantages at the moment, and presumably Digital Research in conjunction with companies like ICL will continue to sell many systems which satisfy users' needs for DOS multi-tasking and/or true 80386 computing. But you cannot help feeling that this is all very interim and stopgap. Once OS/2 and the applications come through — and it is worth noting that the original Windows product was shipped two years after first being shown — it seems likely that the world will split into two camps: the old DOSers running PCs and ATs, and the new OS brigade running PS/2 machines. Once that happens, there seems little reason to go for Concurrent DOS, except in the niche market of low-end multi-user systems. And even that is likely to prove a precarious position.

It will be a sad day when Digital Research is no longer a major player in the world of micro operating systems. In times past, when Microsoft was fresh on the scene, there was a real sense of creative competition between them. As the double juggernaut of DOS and OS builds up an unstoppable momentum in the world of corporate computing, things will become much more predictable. The battle for the multi-user world will still be raging, but it is unlikely to be won by Digital Research with its present range of products.

(continued on next page)
**MULTI-USER STRATEGIES**

Thinking of Pick purely as an operating system misses the main point. It is more accurate to regard it as a database like dBase III that just happens to have been a tailor-made operating system built-in. Pick has all the usual operating system functions, like managing the discs, screen and other peripherals. On IBM-compatible PCs it replaces MS-DOS, taking over all its functions.

When you buy Pick you also get something which in the PC market would normally be considered as a major separate application: a relational database manager with an English-like enquiry language called Access. In addition you get a powerful version of Basic that has several extensions to make it work naturally with the database. Less attractive parts of the bundle include a rather primitive text editor and a flexible but very old fashioned word processor.

All this comes quite cheap. The AT version costs £596 for one to three users or £995 for 10 — the maximum number on an AT. You can also obtain Pick for the Amstrad PC: this version costs £500 and can support up to three users. On some Amstrad machines it is necessary to modify the hard-disc controller, adding about £50 to the cost.

Pick is an integral part of Pick system, which is Pick itself. Pick system is Pick running on Pick. It excels at the same kinds of tasks as dBase II. Small system houses and DP departments use Pick as dBase II. Small system houses and DP departments use Pick as dBase II. Small system houses and DP departments use Pick as dBase II.

The most important part of Pick is the Access query language. You can create extensive Procs consisting of long strings of Access commands. So with a file of customer details called Cust, a typical Access query might be:

```plaintext
LIST CUST CONTACT COMPANY CITY PHONE
```

This would list customers on the screen, displaying only the contact, company name, city and phone-number fields; if you do not specify the fields you are interested in you get the whole lot. A bit more sophisticated would be:

```plaintext
SORT CUST BY CITY CONTACT COMPANY PHONE BREAK—ON CITY
```

which produces the same results sorted by city and displayed on-screen in city groups.

You can make numeric and date comparisons. For example:

```plaintext
SORT CUST WITH BALANCE > "1000" AND WITH DATE BEFORE "01/04/87" BY BALANCE
```

Here Pick will give you full details on the worst of your bad-paying customers. You can also compute fields from other fields, use spreadsheet-like mathematical functions and control the format of output on-page or on-screen.

Though Access is easy to use for casual enquiries, it is ultimately also very powerful. To get the best from Access it helps to know how Pick organises its data. Together with the data for each file, Pick keeps a matching dictionary. It holds information about the data in the file, such as the field name, and the format and length you want it displayed on the screen. The dictionary also cross-links to other files if the data is to be pulled in or computed at run time.

This structure is flexible. You can change field names without changing the data, or set up synonyms; for example, you could give your Salesmen field the additional name of Rep. Since the command words of Pick itself are held in the same way as other Pick data, you can even do the same thing with them. You could allow Sift, Filter or Winnow in addition to Sort, for example, or redefine the whole Pick system into Spanish for a foreign-language application.

Each user has their own set of dictionaries, so what you do does not have to affect anyone else. You can be using Rep; they can be using Salesmen. But providing you both have the right access codes, you can both be using the same data.

The ability to set up cross-links to other files is what turns Pick into a true multi-file system.
MULTI-USER STRATEGIES

RUNNING PICK ALONGSIDE UNIX OR MS-DOS

Redefining Pick as a database rather than an operating system helps clarify some otherwise puzzling features of the Pick scene. You can run Pick—or more accurately Pick-like clones—under both Unix and MS-DOS. The Unix product is called Universe. At present it is only available on large Unix systems, and it is expensive. The smallest machine presently supported is the IBM RT/PC, though it may well migrate down onto the larger 80386-based machines in the near future.

According to Keith Abnett of Orac Information Systems—which is both a Pick and a Unix shop—if Universe works it should be a highly desirable product. Many users are forced by standardisation policies to opt for Unix. While Unix is rather lacking in tools for building business applications fast, this is just the sort of thing Pick excels at. Pick is weak in communications and language support, which are both strong suits for Unix.

The MS-DOS product is called Revelation. It is available in both single- and multi-user versions, with prices starting at £695. The rationale for Revelation is rather different. Pick itself is designed to run on classic star-type multi-user configurations, where you hang terminals off a PC. Revelation is designed for network use. Many micro users prefer the network approach because it gives each user a full-blown PC.

The choice between Pick itself and Revelation is therefore made for you by your organisation's overall multi-user strategy. For classic star-type multi-user setups with terminals you get Pick; for a local area network you get Revelation. Stand-alone PC users can obviously choose either.

Installation of Revelation is simpler than for Pick proper. You just set it up inside a sub-directory on your hard disc. You can then run it from the MS-DOS prompt. Various utilities are provided to copy between Pick and MS-DOS formats, and you can import dBase files and use pop-ups. Apart from trivial external differences like the shape of the prompt, Pick and Revelation are very similar.

Unfortunately Revelation is not fully compatible when it comes to transferring applications to or from Pick, though you can generally move the data. Because Pick has been going longer it has many more applications available for it than Revelation. And obviously Revelation only runs on PC systems, while Pick runs on virtually anything. So if full portability matters to you only Pick itself can deliver the goods.

database. Again the dictionary is the key concept. You might, for example, decide to hold your customers' full addresses separately to the customer file itself, this could save space if you have several applications which use the same addresses. In the dictionary for the Cust file you would insert a field called something like Company.Addr which would contain instructions to go off and search the address file whenever a request for Company. Addr is made.

While Pick itself provides all the facilities needed to build many kinds of application, some users may require the greater control of a proper programming language. With Pick you do not have much choice of programming language, but the Basic which comes bundled with the system is very good. Pick/Basic is compiled, and is closely coupled to the database. This means you can get at the same data with either a Basic program or Access commands from the TCL prompt.

Pick/Basic has a number of powerful and unusual file-handling commands. You can read complete records up to 32K long into multi-dimensional arrays. Space is allocated dynamically, so you do not need to declare or dimension arrays beforehand. The virtual-memory management system ensures your program does not run out of space. You can then use the special Pick/Basic string-handling commands to extract, replace or delete fields, or insert new ones.

The Pick/Basic Read command is quite startling in its power. If you want details on a customer called Jenkins, for instance, you can just say:

```
READ C FROM CUST, 'JENKINS' ELSE PRINT "NOT THERE"
```

This will search the file for the name Jenkins, and put Jenkins' record into the array C if it is there, or print out an appropriate message if it is not.

High-level features of this kind make Pick/Basic a quicker language to write in than standard micro Basics. Development is speeded up further by the ability to use Access commands or invoke Proc macros from within the Pick/Basic program; in fact you can issue any valid TCL command. You can use Access commands to do sorts or record selection for you, or pull in a Proc macro to carry out input validation. You can pass variables across directly, using the Pick/Basic Chain command, or just rely on the common Pick file format. Pick is a multi-user system, so Pick/Basic provides file locking at the record level.

Commercially available Pick application software mainly falls into the accounting and vertical-market categories such as ledger and payroll systems or specialised systems for pharmacists, hoteliers or quantity surveyors. What Pick lacks is the vast wealth of generic productivity software that characterises MS-DOS. There are a few word processors and spreadsheets around, such as Jet and Compusheet, but not a wide choice.

For system tools and languages Pick falls far short of Unix. Skilled programmers can work in the machine-independent intermediate-level code used to implement the operating system itself. C is likely to become available in the near future as part of the effort to get Pick running under Unix. But what Pick lacks is other well known high-level languages. If Pick had had a good

You manage your database from the Pick prompt using English-like commands.

(continued on next page)
MULTI-USER STRATEGIES

Pick was taken up primarily by people trying to turn out applications as rapidly as possible. Because Pick was not tied to any specific computer, it could be run on anything from an Apple to a PDP-11, but the best experience would be on a minicomputer. This has obvious benefits in terms of multi-tasking, multi-user applications has grown up round this British operating system and looks at its future prospects.

The operating system can claim a presence in the multi-user market that stretches back many years. The evolution of the company which developed it — is an unusual one which sheds light on the nature of BOS and its associated application programs. Both have a number of unique features.

The name BOS stands for Business Operating Software. The product was originally developed some 11 years ago at the large software house CAP. After a management buyout, the first operating system — confusingly named BOS 5.0 — was launched eight years ago. As its name suggests, BOS was designed from the start for business applications — unlike CP/M or MS-DOS, which grew out of the microcomputer enthusiast movement. The first micros on which it was implemented used antique processors like the 8080 and 6800, distant forerunners of the 80286 and 68000 of today. It also ran on some minicomputers of the time, such as the PDP-11 and the Series/1 IBM.

BOS is written in Cobol, itself a relic from the past. It is unusual enough for an operating system to be written in a high-level language, and it is highly unusual for one to be written in a high-level language, and in this case the language was an interpreted one. Normally this combination would mean an impossibly slow response time, but the Cobol used in BOS has been designed to be very fast.

From the start BOS was designed to be a multi-tasking, multi-user system. Release 5 introduced networking as well, and with it a whole new set of applications can be run. The code is compact enough to fit in around 128K of RAM, although more memory allows a more powerful system to be set up. The disc space required is around 512K.

Just as a mainframe language was used to write the operating system, so a number of mainframe features were taken over into BOS’s design, particularly with regard to file handling. For example, file sizes can be up to 2Gbyte; compare this with the mere megabytes available on many other microcomputer operating systems. The code is compact enough to fit in around 128K of RAM, although more memory allows a more powerful system to be set up. The disc space required is around 512K.

From the start BOS was designed to be a multi-tasking, multi-user system. Release 5.1 introduced networking as well. Because of the nature of BOS, networking and the multi-user systems are set up in a very similar way. It is even possible to run multi-user systems on the network, and pull in data from distant file servers from any of the systems running on a single computer. This has obvious benefits in terms
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have been written by BOS Software itself. As they move from machine to machine, consistency of the approach adopted by the users to retain their investment in software will run on all the machines, even if they are of different types. It is this portability which is perhaps the greatest attraction of BOS. Unlike many other operating systems, BOS is available on a very wide range of micros and minis. For example, BOS has recently appeared in a version running on the Vax. This allows users to retain their investment in software as they move from machine to machine. Another attraction of the BOS range is the ever-wider range of vertical-market packages and supporting more machines. For example, a version of BOS which can utilise the Protected mode of the 80386 chip is imminent. The company also sells some hardware: its AT clone, called Foundation, is a badged version of the Wyse 286 reviewed in the October 1986 issue of Practical Computing. BOS is clearly not a mainstream operating system; it has neither the user base of Unix nor the specific attractions of Pick. Portability is its main virtue, but this is becoming less important as the world of micros splits into separate camps based around the Intel and Motorola family of chips. The Babel of silicon chip architectures which BOS successfully negotiated is thankfully a thing of the past. Ease of upgradability is attractive, but again its allure has been undermined by the latest developments in the chip families which have made code upwardly compatible anyway.

Perhaps BOS's strongest selling points are the software and dealers its particular nature has engendered. Because it uses a form of Cobol, and it was written with future application products in mind, BOS has been attractive to developers of small-scale software products serving small markets. The disproportionately large number of very specialised packages running under BOS encourages dealers to develop detailed knowledge of both the operating system and the range of products it supports. BOS Software claims that a high level of commitment and expertise is what marks out its dealers and makes the BOS family of products so attractive.

BOS is never going to make AT&T quake in its boots for fear of what might happen to Unix. It will probably continue to do nicely in the realm of software for footwear manufacturers, chiropractors and suchlike which it currently inhabits. But with time it is bound to become increasingly marginal as far as the main thrust of the multi-user market is concerned.
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EXPANSION CARDS

It is now possible to transform your PC into a totally different animal to the one you originally bought simply by fitting a selection of expansion cards. Although this approach makes little or no economic sense if you are building up a system from scratch, it is a measure of just how sophisticated the add-on board market has become. It can also be a useful way of giving a new lease of life to old kit. The boards now on the market can be split into five main groups: multi-function, expanded/extended memory, display, modems/communications, and accelerator boards.

While PC manufacturers produce their fair share of expansion cards it is left to the specialist third-party manufacturers to come up with the really innovative devices. Some of these companies have achieved such success in this previously small sector of the market that they have turned into PC manufacturers themselves. AST started the board revolution some five years ago, and has recently launched a very creditable AT compatible, the AST Premium. This machine manages to stand above the rest of the AT crowd largely on the strengths of features developed from AST's memory and display board experience.

Multi-function units are now cheap and plentiful, but the need for them has declined because more and more PCs are fitted with the maximum 640K of memory that can be addressed by MS-DOS. If the motherboard cannot accept this quantity of RAM, then multi-function cards provide a cheap and quick way of expanding conventional memory to this level. They also offer extras like serial ports, parallel ports and clock/calendars as an additional incentive to the owners of the more primitive PCs.

Going beyond conventional memory has proved more lucrative for the board manufacturers in recent times. Lotus, Intel and Microsoft started the ball rolling with their joint development of the Intel Above Board. This product enables certain applications to run simultaneously on a fully populated EEMS system. The trouble with EEMS is that few software houses have pledged outright support for it, but AST and Quadram claim that it is EMS compatible and should run any packages intended for the LIM system.

Both EMS and EEMS are somewhat messy solutions to the constraints imposed by MS-DOS. The way forward must lie with extended memory systems which exploit the Protected mode of the Intel 80286 processor used in the AT and its compatibles. This system supports at least 8Mbyte, depending on hardware, and when in place is invisible to current versions of DOS. It is there waiting for OS/2 when it arrives, later this year or early next. In the meantime all users will have to content themselves with using Extend Memory Systems to set up massive RAM discs and print spoolers.

Display adaptors get more and more versatile as the months go by. Latest offerings from AST and Quadram support all known standards, including IBM text (MDA), Hercules, the CGA and EGA colour-graphics formats, and a few specials thrown in for good measure. The old MDA system has now been laid to rest by all but the most stingy PC manufacturers. The Hercules monochrome standard which has replaced it is now supported by 98 percent of applications packages.

Board modems are a relatively new addition to the card manufacturers' repertoire. It took a lot longer than anticipated for these devices to get the essential BABT approval, but now that they are at last officially blessed they look a particularly tidy way of providing comms hardware. There are no power wires to worry about, the card does not use up one of the existing serial ports, and it can be moved around as an integral part of the PC.

Accelerator boards boost performance by replacing the PC's processor and memory with a more powerful setup, usually boasting a processor from the next generation up. This means that an 8086 machine gets the Intel 80286, and an 80286 machine gets the 80386. Accelerator boards can certainly give a performance a tremendous shot in the arm, but in the process they can throw up compatibility problems too. It is at present an expensive option compared to the cost of selling your original PC and buying a more powerful machine. But with respected names like Intel offering their own accelerator boards it is a market that has to be taken seriously.

Although the board market has been extremely buoyant in recent months, IBM's announcement of the PS/2 looks set to stifle development, temporarily at least. It must inevitably take some time for the dust to settle. When it does, a new breed of add-on boards will emerge, but until then manufacturers will have to rely on existing products to keep their businesses turning over.

**SUPPLIERS**

**Allcard** All Computers, Prince Rupert House, 64 Queen Street, London EC4R 1AD. Telephone: 01-248 8895

**Hayes 1200B** Hayes Microcomputer Products, 1 Roundwood Avenue, Stockley Park, Uxbridge, Middlesex UB1 1AE. Telephone: 01-848 1858

**Hercules Graphics Card Plus, Intel Above Board, Intel Inboard 386/AT First Software, Intec 1, Wade Road, Basingstoke, Hampshire RG24 1NE. Telephone: (0256) 463344

**Irma** Computer Marketing, grea House, Lansbury Estate, Lower Guildford Road, Knaphill, Surrey GU21 2EW. Telephone: (04867) 4555

**Mountain Drive Card** P&P Micro, Todd Hall Road, Carrs Industrial Estate, Huddersfield, Rossendale, Lancashire BB4 5HU. Telephone: (0706) 217744

**Number Smasher** Microway, 32 High Street, Kingston-upon-Thames, Surrey KT1 1HL. Telephone: 01-541 5466

**Quadram EGA Prosync** Interquadram, 653 Ajax Avenue, Slough, Berkshire SL1 4BG. Telephone: (0753) 34421

**Sixpak Plus** AST Europe, AST House, Goat Wharf, Brentford, Middlesex TW8 0BA. Telephone: 01-568 4350
ALLCARD

THE Allcard uses an unusual approach that allows direct addressing for up to 952K of RAM in addition to powerful extended-memory capabilities. It works in a similar fashion to the PC/AT's memory-management unit, acting as a preprocessor to the CPU. By adding four bits to the beginning of the usual memory address it enables the resulting 24-bit address to access up to 10Mbyte of RAM. The most interesting aspect of the Allcard is the way it reconfigures the memory map, so that on power-up the operating system does not see the 640K barrier and will initialise memory up to 952K.

PRICE: £595 for 512K RAM

FOR: Conventional memory to 952K. Extended memory.
AGAINST: Does not conform to an accepted standard.

AST SIXPAK PLUS

PROBABLY the best known multi-function expansion board. It can expand PC/XT memory by anything from 64K to 384K, bringing it up to the full 640K limit. Also included on the board are an extra serial port, a battery-backed clock/calendar, a parallel port and an optional games port for use with joysticks. Along with this wealth of hardware AST also throws in some useful software, including Desqview, a multi-tasking environment that enables you to run several applications packages concurrently. Also supplied is the Sidekick desk-top manager, Superdrive RAM disc and Super $pool print spooler.

PRICE: £470 for 384K RAM

FOR: Good value for extra facilities.
AGAINST: Conventional memory only.

HAYES SMARTMODEM 1200B

THE 1200B is a plug-in board version of the popular Smartmodem 1200 that offers 1,200/1,200 baud CCITT V-22 compatibility. The card simply plugs into an eight-bit expansion slot and does not require external power. The 1200B features autodial/auto-answer, call-progress monitoring, and both tone and pulse dialling. It is available bundled with Smartcom II communications software for a competitive £475; Smartcom is a full-feature menu-driven communications package which supports batch commands, multiple protocols and terminal emulation. The 1200B is sold with a two-year warranty, and you have the option to extend it for a further two years. Hayes operates a customer-service facility during normal office hours.

PRICE: £425

FOR: Tidy installation. Does not occupy existing serial port.
AGAINST: No status LEDs.

HERCULES GRAPHICS CARD PLUS

THE NEW Graphics Card Plus, which is 100 percent compatible with the original Hercules card, includes a powerful facility called Ramfont. It is a monochrome-only board, and offers resolution as before of a healthy 720 by 348 pixels on all applications packages that have a Hercules-compatible screen driver. Ramfont adds the capability to display characters ranging in size from eight by four pixels to nine by 16 pixels. When used with Lotus 1-2-3 release 2, for example, this can double the size of the visible section of the spreadsheet. The same facility can also be used with Microsoft Word 3, Framework and Symphony. Included with every card is software to extend the life of your monitor, print graphics and display 25 ready-made character fonts. The Graphics Card Plus also includes a parallel port.

PRICE: £245

FOR: Hercules compatible. Ramfont facility.
AGAINST: Monochrome only.

INTEL ABOVE BOARD

THE board that kicked off the LIM EMS standard. Although not as powerful as EEMS boards from AST and Quadram, boards that conform to the Intel standard can claim more widespread support from software houses. Lotus 1-2-3 was one of the first spreadsheets to support the Above Board, followed by SuperCalc 4. Other supporting packages include Symphony, Framework and Microsoft Windows. By the use of memory paging, the Intel Above Board allows supporting applications to break the 640K barrier. This facility is particularly useful for creating and manipulating ultra-large spreadsheets. Each memory board can support up to 2Mbyte of RAM; a maximum of four boards can be installed.
in a PC to provide a grand total of 8Mbyte. The extra memory can be used in expanded mode or as a high-speed RAM disc. **PRICE:** £615 for 512K RAM

**FOR:** The standard for expanded memory. **AGAINST:** Not as powerful as EEMS.

**INTEL INBOARD 386/AT**

It is claimed that this board offers AT users the performance of 80386-based machines such as the Jarogate or Compaq DeskoPro 386. The Inboard 386/AT carries an Intel 80386 processor running at a sprightly 16 MHz, along with its own 1Mbyte of RAM. A further 2Mbyte can be added piggyback fashion, and the 80387 math co-processor will be available later on this year. Applications concurrency is another carrot being dangled in front of users, but once again this is on the list of goodies that has yet to be released. The Inboard plugs into any AT expansion slot, but in addition you have to remove your machine’s original 80286 processor and replace it with a special plug which hooks into the board’s 80386 chip. **PRICE:** £1,158

**FOR:** Micro-to-mainframe communications standard. **AGAINST:** Cost. Complexity.

**MICROWAY NUMBERSMasher ECM**

Compatibility problems tend to dog more sophisticated accelerator boards, but the Numbersmasher sets out specifically to avoid them. It amounts almost to a self-contained micro with its own processor and memory on one board. All the processing is done on the board, leaving the PC’s own motherboard to carry out only basic I/O functions. The Numbersmasher is equipped with an Intel 8086 processor, which can run at up to 9.54MHz, coupled to an 8087 arithmetic co-processor and 1Mbyte of full 16-bit memory. In normal operation the performance of a Numbersmasher-equipped PC lags behind the IBM PC/AT, but when the Intel 8087 comes into play the hybrid setup outperforms the AT. **PRICE:** £569

**FOR:** Performance. **AGAINST:** Potential compatibility problems.

**MOUNTAIN DRIVECARD**

As the price of built-in hard discs has dropped in the past year, the price of a hard disc and controller combined on to a PC expansion card has fallen too. The Mountain range is one of the more expensive, but it has an excellent reputation for reliability and support. It is available in both 20Mbyte and 30Mbyte capacities. A Mountain card simply plugs into an eight-bit expansion slot and then requires installation using the software provided. It is thick enough to encroach on the space of the neighbouring slot, so it must be installed next to a half-length card or an empty slot. Performance is good, though not up to the standard of conventional sub-systems available at much lower prices. However, hard-disc cards allow you to retain two floppy's along with your hard disc, and many users find this ample compensation for lacklustre performance. **PRICES:** £795 for 20Mbyte, £995 for 30Mbyte

**FOR:** Convenience. Ease of installation. **AGAINST:** Rather sluggish.

**QUADRAM EGA PROSYNC**

Support for two additional EGA modes is provided by the Quad EGA Prosync advanced enhanced graphics adaptor when used with Multisync monitors. The 640-by-480 and 752-by-410 modes allow up to 37 percent more data than normal to be displayed on the screen. The EGA Prosync also supports conventional EGA monitor display modes, including 640-by-350, 320-by-200, 720-by-348 monochrome Hercules and 640-by-350 monochrome IBM text. While other adaptors demand complex installation procedures, Prosync’s Autoselect system automatically selects the correct viewing mode for many popular applications. Other useful features include softfont character generation, a screen saver and flicker-free scrolling. **PRICE:** £349

**FOR:** Multi-mode compatibility. **AGAINST:** Cost. Needs special monitors.

**IRMA**

For those with the problem of accessing a mainframe system from a micro, the Irma board provides a powerful solution. It adds to the IBM PC, PC/AT and compatibles the features of an IBM 3278 terminal, thus offering a direct link to an IBM mainframe without sacrificing any of the PC’s stand-alone functions. The 3270’s coaxial type of interface is easy to install and supports 11 possible IBM keyboards and several different screen formats. File-transfer utilities are included for WM/CMS and MVSTSO; both provide a binary mode to transfer files containing special symbols, such as those found in BAS programs. Irma can be connected directly to any 3274 or 3276 cluster controller with supports SNA, non-SNA and BSC environments.

**PRICE:** £2,425

**FOR:** Performance. **AGAINST:** Price.

**NUMBERSMasher PROSYNC**

Enhanced graphics adaptors demand complex installation procedures, but the Numbersmasher Prosync’s Autoselect system automatically selects the correct viewing mode for many popular applications. Other useful features include softfont character generation, a screen saver and flicker-free scrolling. **PRICE:** £1,995

**FOR:** Multi-mode compatibility. **AGAINST:** Cost. Needs special monitors.

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BIG BLUE
By Richard Thomas DeLamarter ● Published by Macmillan London Ltd, £14.95 ● ISBN 0 396 08515 6

IBM DOMINATES the information-technology industry — too much so. This is the premise behind Big Blue. The author, Richard DeLamarter, worked for the anti-trust division of the US Department of Justice for eight years in the case of the US v IBM. The case was finally dropped by the Reagan administration in 1982.

This clearly made DeLamarter bitter, and in the book he presents the evidence for the prosecution which was denied a Federal hearing. Using a wealth of information, a lot of it culled from IBM's own files, DeLamarter sets out to prove his case.

The nub of his argument is that IBM uses its power to squeeze excessive profits from the areas where it maintains a near-monopoly position. The cash generated from the monopoly business is then used to wipe out rival companies in those areas where it faces competition — even where those rival products are superior.

DeLamarter also claims that IBM does everything in its power to evade scrutiny by anti-trust investigators and, while paying lip service to the concept of standards, attempts to circumvent them if they lead to a threat to its position as dominant supplier. The author ends the book by predicting that IBM is poised to take over the world communications industry too, and makes a plea that IBM be dismantled for the good of the information-technology business and all those it affects — that is, every one of us.

DBASE

THE DBASE III COMPANION
By Peter Gosling ● Published by Paradigm, £5.95 ● ISBN 0 948825 05 7

The great advantage of Peter Gosling's book is that it is short; it has 130 pages, but they are not very big. Most DBase books are massive, which makes them quite unsuitable if all you want is a quick guide to what DBase is all about.

Gosling is excellent for this. He writes well, using simple examples which he changes frequently to fit the problem in hand, so that they do not get tedious. He always gives the output you would get from typing in a particular piece of DBase code, so you do not need to have a machine running DBase in front of you while you read.

Quickly you can almost read The DBase III Companion like a novel — it should take an hour or two at the most. For this reason, it is a good book to get if you are not sure if you could handle the complexities of DBase and just want a flavour of the system. It is a good deal less intimidating than the colossal DBase III user manual, so it should also help anyone who has had the package thrust upon them, unasked for.

DBase is far and away the most widely used database package. Gosling's book is probably worth the £5.95 if you feel you would like to be able to type at least something sensible when confronted by the DBase dot prompt.

DTM

THE DESKTOP PUBLISHING COMPANION
By Graham Jones ● Published by Sigma Press, £14.95 ● ISBN 1 85058 078 2

In his introduction, Graham Jones says that The Desktop Publishing Companion is a book about publishing rather than computers. This is certainly true and he writes as much about the general publishing process as he does about desktop publishing (DTP) in particular.

The author does tackle problems such as what hardware to buy and how to go about choosing a DTP package. However, he takes the wise line that just as no word-processing program will make an illiterate into a Shakespeare, neither will a DTP program make a novice into a Harald Evans. He feels that anyone using a DTP package will have to learn as much about designing, planning and distributing their document as about how to use a particular program.

The book discusses the pros and cons of different machines and packages, giving synopses of how different packages work and what purposes they are best suited for.

He even advises that you may want to use not just one package but a few, exploiting the advantages of each. He also writes about what ancillary equipment you might need, such as laser printers, image scanners and so on.

Much of the book is given over to tips on how to lay out pages — complete with sample layouts to follow — positioning graphics, use of typography and the like. It also gives basic guidelines on writing and the finer points of production, such as where to hyphenate words and how to write headlines. It even looks at the legal aspects of publishing, giving advice on copyright and libel. To finish, there is a helpful chapter of source material which gives addresses of distributors, companies running training courses and publishers of relevant magazines.

This is an extremely useful book: not only does it look at the computing side of DTP, it also makes readers aware of the world of publishing beyond the bounds of the PC or Mac on their desk. Anyone producing anything using a DTP system — from a newsletter to a book or brochure — should find it worth reading.

PCs FOR BEGINNERS

USING MICRO COMPUTERS: APPLICATIONS FOR BUSINESS
By J Wayne Spence and John C Wendler ● Published by Blackwell Scientific Publications, £23.50 ● ISBN 0 8016 4778 9

As a matter of fact, the authors adopt to explain things. It claims to be a practical introduction to using a micro as a business problem-solving tool. The problem is that the book appears to be aimed at students and sixth-formers, and many of its examples are geared to such a readership.

The authors follow the trials of a fictitious character called Chris who has just started a new job. Each chapter is preceded by a scenario which details the authors' job. The book meets various friendly employees

MANTENANCE

TROUBLESHOOTING AND REPAIRING THE NEW PERSONAL COMPUTERS
By Art Margolis ● Published by John Wiley and Sons, £18.05 ● ISBN 0 8306 2809 6

There is an apocryphal story that went the rounds a few years ago about a man who decided to make his home computer go faster by attaching a speed of your disc drive, attaching all kinds of gizmos to chips, and desolder surface-mount devices. The consequences of mistakes hardly need to be spelt out.

This is not to say that the book is without merit. It gives detailed explanations at the transistor level, of how processors, RAM, ROM and support chips work. It is worth reading by anyone interested in how their computer works at the electronic level, although many of the early pages contain very basic information.

Although published this year and claiming to take in the Macintosh, IBM PC and Amiga micros. It is obvious that the book is a rewrite of one that Margolis wrote some years ago, as there are frequent references to the TRS-80 and Vic 20 computers. All the same, it is a worthwhile read, as long as you hide the soldering iron before you start.

You can almost read The DBase III Companion like a novel — it should take an hour or two at the most. For this reason, it is a good book to get if you are not sure if you could handle the complexities of DBase and just want a flavour of the system. It is a good deal less intimidating than the colossal DBase III user manual, so it should also help anyone who has had the package thrust upon them, unasked for.
BOOK REVIEWS

(continued from previous page)

who offer to show him their spreadsheet and recommend courses in computing for him to go on. By being super-keen and managing to solve every problem he comes across using a micro, Chris rises through the company without ever being promised promotion. He is then approached to join another part of the company.

If you can tolerate the American flavour of the book and reading about creepy Chris, it might be worth a look. It contains many illustrations and colour photographs, and there are detailed explanations of subjects ranging from operating systems to computers. The author also introduces many of the popular packages, including WordStar, Lotus 1-2-3, dBase II and III, and the PFS products. Also the idea of setting a business-oriented problem which has to be solved by using a particular application is a good one. But whether busy people can spend their time wading through the 678-page book to sift out the relevant information is another question. Chi

What he has really got it in for is the term "information", as in "the information society", "information technology" and so on. He thinks these phrases are often deliberately used to conceal the real nature of the changes that are going on. Roszak is also worried about the corrupting effects of the school micro on the nation's youth. It seems to me that the main weakness of Roszak's argument is that the more contact people have with computers, the less tendency they have to venerate them. They rapidly appreciate that the machines are basically very simple-minded and that the cleverness resides in the human-written software. The fascination of computers to anyone who gets seriously involved with them is that at a deep level they are so obviously creations of the human mind. But the book is well worth reading for the observations and - I hate to say it - the information it imparts along the way. Roszak is a professor of history, and in developing his argument he lays out a very good informal history of the evolution of the computer industry.

He describes Shannon's pioneering work on information theory, the rise of IBM-style corporate computing and the counter culture of micro users. None of these things impresses him much, but he really gets into his critical stride with the development of the notion of artificial intelligence and the educational ideas of people like Seymour Papert.

Sometimes the book rings true, as when it describes the way politicians and corporations have increasingly resorted to the tactic of swamping the citizenry with more raw data and supposed facts than they can possibly absorb. Very often this successfully confuses and conceals the real issues, allowing those in control to retain the initiative.

But most of the time I feel Roszak is getting worried about an antique notion of computing - big centralised machines which work with masses of data and require everybody to adapt to their way of doing things. This is data processing 1950s-style. True, a lot of it still goes on, but hopefully the arrival of cheap, small computers and the idea of the personal-productivity tool has decisively shifted things in another direction. 15

Reviewers this month: Carol Hammond, Steve Malone, Ian Stobie.
FILE-SIZE TOTALS

If you regularly back up your hard disc on to floppy's this program by Jim Bates will help you ensure that you make economical use of your disc space.

HOW DATA IS STORED ON A FLOPPY

The standard floppy disc on an IBM PC is double-sided with 40 concentric circular tracks of recorded data on each side. Each track is divided into nine equal sections, called sectors. Thus each disc has 360 sectors per side or 720 sectors altogether. Each sector contains 512 bytes of data, so the total capacity of a floppy disc is 368,640 bytes.

Not all of this space is available for data storage. When a floppy disc is formatted for use under MS-DOS, certain pre-specified areas are set aside for special purposes. The very first sector on track zero of side zero is used to indicate to the computer what type of disc it is dealing with. It contains details of the type of system that the disc should operate with — MS-DOS in this case — whether the disc has an operating system on it, and so on.

The next four sectors contain the File Allocation Table (FAT), which is a sort of street map of available space on the disc. The FAT is used by the operating system to decide where to put data when new files are added. The next seven sectors are the directory sectors, and they contain an index of the names of all the files on the disc together with details of the size and location, and the date and time that each file was last updated. The remainder of the disc is available for data storage, though if the disc has been formatted with the /S option several sectors will contain the relevant system files. Thus, of the original 720 sectors only 708 are available for data storage. Multiplying this by 512 will give you the familiar figure of 362,496 bytes which you see whenever Chkdsk is run on a floppy.

MS-DOS allocates space on a disc in blocks called clusters or allocation units. On IBM PC floppy's the cluster size is two sectors or 1,024 bytes. This means that when a file is copied on to a floppy disc it will occupy a number of clusters large enough to contain the file.

You can see this for yourself by doing a simple experiment. First format a floppy disc — without the system files — and then run Chkdsk to ensure that you do have 362,496 bytes available. Now copy any file smaller than 1,024 bytes on to the floppy, and type Dir to produce a directory listing. You should see your small file name listed and the available bytes shown as 361,472, or 1,024 bytes less than you had before.

This seems to indicate that with 354 clusters available on the disc, copying 354 files of one byte each would fill the disc, since each file would occupy one cluster. However, there is a further complication, since each file name along with its associated data will occupy 32 bytes in a directory sector. Although the disc can store 354 separate clusters, the seven directory sectors can only hold 3,584 bytes or 112 file name entries. One of these entries would be the volume name of the disc if the /V option was used during formatting. The net result is that if you have more than 111 files to copy, and they are all less than three clusters in size, you will fill the directory before you fill the disc.

This limitation on the number of directory entries is not considered serious on floppy discs, but it can be a nuisance when dealing with large numbers of small files. One way around it is to create a sub-directory on the disc and copy files into that. A sub-directory is actually a file laid out in exactly the same way as the directory sectors. The difference is that it is not limited in length in the same way as the directory, so up to the limit of disc capacity you can list as many file names as you wish.
TD.ASM ASSEMBLER LISTING

COMMENT

This program is designed to produce a byte total of the sizes of all specified files, corrected for allocation units.

*************************************************************************

EQUATES
CR EQU 13 ; Carriage Return character
LF EQU 1F ; Line Feed Character
CM EQU 21H ; Name DISPLAY Function (to display contents of DL)
DISPLAY EQU 28H

*************************************************************************

CODE SEGMENT

MAIN PROC FAR

ORG 18BH ; MUST BE 18BH FOR .COM FILE

BEGIN: JMP START

************************************************************************ *

MESSAGES

MSG# DB 'BATES Associates' ; File Size Totalizer Version 1.36'
MSG#1 DB 'Can',39,'t total just one file!
CRF DB CR,LF,'Selected Files are :-'
TOT MSG DB CR,LF,'$'
NF MSG DB 'Can',39,'t total just one file!
CRLF DB CR,LF,'$'

*************************************************************************

END OF PRIMARY DATA AREA

*************************************************************************

EQUATES

ASC TOT DB
FIL TOT DB
TOT_MSG DB
NF MSG
CRLF

BEGIN:

MAIN CODE starts here -

START:

LEA DX,MSG# ; Display Sign on message
MOV AX,90H
INT 21H
MOV SI,OFFSET CMD ; Source to Command Line
INT 21H
LEA DX,DIPTOT ; point to File Control Block
MOV AH,04H
; Function Call 29H
INT 21H
PUSH AX
POP AH
MOV AL,71
INT 21H
Call Command Line to FCB

ERROR!

LEA DX,MSG#1 ; Only one file!
INT 21H
MOV AX,90H
INT 21H
ERROR!

MAIN ENDP

*************************************************************************

UTO LITIES

*************************************************************************

SUBROUTINES

*************************************************************************

GET_FILES:

READ DB

*************************************************************************

ADD SIZE:

*************************************************************************

ADD_FILES:

*************************************************************************

PRIVATE SUBROUTINES

*************************************************************************

SHOW NAME:

*************************************************************************

ASSUMING that a correct command tag was entered, the routine Get_Files is called. If it returns

(continued from previous page)

a program should look like. On the other hand, the eight blanks at the start of the Display message are not replaced; the relevant numbers are simply inserted as calculations are completed.

The first part of the code after the message area at Start begins by displaying the data recovered from the disc (MSG01). The program then uses a new function call into interrupt 21hex. This is function 29hex, which will sort out a file name into a form that other DOS functions can use. Various options are available with function 29hex, but the only one of interest here builds a complete file specification from a string containing the global characters * and ?.

Function 29hex is used to build a complete file specification from the string addressed by DS:SI into the area addressed by ES:DI. In a full program, all segment registers are set to the current code segment and so can be ignored. SI is set to point to CMD, and DI points to the File Control Block (FCB). Function 29hex will return a code in register AL to indicate the result of the interrupt. The result 01 indicates that global characters were used in the command line, and so a check is made to see if it is present; if it is not, the program must abort with an appropriate error message. This is done by the JNZ Error instruction, which will display the message MSG01 before terminating execution and returning to DOS.

Assuming that a correct command tag was entered, the routine Get_Files is called. If it returns with 01 in AL, then no matching files were found and the program displays an appropriate message and terminates. Get Files is very similar to the routine used in the Prompted Delete program, except that in this instance I decided to set up a special buffer called the Disc Transfer Area (DTA) for accessing the data recovered from the disc directory.

The first part of Get_Files uses function 2DHex to collect and store the existing DTA into the four bytes at label Old_DTA. This
should be address 80hex in the program's own code segment, but since you can never be quite certain of anything in writing assembly language, it is collected and saved for restoration later. The DTA can now be set up by putting the address into DX — actually DS:DX — and calling function 1Ahex to set it.

Now the program is ready to start looking for files. It searches for the first one by using function 1hex as last month, and checking for zero in AL. If a file is not found, AL is marked with a 01 and the program returns from the Get_Files subroutine. If the first file was found, you can branch ahead to Get_Next where the Add_Size and Show_Name routines are called.

Processes then return to Get_Next, this time using function 12hex to find the next matching file name. The program will continue executing around this loop until AL returns with something other than zero after function 12hex is called. When this eventually happens, 00 is put into AL to show that files were found, and the program returns to the main program code.

As each file name is found, the details regarding that file are read from the disc into the DTA. You can see the Secondary File Area at the bottom of the listing that the DTA is set up in two sections. The first part is 29 bytes long, and the next four bytes are labelled FSize. Thus when the file details are transferred into this area the file-size bytes can be accessed immediately since they have already been labelled.

The first routine that is called when a file has been found is the Add_Size routine. This routine must calculate the number of clusters required to store any particular file. The arithmetic necessary to accomplish this is quite simple. The program first adds a complete cluster, less one byte, to the file size, then divides by the cluster size. This produces a number representing the total file size.
number of clusters required, plus a remainder which represents a number of bytes. The remainder can be ignored since a full cluster — less one byte — was added to start with. The number you are left with represents the number of clusters required to contain the file. The final step is to re-multiply the number of clusters by the cluster size, giving the exact number of bytes in the specified number of clusters.

The coding for this calculation is at the start of the Add_Size routine. The DI register is first set to point to the file-size bytes in the DTA, and the cluster size is collected into the AX register. If you have deliberately set the cluster size into a data area so that more enterprising users can modify it for other values.

Having collected the cluster size, the program decrements it and adds it to the low word of the file size. This addition may cause a carry, which must be added to the high word of the file size, so AX is cleared and the high word added — with carry — to the high word. It is now necessary to divide, so the high word of the file size is put into DX and the low word into AX, for the divide instruction, DX:AX represents the 16-bit divisor value. The divisor — which is the cluster size — is placed into CX, and a Div instruction is issued. This leaves the quotient — equal to the number of clusters in AX, and the remainder in DX. For the multiplication, AX is considered as a single 16-bit value so DX can be ignored. A MUL instruction puts the product into DX:AX, again as a 32-bit integer value.

**ADD VALUES**

All that remains is to add this value to the total of files found so far. I have coded the addition slightly differently this time, just to illustrate that there are different ways of doing the same thing. The low word of the total — which is in TotalW1 — is placed in BX, and the low word of the correct file size, AX, is added to it. This may result in a carry. The result is then replaced in TotalW1. TotalW2 is taken in the same way, and DX is added to it, this time with whatever carry may have resulted earlier, also being replaced. The final step in the Add_Size routine is to add 1 to the value of Files.

The next task is to display the file name on the screen. DTA has the full name of the file that has just been found and totalled, so this can be used for the display. The layout of the file name is slightly different to the normal arrangement. Instead of the familiar Name:Ext construction, the DTA will always contain 11 characters. The first eight are the file name, padded out with spaces if necessary, and the remaining three are the extension, again padded with spaces.

There are many ways to reinterpret this format, but I decided that to keep the code simple I would just add a single full stop between the eighth and ninth characters of the file specification. This splits the name from the extension, leaving the spaces in place. I also decided that the simplest display would be five columns of file names along each line of the screen, rather like the format of the Dir/W listing. This means keeping a count of how many files have been displayed on the current line, and issuing a carriage Return and a Linefeed when five have been shown.

This is all done in the Show_Name routine. First the program increments the displayed file count (FCount). Then it points to the SI register at the start of the DTA and uses the CX register to step up a loop count of 8, for the first eight characters. In this first loop at SNO, SI is incremented to point to the required character, move it into the DL register and call the Display function. You can now see how equating the word "display" to function 2 makes the program easier to read.

**NAME DISPLAY**

Processing continues looping until the CX count is exhausted, thus displaying the first eight characters in the file name. The full-stop character is then put into DL and displayed. The loop routine is repeated at SNI, this time for the three characters of the extension to the file name. Three spaces are then needed to position the cursor ready for the next file name. Finally a check is made to see if five file names have been displayed on this line. If they have not, the routine is exited; otherwise it displays a carriage Return and a Linefeed to move the cursor down to the beginning of the next line, and the value in FCount is reset to zero.

The Get_Files routine continues finding, totalling and displaying unallocated sectors of files. Assuming that files were found, processing continues at ST2 in the main code. At this point, the corrected total of the sizes of all files found have been accumulated in TotalW1 and TotalW2, while the total number of files involved is held in Files.

These answers along with the relevant messages must now be displayed on the screen. The first process is to call the Show_Size routine. It starts by loading the file size in 32-bit binary form into DX:AX and the destination pointer for the ASCII answer into DI. The program can then call the AxeHex2Asc routine. This routine takes the 32-bit number in DX:AX and converts it into ASCII characters representing the decimal equivalent of the number. The AxeHex2Asc routine can in fact be used whenever binary to decimal/ASCII conversion is required.

**REPEATED DIVISION**

Though the maximum number that can be stored in 32 binary bits is 4,294,967,295, but 100 million, the largest number you are likely to encounter when dealing with file sizes is around 20 million. The decimal number 13,742,568 represents one 10-million, plus three million, plus four hundred-thousands, plus four 10-thousands and so on. So by taking the file-size total and dividing it by 10 million you get a quotient that corresponds to the first decimal digit; similarly, dividing the remainder by one million, the quotient becomes the second decimal digit. By repeating this process and dividing the remainders by reducing powers of 10 each time you eventually get all the decimal digits. The only snag with this is that the 8808 processor only allows a maximum divisor of 16 bits or 65,535 decimal. This makes it necessary to divide twice on the initial step — first by 10,000 and then by 1,000, making 10,000,000 in all.

The program enters the AxeHex2Asc routine with the required number and the destination pointer for the answer in DI. First it saves the DI pointer on the stack, and then it completes the division by 10,000. The remainder, DX, is saved on the stack and the program performs a further division by 1,000. AX now has the number of 10-millions; since it will always be less than 15 only the low-byte AL.
This is done three times, sending successively the 1,000, 100s and 10s digits of the decimal number. The final remainder — which is in DI, since it must be less than 10 — is corrected and sent to the destination. There is now an eight-digit decimal number in ASCII format at the destination. The pointer is restored from the stack, and CX is set to count to 7.

### STRIPS ZEROS

The next series of instructions is at Hexloop 2. It checks each digit in turn to see if it is an ASCII zero (0hex), and if so replaces it by a space. If it is not a zero, processing exits the loop, leaving the rest of the destination buffer intact. This effectively removes all leading zeros except the last one, to give a neat buffer capable of immediate display. The destination has been set to the Asc.._Toc section of the message, so when the whole message is displayed the numbers are already filled in.

The same process is completed in the Filnum routine, with the exception that only three digits are checked for zero suppression. There is one extra instruction that swaps the contents of the DI and DX registers. It has no effect during Filnum, but is used by the Divide routine to indicate the position in the destination buffer where the decimal point will be placed. Each time that the Filnum routine is completed, on exit DX contains the position reached in the destination buffer.

The Divide routine produces a number with two decimal places indicating the number of floppy discs required. This is achieved in a similar way, except that this time it is necessary to divide by the capacity of a floppy disc, which is way above the 16-bit limit: the actual number in hexadecimal would be 058800. In this case, it is convenient to shift the divisor right by eight bits, and then to shift the quotient by the same amount. The arithmetic equivalent of this is division by 1/256th of a floppy, and then division by a further 256. There is no need to do an explicit division here though. All you have to do is access the high byte in AH and convert it to ASCII via Filnum.

### HOW MANY FLOPPIES?

Once the integer section of the answer from AH has been shown, the position in the destination buffer must be restored to DI and then used to send a decimal-point character. The final arithmetic operation recovers the complete quotient of the previous division, zeros the AH portion of it and the whole of DX, remultiplies it and adds back the previous remainder to give the number of bytes required on the remaining floppy disc. This figure is divided by 100 decimal, giving the number of hundreds of a floppy for conversion to ASCII and eventual display.

When it returns from the Divide routine, the program displays the completed final message and puts things back as it found them by resetting the original DTA. Function 4Chex is used to exit instead of interrupt 20hex. It is the MS-DOS approved way to end a program, since it completes a certain amount of tidying up and can also be used to return an error code to the calling program. If you have version 1 of MS-DOS you should use interrupt 20hex.

All the programs in this series are available on IBM-formatted discs at a cost of £5 for each program. Each disc contains the assembler source code, the assembled program and a document file describing the operation of the code in detail. Please send your order to Jim Bates, c/o Practical Computing; cheques should be made payable to Jim Bates.

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