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COVER FEATURE



PERFORMANCE ENHANCEMENT

Micros with 80386s and 68020s are all very well if you are buying now, but what about if you are stuck with an old IBM PC or Mac? We survey the range of add-ons that can turbocharge your old hardware. On page 90 there is a review of IBM PC add-ons, followed by software superchargers on page 95. In the Macintosh section we look at ways of making the machine go faster and the screen get bigger **89**

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WAITING FOR AI

HAL, as you will recall, was the intelligent computer in Stanley Kubrick's film *2001* which got too big for its boots. This was rather appropriate for a machine whose name came from the initials "IBM" shifted back by a letter. In an act of hubris, Lotus has used this name for an add-on to its best-selling 1-2-3. As we describe in the review on page 64, HAL lets you enter English sentences instead of the normal 1-2-3 commands. It is very clever, but not by any stretch of the imagination intelligent, unlike its namesake.

It is quite possible that its successor, if it has one, will be. An obvious enhancement of the product would be to replace the conventional typed input by voice commands. Current voice-recognition techniques, as used in systems from companies like IBM and Kurzweil, can just about manage the 800 words allowed by HAL. Moving across from one input medium to another would be relatively straightforward.

Even if HAL remains without this added intelligence, it is very likely that Lotus will bring out other products which use similar techniques. For example, there are rumours of a word processor which makes extensive use of AI techniques to help you with spelling and synonyms. After all, something must come from the millions of dollars Lotus must be spending on research each year.

The gulf between HAL fact and fiction provides a neat reminder that the long-awaited revolution of artificial intelligence (AI) has still to arrive. All those super-friendly front ends which would guess your every wish even before the thought had formulated itself in your mind; all the voice-activated spreadsheets and databases; all the expert systems which would make everyone redundant: all of them are conspicuous by their absence.

There was a period a couple years back when it seemed that we might indeed be on the brink of a new era. There was a spate of expert-system shells — mostly very expensive — as well as voice-recognition units from firms like Texas Instruments and Votan. The less said about the Apricot Portable and its voice input, the better.

After this spate of products signally failed to deliver the goods, a weary scepticism set in which prevails to this day. The question is no longer AI when? but AI what? Yet things may be changing. It is not that there have been any breakthroughs in software, though these may come in time. At the moment it is the advances being made in hardware that look like turning AI into a reality.

The arrival of the 80386, 68020 and now the 68030 have taken the performance of micros into the realm of minis. Once prices drop through the floor in the way they have with the 8088 and now 80286 machines, we will be able to take this kind of power for granted. Those fabulous front ends — which incidentally will probably require at least an 80386 or even 80486, and megabytes of memory — will then arrive.

Unfortunately this is only a stopgap measure. The basic problem is the von Neumann architecture of today's machines. That is, the fact that the central processor works on only one task at a time. The only way to get performance improvements is to make the chips bigger — go to 32 bits for example — or make them faster. It blithely ignores the fact that however fast a single chip is, it is simply inappropriate.

The correct solution is likely to involve some form of parallel processing, where a task is shared out between a number of computers — possibly thousands of them — which are programmed as one. Not only does this allow almost unrestricted expansion possibilities, unlike conventional computer architectures, it also seems to fit certain applications very well.

One such application is AI. Running AI programs on von Neumann machines is a painfully slow business. But with parallel processing the problem can often be mapped on to the architecture very naturally, with a resulting improvement in performance.

Nor is parallel processing a pipe dream for micro users. It is true that much of the research going into this area is aimed at producing supercomputers which leave the Cray class machines dead. But a multi-chip parallel processor can have low-end models as well as top-end. For example, N-Cube, an Oregon-based company, produces a four-processor device which hooks up to an IBM PC/AT. Each of the extra four chips has the power of a DEC Vax mini. The cost is a mere \$10,000. Nearer home we have the Inmos Transputer, now available as an add-on for a range of micros.

AI will probably make the big breakthroughs it promises, but not until the hardware is available. That hardware will almost certainly be a desk-top machine using parallel processing.

5 YEARS AGO...

A 16-bit desk-top microcomputer extends the present Texas Instruments range down into the most competitive sector of the market. Texas Instruments has called the computer the Business System 200 and it is the first of a new range of small-business systems planned by the company. The machine is a small desk-top, single-user computer based on the 16-bit TMS-9900 microprocessor chip.

The Business System 200 is designed to be compatible with other, up-market Texas computers, including the more expensive multi-user machines. The machine will retail at less than £5,000 and offers 64K user RAM, a display, keyboard and processor.

There are four models in the initial range and they differ from one another only in disc storage capacity — the 220 has twin double-sided, double-density discs providing 1.2Mbytes. At the top is the 251 with two Winchester hard-disc units as well as 8in. floppy backup, giving a total of 11.2 Mbytes of on-line storage.

PC Volume 5 Issue 2

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Win a week in California and meet the head of Borland, Philippe Kahn, in this amazing competition. There are 10 second prizes, each worth well over £1,000, consisting of all the current Borland products. Don't miss the details and entry form in next month's issue.

SOFTWARE

After word processing comes hypertext. We review *Guide*, a new product for the Macintosh which lets you cross-reference text, expand and compress it — you can even make your documents interactive. And following our painful experiences this month with disc optimisers, we try out the alternative approach and examine caching software. Is it any better?

HARDWARE

Once again, the Japanese are making an assault on the PC market. We review a pair of high-quality AT clones from Panasonic and Sharp. There is also a look at a product which packs voice recognition, telex and more on to one board.

SPECIAL SECTION

PRESENTATION GRAPHICS

As the business software market matures, people are moving on from simple word processing and spreadsheets to more sophisticated applications. In particular, presentation graphics are becoming increasingly popular. We look at the whole range, from top-end products to some of the cheap programs designed for the Amstrad.

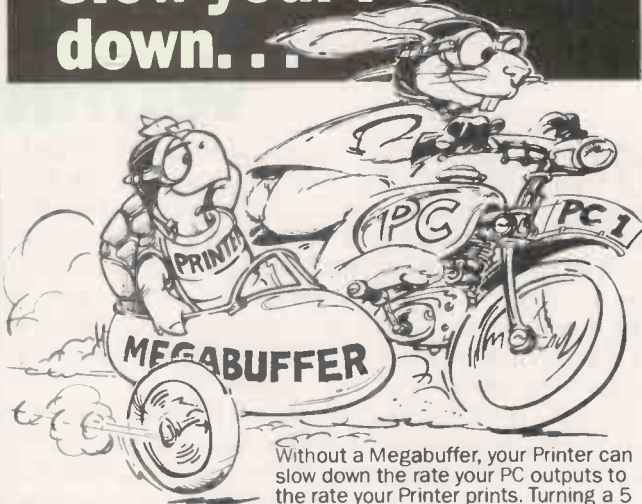
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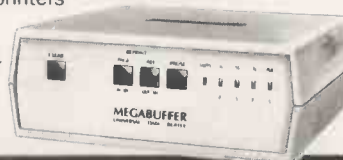


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BT M-5000

BRITISH TELECOM is offering a range of PC-compatible micros. The M-5000 series covers the range of PC and AT machines and is intended for use as part of BT systems and communication products, such as call management.

The machines are manufactured in Eire and badge engineered from Zenith. They are available as single-floppy, twin-floppy or 20Mbyte versions. Prices start at around £2,400.

Details from British Telecom, British Telecom Centre, 81 Newgate Street, London EC1A 7AJ. Telephone: Freephone Merlin.

Advanced Network for Torus

THE Torus Icon and Tapestry local area network software is now able to run under Novell's Advanced Network. Torus claims that this will allow users access to the Torus system while exploiting the power of the Network products.

The combined system is known as the Torus Network Integration Option. It allows Network to install a powerful file server on Ethernet running Icon, or on IBM's token ring network running Tapestry. The Torus Network Integration Option costs £75.

Torus has also reduced the price of the Tapestry network software. The Tapestry Workstation Pack now costs £300. For further details contact Torus Systems Limited, Unit 32, Science Park, Milton Road, Cambridge CB4 4BH. Telephone: (0223) 862131.

Talking PC

ISRAELI company Alfa Gat Ltd is to introduce a PC-dialler which can produce spoken messages. The device, known as the Mul-T-Dial allows the user to prepare digitised messages for later transmission across the telephone network.

The system consists of a short-slot card and the necessary software. It can store and dial several numbers and detect whether the line is engaged, with the option of calling back later. The user can store a digitised message either in memory or on hard disc.

For further information contact Alfa Gat Ltd, Dizengoff Centre, POB 23142 Tel-Aviv 61231, Israel. Telephone: (010 972) 03-284743.

U.K. LAUNCH FOR IBM CONVERTIBLE LAP-TOP

IBM started shipping the Convertible lap-portable computer in its U.S. version in December 1986. The U.K.-specific models of the computer, to be built at the plant at Greenock, are planned to come on to the market in April 1987.

Three models are announced. The differences between them are only in the software; the hardware is identical across the range. Model 1 is provided with a *Guide To Operations* and a start-up disc. This disc will include Application Selector, Systemapp, Tools, Exploring the IBM PC Convertible and Diagnostics. Also bundled with the machine is PC-DOS version 3.2. Model 1 is priced at £1,894.

Model 2 is the same but lacks the *Guide To Operations* and is priced at £1,878. The Model 3 version, costing £1,818, is supplied without the *Guide* and DOS 3.2. The prices given are for the U.S. versions and IBM has no prices fixed yet for the U.K. models.

The Convertible has been available in the U.S. since the spring of last year. It is based around the 80C88 processor and has 512K of RAM. The machine is fitted with



twin 3.5in. discs and a detachable 80- by 25-character display. The U.S. version is equipped with a 78-key keyboard; the U.K. models, when they appear, will have an extra key. Buyers of the Convertible will also receive an a.c. adaptor and battery pack.

Among the options available for the Convertible is a 24-element

thermal printer costing £309, a cathode-ray tube adaptor at £419, and a serial/parallel adaptor at £203. A carrying case for the Convertible is priced at £42.

Further details are available from IBM (U.K.) Ltd, Baltic House, Kingston Crescent, Portsmouth, Hampshire PO6 3AU. Telephone: (0705) 694941.



Tandon targets the PC market

TANDON has released a new AT-compatible computer known as the Target. It will be available from February, and Tandon says it will cost under £2,500.

The machine follows a recent trend towards computers with a smaller footprint: it measures just 12.6in. by 15.7in. This is achieved by the unusually large height of the machine and the company's new six-layer VLSI system board.

Inside the machine Tandon has found the space for a 3.5in. 30Mbyte hard disc, 1Mbyte of RAM, a 1.2MHz floppy-disc drive and five full-length expansion slots. Expansion cards have to be slotted in sideways in order to fit.

Further details from Tandon Computer (U.K.) Ltd, Unit 19, Dunlop Road, Hunt End, Redditch, Worcestershire B97 5XP. Telephone: (0527) 46800.

All Aboard 286 for DOS 5.0

THE All Aboard 286 is claimed to be the first multi-function board available for both the IBM PC/XT-286 and PC-DOS 5.0. The manufacturer says the card can support up to 16Mbyte of RAM and the standard Enhanced Graphics Adaptor video specification.

The All Aboard can supply additional memory to bring PC-DOS user RAM to 640K along with up to 4Mbyte of Lotus/Intel/Microsoft expanded memory or a full 16Mbyte of extended memory. The product is expected to be officially launched at the Which Computer? Show, which takes place in mid-February.

No prices have yet been set, but they will probably be in the range of £700 for the basic 128K version to £8,000 for the full 16Mbyte model.

Further information is available from Ideassociates at Tolworth Tower, Surbiton, Surrey KT6 7DP. Telephone: 01-390 5945.

Zygal DTP system at £11,000

ZYGAL DYNAMICS is to launch a complete desk-top publishing system, including monitor, software and laser printer for an entry price of approximately £11,000. The Zygal DTP can support up to 16 users, with each additional work station costing £3,500.

The basic system consists of an 80286 processor, 1Mbyte of RAM, a 20Mbyte hard disc and Zygal's own 10-page-per-minute F-1010 laser printer. The software is document rather than page oriented, and features multiple windowing, WYSIWYG display and 60 type fonts.

For further information contact Zygal Dynamics plc, Zygal House, Telford Road, Bicester, Oxfordshire OX6 0XB. Telephone: (0869) 253361.

Apricot upgrades

APRICOT is to expand its upgrade policy to encompass the early Apricot PC and xi machines. From June, users will be able to upgrade to full IBM AT compatibility.

No definite price has been fixed for the upgrade as yet, although Apricot says that it should be around £900. The conversion involves replacing the motherboard, adding new caps to some of the keys and altering the scanning speed of the monitor to 18kHz. The casing, power supply and wiring are retained.

As the casing is retained intact, there is no alteration available to enable a 5.25in. floppy disc drive to replace the existing 3.5in. drive. Apricot says this is not a major drawback as most software houses are converting their software for the smaller format. Bundled with the upgrade will be a LAN card built on to the motherboard, and a copy of MS-DOS 3.2.

Apricot says it is able to offer the upgrade because of advances in surface mount technology, which allows all the necessary chips to be crammed into the small box. The restricted space does mean there will be no internal expansion facilities, although the XP-i external expansion box can be interfaced to the computer.

Further details from Apricot plc, 111 Hagley Road, Edgbaston, Birmingham B16 8LB. Telephone: 021-456 1234.

FLOATING-POINT PROCESSING FOR THE TRANSPUTER

INMOS has unveiled the latest in its line of Transputer products. The IMS T-800 is a 32-bit processor with a floating-point processor built-in.

There are currently two versions of the T-800, which run at 17MHz and 20MHz. A 30MHz version is planned for late 1987. The 20MHz device has been benchmarked by Inmos at 1.5 million floating-point calculations per second (1.5Mflops) when handling 32-bit operations, falling to 1.1Mflops while it is performing 64-bit operations.

The T-800 series has 4K of RAM on board, a 26.6Mbyte/s. external

memory bandwidth, and can support high-performance graphics. Like earlier versions of the Transputer, the T-800 series also has a 32-bit address bus and four Inmos serial links to support parallel processing.

The T-800 is pin compatible with the earlier T-414 but is capable of double the throughput. Prices will commence at £348.21 each for batches of 100 for the 20MHz device, or £290.18 for the 17MHz version. Further details are available from Inmos, 1000 Aztec West, Almondsbury, Bristol BS12 4SQ. Telephone: (0545) 616616.



DTP brings out the big screens

THE growing popularity of desk-top publishing on the IBM PC has led to a rash of new display screens. Among the latest contenders in the U.K. are new screens from Sigma Designs and Micro Display Systems.

Distributed by Katakana Ltd, Sigma Designs' Laser View display is claimed to be the highest resolution system available for the PC range. The Laser View has a resolution of 1,664 by 1,220 pixels, offering four levels of grey on a paper-white screen. Both a 15in. and 19in. version are available.

No U.K. prices have been set for the Laser View display, although in the U.S. the 15in. system costs \$1,900 with the price rising to \$2,400 for the 19in. model. Details from Katakana, Manhattan

House, Bridge Road, Maidenhead, Berkshire SL6 8DB. Telephone: (0628) 75641.

Altor Computer has begun distribution of The Genius Full Page Display System. Combining a display adaptor and display screen, the package is unusual in having a portrait-format monitor, measuring 15in. high by 14.2in. wide.

Two monitors are offered. The Model 401 provides full compatibility with the IBM MDA format, while the Model 402 supports bit-mapped graphics. The Model 401 version is priced at £1,450, while the Model 402 system costs £1,599. Details from Altor Computer, Unit 11A, Anderston Centre, Glasgow G2 7PH. Telephone: 041-226 4211.

HARDWARE SHORTS

● Equinox Computer Systems is offering a low-cost RS-422 PC network at £295 per node. The System is called DNA Local area Network. Details on 01-739 3450.

● Walters International has reduced its prices yet again. The basic 256K XT now costs £455 and the AT costs £1,180. Details on (0494) 32751.

● Olivetti has introduced a 3270 PC Emulation Kit for the M-24 and M-28 ranges. The kit costs £1,020. Further details are available on 01-785 6666.

● The WS-4000 modem is now available with an interface for the Amstrad PCW-8256. Offering autodial, auto-answer and Hayes protocols, the package is priced at £259 from Miracle Technology. Phone (0473) 216141.

● C. Itoh has announced the price of its Lips-10 laser printer at £2,995. Further details on (0491) 573675.


● Black Box has introduced two modems. They are the Data Modem 4800 and the Data Modem 9600, costing £695 and £795 respectively. For details ring (0734) 866800.

● PC-Share is a system which allows two users to share the same PC and peripherals, with each user having their own keyboard and monitor. Details from Savtec Computer Technology on (0252) 725507.

Novell's DIY card

NOVELL DATA SYSTEMS is to introduce a new networking card which can be customised for users' specific needs. The Novanet-TTS consists of an ordinary plug-in card to which customised chips can be added to suit the requirements of both the user and the network.

The idea is that Novell will install the configuration you need, from a simple 1.5Mbit/s. twisted pair and collision-detection card from around £300, to a full 3Mbit/s. co-axial token ring system — all based around the same board.

Further details from Novell Data Systems Limited, 78-82 St. Johns Road, Tunbridge Wells, Kent TN4 9PH. Telephone: (0892) 47833. 



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Olisoft unveiled

THE charmingly named Olisoft series from Olivetti has kicked off with Olitext Plus, a word processor written by Olivetti itself. Other programs in the series will include badge-engineered products from other software houses.

Olitext Plus offers spelling checks, print spooling and multiple document printing. There is an Olitext Plus spreadsheet feature which allows users to generate mathematical data for inclusion in the text.

Olitext Plus costs £230 and runs on PC-compatible machines. Contact Olivetti, PO Box 89, 86-88 Upper Richmond Road, London SW15 2UR. Telephone: 01-785 6666.

SOLID MODELLER

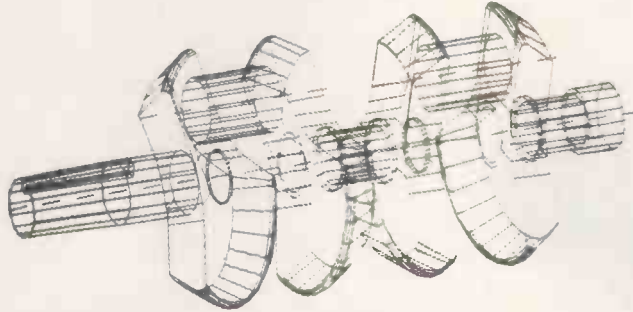
TO FOLLOW its Robocad system, Robocom has announced another package with a memorable name, Robosolid. As you might guess, this is a solid-modelling package. Unlike the simpler wire-frame approach, the model used by Robosolid describes the object by

an internal data model. This allows Robosolid to be used for stress, kinetic and simulation exercises.

Once a component is in solid form, cross sections may be taken, even along complex boundaries. Masses and surface areas can be calculated automatically. Robo-

solid is written in C, and integrates directly with Robocad. It runs on IBM PCs and compatibles and costs £1,250.

More information from Robocom, Clifton House, Clifton Terrace, London N4 3TB. Telephone: 01-263 8585.



Robosolid uses an internal data model to describe objects.

Sardine dictionary

THE U.S. company Traveling Software has produced Sardine, a ROM-based dictionary for Tandy 100, Tandy 200 and NEC PC-8201 lap portables. The total vocabulary is around 33,000 words, drawn from the Random House American dictionary.

Using Sardine with most word processors lets you check a 25K document in around three minutes, according to the authors. Sardine itself contains the word processor T-word from the same company. The cost is \$169.95.

More details are available from Traveling Software, North Creek Parkway, Bothell, Wa 98011, U.S.A. Telephone: (U.S. area code 206) 483-8088.

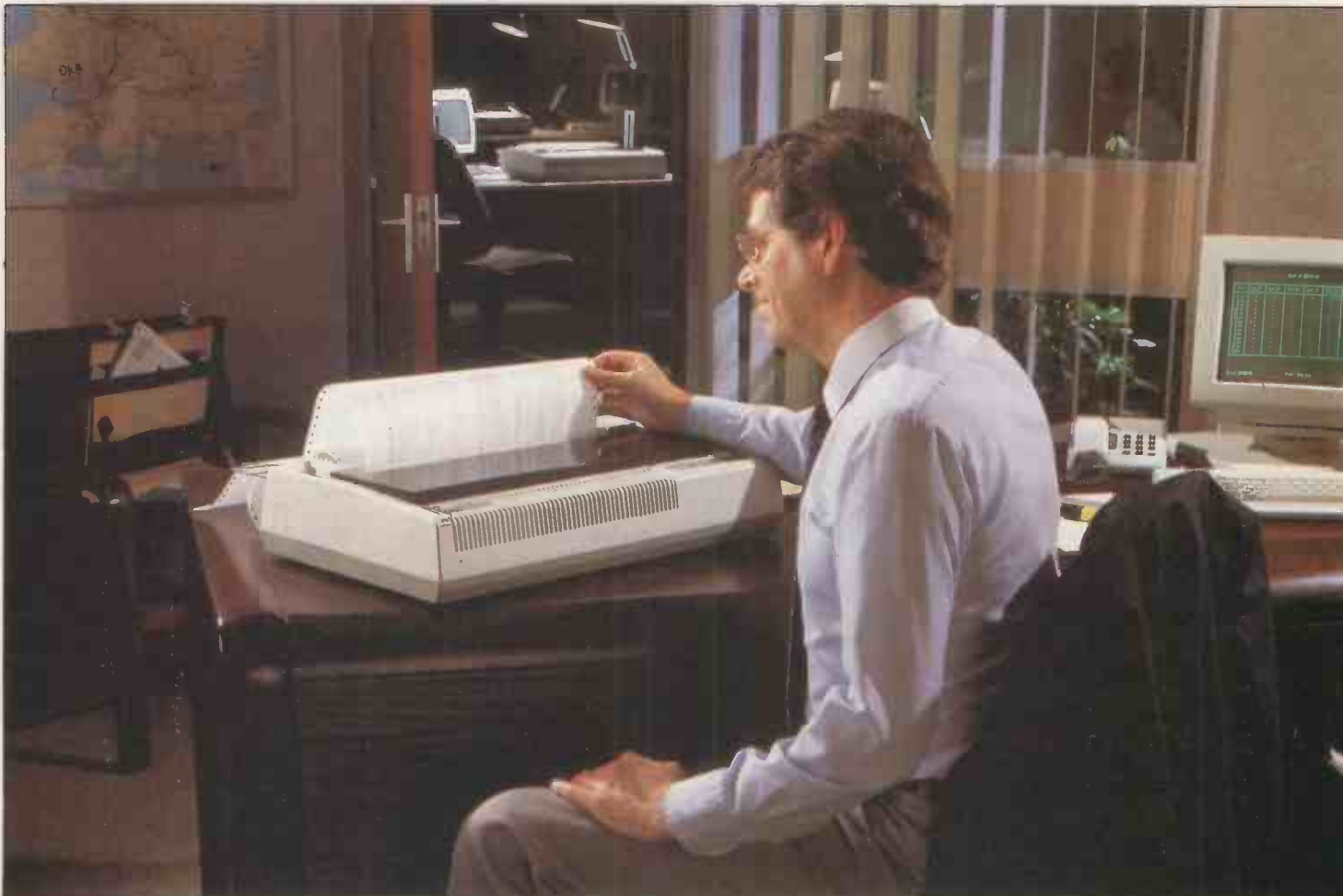
Big boys are still getting bigger

ASHTON-TATE and Borland have turned in healthy interim figures, indicating that the big boys are getting bigger. Ashton-Tate reported revenues of \$147.9 million in the first nine months of 1986, against \$80 million the previous year. Its profits were \$19

million, as against \$10.6 million. Ashton-Tate has also achieved the 1,000,000th sale of a dBase product.

Borland's results are on a somewhat smaller scale, but still pretty acceptable. In the first six months of 1986 it produced profits of \$1.8

million on sales of \$14.3 million against \$1.2 million on \$9.6 million for the same period last year. For those lucky shareholders who were able to take up Philippe Kahn's offer last summer to subscribe to Borland there will be dividend of 0.75 cents per share.



S&S does it again

S&S ENTERPRISES has launched more of its £10 programs. The latest are Redirect, which intercepts print-out and writes it to a file; Buff-128, which increases buffer size from 15 to 128 keystrokes; Putbuff, which lets you put characters in the keyboard buffer; and Setdate, which lets you update the Date function.

S&S has also come out with PC Prestalk, a comms package which will handle email and Prestel. The cost is £20. Details on all these products form S&S Enterprises, 31 Holloway Lane, Amersham, Buckinghamshire HP6 6DJ. Telephone: (02403) 28095.

Greyfonts

GREYFONTS allows the Apple Laserwriter to produce founts at nine different levels of greyness.

The cost is £49.50 per fount. Those available include Helvetica, Times, Dingbats, Avante Garde, Palatino, Bookman and Symbol. More from Macsoft, Tonedale, Wellington, Somerset TA21 0AA. Telephone: (082347) 3625.

PRINTER BOSS RANGE GROWS

PRINTER BOSS is a utility program originally designed for the Epson FX printer. It is now extended to include a number of parallel printers. It is operated from a single menu and can be used from within 1-2-3. It allows spreadsheets to be printed sideways, in double- and quad-density letter quality, and has RAM printer

buffer and fount design capabilities.

Printer Boss costs £99.50 and runs on IBM PCs or compatibles with at least 128K RAM. More details from P&P Micro Distributors, Todd Hall Road, Carrs Industrial Estate, Haslingden, Rossendale, Lancashire BB4 5HU. Telephone: (0706) 217744.



SOFTWARE SHORTS

- Comshare has launched a new version of its Personal Wizard modelling package. The cost starts at £750. More on 01-222 5665.
- Menudos is a menu front end to DOS from Excel Computer Systems. It costs £45. The package is available on (0245) 351608.
- Caxton has released a new version of Mega Basic which is compatible with MS-Basic. The price is £249. Details on (093586) 2609.
- PC-Four is a £69 version of Psion's Xchange integrated packages. More on 01-723 9408.
- BCPL for the Amstrad PCW series is available from Arnor Ltd at £39.95 on 01-684 8009.
- Grafox has quartered the price of its Logistix spreadsheet and planning package to £99.95. Details on 01-922 8807.
- Unlock lets you copy protected programs to your hard disc. It costs £74 and is available from Corporate Software on (07357) 5361

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All Star printers give exceptional print clarity, even in draft mode. The S series has one of the clearest draft fonts available and its near letter quality printing has been widely acclaimed by reviewers and users alike.

Of course, the S series is fully IBM compatible, ensuring that it will work happily in any modern business environment, using either serial or parallel versions.

Whether your paper requirements are for single sheets or continuous with additional copies, the S range has a tractor feed as standard. The SR models even come with an automatic single sheet feed to make your letterheads really easy to load.

The Star pedigree is inherited from many years in the manufacture of precision machine parts and a long

history of producing computer printers. This means you can rely on Star's wealth of experience in advanced design and manufacturing.

Countless users have made the right decision - why not join them?



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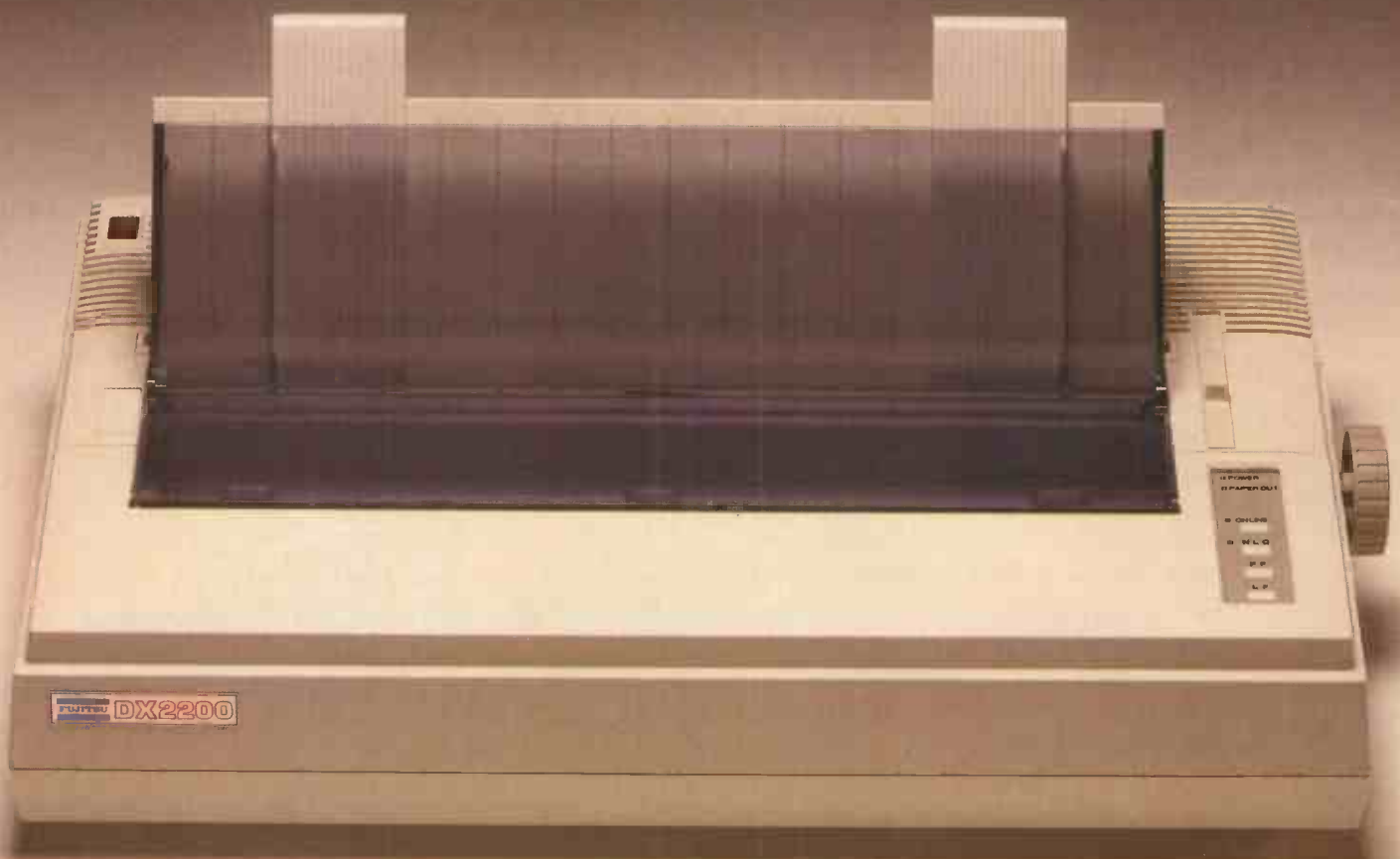
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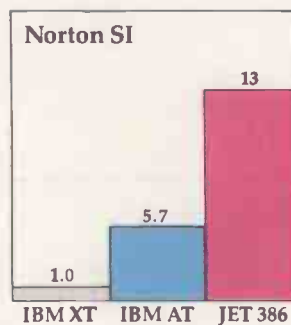
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BSI Basic working group

THE British Standards Institution has reconvened its working group on Basic. First it will review the recently published ECMA-116 standard from the European Computer Manufacturers Association. This document may eventually form the basis of an ISO standard.

The working group intends to circulate the ISO document for comment, and would be pleased to hear from anyone who has opinions on the subject. Contact Mrs S L Pulford, Computing Services Section, University of Salford, Salford M5 4WT. Telephone: 061-736 5843, ext. 7328.

Wordcraft German site licence

WORDCRAFT has signed up German chemical giant E Merck for a site-licensing deal worth 1,000,000 Deutschmarks. This gives the company the right to use Wordcraft anywhere within the Federal Republic of Germany and West Berlin. So far 500 copies have been supplied. The eventual number is expected to run to thousands. Annual payments by Merck will provide it with future upgrades and software maintenance.

CCTA data network in sight

THE Central Computer and Telecommunications Agency, which helps specify standards for government departments, has announced further developments in its plan to develop a joint data network for the Department of Health and Social Security, Inland Revenue, Customs & Excise and Home Office.

A service requirement is being issued to a number of computer and communication firms, including ICL with Cable and Wireless, Plessey with CAP, and the American facilities-management giant EDS with Northern Telecom. The network will start with around 85,000 terminals in 3,000 locations, and use the X-25 standard.

AMSTRAD PC TO BE SOLD IN THE STATES

AMSTRAD has announced that the Amstrad PC will be sold in the U.S. by Vidco Inc., a Dallas-based computer and office-equipment supplier. The machine was launched at the Las Vegas CES exhibition on 8 January.

Continuing its policy of zero exposure established with the U.S. launch of the PCW-8256 word processor, Amstrad is funding

neither marketing nor stock. This is to avoid the financial embarrassments suffered by other British companies like Acorn, Sinclair and Apricot.

Amstrad claims that orders for 300,000 of the machines had been placed within one month of the launch in the U.K., and that units are being shipped at the rate of 70,000 per month.

DP Registrar hunts illicit data users

THE Data Protection Registrar has announced that he is starting to track down data users who have not yet registered. The first areas to be investigated will be health and local authorities, finance and direct marketing.

The technique employed will be to match register entries against other published lists in these areas. The object is to tidy up the register before 11 November 1987; from that date all members of the public will have the right to inspect per-

sonal data about themselves held on a computer.

It is not likely that the registrar will prove a soft touch to recalcitrants. A survey of more than 2,000 computer users carried out for him indicated that in larger organisations — those employing more than 250 people — 94 percent were aware of the Act, and 87 percent thought the Act applied to their organisation. So excuses like "I didn't think it applied to me" will not cut much ice.

British Telecom Lasercards

BRITISH TELECOM has obtained a licence to sell Lasercards made by Drexler Technology Corporation of California. These credit-card sized devices can hold up to 2Mbyte of data imprinted by photographic techniques at the time of manufacture.

The cards are claimed to be intrinsically secure and difficult to corrupt either accidentally or deliberately. Potential uses include holding medical records, financial information and other personal data. Big Brother is also believed to be interested.

Dun and Bradstreet on-line

PERGAMON INFOLINE has added Dun and Bradstreet's Dun's Market Identifiers to its range of databases. It holds information on around 200,000 trading companies, and is largely aimed at the marketing community. More information from 01-377 4390.

Telecom Gold has added Petroleum Monitor to the databases which users can access. Details on 01-403 6777.

CD-I News

COMPACT DISC magazines are two a penny. But now there is a magazine devoted entirely to interactive CD, otherwise known as CD-I. It is issued monthly, and costs a rather steep \$195 or equivalent. More information from Link, 2 Bath Road, London W4 1LN. Telephone: 01-995 8082.

Kodak's optical storage

EASTMAN KODAK has announced that it is joining with Philips and the Du Pont Optical Company to produce optical products. As a start, they will be working towards an industry standard for 14in. write once read many times (WORM) discs. Kodak has a 14in. disc with a capacity of 6.8Gbyte, which uses aluminium overlaid by gold.



Magnified VDUs

INMAC has come up with a magnifying device for increasing the size of text by between 40 and 50 percent. The Magniscreen is claimed to enhance contrast and reduce perceived screen flicker. It can be used with machines like the IBM PC, Olivetti M-24 and Apricot

Xen. Self-adhesive strips are used to fix the magnifying device to the screen.

The Magniscreen costs £159 and is available from Inmac, Westerley Point, Market Street, Bracknell, Berkshire RG12 1EW. Telephone: (0344) 424333.

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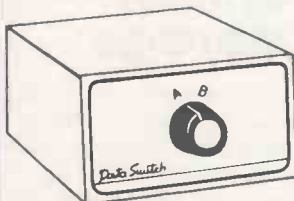
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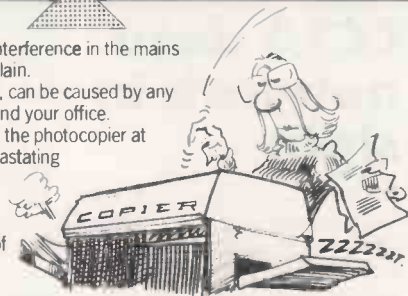
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Shown here are 10 pictures of famous personalities from the computing world. All you have to do is identify them. The two prizes will be awarded to the people who are most successful in putting names to faces. As a clue, most of them have appeared in earlier issues of *Practical Computing*. In the event of a tie, the tie-breaker will be used to decide the overall winners.

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In not more than 15 words, explain which individual — not necessarily one of those whose picture appears here — you think has contributed most to the world of computers. For example, you might cite John Akers, Chairman of IBM, for his responsiveness to users' needs. In judging the tie-breaker, we will be looking for wit and originality. The only limit to possibilities is your imagination.



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1. The competition is open to all readers of *Practical Computing* normally resident in the U.K., except for employees of Business Press International Ltd or Ferranti Computer Systems Ltd or their families.
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A TIGHT SQUEEZE

YOU CAN SAVE DISC SPACE BY STORING YOUR TEXT FILES IN COMPRESSED FORM.

If you do a lot of word processing, the chances are that you would find a text compressor a worthwhile investment. A good compression program can reduce the size of your text files by one-third or more without any loss of information. It is true that the files would have to be uncompressed before they could be used, but if nothing else the process would make big savings in the space needed for backups and archive copies.

Although there are a number of text compressors on the market there is no reason why the average programmer should not write one. The difficulty lies in deciding which of the many available methods to adopt. The most effective techniques are inevitably the most complicated, but even a simple compression program can cut the size of your files by about one-fifth.

One possibility would be to use word tokens. Like most compression schemes, this takes advantage of the redundancy in the ASCII coding system. ASCII is really a seven-bit code: it contains 128 characters, of which 95 are printable and the remainder are used as control codes. But because of the near universal use of the eight-bit byte in modern computers, it is convenient to assign eight bits to each ASCII character. This gives 256 possible values. So in practice 128 of these are wasted.

A compression program could use these 128 spare values to represent often-used words. For example, the word "the" would normally need three bytes. But represented by the number 129, it could be squeezed into one byte. This is a trick used in Basic interpreters, where it is used to store reserved words in program files.

The problem is to decide which 128 words should be tokenised. In the June 1984 issue of *Practical Computing* I described some research into word frequencies and showed a list of the 207 most common words in day-to-day English text. The first 50 of these were said to account for 47 percent of normal English, and tokenising them in the way described here would in theory give a saving of about 22 percent.

Unfortunately, the theory rarely holds good for real-life text files. To illustrate this point I analysed the last eight articles that I have written for *Practical Computing*, which amounts to about 10,000 words or just under 70,000 characters. Not surprisingly, my 128 most frequent words shown on this page include many examples that would be considered very rare in non-technical prose. There was only a 50 percent overlap between my list and the published research so I only achieved a reduction of 11 percent by tokenising the standard word list.

In such cases the text-compression program would give much better results if it were to build a separate list of word frequencies for each document being processed. This would be time-consuming, since it involves an extra pass of the text and some hefty sorting. It would also mean storing the word list with the compressed text, which would add an overhead of around 1K per file.

However, the overhead can be justified by the dramatic improvement in compression. By customising the frequency list in this way, my sample file was cut by 21 percent — nearly double the saving obtained with a standard list. Another advantage is that the technique works just as well with foreign languages and program source files.

Further fine tuning is possible. For example, the program could weight the word list according to the length of the word, thus tokenising the words that would give the largest savings. In my sample, this increased the compression factor to 22 percent. You could also count the space before a word in with it, which would increase the saving resulting from tokenising. But since not all words come immediately after a space, it would decrease the number of words to be tokenised.

One limitation of word tokens is that they cannot be used with eight-bit characters, such as the extended character set used in the IBM PC. If this is likely to be a problem, a character-based scheme is more appropriate. In general, these give better savings. The trade-off is that they are slightly more difficult to program because they involve coding at the level of individual bits.

The most popular of the character-based techniques is the four-twelve method. Here, each of the 15 most commonly used characters is represented by a number between 1 and 15, and is held in four bits. If the character is not one of the 15 common ones, it is held in 12 bits, the first four of which contain binary zero.

As with word tokens, the effectiveness of this method depends on how you choose the "common" characters. Once again, it makes sense for the program to do a separate pass of the text to determine the frequencies, although in this case the process is a good deal faster than with the word-based method.

The character frequencies in my sample test turned out to be fairly close to the published research. The top 15 characters accounted for 80 percent of the text. So using half a byte for each of them cut the file

WORD FREQUENCIES

787	the	42	its	24	many	16	Dos
398	of	40	from	24	copy	16	out
334	to	39	any	23	your	15	while
267	is	38	there	23	then	15	good
224	in	37	so	23	some	15	first
206	and	37	all	22	number	15	disc
164	you	37	text	22	we	15	characters
153	it	36	they	22	most	15	two
149	for	35	these	21	like	15	well
133	this	35	more	21	database	15	key
115	are	35	do	21	command	15	binary
106	be	35	used	21	own	15	although
103	that	34	tree	21	set	14	between
99	can	34	way	20	how	14	batch
78	as	32	form	20	only	14	new
73	with	31	other	20	Pascal	14	functions
69	on	31	example	19	than	14	should
68	which	30	up	19	type	14	application
64	by	30	system	18	could	14	directory
63	program	30	has	18	code	14	get
54	not	29	data	18	software	14	forms
54	or	28	programs	17	about	13	screen
53	but	28	also	17	package	13	keyboard
52	will	28	files	17	does	13	language
50	at	26	MsDos	17	when	13	main
49	an	25	find	17	line	13	RAM
47	have	25	into	17	need	13	trees
46	file	25	words	16	size	13	resident
46	use	25	would	16	them	13	product
45	word	25	no	16	their	13	path
45	if	24	user	16	point	13	list
42	one	24	each	16	such	13	another

Frequencies per 10,000 words of the 128 commonest words in a sample of articles in *Practical Computing*. A saving of 20.8 percent could be achieved by storing each of these words as a one-byte value. One-letter words are excluded from this list since there is no point in tokenising them.

(continued on next page)

SOFTWARE WORKSHOP

BY MIKE LEWIS

(continued from previous page)

by 40 percent. An extra half byte was needed for each of the characters in the other 20 percent of the file. The overall compression factor was therefore 30 percent.

A variation of this technique is the three-eight method. In this case, one bit of each byte is reserved as a flag. If this is set to On, the next three bits hold one of the seven most frequent characters in the text. If the flag bit is Off, the remaining seven bits in the byte hold one of the less common characters.

There seems to be very little to choose between the four-twelve and the three-eight systems. Both involve about the same complexity of programming and the same overhead for working out the frequencies. Their relative effectiveness will depend on what proportion of the 15 most frequent characters are also in the top seven. In my sample, this proportion was nearly three-quarters, which happened to give an almost identical compression factor.

In both methods, further savings might be obtained by converting strings of spaces to tabs, and by treating any Carriage Return followed by a Linefeed as a single character. This trick saved me another 1.1 percent. Bear in mind that the three-eight technique

CHARACTER FREQUENCIES

11612	space	3304	n
6275	e	2395	h
4704	t	2147	l
4158	o	1802	d
4028	a	1732	c
3666	i	1584	cr/lf
3354	s	1543	u
3335	r		


The 15 commonest characters in the same sample of text, showing the number of occurrences in 69,899 characters. The actual saving achieved by character-based compression was 29.6 percent for the four-twelve system, and 29.4 percent for the three-eight method. Carriage Return and Linefeed are considered to be a single character for this purpose.

does not work with eight-bit data, other than by incorporating some form of shifting.

Beware too of the worst-case syndrome. If there is a fairly even distribution of characters in the file, the compressed version could be nearly as large as the original. In extreme cases it might even be larger. This problem does not arise with word tokens, except as a result of the overhead needed for storing the frequency list.

More ambitious compression schemes can be developed by combining the various techniques. One system uses either four,

eight or 12 bits to hold each element of the text, where an element is either a character or a word. The first half-byte of each element contains flags to indicate the length of the element and whether it represents characters or words.

A total of 205 words can be tokenised in this way, while still allowing the 13 commonest characters to be held in four bits each. Savings of around 50 percent are claimed for this method. You can find further details on this in the June 1984 Software Workshop. 

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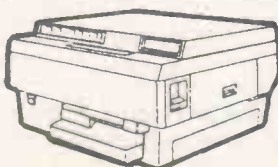


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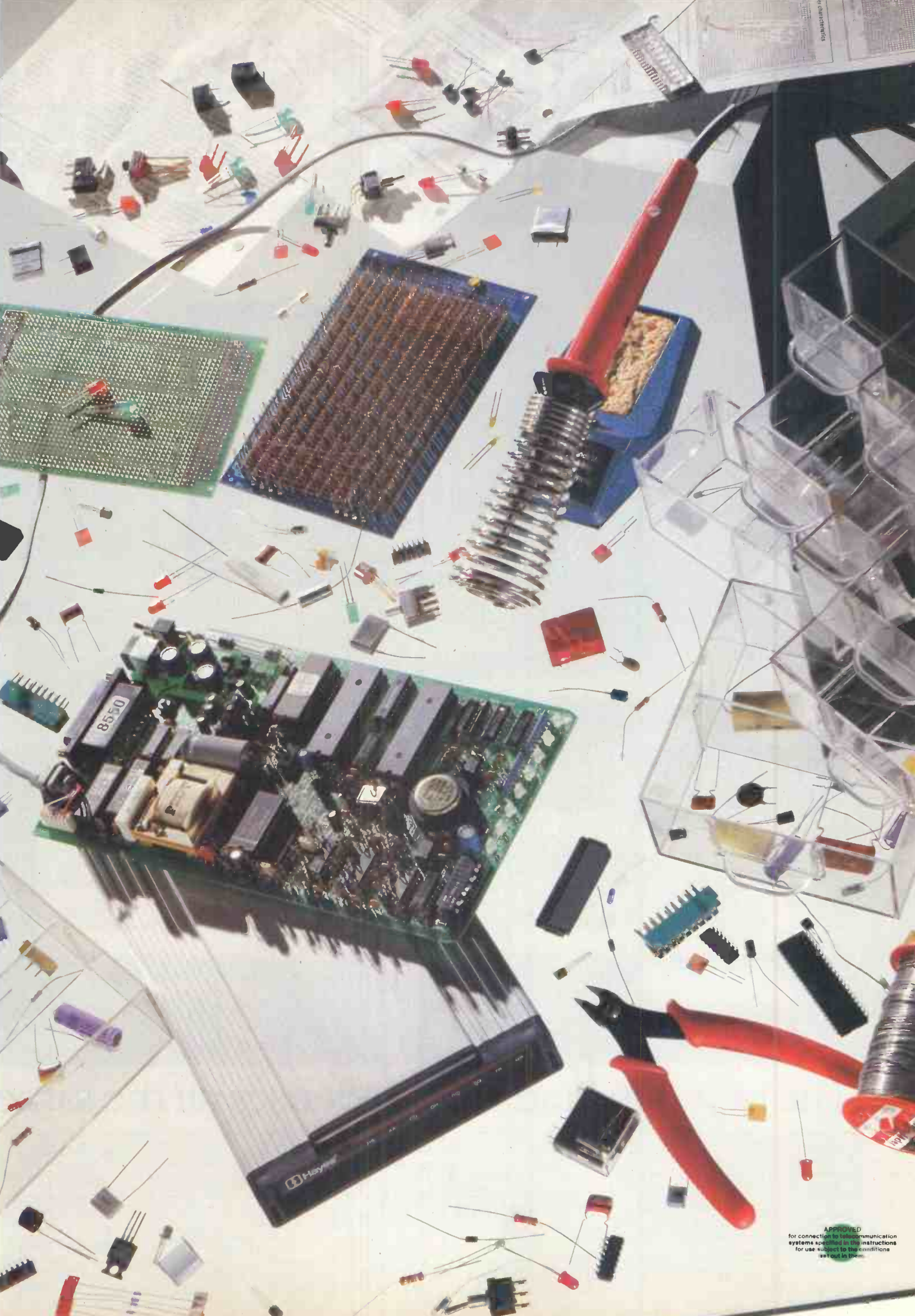
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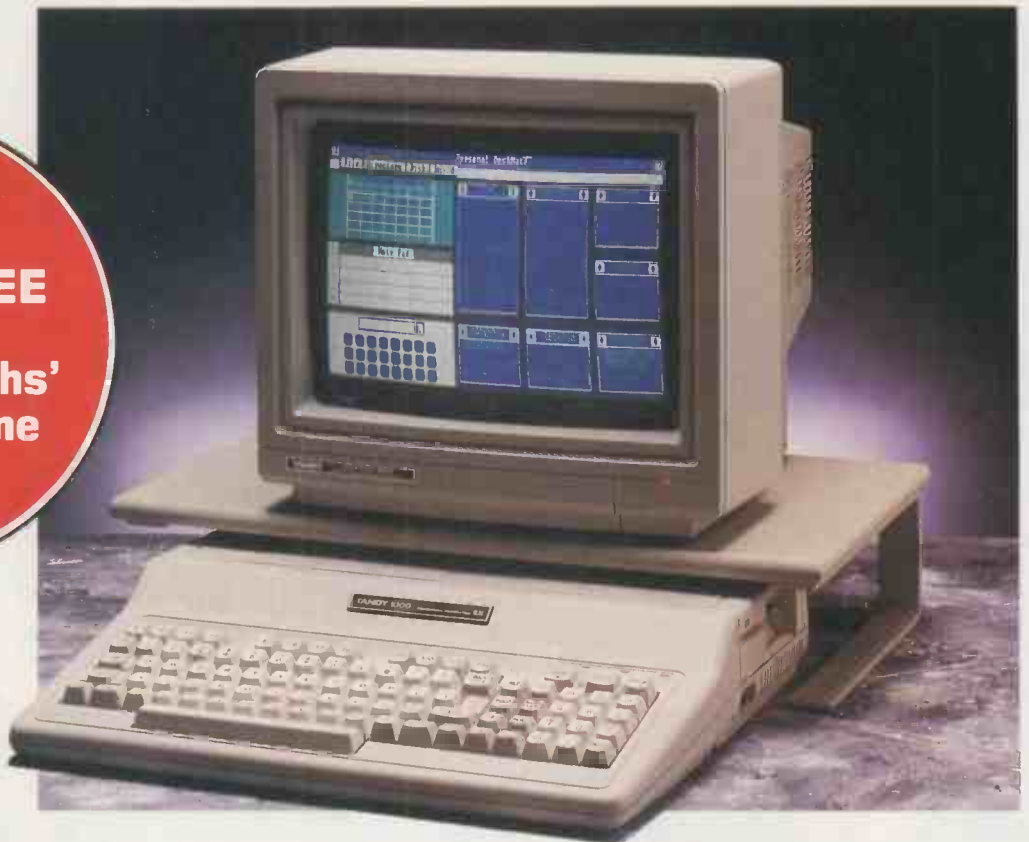
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COMMS LINK

BY JACK SCHOFIELD

TELEX 2

NEW TELEX SOFTWARE IS AVAILABLE FOR USE ON TELECOM GOLD.

Last year *Practical Computing* published a series of three articles about the economical use of Telecom Gold, British Telecom's electronic-mail service. It appears that the articles were generally helpful, as Telecom Gold has produced an eight-page reprint to give away to its customers. This is where the problems started, however, since unbeknown to us the telex software was about to be upgraded to something significantly different.

The new telex software is called Telex 2; version 1.6 of the software runs on my System, 83. The new software is easier to use and more informative, and it is more self-contained than before, rather than relying on other software utilities. It does not require the use of Uwraps, does not access the Param.Ini file, and does not use the same system for short codes.

Instead there is a new tailoring facility called Options. You just type Options at the command prompt to get a list of choices. You answer Y or N to set them, or press Carriage Return to leave them set as they are.

Previously, if you wanted an express-mail item sent to your mailbox to confirm that a telex had been despatched, you had to put the line

```
TELEX MAIL ARX
```

in a file called Param.Ini. Now you just have to type Y to the query

Express mail item when telex sent (Y/N)? You can set options and save them for future sessions. Alternatively you can set them for one session only, which is important as you may not always want to use, say, the Add Signature facility.

The other part of the telex software that has changed a lot is the system of short codes. This is one of the most important parts of the Telecom Gold telex facility, because it allows you to send a telex using a familiar name of your choice. For example, I can telex a text file called Fred to *Practical Computing* by typing:

```
SEND FRED PCOM
```

at the command prompt. The system itself then puts in the country code, the number, the answerback and the attention line, all of which is a great time and memory saver.

Of course you have to define your short codes first, and this is done by entering the word Code at the command prompt. You can then list, delete, define and edit your file of codes. If you choose Def to define them, the system will prompt you for each item of information separately. On the other hand, it is also possible to prepare your list of codes off-line as a text file, and then simply upload it.

To do this, first prepare your list of codes.

Each address must be on a separate line with the short-form version first. An example would be

```
PCOM Tlx G 892084 (BISPRS G) 'ATTN  
GLYN MOODY, PRACTICAL  
COMPUTING'
```

and so on. At the > prompt you type
TELEX CODE ED

to edit your codes, press CR to change from Edit mode to Input mode, upload your text file of codes, type CR again to get back to Edit, and finally type SA to save them. The system then asks

```
Do you want to install?
```

and you type Y for yes.

I got caught out here because I decided to reinstall my existing list of codes from the .RF. file in the old telex system. I thought I was successful in doing this, until I discovered that none of my telexes were being sent even after up to 14 tries.

The problem turned out to be in the answerbacks. The old system was happy to have, say,

```
EVNEWSG
```

as the answerback for the *Manchester Evening News*. The new system just aborted all telexes on the grounds that the answerback should have been

```
EVNEWS G
```

At such times Easylink suddenly acquires enormous charm.

As it happens I was able to resend my telexes by entering all the details manually — the country code, number, answerback, etc. But this was only a temporary solution. The full answer turned up in a help file called Info Telex Answerback. I only mention it here because it is not listed among the 14 options offered under Info Telex. There may be other unlisted telex information files too.

Anyone who has not changed to the new telex system can use the old one by typing

```
OLD_TELEX
```

at the > prompt. The reason that I didn't do that is that I'd made another mistake: in a rush of overconfidence, I had already deleted the old telex system from my mailbox.

Telecom Gold does not tell you how to do this, so I thought I would experiment to find out. The answer is that you go into Old_Telex, and type

```
DEL ALL
```

to get rid of the texts of any remaining telexes which may have been aborted, abandoned or even sent. Then you type

```
DEL ALL FILES
```

to delete the files, and then type Q to quit. The system asks

```
"Do you want to delete your old telex storage  
(*TELEX*)?"
```

and of course you type Y for yes. This removes *Telex* from your root directory, and those seven or eight blocks of odd files called Mesg, Queu, Zzzi, Zzdz, Codi and Codd. If you didn't do this, Telecom Gold should have done it for you on 9 January.

Telex 2, you will be pleased to hear, requires a minimum of only five files, called by the user-friendly names of Telex 2, Params, Tlx.Queue, Text.Files and Addr.Files; these are models of comprehensibility compared to Zzzi.

You can see the list of files used in Telex by the usual system of typing

```
TELEX_STORAGE
```

at the > prompt. However, there is a better way to list this storage, which is to use the long command

```
>STORAGE -L
```

As far as I know this is not documented anywhere. It is not even in the *Practical Computing* reprint, since I did not know about it either.


The advantage of Storage -L is that unlike L and F, it lists all your files, whatever they may be and wherever they are on the system. It includes ordinary text files, files of read and unread mail, and telex storage. F and L only list text files.

There is only one thing which now makes the new telex slightly less attractive than the old one. The old telex system simply numbered your telexes as you sent them, in a queue of up to 50. If you remembered that your last effort was numbered 24, you could track it by typing

```
WHERE 24
```

at the command prompt. This helped you to keep track of sent telexes and delete them to save storage costs.

Initially, in the new telex system deleting telexes took the numbering straight back to the beginning; virtually all telexes were numbered either 1 or 2, which was confusing. Telecom Gold has now added message reference numbering: each telex is automatically given a number, which will go up to 9,999 before reverting to zero. The first person to send 10,000 telexes can let me know if this is true.

All the new telex facilities are explained in a new £4 manual. It is far superior to the old one, which was only slightly more comprehensible than the Rosetta Stone. You do not need the manual if you download the Info files which are on-line, and this might be worth doing at 1,200 baud or 2,400 baud. However, the nice layout, colour and spiral binding of the printed *Telex Guide* mean it is probably worth heavy users of telex spending the money and buying it. If you want a copy you can phone 01-403 6777 or order it on-line. 



C H I P - C H A T

BY RAY COLES

THE NUMBERS GAME

INTEL'S 8086 FAMILY WAS THE CLEAR WINNER IN THE BATTLE FOR MARKET SHARE AMONG THE MAKERS OF 16-BIT PROCESSORS. NOW THE STRUGGLE FOR SUPREMACY AMONG THE 32-BIT CHIPS IS IN FULL SWING.

With the Intel 80386 now out of the starting gate, a battle royal has commenced to capture the hearts and minds of 32-bit system designers. Despite its late start, the 80386 is the chip that the other major contenders — namely National Semiconductor, Motorola and NEC — have to beat.

Intel virtually swept the field in the 16-bit contest, and this gives it a powerful advantage when the designers of those earlier systems come to choose a processor for their new 32-bit machines. Familiarity with the Intel architecture and a large measure of software compatibility are powerful incentives to current users to stay within the fold. To beat Intel, the other contenders, with the possible exception of NEC, have to show cast-iron technical and performance superiority to persuade designers to change.

The stakes are high, since the market for 32-bit processors is expected to grow from only 60,000 units in 1985 to as many as 4.7 million units by 1991. The main areas of application will be office-automation and engineering work stations. With the design, development and launch of 32-bit processors costing hundreds of millions of dollars, none of the contenders can afford to fail in the way that Zilog did in the 16-bit race.

During the launch of the 80386, Intel was able to claim more Mips, more features and more transistors on the chip. This is a combination guaranteed to turn any young designer's head, even without the further promise of software compatibility. With the gauntlet flung down in such a decisive manner, it has been fun to sit back and await the response from the other contenders.

Motorola was first to respond, and it has met the challenge head-on with a powerful three-pronged attack. Prong number 1 was a series of advertisements in the technical press which threw substantial doubt on the validity of the published Intel benchmark tests on the 80386. In a nutshell, Motorola has been claiming that while its own tests on the 68020 were carried out on realistic hardware using industry-standard software routines, Intel's tests were run on specially configured hardware and used non-standard test routines.

Prong number 2 was the announcement of a 25MHz version of the 68020 and a 20MHz version of the 68881, which effectively upstages the 80386 in the numbers game by providing 5Mips operation, against 4Mips for the 80386. The new, faster 68020 is not just a selection from the standard 68020 line but a partial redesign using a

tighter 1.5 micron CMOS process to squeeze in an on-chip instruction cache and a three-stage instruction pipeline.

Prong number 3 was an announcement of goodies to come which should beat the pants off the 80386, namely the all-new, all-singing, all-dancing 68030 second-generation 32-bit processor. The message is clear: 68000 fans who are being tempted by the 80386 should stay with Motorola. Designers not yet committed should switch to Motorola as the best all-round supplier.

The 68030 certainly looks impressive on paper, though the actual silicon will not be available until well into 1987. Sticking rigidly to the concept of code compatibility across the entire 68000 family, Motorola has based its new processor on the high-performance 68020. But it has added a variety of new on-chip features which should double the available overall performance. The chip will be fabricated in 1.2 micron high-performance CMOS and will comprise around 300,000 separate transistors, as against 180,000 for the 68020 and 275,000 for the 80386. The performance of systems using the 68030 should comfortably exceed that available from a top-of-the-range Vax 8600 machine.

The secrets of the 68030's performance include increased internal data-path parallelism, on-chip instruction and data cache memories, an on-chip paged memory-management unit (PMMU) and an improved bus interface design. Two independent 32-bit address buses and two 32-bit data buses are provided on the chip to allow the CPU, cache memories, bus controller and PMMU to operate in parallel after the fashion of the Harvard architecture used in some mainframe and supercomputers. A total on-chip bus bandwidth of more than 80Mbyte per second is the impressive result. At full tilt, the 68030 can simultaneously read an instruction from the instruction cache, data from the data cache and an instruction or data from external memory.

The on-chip instruction and data cache memory arrays each provide 256 32-bit entries and very high-speed access to boost the data flow rate to the CPU. Putting the required instructions and data into the caches provides a major boost in processor performance. It also reduces the need for the CPU to tie up the external buses because the caches can be filled from external memory using a high-speed burst mode.


With more spare time available on the external buses, other system components such as DMA channels or other processors

can also operate faster and more effectively. The cache-filling algorithm cannot anticipate long jumps or the need to operate on data variables scattered far and wide in main memory, but in typical applications the required data and instructions can be expected to be in the caches more than 90 percent of the time.

Like the 80386 the 68030 will have a powerful PMMU on the chip, where it can take full advantage of the multiple bus architecture to speed up address translations. The 68030 PMMU offers the same features as the 68851 PMMU chip, including multiple page sizes, multi-level translation trees, an on-chip address translation cache (ATC) and automatic access history maintenance.

The PMMU will also automatically search the main memory for address translations when they are not found in the ATC, just like the 68851. But unlike the 68851, the 68030 PMMU takes advantage of its integrated status to carry out address translations during the CPU cache-access time, so that no degradation of performance is suffered. As a result, the 68030 adds no translation time to any bus cycle, and physical accesses are just as fast as logical accesses. This effectively removes the penalties traditionally associated with the sophisticated memory-management techniques used by virtual-memory operating systems such as Unix.

The new 68030 bus interface design allows systems to be configured using a variety of memory types simultaneously, without the need for the processor always to operate at the speed of the slowest. High-performance systems can now use a mixture of very high-speed static RAM with slower and cheaper dynamic RAM, thanks to the support of both a high-speed synchronous bus mode and a variable-speed asynchronous mode. The bus interface also offers dynamic sizing, allowing access to off-chip devices operating in eight-bit, 16-bit or 32-bit mode.

To further extend the power of systems based on the 68030, Motorola also plans to introduce the 68882 enhanced floating-point co-processor (EFPCP), which will offer two to four times the performance of the 68881 used with the 68020. The 68882 will offer a range of transcendental operations in addition to basic maths, and will link to the 68030 using the standard co-processor interface. As usual, Motorola has come up with an elegant, user-friendly design, and one which should be a clear winner in the numbers game. 

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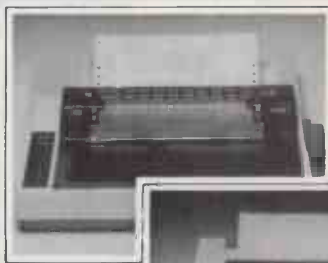
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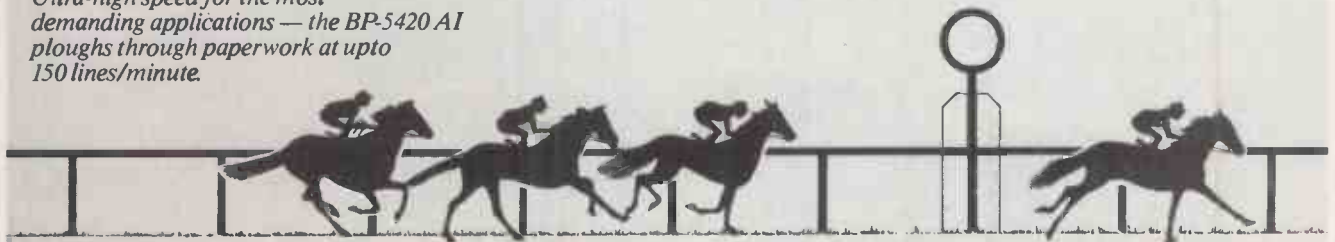
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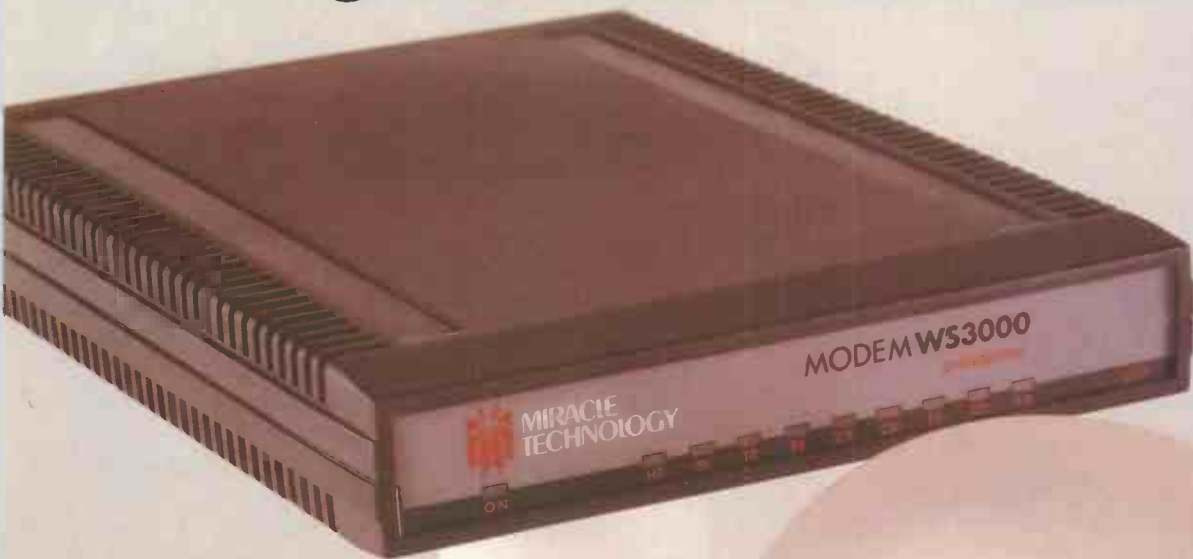
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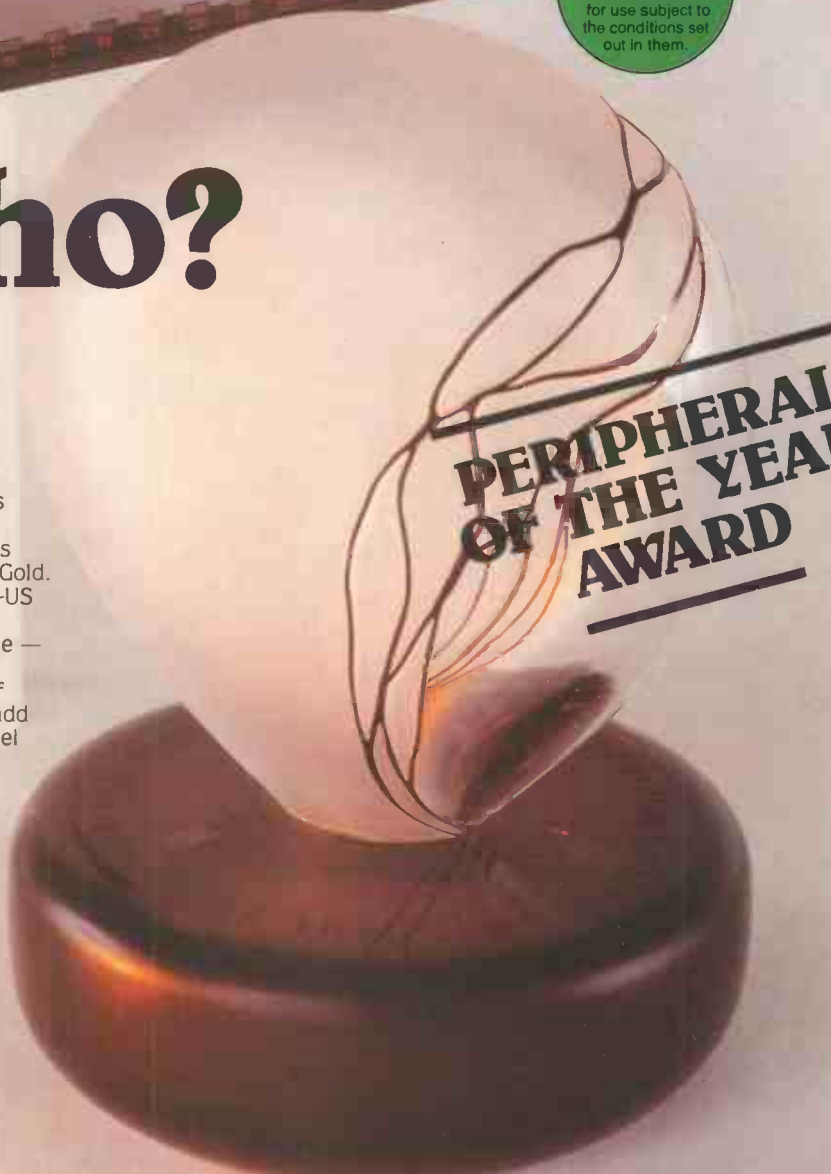
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BOOK REVIEWS

IT IS a cliché of the computer age that we have too much data and too little information. Yet it has been estimated that executives will handle on average a million pieces of paper in their career, and that every year 75 billion new pieces of information are generated. As information becomes the key strategic commodity in most businesses, more and more attention is focused on the use of computers to provide it efficiently.

By its very nature, this is a company-wide task. But as micros find their way into all aspects of business life, the problem often boils down to integrating personal computers with pre-existing corporate DP departments. As the sub-title indicates, *Managers, Micros and Mainframes — Integrating Systems for End-users* concentrates on this theme. It consists of a series of tidied-up papers presented to a conference at New York University in 1985. The advantages of this approach are topicality and a certain rigour; the down side is a ponderous, academic tone and a fragmented viewpoint.

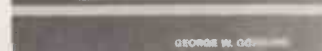
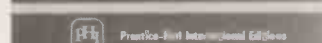
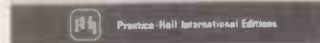
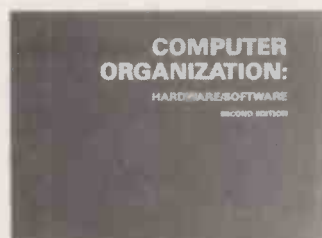
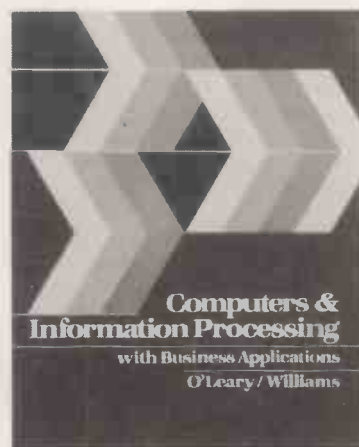
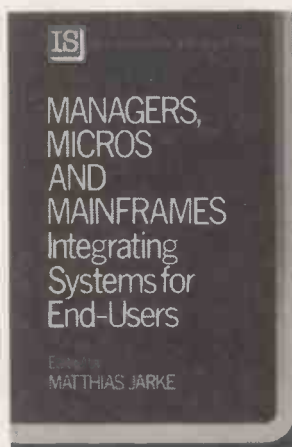
However, the book does present a clear picture of the difficulties facing those trying to evolve a coherent information strategy. As one of the best chapters points out, most companies are trying to manage 1980s technology using the techniques developed for implementing the traditional data processing of the 1950s. One problem with this approach, analysed by another paper, is the DP department's perceived loss of central control as stand-alone PCs are introduced, and the inter-ecine struggles that follow.

Much of the book is devoted to the planning and development of decision support systems. This is clearly an important area: many of the other books reviewed here dwell on it as well. Unfortunately it is the least satisfactory part of a generally interesting book.

The provision of this kind of integrated system has traditionally been called a management information system (MIS). *MIS Concepts*

HOW TO MANAGE THE MICRO

When micros are introduced into large organisations they inevitably find themselves having to coexist with established large-scale DP systems. **Glyn Moody** has been looking at some books which examine the consequences.



and Design, as its name suggests is an examination of the principles behind an MIS, together with some details of implementation. This is a paperback reprint of a university textbook first published in 1980, and so is rather out of date and heavily weighted towards the traditional DP structures. Nonetheless, it does provide a massively thorough explanation of the theory. It is also useful for its exposition of basic management techniques, as well as providing hundreds of pages on how to design an MIS and implement it. These general principles will mostly carry across to any organisation, including one with a high degree of distributed processing.


At 690 pages it is good value, if long-winded. The same can also be said of a companion volume *Computer Organisation*. The title is slightly misleading: it is not so much how to organise computers, as how they are organised internally — what most people would call architecture. The bulk of the

book provides a detailed explanation of some of the leading machines, embracing models like the IBM 360 mainframe series, the DEC Vax mini and the IBM System 38.

This book will clearly be of great value to those who subscribe to the "know thine enemy" approach. The rest of us will just be thankful that the micro was invented. The closing chapters have some interesting — though still technical — details of supercomputers like the Cray 2. It is another 600-page monster, but at a surprisingly reasonable price; it will be mainly of use to those who wish to understand existing DP environments and attitudes.

The final volume, *Computer and Information Processing*, is another university book, aimed at rather less technical audiences than the two paperbacks already discussed. But its heart is in the right place: early on, it states that "to managers in the rest of the twentieth century, the name of the game is handling information."

Even more than the previous book, it is firmly rooted in the business world; there are numerous case histories, examples and even problems to solve, formulated as hypothetical companies. This is in addition to the busy layouts, boxes and quotations which pepper the text. All-in-all the authors have bent over backwards to be accessible, and they succeed remarkably well without patronising the reader or diluting the content unduly.

The first 500 pages of the book discuss the usual components of company computer systems, giving due emphasis to micros. Corporate information processing is only really discussed in the next 100 pages or so, but it is well thought out, progressing from the low-level operating information systems, used for aiding production, through MIS to decision support systems. Unfortunately the last 100 pages of the book are wasted on an introduction to structured Basic programming, something that is quite inappropriate in this context. There is an excellent index which also functions as a glossary. The book is well produced, though expensive. 

HOW TO MANAGE THE MICRO

Managers, Micros and Mainframes edited by Matthias Jarke. Published by John Wiley, £16.95. ISBN 0 471 90988 2

MIS Concepts and Design by R G Murdick and J C Munson. Published by Prentice-Hall International, £15.95. ISBN 0 13 586413 5

Computer Organisation by George Gorsline. Published by Prentice-Hall International, £14.95. ISBN 0 13 165796 8

Computers & Information Processing by T J O'Leary and B K Williams. Published by Addison-Wesley, £27.95. ISBN 0 8053 6920 1

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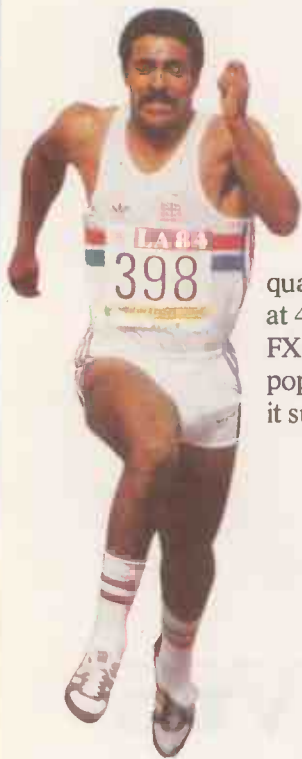
The Daley Thompson guide

100m and 400m

The speed of Epson's new FX800 printer has to come first on two counts.

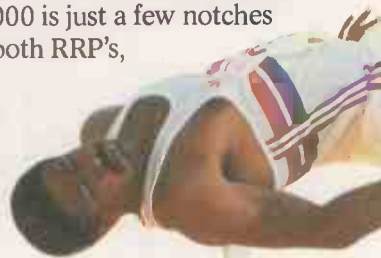
In draft Elite, the sprinter sprints along at 240 characters per sixtieth of a minute (Note: the word s****d has no place in our vocabulary.)

And even in letter-quality mode, it dashes along at 40 c.p.s. This makes the FX800 far faster than the popular FX85 machine which it supercedes.



High Jump

The FX800 has a far higher spec than the old FX85, it is clear — yet the price is actually lower. The FX800 costs only £410 — and the FX1000 is just a few notches up at £525 (both RRP's, bar VAT).



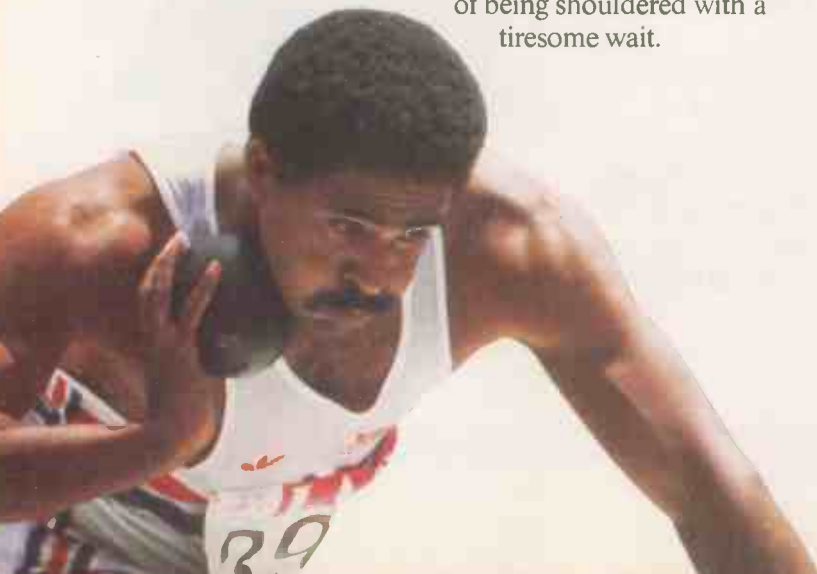
Long Jump

A longer version of the FX800 is also available — the FX1000. This does everything the FX800 can, but has the further advantage of allowing you to run up spreadsheets (up to 0.406 metres flat out).



Shot Putt

A powerful 8K memory is another of the FX800's great strengths. This enables you to put your computer to other uses while it is still printing, instead of being shouldered with a tiresome wait.

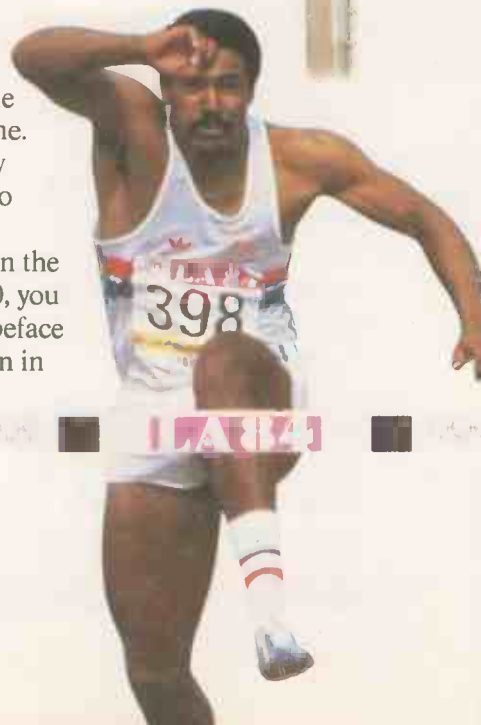


110m Hurdles

Making quick leaps from one typestyle to another is no problem with the FX800.

You no longer have to stumble over difficult software commands or trip awkward DIP switches on the back of the machine.

For by simply pressing one or two buttons on the 'Selectype' panel on the front of the FX800, you can change the typeface over and over again in no time at all.



to being a great all-rounder.

Discus

Discussion papers, reports and accounts can be greatly enhanced if you throw in a few pie charts, bar or line graphs.

Of course, you can rely on the Epson FX800 to come up with the goods every time.

1500m

Finally, as you would expect from the world's number one, the FX800 will run on and on and on with no sweat.

Indeed, it is so well-built that its print head will pound the paper at least 100 million times before it even thinks of giving out, which means that it stands head and shoulders above its so-called rivals.

Pole Vault

The FX800 is highly flexible on several levels.

It is compatible with the vast majority of PCs, as it has an IBM character set built in.

It can produce high-

resolution graphics as well as text.

But over and above all this, a range of paper feed options is available to enable you to free your hands when your workload is at its peak.

When you add up all the points above, there can be no doubt that, for its price, the Epson FX800 is unbeatable for daily use in the office.

After all, what other printer can T.C.B. ('take care of business') so brilliantly for rather less than half a big 'G'? (Or just over, in the case of the FX1000.)

If you would like further information, either: write to Epson (U.K.) Limited, Freepost, Birmingham B37 5BR; call up Prestel *280#; or dial 100 and ask for Freefone Epson.

At all events, we will be pleased to send you victorious, happy and glorious details.

Javelin

The sharpness of the FX800's print quality far surpasses that of any other printer in its price range.

In fact, it is armed with not one, but two correspondence-quality fonts for you to use when sending out business letters.

However, even when the FX800 is flying along in draft, the quality is still perfectly fit for internal memos, labels, spreadsheets and general data sheets.



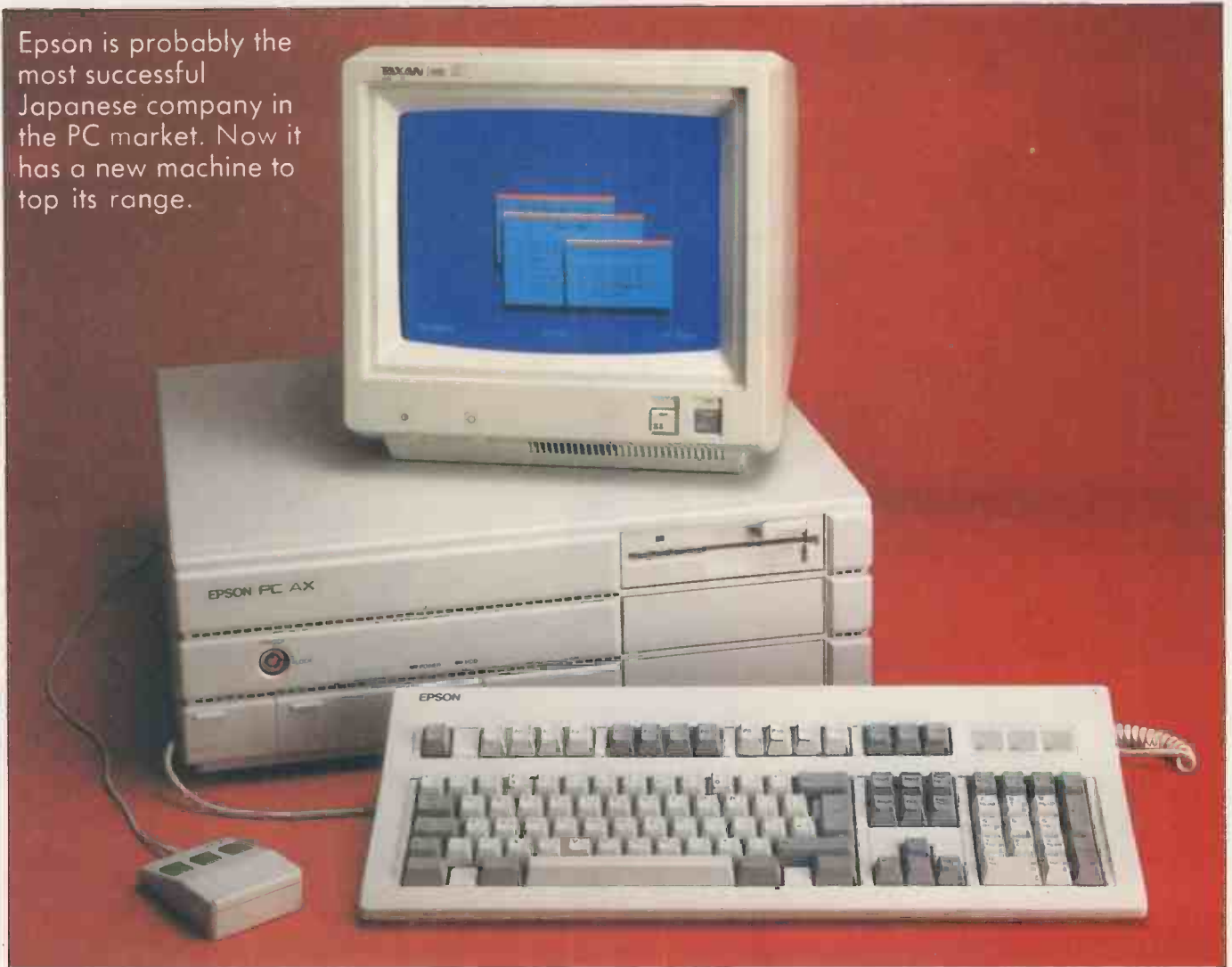
EPSON

EPSON PC AX

SOLID JAPANESE VIRTUES

By Ian Stobie

Epson is probably the most successful Japanese company in the PC market. Now it has a new machine to top its range.



While Japanese companies are overwhelmingly successful in the printer, chip and disc-drive markets, few of them have had much success selling personal computers outside Japan. Epson is the one outstanding exception.

The company's latest offering, the PC AX, fits in at the top of the range. It is a straightforward IBM PC/AT clone, based around the now unexceptional 80286 processor. But its performance is given extra sparkle by fast hard discs and a clock rate which can be boosted to 10MHz.

The PC AX is going on sale in the U.K. in the early part of 1987. A similar machine, the Equity III, is already established in the U.S. and it is likely to be upgraded to the higher specification of the AX. Pricing is not yet finalised, but our review configuration,

The Epson PC AX's keyboard and system box take up a lot of room.

with a 40Mbyte hard disc plus one 1.2Mbyte floppy drive will probably cost under £3,250. We expect the base model, which has just the 1.2Mbyte floppy, to cost under £2,000. Pricing is therefore competitive compared to other good-quality AT clones, such as those from Compaq and Olivetti.

Like the IBM PC/AT itself, the PC AX is physically a big machine and appears well made. The system box and the keyboard between them take up a great deal of desk space. Epson's mouse is a useful option, providing you can find somewhere to put it.

Epson can be excused for its large system box. The PC AX is a machine aimed at the more ambitious user, and it is designed with expansion in mind. So there is room in the

system box for a great deal of extra stuff, both cards and disc drives. There are nine full-length expansion slots: three of them are XT-style eight-bit slots and six are AT-style 16-bit ones. At least three slots will normally be occupied, leaving six free for the user.

Our only criticism of the PC AX expansion arrangements applies to many other IBM clones. To install a card you have to undo several screws and remove the main casing, which wraps round the machine. We would have preferred a lift-up lid: by now anyone offering a nine-slot IBM-compatible system should expect people to add or change cards quite often.

In the price Epson provides a hard-disc controller, a multi-function board which incorporates a floppy-disc controller, an

RS-232C serial port and a parallel printer port. It takes up one of the 16-bit slots. You also need to get a graphics adaptor card, which will fit into one of the eight-bit slots. Epson will sell you a monochrome adaptor for £92 or a CGA-compatible one for £111. You could install an EGA or Hercules card, for example, if you prefer.

The monitor itself is not included in the price. We tried the system out with a Taxan Supervision III colour monitor driven by Epson's CGA card, and with the Wyse WY-700 high-resolution display system reviewed in the performance-enhancement section of this issue. Results were very good as long as we did not try to use the two displays together; when we did the Wyse display developed a disturbing wobble.

The Epson multi-function card is capable of controlling two floppy drives. Standard 5.25in. units in 1.2Mbyte AT or 360K PC format, and 3.5in. units in 720K Convertible format are all supported. At the front of the machine are slots for three floppy-disc drives or half-height hard discs. Inside the system box there is space for two more hard discs. They go next to the power supply, which is rated at 190 watts and is therefore capable of powering at least two hard discs and plenty of cards.

80MBYTE DISC SPACE

The Epson hard-disc controller, which takes up another 16-bit slot, can cope with two drives. On our system we had one 40Mbyte unit fitted internally. Epson also offers a 20Mbyte unit, so depending on how you mix the drives you can have 20Mbyte, 40Mbyte, 60Mbyte or 80Mbyte of hard-disc space.

Setting the system up proved simple. The documentation is good: you just follow the instructions and, with a bit of luck, everything works. On our system we also had the mouse, which occupied another card slot.

Concealed behind a flap on the front of the machine is the Reset button and alongside it a more unusual feature, the speed switch. This lets you choose between running the machine at the normal AT speed of 6MHz, or boosting it up to 8MHz or 10MHz. The point of providing the slower speeds is that some software uses timing loops, though we ran a broad range of application software at 10MHz without experiencing any problems. Some users have reported difficulties loading certain copy-protected software at boosted clock speeds, so it is worth having the option of running at standard AT speed.

The keyboard is on a very long cable and plugs into the front of the machine. It is identical to the new type recently introduced across its entire PC range by IBM, which itself is very similar to the standard DEC layout. It has 12 function keys in three groups running along the top, and a separate cursor keypad in addition to cursor keys on the numeric pad. It is an excellent layout once you get used to it, with the cursor keys and important keys like Insert and Delete near at hand for touch-typists.

The system comes with MS-DOS 3.2

SPECIFICATION

CPU: 80286 running at 6MHz, 8MHz or 10MHz; optional 80287 co-processor

RAM: 640K

Expansion slots: nine full-length slots; at least three normally in use for display and disc controllers, leaving four 16-bit slots and three eight-bit slots free

Discs: system box can house five drives; typical configuration is one 1.2Mbyte floppy plus 20Mbyte, 40Mbyte, 60Mbyte or 80Mbyte worth of hard disc; other options include 360K 5.25in. and 720K 3.5in floppies

Keyboard: 102-key IBM-style, with 12 function keys along top and separate cursor and numeric key blocks

Interfaces: one RS-232C serial port and one parallel printer port standard

Dimensions: 499mm. (19.6in.) × 442mm. (17.4in.) × 169mm. (6.6in.)

Price: not finalised; target prices are under £2,000 for base system with 640K RAM, keyboard, one 1.2Mbyte floppy drive, hard-disc controller and multi-function card; under £2,500 for same configuration with 20Mbyte hard disc; under £3,250 with 40Mbyte; under £3,800 with 60Mbyte and under £4,500 with 80Mbyte

Options: Epson monochrome display card £92, CGA card £111; Epson mouse plus Taxi user interface software £199

Manufacturer: Seiko Epson Corporation of Nagano, Japan

Software in price: MS-DOS 3.2 and diagnostics

U.K. supplier: Epson (U.K.), Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH. Telephone: 01-902 8892

Available: early February

included in the price. Epson's proprietary mouse-driven front end, called Taxi, is included in the price of the mouse. Taxi is less ambitious than either Windows or Gem, but is still quite useful in shielding beginners from the rigours of MS-DOS. It comes with several desk accessories, the most useful being a calculator and a notebook, and they work from within other applications, even your old ones. It is also possible to install Taxi help files to work within applications such as Lotus 1-2-3 or WordStar.

Epson has also made several additions to MS-DOS itself. The new commands are mainly simpler, menu-driven versions of old ones. If you have old batch files you want to use they will still work, as all the standard MS-DOS commands are retained too. Epson has provided an entirely rewritten and much improved version of the MS-DOS manual. Sensible examples are given for every command and an explanation of the circumstances in which you might want to use it.

The other documentation is also good. As well as the DOS reference manual and the straightforward setting up guide you get *Everyday with MS-DOS*, which explains basic housekeeping tasks as well as more advanced things like batch files, redirection and piping.

The PC AX came out well in the standard

performance tests. Running our usual Basic Benchmarks with the clock rate set to 10MHz it averaged 3.4 seconds, which is faster than the 8MHz Compaq 286 at 4.3 seconds and the 6MHz IBM PC/AT at 6.8 seconds.

The Sysinfo command in the Norton Utilities checks out the speed of registers and memory and reduces it to a single figure scaled relative to the IBM PC. With this test the desirable thing for a compatible machine is to achieve as near a figure as possible to whatever it is cloning. Running the Norton test on the IBM PC/AT and the Epson PC AX set at the same clock speed of 6MHz we got an identical figure of 5.7, indicating that the AX closely matches the AT in its internal operations. Set at its top clock rate, the AX yielded a figure of 10.3. This means that it is 10 times as fast as an IBM PC at performing the Norton calculation routines, and nearly twice as fast as the IBM PC/AT.

Of course, most real-life applications involve a lot of disc operations, so we also ran the Bagshaw Disc Benchmarks to check out the speed of the hard disc. Again the Epson disc came out well, with a figure of 47.9 seconds — very close to the Compaq Deskpro 286, and about 20 percent faster than the IBM PC/AT.

These figures tally with our impressions of running software and copying large directories full of data. While not in the performance class of 80386-based machine like the newest Compaq Deskpro model, the PC AX is well up with the best of the straightforward AT clones.

EPSON PC AX

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Value for money	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Well-presented AT clone from a well-known supplier. Should sell.

CONCLUSIONS

■ A good machine which does everything an AT clone should. The switchable clock speed gives users the benefit of better performance while retaining compatibility with badly behaved software.

■ By offering Taxi and a mouse with the system, Epson has made an effort to shield beginners from the less friendly aspects of MS-DOS.

■ All the documentation is very good. The menu-driven commands Epson has added to MS-DOS make routine housekeeping tasks simpler, but the old commands are still there for the sake of compatibility.

■ Likely pricing is keen if not ultra-low, but this is a competently turned out machine from a established manufacturer. The PC AX is good value and should sell well.



Powerful, single or multi user system.

ASPECT offers the database builder the facilities to set up applications quickly and simply using its powerful English-like command language. It can be run entirely via menus which provides an excellent way for the new user to learn the system, or through direct command entry.

ASPECT can read data from and output data to most other systems including accounting packages, spreadsheets and word processors. It has a report generator of such power and flexibility that this alone can justify purchasing ASPECT.

For the increasing number of organisations that are recognising the importance of linking their microcomputers together ASPECT is available in a multi-user version with the appropriate file and record locking facilities.

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THE ASPECT SYSTEM FEATURES

MULTI FILE · MULTI LEVEL (HIERARCHICAL) FILE STRUCTURE WITH UP TO SEVEN LEVELS · VARIABLE LENGTH RECORDS · SYSTEM MENUS · USER DESIGNED MENUS · DIRECT COMMAND MODE · FULL SET OF CONDITIONAL OPERATORS · POWERFUL REPORTING SYSTEM · LABEL PRINTING · CONTEXT SENSITIVE AND USER WRITTEN HELP FACILITIES · READING AND WRITING OF FILES FROM OTHER SYSTEMS · REPORTING DIRECTLY FROM OTHER SYSTEMS

ASPECT costs £400 + VAT for a single user version and £950 + VAT for the network version*. A limited record version is available for £40 + VAT and this amount will be deducted from the price of the full version if one is purchased later.

ASPECT is available from Microft Technology Limited, The Old Powerhouse, Kew Gardens Station, Kew, Surrey TW9 3PS, or from many dealers. For further information telephone 01-948 8255.

* This allows up to 5 terminals on the network. A further £100 + VAT is payable for each additional terminal.

The logo for ASPECT, featuring the word "ASPECT" in a bold, sans-serif font. The letters are white and are set against a dark, rectangular background that has a slight gradient and a drop shadow effect, making it stand out.

The database management system.

ASPECT is a Trade Mark of Microft Technology Limited and is a British Product.

→ circle 108 on enquiry card ←



Power Without The Price!

520ST PACKAGES

The 520ST-M keyboard costs only £346.96 (+VAT=£399) and includes an RF modulator and cable, allowing you to connect it to an ordinary domestic TV set. The keyboard is supplied with 512K RAM, a mouse and a free set of 3 1/2" disks containing applications software. For a limited period from August 11th 1986, we have some special packs offering combinations of the 520ST-M keyboard with a 1/2 Mbyte SF354 Atari disk drive and an Atari monitor (either the Mono SM124, or Colour CM36512). These packages offer up to £200 extra discount on a system. If purchased from Silica, they also come with our free 'ST STARTER KIT'. All of the pack prices shown in the chart include VAT.

UPGRADE TO 1024K RAM

We are pleased to be able to offer a 1Mbyte upgrade on the standard 520ST keyboard to increase the memory from 512K to a massive 1024K. It has a full 1 year warranty and is available from Silica at an additional retail price of only £86.96 (+VAT=£100). Any of the five packs can be upgraded to 1Mbyte for only £100. The 1Mbyte ST offers a low price alternative to the 1040, but also gives you the benefit of an RF modulator (not normally fitted on the 1040).

£100 DISCOUNT 1 DISK DRIVE	ALL PACK PRICES INCLUDE VAT	PACK 1
		Keyboard £399
		Disk Drive £149
		Normal Price £548
		Discount £100
		Pack Price £448
£150 DISCOUNT 2 DISK DRIVES + MONITOR		PACK 2 (MONO)
		Keyboard £399
		Disk Drive £149
		Disk Drive £149
		Monq Monitor £149
		Normal Price £846
		Discount £150
		Pack Price £696
£200 DISCOUNT 2 DISK DRIVES + MONITOR + PRINTER		PACK 4 (MONO)
		Keyboard £399
		Disk Drive £149
		Disk Drive £149
		Mono Monitor £149
		Printer (SMM804) £199
		Normal Price £1045
		Discount £200
		Pack Price £845
		PACK 3 (COLOUR)
		Keyboard £399
		Disk Drive £149
		Disk Drive £149
		Colour Monitor £299
		Normal Price £996
		Discount £150
		Pack Price £846
		PACK 5 (COLOUR)
		Keyboard £399
		Disk Drive £149
		Disk Drive £149
		Colour Monitor £299
		Printer (SMM804) £199
		Normal Price £1195
		Discount £200
		Pack Price £995

REDUCED PRICES

Atari's ST personal computers are now firmly established both in the USA and Europe. The main attraction of the ST range is the value for money which these computers represent, giving both private and business users a powerful asset at a very modest price. There are now several ST packages available from Silica at a reduced price, further enhancing the Atari 'Value for Money' reputation. In addition, we are giving away a FREE Silica 'ST STARTER KIT' with every 520 or 1040 ST purchased at Silica Shop. These offers will only be available for a limited period and commence on 11/8/86.

POWER FOR BUSINESS

The list below shows some of the new business products which have been recently launched for the Atari ST range. It gives an indication of the ST's potential to business buyers looking to install a powerful, low-cost system:

- CP/M EMULATOR
- 20Mbyte HARD DISK
- LOTUS 123™ CLONE
- dBASE III CLONE
- IBM COMPATIBILITY
- VT100 EMULATOR
- MICROSOFT WRITE
- dBASE II

Any ST computer will provide its user with a very powerful asset, utilising a vast range of applications, particularly in the business world. Many software companies have been quick to recognise it for its business potential, and have produced programs for the ST which harness this potential. In addition, there are several peripheral and hardware products becoming available to add to the ST's 'Power For Business'. Software now available includes dBMan, a dBASE III clone as well as H&D Base, a dBASE II clone. In fact, First Software have now launched Ashton Tate's original dBASE II program for the ST. In addition, PC Intercomm is a VT100 emulator which enables you to use any ST keyboard as a terminal connected to a mainframe or mini. Other programs include a powerful accounts package by Cashlink and a Lotus 1-2-3™ clone called VIP Professional. Microsoft have announced that their powerful word processor 'Microsoft Write' will soon be available for the ST. Many packages are available for very specific market applications including a powerful CAD (Computer Aided Design) program called Easy Draw from Migraph. In addition, there is an engineering tool called PC Board Designer by Abacus Software which will enable the user to design printed circuit boards. For further details of how the ST can help in your business, return the coupon below. We will be pleased to send you our latest newsletter and price list.

PRICE MATCH PROMISE

We hope you will find that the combination of our low prices, FREE delivery service, FREE Starter Kit and after sales support, will be enough to make you buy your Atari equipment from Silica Shop. If however, there is something you wish to purchase, and you find one of our competitors offering it at a lower price, please contact Owen Pascoe (Office Manager), or one of the telesales staff in our sales department. When you telephone us, please provide us with our competitors name, address and telephone number. Providing our competitor has the goods in stock, we promise to match his offer (on a 'same product - same price' basis) and still provide you with our normal free delivery. You will also be entitled to our full after sales service, including free newsletters and technical helpline support. We don't want you to go anywhere else for your Atari products. So shop at Silica, the U.K.'s undisputed No1 Atari specialist.

FREE SOFTWARE

When you buy a 520 or 1040 ST computer keyboard from Silica Shop, you will receive a large and varied software package free of charge. This package consists of twelve programs. Wherever you purchase your Atari ST computer, you should receive the first six software titles as standard. However, if you purchase your ST from Silica, you will also receive a further six extra titles, giving you a total of twelve. All ST's now have TOS/GEM already installed on ROM, so the list of free software you should receive is as follows:

- 1) GEM - DR Desktop environment with WIMP (fitted in ROM)
- 2) TOS - Tramiel Operating System (fitted in ROM)
- 3) 1st WORD - Word Processor by GST using GEM
- 4) BASIC - Personal Basic by DR (with manual)
- 5) LOGO - Logo language by DR (with manual)
- 6) NEOCHROME - A powerful colour paint and graphics package (only useable with colour systems)

If you purchase your ST from Silica, not only will you receive the standard six pieces of software as listed above, but we will also give you the following six additional programs FREE OF CHARGE:

- 7) MEGARIDS - Asteroids type game by Megamax
- 8) DOODLE - Simple paint/doodle drawing package (works on mono or colour systems)
- 9) CP/M EMULATOR - Allows use of DR's Z80 CP/M software to run on the ST range
- 10) CP/M UTILITIES - Various utilities to use with CP/M
- 11) DEMONSTRATION & PUBLIC DOMAIN SOFTWARE - Various games, demos and accessories
- 12) CARDS - A unique set of card games from Microdeal

These additional free software titles are all part of the FREE Silica 'ST STARTER KIT', return the coupon below for further details.

FOUR FREE MANUALS

In addition to the free software which will be given to you when you buy your ST from Silica, you will receive four free manuals:

- 1) ST OWNERS MANUAL (80 pages): Easy access to the information you require to unpack, set-up and become familiar with the ST.
- 2) ST BASIC SOURCE BOOK & TUTORIAL (240 pages): Gives you the information to increase your level of programming expertise.
- 3) ATARI LOGO SOURCE BOOK (77 pages): A source book for Logo, showing how to use the language in the GEM environment.
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WANG LAPTOP

A TYPEWRITER WOULD BE EASIER

By Jack Schofield

The world of Wang is normally quite distinct from the PC-DOS environment familiar to most micro users, but they meet in this hard-disc lap-portable machine.

The Wang Laptop PC looks very much like a large portable electric typewriter such as you might expect from, say, Brother. But it has two noticeable features that you will not find on any typewriter: lots of function keys above the keyboard proper, and a swing-back liquid-crystal display (LCD) screen above the platen.

Appearances deceive. The Wang Laptop is an Intel 8086-compatible business micro with a built-in 10Mbyte hard disc. It is the printer and the absence of a built-in floppy-disc drive that make the Wang machine distinctively different from other portable PCs such as the Toshiba T-1100, Zenith Z-181 and the IBM PC Convertible.

The Wang Laptop has no carrying handle but comes packed in a light zip-up case with external measurements of roughly 15in. by 13.5in. by 5in. After hoisting it out — it weighs over 14lb. — you snap open two catches to release the 9.5in. screen, which can be rotated back a full 180 degrees. This is useful, because it makes it easier to find a good viewing angle; you also need to push the screen out of the way to get paper into the printer in the top.

Legibility is not that bad as LCDs go, but it isn't a patch on the Zenith Z-181, which uses the same super-twist technology but has the additional advantage of back-lighting. The Wang display is better than some, but bad enough to be uncomfortable to work with. An external monitor can be attached for in-office use.

The keyboard is slightly raked and the keys have nicely dished tops; it feels good, not cramped. The layout seems odd, mainly because it is ultimately closer to a typewriter or Wang word processor than any of the numerous IBM PC keyboards. On the Wang Laptop the Shift, Caps Lock and Tab keys keep their typewriter positions, while the Control key is sited next to the space bar.

At the right-hand end of the space bar is a key labelled 2nd on top and Alt on the front. This establishes the principle that Wang packages get to use the keytops while PC programs — the poor relations — use the legends on the side.

There are two rows of keys above the main

keyboard. First there are 16 function keys, numbered both f1 to f16 and f17 to f32, in four groups of four. Above them are two groups of three special keys labelled Help, Paper Back, Paper In, Print, Erase and Cancel. Cancel doubles as Break, and f16 as Num Lock — though the purpose of Num Lock when there is no numeric keypad to lock remains a mystery.

The left-hand side of the machine has a standard female D-shell connector providing an RS-232C serial port. Next to this are two phone-type sockets. One is for taking a line out from an optional internal modem — if BABT ever approves one — to the telephone socket; the other is for plugging in a telephone handset. There is no external parallel printer port, but if you want to use a parallel printer you can buy a serial-to-parallel converter from Wang.

The right-hand side has an SCSI port to which up to six peripherals can be daisy-

WANG LAPTOP				
VERDICT				
	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Value for money	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Could well appeal to existing Wang users, but an unattractive option for IBM PC and compatible owners or would-be buyers.

chained. Two of them can be external drives A: and B:. There is also a printer switch and a push-button to turn the power on and off. A panel behind the printer hides two sockets into which you can plug an internal modem and extra RAM; the system is supplied with 512K as standard.

Personally, I am not very happy about a portable PC which does not have a built-in floppy drive. You can get an external disc drive but it weighs the best part of 4lb. and greatly reduces portability. Yet without it you cannot back up files, and any damage to the shock-mounted but delicate hard disc leaves you with an unusable machine.

On the back of the Wang is a socket for an external a.c. power cable, which also recharges the battery stored in the bottom of the machine under a long panel. One nice point is that you can shove the power cable



SPECIFICATION

CPU: NEC V-30 CMOS running at 8MHz

RAM: 512K

ROM: 32K bootstrap and diagnostics

Dimensions: 302mm. (11.9in.) × 353mm. (13.9in.) × 102mm. (4in.) with cover closed

Weight: 6.5kg (14.25lb)

Display: LCD, 80 characters by 25 lines, or up to 640 by 200 pixels

Keyboard: QWERTY with four cursor-control keys, 12 special keys, and 16 function keys

Mass storage: 10Mbyte hard disc

Interfaces: RS-232C, SCSI, numeric keypad port, colour-monitor port

Expansion options: 512K RAM card, internal modem undergoing approval, external 360K 5.25in. and 720K 3.5in. floppy-disc drives

Software in price: MS-DOS 3.2 and Basic; Wang menus and utilities

Other features: built-in thermal dot-matrix printer, 12V battery

Price: £2,535; 5.25in. extenal disc drive £255; 3in. drive £365

Manufacturer: made in Japan for Wang Laboratories of Lowell, Massachusetts

U.K. distributor: Wang Headquarters, 1000 Great West Road, Brentford, Middlesex TW8 9HL. Telephone: 01-568 9200

Available: February 1987

in or take it out at will, without having to reboot. When the battery runs low you get a most insistent four-minute warning on-screen, so having the a.c. adaptor handy can stave off disaster. However, the adaptor weighs 3.75lb.; when you have thrown in a couple of cases, a manual, the external drive and a few discs, the all-up weight of the Wang Laptop is around 26lb.

The printer is a thermal dot-matrix model



Hard disc and printer (below) are built in, but to load from a floppy you need an external drive (inset).



which can be used either with special paper or with ordinary paper and a special ribbon. It is just like the Canon Typestar or Brother EP-44 portable electronic typewriters. It produces a good-quality image and can handle the usual range of enhancements. The manual says the printer runs at 16cps, which is very slow. Subjectively it is even slower: it took two minutes to print a 14-line by 70-character spreadsheet from Multiplan, which I make about 8cps.

When it comes to running software, Exec is the most important key. Wang has set up its own menu-driven front end for the Laptop which protects you from the MS-DOS 3.2 operating system. In Wangland you have to press the Exec key to make anything work; pressing the Enter key gets you nowhere. To go back a screen you press the Cancel key. Function keys may also be used, though they are not labelled; an overlay supplied by Wang must be stuck on to identify the key assignments.

Just how hard it is to run PC software under this non-standard shell is open to

speculation. Lacking a 5.25in. drive, I could not try the machine with off-the-shelf IBM PC programs. However, running Wang versions supplied on the hard disc or loaded via an accessory 3.5in. drive sometimes led to confusion. In Multiplan, for example, the Esc key simply did not work. This made the package almost unusable until I discovered that in some cases — though not all — Exec worked instead. This made the program usable but horrible.

Nor did I enjoy using the front-end software originating from Wang. For example, I expect to be able to use the cursor-control keys to scroll up and down a menu. No such luck. Pressing the space bar moves the cursor down the list, but then pressing Enter doesn't activate the selection. I tried running the Notebook program and was brought close to despair. Not counting mistakes it took me half a minute, six screen displays and seven key presses to get nowhere.

Printing a file from disc is just as tedious, given that

TYPE FRED >LPT1

does not work and locks up the machine. The sequence goes: reboot, hit Exec; select System Utilities and hit Exec; select Advanced Utilities and hit Exec; select File Display and hit Exec; hit Enter to accept C as the drive name; hit Enter to skip the Volume ID; type

FRED

next to File ID and hit Enter; press the space bar to select the Printer option; hit Exec. Lo and behold, the miracle unfolds, and the machinery whirrs into action. It prints your file, and you only have to hit any key followed by three Cancels to reverse through the menus to get back to where you started.

Actually it is not quite accurate to say it prints your file: it also prints the date, the

time and the words "File Display" at the top of the page, followed by the file name, before printing out the actual text. As the file was, in this case, just an address the resulting envelope looks pretty silly. A portable electric typewriter would do the job better, more quickly, more cheaply and with far less fuss.

I subsequently found out how to use the machine in Typewriter mode. After booting the system you hit Exec, then hit Exec again to accept the default, which is Applications. You then hit Exec a third time to accept the next default, 2.68 Integrated WP; then type S for Special Print Functions, then Exec; then press the space bar to select the Typewriter option; hit Exec; and finally hit Exec to accept the default settings, including the integral printer. You can now type away, before hitting the Enter key to send the line you have typed to the printer.

The problem with the Wang Laptop is that it is neither a typewriter nor a whole-hearted IBM PC compatible like, say, the Tava Flyer. It is a Wang compatible with IBM-compatible features. Wang includes its own version of the ASCII code, so the Laptop has to cope with two different character sets. I used the printer to take a screen dump of a menu, and that worked fine. But inside Wang's Integrated Word Processing the screen dump simply omitted all the space between words.

After such struggles it was almost a relief to get to good old Microsoft GWBasic 3.2. It offers 59K free for programs, and running the Basic Benchmarks the Laptop's NEC V-30 chip proved to be a respectable performer. It turned in an average of 6.3 seconds, which is roughly the same as a 6MHz IBM PC/AT. The Toshiba T-3100 manages 4.3 seconds, though even this is well down on today's quicker Basics.

To someone who is used to running a modern Basic on a modern machine the Laptop's performance is pretty unimpressive. To someone used to Digital Research's Gem, Microsoft Windows or the Apple Macintosh system, the Wang menus seem antediluvian. Of course, the Wang Laptop runs IBM PC programs. One of the few available on 3.5in. PC discs is that old faithful, Lotus 1-2-3.

CONCLUSIONS

■The Wang Laptop provides the power equivalent to an 8086-based hard-disc PC in a portable package, along with an integral printer.

■The lack of a built-in floppy-disc drive could be a major drawback for some users.

■While a level of IBM compatibility is a feature, the operating environment is more calculated to appeal to existing Wang users. If you are not one already this is probably not your best choice of machine.

■Wang's menu-driven front end brings new levels of meaning — several new levels — to the concept of tediousness.

■With 512K of RAM, a 10Mbyte hard disc and an unilluminated LCD, the Wang is practically out of date on its launch. With a megabyte of RAM, a 20Mbyte disc and a back-lit screen it would be better fitted for the future.





FUJITSU 2020 TAKE YOUR PICK

By Steve Malone

While most multi-user business micros struggle to make the best of MS-DOS orientated operating systems, Fujitsu has opted for Pick.

Fujitsu is one of the world's largest computer manufacturers. Yet like many of the giant Japanese electronics companies it has remained in the background while others have hogged the limelight. Now Fujitsu has entered the U.K. market with the System 2020, a multi-user micro based around the Pick operating system.

The 2020 is designed as a multi-user engine for office-automation applications. Its processor unit can support up to eight users and can be networked with other System 2020s or to other manufacturers' machines.

The systems box is approximately the same size as a PC/XT, but as it is mounted in a tower arrangement it has a much smaller footprint. The entry-level system comes complete with an RGB colour monitor and keyboard.

The processor is an Intel 80286, and there is 1Mbyte of RAM. On the front of the system box is a 360K 5.25in. floppy-disc drive. The disc format was chosen to allow data and programs to be transferred to and from an IBM PC running under Pick. But IBM compatibility stops there: the Fujitsu machine is in no way PC-DOS compatible.

In fact the Pick operating system does not recognise disc formats at all. The operating system simply treats the floppy-disc drive as a fast tape machine; the disc is used as a sequential device only. As a result the disc drive is only really suitable for data transfer, rather than for storage.

The 2020 is intended to be a multi-user system, but with a number of terminals connected to the CPU the colour monitor provided is configured differently from the usual terminal format. Instead of the keyboard being connected to the terminal, and it in turn connected to the computer via an RS-232 cable, the colour display and keyboard are both attached directly to their own ports on the rear of the machine.

Among the other interfaces on the system are those for a light-pen, printer port and RS-232. There are four expansion slots fitted to the 2020. On the review machine one of them was occupied by an SSIO port through which you can attach an external hard disc or tape backup interface. Another was fitted with one of the Fujitsu standard terminal interface cards.

Each of the standard cards can support up to two users, so up to nine users can be sup-

ported through a single unit. In addition, the fast SSIO can be configured to support eight users. Thus with all expansion ports used as SSIO ports, up to 64 users can be supported — although nobody could then expect to get much done.

The origins of Pick go back some 20 years. It is derived from software designed for the U.S. military to assist with stock control. As the system was intended to be run and maintained by personnel with no background in computers, the requirement was for a package which would be simple to use and operate. This system was taken over by Richard Pick, who began to develop it for commercial use. The first versions for the business community appeared at the beginning of the 1970s.

Pick is not actually an operating system in

adding it to the existing file; Pick will do the rest, without you having to reformat the data.

The files on the disc are organised into dictionaries. They roughly correspond to the directories in MS-DOS, although the structure is more fluid. At the top of the hierarchical file structure is the system dictionary, which holds the system information and a number of pointers to the lower dictionaries. It also contains pointers to the next level down, which holds what are known as the master dictionaries.

Dictionaries can be assigned to users or processes within areas known as "accounts". The point about accounts is that they are assigned certain restrictions, known as "privileges" in Pick terminology — that is to say, they are password protected to prevent unauthorised access. Following the hierarchy down you come to dictionary files containing further pointers, and at the bottom the data files.

EDITING FILES

Although this might sound complicated, the whole system is effectively transparent to the user. You can call up a command as though it resided in a local directory, even though it may actually reside elsewhere. From the MS-DOS viewpoint, you could look at it as though a directory consisted of a number of pipes to other directories which contain the needed files. The beauty of the system is that files and privileges can be added and removed simply by editing a particular master dictionary and changing the pointers.

The user can read and write information held on the disc and define the way in which it is formatted via modules provided with Pick. The central module, known as Access, is an enquiry language which can interrogate the database and generate reports. Its most outstanding characteristic is the way it can use English-type phrases. For example, suppose there is a file called Customers, and inside it is an item called Addresses. To obtain a simple display of customer addresses via Access you just type

LIST CUSTOMER ADDRESSES

and the relevant information will be output.

Pick makes no distinction in its method between programs and data files; there are no identifier extensions as in MS-DOS or CP/M. The only way that Pick can distin-

FUJITSU 2020				
PC VERDICT				
	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Value for money	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

A major event for Pick users, but unlikely to make much of an impact on the world of DOS.

the normal sense. Rather than handling disc management, Pick is a relational database management system which also handles the input/output to the disc storage.

Data is held by Pick on a file basis. The information is sub-divided into records, known as "items" in Pick terminology; fields, known as "attributes"; and sub-fields called "multi-values". The files and their sub-divisions are of variable length. This flexibility gives Pick a number of useful advantages over other database-type systems.

To begin with, the variable length allows for maximum compaction of data. If an item or attribute is unused, the system will just concatenate the data together. On the other hand, should you want to add an additional field to the file it is simply a matter of

(continued on next page)

REVIEW

(continued from previous page)

guish between data and program files is by looking inside the file for a header. Headers begins with P for a program file and D for a data file; Pick will only begin to execute the file if it comes across the P header.

Because Pick does not care what files are called, even built-in program files can be renamed if you wish. Thus it is possible to rename List to Show Me or whatever you are happiest with. This method can be used to copy and rename files at will, so the same command can be invoked in different ways.

Access has several other built-in commands at its disposal. Relational operators allow you to generate reports whose contents depend on whether particular criteria are fulfilled. For example, the With operator allows you to pick out information which satisfies two or more conditions. There are also operators which correspond to the arithmetic comparisons =, <, > and so on.

In this way English-type statements can be used to generate report information. For example, you can say
LIST CUSTOMERS WITH ADDRESS TOWN
"LONDON"

This tells Access to look in the Customers file and display those items which have London in the attribute's multi-values: in effect to print out the London addresses.

This method of accessing information via a series of commands is at the core of Pick Basic, an interpreted form of the language. It enables you to customise your system to produce menus, interact with files and perform other data-processing functions. While the syntax of Pick Basic is recognisable to anyone familiar with other versions of the language, it differs in its data structures. All variables are treated as strings, and no distinction is made between integer, real or alphanumeric data, reflecting the language's orientation towards database structures.

PICK BASIC

Another feature of Pick Basic geared towards the database structure is in its use of dynamic arrays whose elements are mapped directly on to the corresponding sector position on the disc drive. With the ability to map attributes and sub-values on to the disc, it is possible to write a Basic program which assigns data to a precise position on the disc.

Pick Basic also contains many of the features found in other versions, such as Print and Input commands and the If-Then-Else conditional structure. One useful feature is the ability to format screens for menus and data displays. The cursor can be displayed on the screen using the command

```
PRINT @ (X, Y)
```

where X and Y correspond to the horizontal and vertical columns.

A variation of this command allows you to pass control characters to the VDU. These commands, written in the format

```
@ (-x)
```

where x is an integer, give specific information to the display: to clear the screen or backspace the cursor, for example.



SPECIFICATION

CPU: Intel 80286 processor running at 8MHz

RAM: 1Mbyte internal RAM

Mass storage: one 360K floppy-disc drive and one 76Mbyte hard disc

Interfaces: RS-232C serial port, parallel printer interface, SSIO interface

Keyboard: 98 typewriter keys, including 10 programmable function keys and numeric keypad

Display: text resolution of 80 x 25 characters, giving a pixel resolution of 640 x 200 with eight colours; terminal-emulation program available for a range of makes

Software in price: Pick operating system, Jet word-processing program, electronic mail, calculator, CNA levels 1 and 2

Price: £6,925 for entry-level system
Manufacturer: Fujitsu Europe Limited, Systems Department, Station Road, Langley, Berkshire SL3 6EJ. Telephone: (0753) 683949

Available: now

Pick was originally intended to be as non-machine-specific as possible, and required drivers to be written to implement the generic commands on specific machines. But as more hardware facilities have become available, manufacturers have added their own commands to the original 10 defined by Pick Systems.

The origins of business Pick lie with mini-computers supporting text-only terminals. However, since most microcomputers are capable of displaying text and graphics in colour, Fujitsu has added commands to support these features. Pick Systems says the colour and graphics will also be added to the standard Pick implementation, and as Fujitsu is a member of the Pick standards committee it may well be the Fujitsu commands that are adopted.

The graphics capabilities of the System 200 have caused a ripple of excitement in

the Pick world, though in microcomputer terms they are nothing much to write home about. In text-only mode the System 200 seems particularly fast, with good scrolling and fast access. The graphics displays are somewhat slower, and a noticeable delay is apparent when a display is being constructed.

The final Pick construct to mention is the proc. As the name suggests, procs are procedures, and are essentially subsets of the Basic. They do not support the I/O functions to the disc, and are generally used as a job-control language to perform batch operations, and to link applications and modules together. In minicomputer days procs were often used by programmers. But with the increased power and sophistication of many of the applications programs written for Pick, they are now becoming less common.

APPLICATION SOFTWARE

The Fujitsu System 200 has three pieces of application software included in the package. An electronic-mail program allows users logged on to the system to communicate with each other. There is also a simple calculator, which can be used as a kind of pop-up program within other applications, and a word-processing package called Jet. The best that can be said about Jet is that it is the standard word-processing program used on Pick systems; users familiar with PC word processors will find its abilities somewhat limiting.

Fujitsu has also added the software for its Complete Network Architecture (CNA) networking system. Currently, levels 1 and 2 are bundled with the computer. CNA level 1 contains the software to connect to other Pick devices via standard RS-232 links; level 2 is the network software, which requires an additional board to fitted to the 200 to work. It is essentially a version of the Omnet system and is a 1Mbit/s. RS-422 based network. It allows a number of 2020s or other Fujitsu machines to be networked together, supporting up to 384 users.

Level 3, which has recently become available, will allow IBM PCs to be added to the network. This would undoubtedly increase the attractiveness of the system to businesses which already have computing power in the office, but as yet no decision has been reached whether or not to supply it with the 2020 system.

CONCLUSIONS

■ The System 200 is Fujitsu's bid to enter the expanding office-automation market.

■ The machine has been designed as an engine for the Pick multi-user operating system which, although highly rated, is out of the microcomputer mainstream.


■ Pick is constructed around the concept of the database, and is easy to use. Despite help from the hardware it is not the world's fastest system, though it is probably adequate for small-business use.

■ The System 200 should be a gift to value added resellers, who will be able to configure a system for a particular user in a fraction of the time it might otherwise take.



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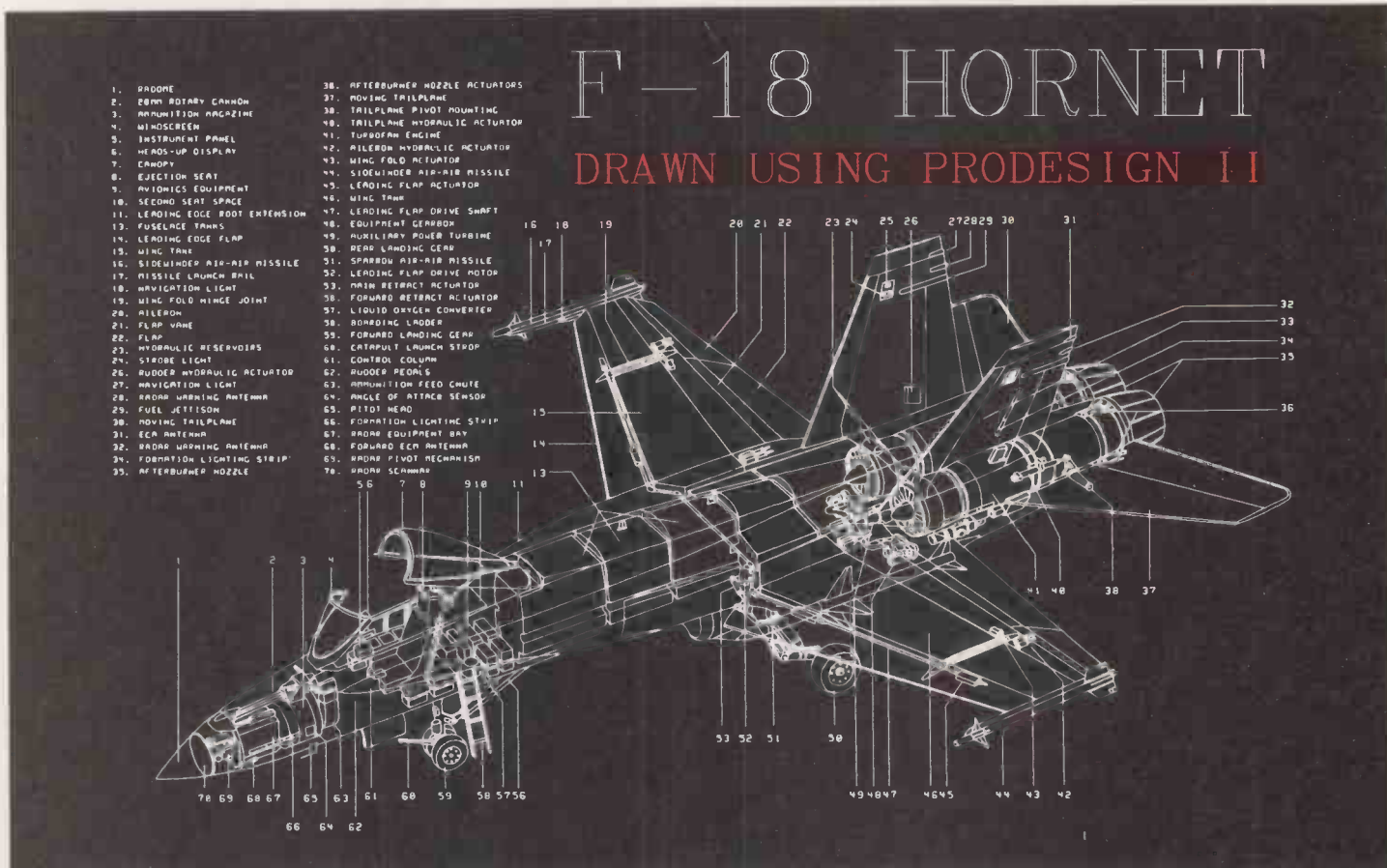
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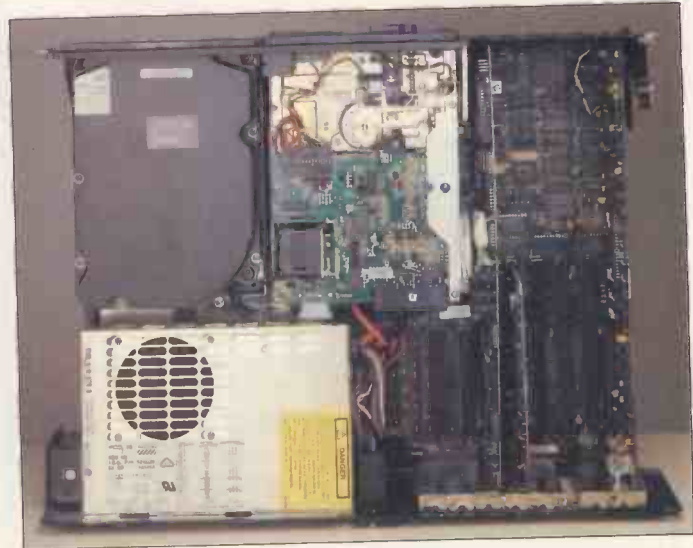
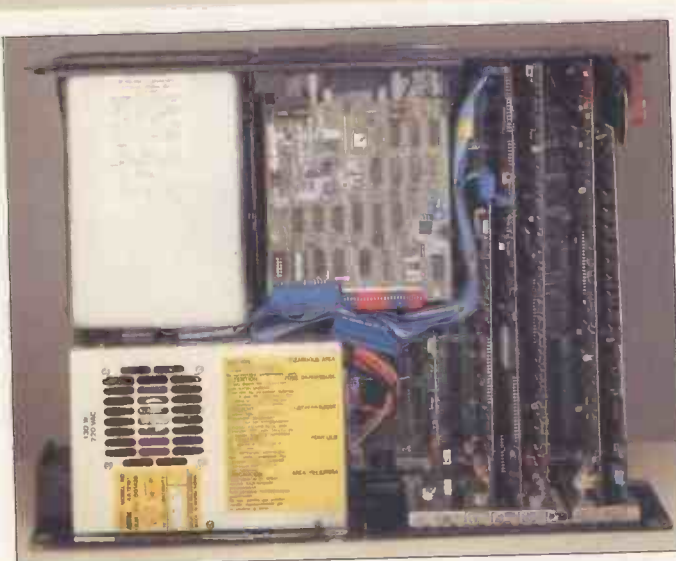


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IBM PC/XT-286

SURELY SOME MISTAKE?



The PC/XT (left) and XT-286 (right) share a similar basic layout, but the motherboard has been completely redesigned for the new machine.

Glyn Moody unravels the mystery of the latest addition to the IBM PC family. Heralded as a souped-up XT, it appears on closer inspection to be designed primarily to keep the clones at bay.

The launch of the IBM PC/XT-286 was somewhat obscured, in this country at least, by the announcement on the same day of the Amstrad PC. This was no doubt pure coincidence on IBM's part, but for those not dazzled by Alan Sugar's latest marketing coup, the new IBM PC proved a very puzzling beast.

As its name indicates, the PC/XT-286 uses an 80286 processor, which would seem to put it in the AT family. Furthermore, like the entry-level AT it runs at 6MHz. But IBM has chosen to regard it as a souped-up XT, complete with 20Mbyte Winchester. Cynics suggested that this was simply to protect the AT range from being undercut. The XT-286 with colour graphics reviewed here costs £3,549 compared with around £3,700 to £4,600 for the equivalent AT systems.

Closer inspection of the machine proves just as puzzling. Externally, the casing is identical with that of the IBM PC. Instead of the full-height floppies, new half-height Japanese drives are used. The Winchester remains full-height, and is made by IBM Japan. The motherboard is new.

At the front of the motherboard is the square-packaged 80286, and next to it the space for the 80287 maths co-processor. A sea of new chips surrounds it. Gate arrays have been used instead of the more usual custom designs for most of the chips that glue the system together. The RAM is fitted on tiny boards mounted horizontally on carriers.

Next to the RAM are two EPROMs. The fact that the BIOS is not yet in permanent ROM is a further indication that this machine is not a strategic member of the IBM PC family. Jumper leads on the motherboard also suggest last-minute fixes — not something that inspires confidence.

RT/PC KEYBOARD

Standard CGA or EGA graphics can be used. The keyboard supplied with the system is that introduced with the IBM RT/PC, and now standard on the PC range. The separation of cursor and numeric keys is an improvement over the standard PC and AT keyboards, but in most other respects there is little to recommend the RT version.

For example, the Backslash key has crept back to the position between the Z and the Shift key. The Control key has moved down to the bottom of the keyboard — not very convenient for those packages like WordStar which use it extensively. The 12 function keys are now placed along the top of the keyboard, which again is very confusing for those used to reaching out to the left. The size of the keyboard has increased enormously to provide space for all the extra key

groups. Taken together with the system box this means that a considerable desk area is required for the machine.

The overall standard of construction has declined too. The keys have lost the solidity of earlier models, and the metal casing has been replaced by a flimsier plastic.

As you might expect from a machine running an 80286 at 6MHz, its performance is better than that of the PC; it is actually 50 percent faster than the PC/AT. Running the standard Basic Benchmarks produced an average time of 4.6 seconds, compared with 17.7 seconds for the IBM PC and 6.8 seconds for the PC/AT. Top AT compatibles like the Sperry Micro IT and Apricot Xen-i turn in times of around 3.4 seconds.

On this basis the PC/XT-286 would be a better buy than a PC/AT. However, the discs used on the XT-286 are no great shakes. Running the Bagshaw Disc Benchmarks, the hard disc took 156.7 seconds. This compares with 232 seconds on the IBM PC/XT, and 60.3 seconds on the PC/AT. The 1.2Mbyte floppy clocked up 303 seconds, which is a great improvement over

IBM PC/XT-286				
PC VERDICT				
	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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the 360K floppy on the IBM PC which took 742 seconds, but worse than the PC/AT's 285 seconds. On the review machine, the floppy disc also had the curious habit of waiting a few seconds before carrying out read operations.

It might seem perverse to check the compatibility of a machine from IBM. But there were several programs for the IBM PC which did not run on the PC/AT, and it is likely that future machines from IBM will move even further from the PC standard. However, we had no difficulty in running any of the standard compatibility tests, though using the Sysinfo test in the Norton Utilities produced a figure well away from a perfect match.

Hardware compatibility is another matter. Perhaps to hobble the XT-286 further and prevent it functioning as a cheap AT substitute, IBM has not raised the height of the IBM PC casing for this machine, which means that full-height AT cards will not fit.

All in all, this machine is a mess. It would be a joke if IBM had a sense of humour, but since it does not this curious product has some far-reaching implications. The XT-286 has every appearance of being a stopgap machine, probably launched to divert atten-

SPECIFICATION

CPU: 80286 running at 6MHz
RAM: 640K expandable up to 6.6Mbyte
ROM: 64K EPROMs
Mass storage: 20Mbyte hard disc, 1.2Mbyte floppy as standard, optional 360K floppy
Keyboard: standard RT/PC layout with separate cursor and numeric keys; 12 function keys
Display: standard IBM range
Ports: serial port included as standard
Hardware expansion: five 16-bit slots, three eight-bit slots; two 16-bit slots and one eight-bit slot were occupied on the review machine
Software in price: none
Price: £3,459 for review system
Manufacturer: IBM United Kingdom, PO Box 41, North Harbour, Baltic House, Portsmouth PO6 3AU. Telephone: (0705) 694491
Available: now

tion from the Amstrad PC and to confuse prospective purchasers of clones. The performance of the XT-286 is far superior to that of the PC/XT, and so superficially might appear a better bet than an XT clone.

However, I suspect that both the XT-286 and the entire 8088-based PC family will soon be junked. The rumours about a new range of IBM products, ominously code named Renegade, are growing steadily. As well as a top-end 80386 machine, or machines, there will be a PC-style offering which is likely to become the new standard at the bottom end of the range. There are also rumours that the new machines will not be fully compatible with the old ones, possibly through proprietary additions to the operating system or a change in graphics resolution.


It seems safe to say that the XT-286 can be ignored, except by collectors of curiosities. If you want a high-performance XT machine, get one of the Amstrads or wait until the new IBM version comes out. Since the latter has been dubbed by many as a clone killer, it is possible that it will be competitively priced and hence well worth considering.

Better still, move up to the AT range. Clones are getting cheaper all the time, and performance is being improved. Since for all practical purposes the PC/AT is simply a souped-up PC, you may as well go for the superior model. Also if and when MS-DOS 5 — also called Advanced DOS — appears it will allow you to use the full power of the 80286 and AT owners will be well placed to take advantage of new software.

CONCLUSIONS

■ The IBM PC/XT-286 is a botch. While the performance of the processor is considerably better than any previous IBM machine, the discs are slow.

■ The use of the standard IBM PC casing means that you cannot use full-height AT cards.

■ EPROMs and jumper wires on the main board suggest that the PC/XT-286 has been put together hastily. It is likely that its departure will be just as swift. 

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FERRANTI XT PC-COMPATIBLE WORKHORSE

By John Lee

Ferranti has upgraded its family of IBM-compatible machines.

The arrival of the Ferranti XT marks the coming of age of the best-known British-made IBM look-alikes. The new machine has many small but worthwhile design improvements over its predecessor, the PC-860, which we reviewed in the September 1985 issue of *Practical Computing*. There are two machines in the range. The first has two half-height 5.25in. Shugart floppy-disc drives, storing 360K each. The second machine is fitted with a single floppy disc and a 20Mbyte hard disc.

The case of the Ferranti XT is solidly made from sheet metal. It is appreciably smaller than its predecessor and virtually identical in

size to the IBM PC. There is room inside for three half-height mass-storage devices. In addition to the floppy and hard discs there is the option of a tape streamer. Two power-supply units are fitted as standard, which should be more than up to the job of feeding the three devices for which power cables are supplied. This brings the weight of the twin-floppy machine up to a fairly hefty 32lb.

Ferranti supplies a high-quality AT-style keyboard with the XT machines. Like the IBM unit it is plugged into the back of the computer via a coiled cable and a five-pin DIN plug. I liked the good, positive feel of the keys. The layout is similar to that of the AT, with a large and well-placed L-shaped Enter key.

There are two very large Shift keys, one on each side of the keyboard. The usual numeric keypad is on the right, and there

are 10 function keys on the left. LED indicators are built into the tops of the Caps Lock, Num Lock and Scroll Lock keys, which is better than having a separate panel for the indicators, as on the IBM PC. The English keyboard layout is used, though you have to run the Keybuk program every time the machine is switched on, otherwise the U.S. layout is assumed.

Inside the machine, a redesigned motherboard replaces the two boards of the previous machine. A full 640K of RAM is fitted as standard. The cassette circuitry has been removed to make more room, and the chip count has been reduced. Numerous individual chips have been replaced by several large ULAs, which reduces the amount of heat produced and should improve reliability. There is the usual empty socket for an 8087 maths co-processor, but no built-in clock/calendar.

A rear-mounted fan draws air over the motherboard, the expansion boards and the power supply. This is a better arrangement than in the IBM, where the fan cools only the power supply.

There are five full-length eight-bit expansion slots which can take any IBM-compatible boards. One slot is used for the video board, and a second slot is occupied by the disc controller. Serial and parallel ports are supplied on the motherboard, so three unused slots are available for expansion.



SPECIFICATION

CPU: Intel 8086 running at 4.77MHz; optional 8087 maths co-processor
RAM: 640K as standard
Mass storage: two 360K 5.25in. floppy-disc drives or one floppy and one 20Mbyte hard disc; space and power leads available for a third half-height device
Ports: one RS-232 and one Centronics port built-in on motherboard
Keyboard: AT layout
Price: £995 for twin-floppy version, £1,345 for hard-disc version; Hercules-compatible monochrome graphics card £195; colour-graphics card £105; monochrome monitor £185; colour monitor £425; 12-month warranty included in price
Software in price: MS-DOS 3.2, Basica, Perfect suite of applications software
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Available: now

(continued on next page)

(continued from previous page)

Both ports are accessed via 25-pin D plugs at the back of the machine.

Each of the power supplies is rated at 50 watts. One of them drives the discs and the motherboard while the other is connected to the expansion slots. With a full set of five boards fitted I tried alternately increasing and reducing the mains voltage by 10 percent: somewhat to my relief the machine carried on working without any ill effects. I later found that Ferranti had tested the machine with a 15 percent voltage variation.

Although removing the display circuitry from the motherboard reduces the number of expansion slots available it has the compensating advantage of allowing you to use whatever kind of display card you choose. Our test machine was fitted with a standard colour-graphics adaptor manufactured by AST connected to a Microvitec 13in. colour monitor. It produced 16 colours, like the IBM PC, but the colours were slightly muddy.

I much preferred the results from an Interquadram EGA+ board connected to a Qubie HR-31200 14in. monitor. The higher resolution — equivalent to that of the IBM EGA — made text much easier to read, and the colours were the best I have ever seen. This combination makes word processing on a colour monitor a pleasure.

The Ferranti monochrome monitor we saw was a 14in. green-screen model manufactured by advanced Datum Information Corporation of Taiwan. The high-per-

sistence monitor ensured that there was no visible flicker, even when scrolling; there was no snow on the screen at any time and the characters were easy to read, indicating that the video board was of good quality. The power cable for the monitor plugs into the back of the computer.

The MS-DOS 3.2 operating system is included in the price of the system, along with a recent version of Basic which gives

FERRANTI XT				
PC VERDICT				
	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Value for money	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Solid and reliable, but far from outstanding in terms of price and performance

graphics on the Hercules screen. The Perfect 2 series of application software is also included in the price; the suite comprises filing-system and spreadsheet programs and a word processor with spelling checker.

In extensive software compatibility tests I did not find a single program that ran on an IBM PC and would not run on the Ferranti.

Lotus 1-2-3, Sidekick and Flight Simulator were all handled faultlessly.

The standard Basic Benchmark routines show the Ferranti XT to be marginally faster than its predecessor, and about 25 percent faster than the IBM PC. The Norton Utilities Sysinfo program gives it an index of 1.1, compared with 1.0 for the IBM PC.

The performance of the floppy discs was a major disappointment. They took a total of 891 seconds to complete the Bagshaw Disc Benchmark routines; this puts them behind even the leisurely IBM PC discs, which take 742 seconds. The 20Mbyte hard disc managed a rather more respectable 109 seconds, putting it mid-way between the IBM PC/XT and the relatively speedy Compaq Deskpro 286.

The Ferranti comes over as a solid and well-made machine which should appeal to business users who need reliability first and foremost. If help should be needed there is a large customer-support department to call on, and a 12-month warranty by National Advanced Systems.

CONCLUSIONS

■ The Ferranti XT is a thoroughly IBM-compatible British-built micro.

■ The build and finish of the machine and keyboard are of good quality, but its performance — especially in respect of the floppy discs — is no more than average.

■ Those who are prepared to pay for a reliable, heavy-duty machine for business use may find the Ferranti a more attractive option than the rock-bottom clones.

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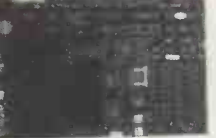
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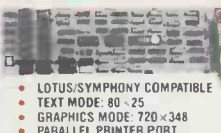
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TAS-Plus runs on IBM PC, XT, AT and all true compatibles. It requires at least two floppy discs and a minimum of 384KB RAM. The current TAS Level-1 product is available for CP/M and non-IBM compatible MS-DOS systems (including Apricot) for £199.

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VENTURA PUBLISHER

DESK-TOP PUBLISHING FOR IBM

By Ian Stobie

Until recently all the best desk-top publishing software ran on the Macintosh but Xerox's new package for IBM compatibles is easily their match.

What first strikes you about Ventura Publisher is how very Mac-like it is for a package running on the IBM PC. But what is more impressive is that Ventura Publisher manages to make an inherently complicated task fairly easy.

It is not so much its mouse-style interface, based on Gem, which achieves this but some intelligent planning at the design stage. Ventura Publisher is not just about pull-down menus, dialogue boxes and seeing on-screen what you get at print time; a great deal of thought has gone into who will be using desk-top publishing (DTP) and what they will use it for.

The package should be on sale in the early part of this year priced at £795. It runs on IBM PC or AT systems equipped with a hard disc, and works with a broad range of laser printers and typesetting machines.

It is a highly important product — and not just because it is one of the first really powerful DTP packages for the IBM PC. Ventura Publisher also marks the return to the fray in earnest of Xerox, one of the giant office-system companies slumbering on the edge of the personal-computer market.

Xerox acquired marketing rights to Ventura Publisher in April 1986. The product was developed and is supported by Ventura Software, a small new California-based company formed by a group of ex-employees of Digital Research. The fact that all four of the Publisher project team had worked on Gem at Digital Research explains why the mouse interface is implemented so well.

Ventura Publisher is aimed at ordinary office users, not at journalists or other staff working in the existing newspaper or magazine industry. The people using the system will probably be those who originate the documents, such as marketing or technical specialists, or secretaries who have been retrained to supply a DTP facility.

The motive for buying a package like Ventura Publisher is to get presentable results more cheaply than a conventional print supplier could manage. It then becomes economically feasible to upgrade

existing word-processed documents to near-typeset quality, and to bring many existing jobs in-house.

Typical DTP jobs might be the preparation of product manuals, project proposals and client reports. Documents of this kind tend to be quite long, so a DTP package must not be too time consuming to use. For example, it should be capable of automatically applying the same format to successive pages.

ACCURACY

With internal phone directories, specification sheets and price lists DTP's main benefit is potentially greater accuracy. So the package needs to be simple enough to be used by whoever has the knowledge to spot the mistakes. For brochures, press releases and presentation aids you also need a package which can produce results that look good.

To meet these goals Ventura has adopted an approach which hinges on keeping form and content separate. The key concept in Ventura Publisher is embodied in special files, called style sheets, which contain page-layout information. The style sheet defines things like the number of columns and their width, the positions of rules on the page, and the size of the margins. It also contains named formats that define the style that

headlines, sub-heads, captions and so on are to take; these formats are called "tags".

Style sheets are kept separate from the text they apply to. You can use the same style sheet to lay out a large number of different documents, thereby giving them all a consistent house style. Alternatively you could apply more than one style sheet to the same document to give it a different appearance for, say, a different readership.

Style sheets are the key to Ventura Publisher's ability to format documents fast. The package comes with 21 style sheets on disc covering tasks like reports, product lists, brochures, newsletters and technical manuals. You can also make your own style sheets or modify the ones supplied.

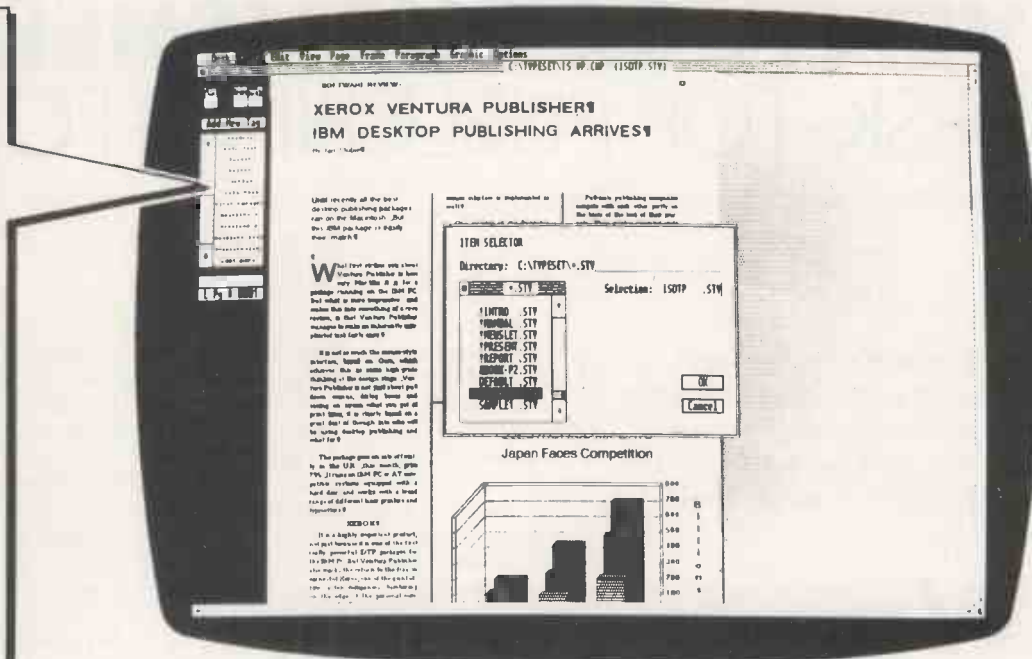
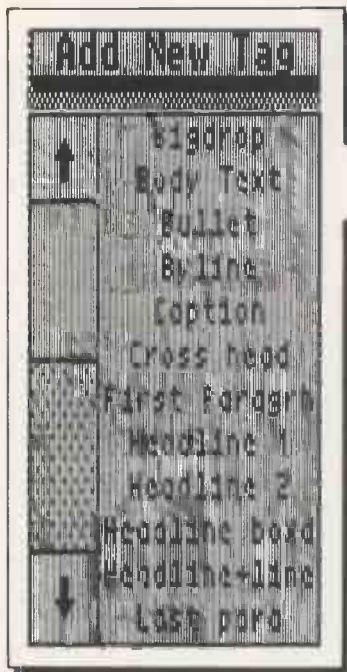
In a typical session with Ventura Publisher you import a text file from a word-processing package, apply a style sheet to it, create or import any graphics, then print. Ventura Publisher has a built-in word processor, but the normal procedure would be to use files created with a conventional word processor such as Word Perfect or Microsoft Word.

When the program first loads, Ventura Publisher's main screen displays a page in the default style, with a menu bar along the top. You can change the view at any time to show two pages at a time or a portion of a page.



Ventura Publisher lets you design documents on-screen, mixing text and graphic images. You input text from existing word-processor files or type it in as you go.

(continued on next page)



(continued from previous page)

To lay out a document for the first time you select the option from the file menu to load a different style sheet, and use the mouse to select from the style sheets displayed in the selector box at the top left of the screen. You then select the Load Text/Picture option from the same menu.

Your text is automatically hyphenated and paginated as it is loaded in, according to the description laid down in the style sheet. Page Down will show you the next page, or you can go to a specific page. On-screen you will see up to eight columns of text. Everything will be displayed in the particular spacing, font and style laid down for the body text in your chosen style sheet. You pick out anything that differs from body text by tagging.

TAG NAMES

Clicking on the Tagging icon at the top of the control box at the left of the screen brings up a list of the tags available in your chosen style. For a newsletter these might have names like Headline 1, Headline 2 and Caption; for a brochure they could be Bullet, Address, Specification and so on.

Using the mouse, you select the text you want to apply a particular tag to and click on the tag name. Ventura Publisher displays the result on-screen in as near to the right fount as your display allows. So if Headline 1 creates a 36 point headline across all three columns with a triple underline beneath it, your selected text will be transformed into this style and all the other text shifted down to make room for it — even pushed to the next page if necessary.

Tagging works on a paragraph basis; Ventura Publisher considers anything that ends with a Carriage Return to be a paragraph. You can select large numbers of paragraphs at the same time by holding down the Control key, but tagging does not allow you to make major changes to style within a line.

By choosing a different style sheet from a menu (above) you instantly change the whole appearance of a document. For details such as headlines and caption styles you go to the tag menu (left). You can pull in pictures from scanners or other packages.

SPECIFICATION

Description: WYSIWYG page makeup program with built-in word processor; works on a document basis and is well suited to handling multi-page documents

Hardware required: IBM PC/XT, PC/AT or compatible with at least 512K or RAM, a hard disc and Gem-compatible mouse; CGA or Hercules card; Postscript-compatible output device, HP Laserjet or device using the Xerox Interpress PDL; XT owners are recommended to add an accelerator card

Word processors supported: Word Perfect, Microsoft Word, Multimate, WordStar and ASCII text files; dBase III and Lotus 1-2-3 data can also be published

Graphics support: Lotus, Autocad, Mentor Graphics, Gem Draw line-art formats; PC Paintbrush and Gem Paint bit-image formats

Copy protection: none

Price: £795

Publisher: Xerox of Rochester, NY
U.K. supplier: Rank Xerox U.K., Bridge House, Oxford Road, Uxbridge, Middlesex UB8 1HS. Telephone: (0895) 511133

Available: early 1987

Ventura Publisher uses a mixture of units, including inches, centimetres, picas and points. You can use whichever you wish for any function and mix them up as you like. The range of type styles and effects available depends on your printer. The Hewlett-Packard Laserjet cannot produce white text on a black background, for instance, while the Apple Laserwriter can.

Ventura Publisher treats graphics in a similar way to word processing. There is a limited built-in graphics function, which you can use for putting tints over text or drawing boxes or circles around things.

These functions allow you to create quite effective forms, for instance, but for more sophisticated graphics you import files from elsewhere.

Another Ventura Publisher concept, called frames, comes into play when graphics are involved. The simplest layouts consist of just one text file and use the one frame that is automatically provided for each page. But you can have other frames anywhere you like, and use them to hold text or pictures.

To create a frame you click on the Frame Setting icon on the control box at the left of the screen, and then select the option to add a new frame. The cursor changes to a Frame symbol, and you use the mouse to size the frame. The edges of the frame normally lock on to likely positions like the edges of a column or the text areas within it, but you can disable this feature if you wish. Existing text flows smoothly around the frame. You can also size frames by typing in dimensions — for instance, if you want to leave a gap for a picture to be added later at a print shop. Ventura Publisher supports both line art derived from drawing packages such as Autocad, Gem Draw and the Lotus Pic format, and bit images originated by scanners or paint programs like Gem Paint or PC Paintbrush.

Frames can hold text as well as pictures. To run text in you click on the frame concerned and then load a text file. You can have several text files going into different frames on the same page. If a frame is not big enough you are prompted to specify where you want the overflow to go.

One of the great strengths of Ventura Publisher is that until you start doing quite complicated things you do not need to know much about frames. Many other packages require you to spend time drawing boxes all over the page, even for routine documents.

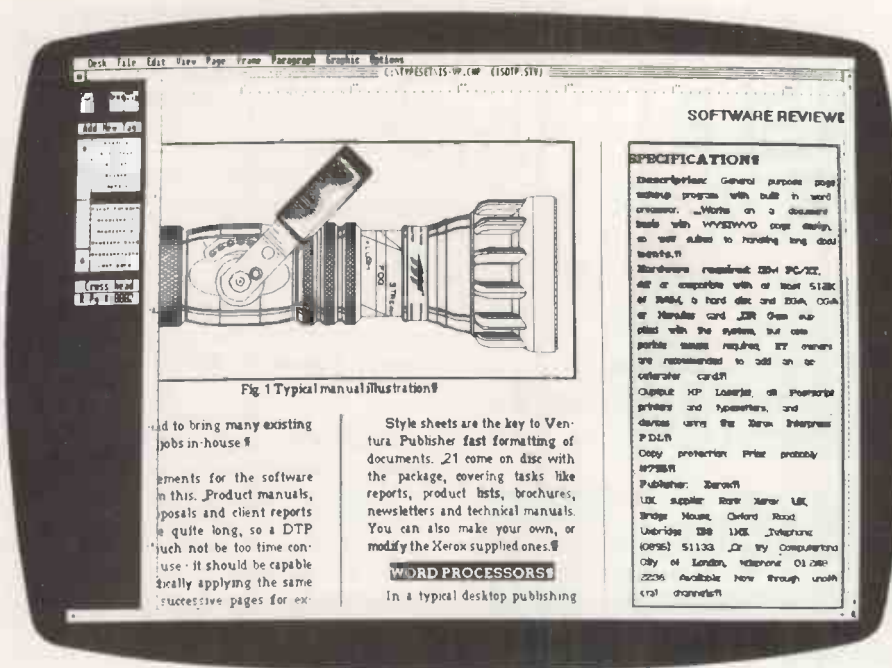


Fig 1 Typical manual illustration

...to bring many existing jobs in-house.

...ments for the software in this. Product manuals, proposals and client reports are quite long, so a DTP package not be too time-consuming. It should be capable of applying the same style to successive pages for ex-

Style sheets are the key to Ventura Publisher's fast formatting of documents. They come on disc with the package, covering tasks like reports, product lists, brochures, newsletters and technical manuals. You can also make your own, or modify the Xerox supplied ones.

WORD PROCESSORS

In a typical desktop publishing

SPECIFICATIONS

DESCRIPTION: General purpose page making program with built in word processor. Works on a document basis with WYSIWYG page design. It will allow to handling long documents.

Hardware required: IBM PC/XT, all or compatible with at least 512K of RAM, a hard disc and VGA, CGA or Monitor card. Don't own one? Get it with the system, but one possible reason requires. If owners are recommended to add on to whatever card.

Output: HP Laserjet, all Postscript printers and Postscript, and devices with the Xerox Interpress PDL.

Copy protection: Price probably \$2750.

Publisher: Xerox

UK supplier: Xerox Xerox UK, Bridge House, Oxford Road, Windsor, Berkshire, SL1 1XJ, UK. Telephone 01753 51103. Or try ComputerCity in London, telephone 01-262-2226. Available now through usual retail channels.

With Ventura Publisher long documents based on one word-processing file will spill from page to page automatically, based on the style you have chosen. You then tag paragraphs and insert picture frames in a way which seems quite natural.

If you want to cut or alter text or add headlines or captions Ventura Publisher's built-in word processor is quite adequate. It lacks the full range of features found on a full-scale word-processing program, but it is capable of normal deletion and insertion operations, block moves, changing words to bold or italic, and so on.

TEXT ATTRIBUTES

With files from the major word-processing packages Ventura Publisher is able to recognise text attributes such as bold, italic and underline; page-formatting information like margin setting, page breaks, tab settings and hyphenation is ignored.

Once you have created a page layout Ventura Publisher saves details of the text and picture files you have used, together with the name of the style sheet, in a separate file called a chapter file. This way you can print or recall your work to screen using a single command. A chapter can stretch over several pages; the actual number of pages depends on the memory available on your system, but a 512K machine allows you about 30K of text per chapter. Chapters can be grouped together into publications. You are allowed up to 64 chapters per publication.

Some extra functions are available at the publication level. Ventura Publisher will automatically generate page, figure and chapter numbers in a variety of formats. It will also create a table of contents based on tagged text. For instance, if you have used tags called Chapter Name, Heading 1 and Heading 2, then Ventura Publisher will put a copy of each tagged paragraph, with its page number, on to a table of contents laid out in three levels. You specify which tags to

look for; the program allows you up to eight levels.

To generate an index entry you click on the location where you want an entry to point. Ventura Publisher will then use the word you have selected. You can also type in different or additional indexing terms, and specify the sort order for the index entries; in this way you could group all abbreviations or keywords together under a higher-level entry, for example.

VENTURA PUBLISHER				
PC VERDICT				
	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Value for money	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

The IBM DTP package to look at first.

The hardest thing to do with any DTP package is duplicating an existing typographical style. To do this in Ventura Publisher you have to create new tags. It is not difficult, but you eventually run up against the limitations of the package as you push closer to exactly matching the target style.

To create a new tag you click on Add New Tag, and type the new tag name along with the name of an existing tag to copy from. You then go to the Paragraph pull-down menu, which gives you detailed control over font, alignment, spacing, columns, and page and line breaks. You can also specify special effects like bullets or drop capitals.

Once a tag has been changed it affects all paragraphs that use it. This means you must be careful to create new tags rather than alter

existing ones unless you are sure what you are doing. Tags are saved along with their style sheet, so if you change a tag and then save the style sheet containing it, all documents that use the style sheet will be affected. This is convenient but it is also dangerous, particularly if more than one person is using the package.

The documentation supplied with Ventura Publisher is superb. You get a 125-page training guide which links to a set of example style sheets, text and pictures supplied on disc. The reference manual is about 500 pages long and contains information on printer and word-processor support as well as examples of all the style sheets supplied with the system.

The fonts available depend on your printer. Installation is straightforward but it takes a long time as the program generates analogues of your printer's fonts for on-screen use. Ventura Publisher takes up 11 discs as it is, so rather than distribute screen fonts for all supported printers only the essential width information is supplied. During installation the relevant bit images are generated for screen display and are then stored on your hard disc.

Although the full range of effects is only available if you use a laser printer the package also supports dot-matrix printers such as the IBM Proprinter and Epson FX compatibles. Output quantity is clearly inferior with these machines, but it is still worthwhile to be able to use these relatively cheap devices to preview page layout.

DTP is not for everyone. Top-end word processors like Word Perfect, Microsoft Word, Wordcraft and Samna IV can do a lot when connected to a laser printer. They all cost over £400, but Ventura Publisher costs nearly double that. What you get for the extra money is the ability to produce a much greater range of documents.

Ventura Publisher scores in that it is not much more difficult to use than a top-end word processor, while equalling most other DTP packages in power. There are some things it cannot do. If you wanted to exactly mimic this page in *Practical Computing* you would be better off getting the £195 Just Text package if you have a Macintosh, or the £7,000 Superpage II if you have an IBM. But both these packages are harder to use than Ventura Publisher.

CONCLUSIONS

There are a few other packages — mainly on the Mac — which allow you greater output quality if you are prepared to agonise over every page, but for mainstream business users Ventura Publisher is probably pitched at the right level.

The way Ventura interacts with word-processing packages is useful. You can put formatting commands into your documents as you word process, which helps to speed things up.

Ventura Publisher's strengths are its style sheets and its ability to process multi-page documents quickly. Xerox supplies a good selection of style sheets with the package and a third-party market in them may well develop if Ventura Publisher becomes successful.

HAL THE ACCEPTABLE FACE OF 1-2-3

By Glyn Moody

By providing a natural-language front end this package makes Lotus's spreadsheet more easily accessible to beginners and a more powerful tool for the experienced user.

The history of Lotus 1-2-3 has been a remarkable study in longevity. The product was first launched at the beginning of 1983, and has since gone through two releases and a tweak or two. But the basic program has remained largely unchanged. Subsequent Lotus programs like Symphony and Jazz have been conspicuous for failing to set the world alight. Yet Lotus has been content to milk its one cash cow, and has grown to become the world's largest software company on the proceeds.

In the meantime it has evolved an alternative strategy. Around the apparently immortal 1-2-3 it has added a series of satellite products designed to enhance and extend its range of features. Report Writer, launched in 1985, allows you to produce tidy reports from data stored in 1-2-3 worksheets. In the U.S. Signal provides up-to-the-minute share prices in the form of broadcast data for direct capture into 1-2-3. For scientific and engineering users, Lotus has just launched Measure, a program which allows you to pull data straight into 1-2-3 from a wide range of measuring devices.

MEMORY OVERHEADS

Lotus acquired the Human Access Language (HAL) when it bought the company which produced it back in December 1985. A spate of acquisitions has been one consequence of Lotus's healthy cash flow. As its name suggests, HAL is designed to smooth the interaction between 1-2-3 and users. It costs £120 and initially requires 100K of additional memory, though it also imposes some further large memory overheads if used to the full.

HAL is a memory-resident program which pops up over the 1-2-3 interface. It appears to coexist quite happily with Sidekick, even though HAL has to be loaded last. Rather cunningly, Lotus has arranged matters so that HAL automatically calls up 1-2-3. This locks out all the 1-2-3 clones which have been nibbling away at Lotus's sales: if you want to enjoy the benefits of HAL you will have to use the real thing. Perhaps as a further incentive to use HAL, Lotus has left off copy protection for the first time on a 1-2-3 product.

To use HAL you place a copy in the directory containing 1-2-3 and enter
HAL

The worksheet which is then displayed looks identical to a normal 1-2-3 screen, with the addition of a short message at the bottom to the effect that HAL is present. You call up HAL by pressing the Backslash key to invoke the command menu. Just as the command menu appears at the top of the screen in the status area, so the HAL request box appears in the same position.

At the request prompt you enter your commands. Instead of 1-2-3's normal single-letter commands, you type in a series of English-like sentences. For example to enter the months of the year across row 2, you simply type

enter jan to dec across row 2

Normally the request box disappears after it has effected each action, but if you type
Stay
the request box remains.

The normal syntax for requests is
verb location qualifier destination
If HAL does not understand the vocabulary or syntax, it beeps and places the cursor under the offending word. HAL comes with a very extensive help files; as in 1-2-3 itself, they are called up by pressing f1. The help is context-sensitive, and I found that it usually solved my problems. Another valuable feature is the Undo command, which lets you have second thoughts on practically any previous action, including deleting entries.

To make Undo possible, HAL keeps a complete copy of worksheet data and status information when it carries out a command. This imposes enormous overheads on memory. The status information alone requires something approaching 40K of memory; the ghost spreadsheet is stored in half the available free memory. HAL will

automatically use the Lotus/Intel/Microsoft Above Board if it is present. The cynical might see the Undo facility as a way of forcing people to buy the board, but the Undo command can be turned off if you do not have the space to use it.

HAL automatically converts your English-language requests to their equivalent 1-2-3 commands, and by pressing f6 you can view the translated version. The program applies a modicum of intelligence to interpreting your instructions, though this should not be confused with real artificial intelligence. For example, you can use words like "this" and "it", as in

graph this

which HAL will interpret to mean the block of data in which the cursor currently resides.

The graph command is one of the nicest features of HAL. Producing graphs from 1-2-3 command menus has always been a rather disheartening process, but HAL absolves you from having to make many of the decisions, and lets you view a possible output. You can then go back and refine the graph if need be.

HAL is also able to carry out certain operations for which there is no equivalent in 1-2-3. For example, you can enter several cells of data at once, which speeds up spreadsheet creation enormously. Formulae can be set up using row and column names. HAL knows all about days, months, letters and numbers, and will enter lists of them with one command. Functions like @avg, @sum and so on, can all be used directly from HAL.

SPREADSHEET AUDITING

HAL can also be used for auditing spreadsheets. By asking for a list of dependencies or precedents you can see how one cell affects others. Some of the more advanced features of HAL only work with Lotus 1-2-3 release 2.

The limited database functions on 1-2-3 lend themselves well to HAL's natural-language query approach. For example, if you wish to extract records according to certain criteria, you enter a request such as

extract ones whose wages > 15000
referring to a current table. You can also ask for tabulations of data together with additional information like averages. Unless you are a practised user of 1-2-3 you will almost certainly find this much easier than using the standard commands.

Another great advantage of HAL is that it allows you to set up macros of requests. Since each request corresponds to an ordinary 1-2-3 command, this provides a handy way of setting up macros without recourse to the hieroglyphics that are normally required. It also means that the macro, which is stored in the usual way on an empty area of the spreadsheet, can be read more easily.

A macro that contains requests must be run from the request box; you cannot assign it to a key. In effect the macros allow you to extend the HAL vocabulary. You can also obtain transcripts of some or all of the requests and keystrokes you enter in the request box, which can then form the basis

SPECIFICATION

Description: front end to 1-2-3 that provides for English-style requests

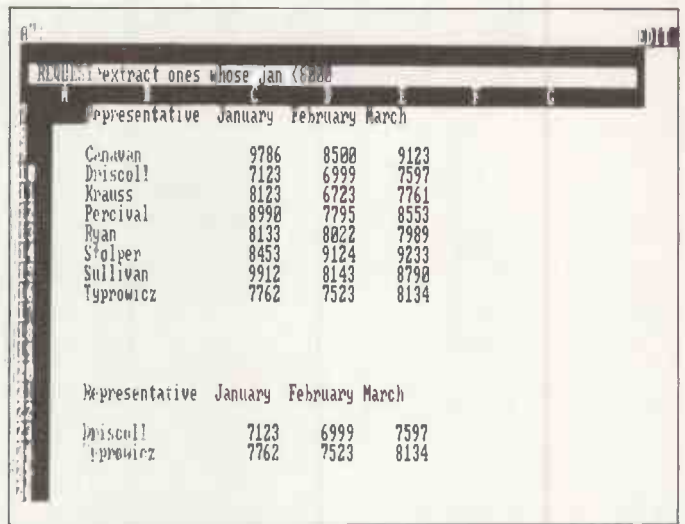
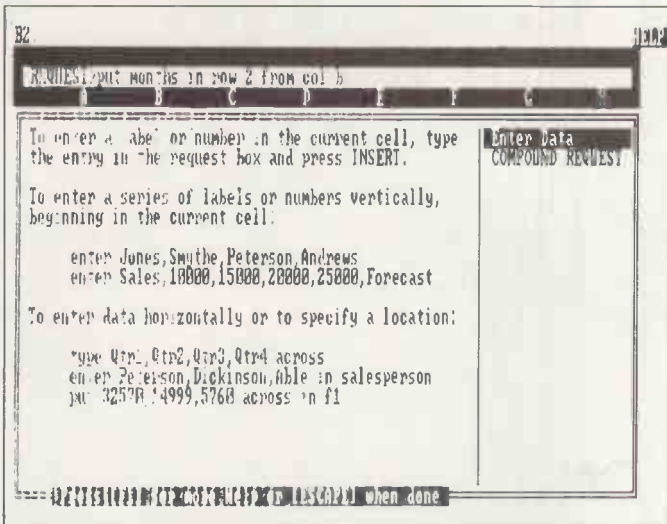
Hardware required: IBM PC, PC/AT or compatible with at least 512K RAM; Above Board memory expansion advisable

Copy protection: none

Price: £120

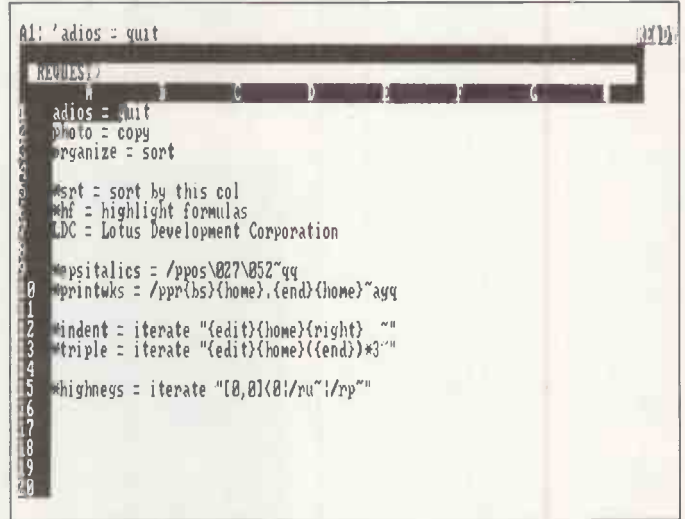
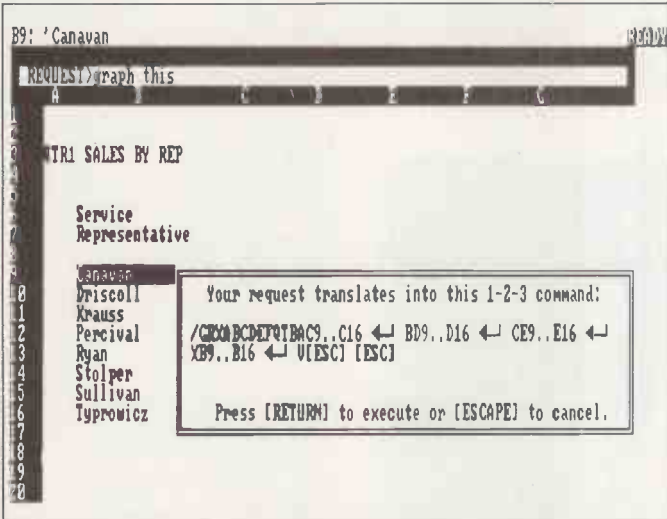
Publisher: Lotus Development, Consort House, Victoria Street, Windsor, Berkshire SL4 1EX. Telephone: (0753) 840281

Available: now



Above: Hal uses the command area for its request box.
Below: Pressing f6 converts requests to their 1-2-3 equivalent.

Above: Hal can accomplish complex sort procedures.
Below: You can add personalised synonyms to HAL's vocabulary.



HAL

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Value for money	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

A seductively easy way to use 1-2-3.

I found HAL surprisingly natural to use. It generously ignored my British accent, coping admirably with words like "centre" and "colour". I found that most of the obvious commands worked; if they did not, or if the syntax was shaky, a quick look at the help screens soon sorted things out. The basic features of the package can be used without reference to the manual — always a good sign.

The manual itself is very well produced and readily comprehensible. The progression from the daunting and almost unusable manual for the first release of Lotus to this attractive package is testimony to how far the company has moved towards making its products easy to use.

This, of course, is very much the philosophy behind HAL. Some of its features, like entering several rows of data at once, will lend themselves to the most advanced applications, and will do much to reduce the grind of setting up spreadsheets. But HAL will find its most enthusiastic users among managers who use 1-2-3 only occasionally and have no desire to turn themselves into Lotus experts.

HAL can also be seen as a strategic product. It enhances the whole 1-2-3 family, and goes some way towards remedying omissions in previous releases. But more impor-

tantly, it may help stem the haemorrhage Lotus has suffered from people defecting to the cheaper software clones. HAL will only work with 1-2-3 itself, but many managers will be sufficiently attracted by the prospect of using English commands that they will happily pay for it.

Looking to the future, it is probably significant that the vocabulary of HAL is around 800 words. This matches the level of expertise currently offered by voice-recognition systems, so it is only a small step from HAL to a voice-activated version of 1-2-3. Although this would probably require an 80386-based machine with large amounts of memory, there is no reason why it could not sit on top of 1-2-3, just like HAL. Where HAL is a pleasant extension of 1-2-3 this would be a real advance.

CONCLUSIONS

■ HAL is a memory-resident front end to 1-2-3 that allows you to enter English-like requests instead of 1-2-3 commands.

■ It is very easy to use, and has been implemented in an intuitively obvious fashion.

■ Advanced users will find HAL a pleasant addition to 1-2-3, but not absolutely crucial; they will value one or two of the new functions it provides.

■ The big penalty you pay for using HAL is the large amount of memory it requires. **PC**

of a macro file. Once again, this is much easier than earlier methods of setting up macros, and goes some way to matching similar transcription facilities on rival spreadsheets.

The basic HAL vocabulary contains many synonyms for actions. You can add further personalised synonyms; they can be fairly complex sets of commands, and can be used like macros to extend the HAL vocabulary. Up to 64K of synonym files may be created. The program allows you to amend help screens to take account of new synonyms — or for any other reason you choose.

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EPSON

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POPDROP

POP-UP MANAGER

By Steve Malone

If you already have too many memory-resident programs for comfort you need another one to keep the rest under control.

For the past year or so pop-up programs have been all the rage. There are now numerous memory-resident application programs, as well as a huge number of pop-up utilities. The range stretches from the simple desk-accessory functions provided in Sidekick, through Superkey's keyboard macros to the full-blown outline processor capability of Ready.

With so many memory-resident programs available simultaneously, matters can easily get out of hand. Most pop-up programs consume far less memory than normal application packages, but they still take up an appreciable chunk of RAM. Once you start including things like RAM discs and print spoolers in the Config.Sys file, even the full 640K of user RAM available under MS-DOS is not enough to hold everything.

Of course, if you find there is insufficient memory to run an application, the obvious thing to do is to remove some of the pop-up programs. But this is easier said than done. The whole point of pop-up programs is that they stay in the background and cordon off an area of memory which cannot be tampered with. This is necessary to ensure that DOS is unable to overwrite the pop-up when loading other programs. You are therefore reduced to rebooting the entire system and starting all over again.

This is where Popdrop comes in. Its purpose is to manage other pop-up programs in memory, allowing you to delete and add to them without rebooting the computer. It works by monitoring the current state of the system, keeping tabs on how much RAM is being used by each of the programs, where they are, and so on.

Popdrop organises the memory on a layer system. If you load Popdrop first you can then monitor all subsequent pop-up programs. Thus you can put Spotlight into the first layer, move Popdrop up a layer and then load Ready.

Any time you find there is insufficient memory for an application program you can remove the second program while leaving Spotlight resident. To do so you run the Popdrop Down utility. This removes the program from the second layer and makes the memory that it occupied available to the application program. The process of adding and subtracting layers can be repeated as often as you like.

If you had loaded both Ready and another memory-resident program into the same

layer, Popdrop would have removed both programs when it moved down a layer. For complete flexibility it is best to move up a layer for each pop-up program you install. Popdrop supports a maximum of eight layers, so if you are a particularly enthusiastic user of pop-ups some doubling up will be required.

Popdrop can only control those programs that are loaded after it has been installed. This is a useful safety feature, as you can protect key pop-up programs from accidental erasure simply by loading them first. The drawback is that certain other RAM-hungry utilities must be implemented before Popdrop, and so cannot be budgeted. RAM disc files in Config.Sys, for example, cannot be reached as they are loaded automatically by DOS.

POPDROP

VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Documentation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Value for money	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

A required purchase for pop-up fanatics.

There is another problem with the layered method. Because Popdrop works on a last-in first-out basis you have to be careful how you organise your programs. If you wish to remove a program which is in the first layer, you are forced to remove the programs in the second and third layers as well. This is a particular nuisance if you wish to retain Sidekick and remove some other program. Sidekick will only work in concord with other memory-resident programs if it is loaded last. When used with Popdrop, this inevitably means that Sidekick will always be at the highest level, and so must always be the first to go.

You can use Popdrop's View command to examine which pop-up programs are in residence on the computer. The program produces a display of the various layers implemented, together with the amount of

655360 bytes total memory 286880 bytes free	
646560	Popdrop Layer 5 READY 132544 bytes
314816	Popdrop Layer 4 SH 95856 bytes
218960	Popdrop Layer 3 TM 74640 bytes
144320	Popdrop Layer 2 SL 78392 bytes
65728	Popdrop Layer 1 PRTSCR POPDOS 28688 bytes
37648	DOS 3.10 DOS extensions, and programs loaded before Popdrop 37648 bytes

Popdrop: Press v, c, d, s, u, 1-4, or the enter key:

Popdrop organises memory using a layered system.

SPECIFICATION

Description: manager for pop-up utilities

Hardware required: IBM PC, PC/AT or compatible with DOS 2.0 or later; DOS 3.0 required for best results

Copy protection: none

Price: \$20

Publisher: Infostructures Inc., PO Box 32617, Tucson, Az 85751 U.S.A.
Telephone: (U.S. area code 602) 323-4600

Available: now, in U.S. only

memory each one uses. In MS-DOS 3.0 or above it will also tell you the names of the pop-up programs that are installed. View also provides you with a command line and allows you to implement all the other commands that Popdrop allows, including Up and Down. Other options are to drop a number of layers at once, clear all the pop-up programs but leave Popdrop installed, or remove all the programs, including Popdrop itself.

The various commands and overlays are held on disc, so these utilities can only be run from the DOS command line. If you are in an application program and suddenly realise you have insufficient memory for your data you will have to save your data, quit the application and then run Popdrop before you can proceed. The benefit of this approach is that the Popdrop manager program takes a mere 1.5K of RAM, with each layer's control occupying another 1,000 bytes.

CONCLUSIONS

- Popdrop allows you to manage your pop-up programs and memory to optimum effect.
- The program uses a layered method. This means that you have to be careful about the order in which you load your pop-programs.
- Popdrop is invaluable if you habitually use a large number of pop-up programs.

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MS Word 3	MS Windows	Gem Draw/Graph 99/155
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Wordstar 2000 +	Datamaster	Wordstar 1512
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FASTBACK & DS-BACKUP

WINCHESTER BACKUP UTILITIES

By John Lee

Unless you back up your hard disc regularly you risk losing several megabytes of data when it breaks down. These two utilities make the job quick and easy to do.

There has always been a problem with hard discs. They can store an enormous amount of data, but when they go wrong all that data is lost — or at best, inaccessible until they have been fixed. In addition, there is always the problem of data files becoming corrupted or accidentally erased. There is an unanswerable case for having some means of backing up the disc to allow recovery when, not if, something unfortunate occurs.

The easiest method is to use tape backup. But with hard discs now costing as little as £300, the £500 price tag of a tape streamer unit appears disproportionately high. A cheaper alternative is to back up on to floppy discs, and MS-DOS provides the Backup and Restore utilities for this purpose. The drawback here is that the programs are slow and cumbersome to use. Fastback and DS-Backup do the same job, but they are much faster and more convenient. Both programs run on IBM machines and compatibles. DS-Backup is also available in a Macintosh version.

My first attempt at using Fastback to back up the hard disc on an IBM PC/XT was a total failure. First you have to run an Install procedure. The system reported

No Floppy Discs Fitted

and quit, even though a floppy-disc drive was very plainly there in its usual position. Fastback does a lot of things that do not use calls to DOS, and I suspected that the cache that I normally set up on my system might have fooled it into thinking that there were no floppy drives. For my second attempt I booted with a standard PC-DOS disc, and sure enough all went well.

SPARSE DOCUMENTATION

The documentation comprises a mere 16 sparsely filled A5 pages. It has a poor table of contents, and lacks an index altogether, so you have to read, understand and remember the whole manual. Most though not all of the information you need is in the booklet, but it should have a beginners guide and some examples so that users get it right first time. I would have expected much better documentation for a program at this price. With a better manual I would have found it a great deal easier to get the program running.

When I tried to run Fastback on a small

portion of the disc it took appreciably longer to write than the manual suggested. This fault was traced to the Buffers parameter, which was set to the default value of 2. With Buffers set to 20 Fastback ran properly.

Filled with confidence I then attempted to install Fastback on an IBM clone. Once again the floppy-disc drive failed the test. The manual gave me no help on this, but I eventually found that I needed to invoke the Fastback Slow command, which increases the maximum number of retries at reading before the operating system accepts that it cannot read a disc and quits.

Once it has been properly installed Fastback runs extremely fast. Part of the

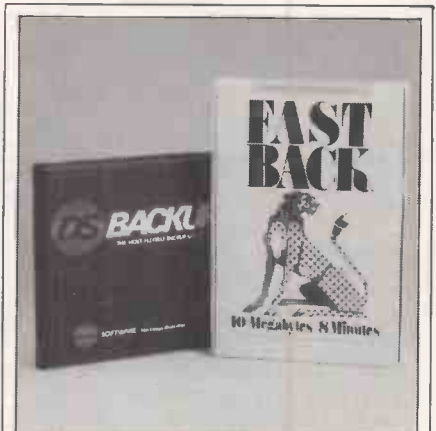
FASTBACK				
PC VERDICT				
	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Documentation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Value for money	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Expensive and hard to use, but worth considering if speed is overwhelmingly important to you.

reason for this is that the floppy drives run continuously while the program is operating. You change discs when instructed by a message on the screen, even though the disc light is still on and the motor is still running. With any normal program changing discs like this would have disastrous results, but with Fastback it is quite OK.

There is no need to format discs before use, since Fastback does it for you. Minor tuning to the number of buffers may be required to achieve top performance, but once this has been done it takes only 18 seconds to write a 360K disc. A full 10Mbyte hard disc on a PC/XT takes under 10 minutes to back up.

If you have two floppy drives as well as your hard disc the process is even faster. While Fastback is writing to the floppy in one drive you can be inserting a blank disc



SPECIFICATIONS

FASTBACK

Description: program to back up a hard disc on to floppies

Hardware required: IBM PC, PC/AT or compatible with hard disc and at least 128K RAM

Copy protection: none

Price: £170

Publisher: Fifth Generation Systems

U.K. supplier: Riva Terminals, 9 Woking Business Park, Albert Drive, Woking, Surrey GU21 5JY. Telephone: (04862) 71001. Ideal Software, Tolworth Tower, Surbiton, Surrey KT6 7EL. Telephone: 01-390 6722

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DS-BACKUP

Description: program to back up a hard disc on to floppies or another hard disc

Hardware required: IBM PC, PC/AT or compatible with hard disc and at least 256K RAM

Copy protection: none

Price: £69.95

Publisher: Design Software Inc. of West Chicago, Illinois

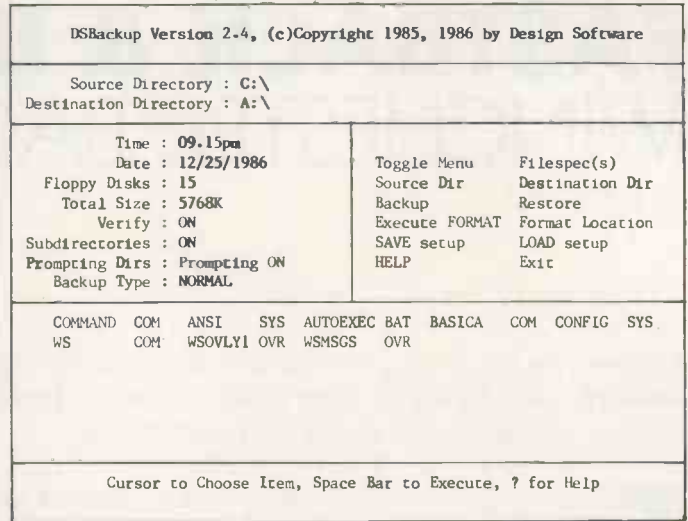
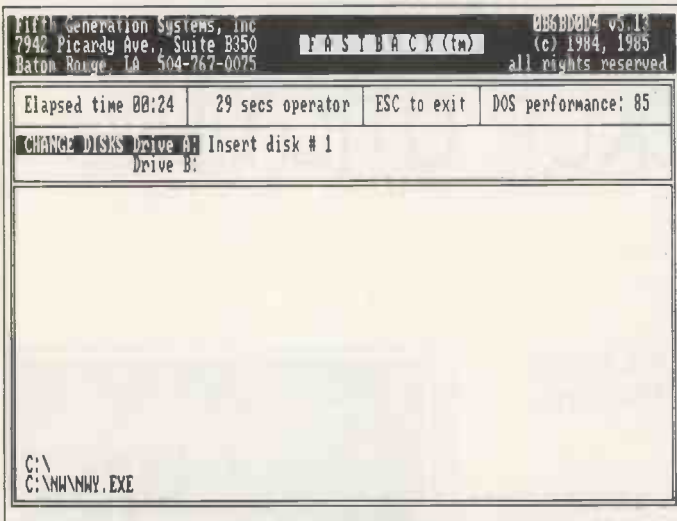
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into the other drive. When the first disc is full the program automatically switches to the second drive. You can then swap discs in the first drive while copying continues on the second, and so on.

Backup on a PC/AT is faster still. It takes about the same time to dump 20Mbyte on to 1.2Mbyte floppies as it does to copy the contents of an XT's 10Mbyte disc to 360K floppies. The program uses a data-

(continued on next page)



Fastback's main menu shows how long it has been backing up.

The target and source directories are indicated on DS-Backup.

(continued from previous page)

compression technique which squeezes 10Mbyte on to 23 360K floppy discs and 20Mbyte on to 14 1.2Mbyte discs.

Because the discs do not use the normal DOS format and the program compresses the data, the discs cannot be read by the operating system in the usual way. A program called Frestore is therefore provided to get files back on to the hard disc. The program is menu driven and allows you to recover a single file, all the files or a family of files such as a complete sub-directory or all the files with a particular file extension.

Frestore will query whether to overwrite an existing file on the hard disc with a more recent date than the backup copy. It also has a Verify mode where nothing is written, but the hard-disc and floppy files are compared to verify that they are identical. The program includes some clever error-correction code which will rectify most accidents or corruptions which may have occurred.

BERNOULLI BACKUP

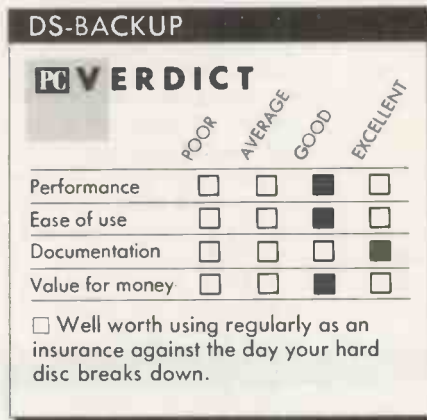
DS-Backup operates on a similar principle to Fastback, though in addition it will back up on to a second hard disc or Bernoulli drive. No installation is required to run the program from the floppy disc provided. A neat Install batch file is provided in case you want to copy the programs on to your hard disc. You simply change to the required sub-directory on the hard disc, and type

A:INSTALL

to copy the files from the master floppy in drive A to the current directory on the hard disc.

The documentation of DS-Backup is good by any standards, especially so for a product at such a modest price. The 98-page printed booklet contains lots of examples and shows the menus as they appear on the screen. There is a table of contents and a substantial index.

I spent half an hour reading the manual to find what the program could do, and since then I have been able to do everything from the on-screen menus. As soon as the program is loaded the main menu is displayed,



showing which drive is the source directory and which is the target. You can change these assignments if you wish.

Several other functions are also controlled from the main menu. You can switch the DOS Verify function on, so that information written to disc is read back to check for accuracy. This slows the backup process, but guarantees against copying errors. You can back up from a single directory, or from the current directory and all or some of its sub-directories.

The program offers you the choice of backing up just the normal files or the hidden system file as well. Normally you would back up both; but if, for example, you wanted to put a new version of DOS on the hard disc you might not want the old hidden system files backed up. In that way you can be certain you would not overwrite the new DOS with the old one when you restore your files. Another alternative is to back up only those files which have not previously been archived: that is, only those which been altered or are new. Once you have chosen from these options you can save them in a setup file, which can be used to reset the same options when you use the program again.

The menu indicates how many floppy discs will be required to back up the section of the disc you have selected. Before starting you need a supply of formatted discs. They need to be numbered sequentially, so that

you can use them in the right order when restoring the data. The program allows you to pause in the middle of a backup session and format more floppies if you need them.

While you are copying, the screen displays a listing of the directory currently being backed up and highlights the file being copied. When a floppy is full, the machine beeps and displays a message on the screen prompting you to insert a new disc. It tells you the serial number to help you keep them in the right order. It also detects if you try to continue without changing the floppy, and will not allow you to overwrite a full disc. The name of the directory being backed up and a list of the files in the directory are shown on-screen.

For my first attempt I backed up about 5.5Mbyte of data from a 10Mbyte disc on to 360K floppies. It took 48 seconds to write each of the 15 discs required, so the whole job was done in less than 15 minutes. Subsequently I have done regular backups in Archive mode, saving only those files which have been written or altered since the main backup.

To restore the disc you run DS-Backup and load the 15 original floppies in turn, followed by the extra discs produced from subsequent backups of the new files. You may restore the whole disc, or it can be done selectively. DS-Backup runs at about three times the speed of the DOS Backup utility, but is less than half the speed of Fastback. I tested version 2.4c; a later version is promised that runs as fast as Fastback.

CONCLUSIONS

■ Both Fastback and DS-Backup are a big improvement on the DOS backup utilities. Such programs are well worth having as an encouragement to make regular backups of the files on your hard disc.

■ Fastback works very quickly indeed, but it is tricky to install and is not well supported by its documentation. It is also expensive.

■ DS-Backup is flexible, easy to use and much cheaper. Although it is not as quick as Fastback, this is unlikely to be an overriding factor unless you frequently need to back up the complete contents of a large hard disc. **PC**

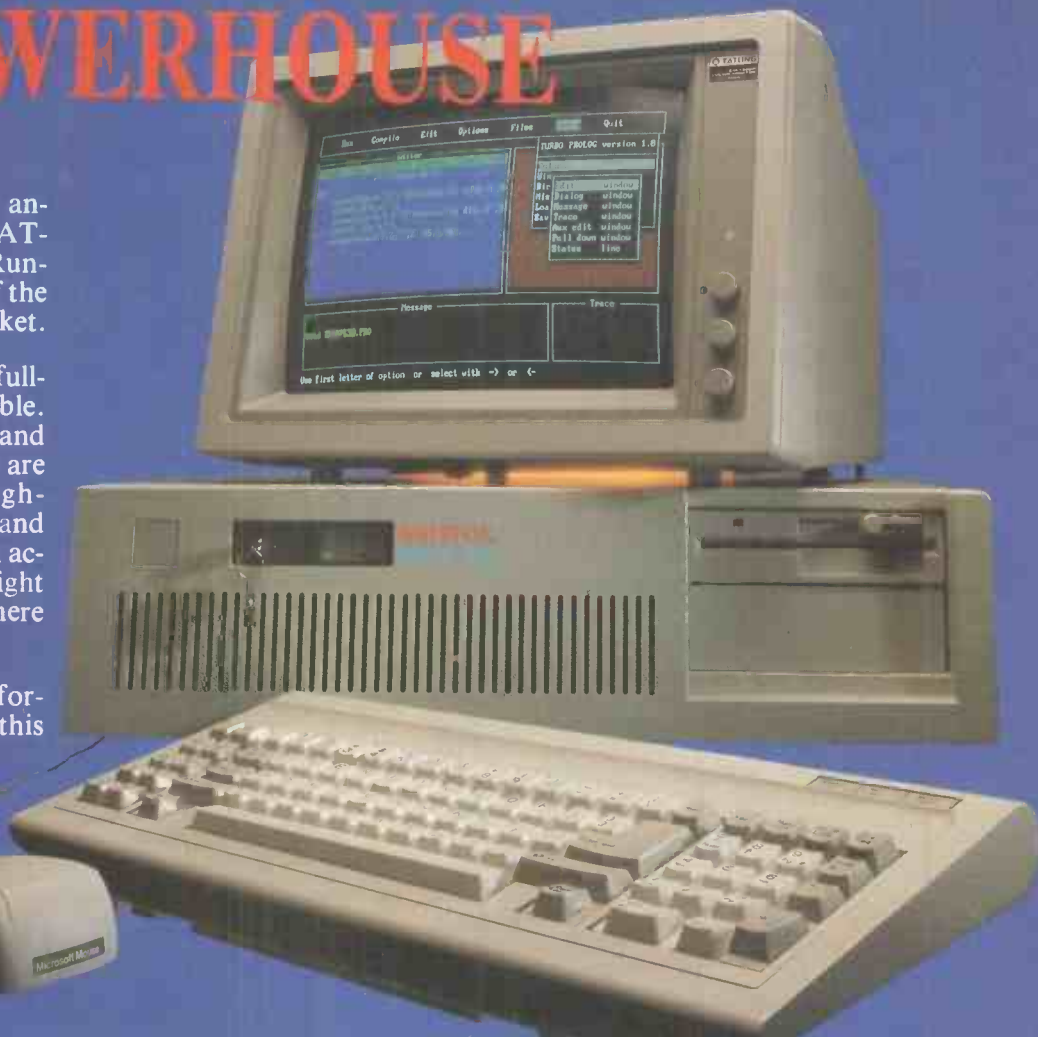
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System shown with optional EGA monitor and optional Microsoft Mouse. Fascia on production version is somewhat different.

The Powerhouse

If you are a 'power user', forced to wait while your XT slowly grinds its way through a large spreadsheet or engineering calculation, this is the machine for you. The Bristol Micro 286 is an 80286-based computer, compatible with the IBM PC/AT, but running at 10 MHz instead of the 6 MHz and 8 MHz of IBM's AT models. As a result, on the widely used Norton SI ratio system performance, the Micro 286 scores over 10, vs. the 1.00 score of the PC

Performance

The Micro 286 offers exceptional performance and exceptional savings as the server in a low-cost network. The system can be configured with fast Seagate or Tandon hard disk drives to over 100 megabyte storage. If disk caching software such as MicroCache is used, the performance is simply phenomenal.

Bristol Micro can supply a local area network as a turnkey system. This includes a Micro 286 as file server, network interface cards, cabling, software, and XT-compatible workstations. This network can be as cheap as a multi-user system, has the same advantages. But instead of a terminal, each user has their own computer, which can be expanded with a hard drive, printer, etc.; and which is reliable, since it can be run completely independently of the Micro 286.

If a multi-user system breaks down, even a single station in a network stops working. If a station in a network

breaks down, some people are inconvenienced. It's a world of difference.

Performance in CAD

CAD is another area where a high performance system is essential. The Micro 286 can be configured as an ideal CAD workstation, with high resolution colour graphics, a maths coprocessor, mouse, and high-speed hard

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UNITED THEY STAND

User groups have acquired something of a hobbyist image but many of them have plenty to offer the serious user too, as **Carol Hammond** reports.

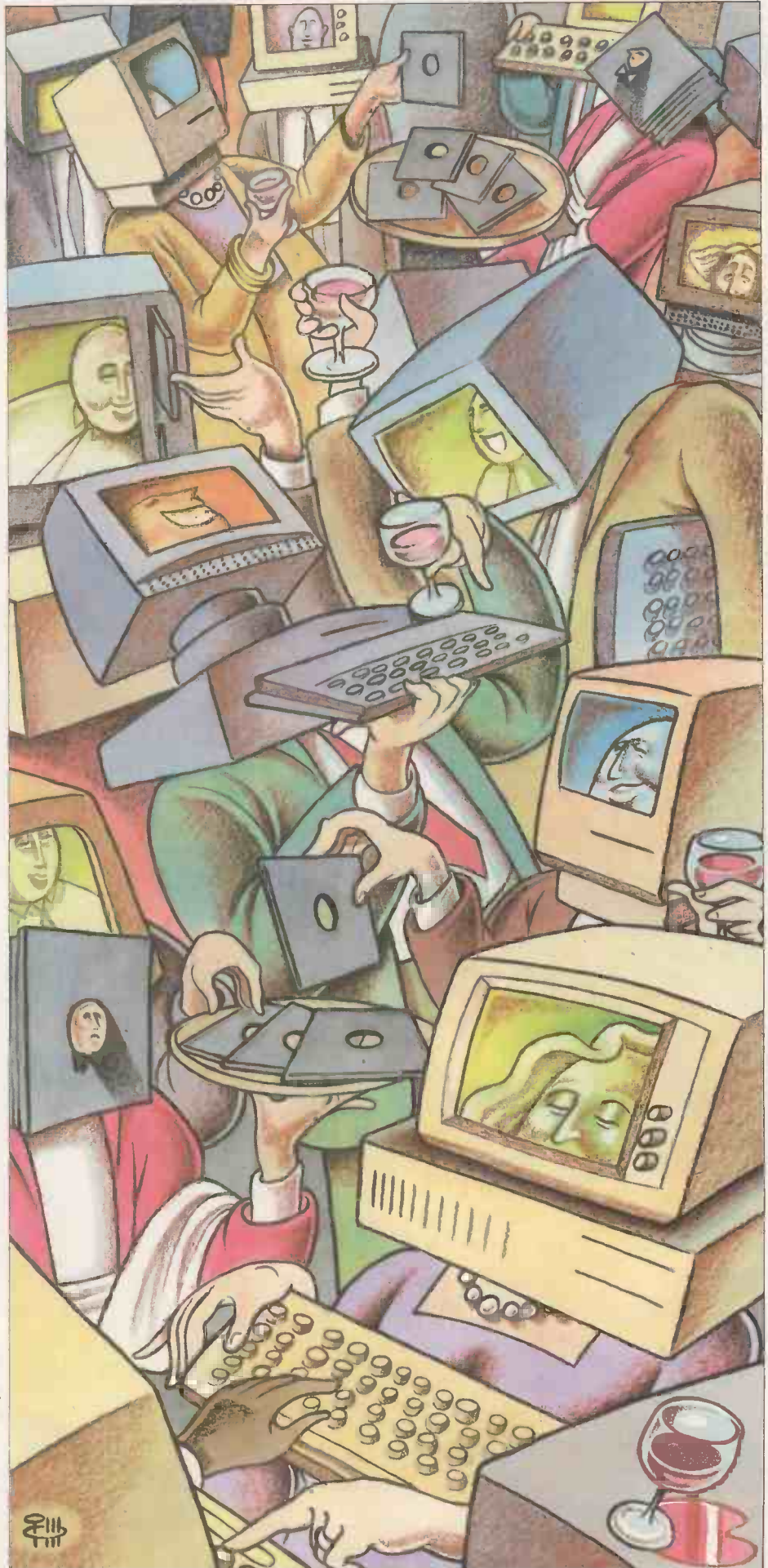
User groups have come a long way. Gone are the days when they were merely clubs set up in someone's shed for hobbyists to swap programming tips and pieces of code. As users have become more sophisticated so have the user groups. And now that many manufacturers are providing little or no customer support, user groups are taking on a new importance.

There is also a new kind of user. The explosive growth of micros in the business world has brought in its wake a large number of users who are in no sense computing enthusiasts. Their prime concern is to get the most from their hardware and software, and this alone may encourage them to join a user group.

The danger with user groups is that there is a lot of money to be made from exploiting people's ignorance. So before you lash out on a year's subscription — which is often £30 or less, but can be much more — it is worth finding out what you are going to get for your money. Is the user group being run by someone reputable? Does a particular group suit your needs anyway? In any case, you will only get as much benefit out of a group as the time you are prepared to give in participating in it.

For those who are considering joining up there are several ways of finding out what particular groups offer. If you ring up the manufacturer of the hardware or software you are interested in you may find someone able to help. But not all manufacturers know all or even any of the groups around. Even if they do, they might be reluctant to tell you. They probably have not got the time to check them all out, and may be loath to direct you to something they cannot recommend. Some dealers may also be able to help; you may even find they are themselves members of a group.

You can look through magazines and bulletin-board systems (BBSs) for a list or a mention of a suitable group, particularly if you can find one dedicated to your machine. The Association of Computer Clubs may also be worth a try, as it holds the addresses of the various groups which contact it. Not all of them are software- or hardware-specific groups; some are dedicated to a programming language, for example.



FIONA MACVICAR

CLUB ADDRESSES

Association of Computer Clubs 12 Poplar Road, Newtown, Powys SY16 2QG
Compulink User Group 67 Woodbridge Road, Guildford, Surrey GU1 4RD. Telephone: (0483) 65895
IBM PC User Group PO Box 830, London SE1 2BQ. Telephone: 01-232 2277
Lotus User Group 79-80 Peascod Street, Windsor, Berkshire SL4 1DH. Telephone: (0753) 841686
National Computer Users Forum The National Computing Centre Limited, Oxford Road, Manchester M1 7ED. Telephone: 061-228 6333

Another possible source of information is The National Computer User's Forum (NCUF), which is part of the National Computing Centre. Its members are mainly the major manufacturers' user groups and professional bodies such as the Institution of Electrical Engineers, and its main purpose is to provide a gateway to government and other significant bodies of authority. It even has links to the EC via the Confederation of European Computer User Associations. The NCUF is really more a user group for other user groups.

You can expect a user group to provide a newsletter which gives tips and articles written by other users, along with news and reviews of related products and events. There may also be users' meetings or seminars, which you may have to pay for, where guests speak about relevant topics or demonstrate products. Some groups also provide access to public-domain software, and members may be able to buy key products or commonly used supplies such as floppy discs at a discount.

User groups may also allow you to indulge your own particular interest through special interest groups set up within the larger group. The IBM PC User Group, for example, has groups covering PCs and music, micro-to-mainframe links, Lotus 1-2-3 and various programming languages, among others.

Most important of all, a user group provides the opportunity to exchange views and share problems with other users. In most cases, the person running the group will try to answer users' queries or try to put them in touch with someone who can.

IBM PC USER GROUP

The largest user group in the U.K., with some 7,000 members, is the IBM PC User Group. It was formed in 1983 by its present chairman, Ian Fraser. He had contacted IBM to find out if there was a user group he could join; there was none, but IBM suggested he start one. The group now caters for users of IBM PC and compatible machines.

What began as a hobby for Fraser grew into a full-time occupation. About 65 per cent of the group's members now come from companies such as ICI and American Express. Two kinds of membership are available: personal membership costs £25 per annum, while corporate membership covering up to five people in a company costs £95. The group does not claim to be non profit-making; as Fraser explains, for the group to grow he had to start running it on a full-time basis.

A setup like the IBM PC User Group may seem too commercial for some. The Compulink User Group, on the other hand, is a non profit-making organisation set up about two-and-a-half years ago by its chairman, Frank Thornley. On a visit to the U.S. Thornley was impressed by the user groups, bulletin-board services and access to public-domain software he found there. When he returned home he found there was nothing to match it, so he set up Compulink.

Compulink is mainly for users of the IBM PC and compatibles, for whom it costs £30 per annum to become a member. It has an Apricot user section too, which costs £35 to join. At present Compulink boasts about 3,700 members. Thornley says they are mainly enthusiasts rather than business people, and he believes that the proportion of enthusiasts will increase as more PC-compatible Amstrads and Taiwanese clones come into use.

Compulink membership entitles you to regular circulars and a quarterly disc-based magazine. The magazine provides details of new additions to the Compulink public-domain software library and upgrades to the Compulink BBS. The latter is the largest BBS outside the U.S. and is described more fully in our July 1986 issue.

User groups can also give you a good opportunity to voice your opinions to a manufacturer. Not every user group burns with reforming zeal, but most provide a convenient way of airing grievances with manufacturers and suggesting improvements. The success of activities of this kind depends a lot on the attitude of the manufacturer towards user groups dedicated to its products. Some firms are keen to exploit user organisations as a target group for market surveys, or as a more informal means of finding out about users' wants, likes and dislikes. Some manufacturers go so far as to vet groups, to make sure they are giving customers a fair deal. Others prefer to keep user groups at a distance.

Atari is one company that feels user groups have the potential of benefiting end-users and manufacturers alike. Atari salespeople sometimes attend user-group meetings to answer questions and to get the feel for the kind of problem users are experiencing. Apple has set up a user-group council to ensure that groups are kept up to date with developments within Apple and to make arrangements for speakers and the loan of equipment.

Some user groups have been set up by the manufacturers themselves. The cynical might view a user group funded on this basis as merely another marketing arm of the company, or maybe even a cheap way of handling customer support. There is clearly a risk that financial links between a user group and a manufacturer could threaten

the independence that many user groups regard as vital to their status.

The Lotus User Group is one group with strong links to the software house whose name it bears. It was set up last year by journalist Simon Moores, who went to Lotus for the necessary venture capital. Moores had previously written about Lotus products, and suggested to the company that a user group might be a good idea. A survey of 1,000 users followed, and the group was formed in response to their replies.


With financial backing from Lotus, the group is clearly vulnerable to criticism that it is not really independent. Moores rebuffs such claims, saying that the group is independent in its decision making — indeed that it has to be to maintain credibility with its users. He also points out that Lotus itself wants the user group to be independent, and that the group intends to become financially self-sufficient.

But the idea behind the Lotus group is clearly different from the principles which motivate Compulink and its kind. Moores is keen to attract to the group blue-chip members who are professional people, managing directors and suchlike, rather than techies and enthusiasts. It provides its members with a bi-monthly newsletter, concessions on products and services, technical support, seminars and training courses, access to a user-group library, free assistance and advice in selecting systems and software, and membership of Telecom Gold. The group is also appointing technical-support consultants who are prepared to answer user queries.

Membership costs £95 per year for individuals or £350 for a corporate subscription. Moores says these relatively high fees are needed to support the wide range of services the group offers. Any profit that may be made from hardware and software offers is expected to be ploughed back into the group to boost services and reduce prices.

BRITISH RETICENCE

At the end of the day, a user group can only function as well as its members allow it to. It seems that in this respect American groups are more successful than British ones. The British are remarkably reluctant to join user groups: even the 7,000 members of the IBM PC User Group are a small percentage of the potential: there are about 120,000 IBM PCs and compatibles in the U.K. User groups tend to be much more successful on the Continent too, possibly because people there have to band together to understand the manuals; in America, the sheer numbers involved must boost membership.

In the U.S., one of the objectives of a group called Guide is to influence IBM. The company is reported to be candid with Guide about forthcoming products, problems with existing products and other aspects of IBM's business and technological plans. Admittedly, Guide members include over half of the Fortune 1000 companies, and membership is not open to everyone, but it does show what can be done. 

THE PROTECTION RACKET

With its current generation of operating systems no longer adequate to cope with the latest hardware, and the promised multi-tasking version MS-DOS yet to appear, Microsoft appears to be in danger of surrendering its pre-eminence, as **Steve Malone** explains.

The flurry of 80386 machines and add-on boards has really shown up the weaknesses of MS-DOS. To be restricted to the 640K MS-DOS limit on a machine capable of addressing 4Gbyte is becoming a joke, and the need for an operating system to handle this amount of memory is now acute.

A new version of MS-DOS has been expected ever since the launch of the PC/AT in the summer of 1985. The 80286's ability to run several programs simultaneously without interfering with each other — the so-called Protected mode — made the implementation of multi-tasking and multi-user applications a distinct possibility. All that was needed was a new version of DOS.

It has not been forthcoming. As a result, every PC/AT has been running MS-DOS applications in Real mode, which allows the 80286 to maintain compatibility with previous generations of Intel chips. The problem is that Real mode and Protected mode cannot be run simultaneously.

The 80386 is much better at this sort of thing, as it can run 8086 PC-DOS applications in a Virtual mode. Here the chip convinces the software that it is running on a member of the 8086 family. In addition, the 80386 can still maintain access to the power of the 32-bit buses.

It is no secret that Microsoft has been working for some time on a release of the MS-DOS operating system able to take advantage of Protected mode. Various features about the system have come to light, but most of what has been released seems to be designed to whet the appetite rather than give hard facts.

Pressed about actual details, Microsoft has given the time-honoured response that it "is not prepared to speculate about un-announced products". But this has not stopped rumour and speculation, particularly in the United States. As far as we have been able to glean, there are two versions of MS-DOS on the way. One version is designed for the 80286 processor,

while at the same time there is a more advanced release on the drawing board for the 80386 chip.

The 80286 version is the much heralded MS-DOS 5.0 — though Microsoft will dispute the nomenclature. It is intended to have a memory limit of 16Mbyte. The delay in its release has been mostly due to the problems of getting an 8086 application to run in Protected rather than Real mode, although it is said that the difficulties have now largely been overcome.

It has been clear for some time that the 80286 DOS will be multi-tasking. At the moment, if you want multi-tasking on a Microsoft product you have to go to Windows or leave the DOS universe altogether and use Xenix. As the new versions of DOS will have a multi-tasking capability built in, the redundant features of Windows will be removed from the separate application product.

The system is expected to work in much the same way as the control programs which have become popular in America. These programs partition the memory to allow various application programs to reside and run in memory simultaneously. Perhaps the best known of these is IBM's Topview. It is worth noting that Microsoft bought Dynamical Systems Research, the author of Topview, last summer and put the programmers to work on its own projects.

Of course, when you are writing a new version of an operating system there are

almost always going to be problems with software from the previous generation. The kind of bugs likely to arise are usually a consequence of programmers' illegal tricks; when the system changes they get caught out.

This is likely to become even more apparent when the 80386 operating system arrives. There has already been trouble running some software on the chip, most notably Digital Research's Concurrent DOS. If software developers writing for the 80286 chip have ignored some of the ground rules laid down by Intel, then they may well find themselves in difficulties when the new DOS arrives.

Microsoft's director of operating-system products, Adrian King, has stated that programs will have to conform to certain procedures regarding memory management and peripheral access in order to run happily under the new Protected-mode versions of DOS. The company points to its C compiler as an example of a program which follows the rules. However, depending on the application, users should be able to take advantage of the multi-tasking and the memory-addressing capabilities of Protected mode. For example, while still being an essentially 8086-based product, Lotus 1-2-3 will be able to hold data in the maximum 16Mbyte address space and be able to run concurrently with other applications.

The 80386 version of MS-DOS will go much further than the 80286 release in pulling together the strands of Microsoft's strategy. Sources close to Microsoft say the 80386 version, which has been dubbed "Advanced DOS", will have a maximum address space of 4Gbyte. This equals the maximum addressable by the 80386 hardware and should keep programmers and users happy, for a while at least.

More intriguing is that the command-line interface, the familiar face of MS-DOS, will disappear and Windows will merge with the 80386 DOS. Therefore it seems likely that future computers will have a mouse interface



**At the moment, if
you want multi-tasking**

on a Microsoft product

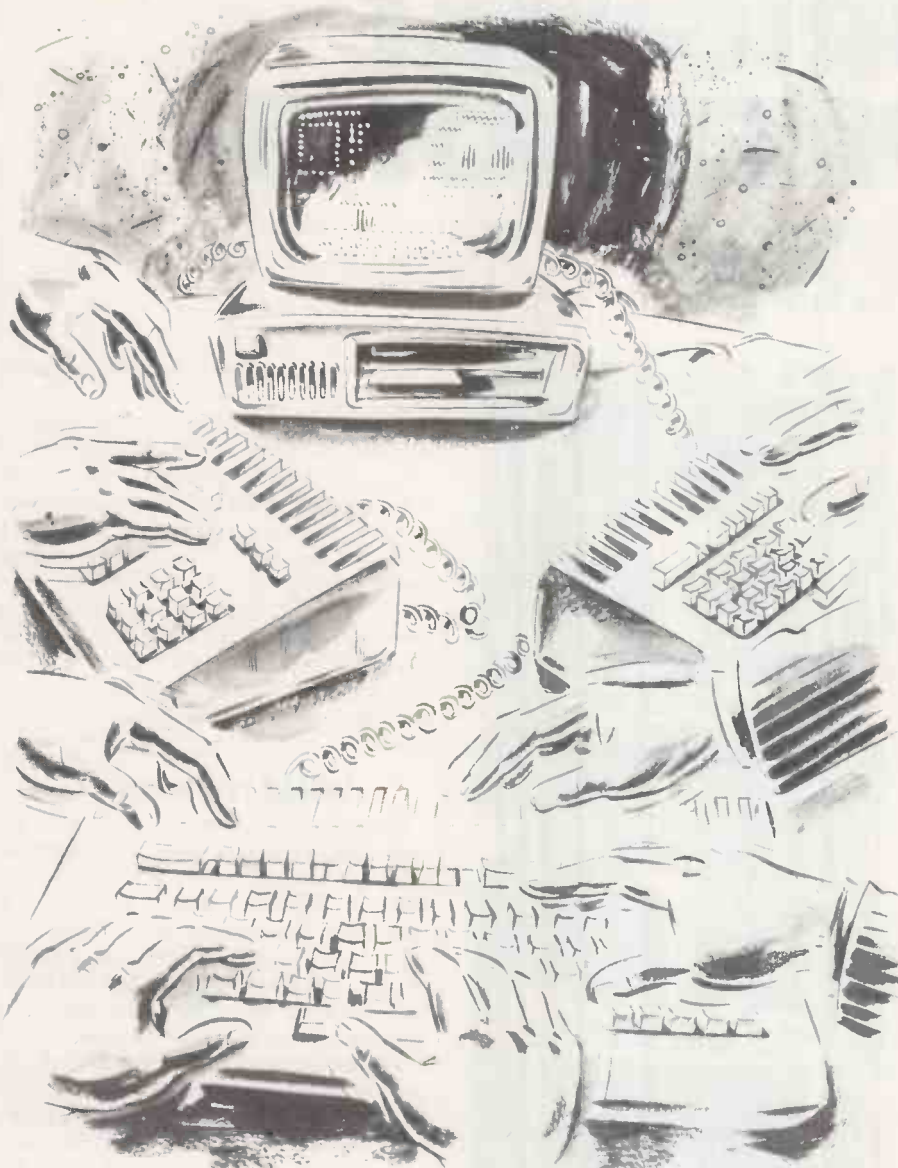
you have to go to

Windows or leave the DOS

universe altogether and

use Xenix.





GARY WING

built in as standard, perhaps with part of the operating system included as well.

Compaq, for example, has included a Microsoft mouse ROM on the Deskpro 386. It has not been implemented yet because it has fallen foul of the FCC, which governs the emission of radio signals in the United States. If part of the operating system is included in ROM it would have to be code Microsoft did not intend to change, otherwise users would have to remove and replace chips every so often.

While the new versions of MS-DOS promise to do wonderful things, they will not support multi-user applications. Microsoft says that it already has a multi-user/multi-tasking operating system in the form of Xenix and does not want a competing product.

No date for the new versions of the operating system has been set. It is unlikely that Microsoft will unveil its new system in advance of IBM's new line of so-called clone killers, code named Renegade.

Like Compaq and other hardware manufacturers who have launched 80386-based products in advance of IBM, Microsoft has

found that several software houses are launching MS-DOS compatible, Protected-mode disc-operating systems before it can set the standard. In the race to launch the first product, the probable winner looks like being the PC Multilink Operating System, also known as PC-MOS/386, which comes not from Microsoft but from an Atlanta-based company called Software Link. Although Microsoft's public posture is to take a relaxed attitude towards rival operating systems, PC-MOS gives clues as to what can be expected from a future version of MS-DOS.

It is not entirely surprising that a third party has produced an 80386 operating system before Microsoft has even developed a suitable system for the 80286. The improved architecture of the 80386 makes it much easier to write operating systems, compared with the convoluted tricks that are required for the 80286 and its Protected/Real mode distinctions.

As such, PC-MOS will not be able to run on the 80286-based computers, and so will not cover the AT generation of micros. Furthermore, the system will not be

It is not entirely surprising that a third party has produced an 80386 operating system before Microsoft has even developed a system for the 80286.

including any part of the Windows interface in the code, but will rely on the traditional A> prompt.

What the British distributor of PC-MOS, ICCT, does promise is that the system will provide simultaneous support for Real and Protected modes. The operating system works by running the 80386 in its Protected mode, yet is able to split work performed by the processor into a number of 8086 modes. ICCT says that there is a limit of 25 partitions or users, each with multiple display capability. The company was unclear at what level the number of users affects the number of multiple screens which could be supported; presumably much depends on the type of application you are running.

The PC-MOS operating system is intended for multi-user functions and assigns processor time to users on a priority basis. Each of the virtual 8086 users will receive a nominal megabyte of space to play around in. However, the architecture of the IBM PC and compatibles will intervene, and part of the memory area will be assigned to screen display, BIOS ROMs, etc. ICCT says the plan is that the DOS will allow the user to encroach on an extra memory segment, permitting access to 704K, of which 24K will be set aside for BIOS routines. If you want more memory PC-MOS will support the Lotus/Intel/Microsoft Expanded Memory Specification (LIM).

The company claims that PC-MOS will support the vast majority of 8086 applications programs, including the awkward PC-Net BIOS and the misbehaved Lotus 1-2-3. There are said to be certain other programs which have difficulty. One of them is Sidekick, which hogs many of the processor interrupts and is likely to interfere with smooth input from other users. Another program which causes trouble is Samna Word III, probably for the same reasons.

The future of PC-MOS is in the hands of Microsoft. While much depends on the system's compatibility with existing software, more will be decided by the nature of the Microsoft product when it appears. If the Microsoft operating system contains valuable features which are not covered by PC-MOS, the developers will have to upgrade quickly or be forgotten.

Timing will also be crucial. If Microsoft gives PC-MOS time to be established it might find itself in the same position as IBM has with Compaq: attempting to make up lost ground from a competitor which should never have been allowed to get ahead in the first place.



ORIGINAL EXPRESSIONS

The distinction between an idea and the way it is expressed is at the heart of the latest legal controversy to hit the software industry. **Anne Staines** explains what it is all about.

If I write a story on the subject of unrequited love I can claim copyright protection for my own story but I cannot prevent anyone else from expressing their own original variation on the same theme. The rule is that copyright protects the expression of an idea but not the idea itself. It is justified on the grounds that copyright grants no monopolies to authors, merely certain rights over the reproduction of their creative works.

The legality of reverse engineering a program — that is, decompiling it to find out how it works, for whatever purpose — rests on the same principles. Monopolies over inventive systems are granted by patent. If a work does not qualify for patent protection — and most computer programs do not — its author cannot acquire a monopoly through the law of copyright.

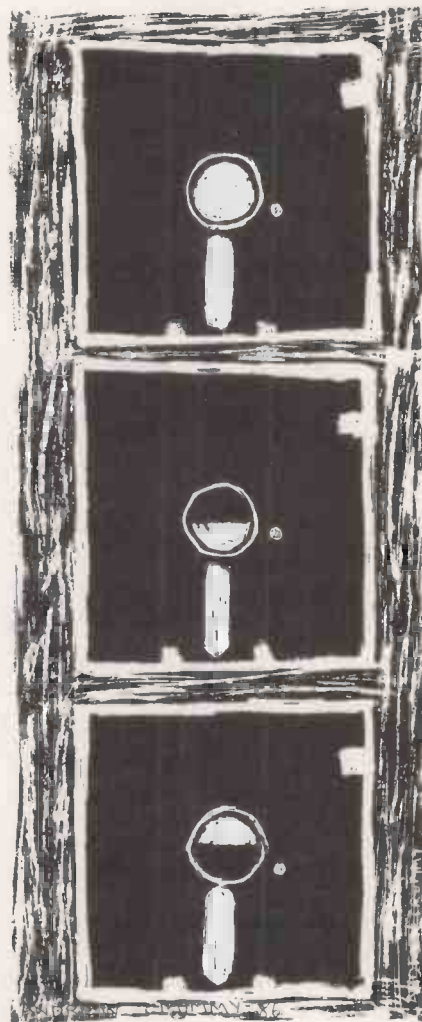
In the U.K. this principle lies at the heart of section 6 of the Copyright Act 1956, which permits copying as fair dealing for the purposes of research or private study. As it now stands, this provision permits reverse engineering for genuine research purposes, provided that this deals fairly with the author's interest.

FAIR DEALING

There are no strict criteria used to determine what is fair, although factors such as the market in which the author competes and the likely effect upon it of the copying are relevant. As the former Master of the Rolls, Lord Denning, said in one famous case on the subject: "What is fair dealing is often just a matter of impression."

In the recent White Paper *Innovation and Intellectual Property Rights* the government has announced its intention to exclude from the notion of fair dealing any copying for commercial purposes. Some reverse engineers produce clones; others use the idea behind an innovative program to produce better alternatives or compatibles. All are united in dismay over the proposals to restrict the ambit of fair dealing, and are seeking to argue their case by reference to the distinction between an idea and its expression. Their position is that they want to copy the expression in order to get at the idea behind it. This, they argue, is good for the industry, good for the market, and does not interfere with copyright in the true sense of the word.

The point has not come under judicial scrutiny in Britain, but in the U.S. it threatens to become a boom area for liti-



gation. Until recently American reverse engineers were in clover. One precedent held that copying an expression of an idea is permissible if it is incidental to the user of the idea behind it. Another held that since in some cases — for example, input format — the idea and its expression were indistinguishable, very slight alterations to the original expression would suffice to avoid copyright infringement. To do otherwise, it was held, would unreasonably fetter the idea.

Then came the case of *Whelan v. Jaslow*. At first instance, the District Court held that the look and feel of a program were copyright protected. It did so by applying rather a hotch-potch of copyright law: not quite the rules for literary works, not quite those for artistic works, but an amalgam of both. An earlier article on page 82 of the April

1986 issue of *Practical Computing* discussed this point.

The U.S. Court of Appeal, upholding the decision, used a more sophisticated line of reasoning. It held that there is in most cases a meaningful distinction between an idea and its expression. Where an idea for a computer program, including input format, can be expressed in more than one way, then the structure and logic through which it is expressed is part of the copyright work. The structure and logic, according to this reasoning, can therefore be treated as part of the expression of an idea, rather than as an idea itself, and may not be copied.

WHAT IS AN IDEA?

Central to this reasoning, of course, is the definition of what actually constitutes an idea. The idea behind the program in *Whelan v. Jaslow* was defined by the court as the management of a dental laboratory. This idea could plainly be expressed in a variety of ways, and the court was influenced by the fact that there were other dental laboratory management programs on the market which bore no apparent resemblance to the program under consideration. On the other hand, more complex programs will require a more detailed explanation of the idea. Undoubtedly some authors will argue that the idea of the program can only be explained by reference to its expression.

The effect of *Whelan v. Jaslow* is really to stand copyright on its head. Copyright is concerned not with protecting clever ideas but clever — or to be accurate, aesthetically pleasing — expressions. The reasoning in *Whelan v. Jaslow* necessarily relegates the expression to second place, behind the idea, which is in this case not aesthetic but functional.

Will British Courts follow suit? Comments made by the House of Lords in *British Leyland v. Armstrong Patents* lead to the suggestion that they would not. In disposing of BL's attempt to establish a monopoly over spare parts for its cars by means of the copyright in their designs, the Lords' disapproval was made plain of both the monopoly attempt and, more generally, the distortion of copyright into inappropriate areas. Though similarities in the look and feel or structure, sequence and organisation of programs may demonstrate that the encoded literary work had been copied, it seems unlikely that British courts will regard that as a cause in itself for an action for infringement. PC

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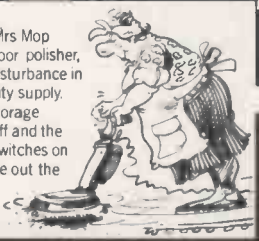
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YOU'D BE AMAZED WHO IS SABOTAGING YOUR COMPUTER

7.30am
An innocent act. Mrs Mop switches on the floor polisher, causing a small disturbance in the mains electricity supply. Even worse the storage heater switches off and the air conditioning switches on – these could wipe out the computer's entire memory.



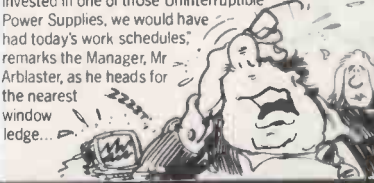
THE TYPING POOL

8.34am
The plot thickens. A dozen typewriters are switched on simultaneously: interference in the mains supply is almost inevitable. Can the computer withstand such blatant attempts at sabotage?



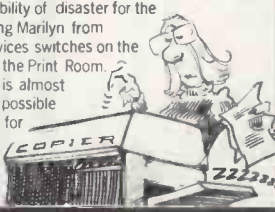
THE COMPUTER DEPARTMENT

8.45am... Success for saboteurs! "Dirty power" has caused a serious computer malfunction. "If only we'd invested in one of those Uninterruptible Power Supplies, we would have had today's work schedules," remarks the Manager, Mr Arblaster, as he heads for the nearest window ledge...



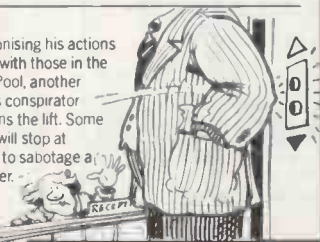
9TH FLOOR

8.17am
A further possibility of disaster for the computer. Young Marilyn from Marketing Services switches on the photocopier in the Print Room. A power surge is almost inevitable; the possible consequences for the computer too awful to contemplate.



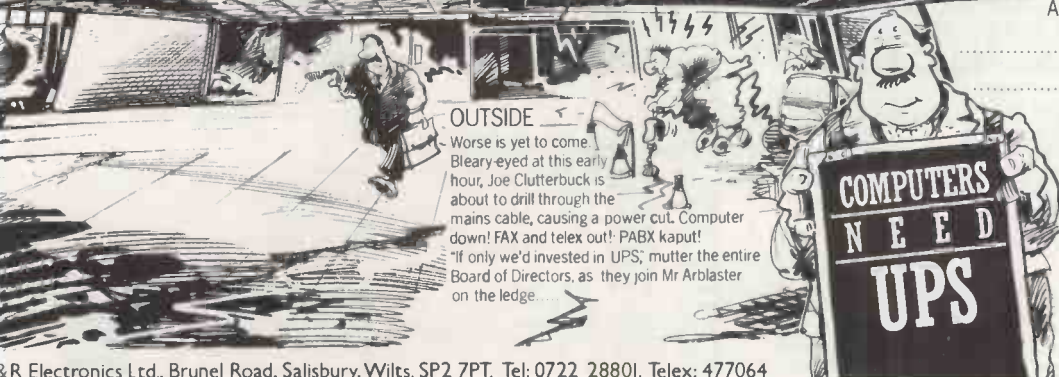
RECEPTION

8.34am
Synchronising his actions exactly with those in the Typing Pool, another ruthless conspirator summons the lift. Some people will stop at nothing to sabotage a computer.



OUTSIDE

Worse is yet to come. Blear-eyed at this early hour, Joe Clutterbuck is about to drill through the mains cable, causing a power cut. Computer down! FAX and telex out! PABX kaput! "If only we'd invested in UPS," mutter the entire Board of Directors, as they join Mr Arblaster on the ledge...



Every time you operate an electrical switch, you risk wiping out your computer's entire memory.

Because any item of electrical equipment can cause interference in the mains supply – surges, spikes, sags or brown-outs.

At peak times, when demand soars, there's a very real danger of this "dirty power" getting through to your computer, with devastating results. In fact, mains interference is by far the commonest cause of malfunctions in information technology equipment, from Facsimile and telex machines to modems and PABX.

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Our Top 10 business packages are not necessarily the top sellers in their field. Rather they represent the state of the art, and certainly cannot be overlooked by anyone in the market for office-productivity software. The selection includes two word processors, two financial modellers, two integrated packages, one database and one presentation-graphics package.

The last two categories exemplify the way that micros are introducing completely new types of activity into day-to-day office work. The Vicom comms package makes computer communications sufficiently painless for the use of electronic mail and similar facilities to become a matter of routine. Similarly, Pagemaker is one of several desk-top publishing packages which are making it possible to produce high-quality printed material without leaving the office.

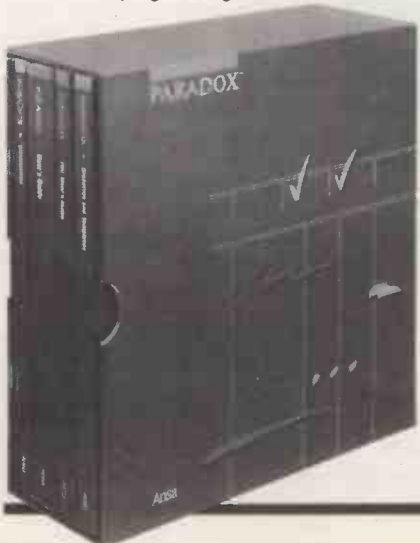
Although the IBM PC and its compatibles continue to dominate the business arena, software development for this de facto standard is beginning to show signs of stagnation. Since the arrival of the PC/AT running the Intel 80286 processor — and more recently the Intel 80386-based machines — it has become clear that the weak link in the chain is the IBM PC's operating system.

THE NEW MS-DOS

PC/MS-DOS does not allow the power of these chips to be exploited to the full. Consequently the software houses seem to be hedging their bets until a new standard begins to emerge. Although Microsoft has MS-DOS 5 in the pipeline it seems that guaranteeing compatibility with earlier versions is proving harder to achieve than expected.

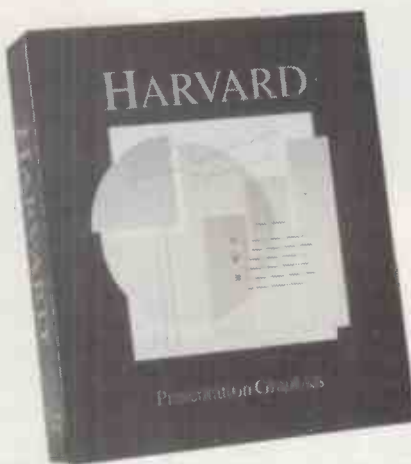
With the IBM PC software market in the doldrums software houses have turned their attention to the previously underexploited Macintosh. The Mac has benefited from some much-needed hardware improvements, so it is now powerful enough to run sophisticated business software. Hard discs are now commonplace, and the ability to manage more memory has improved the capacity of the software. Microsoft is one of the few large software houses to have sup-

Paradox: trying to edge dBase aside.



TOP 10

David Barlow picks out the programs that are currently attracting the attention of business buyers.



Harvard Presentation Graphics is easier to use than most competing packages.

ported both the Macintosh and IBM PC standards consistently, and this policy seems to be paying off. Excel and Works are both Macintosh packages and neither has yet appeared in IBM PC format.

The success of the Macintosh as a proving ground for revolutionary concepts is amply

SUPPLIERS

Excel, Word, Works Microsoft, Excel House, 49 De Montfort Road, Reading, Berkshire RG1 8LP. Telephone: (0734) 500741.

Framework, Javelin Ashton-Tate (U.K.), 1 Bath Road, Maidenhead, Berkshire SL6 4UH. Telephone: (0628) 33123.

Harvard Presentation Graphics Software Publishing, 85-87 Jermyn Street, London SW1Y 6JD. Telephone: 01-839 3864.

Pagemaker, Aldus (U.K.), Craigcrook Castle, Craigcrook Road, Edinburgh EH4 3UH. Telephone: 031-336 1727.

Paradox Ansa Software, PO Box 94, East Grinstead, West Sussex RH19 4YL. Telephone: 01-839 3864.

Word Perfect Sentinel Software, Wellington House, New Zealand Avenue, Walton-on-Thames, Surrey KT12 1PY. Telephone: (0932) 231164.

Vicom AM Computer Technology, 16 Kensington Court Place, London W8 5BJ. Telephone: 01-937 0002.

demonstrated by Vicom. For some time only available for the Macintosh, it has received such critical acclaim that now it has been announced in two IBM versions. One is for the more discerning business market and one is aimed at the budget-conscious Amstrad PC-1512 market.

Business software is slowly starting to make better use of the available hardware resources. With the price of memory now so low, a package which runs on a 128K PC is the exception rather than the rule. Most programs require at least 256K, and generally speaking the more memory is required the more sophisticated and powerful the package will prove to be.

The real power users' software will be able to exploit the LIM standard. This is an agreement between Lotus, Intel and Microsoft which enables the IBM PC running PC/MS-DOS to use memory in excess of 640K, and in some cases as much as 8Mbyte. This is particularly useful when working with large spreadsheets so it has proved a popular enhancement with Lotus 1-2-3 and Supercalc 4. More and more business software makes use of IBM's Enhanced Graphics Adaptor and its cheaper compatible cards.

STABLE PRICES

The top end of the market has not yet seen much in the way of price cuts. Publishers of expensive packages such as Javelin and Paradox show no signs of reducing prices to widen the appeal of their products. This is in marked contrast to the situation that prevails with the more basic packages, where fierce price competition is the order of the day in the rush to attract users of cheap PC clones — the Amstrad in particular.

Two new packages particularly of note are PFS First Choice and Able-1. PFS First Choice is an ideal office productivity package for the first-time user. It combines word processing, database, spreadsheet and communications into one easy-to-use unit. Able-1 is an advanced example of integrated software that supports multi-tasking in addition to all the usual facilities. It has a few odd rough edges, but with its price of around £80 they are forgivable.

Integrated software for first-time and occasional users by PFS.



TOP 10

EXCEL

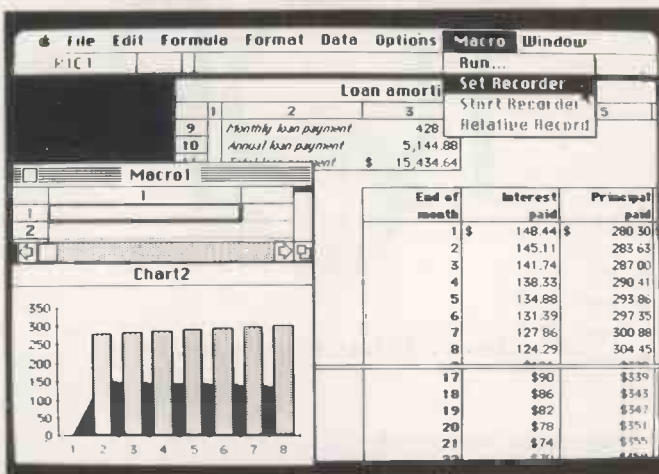
MICROSOFT's impressive spreadsheet and graphics package is only available for the 512K Macintosh with an external disc drive. It can support a 256-column by 16,384-row matrix, and boasts over 85 built-in arithmetic functions. It uses a similar command structure to Multiplan, but is far easier to use. Speed of operation is aided by an easy-to-use macro facility and comprehensive on-line help. Quality output is another strong point, as multiple fonts and advanced print formatting are well supported. The graphics section features 42 pre-designed charts, automatic axis scaling and legends. As with Lotus 1-2-3, a primitive database is provided, allowing up to 16,383 records of 256 fields each. Excel is file compatible with 1-2-3, Microsoft Chart, Multiplan, Syk and ASCII. It supports conventional dot-matrix printers as well as Apple's Laserwriter.

PRICE: £395

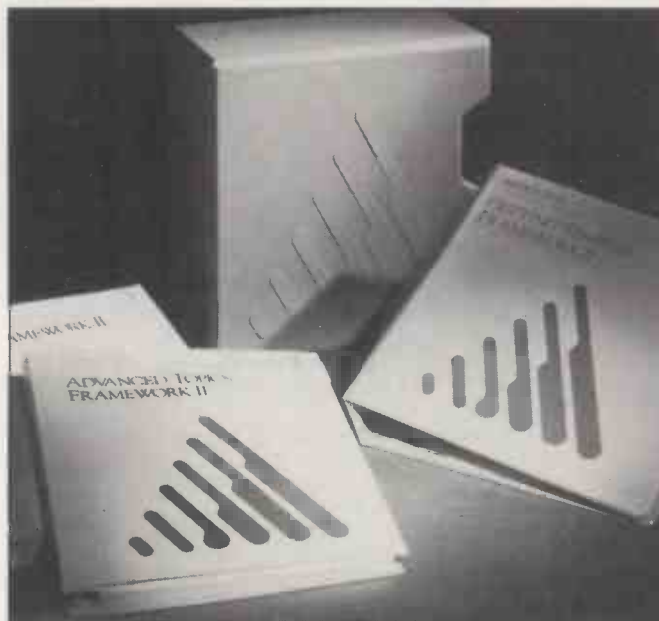
FOR: Well-integrated graphics. Useful macros.
AGAINST: Needs high-spec Mac. Expensive.

FRAMEWORK II

ASHTON-TATE's integrated package continues to accumulate useful enhancements. The spreadsheet now has a huge capacity — memory permitting — and features over 160 built-in functions. The word processor is greatly improved over the original version, with an 80,000-word spelling checker and a mail-merge facility. There are a host of other improvements, the most notable of which provides support for the LIM memory-expansion standard and the IBM EGA card. Its file import/export abilities have also been extended: 1-2-3, WordStar, Multimate and IBM Displaywrite interchange are now supported. A budget version is in the pipeline for users of the Amstrad and similar cheap clones. It will offer



Microsoft's Excel is the most powerful spreadsheet for the Mac.



most of the basic facilities and concepts, but with certain restrictions on more sophisticated functions.

PRICE: £595

FOR: Powerful. Outlining facility.
AGAINST: Complex. Hard to learn. Needs expensive hardware.

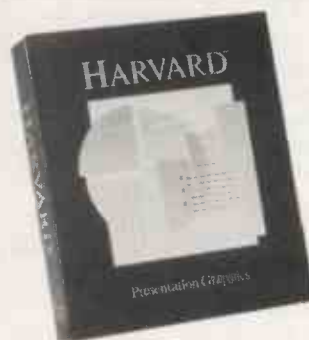
HARVARD PRESENTATION GRAPHICS

ALTHOUGH not as sophisticated as mammoth packages like Graphwriter and Freelance, HPG scores by offering a well-balanced set of features in a remarkably simple package. Its system of menus is so consistent

and informative that you can have it up and running in minutes. It supports 15 different types of graph as well as a variety of text charts. Most screen drivers, including IBM's EGA, are supported; HPG will also drive every major output device, including the Polaroid palette which transfers an image to 35mm. slides. Its output quality is second to none in the sub-£1,000 price bracket. The coming year will see a new version of HPG which will be able to be used in conjunction with Harvard Professional Publisher.

PRICE: £295

FOR: Easy to use. Versatile output-device support.
AGAINST: Screen displays can be rather crude.



JAVELIN

A REVOLUTIONARY alternative to the spreadsheet, distributed in the U.K. by Ashton-Tate. Data related to a particular financial model is stored in a central database, and not a matrix of cells. Rather than referring to complex cell references, you give Javelin variables names such as Sales, Profit or Balance. The central database is divided into two areas: one is for storing variable data, the other for the storage of logical relationships between variables. This approach allows models to be analysed from several angles, called views. Javelin supports 10 views, including Diagram, Formulae, Table, Chart, Worksheet, Graph and Macro. There is even an Error view that highlights undefined variables and other inconsistencies. Javelin is an impressive and powerful tool, though it takes quite a time to get to grips with its unusual concept.

PRICE: £595

FOR: An interesting alternative to the spreadsheet. Fully featured.
AGAINST: Expensive. Takes time to understand.

PAGEMAKER

WITH this product Aldus helped establish the Macintosh as the de facto hardware standard for desk-top publishing. Introduced in 1985, it has clocked up sales of 30,000 copies worldwide and it is currently available in seven languages. A recent tie-up with Microsoft has led to the announcement of an IBM version which can be used in conjunction with products in the Microsoft family, such as Word and Windows. The latest Mac version of Pagemaker features five editable views, double-sided pages, text and graphics import, picture scaling, and support for the Apple Laserwriter Plus. The competition in this area is hotting up.

PRICE: £450

FOR: The current standard. Easy to use.
AGAINST: Expensive. Really needs a laser printer.

VICOM

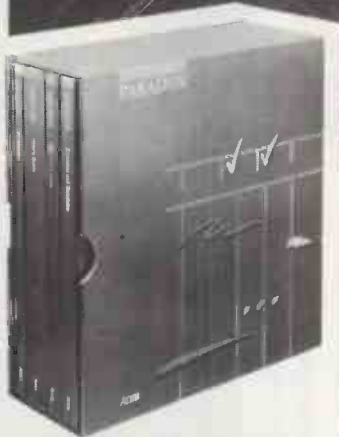
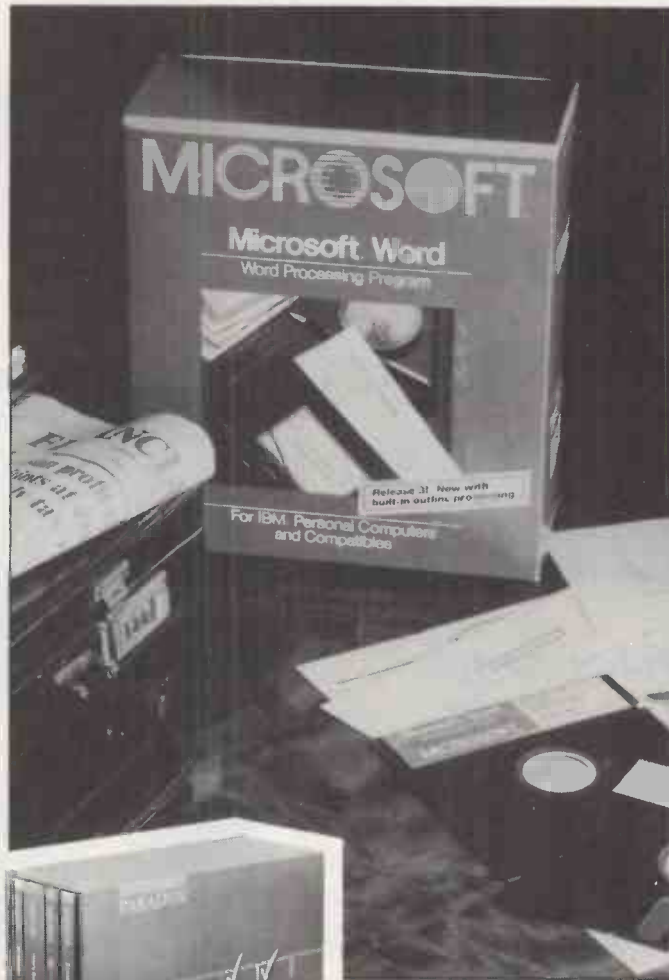
THE BIG news regarding this communications package is that it will now run on the IBM PC as well as the Macintosh; the IBM version has just been launched at a very competitive £160. As with the Mac version, both Viewdata and text-format electronic services are supported, so the package can connect you with the likes of Prestel as well as with Telecom Gold. Although ease of use has suffered marginally in the transfer to the IBM, the package still makes extensive use of screen icons and a mouse, if available. Digital Research has taken Vicom on board, and as a result a new £100 version aimed at the Amstrad PC-1512 user will be appearing shortly. This version will only work on the Amstrad machine.

PRICE: £160 for PC version

FOR: Easy to use. Viewdata and text compatible.
AGAINST: Only listed modems can be used.

PARADOX

THIS powerful relational database is rather unusual in featuring a user interface that resembles Lotus 1-2-3. This makes the package easier to learn than some of the more conventional command-orientated databases, and the ideal choice for existing Lotus users. It also includes a full pro-



gramming language for the production of sophisticated turnkey applications. The Californian software house that produced Paradox has now set up officially in the U.K. and has just launched version 1.1i specifically for the U.K. and European markets. Improvements include better data handling, variable number formats and support for the special characters required in Europe. The latest version has an improved sort, which can now put proper names in alphabetical order without regard to irregular capitalisation.

PRICE: £550

FOR: 1-2-3 style interface. Powerful programming language.
AGAINST: Still young. Expensive.

WORD PERFECT

GENERALLY regarded as the most sophisticated word-processing package currently available, Word Perfect from SSI includes a whole host of features aimed at the power user. Version 4.1 has a built-in thesaurus, line drawing, improved proportional spacing and a unique three-level Undelete facility which allows any of the last three deletions to be restored. Printer support is second to none. Now with the addition of Word Perfect Library there is a file manager, calculator, notebook and calendar, all held in memory and available at any time. It is also possible to run SSI products like the Mathplan spreadsheet and a database, plus other non-SSI packages, all under the control of the Library shell environment.

PRICE: £425

FOR: Full featured. Printer support. Thesaurus and spelling checker.
AGAINST: Expensive. Harder to use than some cheaper WP packages.

WORD 3

MICROSOFT's Word 3 is beginning to establish itself as the standard corporate word processor for IBM machines. Its success can be judged by the fact that it has toppled WordStar as the best-selling word-processing package in America. Word contains a range of features which set it apart from the normal word processor. It is a graphics-based program which supports a mouse for ease of use, style-sheets, Document Content Architecture support for network transfer, and a huge bundled spelling checker. The program even includes a built-in outline processor similar to Living Videotext's Ready. Word is the power-user's word processor. A disappointing cut-down version for the Mac has been around for some time. The newly announced Macintosh Word, reviewed in last month's *Practical Computing* is a thoroughly rewritten program which is strong enough to become the standard Mac WP package.

PRICE: £425 for IBM version

FOR: Multiple founts. Anglicised spelling check.
AGAINST: Unusual user interface.

WORKS

A WORD PROCESSOR, database and spreadsheet with charting and communications are combined in this Microsoft package, which is available only for the Macintosh. It requires at least 512K of memory, and supports Apple Imagewriter and Laserwriter printers. The word processor can display various type styles and founts on-screen in the form that they are printed out. The spreadsheet is a cut-down version of the superb Excel dedicated package, and offers a useful capacity of 256 columns by 9,999 rows. As you would expect of a Mac package, the charting facility is particularly well integrated with the rest of the modules. The database supports up to 60 calculated fields and can be coupled to the word processor for mail-merging.

PRICE: £245

FOR: Ease of use. Modules are well integrated.
AGAINST: Rather expensive.

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May

COMMUNICATIONS

Comms are assuming an ever-greater importance as micros hook up with the outside world. We focus on micro to mainframe links. Top 10 budget software — the best business programs for less.

The race against obsolescence

Both the IBM PC and the Apple Macintosh are starting to show their age, but you can still keep them abreast of modern technology by grafting on a hardware module or by tweaking the system software. **Steve Malone** looks at what is available.

One of the unexpected growth areas in business computers over the past couple of years has been the emergence of the performance enhancer. While machines like the IBM PC have always generated a healthy third-party business in video boards, interface cards and the like, the idea of improving the performance of existing hardware is relatively new.

Now it seems that no part of a standard machine cannot be improved by adding some extra piece of hardware or software. There are processor emulators, co-processors, DOS enhancers, motherboard accelerators and disc enhancers. There are even utilities to improve the rate at which the computer reads the keyboard buffer. These additional features have come about because of a combination of advancing technology and the reticence of customers to ditch their old machines. Users are reluctant to buy new equipment if doing so would make their existing software obsolete.

The existence of some 50,000 applications packages for the IBM PC format has slowed progress to a crawl. In the five-year life of the IBM machine it has been almost impossible for anyone to launch a successful non-compatible into the business market, and few have tried. Even Apple, the only non-IBM contender left, has stuck with the Macintosh, preferring to upgrade the basic machine and maintain compatibility with its established software base.

The one company that has made an impact with a non-compatible machine, on the European business market at least, has been Amstrad with the PCW-8256. Even here Amstrad opted not to try to build a new software base but simply to find another one — in this case the CP/M eight-bit programs which had been forsaken by almost everyone else.

EXISTING SOFTWARE

Yet while the software authors struggle along, hardware innovation strides forward. Because the two sides of the industry move at different rates, the only way that improved performance arrives on the standard business format is when the hardware is somehow made to work with existing IBM-compatible software.

Despite the plethora of products on the market, sales have not been particularly impressive. This is partly because early versions have led to accelerators acquiring the reputation of being unreliable, and also because some boards encounter compati-

bility problems. However, improvements have been made over the past few years in both respects. Many of the problems with accelerators and other enhancement products stem from customers' ignorance of what these boards can and cannot do and a reluctance by many dealers to sell them.

For example, if a customer goes into a dealer's showroom and says, "I want my spreadsheet to run faster," the dealer will probably reply: "Nothing simpler, you need an AT." This is because a lot of accelerator boards need special installation, and the dealer may well not understand the software that the board is to run with.

The rash of enhancement products is not wholly confined to the IBM PC format. Time cruelly exposes hardware deficiencies, and it has now caught up with the Macintosh too. Apple must rue the day it decided to give the Mac a closed architecture. The continued success of the IBM PC and the Apple II is largely a result of open architectures, which allow innovative hardware simply to be plugged in. The original Macintosh architecture made this extremely difficult, although the provision of an SCSI port on the Mac Plus has alleviated the problem.

Performance enhancers not only have to improve the basic performance of the computer, they must also work with existing software. This can cause endless problems, especially with packages which rely on a particular clock speed before they will work. Processor accelerators invariably increase the clock speed as part of the enhancement; but many of them include a utility which slows it down again so that full compatibility can be maintained.

Starting on the following page, we look at some of the various ways in which third-party manufacturers have sought to soup up basic IBM and Macintosh models. Because of the large number of enhancement products available we have decided to concentrate on the three basic areas of CPU, peripheral control and DOS enhancers, and look at some of the most advanced developments within these areas.

The CPU enhancers increase the performance of the basic von Neumann architecture around which every computer is based. Therefore these products may not only improve the basic speed of the machine but also the efficiency of the processor and the amount of memory it is able to address.

The most obvious way to increase power is simply to put in a bigger engine, and this is what many of the performance enhancers

do. Thus an 80286 card is available for the standard IBM PC, and there are 80386 boards emerging for the PC/AT. We look at the latter on page 91.

The advancing 32-bit chips have also entered the Macintosh arena, with 68020 enhancers appearing for the 16-bit Mac. One of the most recent is the Prodigy board, which is reviewed on page 92.

There have been any number of interface cards available for the PC ever since IBM launched the computer without any built-in facilities six years ago. Manufacturers have since vied to see how many functions can be crammed on to a single board. Although this is old hat in the IBM world, it is still a novelty in the Macintosh sphere and we take a look at Microsoft's Mac Enhancer on page 94.

IMPROVED DISPLAYS

A particular failing of the IBM PC has been the lack of an acceptable graphics display, which is important in CAD/CAE and other graphics-intensive applications. One of the most successful solutions to the problem is provided by the Wyse 700 monitor which we test on page 97.

The final area which we have chosen to examine is that of disc optimisers. On a heavily used hard disc files are fragmented between several different clusters on physically separate parts of the disc. Reading a file stored in this way must involve a lot of movement of the read/write head, so by tidying up your disc usage you should be able to speed things up. We shall be inspecting these claims and the disc optimisers on page 95.

The future of the performance enhancer depends on a single factor. The performance of the standard business machine, whether it be the IBM PC, PC/AT or Deskpro 386, has to remain well behind what it could be with the available technology if enhancements are to provide a visible power increase. For as long as small manufacturers can use existing technology to produce upgrades faster than the big corporations can incorporate them into their machines, there will be a market for enhancers.

However, the future does not depend entirely on the tardiness of the big manufacturers. There is increasing evidence that performance-enhancement developers are making innovative products, not for what is available, but what they think will satisfy a market need.

(continued on next page)

Numbersmasher ECM

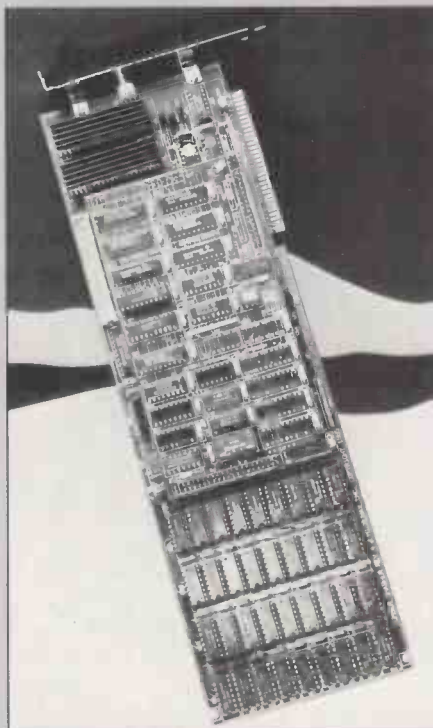
By running 8086 and 8087 processors at double the speed of a standard machine this accelerator board can boost a PC's performance to a level that would not discredit many more modern machines. **Steve Malone** explains how it's done.

Since their inception around three years ago, a large number of PC accelerators have come on to the market. These devices are plug-in boards for the IBM PC and compatibles which boost the processing speed of the machine. One of the first companies to produce accelerators was Microway; the company's latest product is the Numbersmasher ECM.

Accelerators can be divided into several distinct types. Co-processor systems add a second processor to the basic hardware, often to run specific software rather than to speed up programs. For example, if you want to run full-blooded Unix on your PC it is possible to add a Motorola 68000 or a National Semiconductor 32032 to your micro to enable it to do so. On a more modest level, many people add an Intel 8087 or 80287 to their systems purely to cope with maths — providing the software you are using is able to access the facilities.

However, this approach can lead to problems with compatibility. Using chips which are not compatible with the Intel 8086 family means that the co-processor is useless except for dealing with the software for which it has been installed. Even if the processor is Intel-compatible there could still be problems. Application programs do not expect to encounter two processors in a single machine, so to reassure the program some method of dividing the work and the motherboard between the chips has to be devised. This inevitably means a software kludge which may need some kind of re-patching for different applications.

An alternative solution is to use an emulator. This is what the Numbersmasher ECM does: it provides a faster chip with its own memory on an expansion board that is almost a self-contained micro in its own right. All the processing is done on the expansion board; the main board is relegated simply to performing the necessary I/O to the outside world.



SPECIFICATION

CPU: 8086 and 8087 running at 9.54MHz, switchable to 12MHz with Microway motherboard accelerator

RAM: 1Mbyte of 16-bit RAM

Price: £569

Software in price: Numbersmasher utilities disc

Manufacturer: Microway (Europe), 32 High Street, Kingston-upon-Thames, Surrey KT1 1HL. Telephone: 01-541 5466

Available: now

The Numbersmasher ECM hardware is fitted on a full-length PC card. During installation the 8088 is removed and its place is taken by a ribbon cable which plugs into the empty socket at one end and on to the Numbersmasher board at the other. An

emulator then convinces the motherboard that a standard 80808 chip is still plugged in.

Unlike some of the accelerator boards we have encountered, the Numbersmasher is supplied with a cable that is a generous 12 inches long. Microway says that this is a reflection of the board's robustness. The longer the cable, the more liable it is to pick up radio frequencies; in a poorly designed board this could cause considerable problems, but Microway is confident that its unit will not be affected. We have no direct proof of this, but we do know that an expansion card with a long cable is certainly much easier to install as you do not have to shuffle your other cards around to reach the processor socket.

The Numbersmasher is equipped with a full 16-bit 8086 processor together with 1Mbyte of 16-bit memory and an 8087 maths co-processor. The idea behind the design is that applications programs can be loaded directly into the 16-bit RAM, and the data manipulated at a higher clock speed than would be possible using the IBM motherboard. When the 8086 has finished processing, the board translates the information into eight-bit format before transmitting the data to the motherboard. Before transmission, the system is slowed to 4.77MHz or whatever the traffic will allow. When this has been done, the speed of the board is returned to 9.54MHz and the next item of data is processed.

There are problems with this type of emulation. The direct memory access (DMA) controller causes difficulties because the system has been implemented in such a way that there are two such controllers within the micro, each fighting for control of the data bus. A situation could easily arise in which the eight-bit motherboard memory attempts to access data that has already been written to 16-bit memory. The system would then quickly crash.

HOW MUCH FASTER?

As an example, we ran the Basic Benchmarks on a PC/XT with a full Numbersmasher ECM running at 9.54MHz. The results for the standard tests show that the performance of the machine rises from the IBM PC rating of 16.8 seconds to 7.5 seconds — almost that of the Olivetti M-24 at 7.1 seconds, which uses an Intel 8086 as its central processing unit. Although the M-24 runs at a slower clock speed than the Numbersmasher, the accelerator is hampered by having to switch back to 4.77MHz for I/O operations.

A further increase in performance occurred when the system was boosted to a 12MHz clock speed. This duly produced a further performance increase of 20 percent, with a Benchmark average of 5.75 seconds. Though considerably faster than the PC it falls short of the performance of an 8MHz PC/AT. The 80286 processor is inherently a much more efficient chip than the 8086,

especially in terms of the integer arithmetic around which the interpreted Basic Benchmark routines are based.

Another limitation of the Benchmarks is the fact that the interpreted Basic does not utilise a maths co-processor. We therefore compiled Benchmarks 7 and 8 and ran them as .Exe files. The PC/AT with a 6MHz 80287 fitted came in at an average 1.8 seconds, while the Numbersmasher ECM with both the 8086 and 8087 processor running at 12MHz gave an average time of 8.5 seconds.

The 8086/87 combination is particularly well suited to this kind of application; though the 80286/287 configuration looks better on paper it does not perform as well in practice. This is because the 8087 is a full processor in its own right, with direct access to memory and the 8086. The 80287, while nominally more powerful, cannot access memory directly.

There are several ways in which this problem can be overcome. The first is to alter the memory image of the application program so that the 16-bit memory drivers take precedence over the motherboard driver. The difficulty here is that you would have to write new drivers for every application, which is clearly unsatisfactory. A second method is to configure the motherboard DMA controller to point to non-existent memory locations, so that no data is stored there.

A further option is to write the same data to the memory locations on both the motherboard and the daughter board, and this was the method used by the first version of Numbersmasher. But for this the emulator clearly has to write each piece of data twice, considerably reducing the performance of the board.

The latest version, called Numbersmasher ECM, uses bank switching to address the correct memory locations. The Numbersmasher has a full 1Mbyte of memory on board. It also includes a 16-bit control register in which each bit corresponds to one of the 64K segments in the megabyte of address space available to the 8086 chip. This register is used to alternate addressing between the Numbersmasher's own memory and I/O locations on the main board.

The Megados and Memset commands provided with the Numbersmasher allow all kinds of interesting tricks to be performed. First, the system can copy the ROM BIOS on the motherboard into its equivalent location at the top of memory in high-speed RAM. This means that the ROM can be accessed at the full 9.54MHz clock speed of the Numbersmasher rather than the 4.77MHz of the PC itself.

MEMORY MANAGEMENT

The commands also provide a memory-management capability on the Numbersmasher ECM. The BIOS ROM occupies a mere 8K, so there is plenty of scope. Normally there is no point in installing more than 640K of memory — that is 10 64K sectors — in a machine, as this is all that the IBM architecture will allow. The remaining six sectors contain the video RAM or other ROMs such as those controlling the hard disc. These features are best left where they are, and not moved into high-speed RAM, but this does not mean that the additional memory should go to waste. Using the kind of technique pioneered in the Allcard memory-expansion board, the memory-management unit switches out the video RAM and hard-disc ROMs when they are not needed, to provide DOS with a megabyte of contiguous RAM.

While the system works satisfactorily with well-behaved programs which access the correct BIOS routines and DOS hooks as they should, trouble comes with programs like Autocad and Lotus 1-2-3 which drive the hardware directly. This is because the accelerator board will almost certainly have a different architecture to the IBM motherboard in order to achieve the maximum speed increase.

Furthermore, when direct calls are made to the video RAM, the Numbersmasher MMU software has no way of knowing whether the call is directed at the screen display or at a program residing underneath. For this reason any attempt at direct hardware manipulation is liable to run into problems.

Microway is writing new device drivers which will enable misbehaved programs to use the Numbersmasher architecture. Autocad, 1-2-3 and WordStar drivers are available now and others are on the way, though it looks as if it could be some time before a Sidekick driver appears.

CONCLUSIONS

■ Numbersmasher is a high-performance emulator accelerator, fitted with 8086 and 8087 processor chips and 1Mbyte of full 16-bit memory.

■ While this configuration has its problems with certain software products, it enables the BIOS ROM to be copied into high-speed RAM and provides a continuous DOS area of up to 1,016K.

■ On the basis of our benchmark tests the 8086 lags behind the more advanced 80286, yet when the maths co-processors are brought into play the board outperforms the IBM PC/ATX.

Ajwad 80386 Accelerator

By plugging an 80386 chip into an AT you should be able to get some startling increases in performance. Steve Malone recounts his experiences when he tried.

Now that Intel is mass producing the 80386 processor it seems everyone wants 32-bit power under the bonnet. Compaq is selling Deskpro 386 machines far beyond its own expectations, and a number of competitors are not far behind.

But people who have already bought 80286-based ATs and compatibles need not be left behind. A number of manufacturers have brought out 80386 accelerator cards for the AT, one of the earliest being Ajwad. The reasoning behind the Ajwad 386 Accelerator card is quite simple. Current versions of the 80386 run at about twice the speed of most 80286s, and the chip is better designed. So if you could remove the 80286 and put an 80386 in its place you should get better performance.

The 80386 is twice the size and not pin

compatible with its predecessor. Ajwad has therefore mounted it on a 16-bit expansion card, with a pair of ribbon cables joined to a pin connector which fits into the 80286 socket. The Ajwad card has also been fitted with 1Mbyte of extra-fast RAM in order to be able to cope with the increased clock speeds of which the new chip is capable. The idea is that the accelerator RAM occupies the 1Mbyte address space available to PC-DOS, so that user-accessible memory, video RAM and the ROM BIOS can all be transferred to it.

So much for the theory, now to the practice. The installation of the card is fairly nerve-racking — though this is not entirely Ajwad's fault. We tried the card in both an 8MHz AT and a 6MHz one. On the 8MHz version the processor is underneath the first slot. This position is generally occupied by the disc-control card, which therefore has to be removed. If you have a lot of cards you end up tucking the 80386 ribbon cables between them. In our view this is a risky practice as the insulation of the cable could be damaged by hot-running cards. Still, if the cables had been shorter we would have probably complained as well.

SEALED-IN CHIP

We were also going to try to install the 386 Accelerator on other machines that happened to be in our office. However, on the IBM XT-286 the CPU's slot is not in the same position as on the AT and could not be reached by the cable. The processor on the Epson PC AX was sealed in and we would have needed a special tool to remove it.

We therefore turned our attention to an 8MHz AT. Prising the 80286 out of its socket on the motherboard without breaking the pins was a slow and laborious process. There then followed the problem of inserting the pin connector in its place, once again ensuring that all pins were in place and not bent. With the board fitted we powered up the machine. The system refused to recognise the new processor but simply sat and beeped complaints. We checked the pins, cables and positioning several times, but with no luck. Ajwad said it could not understand why the problem had arisen as the card had been checked half an hour before being sent to us. We promised to try another AT.

Repeating the installation process on a 6MHz AT was even more harrowing, as the processor is half hidden beneath the floppy-disc drive. But this time our labours produced better results. The machine made horrible beeping noises on power-up, but at least it went through the memory check and loaded PC-DOS.

A number of software utilities are provided by Ajwad to increase the clock speed and transfer user RAM, ROM BIOS and video memory into the Accelerator's own fast RAM. These utilities are named Fastclk, Fastram, Fastrom and Fastvid respectively. Ajwad recommends that these are executed in that order on power-up, as the machine is liable to hang up otherwise.

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Incidentally Ajwad provides a batch file which has the utilities in a different order, which duly hung up the machine.

When we ran the utilities in the recommended order the consequences were appalling. Software would not run, attempting to list a directory caused the machine to hang up, and other things happened that are too gruesome to mention in a family magazine. The best that can be said is that it did no permanent damage to the computer or its files. By progressively disabling the go-faster utilities in the system we traced the bug to the Fastalk utility.

Ajwad said the problem lay with the jumper switches on the card. Two jumper switches are provided. Linking pins 1 and 2 on jumper W1 sets up the card for a 6MHz AT, while for an 8MHz machine you connect pins 2 and 3. Jumper W2 switches the card itself between 12MHz and 16MHz operation. This detail was omitted from the documentation provided with the card, but we were prepared to forgive the oversight and alter the jumper switches.

SUCCESS AT LAST

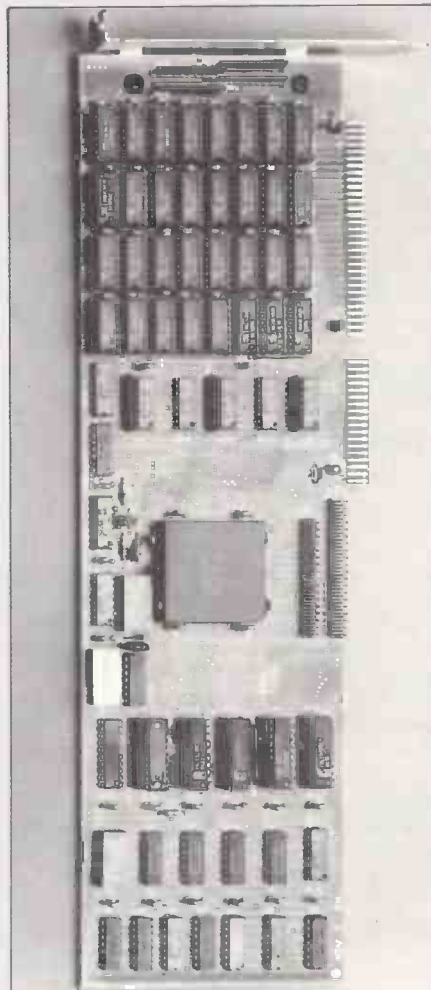
This time the computer booted — though it still made nasty beeping noises — and we could read the directories without the machine hanging up. Even the software ran. We tried the programs which are noted for direct hardware addressing such as Sidekick and Lotus 1-2-3 and they worked perfectly. Concurrent DOS, which did not work on the Compaq 386, did not work on the Ajwad 386 Accelerator either, but that we expected.

Satisfied that all was well we ran the Basic Benchmarks. The computer reset itself after Benchmark 2, but apart from that the process was uneventful. The final results were revealing: the 386 Accelerator card produced an average time of 8.52 seconds, compared with the standard 6MHz AT performance of 6.76 seconds. The board actually ran slower than the standard 80286-based AT.

We disabled the card's go-faster utilities again and retried the benchmarks. No difference was recorded between running the card with its own memory and that of the motherboard. When we tried reinstalling the utilities in a different order the computer hung up.

Ajwad subsequently suggested that the problem lay with the IBM PC/AT and the way we do our benchmarks. Attempting to use timing loops within a program that uses the IBM BIOS will cause the computer to spring a speed trap which pulls the computer back down to 6MHz or 8MHz. This is a feature solely used by IBM, and not by BIOSs such as the Phoenix. Ajwad said the speed trap is only evoked by timing loops, and that programs which are not timing dependent should not be affected. By the time Ajwad had come up with this explanation we had already returned the card and were unable to test the theory.

Accelerators do work. You have only to turn to page 90 to see that they do. But this



SPECIFICATION

CPU: Intel 80386 running at 12MHz or 16MHz

RAM: 1Mbyte fast memory

Software in price: utilities to change the clock speed, copy user RAM, video RAM and the ROM BIOS to and from the card's own memory

Price: £1,199

Manufacturer: Ajwad, 70 Brookwood Road, London SW18 5BY. Telephone: 01-788 1982

Available: now

episode is an object lesson in the pitfalls that may lie in your way. Accelerators are supposed to be user installable, but clearly the Ajwad is not. Many people with the resources and clout of a computer magazine are likely to end up frustrated and angry — or worse still, with a damaged machine — if they try fitting one.

CONCLUSIONS

■ An 80386 accelerator card should provide between two and three times the power of an ordinary AT machine.

■ The Ajwad 386 Accelerator provided to us for review failed to deliver the goods. The installation process was dogged by problems — some of them intrinsic to the principle of replacing the 80286 CPU chip — and we were unable to register any improvement in the machine's performance.

■ As always: caveat emptor.

A bigger Mac

Glyn Moody reports on how third-party manufacturers are managing to squeeze some spectacular extra power into the Macintosh box.

When the Apple Macintosh was first launched it was generally conceded to be brilliant in conception. But many felt that the implementation left a lot to be desired. The initial 128K limit on RAM was a great constraint on both programmers and users; the floppy disc was slow and there was no hard disc; and the screen, while clear, was rather small. Apple did not help matters by making the system a closed one. Unlike the Apple II, or even the IBM PC, where the presence of slots allowed add-ons from third-party manufacturers to remedy defects, the Macintosh was designed not to be tampered with.

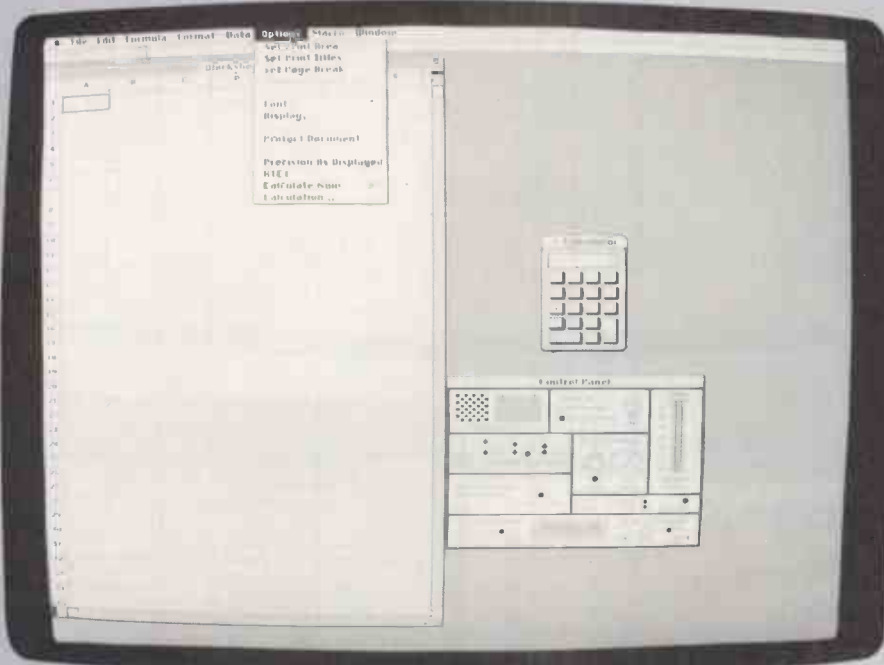
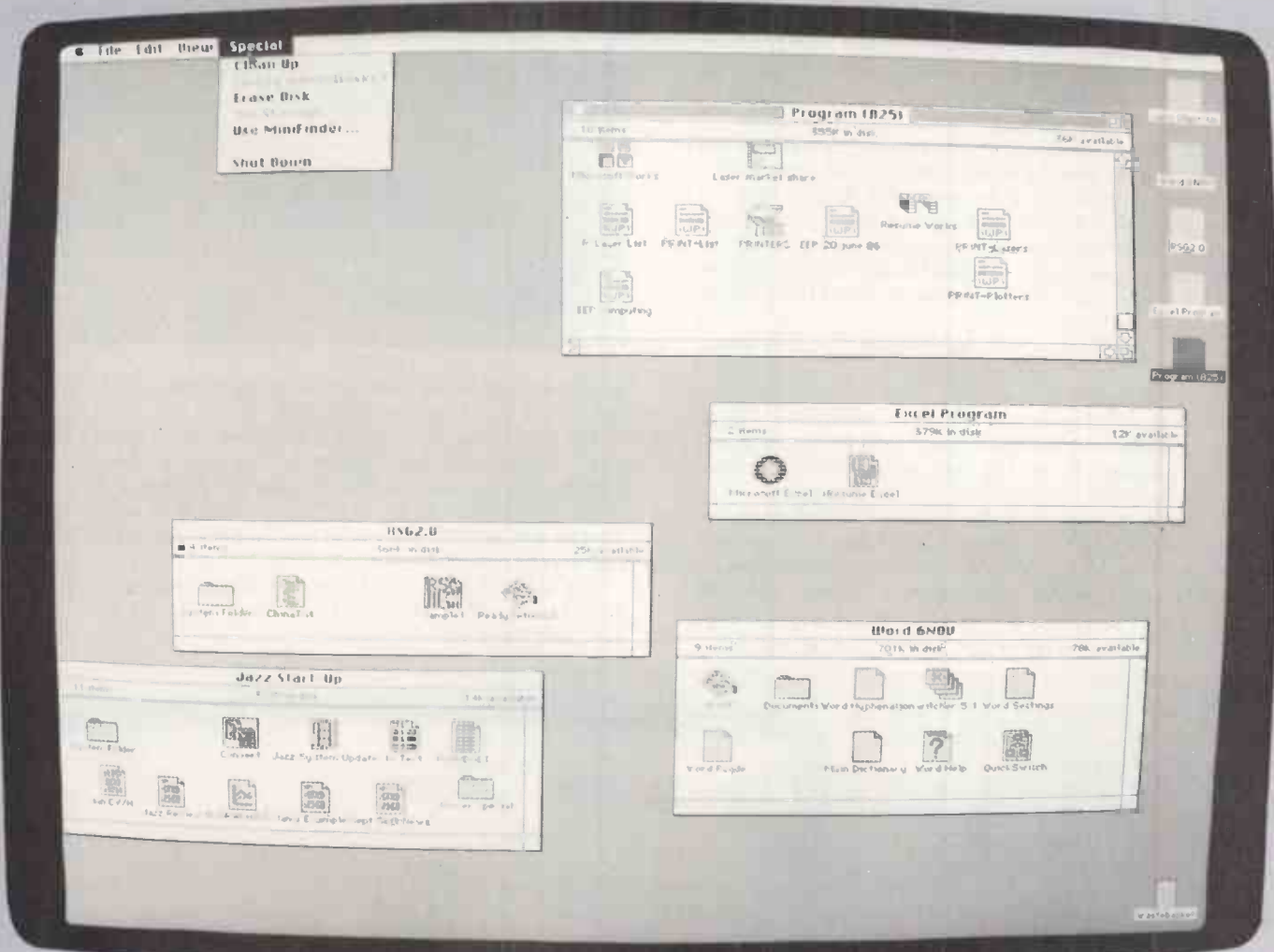
Apple has now addressed some of the Mac's worst failings: it has speeded up the floppy disc, added an SCSI port for hard discs, and beefed up both memory and processor. But, inevitably, users' needs have moved on too, and this has led to the emergence of a few specialised third-party suppliers who will take your Mac, pull it apart and then put it back together again with some high-power goodies inside.

One such add-on is the Prodigy 4 board. It does the very sensible thing of replacing your humble 68000 with a souped-up 68020 running at 16MHz, along with a 68881 maths co-processor and a healthy 4Mbyte of RAM. The Prodigy board is manufactured by the U.S. company Levco and costs around £6,000. The U.K. supplier, Go-Mark, charges about £100 to install it in your old Mac.

Like other Mac add-ons, the Prodigy board is something of a feat of packaging, since the inside of the Macintosh is hardly echoing with empty space. The board clamps on to the processor chip; Go-Mark assures us that this is both reliable and healthy for the 68000. It comes with its own power supply and a fan.

Once the board is installed, you simply run software as normal. The Prodigy's own ROM supplants the standard one, and handles all the timing and the extra width of the data path. The smiling Mac icon which greets you when you boot up now has fangs, thereafter the only difference you notice is the blinding speed of the software. Perhaps this is most noticeable as the icons roar around the screen like demented things when they are opened and closed.

With two exceptions, every Mac program we threw at the Prodigy ran perfectly, in-



cluding software like Flight Simulator, Smooth Talker and Vicom. The distributor says that any program written in accordance with the Macintosh design guidelines should run. The non-runners were Macwrite 4.5 — ironically, a product from Apple itself which

breaks the rules — and a version of Life, which obviously made quick and dirty calls to the ROM and caused the Prodigy system to hang up. Given that Macwrite must be one of the most popular Mac programs, Levco has very sensibly included a patch

The Megascreen brings the Mac desk-top metaphor to life. It has room for a big spreadsheet, plus utilities and applications.

PRODIGY 4

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Value for money	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

A supersonic Mac — totally addictive.

which enables it to run, though it does so more slowly than other Prodigy-boosted programs. As a last resort you can always revert back to the straight 68000 system without dismantling the whole caboodle.

Apart from these snags, the Prodigy 4 is a joy to use and spoils you completely when you have to go back to a mere Mac Plus. It also means that you become very impatient with the disc drives, which simply cannot keep up with the supersonic speed of the processor. Unfortunately the Prodigy board

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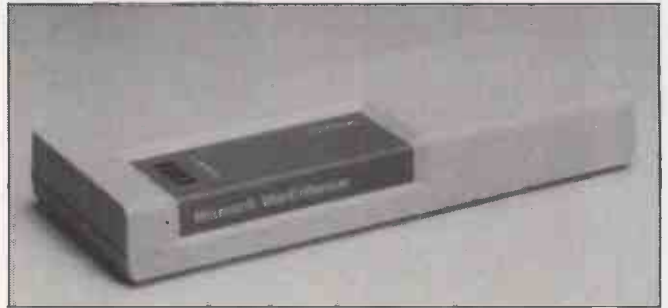
MICROSOFT MAC ENHANCER

For those who cannot aspire to a £6,000 add-on or who have no burning desire to drive a 200mph Mac, Microsoft has come out with a more modest offering — its first purely hardware product for the machine. The Mac Enhancer works with 128K or 512K Macs to provide extra serial ports and a terminal-emulation package. It does not work with the Mac Plus.

The unit comes with its own separate power supply, and hooks up to either the printer port or the modem port. One of the additional ports uses a standard Mac RS-422; the other two are IBM PC compatible ports. They allow a range of IBM printers to be used, but no lasers.

To use an application with Mac Enhancer requires some tiresome installation, which may involve checking that baud rates are appropriate and suchlike. To do this you use one of the discs provided with the hardware, choosing the options required and then copying the setup values across to your normal Mac application. The program can then be run using the Mac Enhancer hardware and associated printers.

The other function performed by the Mac Enhancer unit is to allow the Macintosh to communicate with other computers, either via a modem or by direct connection. Standard terminals like VT-100 are among those supported. Software provided allows you to store and edit information. Like many things to do with communications, it takes some effort getting the



parameters sorted out. Nor do Microsoft's manuals help; they are not the best it has ever produced.

The Mac Enhancer was conceived as a way of supporting the rather limited 128K and 512K Macs. This heritage shows in its inability to cope with the Mac Plus and the absence of laser support. Now that the Mac Plus is well established and things have moved on in the Mac world, the Mac Enhancer's lifespan will probably be rather limited.

The Mac Enhancer costs £150 and is available from Microsoft, Excel House, 49 De Montfort Road, Reading, Berkshire RG1 8LP. Telephone: (0734) 500741.

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is unable to support hard discs, as they too use the clip-on approach.

For the same reason you are precluded from using the Prodigy with another Mac enhancement, the Megascreen. This 19in. VDU is produced by Micrographic Images, which is based in California, and is available in this country from Thames Valley Systems. The basic Mac screen gets many things right — its square pixels, high-resolution graphics and so on — but it is rather small, especially if you are exploring the joys of desk-top publishing. A bigger screen could clearly be a boon.

One of the advantages of the Mac over other PCs is that the designers have sensibly made provision for just this enhancement. Well-behaved programs pull parameters in from the ROM to set the screen size. So by using a new ROM it is possible to inform the program of the greater screen size, which will then be utilised automatically.

As with the Prodigy, you need to send your Mac away to be doctored. The cost for the board and changeover is £2,595. The board clamps over the 68000, and comes with 128K of video RAM. A lead emerges from the back of the machine, linking the board to the screen itself. There is also provision for the 68881 co-processor; it costs an extra £595 as part of the Megascreen or £795 on its own. The screen is made by Moniterm, which also supplies screens for Sun work stations.

There are several possible configurations for the screen. Most of them are U.S. standards, with a maximum resolution of 1,024 by 1,024. For the right aspect ratio the setting should be 1,024 by 900. This is a considerable improvement over the standard Mac's 512 by 342.

To use the Megascreen you simply run the Megaboot file supplied with the screen after carrying out an ordinary boot-up. This acti-



The Megascreen is well suited to desk-top publishing applications.

MEGASCREEN				
PC VERDICT				
	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Value for money	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Opens up a whole new desk-top world.

vates the Megascreen and shuts down the internal one. As with Prodigy, the only difference thereafter is the enormous improvement in performance.

Most of the programs we tried worked perfectly, adapting themselves to the larger screen without problem. They either automatically expanded to fill the screen in one dimension or else came up in the normal size, but allowed you to pull them to edges of the screen using the mouse. The only failures were an early version of Ready Set Go, which was a fixed size and — once again — Macwrite. Evidently both Macwrite and Macpaint do not follow the Apple guidelines and hence cannot make use of the Megascreen's facilities.

And what facilities they are! Apart from

SPECIFICATIONS

PRODIGY 4

Description: 68020 and 68881 processor add-on; comes with 4Mbyte RAM
Hardware required: any Macintosh
Price: £6,500
Manufacturer: Levco of San Diego, California
U.K. supplier: Go-Mark, 3-10 Peter's Lane, London EC1M 6DS. Telephone: 01-251 1160
Available: now

MEGASCREEN

Description: 19in. monochrome screen, 1,024- by 900-pixel resolution
Hardware required: Macintosh Plus
Price: £2,595
Manufacturer: Micrographic Images of Canoga Park, California
U.K. distributor: Thames Valley Systems, Greys House, 7 Greyfriars Rod, Reading, Berkshire RG1 1NU. Telephone: (0734) 581829
Available: now

obvious ones like allowing you to see full A4-size pages, and using desk-top packages to the full, or setting up bigger spreadsheets, the Megascreeen offers considerable subsidiary benefits. For example, you can set up your application and then put a calculator and options box on the screen, moving them to an empty portion where they can stay while you use the main program. At any time you can go across and use them and pop straight back. This makes the Macintosh's desk-top metaphor a reality: the Megascreeen does resemble a desk, particularly when it has utilities strewn across it.

The big problem with both the Prodigy board and the Megascreeen is cost. One can only hope that as more systems are sold, and competitors emerge, the prices are likely to fall. Another fact which may help is Apple's own intentions in this area: it is no secret that it is working on 68020 machines, possibly with enhanced graphics. The indications are that they will be rather different from the Macintosh, using three boxes like the IBM and incorporating expansion slots. The presence of these official versions of some of the enhancements reviewed here could well lead to a greater demand for them from current Mac users. Certainly, once you have used a 68020 system, or one with a 1,024- by 900-pixel display, you will be reluctant to go back.

CONCLUSIONS

- The Macintosh is physically ill-suited to enhancement because of its closed architecture, but this has not stopped manufacturers from producing some worthwhile add-ons.
- The Prodigy 4 board with its 68020 processor offers a considerable improvement in speed; it is, however, very expensive.
- The Megascreeen increases resolution to 1,024 by 900 pixels. Not only does this make applications like desk-top publishing easier, it can change the way you work with a Mac. The Megascreeen is reasonably priced for what it offers.

Tidy up your hard disc

Software utilities hold out the promise of improving the performance of an ageing system without incurring too much expense. **Ian Stobie** gets into some heavy computer abuse to find out just how effective a pair of them are.

Compared to an accelerator card or a new hard disc the typical software utility at £60 or £70 seems cheap. Disc utilities hold out the greatest prospect for speed gains, so we concentrate on them here.

Disc compaction is an approach to speeding up discs that is particularly in vogue at the moment. It is based on the idea that as you use your discs the files on them become increasingly fragmented, slowing down disc accessing. This happens because DOS puts new files into the first available space it finds. Once you have been using a disc for some time there will probably not be many large areas of continuous space left. Any reasonably large file that you then save will have to be chained across several physically separate areas of the disc.

With a floppy you can solve the problem by copying everything to a newly formatted disc using the ordinary MS-DOS Copy command with the *.* wild card option. But with a hard disc you need a special utility. We tried out two of them.

Disk Optimizer costs £60. In addition to compacting your data it also lets you password-protect files and scan through data on the disc using a monitor-like feature. Mace + Utilities costs £65. It is conceived as a rival to the best-selling Norton Utilities, and so has several other functions, including Unerase and Undelete commands. We were impressed by the Norton Utilities when we reviewed the latest version of the package in the December 1986 issue.

Neither Mace + or Disk Optimizer is intended to increase the amount of space available on your disc; they are not file-compression utilities like Cubit, for example. Instead they collect all the files and move each one to a separate part of the disc. Each file is then stored in a set of physically contiguous areas, leaving one large, continuous region of free space. The idea is that this will reduce the need for physical movements by the read/write head, so speeding things up.

Like most people we are a bit wary about using anything which totally rearranges the contents of a hard disc. After all, the typical hard disc has lots of valuable programs and data on it. However, both packages had been given to us by reputable suppliers and seemed well documented, so we made a few backups of particularly treasured files and set to work.

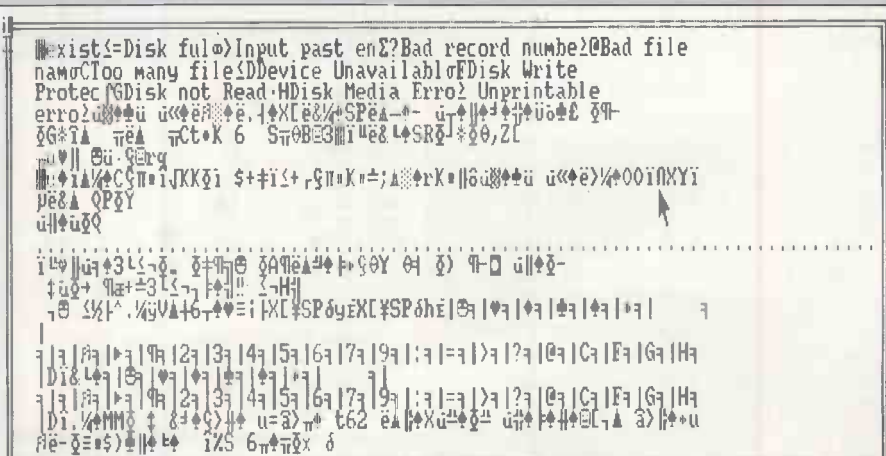
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DISK OPTIMIZER

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	■	□	□	□
Ease of use	□	□	■	□
Documentation	□	□	■	□
Value for money	■	□	□	□

□ Does not appear to make much difference to disc performance.



Microsoft Word files on our Kaypro 16's hard disc were corrupted by Mace.

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Disk Optimizer is easy to install but it is copy protected, which is unusual for a utility. You can install it three times on a hard disc; if you explicitly uninstall it you get an installation back. It lets you optimise the whole disc, or just a directory. In the latter case all the files in the directory would be put into a continuous region of the disc. We tried it on an IBM PC/XT we have been using for the last three years, doing the whole 10Mbyte hard disc. The process took 12 minutes.

Before running Disk Optimizer we had run our standard disc speed test, the Bagshaw Benchmarks, and as soon as Disk Optimizer had finished we reran them. Great was our surprise that after optimisation the benchmarks took longer: Disk Optimizer appeared to have slowed our XT down. Part of the problem lies with the benchmarks we use; we reran them immediately and got a slightly quicker time. In general you get a variation of something like five percent each way each time you run them.

RANDOM ELEMENT

There is a good reason for this. Several of the individual tests which go to make up the single Bagshaw summary figure involve a random element — Benchmark 9, for instance, reads 50 records in a randomly generated sequence from within a 500-record random-access file, while Benchmark 10 writes 50 records in the same way. Though this makes a nonsense of lists of machines carefully ranked by benchmark time — which is why we have stopped publishing them — the technique is still valid as an approximate guide to disc speed.

But as far as disc compaction was concerned the results were disappointing. After all, the Bagshaw Benchmarks are not that inaccurate. Any improvement Disk Optimizer had made must have been slight enough to be swallowed up by the inaccuracies of our measuring technique.

We then tried out Mace + to see if it did any better. This time the object of our attentions was the 10Mbyte hard disc of a well-used Kaypro 16 transportable PC clone. Mace is not copy protected, which is an advantage if you ever have accidents with your hard disc. When you run the program it displays a menu and reconfigures the function keys so you have a utility on each one; f7 is the compaction key.

Mace took longer to reorganise the disc than Disk Optimizer — about 29 minutes. While it is working it displays an interesting map on the screen showing chunks of data moving around the disc. Again there was not much difference between the Bagshaw Benchmark figures before and after compaction: 184 seconds after as against 189 before. The theory that fragmentation of data on a heavily used hard disc diminishes performance is a plausible one, but it appears that in practice the effect is not very great.

It is not just these timings which were disappointing. Our impression on running real



SPECIFICATIONS

DISK OPTIMIZER

Description: disc compactor
Hardware required: IBM PC, PC/AT or compatible with at least 256K of memory; only makes sense on hard-disc systems
Copy protection: only a limited number of installs permitted
Price: £59.95
Publisher: Softlogic Solutions Inc. of Manchester, New Hampshire
U.K. suppliers: Ideal Software, Tolworth Tower, Surbiton, Surrey KT6 7EL. Telephone: 01-390 6722. In Touch, Fairfield House, Brynhyfryd, Caerphilly, Mid-Glamorgan CF8 2QQ. Telephone: (0222) 882334
Available: now

MACE + UTILITIES

Description: disc compactor with other disc utilities
Hardware required: IBM PC, PC/AT or compatible with at least 256K of memory; makes most sense on hard-disc systems; does not work with Windows, Gem or Concurrent DOS
Copy protection: none
Price: £65
Publisher: Paul Mace Software of Ashland, Oregon
U.K. supplier: P&P Micro Distributors, Todd Hall Road, Carrs Industrial Estate, Haslingden, Rossendale, Lancashire BB4 5HU. Telephone: (0706) 217744
Available: now

MACE + UTILITIES

	PC VERDICT			
	POOR	AVERAGE	GOOD	EXCELLENT
Performance	■	□	□	□
Ease of use	□	■	□	□
Documentation	□	■	□	□
Value for money	■	□	□	□

Makes as little difference to disc speed as Disk Optimizer, but does several other things — some of them highly undesirable.

applications on the two machines was that nothing much had happened to their performance. Both machines had been well used and had fairly full hard discs, with about 2Mbyte out of the 10Mbyte free in each case. Neither had ever been compacted

before, so on the face of it they were ideal candidates for the technique. We rate compaction utilities poor value, as they do not seem to do much to boost performance.

However, something had happened to Microsoft Word on the Mace Kaypro hard disc. Attempts to run it just produced some disc activity, then a return of the C> prompt. Fortunately Microsoft does not copy protect, so we were able to restore the program from the distribution disc. More damaging was the fact that all our Word documents residing on the Mace hard disc had been reduced to garbage.

On the surface Mace + is the better value of the two compaction utilities because of the other utility functions it offers. But it is probably best to avoid it altogether, as it is clearly unsafe. Certainly it is unlikely to challenge seriously the much better-established Norton Utilities which, with its famed Undelete, has made its reputation helping users recover data, not destroy it.

Million-dot monitor

Ian Stobie checks out the Wyse WY-700, which provides a high-resolution monochrome display for the IBM PC family at a relatively modest price.

In computer-aided design and desk-top publishing circles the Wyse WY-700 is beginning to establish itself as almost the standard enhanced display for IBM-compatible systems. The WY-700 is a purely monochrome system, but that is all many of these applications require. With a resolution of 1,280 by 800 pixels each Wyse screen is made up from over 1,000,000 elements — over eight times as many as the IBM CGA card uses and over four times as many as the EGA or Hercules card.

The WY-700 has been on sale in the U.K. for just under a year, but the price has recently come down from nearly £1,500 to £895, making it much better value. In the price you get both the Wyse controller card, with its own 128K screen-display buffer, and a matching 15in. high-resolution black-and-white monitor. There seems to be a real niche for the Wyse system, despite the fact that the IBM universe is already full of different graphics standards.

IBM itself offers a hierarchy of four controller cards: the MDA, CGA, EGA and PGA give you monochrome text, colour graphics, enhanced colour graphics and professional-level colour graphics respectively. In the November 1986 issue of *Practical Computing* Steve Malone gave details of these formats.

The Hercules monochrome graphics card is the most popular independent offering, its resolution of 720 by 348 pixels being slightly better than the EGA. While the Wyse offering includes both card and monitor, these products generally only give you the card. With the MDA, CGA and Hercules cards you can use inexpensive standard monitors, but with EGA and PGA options the additional cost of a suitable monitor is significant.

MONOCHROME SOLUTION

In resolution terms, the Wyse WY-700 is competing with the IBM PGA card, which offers an identical 1,280 by 800 pixels. Of course, the PGA card can display 256 colours at a time while the WY-700 just shows black and white. But the PGA card alone costs £1,357 and IBM's matching colour monitor £919. If you are only interested in monochrome applications the Wyse is a far cheaper solution.

We tried out the Wyse display with an AT compatible, running desk-top publishing and graphics software as well as our normal word-processing and pop-up programs. One of the problems of the PGA is that it is incompatible with some pop-ups, but we had no such difficulties with the Wyse.

One thing that strikes you immediately is the size of the screen, which is not much bigger than normal. Wyse calls it a 15in.



SPECIFICATION

Description: high-resolution monochrome monitor for PC compatibles, including dedicated display controller

Resolution: 1,280 by 800 dots

Screen size: 8.5in. high by 11in. wide; 13.5in. diagonally

Text: 160 columns by 25 or 50 lines, 80 columns by 50 lines; plus standard IBM 80- and 40-column by 25-line modes

Graphics: 1,280 by 800, 1,280 by 400, 640 by 400, plus the standard 640 by 200 and 320 by 200 in CGA-emulation mode

Character composition: 16- by 32-dot matrix when displaying 25 lines by 80 characters

Screen colour: P-171 white phosphor; text and graphics can be shown in four grey levels in the lower-resolution modes

Scan rate: 32kHz horizontal scan rate, 69.4Hz interlaced vertical refresh

Compatibility: emulates MDA or CGA cards as well as operating in native Wyse mode; supplied with Gem and Windows drivers on disc and Tektronix terminal emulation

Interface: full-length display-adaptor card to fit into IBM PC, PC/AT or compatible; card has 128K of extra display memory on board

Casing: 366mm. (14.4in.) x 345mm. (13.6in.) x 302mm. (11.9in.); tilts 25° up, 6.5° down; 250° swivel; weighs 11.3kg. (24.9lb.)

Price: £895 for monitor and card
Manufacturer: made in Taiwan for Wyse Technology of San Jose, California
U.K. supplier: Wyse Technology U.K., 26-28 King Street, Maidenhead, Berkshire SL6 1EF. Telephone: (0628) 784037

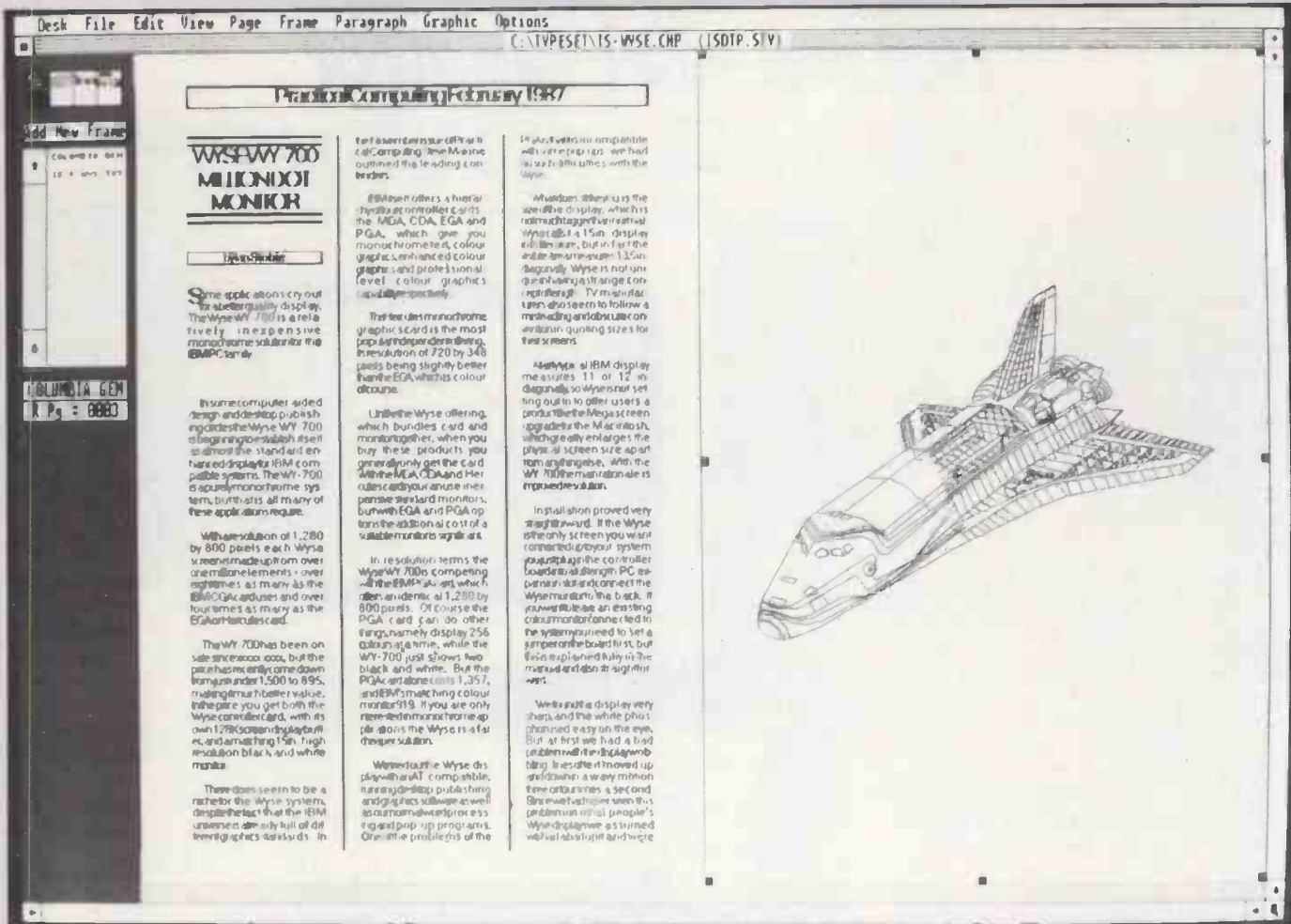
Available: now

display in its literature, but in fact the visible area measures 13.5in. diagonally. Wyse is not unique in having a strange concept of length: TV manufacturers also seem to follow a misleading and obscure convention in quoting sizes for their screens. A typical IBM display measures 11in. or 12in. diagonally. Wyse is not setting out to offer users a product like the Megascreen upgrade for the Macintosh, which greatly enlarges the

physical screen size as well as increasing the number of pixels. With the WY-700 the main rationale is improved resolution.

Installation proved straightforward. If the Wyse is the only screen you want connected up to your system you just plug the controller board into a full-length PC expansion slot and connect the Wyse monitor to the back. If you want to leave an existing colour

(continued on next page)



(continued from previous page)
monitor connected to the system you need to set a jumper on the board first; this is fully explained in the manual and is easy to do.

We found the display very sharp, and its white phosphor is easy on the eye. But at first we had a bad problem with the display wobbling: lines of text moved up and down in a wavy motion three or four times a second. Since we had never seen this problem on other people's Wyse displays we assumed we had a bad unit and were contemplating sending it back. However, the problem disappeared as soon as we removed a second display card we were driving simultaneously from our review system, an Epson PC AX. When used as the only display the WY-700 was rock steady.

NO PROBLEMS

The WY-700 automatically goes into emulation mode when running software set up for MDA or CGA cards. It still shows 25 lines of text across 80 columns but in much better resolution than with the IBM cards. Characters are formed on a 16- by 32-dot matrix, as against the eight by eight of the CGA, and look much better for it. Coloured text and graphics are represented by four grey levels. We ran a wide range of standard business software in this way with no problems.

A growing number of packages will support the WY-700 in its native very high-resolution modes. Supplied on disc you get drivers for Gem and Windows, so anything

text is rendered in all four levels of contrast. The Wyse has outlined the leading contenders.

EBL offers a hierarchical controller cards the MDA, CGA, EGA and VGA, which give you monochrome text, colour graphics, enhanced colour graphics and professional level colour graphics capabilities respectively.

The best monochrome graphics card is the most popular independent being, in resolution of 720 by 348 pixels being slightly better than EGA which is colour capable.

Unlike the Wyse offering, which bundles card and monitor together, when you buy these products you generally only get the card with the MDA, CGA and Hercules cards you also need separate standard monitors, but with EGA and VGA options the additional cost of a suitable monitor applies.

In resolution terms the Wyse WY-700 competing with the IBM 5151 and which offer an 800 by 1,280 by 800 pixels. Of course the VGA card can do other things, namely display 256 colours at a time, while the WY-700 just shows two black and white. But the VGA card alone costs 1,357, and IBM's matching colour monitor 919. If you are only interested in monochrome applications the Wyse is still the better solution.

When it comes to the Wyse display's full compatibility, native display publishing and graphics software as well as our own word processing and pop-up programs. One of the problems of the

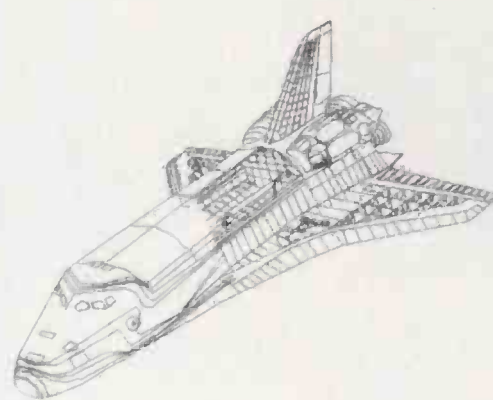
PC card which is compatible with all the packages we had to use. It fits with the Wyse.

Another benefit is the active display, which is not much different from a 15in. display, but in fact the active area is 13.5in. diagonally. Wyse is not unique in having a large controller. TV manufacturers also seem to follow a similar trend in size for their screens.

The Wyse IBM display measures 11 or 12 in. diagonally so when set up to offer users a product that has a screen size that is the Macintosh, which is only larger than the physical screen size apart from the package, with the WY-700 the main advantage is improved resolution.

Installation proved very straightforward. If the Wyse offered a screen you want connected to your system you just adjust the controller board to allow the PC expansion card to connect the Wyse monitor to the back. It is possible to use an existing colour monitor connected to the system and to set a jumper on the board first, but this is explained fully in the manual and is straightforward.

While the display very sharp, and the white phosphor is easy on the eye. But at first we had a bad problem with the display wobbling. It is often moved up and down a wavy motion three or four times a second. Since we had never seen this problem on other people's Wyse displays we assumed we had a bad unit and were contemplating sending it back.



WYSE WY-700

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Value for money	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Compact and easily installed package that makes sense for applications like DTP and CAD which need good definition but not colour.

which runs properly under these environments should exploit the monitor's full resolution. Packages like Autocad, Lotus 1-2-3 and many of the desk-top publishing programs support it directly.

We tried the WY-700 with Ventura Publisher. The big advantage here is that you can display a spread of two pages at a time and still just about make out what is written on the pages. With a standard monitor this is impossible: Ventura will still show the spread, but the text disintegrates into illegibility.

The trouble with using the Wyse in this mode for text work is that all the text, including the pull-down menus and system information, is very small. We preferred to run the package with the Wyse in its CGA emulation mode; here you still get the

The WY-700 works well with DTP packages. Here it is displaying a spread from Ventura Publisher.

benefit of improved definition, but important command information is displayed in larger and more legible characters.

For the moment the WY-700 has few competitors, but as applications like desk-top publishing take off improved screens will be arriving thick and fast. At the time of writing the Belgian-based ETAP Information Technology was about to launch a pair of 15in. monochrome screens in the U.K. Priced at £2,010 and £2,510 they offer resolutions of 720 by 728, and 720 by 1,456 respectively.

The Wyse system beats both models on resolution and price, but possibly a more significant difference is in their shape. The ETAP models are upright, A4 size, and are therefore likely to appeal to word-processing users. The WY-700 is the same as the normal IBM display screen — wider than it is tall — and is therefore suitable for most other PC applications.

CONCLUSIONS

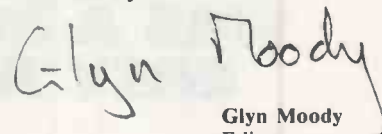
- If you want good definition but do not need colour the WY-700 is hard to beat.
- At £895 it is good value, given that you get a monitor thrown in along with the display controller.
- Because the Wyse emulates the standard CGA card as well as running in native mode, software support is good.
- Documentation is good and installation is easy.

QUESTIONNAIRE

Dear Reader

To help us make *Practical Computing* even more useful to you, we would be grateful if you would take a few minutes to answer the questions below. Once you have completed the form, please tear out this page, or photocopy it, and return it to me at the address below. No stamp is required.

Yours sincerely



Glyn Moody
Editor
Practical Computing

Please rate the following articles in this issue:

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Wang Laptop	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ferranti XT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lotus HAL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ventura Publisher	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Are you likely to buy any of the products reviewed in this issue in the next six months?
If so, which?

Do you have any other comments on the issue?

NOTE: The following information is entirely confidential, and is for my use only so that I may write to you in the future should I need to follow these questions up.

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• O P E N F I L E •

Open File offers programming tips and software to key in. We welcome submissions from readers. We are interested in business programs for any of the main machines such as IBM, Apple, Amiga, Atari 520ST, BBC and Amstrad PCW-8256. We are also interested in applications written in dBase, or for standard spreadsheets like 1-2-3. Utilities are also welcomed.

Submissions should include a brief description which explains what your program does and how it does it. This should be typed with lines double-spaced. The program should be printed with a new ribbon or at double-intensity; the width should be between 75mm. and 90mm., or between 105mm. and 135mm. Also include a disc of your program.

Please send your contributions to

Open File, Practical Computing, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

AMSTRAD PCW-8256

PORTFOLIO

AM Tucker presents a program to record a portfolio of stocks and shares.

THE program listed here will allow you to keep a record of a portfolio of stocks and shares. Each portfolio is divided into up to nine sections, with a maximum of 50 entries in each section.

Records are maintained for each holding under the headings of number of shares, cost, price, value, P/E ratio, dividend cover, yield and dividend. Dividend may be either in gross amounts or net of tax, with the capability of revising the tax rate when necessary. Apart from inserting new holdings and deleting stocks sold, pages may be moved around, and you can alter page and stock names. You can print out either a single page or all used pages.

You can display a summary showing the total value for each page with the sum of the dividends, average yield, and percentages of total value and total income, and finally the total value and income from all the holdings with the overall average yield. You cannot print out a summary from the program, but you can make a copy using Extra and Ptr, which performs a screen dump.

After you have loaded any data

you choose a page from the menu shown on-screen with a single key press. If a chosen page is untitled you will have to title it before the page is displayed. Two lines at the foot of the page display the options available. Most are available with just a single key press, but page numbers must be preceded by P.

Once the name of a holding has been entered, you can enter the statistics in almost any order. Initially you should enter price before yield, dividend and P/E ratio. When a P/E ratio is entered or changed manually, you must set the price to agree with the list from which the P/E figure is taken. You will only need to enter it again when the company issues new earnings figures. The option of entering gross dividends is useful for government stocks. The yield is calculated automatically. When all the alterations to the holdings have

been made, you save the new data by pressing S.

The program contains protection against incorrect use, but it is possible to cause mistakes if the keypad is used by forgetting to enable it with Alt and Relay. Some protection is provided when changing the price, as it will not accept a zero value. Should the holding become valueless, a small fraction of a penny should be inserted as the price. Prices are shown in pence and eighths, rounded down to the nearest eighth. They must be entered with the fraction shown as a decimal part. Owing to printing problems, prices are shown on printouts to one decimal place.

The main parts of the program are identified by Rem statements. The number of entries on a page is set by the variable NR in line 1510. This may be altered, but should not be increased beyond 60 or

the available memory will be exhausted. The

FRE(" ")

in line 380 should maintain enough space, although with 60 lines there are only around 300 to 550 spare bytes.

The conditional Find\$ in line 1540 enables you to run the program without having to open a data file. Initial writing up of pages is done using the Insert option, and may be carried out either last entry first, leaving the cursor on the top line, or in normal order where the cursor must be moved down after each entry. The cursor can only be moved on to one blank line below the last entry, as no gaps are permissible in the listing on a page. When the initial data has been entered, it is saved using S, and then when the program is subsequently run this data will be automatically loaded.

As some totals are altered by subtraction and addition of the figures in an altered row, there is a slight possibility that they might become incorrect, perhaps because of a program error. A verification option is therefore included which reworks the totals.

PORTFOLIO

```

10 REM * PORTFOLIO by A.M.Tucker *
20 GOSUB 1500
30 PRINT FNwind$(0,0,30,90)c1$;PRINT TAB
(31)"P O R T F O L I O"
40 PRINT FNloc$(20,4)"Move # sign up with
h 'a', down with 'z'"
50 PRINT FNloc$(30,7)"0 . Summary";FOR
pp=0 TO 8:PRINT SPC(29)pp+1;". ";p$(0,p
p);NEXT
60 PRINT;PRINT SPC(30)"a . Alter or era
se page title"TAB(31)"m . Move a page"TAB
(31)"r . Alter tax rate (now"100-tax*
10000%)"
70 PRINT TAB(31)"s . Save data"TAB(31)"
t . Printed record"TAB(31)"z . Leave p
rogram"
80 PRINT FNloc$(28,25)"* * Choose from a
bove * *"
90 PRINT FNloc$(8,28)"(Entries may be de
leted and new entries inserted, using 'd
' and 'i'.)";heading=1;menu=0;prompt=1
100 IF q$="p"THEN GOSUB 1290;GOTO 160
110 choice$=LOWER$(INKEY$);IF INSTR("x12
34567890amrstz",choice$)<2 OR(q$="p"AND(
choice$<"0"OR choice$>"9"))THEN 110
120 ON INSTR("0amrst",choice$)GOSUB 490,

```

```

1240,1330,1150,1450,1000
130 IF choice$="z"THEN PRINT esc$"e"esc$
"y"esc$"H";END
140 IF menu THEN 30 ELSE IF choice$="0"TH
HEN 370 ELSE IF ASC(choice$)>96 THEN 80
150 p=VAL(choice$)-1;IF p$(0,p)="THEN G
OSUB 1270;IF q$="p"THEN 30
160 q$="";IF p$(0,p)="THEN 110
170 PRINT FNwind$(3,0,23+5*prompt,90)c1$
180 IF heading THEN PRINT FNwind$(1,26,2
,64)"No. Shs. Cost Price Value P/
E Cover Yield Div."TAB(11)"£
p £ t % £";
;heading=0
190 REM * Print page *
200 r=1;rc=0;PRINT FNwind$(0,2,2,25);PRI
NT"p" MID$(STR$(p+1),2)". "p$(0,p);TAB(
25)
210 PRINT FNwind$(4,4,21,86);;FOR r=1 TO
MIN(rlast(p),20);PRINT p$(r,p)TAB(24)
220 c=0;GOSUB 250;rc=rc+1;NEXT;PRINT FNl
oc$(0,21)"TOTALS";GOSUB 350;r=1;rc=0
230 GOSUB 600;IF prompt=0 THEN RETURN EL
SE 350
240 REM * Print a line *

```

(listing continued on next page)

PORTFOLIO

(continued from previous page)

```

250 WHILE c<8:GOSUB 260:c=c+1;WEND:RETUR
N
260 PRINT FNwind$(4,4,23,86)FNloc$(20+7*
c+(c-3)-4*(c>2),rc);
270 IF a(r,c,p)=0 THEN PRINT SPC(7);IF r
c<19 THEN PRINT:RETURN ELSE RETURN
280 ON c+1 GOSUB 290,290,300,290,310,320
,320,330:RETURN
290 PRINT USING"#####";a(r,c,p);:RETUR
N
300 PRINT USING" #####";INT(a(r,c,p));
: eighth=INT((a(r,c,p)-INT(a(r,c,p)))*9);
IF eighth THEN 340 ELSE PRINT" ";:RETURN
310 PRINT" ";
320 PRINT USING"###.#";a(r,c,p);:RETURN
330 PRINT USING"####,##";a(r,c,p):RETURN
340 eighth=eighth/2:eighth=167+28*(eigh
t-INT(eighth))+ROUND(eighth):PRINT CHR$(
eighth);:RETURN
350 PRINT FNwind$(24,48,2,42):PRINT USIN
G"#####";tt(0,p);:PRINT TAB(23):PRINT
USING"###.#";tt(1,p);:PRINT USING"#####
,##";tt(2,p);:RETURN:REM * Print totals
*
360 GOSUB 580
370 q$=LOWER$(INKEY$):n=INSTR("xazmpslv
ncrtideyq",q$):IF n<2 THEN 370 ELSE IF n
>8 THEN 400
380 x=FRE(" ");PRINT FNwind$(4,4,20,86)
390 ON n-1 GOSUB 420,420,30,110,1450,101
0,1190:IF q$="s"THEN 30 ELSE 370
400 PRINT FNwind$(27,2,4,88)c1$:PRINT TA
B(5);IF p$(r,p)=""THEN 900
410 ON n-8 GOSUB 630,660,710,720,730,860
,920,760,810,900:GOTO 360
420 IF(q$="a"AND r=1)OR(q$="z"AND r>rlas
t(p)+(rlast(p)=nr))THEN RETURN
430 r=r+(q$="a")-(q$="z"):IF q$="a"AND r
c=0 AND r THEN PRINT FNloc$(0,0)esc"L";
:GOTO 460
440 IF q$="z"AND rc=19 AND r<rlast(p)+1-
(rlast(p)<nr+2)THEN PRINT FNloc$(0,20):G
OTO 460
450 rc=rc+(q$="a")-(q$="z"):GOSUB 600:RE
TURN
460 PRINT p$(r,p)TAB(24):c=0:GOSUB 250:G
OSUB 600:RETURN
470 REM * Summary *
480 heading=1:prompt=1:PRINT FNwind$(0,0
,30,90)c1$:FNloc$(40,3)"SUMMARY":PRINT:P
RINT TAB(20)"Value (£) % of Total Av
. Yield % Net Income % Income":PRINT
490 FOR p=0 TO 8:t(0)=t(0)+tt(0,p):t(1)=
t(1)+tt(2,p):NEXT
500 IF t(0)=0 OR t(1)=0 THEN PRINT loc$(
24,15)esc$p":Insufficient data to summ
arise"esc$q":FOR n=0 TO 2500:NEXT:ERASE
t:menu=1:PRINT c1$:RETURN
510 FOR p=0 TO 8:IF p$(0,p)=""THEN 540
520 j(p)=tt(0,p)/t(0)*100:i(p)=tt(2,p)/t
(1)*100:PRINT p$(0,p)TAB(20)
530 PRINT USING"#####";tt(0,p);:PRINT
USING" #####,##";j(p);tt(1,p);tt(2,p
);i(p)
540 NEXT:p=0:PRINT:PRINT"TOTALS"TAB(20)
550 PRINT USING"#####";t(0);:PRINT USI
NG" #####,##";100;t(1)/t(0)/tax;t(1
);100
560-ERASE t:PRINT FNloc$(30,28)"s=save:p
1/p9=pages:m=menu":RETURN
570 REM * Prompts *
580 PRINT FNwind$(27,2,4,88)c1$"Set row;
press n=no,shares;SPACE=price;c=cost;r=
P/E ratio;t=cover;y=yield;e=enter div."
590 PRINT"(q=alter name;i=insert;d=delet
e;p0/p9=page;s=save;m=menu;v=verify tota
ls;l=list page)":;prompt=0:RETURN
600 PRINT FNwind$(3+rc,2,4,2)"TAB(0)"#
"TAB(0)"":RETURN:REM * Cursor *
610 IF tt(0,p)THEN tt(1,p)=tt(2,p)/tt(0
,p)/tax ELSE tt(1,p)=0
620 RETURN:REM * Calculate average yield
*
630 c=2:oldprice=a(r,c,p):INPUT;"Enter p
rice in pence:- ",price$:IF VAL(price$)=
0 THEN RETURN ELSE a(r,c,p)=VAL(price$)
640 IF oldprice AND a(r,c,p)THEN a(r,4,p
)=a(r,4,p)*a(r,c,p)/oldprice
650 PRINT FNwind$(26,0,3,90)c1$:GOTO 670
660 c=0:INPUT"Enter number of shares:- "
,a(r,c,p)
670 oldval=a(r,3,p):a(r,3,p)=INT(a(r,c,p
)*a(r,2,p)/100):tt(0,p)=tt(0,p)-oldval+a
(r,3,p)
680 IF a(r,3,p)AND q$=" "THEN a(r,6,p)=a
(r,6,p)*oldval/a(r,3,p)ELSE oldval=a(r,7
,p):a(r,7,p)=a(r,3,p)*a(r,6,p)*tax:tt(2
,p)=tt(2,p)-oldval+a(r,7,p)
690 GOSUB 250:GOSUB 610:GOSUB 350:RETURN
700 REM * Cost of shares, P/E ratio & ti
mes dividend covered by profits *
710 c=1:INPUT;"Enter cost:- ",a(r,c,p):G
OTO 740
720 c=4:INPUT;"Enter P/E ratio:- ",a(r,c
,p):GOTO 740
730 c=5:INPUT;"Enter cover:- ",a(r,c,p)
740 GOSUB 260:RETURN
750 REM *Enter annual dividend *
760 olddiv=a(r,7,p):INPUT"Enter annual d
ividend:- ",a(r,7,p):PRINT" Gross or
net (g/n) ?";
770 d$=LOWER$(INKEY$):IF d$<>"g"AND d$<>
"n"THEN 770
780 a(r,7,p)=a(r,7,p)*(tax*100)*ABS(d$="
g")
790 IF a(r,3,p)THEN a(r,6,p)=a(r,7,p)/a(
r,3,p)/tax
800 GOTO 830
810 INPUT;"Enter yield:- ",a(r,6,p):REM
* Calculate net dividend *
820 olddiv=a(r,7,p):a(r,7,p)=a(r,6,p)*a(
r,3,p)*tax
830 tt(2,p)=tt(2,p)-olddiv+a(r,7,p)
840 c=6:GOSUB 250:GOSUB 610:GOSUB 350:RE
TURN
850 REM * Make a new share entry *
860 IF rlast(p)>nr THEN PRINT TAB(34)es
c$p":Page is full":esc$q":FOR n=0 TO 1
0 2500:NEXT:RETURN
870 FOR n=rlast(p) TO r STEP-1:p$(n+1,p)
=p$(n,p)
880 FOR c=0 TO 7:a(n+1,c,p)=a(n,c,p):NEX
T:NEXT:PRINT FNwind$(4+rc,0,20-rc,90)esc
$L"
890 GOSUB 600:FOR c=0 TO 7:a(r,c,p)=0:NE
XT
900 PRINT FNwind$(28,6,2,84)c1$:INPUT;"E
nter name (max 20 letters):- ",p$(r,p):I
F LEN(p$(r,p))>20 OR p$(r,p)=""THEN 900
910 rlast(p)=rlast(p)+1:PRINT FNwind$(4+
rc,4,2,20)p$(r,p)esc$K":IF q$<>"q"THEN
400 ELSE RETURN
920 PRINT"Delete at cursor (y/n) ?";
930 a$=LOWER$(INKEY$):IF a$<>"y"AND a$<>

```

PORTFOLIO

```

"n" THEN 930 ELSE IF a$="n" THEN RETURN
940 PRINT esc$"o";PRINT FNwind$(4+rc,0,2
0-rc,90)esc$"M"
950 tt(0,p)=tt(0,p)-a(r,3,p):tt(2,p)=tt(
2,p)-a(r,7,p):rlast(p)=rlast(p)-1:GOSUB
610
960 IF rlast(p)>19 THEN rx=r:rcx=rc:r=r-
rc+20:rc=19:PRINT FNwind$(4,4,20,86):PRI
NT FNloc$(0,19)p$(r,p)TAB(24):c=0:GOSUB
250
970 FOR n=rx TO rlast(p):p$(n,p)=p$(n+1,
p):FOR c=0 TO 7:a(n,c,p)=a(n+1,c,p):NEXT
:NEXT
980 p$(n,p)="" :FOR c=0 TO 7:a(n,c,p)=0:N
EXT
990 GOSUB 350:r=rx-rcx:rc=0:GOSUB 600:RE
TURN
1000 p=0:plast=8:REM * Print-out *
1010 FOR n=p TO p+plast:IF p$(0,n)=""THE
N 1070
1020 LPRINT p$(0,n)TAB(22)"No.Shrs. Cost
Price Value P/E Cover Yield% Net
Div."
1030 FOR rr=1 TO rlast(n):LPRINT:LPRINT
p$(rr,n)TAB(21):;FOR c=0 TO 7:GOSUB 1080
:NEXT:NEXT
1040 LPRINT:LPRINT:LPRINT"TOTALS"TAB(40)
:LPRINT USING"#####";tt(0,n);
1050 LPRINT SPC(13):LPRINT USING"###.#";
tt(1,n);
1060 LPRINT USING"#####.#";tt(2,n):LP
RINT
1070 NEXT:menu=plast:plast=0:RETURN
1080 IF a(rr,c,n)=0 THEN LPRINT SPC(6-(c
<4)):RETURN
1090 DN c+1 GOSUB 1100,1100,1110,1100,11
20,1120,1120,1130:RETURN
1100 LPRINT USING"#####";a(rr,c,n):;RE
TURN
1110 LPRINT USING"#####.#";a(rr,c,n):;RE
TURN
1120 LPRINT USING"###.#";a(rr,c,n):;RET
URN
1130 LPRINT USING"#####.#";a(rr,c,n):
;RETURN
1140 REM * Enter new tax rate *
1150 PRINT FNloc$(1,25)esc$"J";PRINT FNl
oc$(12,28):;INPUT"Enter new tax rate (%
):- ",tax
1160 PRINT FNloc$(54,20);tax"% "
1170 a(0,0,0)=(100-tax)/1000:tax=a(0,0,
0):PRINT FNloc$(33,25)"RECALCULATING"
1180 FOR p=0 TO 8:FOR r=1 TO rlast(p):ol
ddiv=a(r,7,p):a(r,7,p)=a(r,5,p)*a(r,3,p)
*tax:tt(2,p)=tt(2,p)-olddiv+a(r,7,p):NEX
T:NEXT:RETURN
1190 REM * Verify totals *
1200 tt(0,p)=0:tt(1,p)=0:tt(2,p)=0:GOSUB
1230:FOR rr=1 TO rlast(p)
1210 tt(0,p)=tt(0,p)+ROUND(a(rr,3,p),2):
tt(2,p)=tt(2,p)+ROUND(a(rr,7,p),2):NEXT
1220 IF tt(0,p) THEN tt(1,p)=tt(2,p)/tax/
tt(0,p)
1230 GOSUB 350:RETURN
1240 PRINT FNloc$(28,25)esc$"p" Ente
r page number "esc$"q";
1250 q$=LOWER$(INKEY$):IF VAL(q$)<1 THEN
1250 ELSE p=VAL(q$)-1
1260 PRINT esc$"o":PRINT FNloc$(8,27)esc
$"J" If title is to be erased or page le
ft untitled then press ENTER":GOTO 1290
1270 IF q$="p" THEN PRINT FNwind$(0,0,30,

```

```

90)c1$:PRINT FNloc$(34,15)esc$"p" Page
requires title "esc$"q":GOTO 1390
1280 PRINT FNloc$(8,27)esc$"J"TAB(18)"If
page no."p+1" is incorrect press ENTER"
1290 PRINT TAB(12):INPUT;"Else enter tit
le of page, not exceeding 15 letters:- "
,p$(0,p):IF LEN(p$(0,p))>15 THEN 1290
1300 IF choice$="a"AND p$(1,p)>" THEN PR
INT FNloc$(8,27)esc$"J"TAB(23)esc$"p"
Page is in use and must be titled "esc$
"q":GOTO 1320
1310 PRINT FNloc$(0,27)esc$"J":PRINT FNl
oc$(35,9+p)p$(0,p)SPC(15)
1320 FOR n=0 TO 2500:NEXT:RETURN
1330 PRINT FNloc$(27,25)esc$"p" enter p
resent page number "esc$"q"
1340 q$=INKEY$:IF VAL(q$)<1 THEN 1340 EL
SE p=VAL(q$)-1
1350 IF p$(0,p)="" THEN PRINT FNloc$(25,2
5)** Move invalid: chosen page untitled
**";GOTO 1390
1360 PRINT esc$"j"FNloc$(34,25)" new "
esc$"k";
1370 q$=INKEY$:IF VAL(q$)<1 THEN 1370 EL
SE newp=VAL(q$)-1
1380 IF p$(1,newp)>" THEN PRINT FNloc$(2
7,25)** Move invalid: new page in use *
*;
1390 FOR n=0 TO 2500:NEXT:PRINT esc$"o":
RETURN
1400 PRINT esc$"J":;PRINT FNloc$(8,28):;
INPUT"Enter page title, not exceeding 15
letters:- ",p$(0,newp):IF LEN(p$(0,newp
))>15 THEN 1400
1410 p$(0,p)="" :PRINT FNloc$(0,28)esc$"J
":PRINT FNloc$(35,9+p)SPC(15):PRINT FNl
oc$(35,9+newp)p$(0,newp)SPC(15)
1420 rlast(newp)=rlast(p):rlast(p)=0:FOR
r=1 TO rlast(newp):p$(r,newp)=p$(r,p):p
$(r,p)=""
1430 FOR c=0 TO 7:a(r,c,newp)=a(r,c,p):a
(r,c,p)=0:NEXT:NEXT:FOR c=0 TO 2:tt(c,ne
wp)=tt(c,p):tt(c,p)=0:NEXT:RETURN
1440 REM * Save data *
1450 PRINT FNwind$(0,0,30,90)c1$:PRINT F
Nloc$(40,15)"SAVING DATA"
1460 OPEN"O",1,"pf.seq":FOR p=0 TO 8:a(0
,1,p)=rlast(p):WRITE #1,p$(0,p):a(0,0,p)
:a(0,1,p)
1470 FOR r=1 TO rlast(p):WRITE #1,p$(r,p
):;FOR c=0 TO 7:WRITE #1,a(r,c,p):NEXT:NEXT
1480 WRITE #1,tt(0,p),tt(2,p):NEXT:CLOSE
:GOTO 30
1490 REM * Initialise & load data *
1500 DEFINT c,h,m,n,p,r,w,x,y
1510 nr=50:DIM a(nr,7,8),tt(2,8),p$(nr,8)
1520 esc$=CHR$(27):c1$=esc$+"E"+esc$+"H"
:DEF FNloc$(x,y)=esc$+"Y"+CHR$(32+y)+CHR
$(32+x)
1530 DEF FNwind$(r,c,h,w)=esc$+"X"+CHR$(
32+r)+CHR$(32+c)+CHR$(31+h)+CHR$(31+w)
1540 PRINT esc$"f":IF FIND$("pf.seq")=""
THEN PRINT c1$:RETURN
1550 PRINT c1$:FNloc$(39,15)"LOADING DAT
A":OPEN"1",1,"pf.seq"
1560 FOR p=0 TO 8:INPUT #1,p$(0,p),a(0,0
,p),a(0,1,p):rlast(p)=a(0,1,p)
1570 FOR r=1 TO rlast(p):INPUT #1,p$(r,p
):;FOR c=0 TO 7:INPUT #1,a(r,c,p):NEXT:NEXT
1580 INPUT #1,tt(0,p),tt(2,p):NEXT:CLOSE
1590 tax=a(0,0,0)-(a(0,0,0)=0)/100:FOR p
=0 TO 8:GOSUB 610:NEXT:RETURN

```



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PRINTER.BAS

```

0 GOTO 100
1 SAVE "PRINTER",A : STOP
9 REM
10 REM *****
11 REM * PRINTER SPEED BENCHMARK PROGRAM *
12 REM * *
13 REM * ERIC V BAGSHAW - 01/11/86 *
14 REM *****
15 REM
50 REM ***** VARIABLES *****
51 REM
52 REM B$ = BELL
53 REM CR$ = CARRIAGE RETURN
54 REM CLR$ = SCREEN CLEAR
55 REM FF$ = FORM FEED
56 REM I+J = GENERAL LOOP COUNTERS
57 REM M = MINS
58 REM NR = NUMBER OF TIMES EACH TEST IS REPEATED
59 REM NT = NUMBER OF TESTS
60 REM P$ = LINE OF TEXT FROM THE LETTER ON DISK
61 REM PR$ = PRINTER NAME AND DETAILS
62 REM S = SECONDS
63 REM T = TEST NUMBER COUNTER
64 REM T() = TIME IN SECONDS FOR EACH TEST
65 REM T$( ) = TEST NUMBER COUNTER
66 REM TOT = TOTAL TEST TIME
67 REM W = CARRIAGE WIDTH
99 REM
100 REM ***** MAIN CONTROL *****
101 REM
110 GOSUB 64000 : REM INITIALIZE
120 GOSUB 63000 : REM INTRODUCTION SCREEN
130 FOR T = 1 TO NT
140 PRINT CLR$
150 PRINT T$(T)
160 FOR J = 1 TO NR
170 ON T GOSUB 1000,2000,3000,4000,5000,6000,7000
180 NEXT J
190 LPRINT B$;
200 GOSUB 40000 : REM TIMING
210 NEXT T
220 GOSUB 50000 : REM RESULTS PRINT
500 END
999 REM
1000 REM ***** FORM FEED *****
1010 LPRINT FF$
1999 RETURN
2000 REM ***** PAGE OF CARRIAGE RETURNS *****
2010 FOR I = 1 TO 66: LPRINT CR$ : NEXT I
2999 RETURN
3000 REM ***** LEFT HAND PRINT *****
3010 FOR I = 1 TO 66 : LPRINT "@" : NEXT I
3999 RETURN
4000 REM ***** RIGHT HAND PRINT *****
4010 FOR I = 1 TO 66 : LPRINT SPC(W-1)"@" : NEXT I
4999 RETURN
5000 REM ***** LEFT AND RIGHT *****
5010 FOR I = 1 TO 66 : LPRINT "@"SPC(W-2)"@" : NEXT I
5999 RETURN
6000 REM ***** FULL LINE @ PRINT *****
6010 FOR I = 1 TO 66 : LPRINT STRING$(W,"@") : NEXT I

```

PRINTER.BAS

```

6999 RETURN
7000 REM ***** LETTER PRINT *****
7010 OPEN "I",&1,"LETTER"
7020 INPUT&1,P$: LPRINT P$: IF NOT EOF(1) THEN 7020
7030 CLOSE
7999 RETURN
40000 REM ***** TIMING *****
40010 PRINT:PRINT
40020 PRINT "AFTER SECONDS ARE ENTERED THE NEXT TEST STARTS"
40030 PRINT:PRINT
40040 INPUT"MINS";M
40050 INPUT"SECONDS";S
40060 T(T)=(S+M*60)/NR
40999 RETURN
50000 REM ***** RESULTS *****
50010 LPRINT FF$
50020 PRINT CLR$
50030 PRINT "RESULTS FOR ";PR$: PRINT
50040 LPRINT "RESULTS FOR ";PR$: LPRINT
50050 FOR I = 1 TO NT
50060 LPRINT T$(I);TAB(30) T(I)
50070 PRINT T$(I);TAB(30) T(I)
50080 TOT=TOT+T(I)
50090 NEXT I
50100 PRINT TAB(30);"-----"
50110 PRINT TAB(30);TOT : PRINT
50120 PRINT "CPS - "T$(5);TAB(30) W*66/T(5)
50130 PRINT "CPS - "T$(6);TAB(30) W*66/T(6)
50140 PRINT "CPS - "T$(7);TAB(30) 1664/T(7)
50150 LPRINT TAB(30);"-----"
50160 LPRINT TAB(30);TOT : LPRINT
50170 LPRINT "CPS - "T$(5);TAB(30) W*66/T(5)
50180 LPRINT "CPS - "T$(6);TAB(30) W*66/T(6)
50190 LPRINT "CPS - "T$(7);TAB(30) 1664/T(7)
50999 RETURN
63000 REM ***** INTRO SCREEN *****
63010 PRINT CLR$
63020 PRINT "
63030 PRINT "
63040 PRINT:PRINT:PRINT "THE TESTS ARE TIMED FROM CR TO BEEP"
63050 PRINT:PRINT "THE FIRST TEST STARTS AFTER THE WIDTH IS INPUT"
63060 PRINT:PRINT
63070 INPUT "PRINTER";PR$
63080 INPUT "NUMBER OF REPEATS (NULL=1)";NR : IF NR=0 THEN NR=1
63090 INPUT "CARRIAGE WIDTH (NULL=80)";W : IF W=0 THEN W=80
63999 RETURN
64000 REM ***** VARIABLE SETUP *****
64010 FF$=CHR$(12)
64020 B$=CHR$(7)
64030 CR$=CHR$(13)
64040 CLR$=CHR$(27)+"E"
64050 NT=7
64500 T$(1)="FORM FEED"
64510 T$(2)="PAGE OF CARRIAGE RETURNS"
64520 T$(3)="LEFT HAND PRINT"
64530 T$(4)="RIGHT HAND PRINT"
64540 T$(5)="LEFT AND RIGHT PRINT"
64550 T$(6)="FULL LINE PRINT"
64560 T$(7)="LETTER PRINT"
64999 RETURN
    
```

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USING THE ANSI DRIVER

Both MS-DOS and PC-DOS include a versatile program that allows you to customise your keyboard and display. **John Lee** explains how it can be used to set the screen colours.

THE MS-DOS operating system allows you to reassign the meaning of keys on the keyboard, and also to change the cursor position and colours of the screen display. To do any of these an alternative screen and keyboard driver called Ansi.Sys must be loaded into memory when you boot the system.

The Ansi.Sys driver is provided as a file on the standard DOS disc but it is not usually loaded into the computer's memory. When DOS is first invoked it loads the standard drivers for handling the screen, the keyboard and the other standard input and output devices, such as the disc drives.

To make the computer load the Ansi.Sys driver you simply use your editor to add the line.

DEVICE=ANSI.SYS

to the Config.Sys file. In much the same way, if you use a RAM disc as an extra device, the Config.Sys file will contain a line such as

DEVICE=RAMDISK.SYS

or if you are using DOS version 3.0 or higher

DEVICE=VDISK.SYS

Information received from the keyboard and information sent to

TABLE 1. SCREEN AND COLOUR CODES

- 0 — All screen attributes off
- 1 — Bright; high-intensity colours, available on genuine IBM machines but not on some clones
- 4 — Underlining on
- 5 — Blinking on
- 7 — Inverse-video on; mainly used with monochrome monitors
- 8 — Makes display invisible

FOREGROUND COLOURS

- 30 — Black 34 — Blue
- 31 — Red 35 — Magenta
- 32 — Green 36 — Cyan
- 33 — Yellow 37 — White

BACKGROUND COLOURS

- 40 — Black 44 — Blue
- 41 — Red 45 — Magenta
- 42 — Green 46 — Cyan
- 43 — Yellow 47 — White

TABLE 2. PROMPT CODES

- \$n — default drive
- \$p — current directory
- \$g — > sign
- \$l — < sign
- \$b — : sign
- \$a — = sign
- \$\$ — \$ sign
- \$t — time
- \$d — date
- \$v — DOS version number
- \$h — backspace and erase one character
- \$_ — go to new line on screen
- \$e — Escape character; used for screen colours and attributes

the screen — which are collectively called the console or Con device — normally go through the console driver. But when the Ansi.Sys driver is loaded this information passes through the Ansi.Sys driver instead. Most information is still handled in the normal way, but using Ansi.Sys a number of additional instructions are possible. These instructions are preceded by the Escape character, and so called Escape codes.

The Esc key on the keyboard

cannot be used to send an Escape code because DOS uses this key to cancel the command currently being executed. There are two easy ways round this: you can use the Prompt command to send Escape sequences, or you can use an editor to type the Escape sequences into a file and then use the Type command to send the file to the screen.

You may therefore use the Prompt command to change the screen colour by sending the

appropriate Escape codes, provided that the Ansi.Sys driver has been loaded. For example,

PROMPT \$e[(32m will make a colour monitor display green letters on a black background rather than the usual white letters. The Prompt command sends the whole string to DOS, where it is interpreted. The pair of characters \$e represent the Escape character, and on receiving it the Ansi driver interprets the character string beginning with [and ending with m as a special screen or keyboard code.

In a similar way you may use two or more Escape codes on a line. For example, the command to get blue letters on a cyan background is

PROMPT \$e[34m;\$e[46m

The number 34 sets a blue foreground, and 46 sets a cyan background. Rather than send two complete character strings you may shorten them to

PROMPT \$e[34;46m

(continued on next page)

SCREEN.BAT

```

REM Turn previous attributes off
PROMPT $e[0m
IF "%1" == "BRIGHT" GOTO BRIGHT
GOTO FOREGR
:BRIGHT
PROMPT $e[1m
SHIFT
GOTO FOREGR
REM Set foreground colour (the letters)
:FOREGR
IF "%1" == "" GOTO HELP
IF "%1" == "BLACK" PROMPT $e[30m
IF "%1" == "RED" PROMPT $e[31m
IF "%1" == "GREEN" PROMPT $e[32m
IF "%1" == "YELLOW" PROMPT $e[33m
IF "%1" == "BLUE" PROMPT $e[34m
IF "%1" == "MAGENTA" PROMPT $e[35m
IF "%1" == "CYAN" PROMPT $e[36m
IF "%1" == "WHITE" PROMPT $e[37m
REM Set background colour
:BACKGR
IF "%2" == "ON" SHIFT
IF "%2" == "" GOTO END
IF "%2" == "BLACK" PROMPT $e[40m
IF "%2" == "RED" PROMPT $e[41m
IF "%2" == "GREEN" PROMPT $e[42m
IF "%2" == "YELLOW" PROMPT $e[43m
IF "%2" == "BLUE" PROMPT $e[44m
IF "%2" == "MAGENTA" PROMPT $e[45m
IF "%2" == "CYAN" PROMPT $e[46m
IF "%2" == "WHITE" PROMPT $e[47m
GOTO END
REM Help section
:HELP
PROMPT $e[34m; $e[46m
CLS
REM
REM          HOW TO USE SCREEN
REM
REM          The syntax is SCREEN BRIGHT FOREGROUND BACKGROUND
REM          Use CAPITAL LETTERS and there must be a space between the words.
REM          The word BRIGHT is optional and applies only to the foreground.
REM
REM          FOREGROUND is the colour you want for the letters. This is one from:
REM          BLACK, RED, GREEN, YELLOW, BLUE, CYAN, MAGENTA or WHITE.
REM
REM          BACKGROUND is optional, and has the same choice of colours.
PAUSE
REM End section
:END
PROMPT Ready when you are $p$g
    
```

(continued from previous page)

Other colour parameters are shown in table 1. To get high-intensity yellow letters on a blue background you would type

PROMPT \$e[1];33;44m

You may put a Prompt command in your Autoexec.Bat file to set the screen colours to something you find easier to read than the usual black and white.

Using the Prompt command in this way may remove the usual DOS prompt of A> or C> from the screen. You can restore it with the command

PROMPT

or

PROMPT \$n\$g

The \$n prints the default drive A, B or C and \$g prints a > sign, thus giving a prompt of A>, B> or C> as before. If you want it to show the current directory and a > sign you type

PROMPT \$p\$g

If you are working on drive C in the sub-directory called DOS this gives the prompt

C:\DOS>

You may print a message as well, with

PROMPT Ready \$p\$g

which displays the prompt

Ready C:\DOS>

You may print the time with the command

PROMPT \$t

which just after 10.15a.m. will display

10:15:07:23

as a prompt. The last part of the time is seconds and fractions of a second. I find the seconds both unnecessary and distracting. Since characters may be deleted with \$h, typing \$h six times in the Prompt command removes the seconds. So the command

PROMPT \$t\$h\$h\$h\$h\$h\$h\$h\$h

displays

10:15

as the prompt.

The \$__ string starts a new line.

I use a two-line prompt, generated by the command

PROMPT Time \$t \$h\$h\$h\$h\$h\$h\$h\$h

\$__\$p\$g

that gives

Time 10:15

C:\DOS>

as the prompt. If you want a blank space after the > before the cursor, simply type a space after the \$g in the Prompt command before you press Enter. A list of the codes that you can use is given in table 2.

The MS-DOS operating system has a number of batch file commands. The commands are Echo, For, Goto, If, Shift, Pause and Rem. Batch files can be created using your editor or word

processor, and must have the extension .Bat.

The Screen.Bat batch file listed on the previous page will allow you to set the screen colours as you wish. To run it simply type Screen followed by up to four parameters, which must be in capital letters and must be separated by spaces.

For example, typing
SCREEN BRIGHT YELLOW ON BLUE

sets high-intensity yellow letters on a blue background. The word "bright" is optional; it produces intense colours for the letters on the IBM PC, though not on some clones. Next the foreground colour — that is, the colour of the letters — is specified. The word "blue" specifies the background colour; it is optional, and if it is omitted black is assumed. The word "on" that separates the foreground and background colours is also optional.

The following commands are all valid:

SCREEN YELLOW ON BLUE gives yellow letters and a blue background;

SCREEN YELLOW BLUE gives yellow letters on a blue background;

SCREEN YELLOW gives yellow letters on a black background. Typing

SCREEN

with no parameters produces a help menu to explain how to use the program.

The program requires that you choose colours that exist, spell them correctly and use capital letters. The available colours are black, red, green, yellow, blue, magenta, cyan and white.

The command line to call the batch file may have up to four parameters numbered %1, %2, %3 and %4. The program checks to see if %1 is empty; if so it jumps to the Help routine and stops. Otherwise a check is made to see if %1 contains the word "bright". If so, a Prompt command sets high intensity on and then shifts the data one place to the left. The colour can now be identified in the Foregr routine from the contents of %1, and the appropriate Prompt command used to set the foreground.

Next the contents of %2 are checked to see if it contains the word "on"; if so, the data is shifted again. The contents of %2 now represent the background colour. If it is empty the background colour is left as black; otherwise the background colour can be identified by the Backgr routine to select the appropriate Prompt command.



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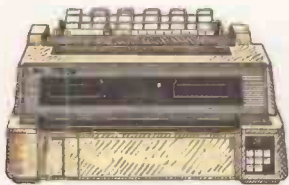
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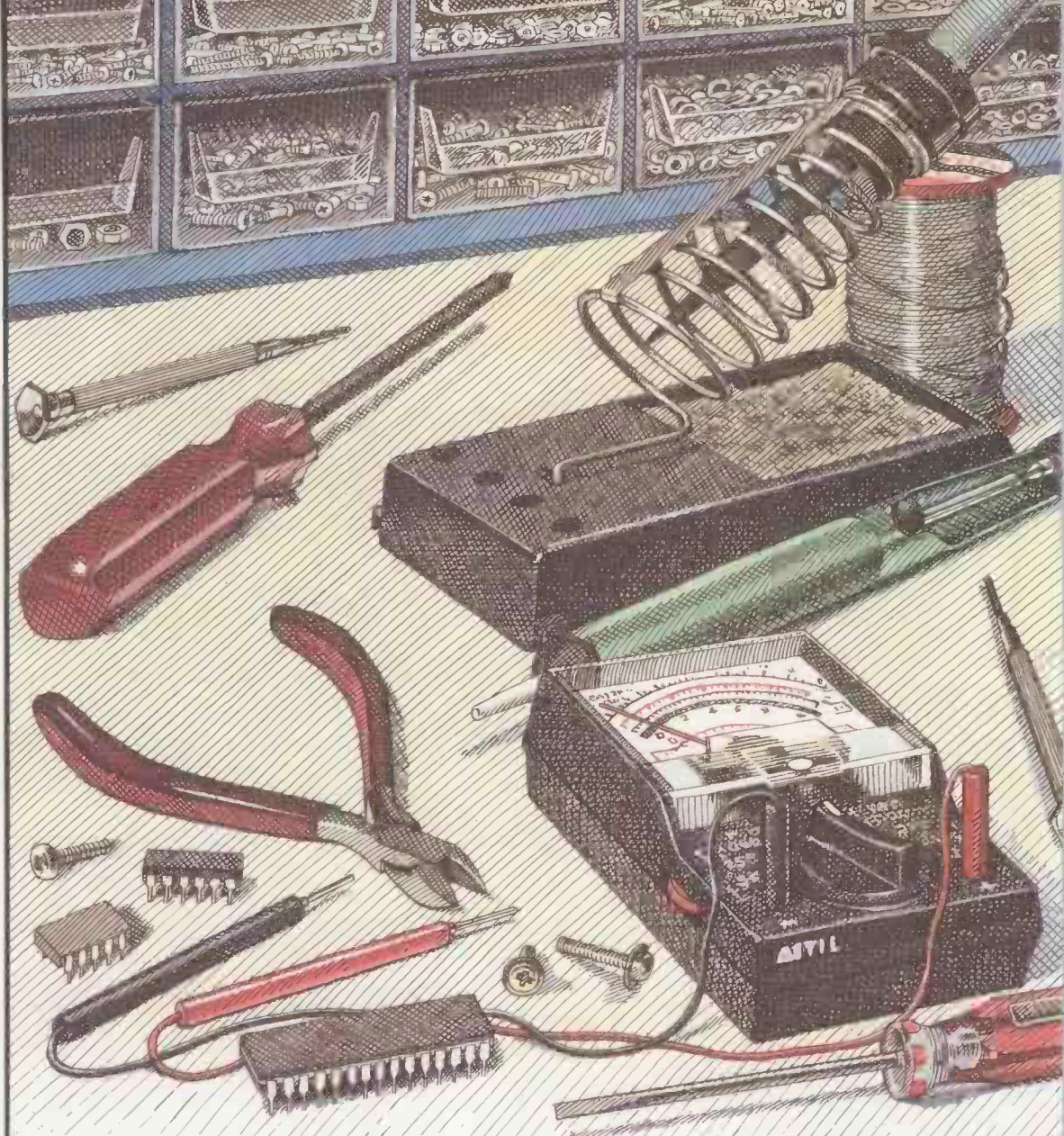
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