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COVER FEATURE

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LASERS TAKE OVER

Once upon a time lasers were exotic and expensive. Now they have a place in almost every office and every manufacturer seems to be launching one. But just how fast are they? And how good are the new units that have broken the £2,000 price barrier? We investigate this exciting world 85

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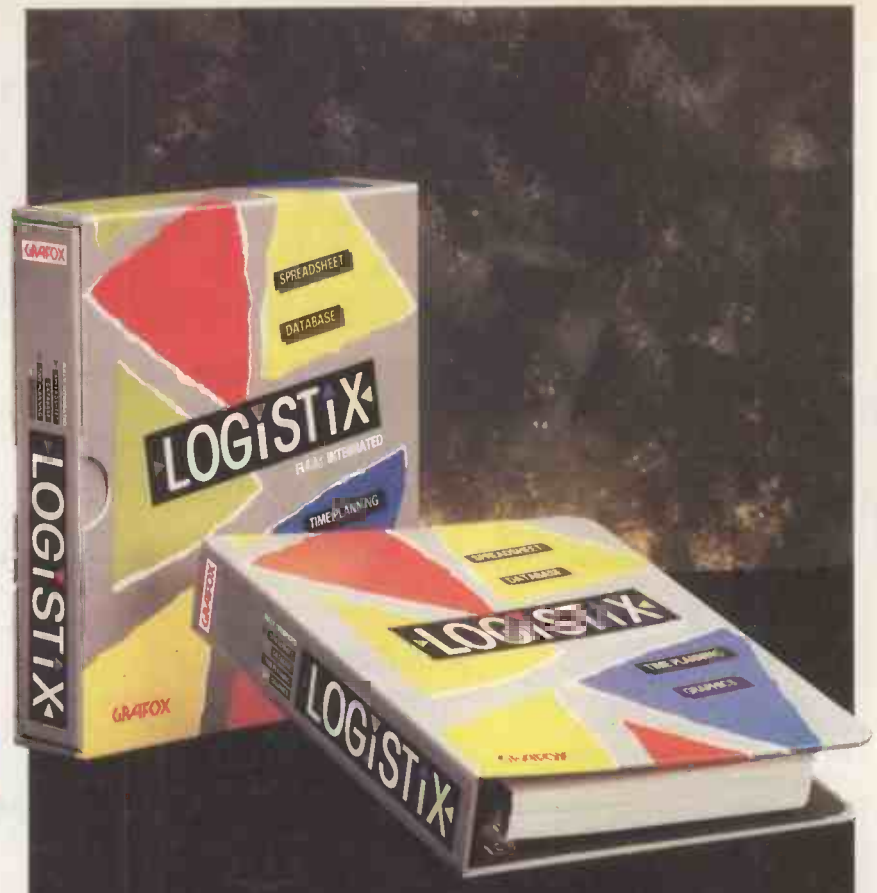

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LASER VISION

Three technologies have shaped the pattern of working in the modern office: the telephone, the microcomputer and the photocopier. The impact of two of them — the phone and the micro — has been fairly obvious; hitherto the third has been taken for granted, its ubiquity masking its subtle but pervasive effect. Recent developments may be about to turn the spotlight on to the photocopier.

The primary impact of the photocopier has been to increase the amount of information passing across a desk. Before the days of Xerox and its host of competitors, copies could mean one of two things. They meant messy carbon copies with limited numbers and low quality or, for larger runs, they would involve one of those splendid devices like a Gestetner or Cyclostyle machine. Although they worked well enough in their own way — which nowadays looks quaintly Victorian to our high-tech eyes — they were hardly a convenient method for generating copies of a large number of documents on a regular basis, say as part of a restricted office circulation list.

The photocopier changed all that. Small or large runs became equally easy. No specially prepared original was needed as with the Gestetner machines. Furthermore, it was possible to copy not just typed or written documents, but also graphs, images, even pages from books and magazines — whatever the laws of copyright may say. This tremendous new power unleashed the torrent of data which most of us have to cope with to this day.

In this context, the more recent effects of the micro can be seen not as anything startlingly new, but rather as a second wave of this information deluge. As anyone working with computers knows, their chief effect, like that of photocopiers, is to increase the amount of paper which has to be dealt with. So much for the paperless office, a once fashionable phrase which has now completely disappeared from manufacturers' advertisements.

Of course, micros differ from photocopiers in one important respect. The prodigality of the photocopier is limited in that all copies are by definition the same. The micro introduces the new possibility of varying the output while retaining the ability to churn out endless amounts of information.

A central idea in visions of future office working is the convergence of the main technologies found there today. Some manufacturers have concentrated on the coming together of the telepone and the micro. This is fine in theory, but the end results have not been so happy: remember the One Per Desk or the Qwertyphone. The other approach — putting together the micro and the photocopier — has been more fruitful, though less fuss has been made about it. The result is the laser printer, one of the most successful pieces of office technology around today.

It is symptomatic of that success that this month's special section on printers starting on page 85 concentrates almost exclusively on laser machines. Manufacturers are piling into the sector; prices are falling — following the same pattern as micros a few years back. What started off as a premium-priced machine costing around £4,000 can now be had for around £1,500. It is no coincidence that Jack Tramiel has announced a laser printer, and that Alan Sugar is rumoured to be looking at one. Both men are sharp at spotting the next mass-market product, and it is clear that lasers now fall into that category.

Already laser printers are beginning to take over in offices, mirroring the pattern of micro acquisition a little while ago. Like micros, lasers are totally addictive; once you have used one, you never want to go back to a dot-matrix, no matter how many pins it has. This has partly to do with the noise of even the quieter matrix machines; acoustic hoods are falling from favour for personal printing, as opposed to heavy-duty departmental work. But the attraction of the laser has more to do with the fact that we have been working in offices based around the photocopier ethic for the last 30 years. When the laser printer arrived, it simply assumed the photocopier's mantle as the natural instrument of the office-information generation.

Peering further into the future, most micro users might soon have a laser printer, which will cost about the same as an Amstrad PC — and might even be made by Amstrad. More and more intelligence will be embedded into it, until it becomes a document scanner, optical character reader and fax machine, all in one box. As a result, the telephone too will migrate along the desk into the same unit. At this point — probably towards the end of the 1990s — we will see the final convergence of those three technologies which have gone to shape so much of the preceding century. And as the micro and the telephone shrink to vanishing point through continuing advances in chip production, all that will be left will be the latest and most exciting incarnation of the humble photocopier.

5 YEARS AGO...

The 16-bit micro has been with us for some time now, and a number of 16-bit systems have found their way into various microcomputer installations. Now it looks as though these machines are to be upstaged by a new generation of 32-bit micros. Industry rumours say that Hewlett-Packard has a 32-bit machine on the way, to be joined by a 32-bit micro developed by Acorn in conjunction with National Semiconductor.

The chip comes from National Semiconductor and is claimed to be the only true 32-bit microcomputer. It is capable of supplying the user with the power of a minicomputer at about 10 percent of the cost. This chip, and the others in the series, are to be incorporated by Acorn into two new products. As a second processor for the BBC Micro, it will come on a board with 256K of RAM and an operating system in ROM. The interface to this processor will be handled by the "tube". Acorn expects to market this product to the existing user base of over 2,000,000 Apple, Pet and Tandy machines.

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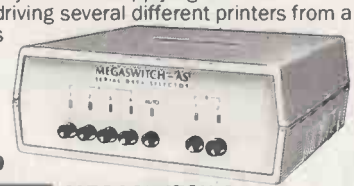

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NEXT MONTH

HARDWARE

A few months ago an 80386 PC was a rare beast. Today everyone seems to be launching one, and prices are tumbling. We look at some of the new low-cost machines, including one from the **Dell** Computer Corporation, which recently set up over here. Plus a review of Acorn's powerful Risc-based **Archimedes** micro.

SOFTWARE

Digital Research is looking to pastures new now that Microsoft has colonised the operating systems market so effectively. We review **Gem Desktop Publisher**, one of its first forays into applications software.

FEATURES

How do you benchtest a **Cray** super-computer? We find out, and look at the different uses such machines can be put to. There is also a consideration of the latest European laws on **software copyright**.

SPECIAL SECTION

THE INTEGRATED OFFICE

Micros no longer work in isolation. Today they are linked with PABXs, scanners, telex and fax. We report on the far-reaching developments which will result in the office of tomorrow.

TOP 10

LANGUAGES

There is life after Basic. We look at some alternatives and the applications to which they are suited.

Don't miss the September issue of

PRACTICAL COMPUTING

On sale at W H Smith and all good newsagents after 19 August.

Contents may vary due to circumstances beyond our control and are subject to change without notice.

The virtues of an LCD

REGARDING the letter from M J Hosken, in your April issue, concerning not looking at the screen while keying in. I too avoid looking at the screen, though for an entirely different reason. I can't stand the thing! The glare, noise and whatever other unknowns come out of it lead to discomfort and a steady decline in efficiency.

It would appear I am not alone. In a recent *For What it's Worth* TV programme, covering building sickness syndrome, 43 percent of VDU users questioned said they found them unpleasant.

What I would like is a nice, boring black-and-grey LCD screen. But only portables are blessed with them. I am sure that staff productivity would increase if they had these, rather than CRTs. I find myself dry coding/running programs on paper, rather than face a CRT, thereby losing all the advantages of screen manipulation and continuous testing.

The answer is an 80-by-25 add-on LCD. It would transform the computer into a much more affable machine. The LCD could be used for most of the text and coding work, leaving the CRT for graphics and colouring. Clive Sinclair's new Z-88 portable has an 80-by-eight unit and costs only £200. Surely there must be companies who could produce a similar screen three times deeper than this, and sell it for around £100.

R SUMMER,
London SW12.

Running Basic with a Hercules card

YOUR correspondent Michael Earley in "Ask PC", June 1987, complained about the lack of Hercules graphics support for IBM PC clones. In response to this problem we have produced H-Graphics, a programmer's toolkit for the Hercules and compatible graphics cards. It costs £45.

H-Graphics provides full Hercules graphics support on the IBM PC and compatibles for programs written in Basica, GWBasic, Quick Basic, Pascal, C and Clipper. As well as the usual drawing commands there are facilities for writing text on the graphics screen, for creating windows and for loading, saving and printing screens.

Quick Basic as it stands does not support Hercules graphics; H-Graphics provides that facility and also allows the programs to be run under the Basic interpreter for development and debugging. Support for Turbo Basic will be available shortly.

F E RICKETT,
Laboratory Software Ltd,
2 Ivy Lane,
Aylesbury,
Buckinghamshire HP22 5AP.

WordStar without backups

MANY people — quite wrongly in my estimation — say that WordStar is complicated and difficult to use. Yet they are ready to praise the Amstrad PCW with Locoscript which, although quite sophisticated in the facilities it provides, presents a sequence on start-up which would frighten an experienced user, let alone the raw beginner to whom it is being marketed.

It may well be that this false impression of WordStar is propagated by such convoluted explanations as that given by M A Rahin in your June issue. The procedure he described involves some 22 keystrokes to avoid the creation of a backup file.

Surely it is far simpler to allow WordStar to make the backup copies for insurance as they are intended, and occasionally clean up the directory by keying X from the opening menu to go to the system and then entering

DEL *.BAK

If your working environment is under the control of batch files which normally change directories automatically, you may need to learn how to change to and from the word-processing directory by means of the CD command, but this is surely more logical and easier to understand than the procedures being suggested by Mr Rahin.

J SIMPSON,
Shoreham-by-Sea,
West Sussex.

Crime and punishment

IN AN otherwise reasonable review of my book *Is Man a Robot?* Glyn Moody makes a serious error which I would like to correct. He says I would do away with prison altogether and that I fail to accept that my stated position provides a justification for some form of restraint.

May I quote from page 261 of my book: "We are entitled to pursue criminals relentlessly and to incarcerate them when apprehended . . . Compulsory incarceration . . . may be necessary in order to achieve a degree of social protection."

GEOFF SIMONS,
Stockport,
Cheshire.

Angry at Apple

AM I ALONE in my sense of fury at Apple for the insane design of the Imagewriter II? Would anybody else be treated seriously if they offered a design for a tractor feed that pushed the paper through the rollers?

Can anyone supply a Macintosh-compatible printer that I can use with continuous stationery?

D C SUTTON,
System Six Ltd,
Warrington.

Easier than 1-2-3

THE REVIEW of low-cost spreadsheets in the June issue raises some points. Spreadsheets like Lotus are the standard method of financial calculation. Before that it was self-written programs; before that the calculator; before that the adding machine. Each standard is more powerful, handles more information and produces more comprehensive results.

A lot of our customers are those who have found Lotus too cumbersome. They find Moneypower quick and easy to use, and the power of its reporting saves time.

P H GOLDEN,
Moneywise Software,
North Cheam,
Surrey.

In our Feedback columns readers have the opportunity of bringing their computing experience and problems to the attention of others, as well as of seeking our advice or making suggestions, which we are always happy to receive. Make sure you use Feedback — it is your chance to keep in touch.

WRITE TO:

Feedback, Practical Computing, Quadrant House,
The Quadrant, Sutton, Surrey SM2 5AS

MOVING ON TO PS/2

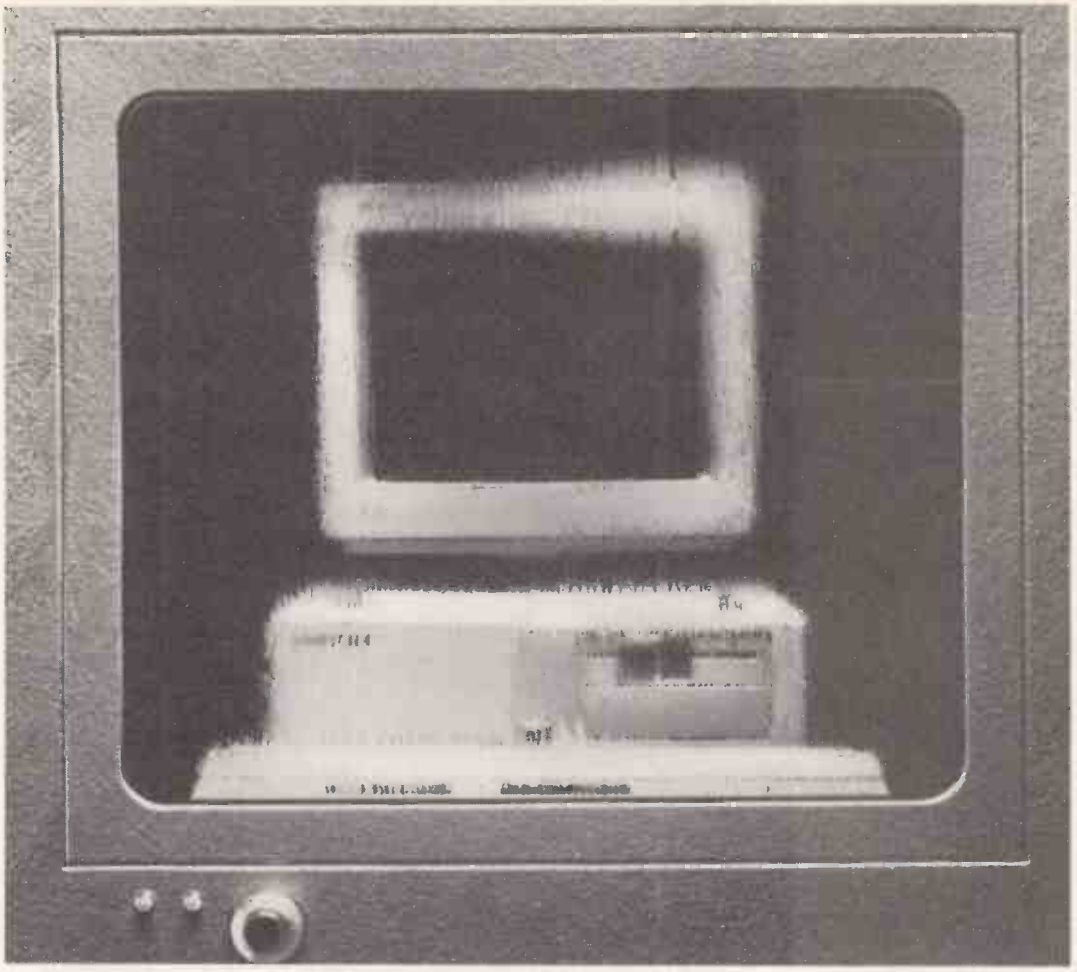
CONGRATULATIONS on June's main feature "IBM's New Standard". I have waited a long time for a sensible analysis of IBM's April 2nd announcements regarding their new range of Personal Systems.

Steve Malone's reservations with respect to the Model 30 and exactly where it fits into IBM's future strategy are understandable, and you certainly hit the nail on the head as far as the Model 50 is concerned. The Model 50 is not a souped-up PC/AT. There are potentially several new and proprietary features about it — its Micro Channel architecture, ABIOS ROM and other proprietary IBM chips — that will make it difficult or impossible to clone. When IBM's OS/2 arrives I suspect a few more people might wish they had the McCoy hardware.

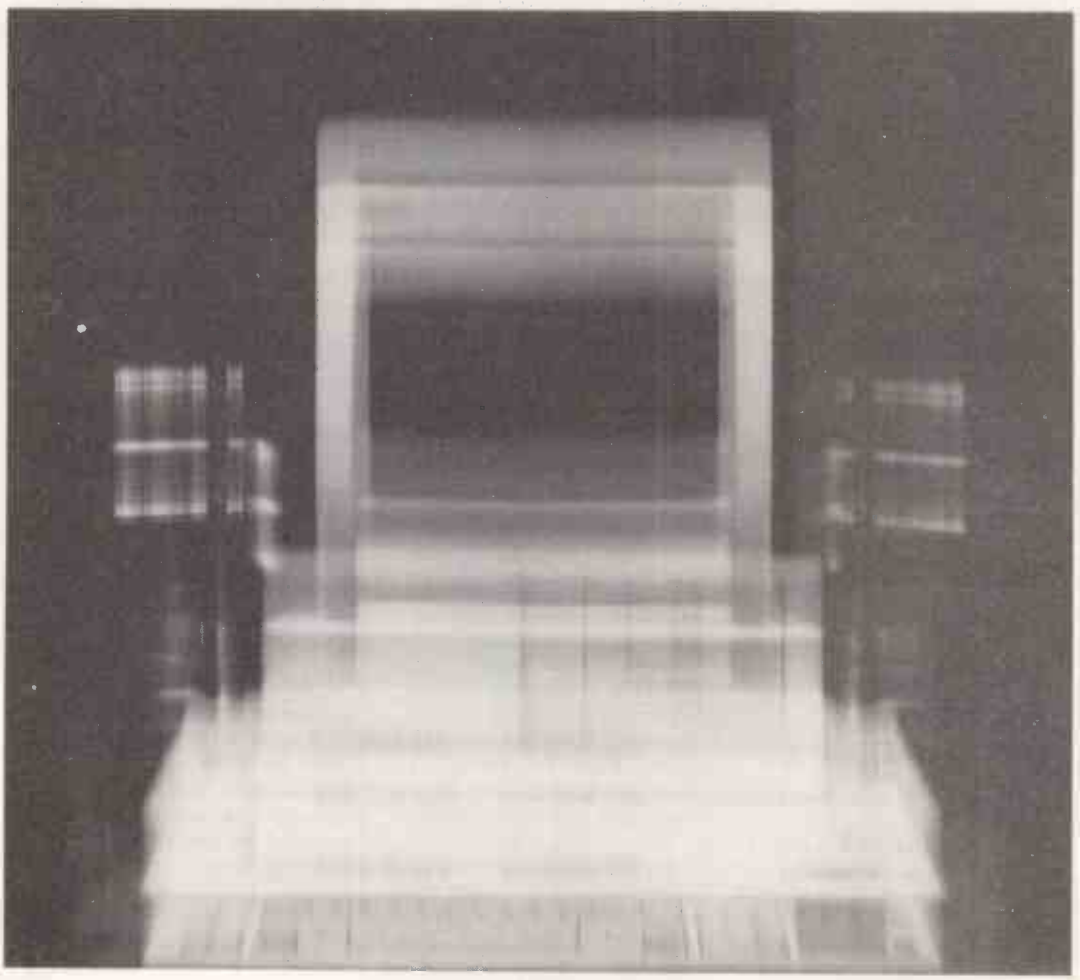
As far as pricing is concerned — yes, it's still an expensive machine. But IBM's highly automated plant in Greenock is churning them out by the lorry load and I am convinced that the unit production cost is a small fraction of the end-user price. Large discounts should be negotiable. A case in point is IBM's agreement with all local authority colleges, known as Lamsac 86. Under this scheme all Personal Systems are discounted by 40 percent, permitting the purchase of a fully configured Model 50 for £1,830.

Of course Olivetti and Compaq say that the new machines do not threaten their markets. However, in 12 months' time the small-systems end of the computing world will have moved on to the new multi-tasking, high-resolution 3.5in. world of PS/2 and OS/2. In the meantime my advice is to go and haggle with your nearest IBM dealer.

R ELLIOTT
IBM Technical Co-ordinator,
Clydebank College,
Clydebank.



We steamed it.



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

The results, we think, will surprise you.

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

For those on dry land, the message is clear.

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To find out more, phone Julie Game on (0734) 696622.

HEWLETT PACKARD

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Compaq upgrades Deskpro 386

COMPAQ COMPUTER has announced that the Deskpro 386 will now support an optional 16MHz Intel 80387 co-processor, and that the machines will have disc cacheing as a standard feature.

The 80387 costs £750. It will prove particularly useful for calculation-intensive tasks such as scientific computations and CAD and CAE applications. All Deskpro 386 models will cater for both the 80387 co-processor and an 8MHz 80287 co-processor.

The use of a disc-cacheing utility program will enhance hard-disc performance. It works in conjunction with the Compaq Expanded Memory Manager, which allows users to address memory beyond the 640K MS-DOS limit with applications that follow the Lotus/Intel/Microsoft Expanded Memory Specification.

Compaq has also introduced an asynchronous communications/parallel printer board and a 102-key enhanced keyboard as standard on the Deskpro 386. The £89 printer board provides an additional asynchronous communications interface and an extra parallel printer interface.

For more details contact Compaq Computer, Ambassador House, Paradise Road, Richmond, Surrey TW9 1SQ. Telephone: 01-940 8860.

Intelligent scanner

KURZWEIL Computer Products' Discover 7320 is a PC-based intelligent character recognition scanner. It allows automatic scanning of documents that include both text and graphics.

Discover is claimed to recognise almost any fount from 8 point to 24 point in size. Scanning takes place in background mode so that users can work on other applications while it is being done. The system consists of a proprietary PC board with 2Mbyte of RAM along with a desk-top scanner unit. It has been tested to average a scanning speed of around four pages per minute. It costs £8,000.

For more information contact Kurzweil Computer Products, Unit 8, Suttons Industrial Park, Reading, Berkshire RG6 1AZ. Telephone: (0734) 668421.

OLIVETTI STRIKES BACK AT PS/2

OLIVETTI has announced its answer to the IBM PS/2 series in the form of a new range of micros based on the 80386, 80286 and 8086 chips. It has also produced a multi-tasking environment for the 80386 chip in advance of the appearance of Microsoft's OS/2. All the machines use the new-style AT-layout keyboard, and can be set up with 3.5in. or 5.25in. floppies.

At the top of the range is the 80386-based M-380, which comes in three versions. The M380/T is a floor-standing unit that bears a remarkable resemblance to IBM's Model 80, except that it possesses a small display for diagnostic messages. There are also two desk-top versions, the M-380 and the M-380/C compact model. The M-380/T runs at 20 MHz, and the other two at 16 MHz.

The M-380/T and M-380 come with 4Mbyte of RAM, expandable to 64Mbyte on the M-380/T. The M-380C comes with 1Mbyte expandable to 4Mbyte. Hard-disc storage starts at 40Mbyte on the compact model and 68Mbyte on the M-380. The 125Mbyte hard disc on the floor model can be expanded to 270Mbyte.

To enable users to exploit the power of the 80386 processor, Olivetti has a multi-tasking manager called 386-Topjob which allows several tasks to be run concurrently under MS-DOS. It also enables the user to address memory beyond the current 640K limit. Up to eight tasks can be run at once, including well-behaved programs like Flight Simulator. Olivetti says that it expects 386-Topjob to have a future even when OS/2 has arrived.

Olivetti has also announced two new versions of the M-24 and M-28, corresponding to IBM's Model 30 and Model 50 in the PS/2 range. The M-240 and M-280 run faster processors and have higher-resolution graphics. They are also able to accommodate backup tape units. The new Positive Graphics Controller supports graphics up to 640 by 400 pixels; there is also an EGA option.

The first of the machines to go on sale will be the M-240, which is due to appear in July. The M-380 is scheduled for September and the M-280 for the last quarter of the year. For 1987 at least, the M-24 and M-28 will continue to be sold. The M-380 costs from £4,410 and the M-240 from £2,033.

At the launch of these machines, Olivetti announced new networking and terminal products, as well as prototype Worm and CD-ROM mass-storage devices. More importantly, it disclosed that it believed that there would be no impediment — neither technical nor legal — to producing a clone of the PS/2's Micro Channel.

For further information contact British Olivetti Ltd, PO Box 89, 86/88 Upper Richmond Road, London SW15 2UR. Telephone: 01-785 6666.

The Olivetti M-280 (left). The full-size (centre) and compact (right) versions of the M-380.

PS/2 memory expansion

ORCHID, Intel and AST have announced add-ons for IBM's PS/2 micros. The Orchid Ramquest 50/60 for the PS/2 models 50 and 60 provides 2Mbyte of RAM. It can be used as extended memory with a processor running in Protected mode under OS/2, or as Lotus/Intel/Microsoft (LIM) expanded memory with MS-DOS. Four boards can be installed to provide 8Mbyte of memory. The Ramquest 50/60 costs £749 and is being distributed by First Software.

First Software will also be distributing Intel's Above Board 286 and PS/286. The Above Board 286 is designed to work with high-speed PC/AT compatibles or the IBM PS/2 Model 30. The Above Board will operate at a maximum speed of 12.5MHz in an AT compatible, and at 8MHz in a PC compatible. It can carry up to 2Mbyte of memory plus a further 2Mbyte mounted on a separate piggyback board.

The 512K Above Board 286 costs £660, the 2Mbyte version £1,085. The 512K PS/286 costs £705 and the 2Mbyte version £1,135.

AST's Rampage/2 expanded memory board for the IBM Model 30 and the Advantage/2 multi-function expansion board for Models 50 and 60 will be available in Europe during the third quarter of 1987. The Rampage will offer users a minimum configuration of 64K of added memory, expandable to 2Mbyte. Rampage/2 supports standard PC-DOS expanded-memory applications software including Lotus 1-2-3, dBase III, Symphony and Framework.

First Software is at Intec-1 Wade Road, Basingstoke, Hampshire RG24 0NE; telephone (0256) 463344. AST Europe is at Goat Wharf, Brentford, Middlesex TW8 0BA; telephone 01-568 4350.

Amstrad PC-1640 to be sold in Britain

FOLLOWING the launch of the Amstrad PC-1640 at the Comdex show in Atlanta in early June, Amstrad has decided to give the range a British preview at the PC User Show.

Amstrad will be previewing the three EGA versions of the PC-1640. UK shipments are expected to start in August and to reach full flow by early September.

Amstrad has denied rumours that it will be dropping the PC-1512. It will continue to sell into small businesses and the home. Meanwhile the company hopes that the addition of the EGA will satisfy the demands of corporate business customers.

Amstrad also intends to launch a new word-processing system, the PCW-9512, in September.

For more details contact Amstrad, Brentwood House, 169 Kings Road, Brentwood, Essex CM14 4EF. Telephone: (0277) 228888.

Two more by Hercules

HERCULES has added two cards to its range of products: a monochrome text card and a version of the Hercules Colour Card without a parallel port.

The text card is a half-card sized alternative to the IBM Monochrome Display Adaptor (MDA). The board is suitable for those who need text-only applications on IBM-type monochrome displays. It can be used on IBM PCs and compatibles in conjunction with standard text-mode software and supports text programs which are compatible with IBM's MDA.

The Colour Card/NP costs less than the original Colour Card and has all its features with the exception of the parallel port. It is thus suitable for users who already have a parallel port, do not need one or who are linked into network configurations.

The Hercules Text Card costs £99, and the Colour Card/NP costs £109. For further details contact First Software, Intec-1, Wade Road, Basingstoke, Hampshire RG24 0NE; telephone (0256) 463344. Softsel, Softsel House, Syon Gate Way, Great West Road, Brentford, Middlesex TW8 9DD; telephone 01-568 8866.

MAIL-ORDER COMPATIBLES

THE US-BASED company PC's Limited has now established a UK subsidiary that it has named Dell Computer Corporation. What distinguishes the company from its rivals is that it cuts out dealers and sells its micros by mail order. This obviously eliminates dealers' profit margins, which can be around 35 percent, and allows it to sell its machines at low prices.

PC's Limited was set up in 1984 by 19-year-old Michael Dell, who is now the company's chairman and chief executive officer. The formula appears to have worked in the US, where the company looks set to turn over $150 million this year.

Dell says it will be spending £2 million on advertising in the UK in its first year. The majority of it will be in the computer trade press, and it will be linked to mail-order sales. Dissatisfied purchasers will be able to get their money back if they return their machine within 30 days.

Support will be provided over the telephone, and machines will be backed up with a free 12-month on-site maintenance contract. Each machine has its own built-in diagnostics, complete with an LED display panel on the front of the machine which will give a constant readout of information that can be relayed to Dell hotline staff.

The basic Dell systems come complete with monochrome monitor, a Hercules-compatible graphics board and an 84-key keyboard conforming to the old-style IBM layout. The 80286-based machine running at 8MHz, the 286-8, starts at £1,299 with a 20Mbyte hard disc. The 286-12, which runs at 12MHz, starts at £1,799 with a 40Mbyte hard disc. There is even an 80386 model, the 386-16, which runs at 16MHz and costs from £3,199 with a 40Mbyte hard disc. No software is included in the price but Dell will supply DOS 3.2 for an extra £65. EGA-compatible colour systems are also available.

For more information contact Dell Computer Corporation, Farley Hall, London Road, Bracknell, Berkshire RG12 5EU. Telephone: (0344) 863420.

The Dell 386-16.

AT clones from Qubie, Walters and Wyse

WALTERS INTERNATIONAL and Wyse have announced 80386-based IBM-machines, while Qubie and Wyse are launching 80286 models.

The Walters 80386 machine costs £2,500 with a 1.2Mbyte 5.25in. floppy drive as standard. A 20Mbyte hard disc costs £395; 360K 5.25in. floppies and 720K 3.5in. floppies are also available as options. The price includes a monochrome monitor and an 84-key keyboard with the old-style AT layout.

For information contact Walters International, Matrix House, Lincoln Road, Cressex Industrial Estate, High Wycombe, Buckinghamshire HP12 3RD. Telephone (0494) 32751.

Qubie's 80286 micro runs at 10MHz, and is fitted with 640K RAM, a 360K floppy drive and a 20Mbyte hard disc. A high-resolution monochrome monitor and card, and a 101-key keyboard are also supplied as standard. It costs £1,395.

Contact Qubie at 7 Ferrier Street, London SW18 1SN. Telephone 01-871 2855.

Wyse has launched four micros. The 80386-based Wyse PC-3216 is clocked at 16MHz. With a single floppy drive it costs £3,995, and with a 40Mbyte hard disc £4,995. The three new models of the PC-286 family are the 8MHz model 2108, the 12.5MHz model 2122 and the 12.5MHz model 2214. They range in price from £1,395 to £1,795, depending on configuration.

Further information is available from Wyse Technology, 26-28 King Street, Maidenhead, Berkshire SL6 1EF. Telephone: (0628) 70420.

HARDWARE SHORTS

- Computer Marketing has launched a 40Mbyte hard-disc expansion board for the IBM PC and compatibles, including the PS/2 Model 30. The Hardcard 40 occupies only one expansion slot and costs £1,095. Phone (04867) 4555 for more details.
- The TD-400 adaptor card from Metrotel Viewdata Systems enables IBM PC and compatibles to function as teletext receivers and so dispense with the need for a television. It costs £269. Contact (09274) 28573.
- Toshiba has added three portable micros to its range: the T-1000 Portable PC, the T-1200 Portable Desktop and the T-3100FF Desktop Portable AT. More details on (0932) 785666.
- Irwin Magnetic Systems has announced that its range of tape backup systems will be available both as an internal model and as an external subsystem for PS/2 micros. For information phone (010411) 3127030.
- Mountain Computer has introduced three ranges of disc-storage products for the Apple Mac Plus, Mac SE and Mac II micros. The Micro Bernoulli range comes in single- and dual-cartridge versions; cartridge capacity is 20Mbyte. The Filesafe external hard discs are available in capacities ranging from 20Mbyte to 80Mbyte. The Micro Bernoulli Combo units marry removable cartridges with a choice of 20Mbte, 40Mbyte or 80Mbyte hard discs. For further information ring (US area code 408) 438-6650.

Transputer PC boards

MICROWAY has launched the Monoputer, a Transputer-based product designed to use an IBM PC or compatible as a host and filer. The Monoputer runs a 20MHz Transputer processor and has 2Mbyte of RAM. The board is bundled with a full-specification stand-alone Occam 2 compiler. It costs £1,500.

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

WINDOWS-BASED APPLICATIONS ARRIVE

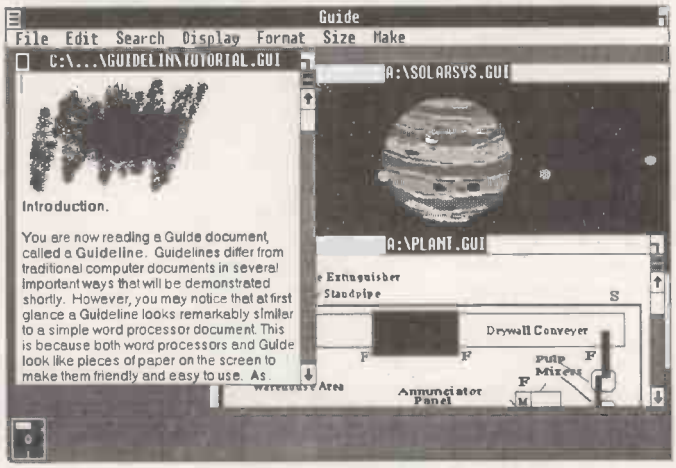
UK SOFTWARE developers have been quick off the mark with software for Windows and OS/2. They include several ambitious products which show off various features of IBM and Microsoft's new operating environments, and some are ready for release.

Blyth software is bringing out Quartz, one of the first database programs designed to make full use of the features of Microsoft Windows and OS/2. Quartz lets you design input forms and reports on-screen, using either the keyboard or a mouse. You control the package by selecting options from pull-down menus or using commands.

You can have up to 60 files open at a time, with a maximum of 12 active on-screen at any given moment. The Windows clipboard lets you move Quartz data between windows into other applications, and you can access DIF, Sylk and ASCII files. Quartz goes on sale priced at £695 for the single-user version.

For details contact Blyth Software, Mitford House, Benhall, Saxmundham, Suffolk IP17 1JS. Telephone: (0728) 3011.

Guide, from Office Workstations Ltd, is another new Windows product that was originally developed for the Mac. This £200 product is something like a cross between a word processor, an outliner and an electronic Filofax, with graphics capabilities thrown in. The basic idea is that you hide detailed text behind key words or phrases that can be expanded at will, as in an outline program. But more than that, you can vary your path through the document in an interactive way.



Guide is an ideal medium for interactive browsing.

To make the concept work properly you need a good screen-based graphics user interface, and the ability to swiftly transfer the large amounts of data involved to and from disc. This makes Guide an ideal application for Windows and OS/2.

For information on Guide, contact Office Workstations, 5 Abbeymount Techbase, 2 Easter Road, Edinburgh EH7 5AN. Telephone: 031-659 6737.

HPS Software Developments has come up with another program it would probably be impossible to do in the old software environment. Termtype emulates the functions of a Hewlett-Packard 2392A terminal, allowing you to link through to a mini or mainframe from your PC.

With Termtype you can have your terminal session going on in one window while other Windows applications remain active on-screen. Under MS-DOS the best you could do was to flip between the host and MS-DOS environments, running them sequentially rather than concurrently.

Termtype also allows you to use Windows facilities like mouse-activated pull-down menus from within the terminal-emulation window. You can use the clipboard to transfer data between your mini or mainframe application and other Windows applications.

Termtype costs £250. For more details contact HPS Software Developments, 196A Whittington Road, London N22 4PD. Telephone: 01-884 6644.

To run any of the packages mentioned in this article you need a copy of Windows. If it is not bundled with your machine it can be obtained from any Microsoft dealer for £75. In case of difficulty you can contact Microsoft, Excel House, 49 De Montfort Road, Reading, Berkshire RG1 8LP. Telephone: (0734) 500741.

SOFTWARE SHORTS

- OS/2 appears to be well inside its schedule. Kits for software developers are being shipped now, a month earlier than expected. Versions for end-users are expected early next year.
- In a direct attack on Borland's Turbo C, Microsoft is introducing its own fast C Compiler. Quick C costs £75 and will be available in September. Contact Microsoft on (0734) 500741.
- Ansa is releasing Paradox 2.0, a full multi-user version of its multi-file database. Paradox 2.0 itself costs £595 and supports one user; the six-user network pack costs a further £795. Telephone: 01-580 4766.
- Macspin is a £189 data-analysis and charting package for the Macintosh that supports three-dimensional charts. Details from Logotron on (0223) 323656.
- Chemword adds scientific features to Microsoft Word or Word Junior. The £200 package lets you add diagrams, formulae and equations. Contact Laboratory Software on (0296) 431234.

Doing DTP the old way

LE PRINT is a £380 desk-top publishing package aimed at people with word-processing experience but who lack the inclination to get heavily involved in new ways of doing things.

Le Print abandons the usual approach to desk-top publishing, and makes no attempt to show on screen what your output will look like: it is not a WYSIWYG package. Instead you enter WordStar-style dot commands into your document, using WordStar or any other word processor capable of producing ASCII files.

For example, to get a centred 24 point headline in Times, you might enter

·FA TIMES
·CH 24PT
·CE ON

Le print recognises these commands and outputs the reformatted and transformed document to your printer.

Unlike most desk-top publishing packages Le Print supplies the founts as part of the package so you do not have to buy them for your printer. It includes 16 distinctive type styles, such as Courier, Prestige and Old English. You can use them in sizes from a tiny 4 point to a massive 200 point, which is a couple of inches high.

While Le Print cannot offer the power and flexibility of packages like Ventura Publisher and Aldus Pagemaker, it offers a straightforward and relatively low-cost route to desk-top publishing that does not require much new learning.

For more information contact Headway Computer Products, Headway House, Christy Estate, Ivy Road, Aldershot, Hampshire GU12 4TX. Telephone: (0252) 333575.

Budget packages

ASHTON-TATE has announced a cut-down version of Framework. The £99.95 integrated package includes a spreadsheet, database, graphics and word processing. Purchasers can upgrade to the full Framework for £350. Contact Ashton-Tate on (0628) 33123.

Samna has also launched a low-cost program aimed at the Amstrad users, this time a cut-down version of the word-processing program Samna Word 4. The new program costs £99 and is called Samna One Word — though one supposes it can handle documents longer than that. Contact Samna International on 01-587 1121.

Concord is a £99 free-text retrieval package. It lets you search through all your existing word-processing documents to pull out chunks of text relating to specific topics. It can cope with most databases and email too. Details from Bytesmiths on (0277) 211490.

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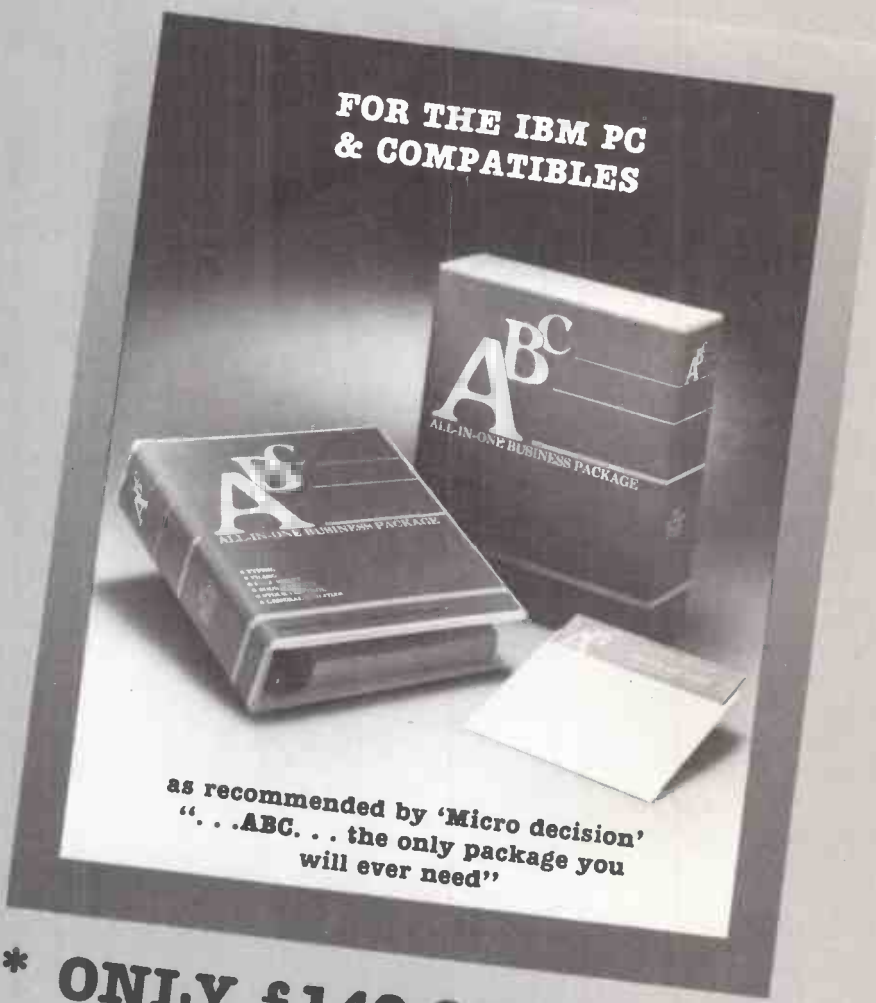

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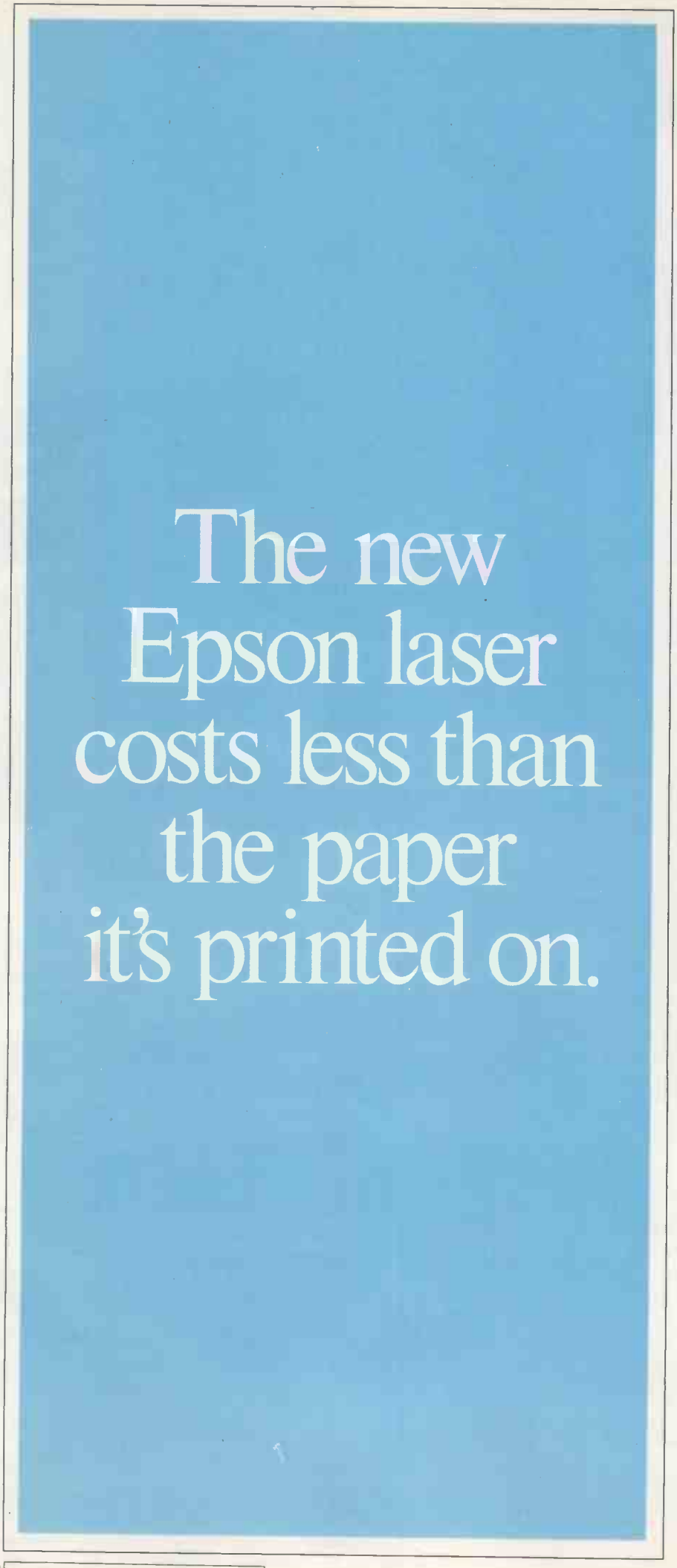

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The new laser printer costs £1,795 (ex VAT). The paper it's printed on here costs us nearly twice as much.

(Expensive stuff this advertising lark.) But we reckon it's worth it.

Particularly since this is the only laser printer you can buy with easy-change IC font cards.

What are they? They're unique to Epson. They're about the same size as your credit cards. They slot into the laser and each gives you a variety of fonts extra to the seven we've already built in.

So you can build up a library of them and never be constrained to just printing in the typeface your software package offers again.

Now then, if you're replacing a daisy wheel, sick of the racket your old printers make, need to print really fast, like to use graphics, fancy flexible fonts or have simply never yet found the printer that makes things look as stunning as you want them to, you want our new laser printer.

Right then, here it is, the new Epson GQ3500 (don't we give them pretty names?).

Two easy-change font card slots; seven resident fonts; prints six A4 pages in sixty seconds; 300DPI graphics; 640K memory; SelecType push-button controls for choosing paper size, line spacing, print modes, number of copies portrait or landscape images and all that kind of stuff; IBM compatibility; prints on any standard paper, envelopes or OHP foils.

What are you waiting for? A bribe?

Oh, all right then, buy the new Epson laser and get an HP emulation IC card as standard, absolutely free (normally you'd have to pay us £125 for one).

Now, please fill in the coupon very carefully. There's about a hundred and fifty quids worth of paper there. Don't waste it.

Best hundred and fifty quid you've ever spent, Epson. Send me details of your new GQ3500, quick.

Name _____ Position _____

Company _____

Address _____

PC 08/87

To: Epson (UK) Ltd., FREEPOST, Birmingham B37 5BR; alternatively call up Prestel *280# or dial 0800 289622 free of charge.

EPSON

Hotline for Amstrad

A TELEPHONE hotline service for the Amstrad 1512 and PCW ranges is available to all buyers of these machines from Dixons. It is provided by Small Business Support and costs £39.99 for a year.

For this sum, subscribers will be entitled to telephone support and free membership of the One to One electronic mail service. It also gives access to other services of the group. For further details contact Small Business Support Group, Bank Buildings, Kennel Lane, Broadway, Worcestershire WR12 7DP. Telephone: (0386) 852641.

APPLE AND TOUCH IN CO-OPERATIVE DEAL

APPLE has announced that it is taking a minority investment in the company Touch Communications, and that together they will be developing Open Systems Interconnect (OSI) networking software products for the Macintosh family. The first Mac implementation of the Touch OSI products will be available by the end of this year.

This marks another step along the road of integrating the Macintosh with existing products from other manufacturers. In particular it will allow Macintoshes to access IBM and DEC equipment. Touch Communications is based in Scotts Valley, California, and was founded in March 1985.

Lotus Development has announced a tie-up with Telerate to develop products for the financial-services industry. Telerate claims to be the leading supplier of real-time fixed-income and foreign-exchange data. A special data feed will be set up for financial analysis and modelling, which can be taken up by 1-2-3 directly. This is Lotus's second foray into the world of specialist products for the financial sector. Recently it launched One Source, a regularly updated CD-ROM of financial data which can be fed into 1-2-3 spreadsheets.

Lotus has reported record figures for its first quarter. Sales rose 22 percent to $85 million, and profits rose 20 percent to $13 million. As well as strong sales of 1-2-3, the Japanese version of the product has been doing well: it was the top-selling PC software package in Japan for the last six months.

Media conversion

THE DX-3 can convert between 1,000 different floppy-disc formats. They include 3in. Amstrad discs, 3.5in. floppies, 5.25in. floppies and even 8in. floppies. A huge number of different formats and sectorings are also catered for.

The system is based on a Gemini computer and costs £7,950. Further details from Timeclaim Ltd, Tanyard House, Station Road, Woodbridge, Suffolk IP12 4AU. Telephone: (03943) 6616.

Comprehensive PC insurance policy

CORNHILL INSURANCE is offering an insurance policy for users of business systems — from micros to minis — which covers software as well as hardware. Called Computer Cover, it provides cover for most risks to all elements of a system, as well as consequential loss due to disruption of business.

It insures against accident, malicious causes, fires, storm, water damage and theft. Also covered is the cost of breakdowns excluded by maintenance agreements — for example, those caused by power failure or operator error.

Damage and breakdown cover includes the cost of any necessary temporary repair and costs of fast permanent repair, as well as debris removal and consultants' fees. Software is covered automatically at any location or in transit. The policy covers the increased costs of working while the system is out of action, and the cost of recovering lost data and the purchase of replacement programs.

For further information contact Cornhill Insurance plc, PO Box 10, 57 Ladymead, Guildford, Surrey GU1 1DB. Telephone: (0483) 68161.

Macsentry alarm system

MACSENTRY looks like a hard disc which sits under a Macintosh Plus or SE. If the unit or computer is moved, it emits a loud high-pitched signal which can only be turned off by using a security key. The unit is powered by batteries which last for around nine months. It costs £89.95.

Macsentry is available from Macsoft, Bridge House, Wellington, Somerset TA21 0AA. Telephone: (082347) 3625.

Reuters buys up database firm

REUTERS has bought I P Sharp Associates for £29 million. I P Sharp was founded in 1964 and has become one of the leading on-line database companies. This move marks a further diversification of the interests of Reuters, and a significant strengthening in the business services market.

Another sale in the world of communications is that of One to One by Comtext International. One to One has become established as one of the three main electronic mail providers in the UK. Comtext already owns BFT Communications, a company involved in telex.

Computer-produced tax forms

THE INLAND REVENUE has announced that it is prepared to accept computer-produced tax forms, though only in hard copy at the moment. The forms must provide the same information as official returns, be recognisable as such, and bear the correct reference number. They must have Inland Revenue approval before they are used. The first year for which they can be used will be returns for 1988/89.

Compsoft competition

COMPSOFT has announced a competition for users of its Delta database package. The top prize will be a holiday for two in Florida; the two other prizes will be European Weekend Breaks. Users of any Delta products — Professional Delta, Professional Delta-Net and Delta 4 — are eligible. The closing date for entries is 31 August.

Further details from Compsoft, Compsoft Manor, Farncombe Hill, Godalming, Surrey GU7 2AR. Telephone: (04868) 25925.

NEC Multispeed warranty

NEC has announced that the Multispeed portable PC and APC-IV Powermate will both now come with a full three-year warranty on all electronic and mechanical components, including disc drives. Details from NEC Business Systems (Europe) Ltd, 35 Oval Road, London NW1 7EA. Telephone: 01-267 7000.

The Altos '87 Show. Wembley September 16th-18th.

DISCOVER THE SECRET OF SUCCESS AT THE ALTOS '87 SHOW ABSOLUTELY FREE.

Finding effective solutions to business problems is the secret of success. It's also the theme of Altos '87, Wembley Conference Centre, 16-18th September.

At the show, you'll have the opportunity to see how some of those solutions could be made to work for your business. We'll be demonstrating a whole range of application software that can be tailored to your specific business needs.

We'll also be staging a series of business seminars with guest speakers from different areas of industry, covering everything from choosing a system through to multi-user systems for the corporate user.

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One good idea leads to another.

The Macintosh Plus

The Macintosh SE

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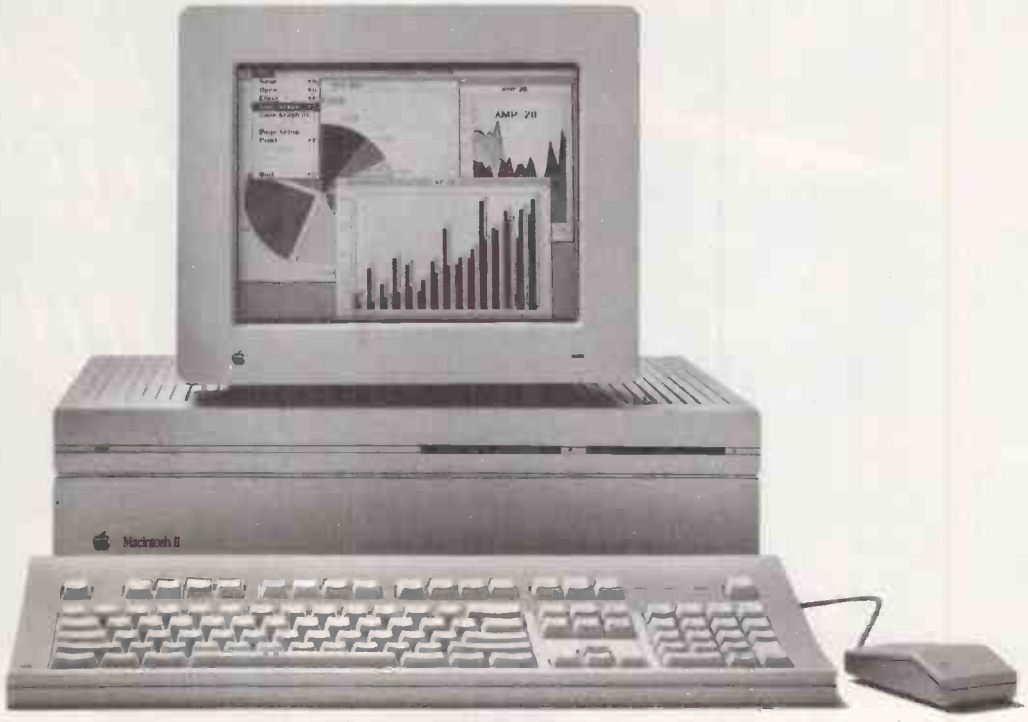
And another.



The Macintosh II

In 1984, Apple introduced the Macintosh™ A computer based on the idea that people shouldn't have to work the way computers work. Computers should work the way people work.

In 1986, the introduction of the Macintosh Plus established Macintosh as the new standard in personal computing.

Which of course led to yet another great idea.

The Macintosh SE. The next step in the Macintosh evolution.

The Macintosh SE combines the same intuitive graphic interface of the Macintosh Plus with many of the technological enhancements corporate customers have been asking for.

Like a second 800K internal drive.

Or a built-in 20 megabyte hard disk with a single 800K internal drive.

The Macintosh SE comes with a full megabyte of internal memory that can be expanded to four megabytes.

There's an expansion slot to customise the Macintosh SE to your specific needs.

So you can add a card for a disk drive that lets you work with documents created on an IBM or IBM compatible PC. Or a card that enables your Macintosh SE to communicate through non-Apple networks to host mainframes.

Of course, the Macintosh SE runs all your Macintosh programs. Only faster. And, because it's a Macintosh, you'll never have to become a computer expert to use it.

In addition to the Macintosh SE, Apple proudly introduces the Macintosh II.

A computer so powerful and so flexible it challenges the very definition of what a personal computer can be. And do.

Inside the Macintosh II resides a new microprocessor. The Motorola 68020.

Which takes you through virtually every Macintosh program at four times the speed of a Macintosh Plus.

The Macintosh II also boasts a new coprocessor which enables it to perform mathematical calculations at two hundred times the speed of the Macintosh Plus.

But the biggest news is the Macintosh II's open architecture, with six expansion slots that allow you to customise your Macintosh to serve virtually any function you can imagine.

Internally, the Macintosh II offers you more memory options than a politician. From one to eight megabytes.

And although our internal forty megabyte hard drive is probably sufficent storage for most users, you can employ an internal drive of up to eighty megabytes.

The Macintosh II offers you a choice of viewpoints. A thirteen inch colour monitor or a twelve inch black and white.

Today, the Macintosh II will satisfy the needs of the most power hungry business user, scientist or engineer.

Tomorrow, it will also lead the way into startling new technologies. After all, one good idea inevitably leads to another.

Please send me more information about the new Macintosh range. Post to: Apple Computer (UK) Ltd., FREEPOST, Information Centre, Eastman Way, Hemel Hempstead, Herts. HP2 4BR or dial 100 and ask for Freefone Apple.

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XEROX 4045 (left)

This compact Laser/Copier Printing System sets new performance standards – 10 pages per minute, excellent typeset quality with 22 fonts per page, plus font switching and downloading. Variety of interfaces and emulation modes allowing the printing of most Diablo 630 and Xerox 2700 applications.

HEWLETT PACKARD LASER JET (front)

A compact, quiet Laser Printer for the desk top environment. Printing 8 pages per minute in true letter quality text with multiple fonts. Extended memory allows downloadable fonts, forms and increased graphics capabilities. Compatible with most P.C's.

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DOCUMENT TECHNOLOGY DL 20 (back)

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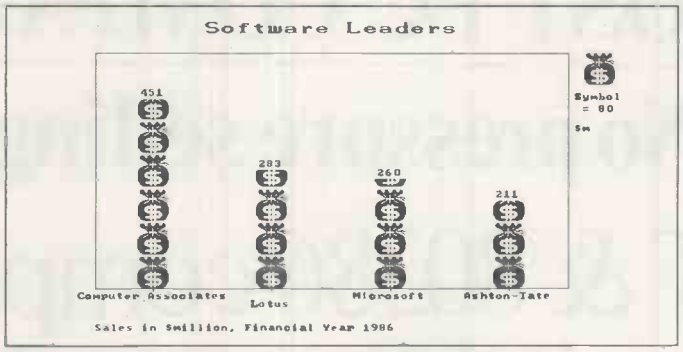
NEC ahead in monitors

NEC now commands 14 percent of the UK market for 14in. colour monitors, according to Romtec. Microvitec is in second place with 19 percent, with Taxan third at 12 percent and Tatung fourth with five percent. Romtec concludes that the arrival of NEC's Multisync monitor, which can handle most types of display card, has triggered very rapid growth in the market as a whole.

Backup units are doing well

SALES of backup storage devices are doing well in the US, according to Frost & Sullivan. The company predicts an annual growth in unit shipments of 23 percent in the micro sector, fuelled by falling prices. The main factor behind the demand is the need for data security.



LOTUS IS PUSHED INTO SECOND PLACE

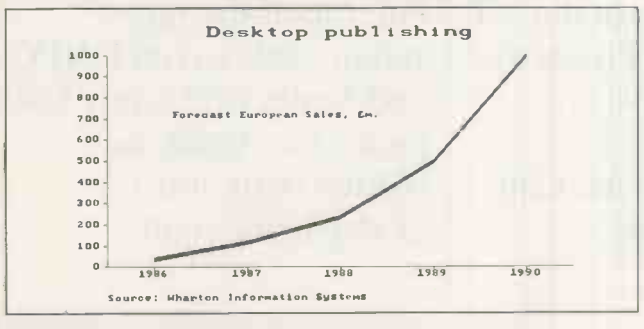
A MERGER between Computer Associates, best known for Supercalc, and UCCEL, a mainframe software company, has changed the league table of software companies. Computer Associates is now a long way ahead, trailed by Lotus and Microsoft, who are neck and neck.

All the leading software companies are American and, interestingly, the top four are all involved in micro software. The next six positions in the top 10 are exclusively mainframe or mini companies.

Fax takes over Telex role in UK

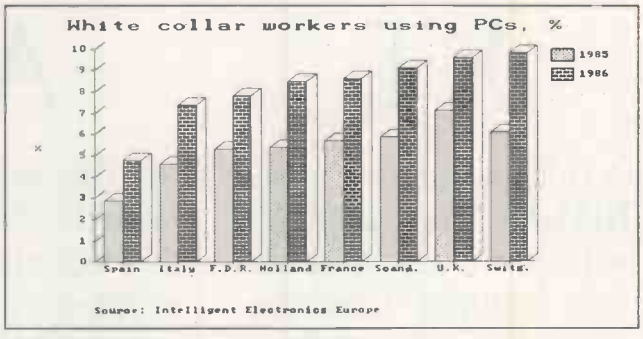
FAX is taking over from telex in the UK. This is the only conclusion possible from a report by International Resource Development Inc. At present the installed base is about the same, at 100,000 units each, but fax outsold telex by over 10 to one in 1986.

The projection is that by 1991 fax will outsell telex by a factor of 15, with telex sales actually falling in volume terms. All the equipment is coming from Japan according to IRD, which comments: "As in the US, the domestic vendors just can't compete with the Japanese on price and features."



DTP gaining ground

SALES of hardware and software for desk-top publishing (DTP) are set to grow to nearly £1 billion by 1990 in the European market as a whole. A study by Wharton Information Systems sees most of the growth occurring in stand-alone systems, although by 1990 multi-user installations will account for about one-third of the total.



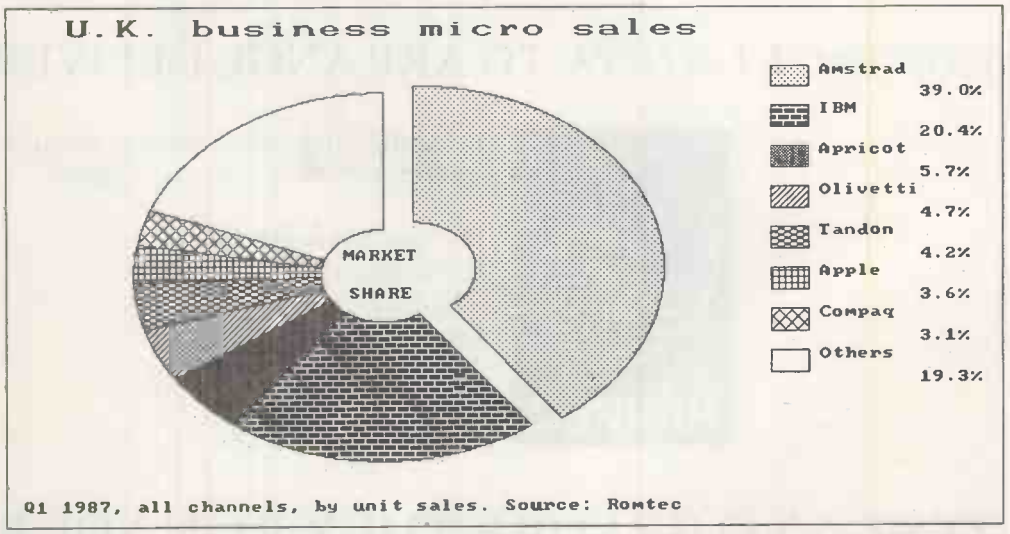
Plenty of scope for expansion in Europe

THE EUROPEAN PC market is still far from saturated, according to a study by Intelligent Electronics Europe (IEE). So far, less than 10 percent of white-collar workers use PCs.

Top European vendor by volume, according to IEE, is IBM, with Olivetti, Apple and Commodore the only other companies to have shares over 4 percent. These figures relate to the calendar year ending December 1986, before Amstrad had time to make an impact.

Amstrad almost reaches 40 percent share

AMSTRAD is doing very well in the UK business micro market, according to Romtec. The market-research company's latest figures are for the first quarter of 1987, and cover all distribution channels: High Street retailers, office-equipment dealers, micro dealers and distributors, and direct sales by the vendors themselves.



Charts this month were prepared with Stella, a low-cost IBM graphics package available from Macbyte, telephone 01-848 0152.

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Our top-of-the-range system, able to run UNIX and Xenix with a very fast processor. Again, no hidden costs and a 28-day-trial option.

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The data protector.

(A SOFTWARE LOCK ON YOUR MICRO OR NETWORK)

Is 'personal' data on your micro secured in accordance with the Data Protection Act? Is sensitive data secure on your micro?

If the answer to either of these questions is NO then you need CLAM from MICROFT TECHNOLOGY. CLAM, as the name implies, provides a software 'shell' around your computer to prevent unauthorised access to programs and data. It can be used to protect either individual files or subdirectories or both. Each copy of CLAM includes a copy of Microft's popular menu generator MENUGEN, so that users, if required, can be presented with a friendly menu interface.

On starting the computer users are asked for a password. They will then be presented either with a menu or the normal DOS prompt. In either case they will only be able to access those files and subdirectories for which they have authority.

Files are protected using 'Dynamic File Encryption'. Under this technique the files are held on disk in a permanently encrypted form. When an authorised user reads the file the data is automatically decrypted by CLAM after it is read from the disk but before it is given to the user. The time taken is imperceptible. When a file is updated the data from the user is automatically encrypted before it is written. This is the only failsafe way to secure data.

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

CLAMNET, the network version will run on all PC/MS DOS based networks. The cost is £580 + VAT per ten or part of ten workstations on the network.

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

MAIN FEATURES

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

CLAM

THE DATA PROTECTOR

There are now over 10,000 users of Microft products worldwide.

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BY RAY COLES

FOR YOUR EYES ONLY

DEDICATED CHIPS ARE NOW AVAILABLE TO HANDLE THE CODING OF SENSITIVE INFORMATION SO THAT IT CAN BE TRANSMITTED IN SAFETY ALONG OPEN DATA LINKS.

The electronic encryption and decryption of sensitive data is no longer restricted to the top-secret domain of the CIA, GCHQ and Smiley's people. The incorporation of relatively simple and inexpensive encoding chips into ordinary PC systems can now help to protect any organisation's sensitive data from the illicit probings of Smersh, Spectre and commercial competitors bent on industrial espionage.

The need for data protection has never been higher. Vast amounts of potentially sensitive data now stream through national and international communications channels on easily intercepted microwave and satellite links.

Electronic funds transfer at point of sale (EFTPOS), bank cash dispensers, on-line credit enquiry systems, facsimile machines, mainframe computer modem links and even local area networks — they all carry data considered private by the owners. All are potentially vulnerable to the electronic eavesdropper, and passwords provide only limited protection. Even schoolboy hackers can find a way into most systems given time. Once entry has been gained, communication continues in plain language.

To provide protection from all but the most determined and sophisticated of snoopers, some form of data-encryption scheme has to be employed. With the benefit of today's dedicated coding chips and ingenious encryption algorithms, this is a straightforward matter. But it would be unwise to think that data transmission can ever be completely secure. The protection provided even by the most modern of techniques does have to be questioned.

In the Second World War the Germans relied almost exclusively on the Enigma coding machine for the protection of secret communications. They were confident that even if the Allies captured one of the machines they would never be able to decode messages unless they knew the regularly changed master key. As it happens, an early Enigma machine was passed to the British by the Poles. Before long the Bletchley Park cryptanalysis team learned how to break the codes using the first electronic digital computer, which was known as Colossus.

The Colossus machine was developed by a team which included Alan Turing. It used 2,000 valves and stored information on punched paper tape. Several Colossus machines were operational by the end of the war, and most of the top-secret German signals traffic was decoded. This operation, known as the Ultra secret, was a major contribution to Allied success. It was so sensitive that it was not declassified for over 30 years.

Research into the development of new codes and the development of new code-breaking techniques has continued ever since behind the locked doors of government security agencies. Yet it is unlikely that the goal of a completely secure coding scheme can ever be achieved with confidence.

The most secure systems are reserved for highly sensitive diplomatic and military use, but other potentially less secure systems have been made available commercially. "Less secure" in this context refers to the amount of computer time needed to crack a single message. In theory the eavesdropper must start from scratch every time the key is changed. Protection is therefore often measured in terms of years of mainframe computer time, but with the constant worry that someone will develop a short-cut algorithm of which the code designers themselves are not aware.

Another pitfall is the danger of interception of the secure message before it has been encoded. Data sent to a monitor screen, for example, is in serial form and generates significant radio-frequency emissions, which can be intercepted by nearby monitoring stations. To overcome this bypass problem, sensitive military data is only handled on approved equipment which has been carefully screened and tested to ensure that radiation has been minimised.

The level of protection available for commercial data is inferior to that used for government applications, but there are several schemes in use which should be adequate for everyday data security. The most widely known coding technique is the Data Encryption Standard (DES) developed by IBM and approved by the American National Standards Laboratory in 1977 At least four chip manufacturers supply devices which will encode and decode DES data.

The DES requires both the sender and the recipient of the message to use the same key, which it splits into two parts. The master key is changed relatively infrequently, while the session key can be changed for each message.

To maintain key synchronism between the two ends of the link, the session key is encoded using the master key and is sent over the link before the message itself. Physical transmission of the master key is still necessary from time to time, and that is both troublesome and potentially hazardous. The DES operates in any one of three different modes, depending on the application and the required level of protection. It is suitable for encrypting and decrypting data files within a system — to prevent unauthorised use for example, and for protecting data-communication links to a remote site.

Chips which implement the DES scheme work on 64-bit blocks of data, encoding and decoding them by means of a 56-bit key. One of the first implementations was the Intel 8294 device, which appeared in 1978. This chip was intended to be connected to the data bus of an eight-bit microcomputer like any other peripheral device. It was capable of an 80 byte per second conversion rate. More recent devices operate at higher data rates. They include the WD-20C03 from Western Digital, the T-7000 from AT&T and the AMD-9568 from Advanced Micro Devices.

One of the neatest cryptographic schemes of all is the RSA public key/private key system. It is named after Professors Rivest, Shamir and Adelman of MIT, and is unique in that it does not require the physical exchange of key data before you establish a communication link. In fact, anyone who is suitably equipped and who has access to the public key directory can send a secure message to anyone else in the directory.

The scheme uses a key which is computed from two very large prime numbers. One of the numbers is represented by the private portion of the key, the other by the public portion. To send a message, the originator encrypts the text using their private key, then encrypts their originator signature using the public portion of the addressee's key. On receipt, the addressee uses his or her private key to decode the identity of the originator so that he or she can look up the originator's public key, which is then used to decrypt the main message.

The combined public/private key length is such that it would take many millions of years of computer time to find the right combination, using the best of known mathematical techniques.

Unfortunately, the precise manipulation of the large numbers required in the encryption and decryption process makes this technique slow and difficult to implement in hardware. This in turn makes its use for high-speed data links unattractive. However, with suitable disc-file buffering for encryption and decryption, the RSA might be just the thing for sending love letters over the Telecom Gold. PC

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BY JACK SCHOFIELD

TEXT DIRECT

BRITISH TELECOM'S NEW TELEXING SERVICE IS AIMED AT BRIDGING THE GAP BETWEEN THE OLD TELEX SYSTEM AND ELECTRONIC MAIL.

Most people seem to find it difficult to adapt to change, and there is often a sort of halfway house which bridges the old and the new. Early horseless carriages, for example, looked like the horse-drawn variety, while the first television sets were just like wirelesses with small picture tubes built-in. British Telecom is probably being sensible, therefore, in launching a new system called Text Direct which bridges the gap between the clanking old telex system and real electronic mail like Telecom Gold.

Text Direct provides every subscriber with a unique telex number and a way to send and receive telexes, but without the added cost and delay of installing a dedicated telex line. Where a telex line costs £88 to start and then £88 per quarter, Text Direct costs only £20 to join and then £25 per quarter. British Telecom can sign you on to the service almost immediately.

With Text Direct you do not need to spend over £1,000 on a telex machine. Telexes are transmitted in the modern way, from your desk-top micro via a modem. Anything that can send an ASCII file down the phone line will do — a smart electronic typewriter or Tandy 100-type lap computer or any old supermicro.

Of course, telex users expect their communications system to be awkward to use, and here Text Direct will not let them down. Logging in is the first requirement. Rather than break new ground with, say, a Linkline number, or even provide a common group account like the one supplied to all Telecom Gold users, Text Direct expects you to get your own Packet Switch Stream (PSS) data communications account and password. The alternative is to dial long-distance to the Text Direct computer in London.

Having loaded your communications software you wake up your modem and dial the local PSS node. You enter two Carriage Returns, your terminal code — D1, for example — and another Return. Then you enter your Network User Identity (NUI) such as

NWHIZCO123XYZ

and the Network User Address (NUA) of Text Direct, which is

A212303019

Assuming you have got these 20-odd keystrokes absolutely right — you are not allowed backspaces or corrections — you are greeted by the Text Direct front end which says, vibrantly,

Please login

Having got this far, Text Direct still has no idea what business you might be about, so you have to type

LOGIN

to tell it that you plan to log in. Now, at last, you can enter your identification such as

WHIZCOMP

followed by your password.

Text Direct then gets positively prolix:

```
Welcome to Textdirect
Previous logout : 1 JUL 87 19:45
Unread messages : 4
Total messages : 4
Storage : 8 kilocharacters
:-
```

leaving you to guess what to enter next. Try Read and its says

Filename:

but of course you do not know what a file name is. So you enter Return, assuming an intelligent system will provide a list, but all it says is

: Not found

After a quick dip into the manual you try typing in

SCAN UNREAD

and take it from there.

Sending and reading unread telexes is actually quite easy, though it is certainly no easier than in either Telecom Gold or Mercurylink, formerly Easylink. The main drawback is the way Text Direct reformats your outgoing message, ignoring Returns you have entered and line spaces.

Text Direct converts everything into one

(continued on page 30)

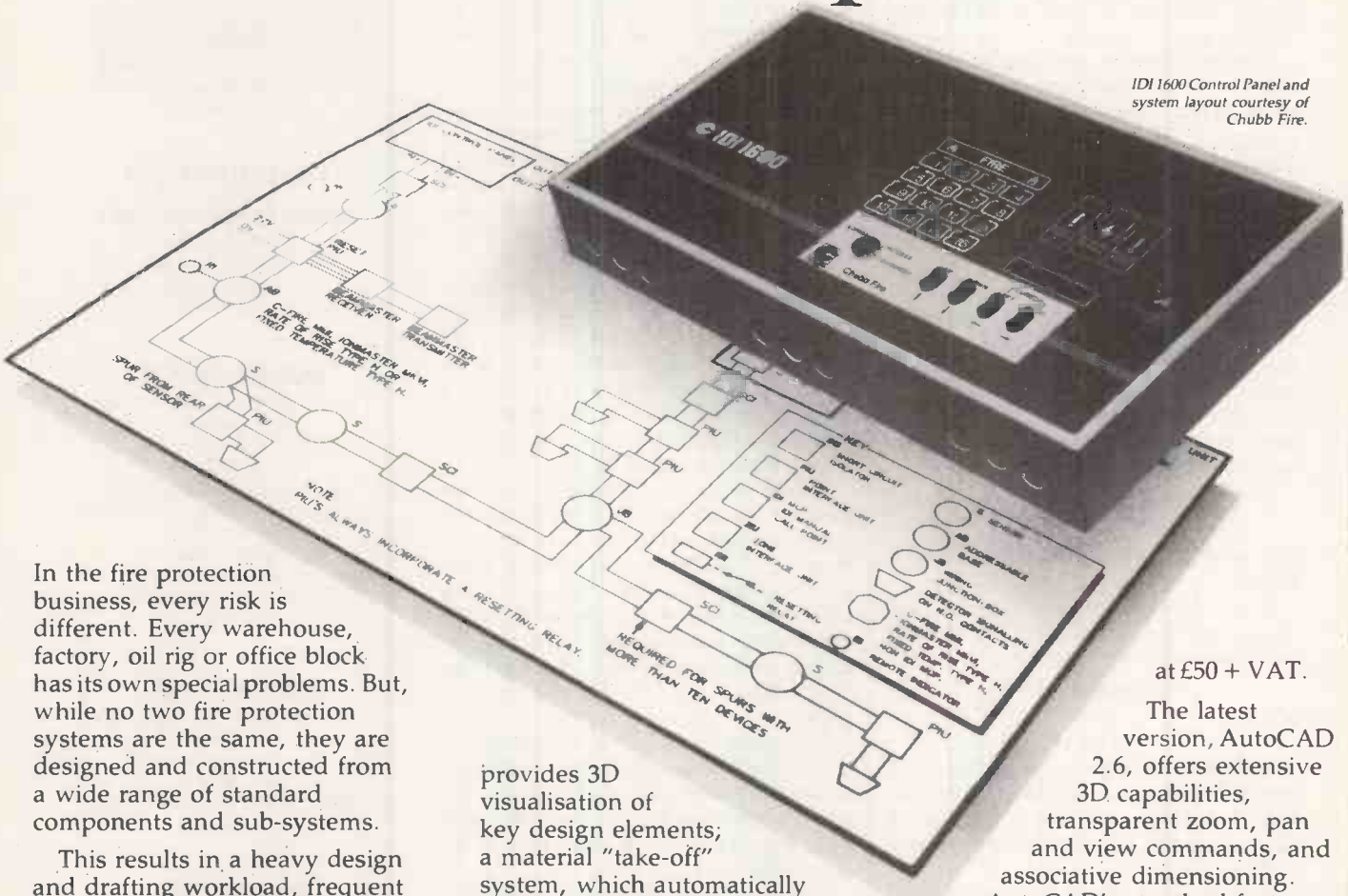
A TEXT DIRECT SESSION

```
:-LOGIN
Enter identity : SCHOFIELD
                 0000000000
                 XXXXXXXXXX
Enter password :
Welcome to TextDirect.
Previous logout : 01 JAN 80 00:00
Unread messages : 0
Total messages  : 0
Storage         : 0 kilocharacters.
:-se
To : 265451
To :
Filename or RETURN to enter text :
Enter your text terminated by ++++<RETURN>

REF 83:JNL020

Dear Jack,

This Telex is being sent to you by British Telecom's new system
called Text Direct. It is in upper and lower case, and has a
carriage return (inserted every 65 characters or less) embedded
in the text. Here are a few interesting telex characters:

Pounds £
Dollars $
Exclam !
Double quotes "
Square brackets []
Angle brackets <>
The at character @

Let's see how this arrives - and when.

Regards
```

THE MESSAGE RECEIVED

```
REF 83:JNL020   DEAR JACK,   THIS TELEX IS BEING SENT TO YOU BY
BRITISH TELECOM'S NEW SYSTEM CALLED TEXT DIRECT. IT IS IN UPPER AND
LOWER CASE, AND HAS A CARRIAGE RETURN (INSERTED EVERY 65 CHARACTERS
OR LESS) EMBEDDED IN THE TEXT. HERE ARE A FEW INTERESTING TELEX
CHARACTERS:   POUNDS £ DOLLARS ? EXCLAM ? DOUBLE QUOTES ? SQUARE
BRACKETS () ANGLE BRACKETS ?? THE AT CHARACTER
   LET'S SEE HOW THIS ARRIVES - AND WHEN.   REGARDS
```

How AutoCAD helps Chubb Fire keep control

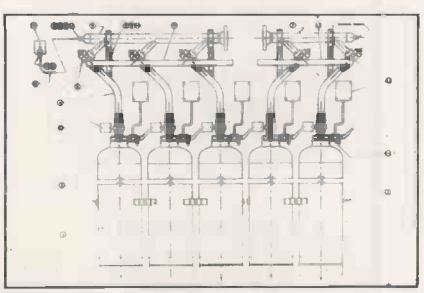


IDI 1600 Control Panel and system layout courtesy of Chubb Fire.

In the fire protection business, every risk is different. Every warehouse, factory, oil rig or office block has its own special problems. But, while no two fire protection systems are the same, they are designed and constructed from a wide range of standard components and sub-systems.

This results in a heavy design and drafting workload, frequent revision, and a high output of drawings for both clients and regulatory authorities.

That's why Chubb Fire, one of the world's leading fire protection equipment manufacturers, decided to implement a computer-aided design system based on AutoCAD.



Over a three-year period, Chubb Fire has progressed to a multiple-workstation system which handles all drafting and design work, including design revisions. It also provides 3D visualisation of key design elements; a material "take-off" system, which automatically generates lists of materials required to fulfill a specific design; a materials management system and job costing.

Chubb Fire's comprehensive design and materials management system is one of thousands of examples of how AutoCAD is making a major contribution to design efficiency in applications ranging from architecture to robotics, in companies both large and small. Today, more than 80,000 installations worldwide, and over 6,000 sold in the UK, have established AutoCAD as the international standard for CAD on personal computers.

AutoCAD runs on more than 30 16-bit and 32-bit microcomputers, supports more than 140 peripheral devices for input and output and costs just £2,500 + VAT. A demonstration version is available at £50 + VAT.

The latest version, AutoCAD 2.6, offers extensive 3D capabilities, transparent zoom, pan and view commands, and associative dimensioning. AutoCAD's standard features include an unlimited number of layers, comprehensive editing facilities, and a complete internal programming language, AutoLISP. AutoCAD is now even faster and easier to use, and more responsive to your drafting and design needs than ever before.

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• ON-LINE •

(continued from page 28)

long piece of spaghetti, which is a disaster if you are trying to send a carefully formatted table. The only amusing aspect of this is the way the Text Direct software handles lines longer than regulation telex width. As you upload, it deletes the overflow and reprints it, starting on a new line.

As on most systems now, you can build up a library of telex addresses to make sending telexes easier, using the form

ENTER: SE <ADDRESS FILE NAME>
<MESSAGE FILE NAME>

This is almost exactly the same as using short codes on Telecom Gold

COMMAND: SE <FILE NAME>
<SHORTCODE>

The real problems with Text Direct start when you want to read and delete stored messages. Instead of entering sensible file names like PCOM8708A or whatever for my uploaded telexes, I foolishly let the system create them. Each telex resulted in two names of the hideous format

s2124apr12.ADR:OLD
s2124apr12.TXT:OLD

and getting rid of them was extremely tedious.

If you have sent a dozen telexes, you might have two dozen files. On Telecom Gold you would just type

TELEX DEL SENT

or

DEL 1-12

in Scanned Mail, or you could batch delete a bunch of files using the Delp command. With Text Direct you have to type in each file name in full and confirm that you want to delete it.

On Telecom Gold, received telexes simply appear in your standard mail tray, which means each one ends with the prompt

Action required:

You can then type Del or Save or File, or simply enter a Return and leave the item on file. Deleting a telex you have read on Text Direct shows how picky the software is. The system asks you whether you want to delete the file, offering you yes/no options. Typing Y or y if you want to delete will not do; only the full Yes will do.

Where the Telecom Gold software copes quite well with the restricted telex character set, Text Direct barely even tries. It does transmit "£5" as it stands, whereas Gold converts it into

POUNDS 5

But where Gold changes $5 into

DLRS 5

Text Direct just puts ?. Where Gold converts a double quote into two adjacent single quotes, an exclamation mark into a full point, and the angle brackets into .LT. and .GT. — which means you can restore them using search and replace on your word processor — Text Direct simply changes them to ?, ? and ??, which is considerably less useful. Nor does Text Direct provide Telecom Gold's on-line editing and filing software.

Nevertheless, there are a few good things to be said about Text Direct. The system does work well. The Stratus 68000-based mini — IBM sells the same thing as the System/88 — is fast, and telexes are despatched within a few minutes. By contrast, Gold users have sometimes found their Prime superminis unresponsive and slow to get telexes out; in exceptional circumstances the delays have been hours. However, this could be because Gold is a success, while I used Text Direct when it was too new to have more than a handful of users. Only when Text Direct fills up will we find out if it is really any better.

Text Direct's neat box of documentation, produced by Baddeley Associates of Cambridge, is superb. However, Telecom Gold has also just released excellent new documentation. Gold's new *Quick Guide*, a readable 96-page ring-bound manual, is now being supplied to new users, though old ones have to pay £4 for it.

Pricing of the two systems is also comparable. Text Direct is a touch cheaper at 10p per minute compared to Gold's 11p. However, Gold offers an off-peak 3.5p per minute, while Text Direct has no off-peak reductions. Gold is also cheaper for light users, since it has dropped the £10 per month minimum charge, whereas Text Direct has a £25 per quarter standing charge.

Given that Text Direct is even less easy to access than Telecom Gold, that its software is even more unfriendly, that the system as a whole is less versatile, and that it probably costs more for many people, what is the point of it?

First, Text Direct provides every users with an individual telex number of the form

9312100099=TD G

This is not as nice as a proper telex number and answerback, but it is better than Gold's bureau service, where the sender has to remember to put your mailbox number in the first line of text.

Second, Text Direct is not aimed at Telecom Gold at all. In my opinion, Text Direct is targeted against the very similar Mercury Link service, which is hopeless as an electronic mail system but provides a quick and easy way of sending telexes.

Finally, and most cynically, it could even be — as I hinted to begin with — that Text Direct is accurately targeted at business users for whom real electronic mail — which is only five to 10 years old — is too futuristic. If you have any better ideas, I am on 255451 or 265871(MONREF G) . . . but please remember to put REF 83:JNL020 in the first line of your telex.

Text Direct is on 01-936 2468 or Freefone Text Direct. The computer is on 01-720 1177 for 300 baud, 01-720 5545 for 1,200/75 baud and 01-720 2011 for 1,200/1,200 baud users. The PSS NUA is 234212303019. PC

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Q Is there any way of altering WordStar's default values in the questions which appear after the Print command? I want to change the default value of the question "Pause for paper changes between pages (Y/N)?" from no to yes, as I normally use single-sheet stationery.

PETER WARING SMITH

A It is much more convenient — and quicker too — if the default can be taken, since you can simply type P to print the document, give the filename and press the Escape key. Printing then starts without you having to answer the questions.

The default values for all of the questions about printing can be changed. First run Install or Winstall and get to the patcher routine by typing + in reply to the question "Are modifications complete?". Then examine the contents stored at the location Podblk. The default answers to all the printer questions are stored in the next four bytes. These bytes either contain 00, which corresponds to a default of no to the question, or FF, which corresponds to a default of yes.

The contents of the byte at Podblk refer to the question "Disk file output?". Again 00 means no and FF means yes. You may alter the value as appropriate. The next byte at Podblk + 1 contains the default answer to the question "Use form feeds?". The next byte at Podblk + 2 refers to the question "Suppress page formatting?", and Podblk + 3 refers to the question "Pause between pages?" Finally, you may care to patch the contents at location Nouff. The contents will probably be 00, which means print the message "Use form feeds?". If you patch this to any non-zero character such as FF, this message will not be displayed.

You should always made a backup copy of WordStar before attempting to patch the program, since a mistake could be expensive.

MS-DOS DATE IN ENGLISH FORMAT

Q A recent visitor from the support company for our XT was rearranging the Autoexec.Bat file to change the prompt and to tart up the display. He discovered a rogue file called Autoexec with no extension, as well as the Autoexec.Bat file. We do not know why, but the rogue file could not be edited. The normal Autoexec.Bat file now works as expected, except that on power-up the system uses the American mm-dd-yy date format, whereas before these changes it used the dd-mm-yy format. How can I get back to the good old English date?

J O SIMPSON

A We suspect that your colleague replaced the Command.Com file that you were using previously, and the new copy expects American dates while the old one accepts English dates. We do not understand what the file labelled Autoexec is trying to do, but it would not be used anyway unless it was renamed Autoexec.Bat. The fact that you cannot edit it suggests that the file attributes have been set to make the file Read Only so that it cannot be edited or deleted by accident. You can check the file attributes with the command

ATTRIB filename

and if necessary you can remove the read-only attribute with the command

ATTRIB –R filename

You can then edit or delete it in the normal way.

We too dislike the American date format of mm-dd-yy used by default on the IBM PC, and there are several ways to get it to use the English arrangement. If you are using PC-DOS version 2.1 — as opposed to MS-DOS version 2.1 — you can produce a new working copy with a changed date format. When you run the IBM Master disc to produce a new working copy on another floppy disc, it will ask you which date format you wish to use. It actually alters the Command.Com file. Boot up the new floppy and type Dir. If the dates that the files were written on are displayed the way you require, copy Command.Com from this floppy on to your hard disc, thus overwriting the one already there. From then on, the English date will be displayed when you boot from the hard disc.

If you are using MS-DOS you are not given this choice of date format. I expect that you have an extra memory board in the computer. If the board contains a battery clock you should be able to read the date and time automatically when you boot up. If this is so, you will not be asked to type the date and time when you boot up, so the order of the terms that you normally would have to type in is not relevant.

You can patch the Command.Com file using the Debug program to make the dates shown when you do a Dir listing appear in English format. Type the command

DEBUG COMMAND.COM

and press Enter. When prompted, type the lines shown in the listing on the right, with Enter at the end of each line. The patch is for PC-DOS version 2.0, but I have also used it on PC-DOS and MS-DOS versions 2.1.

You should now be back at the operating-system level. Reboot the system by pressing Control, Alt and Del, type Dir and press Enter. If you have got it right, you will find that the dates are now shown in the new dd-mm-yy format. It is prudent to make these changes on a backup copy in case of accidents. I found that this code worked for me, but I cannot guarantee it will work for you.

If you use PC-DOS or MS-DOS version 3 then Microsoft have made the choice of date format much easier. If you have a file called Config.Sys on the disc you use to boot the system, add the statement

COUNTRY=044

as an extra line in this file. If there is no Config.Sys file you must create one with Edlin or your word processor, and put just this one line in it. When this file is read automatically at boot-up time, the system will know that British dates are required.

DOS DATE

```
A 1BB6
1BB6 AND AL,1F
1BB8 MOV BH,10
1BBA CALL 2A89
1BBD MOV AL,2D
1BBF STOSB
1BC0 MOV CL,05
1BC2 MOV AX,DX
1BC4 SHR AX,CL
1BC6 AND AL,0F
1BC8
W
Q
```

? · ! · ? · ! · ? · ! · ? · ! · ? · ! · ? ·

Q I have tried everything I can think of, but cannot get the £ symbol to display on the screen or print on an IBM Proprinter using WordStar 3.3. Can you help?

E G ACRAMAN

A Micropro tells me that the problem may arise because you are using WordStar version 3.3., which only supports seven-bit characters — that is, ASCII codes 0 to 127. The £ sign is an eight-bit character, ASCII value 156, so it will not be displayed properly. Our guess is that it will ignore the eighth bit, and thus show the corresponding seven-bit character.

WordStar version 3.4 supports eight-bit characters, so any character in the IBM set may be displayed on the screen. Provided your printer supports the IBM set it should print correctly too.

To cure the problem you need to upgrade your WordStar to version 3.4. This costs £125 and must be done through a dealer, who will require the return of your old master disc. You could upgrade to the full WordStar Professional and get Mailmerge, the Correctstar spelling checker and the indexing program at the same time.

With version 3.4, you can get the £ sign by holding the Alt key down and typing 156 on the cursor pad at the right-hand side of the keyboard; it will not work if you use the numbers along the top of the keyboard. If you examine your DOS manual you will find a full list of the ASCII characters, and you may display any others in a similar way.

In "Ask PC" **John** and **Timothy Lee** answer questions on any area of serious microcomputing. If you have a nagging problem, write to us, marking "ASK PC" clearly on the top left-hand corner of the envelope. Letters should contain one question only. We cannot guarantee a personol reply, but to be considered your letter must include your name and address, together with a stamped addressed envelope. Answers to the most representative questions of general interest will be published in these pages.

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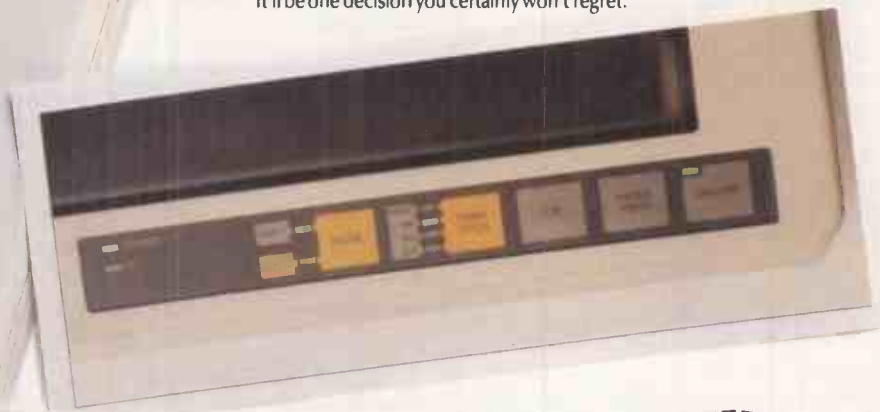

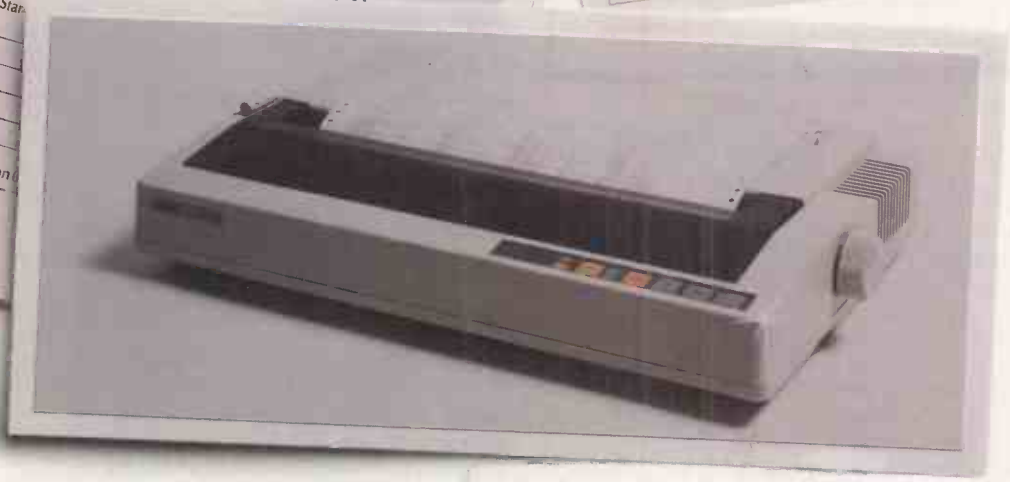

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APRICOT XEN-i 386
COMPACT SUPERMICRO

By Glyn Moody

With its top-end machine Apricot has combined the latest engineering features with full IBM compatibility.

A couple of years ago Apricot was aspiring to become a £100 million company. Last year, its product lines in disarray, it experienced severe financial problems which plunged it into the red for the first time. Recently, however, it seems to have returned to a more even keel. It has now committed itself to the IBM standard, tightened up its range of machines and has even been on the acquisition trail, buying the network specialists DMS, and bidding for Wordplex, a company that manufactures word processors.

Against this background its latest 80386-based micro assumes a particular importance. If Apricot is to establish itself in the high-performance end of the market-place, which is rightly sees as the only viable sector for its continued expansion, the latest addition to the Xen family needs to be right and not just good.

The Xen-i 386 comes in a number of versions. The one reviewed here had a single 5.25in. floppy, a 45Mbyte hard disc and a so-called paper-white monitor. The cost of this system is £4,547.

Externally the new machine looks identical to the 80826-based Xen-i reviewed in *Practical Computing's* September 1985 issue. Indeed, the same box has been used, except for the back panel. At the front there is the disc drive, which can be either 5.25in. or 3.5in. — the cost is the same — together with indicator lights for floppy-disc access, hard-disc access, voice and power. The voice light is an indication of Apricot's long-term commitment to speech recognition, despite the embarrassing failure of the Apricot Portable, which possessed it in rudimentary form.

At the back there are ports for the keyboard and mouse on the right as well as serial and parallel ports, both supplied as standard. There are three output slots for cards, one of which is taken up by a video adaptor. A d.c. power supply output is provided for use with the XP-i expansion-card box. The power supply input and on/off switch are also at the back. The optional Apricot mouse is unchanged from the device available with older machines. It is big and clumsy, and does not roll smoothly across the desk; producing an improved model should be an immediate priority for Apricot.

Three monitors are available from Apricot: green or paper white in monochrome and an EGA-compatible colour unit. For each type a different display adaptor is required. This use of a separate card for video is something of a reversal for Apricot, as it has hitherto incorporated the circuitry on the main board.

The main external difference between the new and old models of the Xen lies in the keyboard. Apricot has gone fully IBM compatible in this department, using the layout with separate cursor keys. The distinctive Microscreen found on earlier Apricot machines has finally disappeared. The keyboard has a rather mushy touch to it; it feels odd at first, but proves quite suitable for fast touch-typing.

APRICOT XEN-i 386

PC VERDICT

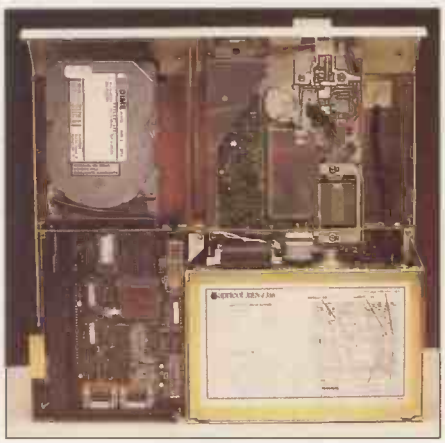
	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	☐	■
Ease of use	☐	■	☐	☐
Documentation	☐	☐	■	☐
Value for money	☐	☐	■	☐

☐ Probably the fastest 80386 machine yet.

Opening up the machine reveals a characteristically neat and tightly packed interior. One reason for this is that the power supply — formerly an ungainly and inconvenient chunk of iron which sat on the floor beside your desk — has now been incorporated within the low-height box. This represents a considerable feat of enginering, but the rating of the unit is only 100W, which seems low for machine of such high processor power. It certainly seems to preclude hanging power-hungry add-ons off the main unit. Not that Apricot makes it easy for you to add cards anyway. Because of the extreme density of components packed within the main systems box — which is much smaller than comparable offerings from Compaq or Zenith — only three half-length cards can be accommodated, one of which has to be a video adaptor card.

Like the new IBM Personal System/2 machines the Xen-i 386 uses surface-mount

A separate box is required for full-length cards (above) but the power supply is now internal (below).



technology and a number of gate arrays. The result is a very neat motherboard. There was only one jumper lead visible, suggesting that the design is now pretty stable. A four-layer PCB is used, with components mounted on both sides — again allowing a lot to be crammed into very little space. Memory is held in the form of the trendy single in-line memory modules (SIMMs) now used on most new machines. The standard configuration offers 1Mbyte of RAM, but swapping in SIMMs carrying 1Mbit chips takes this up to a maximum of 8Mbyte.

The ROM BIOS comes from Phoenix — the leading supplier of compatible ROMs for clones — but includes a number of Apricot additions. One neat feature of the machine is that on power-up the contents of ROM are copied into write-protected 32-bit RAM. Apricot says this speeds up the general performance of the machine. If you use an EGA-compatible card, it is also possible to copy across the contents of its ROM in a similar fashion.

The main 80386 processor is clocked at the usual 16MHz. Running our standard

(continued on page 39)

SPECIFICATION

CPU: 80386 running at 16MHz
RAM: 1Mbyte as standard, upgradable to 8Mbyte on motherboard
Mass storage: single 3.5in. or 5.25in. floppy with 30Mbyte or 45Mbyte hard disc
Keyboard: standard IBM design
Display: Hercules-compatible monochrome or EGA/CGA adaptors available
Size: 380mm.(14.9in.) × 370mm.(14.6in.) × 105mm.(4.1in.)
Weight: 6kg.(13lb.)
Software in price: MS-DOS 3.2, Windows, VP-Planner, GWBasic 3.2
Hardware expansion: external 5.25in. floppy, modem, external expansion box
Price: £2,999 with 30Mbyte hard disc; £3,999 with 45Mbyte disc; mono adaptor £199, EGA adaptor £399, paper-white monitor £349, EGA monitor £699, XP-i expansion box £199, mouse £149
Manufacturer: Apricot Computers plc, Apricot House, 111 Hagley Road, Edgbaston, Birmingham B16 8LB. Telephone: 021-456 1234
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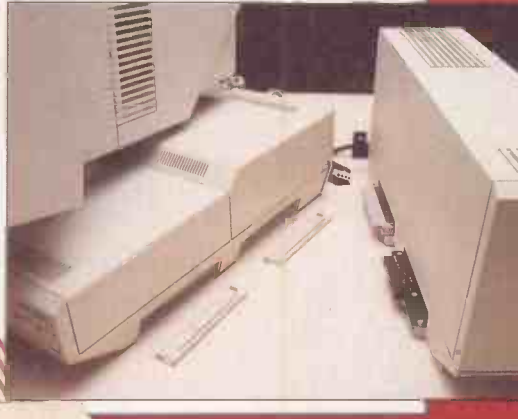

Above: The XP-i expansion box plugs into a bus on the side of the system box. Power comes from an outlet at the back.

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(continued from page 37)

Basic Benchmarks the machine turned in a cool 1.75 seconds. Although it is not particularly meaningful to start comparing figures to the nearest 1/100th of a second, the fact that this machine is at least nominally faster than any other — including the new IBM Model 80, which turned in 1.83 seconds — is an indication that once again Apricot has come up with a superb piece of engineering.

The performance of the discs is similarly impressive: running the Bagshaw Benchmarks produced figures of 31 seconds and 221 seconds for the hard and floppy discs respectively. This compares with 81 seconds and 255 seconds for the Xen-i 286. The Kaypro 386's hard disc turned in 59 seconds, while the Zenith Z-386 achieved 32.4 seconds. The Xen-i 386's performance is partly a reflection of the effort put into R&D by Apricot: even during its rockiest period it maintained a team of about 60 people working on various hardware and software projects.

Another result of this in-house expertise is that Apricot has bundled with the system a number of small but possibly handy utilities. Microsoft Windows comes as standard, and when you are running it you can call up a program which mimics the absent Microscreen. A small window then displays a representation of the 12 function keys together with their current assignments. As you change the active window, the labels change too. This facility provides a handy reference aid for people unfamiliar with the machine or the software on it.

The Timebomb utility enables you to take the clock speed down to 8MHz to overcome any compatibility problems. Rather neatly, it allows you to set the length of time for which this speed is operating. You might allow yourself a minute at 8MHz to log on with, then let the machine rip at 16MHz once you are over the hurdle of any compatibility checks run by the software. This might prove useful when using modem cards and the like.

To cater for full-length cards, Apricot has provided one of its bolt-on expansion boxes. Two ports on its side connect into the main system box; power is taken from the d.c. socket at the back. This is a solution to the needs of those who want to add various exotic cards, but it is not completely satisfactory.

The Xen-i 386's main virtues are its performance and compact form, together with a reasonable price. They make it ideal for power users who want a really fast machine on their desk, but not on all of it. The Xeni-i 386 is also ideal for Xenix applications. Apricot is hoping to sell large numbers of the machines for this purpose, and has produced a range of high-capacity hard-disc units. In this form, the machine will be sold as the Apricot VX.

As well as Windows and GWBasic, the Xen-i 386 comes bundled with the VP-Planner spreadsheet, which we reviewed very favourably in our February 1986 issue. There are four manuals, produced in a uniform style and to a consistently high standard. The manual for VP-Planner is a direct reprint of that from Paperback Software, one of the best manuals around.

Apricot remains the country's leading indigenous micro manufacturer, but that is not the only reason for wishing the company well with its latest product. Unlike IBM, it has always pushed the technology hard — sometimes, as is in the case of the ill-fated Portable, too hard. Its pricing is aggressive and generally its approach to micros has always been refreshingly different. By targeting the Xen-i 386 at the top end of the market, in both single- and multi-user environments, Apricot seems to be showing a just appreciation of both the current micro world and its own strengths and weaknesses. How it fares will depend on the evolution of business micros during the current period of uncertainty created by the launch and delayed availability of the new PS/2 and OS/2 products.

CONCLUSIONS

- The Apricot Xen-i 386 is a superlatively fast, compact AT compatible.
- Apricot has finally gone completely IBM compatible, even down to the keyboard.
- The greatest weakness of the machine is its limited expansion capability within the main system box and the low rating of the power-supply unit.
- As well as being ideal for power PC users, the Xen-i 386 lends itself to departmental computing based around Xenix. PC

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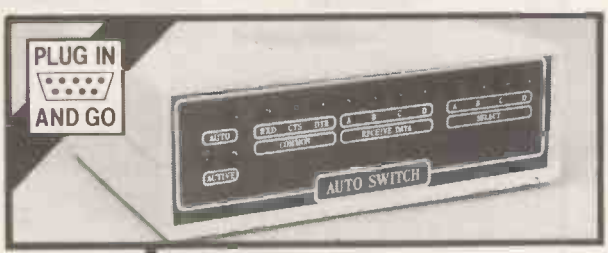

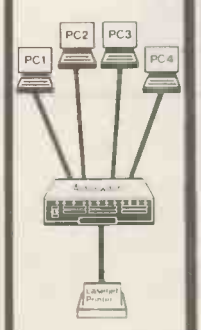

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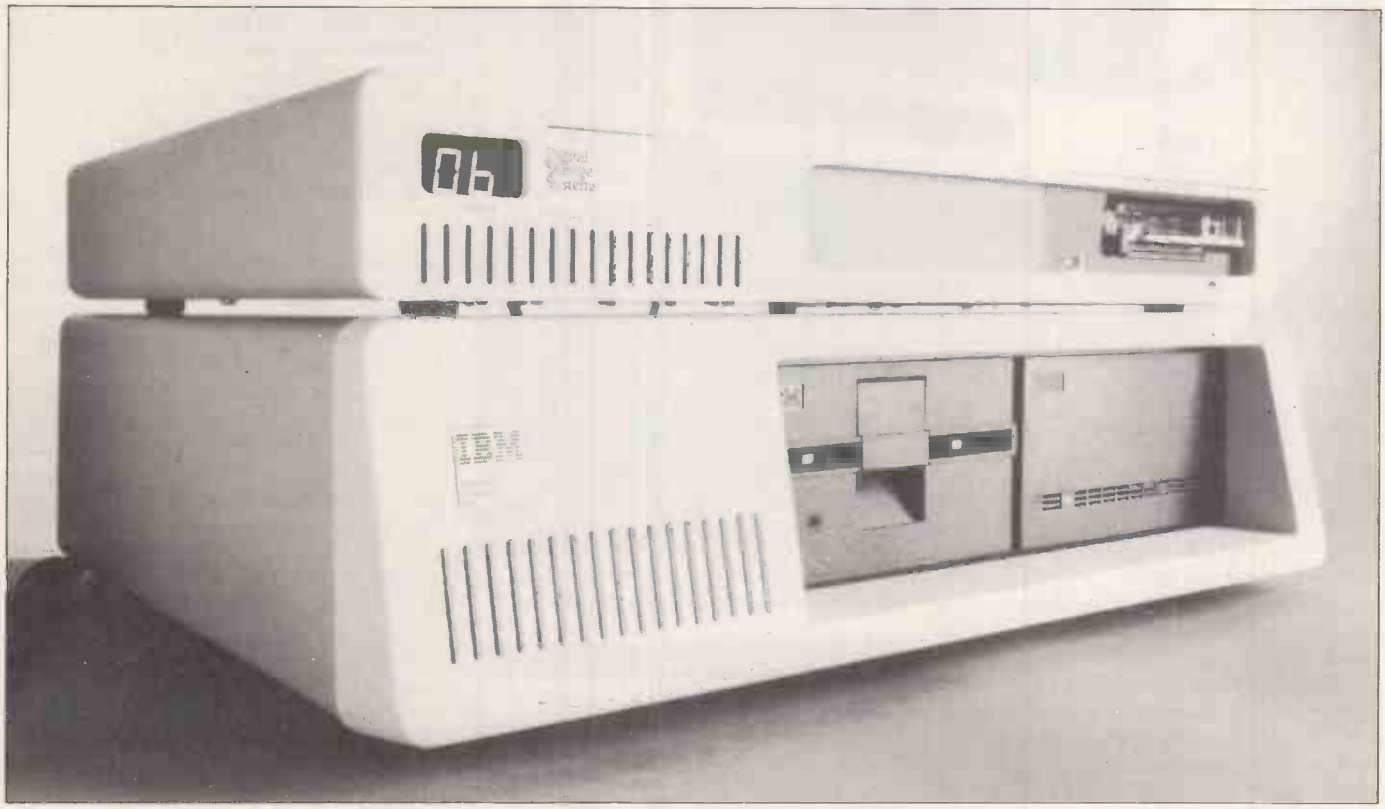


All too often, valuable data is lost when people forget to make backups. With this system the job is done automatically.

Micros have become such an accepted part of business practice today that nobody thinks twice about using them. Unfortunately, it is also true that few people think twice about some of the more mundane aspects of micros, like making backups. Losing valuable data irrevocably is perhaps the business user's most painful lesson in the pitfalls of information technology. Hitherto this initiation rite has probably seemed the only way to get across the message that regular backups are not just good practice but they are essential whenever hard-won or voluminous data is involved.

But this is no longer so. The Automatic Recovery and Control (ARC) tape backup units from Digital Storage Systems are based on the familiar premise that prevention is better than cure. Instead of banging your head against the brick wall of users' insouciance, they allow you to circumvent it by getting the hardware to make backups automatically.

The idea is simple enough. An intelligent tape backup unit monitors all updatings of files. Once its buffer is full, or after a preset time interval, all new versions of files are automatically backed up on to tape. In the event of power failures or some other catastrophe, there is a full audit trail available. The price of such a neat and simple idea varies from £1,600 to £4,000.

The ARC units come in two series. The ARC-8000 has the appearance of a small stand-alone disc drive, and uses high-density magnetic tape cassettes. The ARC-9000 series reviewed here comes as a low unit which sits on top of the main PC systems box, and uses standard 0.25in. data cartridges. It also has optional Winchester disc drives for boosting conventional storage.

Hooking the unit up to a PC, AT or close clone is simple. A half-length card takes up one slot, and a cable from it connects to the large 37-pin D socket in the back of the ARC unit. There is a separate power lead, so no power is drawn from the PC.

Software installation takes a little longer. First you must switch on the ARC unit with the PC turned off. This allows the tape streamer to go through a full diagnostics routine, signalled at the front via a two-character numeric display which shows the codes of any faults. Once the system has been set up, the same display is used to indicate the percentage of the tape which has been filled with data.

The micro is then booted up using DOS 3. Placing the ARC software disc in the floppy and typing

TAPE

sets off the automatic installation procedure. After asking a few questions about the target drive and suchlike, it makes a subdirectory called Tape, and then loads the relevant files across from the floppy.

Once these files have been transferred, you have the choice of running the ARC unit via simple menus, or directly from the command line. The menu is brought up by typing

TAPE

again, and has eight options. After installing the hardware and software, the System Setup option is used to set the time and date, the interval between data backup, up to two selected drives, and the tape

(continued on next page)

SPECIFICATION

Description: automatic intelligent tape backup unit for PCs
Software in price: memory-resident program and relevant utilities
Hardware required: IBM PC, PC/AT or compatible running MS-DOS 3 with at least 256K RAM
Price: £1,600 for ARC-8020 20Mbyte cassette unit; £1,800 for ARC-8040 45Mbyte cassette; £2,500 for ARC-9060 with 60Mbyte tape streamer; £4,000 for ARC-9062 with 60Mbyte tape streamer and 40Mbyte Winchester
Manufacturer: Digital Storage Systems, Colorado
UK supplier: Specialix Systems, Roseneath House, Giggs Hill Road, Thames Ditton, Surrey KT7 0TR. Telephone: 01-398 7122
Available: now

(continued from previous page)

length. The ARC-8000 series offers either 20Mbyte or 40Mbyte, and the 9000 series 60Mbyte.

The Save option is used to establish what is known as the baseline save, which represents the basic group of files which will be backed up automatically as updates are made. Essentially it serves to define the active set of files on the tape, and can be added to at any time. Typically you would use a fresh tape at the beginning of the week, and then back up the entire hard disc. This can be accomplished with a single command. Whenever any of these files are changed on the hard disc, copies will be added progressively to the tape. It is also possible to save specific sub-directories rather than whole discs.

Complementing the Save command is the Retrieve command, which allows you to pull back copies from the tape to the hard disc. As with Save, there are a variety of levels at which this can operate: disc, directory and files. It is also possible to specify whether or not the chosen files will overwrite all files, including those which are read-only.

The Catalog command is like Dir in DOS, and allows you to inspect which files have been saved on tape. Again, the search can be narrowed down to any level. At the lowest level you choose a file by the time at which it was saved. All files are date and time stamped as they are saved to tape. This provides a unique reference to multiple copies of files which are constantly modified. It also allows you to choose which version you restore from.

One problem with the software is that you need to know the exact date when the desired version was saved, unless it was the most recent, in which case it can be found quite easily. What is needed is some facility for pulling out all versions of a particular file, thus providing a complete audit trail.

The automatic backup is initiated by exiting from the Main menu, and then typing

LOGON

This sets the system running, with files which have been selected as part of the baseline saved every so often when changes are made. The interval between saves can be varied from one to 20 minutes.

Although the menu approach is simple in theory, ARC's implementation has its limitations. It is not possible, for example, to edit entries as you make them; instead you must go through the whole procedure and then use Esc. It is possible to go straight to the command line, but then the parameters which must be set make the final entry far from memorable.

Of course, for most users this problem will not arise. The ARC unit is designed to chug away in the background, completely unnoticed. It incorporates its own internal processor, a souped-up Z-80, which ensures that there is no degradation in the response of your computer's main processor. And by setting up the Autoexec. Bat file to include the Logon command, the system will be set running automatically, without the user even being aware it is there. Provided a new tape and full baseline backup is provided at the beginning of the week, perhaps by an office supervisor, the naive user can proceed, blissfully unaware of the need for backing up.

As far as performance is concerned, the unit behaved well. It can copy even protected files like Lotus 1-2-3 — though obviously it is not possible to run them from the tape. It managed to copy around a couple of megabytes of small files in around two minutes. In operation, the tape streamer was audible but not obtrusively noisy.

The ARC units are attractive products, even if their software leaves something to be desired in the way of sophistication and user-friendliness. For organisations where backup is crucial but problematic, they could offer a handy solution. The main problem is price, which is likely to preclude their everyday use across a company. But within their own particular niche, they work well.

Once installed, the ARC-9000 can be used without further attention from the operator.

ARC-9000

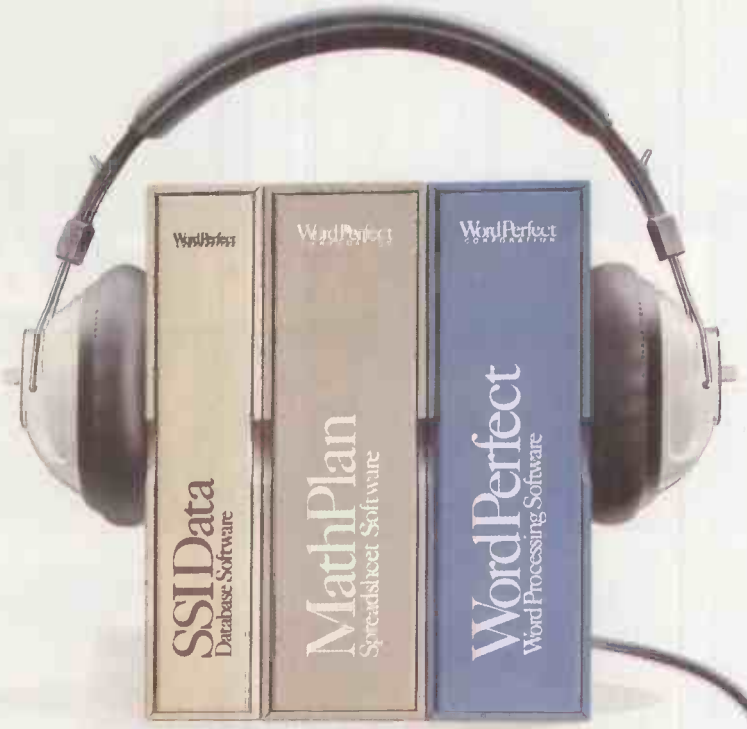
PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	■	☐
Ease of use	☐	■	☐	☐
Documentation	☐	■	☐	☐
Value for money	☐	■	☐	☐

☐ Idiot-proof backups — but at a price.

CONCLUSIONS

- The ARC units provide automatic backup on to tape in a simple and apparently foolproof manner.
- Once installed by a supervisor, they can be ignored by inexperienced users.
- The hardware is well constructed, though the software is a little crude.
- For companies with crucial data which must be backed up, the ARC approach is an effective if slightly pricey solution. PC



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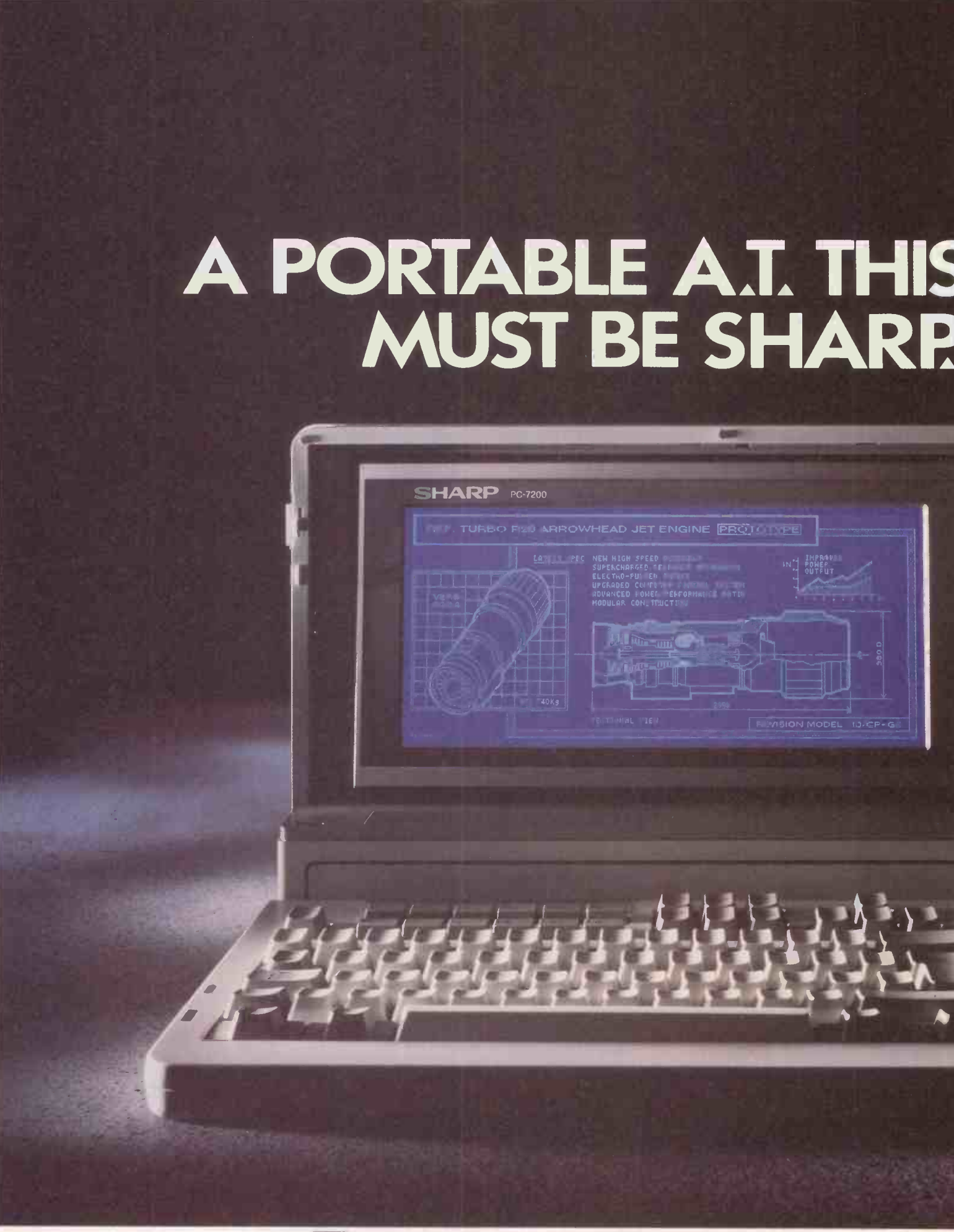

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REVIEW

MACINTOSH II
THE BIG MAC

By Carol Hammond

With colour and a full expansion capability Apple is hoping to move the Macintosh concept into the power-user mainstream.

The first thing that hits you about the Mac II is how much like an IBM it looks. Gone is the tidy all-in-one unit of the original 128K Mac and its latest upgrade, the Mac SE, which we reviewed last month. Instead you have what looks like any other desk-top PC, complete with system unit, monitor, keyboard and mouse, Like most desk-top setups, it is not something you would want to move around very often. While the Mac SE, with its single hard-to-reach expansion slot, was Apple's gesture towards an open system, the Mac II embraces the philosophy wholeheartedly and has six slots.

The Mac II comes in the same off-white colour that the SE does, but there the similarity ends. The Mac II's system unit is big and boxy — about the size of a PC, though more smartly styled. The plastic casing is ribbed on the top and sides, neatly hiding the ventilation slots.

At the front there is an indicator light for the 20Mbyte hard disc which was fitted to the model we reviewed. Apple also offers 40Mbyte and 80Mbyte options as well as a floppy-only version. To the right lie two slots for 800K floppy-disc drives. One floppy drive comes as standard; the second slot is covered by a plastic plate when not in use.

At the back of the system unit from left to right lie an on/off switch, a sound port, two Apple Desktop Bus connectors, two RS-232C ports and an SCSI port. Above them lies a ventilation grille and then to the right the six expansion slots, the mains input socket and an auxiliary power socket for the monitor.

The monochrome monitor normally sits on top of the system box. The nominal size is 12in., but we measured it at just under 11in. diagonally — a discrepancy that is not uncommon. Although larger than the 9in. screen of earlier Macs, it is smaller than most PC monitors. An on/off switch and the port for the video cable are positioned at the back. Brightness and contrast controls are provided on the right-hand side of the unit.

The keyboard supplied is the Standard Apple Keyboard, similar to the unit provided with the Mac SE and the Apple II GS. The large key at the top of the keyboard, which was not functional on the Mac SE, now serves as a Power On key. You can use it to switch the machine on — but not off — overriding the on/off switch at the back of the system box. The key activates a standard soft-switch IC on the main board that is powered by the machine's on-board batteries.

In the same way you can turn the machine off from the keyboard by selecting Shutdown from the Special menu. Whereas on earlier Macs this simply closed your files and ejected any discs, on the Mac II it switches off the power as well. If you wish to reboot without actually shutting the power off first, there is also a Reboot option on the same menu; this has the advantage that the hard disc is not continually subjected to the stress of being switched off and then on again.

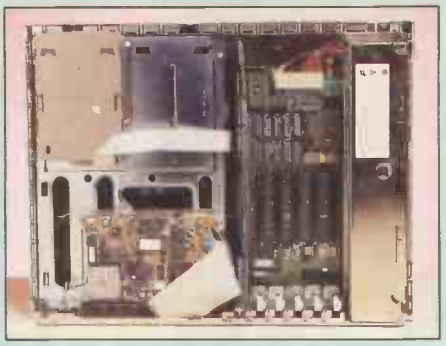
As with the Mac SE, the Extended Apple Keyboard is available as an alternative to the standard keyboard. The Extended keyboard has a layout close to that of IBM's latest model, complete with function keys. Also, you have two ways of connecting the mouse. You can either plug both the keyboard and the mouse into the Desktop Bus connectors, or you can daisy-chain the mouse to the keyboard. The mouse itself is the new-style unit that also comes with the SE.

EASILY OPENED UP

Opening up the Mac II is a joy. You can wave goodbye to the long-handled screwdrivers needed to open up previous Macs — and in fact the Mac II is easier to open than many IBM compatibles. You only have to undo one screw at the back of the system unit, then press down two catches at the top of the box to release the lid. It is then free to be lifted up and back, and removed completely. Putting it back on again is even easier, as it snaps back firmly on to the case.

The motherboard sits right at the bottom of the unit. To the right of it are the power supply and cooling fan, housed together in a steel box. The hard disc is positioned to the left, mounted on a steel brace above the motherboard. The floppy-disc drive is positioned towards the front of the machine, where there is also space for a second floppy drive. The steel brace supporting the disc drives can be easily removed by undoing four screws. The disc assemblies can then be lifted out to reveal the motherboard.

Two batteries for the clock are mounted on the motherboard; they are said to have a life expectancy of eight years. Beside the batteries lie eight single in-line memory (SIMM) slots. On the review machine, four of these slots were occupied by small cards tilted at an angle to the motherboard. Each card carries eight 256Kbit chips, making a total of 1Mbyte on the four cards. Memory can be increased by swapping in cards carrying bigger chips. Apple offers 1Mbyte cards, allowing memory to be upgraded to 8Mbyte. Above the cards lies the 68020



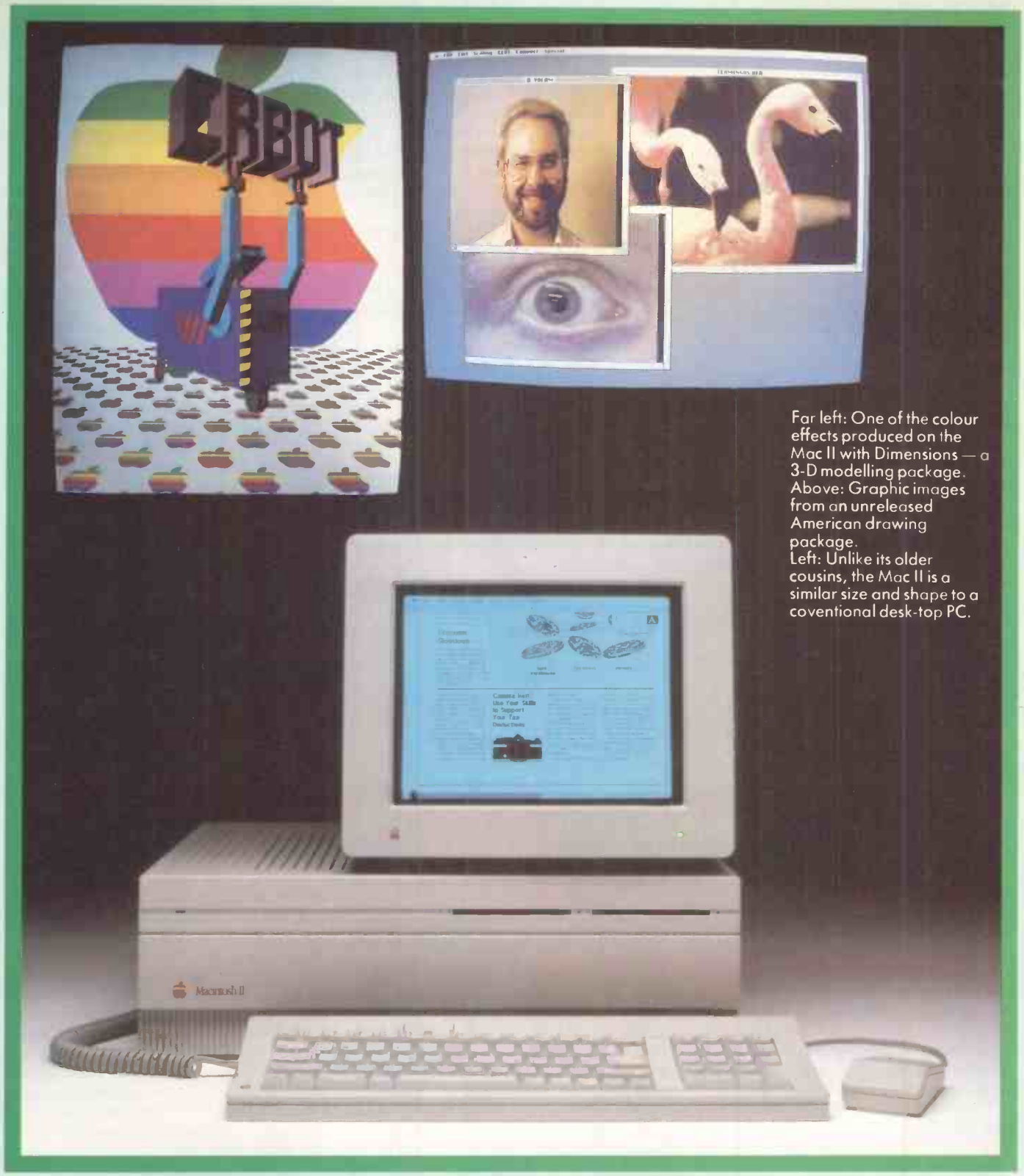
The inside of the system box has space for six Nubus expansion cards.

SPECIFICATIONS

CPU: 68020 running at 16MHz; 68881 maths co-processor standard
RAM: 1Mbyte, expandable to 8Mbyte on board; expandable to 2Gbyte using expansion slots
ROM: 256K
Disc storage: 800K 3.5in. floppy drive; optional second floppy drive and 20Mbyte, 40Mbyte or 80Mbyte hard discs
Display: 12in. monochrome monitor, 640 by 480 pixels; 13in. colour monitor 640 by 480 pixels; up to 256 colours or shades of grey from a total of 16 million shades
Keyboard: choice of Apple or 105-key IBM layout with 15 function keys
Interfaces: sound port, two RS-232 serial ports, SCSI port, two Apple Desktop buses, six Nubus internal expansion slots
Hardware expansion: external drives, Ethernet card, MS-DOS floppy-disc card
Dimensions: 475mm. (18.7in.) ×366mm. (14.4in.)×140mm. (5.5in.)
Weight: 10.9kg. (24lb.) to 11.8kg. (26lb.), depending on configuration
Prices: monochrome system with floppy disc only, £4,495; 40Mbyte hard-disc version, £5,690; 40Mbyte system with colour, £5,995
Software in price: none
Manufacturer: Apple Computer UK, Eastman Way, Hemel Hempstead, Hertfordshire HP2 7HQ. Telephone: (0442) 60244
Available: now

SPECTRUM GRAPHICS SYSTEM

Description: colour adaptor with 786K of RAM and 19in. colour monitor with maximum resolution 768×1,024 pixels
Prices: adaptor £999, monitor £2,195
Manufacturer: Supermac Technology of Mountain View, California
UK supplier: Supermac Technology, Grove House, 551 London Road, Isleworth, Middlesex TW7 4DS. Telephone: 01-847 2101
Available: now



Far left: One of the colour effects produced on the Mac II with Dimensions — a 3-D modelling package.
Above: Graphic images from an unreleased American drawing package.
Left: Unlike its older cousins, the Mac II is a similar size and shape to a coventional desk-top PC.

main processor and 68881 maths co-processor. A loudspeaker is mounted next to the motherboard, attached directly to the casing.

The maths co-processor is a significant addition, given the market at which Apple is aiming the Mac II. Apple sees the Mac II as a high-performance business machine aimed at medium to large businesses. It is being targeted particularly at organisations dealing in CAD, engineering, higher education and research, where high-quality graphics, modelling and computationally intensive tasks are likely. Packages written according to the Standard Apple Numerics Environment (Sane) will automatically invoke the maths co-processor to increase performance by up to 30 times. Lotus Jazz, for example, will be able to make use of the co-processor in this way.

Apple claims that the Mac II is four times faster in operation than the Mac Plus, but when the maths co-processor is addressed directly this speed advantage is said to increase to a factor of 200.

The Apple Sound Chip (ASC) has four channels, a stereo capability and a 44kHz sampling rate. The high sampling rate will allow very high-quality output, and the on-board stereo sampling generator means it can drive external stereo equipment like speakers, headphones and amplifiers. The Mac II supports the Midi interface, allowing it to be used as a controller in music applications. In future Apple hopes to use the capability of the sound chip to handle voice input and output, and to add sound to graphics.

The presence of the sound chip is evident from the moment you switch the machine on. Instead of the puny beep of its siblings, the Mac II emits a far grander sound, as if someone had struck a chord on an electric piano. You can adjust the sound the machine makes to accompany an on-screen

(continued on next page)

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error message. To do this you go to the Control Panel, select the Sound icon, and then adjust the volume and quality of the sound. You are given four different sounds to choose from: Clink-Klank, Bong, Monkey and Simple Beep, which will cause various humorous screeching and clanking sounds to come from your machine.

The inside of the Mac II is very roomy, primarily because there are very few chips. Like IBM, Apple has opted for custom chips and surface-mounted technology. The spaciousness of the machine's interior makes inserting expansion cards a relatively simple task.

There are six Nubus expansion slots. They use a bus and card design completely different from the SE; it is not possible to transfer cards from one machine to the other. Apple says that it chose a different bus for the SE to keep it compact; it would have been impossible to incorporate the large Nubus slot. This reasoning is undoubtedly sound, but it is a shame that Apple could not maintain compatibility across its two card-carrying machines.

One of the slots in the Mac II will always be taken up by a video card. Inserting extra cards into one of the empty slots is easy. You do not even have to undo any screws to take out the expansion cover shield; you just lift up the shield until it is free of the guide and pin holding it, then push out the plastic cover that lines up with it. Expansion cards all have their own cover shields that slot into the guide and pin.

Unlike IBM expansion slots, Nubus slots can operate independently of the processor. This allows the expansion cards to take control of the machine. Even the machine's main power supply can be controlled by software running on a card so that, for example, a battery-powered modem card can wait to receive an incoming signal while the main machine is switched off. Once a signal is received, the software can switch on the power supply and run the main program to, say, download a file, then switch off again afterwards. Another advantage of the Nubus is that it does not require the user to configure the slots or set any DIP switches; also you can put any card in any slot.

The open architecture of the Mac II may well be seen by clone makers as an open invitation. However, a glut of Mac compatibles seems unlikely for a number of reasons. Apple's use of its own custom chips will act as a deterrent to many people, while others may be put off by Apple's track record in defending the copyright of its products. It was very active about three years ago, taking action against Apple II clone makers. Even more importantly, the Mac II is as yet unproven, and clone makers may be reluctant to invest heavily in copying a machine that is heading for a niche market with little room to spare.

Apple supplied us with a monochrome monitor for this review since its own colour monitor was not ready in time. We were also able to use Supermac's Spectrum graphics system, which consists of a video card and a 19in. colour monitor with a maximum resolution of 768 by 1,024 pixels. To set the monitor status on the Mac II you go to the Control Panel and click on the monitor icon. You then click on Color or Black & White/Grays, whatever is appropriate, and scroll to the number of colours or shades of grey that you want.

With the standard video card you get a maximum of 16 colours or greys. With the video-card expansion kit you get a maximum of 256. Colour is displayed on monochrome monitors as the equivalent number of grey levels. If your monitor is colour you click on the Convergence Test button. A grid of four boxes then appears, which helps you check that the red, green and blue guns are set correctly for the best picture colour. You do this by adjusting the brightness control until the middle of the lines surrounding the boxes appears white.

Any test of Mac's colour capability is hindered by the scarcity of colour software. We were able to see a display of pictures produced on a three-dimensional modelling package called Dimensions. Other than that the only package we had any success with was Cricket Graph, though Cricket Draw is said to work in colour on the Mac II as we have previously seen the Xpress DTP package do.

MACINTOSH II

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	■	☐
Ease of use	☐	☐	■	☐
Documentation	☐	☐	☐	■
Value for money	☐	☐	■	☐

☐ Looks good, but the software and hardware to exploit its possibilities has yet to arrive.

We were able to use Reflex, Write Now, Just Text and Ready Set Go 3. But we were surprised to find that many packages did not work properly on the Mac II. Macwrite, Macpaint, Full Paint, Comic Works, Superpaint, Colormate and Adobe Illustrator all failed to function; some of them would not even load. With the drawing and painting packages, four boxes appeared at the top of the screen, obscuring the menu bar, and whatever we drew appeared inside them.

The problems arise because some software developers have not followed Apple's programming guidelines. Painting programs in particular have proved to be a problem, and many of them encounter difficulties with memory management that cause them to go into the screen buffer and repeat themselves. Apple's own Macwrite does not work because it is one of the very first Mac programs, written before colour features were allowed for in Apple's guidelines.

Apple says it will be providing upgrades for Macwrite, Macpaint, Macdraw and Macproject. At the moment it is envisaged that they will be free, though the upgraded Macwrite may require a new manual which might have to be paid for. The decision of Apple in the US to hive off its software operations may also affect this.

How outside software publishers deal with the problem is yet to be seen. Apple is compiling a list of packages which have been tested for compatibility. Microsoft has announced upgrades of Excel and Word 3, while claiming that existing versions will run on the Mac II.

There was also a dearth of expansion cards for us to test the Mac's expansion capabilities with. AST has announced an MS-DOS expansion kit which puts the equivalent of a PC/AT on two boards and allows MS-DOS to appear in a window on the Mac II, but is not due to appear until late this summer. Apple itself will be launching a version of Unix System V version 2 in September or October. The £325 Apple PC disc will support a standard 360K 5.25in. IBM disc, when it appears.

When we booted up the machine from the hard disc, it occasionally bombed out on us straightaway. We remedied this with the aid of advice from the very clear manual, which suggests that you boot up from a System Tools disc in the floppy drive and replace the System file on the hard disc with the file from the System Tools disc.

A further disappointment was that the base system costs about £1,000 more than Apple anticipated. Apple says there is no particular reason for this, merely that its original estimate when we previewed the machine in April was only a rough guess. The unfortunate consequence is that the machine is not as good value as we first thought. Apple believes that its target market for the machine is not price sensitive, and that for CAD/CAM use the Mac II is a lot cheaper than comparable work stations.

Apple sees the Mac II as being in competition with the IBM PS/2 Model 80, which costs just over £5,000 for a base machine with a 44Mbyte hard disc and mono monitor but no maths co-processor. The Mac II with a 40Mbyte hard disc costs £5,495, but Apple has the advantage that the Mac II is around now, with a fully functioning operating system. The Model 80 and the OS/2 operating system are not expected until the end of the year.

CONCLUSIONS

■ The Mac II looks good. It has nearly all the virtues of the original Mac plus an impressive colour capability.

■ The possibility of expansion opens up the world of the Macintosh to the outside — in particular to the IBM world — which will make it a more attractive proposition for business users. It will also find new markets in the CAD/CAM area.

■ The Mac II is as easy to use as its predecessors, and inserting expansion cards appears to be simple too.

■ Not much software and few hardware expansion products are yet available to run on the Mac II, still less to make full use of its features. PC

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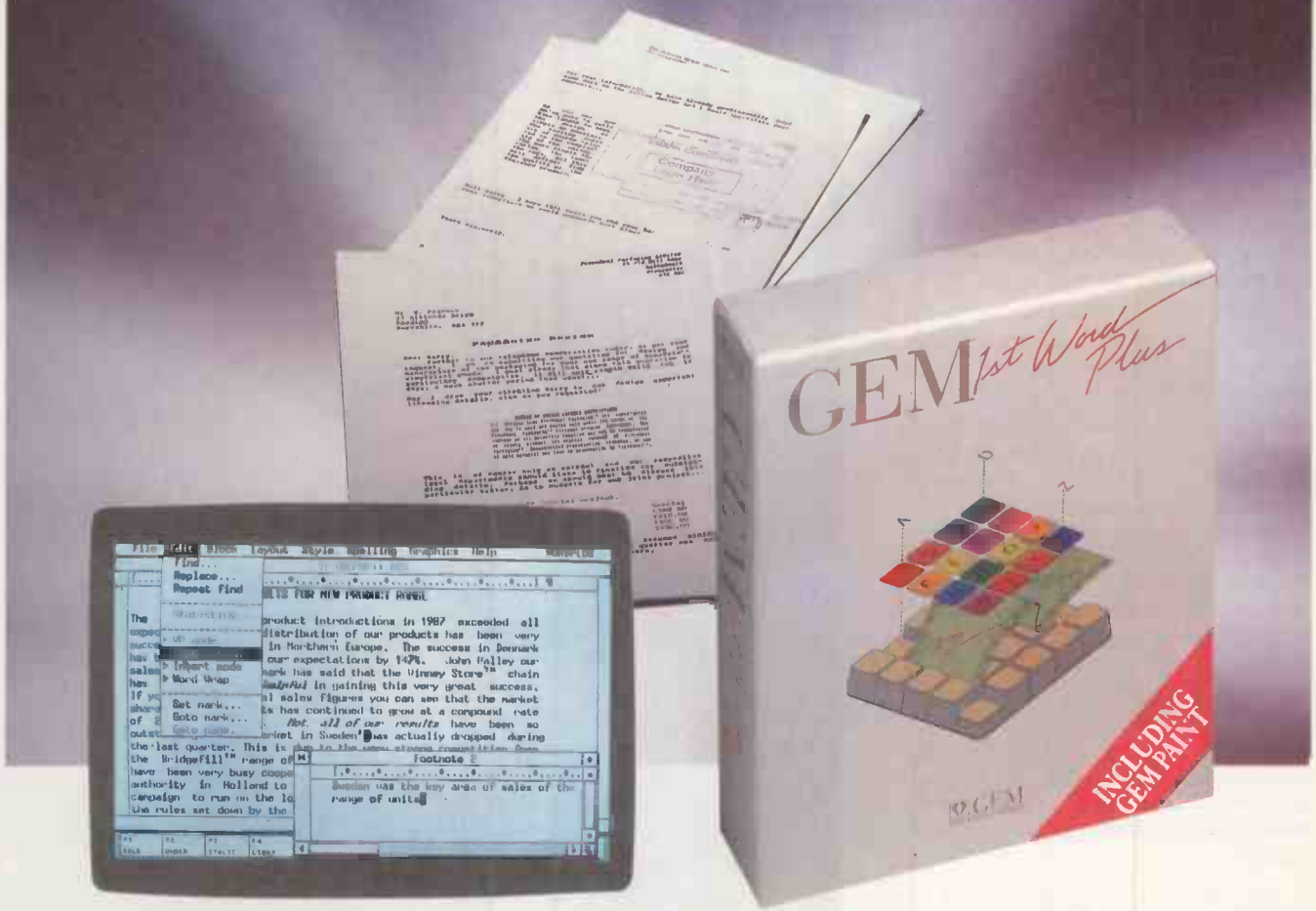

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HARVARD PROFESSIONAL PUBLISHER
DOCUMENT PRESENTATION PACKAGE

By Carol Hammond

The ability to handle long documents and detailed control over typesetting style are the special virtues of Software Publishing's DTP package.

The first time we looked at a desk-top publishing (DTP) package for IBM compatibles was back in February when we reviewed Ventura Publisher. Harvard Professional Publisher (HPP) is Ventura's main rival and comes from Software Publishing, which also distributes the successful range of PFS products and HPP's two stablemates — Harvard Presentation Graphics and Harvard Total Project Manager.

HPP rivals Ventura rather than Aldus Pagemaker because, like Ventura, it is not a page-based package; its strength lies in its handling of multi-page documents. HPP's roots lie in the typesetting industry. It was co-developed by Software Publishing and Bestinfo, the company which produces the Superpage package. Superpage costs around £7,000 and is aimed at typesetters who want to do page layout. Software Publishing claims that HPP is essentially a cut-down version of Superpage, aimed at buisness users, with its important features crammed into a £595 package. HPP has the facility to transfer files across to Superpage, where further refinements to typography and layout can be undertaken.

HPP certainly does offer a high degree of typographical control, including kerning, tracking and hyphenation. In this respect it is on a par with Xpress, which runs on the Mac. HPP uses its own in-built alogorithm to control hyphenation and to ensure that no more than two consecutive lines end with hyphens. It does not, however, offer users the option of setting up their own exceptions dictionary where they can specify their own house style for particular words to be hyphenated.

HPP does not offer search and replace or cut and paste. These functions are deemed to be the province of a word processor, something HPP does not possess. The authors argue that since HPP works with files that have been imported from word processors, to include one within the package would be merely repetitious.

Some editing can take place within the package, but any hefty alterations should be made within a word processor. When you edit text within HPP, your original word-processed files are updated to incorporate the changes. This allows HPP to use the updated version if any pages are rerun.

In this respect HPP betrays its typesetting heritage. Typesetters expect word processing to be done by someone else; they are merely the vehicle to produce finished work in typeset form. To a large extent HPP adopts the same principle: it takes word-processed files and puts them alongside graphics to produce a typeset version of a document. Everything in the package is geared towards fast turnaround, and to that end it employs tags and style sheets just as Ventura does.

LESS FRIENDLY INTERFACE

What you lose with this approach to DTP is the ability to do more complicated individual page layouts. Another drawback of Harvard is that you have to deal with a less friendly user interface than on Mac packages like Xpress — or indeed with Aldus Pagemaker and Ventura on the IBM, which use Mac-like interfaces.

The entities that HPP works with are document files, style sheets and format files. The document file contains the text and graphics which make up your document. You set up style sheets and format files and then attach them to your document file; they dictate the style your document is to follow and what typeface and style its headlines and text will appear in.

Software Publishing recommends that you create a separate sub-directory for each document to enable you to keep track of files as you work. All the files you want to use in a document should be kept in the same sub-directory, including the picture files, text files and page styles you expect to use. If you want to reuse the same formats and page styles you just copy them to the relevant sub-directory each time.

When you enter HPP you are met by the main menu which lists six functions: Lay Out Document, Define Page Style, Print Document, Import Files, Set Defaults and Exit to DOS. Define Page Style is where you set up your style sheets to provide the grids on which you lay out your pages. As with Ventura Publisher, you use style sheets to define the number of columns, the size of margins and so on. Unlike Ventura, HPP does not supply you with ready-made style sheets on disc.

The Page Style screen consists of a menu bar across the top and rulers along the bottom and to the right marked in inches and picas. You cannot change the measurement system to centimetres or millimetres, nor can you mix and match them in any way. This could be awkward, as it is quite common to measure text in inches, column widths in picas and picture sizes in millimetres.

The menu bar lists five options, complete with function-key numbers. You can activate the pull-down menus by pressing the appropriate function keys or by using the mouse. The first option gives you context-sensitive help. The Style menu allows you to get, create, copy or delete a page style, and zoom and exit to the main

(continued on next page)

SPECIFICATION

Description: WYSIWYG page make-up program
Hardware required: IBM PC/AT or compatible with at least 640K RAM, a hard disc, DOS 2.1 or higher, Hercules Graphics Card with monochrome display or IBM EGA with 256K and Enhanced Graphics Display, Microsoft mouse
Software supported: accepts word-processed files from DCA documents and ASCII text files; also compatible with Harvard Presentation Graphics, Lotus Pic files, Lotus 1-2-3, PFS Professional File, dBase, Microsoft Windows Paint, PC Paintbrush
Printers support: Postscript or HP Laserjet
Copy protection: none
Price: £595
Publisher: Software Publishing of Mountain View, California
UK supplier: Software Publishing Europe, 85-87 Jermyn Street, London SW1Y 6JD. Telephone: 01-839 3864
Available: now

(continued from previous page)

menu. You can zoom to choose from four views of the page: full page, 75 percent, actual size and 150 percent. You cannot view facing pages as you can in Ventura and Aldus Pagemaker. Header and Footer allow you to enter what headers and footers you want. Rule/box allows you to draw rules and boxes anywhere on the page.

A background grid shows the columns and margins of the page with dots at pica intervals. A status line at the bottom of the page reminds you of the next step required for certain tasks and displays error messages.

To create a page style you select Get/Create. Harvard then displays the Page Style directory, and a file-name prompt appears on the status line. You type a name up to eight characters long and press Enter. When you save a style sheet Harvard automatically adds Sty to the file name as a file extension. You then select paper size and orientation, the number of columns — up to six — and the width of the margins. All these options are chosen from a dialogue box which appears on-screen.

Once your page appears you can use the Rule/Box menu to draw rules, boxes and tints that are to appear on every page. Rules can be from 0.5 point to 12 point in weight. Tints can be anything from 10 percent to 100 percent strength in 10 percent increments.

When you select Draw Rule a pointer appears on the page. You position the pointer where you want the line to begin and click on the left mouse button or Tab. You then position the pointer where you want the line to end and press the right mouse button or Enter. The rule then appears on-screen. I found having to switch between the two mouse buttons rather fiddly, and would have preferred to have had just one button to press.

When you move the cursor to the edge of the screen the display normally scrolls to reveal parts of the page you cannot see. But if you have zoomed up to 150 percent this does not work, and to view a hidden portion of the page you have to reduce magnification, move to the part of the page you want to see, and then zoom up again to the larger size.

Formats and tags are used to specify the text styles for your document. A tag is a combination of type characteristics such as fount, size, line positioning, spacing above, indents and the number of columns the text is to span. You could call a tag for a headline Head1, say, and then use it for every headline with a document. You can tag your text on-screen by choosing from a list of tags you have set up, or you can add tags from within your word processor. When applied to a document, tags do not normally appear on-screen but they can be made visible if you wish.

Tags also allow you to provide effects like subscript, superscript and leaders, and are used for more detailed operations such as forcing fount changes within a line. This kind of tag is normally added to the text when you use a word processor or the HPP Edit window when you lay out a document, rather than when you are building a format file.

Being able to put commands into your word-processed text can save time, especially if you are only using a few headline and text styles. But if you have a large number of different style elements within your document, having to use commands is rather cumbersome compared with the menu-driven approach of Pagemaker. Harvard's command-driven approach is similar to Lotus Manuscript on the IBM and Just Text on the Mac.

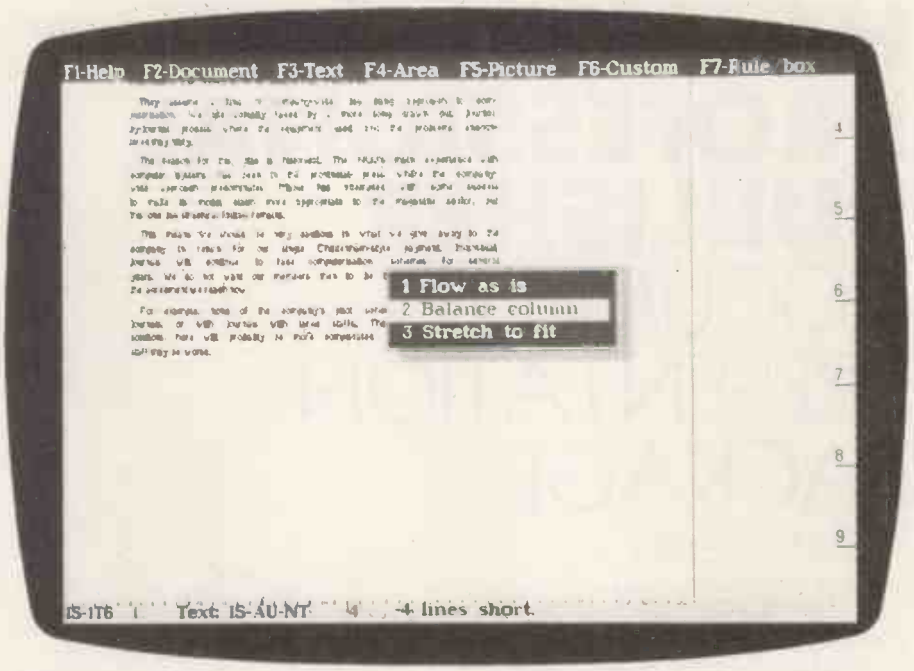
To create a document you choose Layout Document from the main menu. The Document directory lists all the documents in the sub-directory and displays a file name prompt on the status line, where you can type a name for a new document. A name

HARVARD PROF PUBLISHER

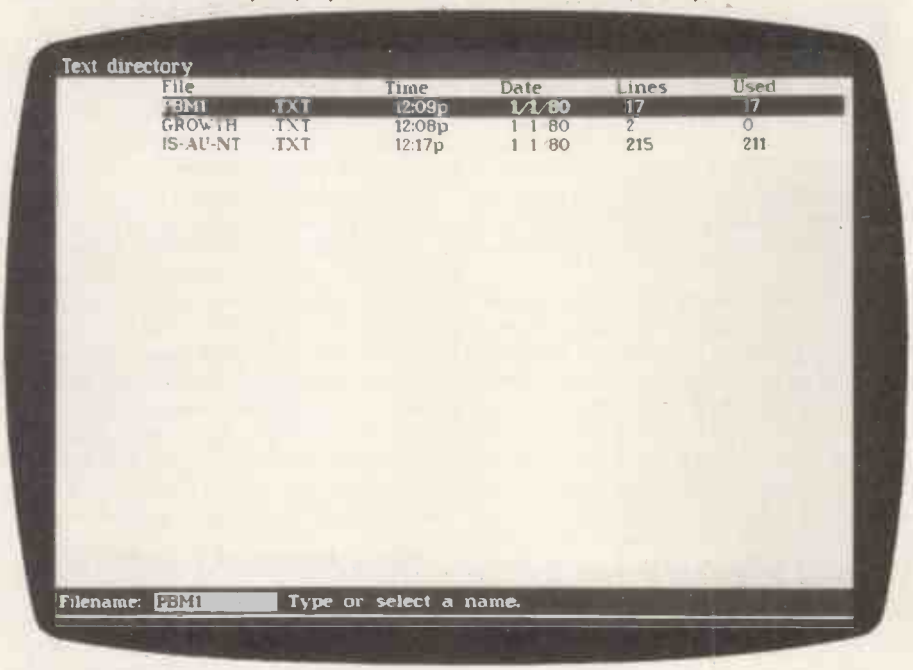
PC VERDICT

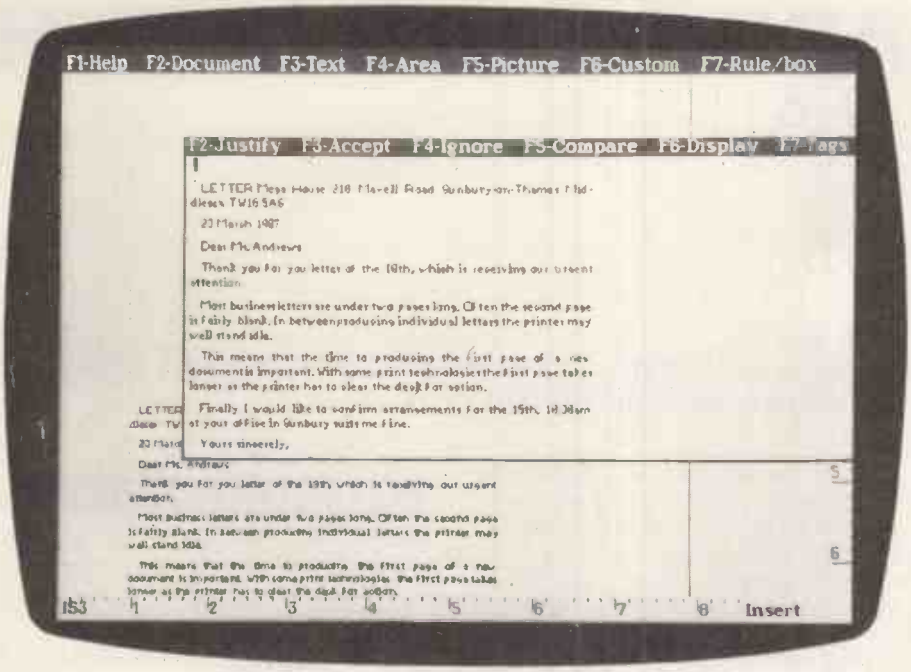
	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	■	☐
Ease of use	☐	■	☐	☐
Documentation	☐	■	☐	☐
Value for money	☐	■	☐	☐

☐ Best for handling long reports or documents with a simple, repetitive style, but inconvenient for elaborate page designs.

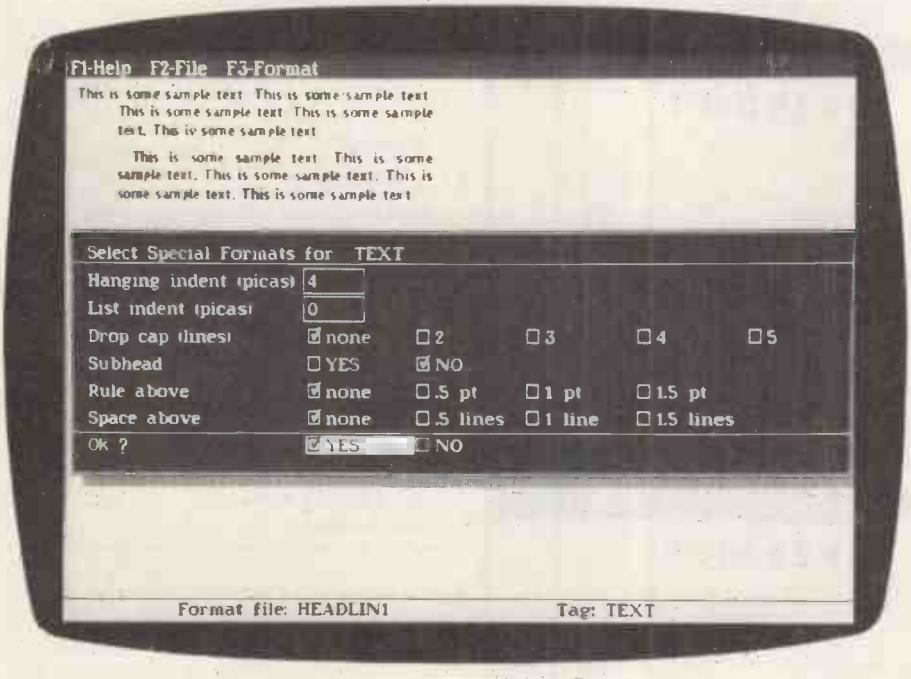


Above: You are given a running tally of overmatter or shortfall.
Below: The text directory displays the number of lines of text used by each file.





Above: You can edit text in the Edit window, where there is also a preview facility. Below: Text is automatically reformatted to slow the effect of any tag you apply.



can be up to five characters long and must not end with a number, which is rather awkward. Being restricted to only five characters — rather than the eight which you use when allocating a page style name — was something I found rather confusing.

A dialogue box appears in which you choose whether you want continued lines; a left-hand or right-hand page style; what fount sets are to be used; and what format file is to be used. Continued lines are automatically generated and updated, and you can specify two different sets of founts per document. You can type an asterisk in the Format File field to select from a directory of format files; you leave it blank if you want to create a format file and enter its name later.

To create a format file you go to the Layout screen. It looks like the Page Style screen but has a different set of options on the menu bar. They include Help, Document, Text, Area, Picture, Custom and Rule/box. You select Define Formats from the Document menu to get to the Format File screen. This has three options in a menu bar at the top of the screen, and a status line showing the current format file and tag.

When you first use a text file created with a word processor, HPP will format text according to the definition of the default Text tag unless you have inserted tags within it already. Otherwise you use the Edit window to edit and format text. Text will automatically flow from column to column and from page to page — up to 999 pages if you wish — complete with continuation lines. HPP does this quickly and easily, and it is this ability that is its great asset.

To format headlines within your flowed text you select Edit, followed by the column containing the words to be headlined. The text then appears within the Edit window. You select the Tag menu, which appears at the top of the Edit window, then choose the tag you want to use. HPP applies the tag to the text at the cursor position and formats it in the window accordingly, giving you a kind of preview facility. You can ignore this and select another tag, or accept it and incorporate the changed type style into your layout.

Once you have laid out your text you can incorporate pictures, rules and boxes. Rules and boxes are created in the same fashion as on the Page Style screen. Space for pictures is allocated by creating masks. You do this in a similar way to drawing boxes, but all you see is an area of empty space.

PICTURE DIRECTORY

When you choose Get/Place from the Picture menu the Picture directory appears, showing the picture files. You select the picture you want to place and a flashing box appears on the page. You size it to take the picture, which is then painted where you drew the box. Pictures can be resized — but only to their original proportions — or moved to another part of the page.

The same masking technique is used to create wraparound effects. A mask can be drawn round a picture so that the text flows round it. The smoothness of the resulting wraparound effect depends on how steady and accurate you were when using the mouse to draw the mask. If something is an awkward shape you are likely to have an unequal space between the end of the text and the edge of a picture; it would be extremely difficult to create a smooth curve.

The HPP manual does its best to explain what is quite a difficult package to use. As with all large manuals, there is a lot of cross-referencing but I felt that it would have been useful to have a section showing what different screens look like, and the options and menus available with each. The manual includes some useful suggestions on page layout and organising your files.

CONCLUSIONS

■HPP should prove suitable for long documents with fairly simple layouts that will need little updating. Ventura Publisher also handles long documents well and has a friendlier user interface; it cannot match HPP for typographical versatility, but in its latest version it is catching up fast.

■I found HPP clumsy and irritating to use. Its editing facilities are limited, and the wraparound — like that of all IBM-compatible packages we have seen — is primitive. Its use of tag-like commands makes it laborious to achieve something as a simple as, say, a superscript.

■If you want to produce short documents you may find Aldus PC Pagemaker more suitable; it is certainly far easier to use. If you want to move on to more complicated layouts or are simply looking for something that is easier to use, it is still worth turning to the world of the Macintosh and taking a look at Xpress. PC

GENERIC CADD & AUTOSKETCH
DRAFTING FOR ALL

By Roger Cullis

While object-orientated drawing programs are commonplace on the Mac, it is only recently that affordable packages have become available for ordinary IBM users.

Only a limited number of types of application have achieved wide acceptance on the microcomputer. The spreadsheet and the word processor are used universally, followed at some distance by database managers. After these three clear leaders you have to begin to scratch your head to find tasks which are performed by significant groups. Computer-aided drafting (CAD) is one such application, but already the number of potential users is several orders of magnitude smaller than that of those who wish simply to type or do What-If? exercises.

Smaller volumes equate with higher prices, since the authors have to recover a greater percentage of the development costs from each sale. So up till now, the most popular CAD package has been Autocad, which costs a cool £2,000 a throw. On top of that you have to pay another £500 if you want its advanced drafting extensions. Just recently, however, the CAD market has seen the introduction of budget-priced software which could have a revolutionary effect. The new packages are petty-cash items, the purchase of which does not require major justification. Typical of these offerings are Autosketch and Generic Cadd, which cost £79 and £99 respectively.

The Amstrad PC-1512, like many other computers which come with a Gem interface, has a drawing program bundled with it. Why then should one spend good money — even as little as £79 — to augment something that is available free? The answer is that the bundled drawing programs are pixel-based. This means that when you enlarge an object, the enlargement will contain no more detail than the original. Autosketch and Generic Cadd, on the other hand, are object-based. A circle, for example, is stored as the co-ordinates of its centre plus the radius. When you zoom in to make the object larger, the program adds the necessary detail.

Autosketch and Generic CADD both require an IBM PC or compatible with two drives — either twin floppies or a floppy and a Winchester. The display must be capable of showing a graphics screen with reasonably high resolution. Generic CADD needs at least 384K of RAM. In Autosketch, memory size sets a limit to the complexity of the drawing that can be displayed; a minimum of 512K is recommended.

You can use the cursor keys to move the plotting point about the screen, but a proper pointing device such as a mouse, tracker ball or digitiser tablet greatly facilitates the operation. Hard copy can be output to any printer which is capable of operating in graphics mode, but a plotter is the more usual way of transferring drawings to paper. Object-based drawing programs perform all calculations in floating-point arithmetic, so both Autosketch and Generic Cadd run much more quickly if the system has a maths co-processor.

If your computer has an IBM Colour Graphics Adaptor and a Microsoft mouse attached to the COM1 serial port, then Generic Cadd is ready to go as it comes out of the packing. Otherwise you run a simple menu-driven configuration program to customise the main program so that it runs with your equipment. As well as the IBM CGA and EGA display and the ubiquitous Hercules cards, a wide range of other display options are supported by the drivers supplied as standard. Even if you have an esoteric display format the chances are that you can purchase a special driver for it.

Autosketch comes with two program discs, one for use with a numeric co-processor, the other for use without. The first time you run the program, it will present you with a menu of supported pointing devices, displays, plotters and printers. For some devices there are additional questions to determine the precise manner in which you connect them.

With Generic Cadd it is important to use the drivers which come on the program disc rather than those provided by the peripheral manufacturer, as they will interfere with the proper running of the program. Another difficulty which is likely to be encountered is that the peripherals which will be used with this software are serial devices. They thus present all the problems associated with RS-232 standards, including the need to

GENERIC CADD

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	■	☐
Ease of use	☐	☐	■	☐
Documentation	☐	☐	■	☐
Value for money	☐	☐	☐	■

☐ An ideal package for the user who requires a drafting facility but does not wish to pay for great sophistication or support.

AUTOSKETCH

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	■	☐
Ease of use	☐	☐	☐	■
Documentation	☐	■	☐	☐
Value for money	☐	☐	☐	■

☐ Simple to use, with the added advantage that it is compatible with Autocad.

SPECIFICATIONS

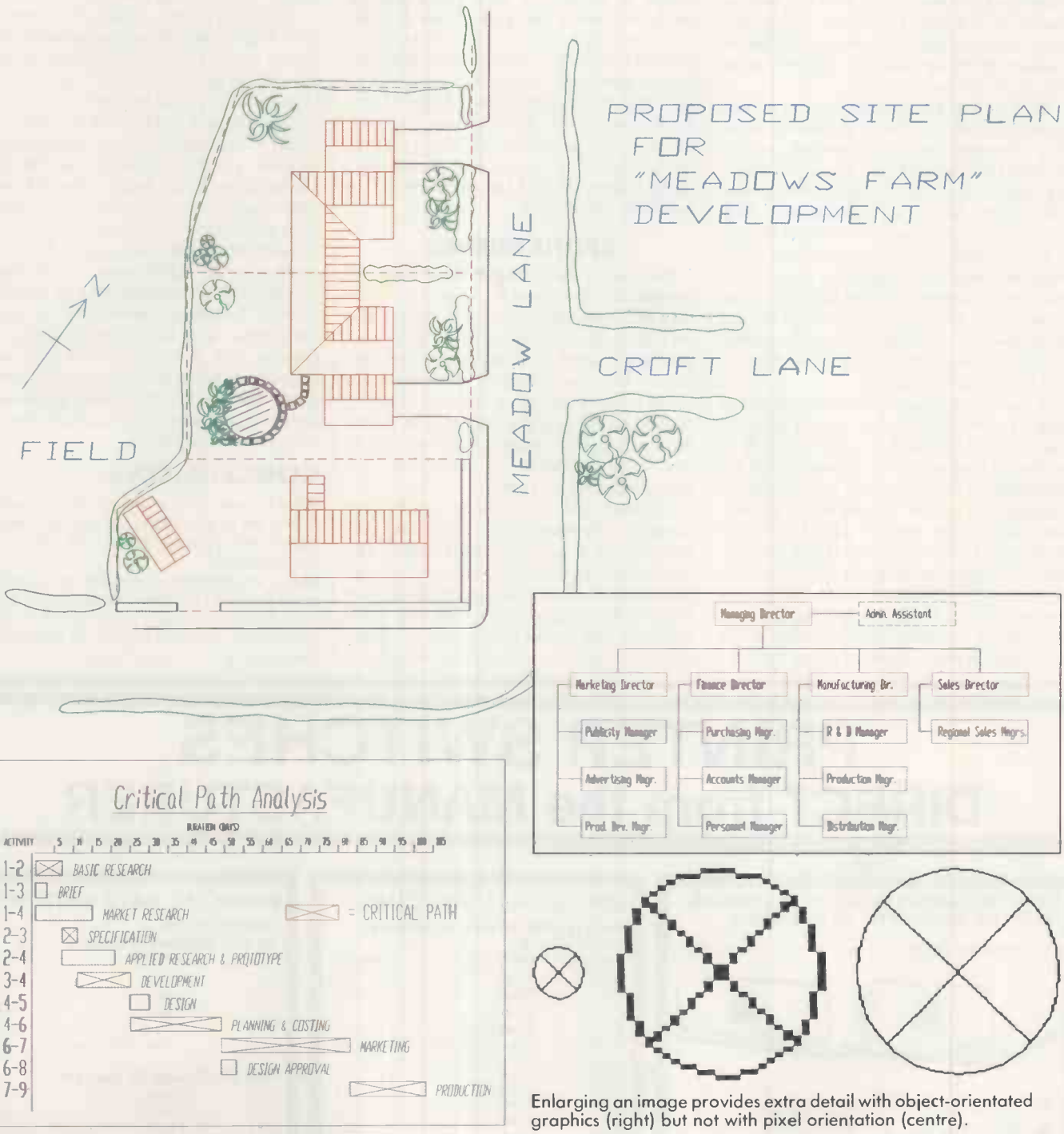
GENERIC CADD

Description: computer-aided design and drafting
Hardware required: IBM PC or compatible with at least 384K RAM, graphics screen, two disc drives, plotter or graphics printer; mouse or bit pad optional
Copy protection: none
Price: £100
Publisher: Generic Software of Redmond, Washington
UK supplier: Robotechnic, 19 Queen Street, London W1X 7PH. Telephone; 01-499 9746
Available: now

AUTOSKETCH

Description: computer-aided design and drafting
Hardware required: IBM PC or compatible with at least 512K RAM, graphics screen, two disc drives, plotter or graphics printer; mouse or bit pad optional
Copy protection: none
Price: £79
Publisher: Autodesk of Sausalito, California
UK distributor: Autodesk, South Bank Technopark, London SE1 6LN. Telephone: 01-928 7868
Available: now

IMAGES FROM AUTOSKETCH



Enlarging an image provides extra detail with object-orientated graphics (right) but not with pixel orientation (centre).

match baud rate, data-word format and handshaking connections. The manual provides comprehensive instructions for a wide range of devices, so with a little patience you should be able to achieve the correct arrangement.

A digitising tablet is the recommended pointing device for both programs, and it is a necessary adjunct if you intend to copy existing drawings by tracing them. If you do not wish to incur the expense of a digitiser — which can cost £900 or more — then a mouse can be used as a rapid input device. For those without even this basic peripheral, the cursor keys may be pressed into service to get you around the drawing.

Belying its origins, it is the screen display of Generic Cadd that more closely resembles that of Autocad. The drawing area fills most of the screen. It has a vertical line on the right-hand side separating it from the menu, and a horizontal line at the bottom separating it from the prompt area.

The menu lists the commands which the operator selects when making a drawing, and the prompt area gives an instruction such as "Enter a Command" and displays information about the drawing in progress. At the top of the screen is an area reserved for the display of cursor co-ordinates. A cross-hair cursor in the drawing area identifies the current plot point on the screen and moves about as the pointing device is operated.

The Autosketch display is very similar to that of Gem. A menu bar at the top of the screen displays menu names, a memory-usage meter and a digital clock. At the bottom of the screen there is a prompt line where prompts are displayed to remind the operator what information the program is expecting. The drawing area in between

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contains a small Gem-like arrow whose position is controlled by the pointing device. Another point of similarity with Gem is that Autosketch communicates with the user by means of dialogue boxes into which you enter values for specified parameters before completing the operation by clicking on an OK or Cancel box.

Both packages group drawing commands under a number of basic categories, accessible through the corresponding menu. Generic Cadd's first group is used for drawing lines, circles, arcs, points and various other items which are collectively called objects. The technique used to create objects is first to specify by the appropriate command which object you require, and then to mark on the screen points which define that object. For example, to draw a circle, the centre and the radius can be specified; alternatively, three points on the circumference will determine it uniquely.

A number of objects may be combined to create a component, which can be saved to disc in a library and recalled when it is needed. These recalled components can be manipulated by changing their scale or rotating them. Text in a variety of founts, sizes and colours may be added from the keyboard. Additional founts can be created, and the new founts need not be restricted to alphanumeric characters. Zoom commands change the area of display: for example, you can zoom in on a small window so that it fills the entire screen. Drawings can be constructed in up to 256 layers, a feature which is particularly valuable for architectural plans or engineering assembly diagrams.

The drafting package uses control commands to produce a professional-looking result even when the operator may be relatively unskilled. For example, by setting a tolerance of 0.25 in combination with the Snapto command, a line may be joined to any point within the specified range. Ortho mode ensures that all lines that meet are strictly at right angles to each other; without this facility it is all too easy to make drawings slightly skew. A grid can be displayed to help with positioning.

SPLINE CURVES

Autosketch has a more limited range of commands than Generic Cadd, although they still permit the operator to create complex drawings. The Draw menu is used to generate objects such as circles, arcs and boxes. One sophisticated feature draws spline curves from up to 100 control points entered by the operator. The control points form a frame of connecting points which, when the operation is completed, are redrawn as a spline curve.

Libraries can be formed from subassembly drawings, and they can subsequently be recalled and manipulated. The facilities for entering text are rudimentary. Two features of the editing commands are likely to be of great value. The first is the ability to step to and fro through the drawing by means of the Undo/Redo commands. The other, which is imported from Autocad, is the ability to stretch part of a drawing. Like Generic Cadd, Autosketch assists unskilled operators with commands such as Ortho, Attach, Snap and Grid.

With both Generic Cadd and Autosketch providing a powerful range of drawing facilities for under £100, you might be wondering why anyone should pay £2,500 for a full-blown drafting package such as Autocad. The answer in a single word is "support". With a hardware package comprising a digitiser, a plotter, possibly a special high-resolution monitor, and a powerful micro with numeric co-processor, each coming from a different manufacturer and costing upwards of £9,000, the system has to be made to work. Furthermore, it will usually be operated by someone who is skilled in drafting techniques rather than the use of computers, so a substantial training programme will be required. For these users full-size packages are a worthwhile investment, but for less specialised applications Generic Cadd and Autosketch are likely to meet most requirements.

CONCLUSIONS

■ For a user who wants to add a drawing facility on to an existing system both Generic Cadd and Autosketch can be thoroughly recommended.

■ As a stand-alone system, Generic Cadd has more powerful facilities. For users with access to Autocad, the ability to convert Autosketch drawings to Autocad format will probably be the deciding factor in its favour. PC

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DVX	2 way cross-over	£79
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DR3	3 way	£57
DR4	4 way	£65
DR5	5 way	£73
DR8	8 way	£109
DRX	2 way cross-over	£65
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DN3	3 way	£52
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DC3	3 way	£79
DC4	4 way	£95
DC5	5 way	£109
DCX	2 way cross-over	£95
IBM PC.25 way 'D' sockets		
DP2	2 way	£59
DP3	3 way	£69
DP4	4 way	£79
DP5	5 way	£89
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DE2	2 way	£89
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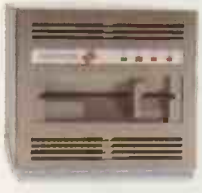

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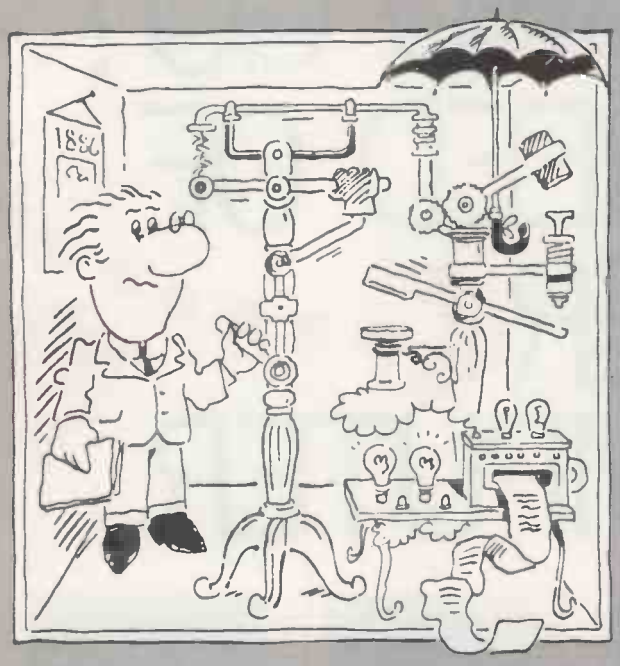

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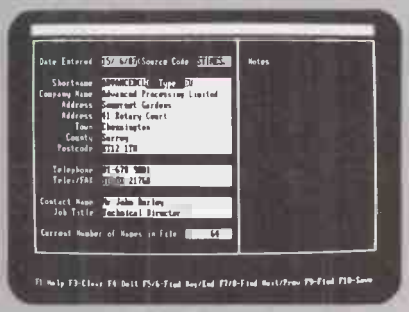

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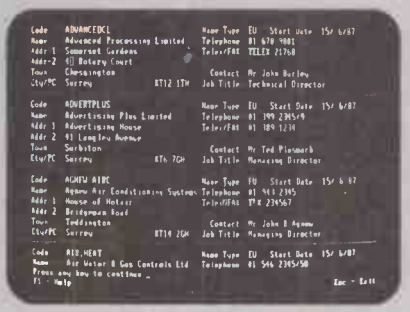

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TURBO BASIC
HIGH-SPEED COMPILER

By Mike Lewis

Although Basic has its critics there remains a dedicated band of users. Borland's typically good-value implementation gives them an additional option.

With Turbo Basic, Borland International has signalled its belief that there is still a future for the much-maligned Basic language. True, more and more programmers are turning to Pascal, C and even Prolog, but the overall market for languages is growing so fast that a first-rate Basic compiler can still make plenty of money for its authors.

Turbo Basic is certain to do just that. It is a world away from the traditional free-standing compilers, with their need for separate editors and linkers. Now the familiar development cycle — edit, compile, link, run and crash — can be performed quickly and easily in an integrated environment, complete with windows and pull-down menus.

In this respect, Turbo Basic follows the route marked out by its stablemates, Turbo Pascal and Turbo Prolog. It has the same WordStar-style editor and fast in-memory compilation, and an error trap that automatically re-invokes the editor and places the cursor at the offending statement. The user interface is much closer to that of Borland's Prolog than the older Pascal, although it is only a matter of time before the latter compiler gets the same treatment.

At the heart of the interface is a set of four windows. The first two are the important ones, being used for editing the program and viewing its output. The Messages window is mainly used to display compilation statistics, while the remaining one is reserved for tracing a program's execution with the Tron and Troff commands. There are plenty of ways of resizing the windows and moving them around, and the Edit and Run windows can be zoomed to fill the screen.

The whole thing is supported by a simple system of pull-down menus and a comprehensive Help file. All told, the user interface is well designed and quite straightforward to use. There are also good facilities for customising the package, including changing screen colours, editor control keys and compiler defaults.

The compiler itself works entirely in memory, with both source and executable programs held in RAM by default, which makes compilation very fast. Alternatively, you can elect to produce a free-standing Exe file, or a TBC file for use with Basic's Chain command. One of the compiler's biggest weaknesses is that it cannot generate separately compiled object modules; the only way of building a library of reusable routines is to duplicate source code via an Include command.

All this inevitably has an effect on program size. Holding the editor, compiler and source code in RAM leaves that much less space for the executable program. But you are still much better off than you would be with Microsoft's Basic interpreters, since they impose a 64K limit on program and data. Turbo Basic's limits are 64K for the source, 64K for each array, 64K for all non-array variables, and an unlimited code segment.

Program size is not the only area where Turbo Basic is ahead of the interpreters. The language itself has many more features. It achieves its aim of being compatible with both GWBasic and Basica, while at the same time offering lots of interesting new commands. Programs written for either of these interpreters should compile and run with little or no change, even if they use hardware-dependent features like sound, graphics and event trapping.

In addition, Borland has tried to make Turbo Basic compatible with another Microsoft product, the Quick Basic compiler. This is important because Quick Basic and Turbo Basic seem to be natural competitors — the first time that the brash young Borland has made a direct attack on the mighty Microsoft. Quick Basic, which we reviewed in the February 1986 issue, is now in its third major release.

SPECIFICATION

Description: Basic compiler with built-in editor and run-time environment
Hardware required: IBM PC, PC/AT or compatible with 256K RAM
Copy protection: none
Price: £69.95
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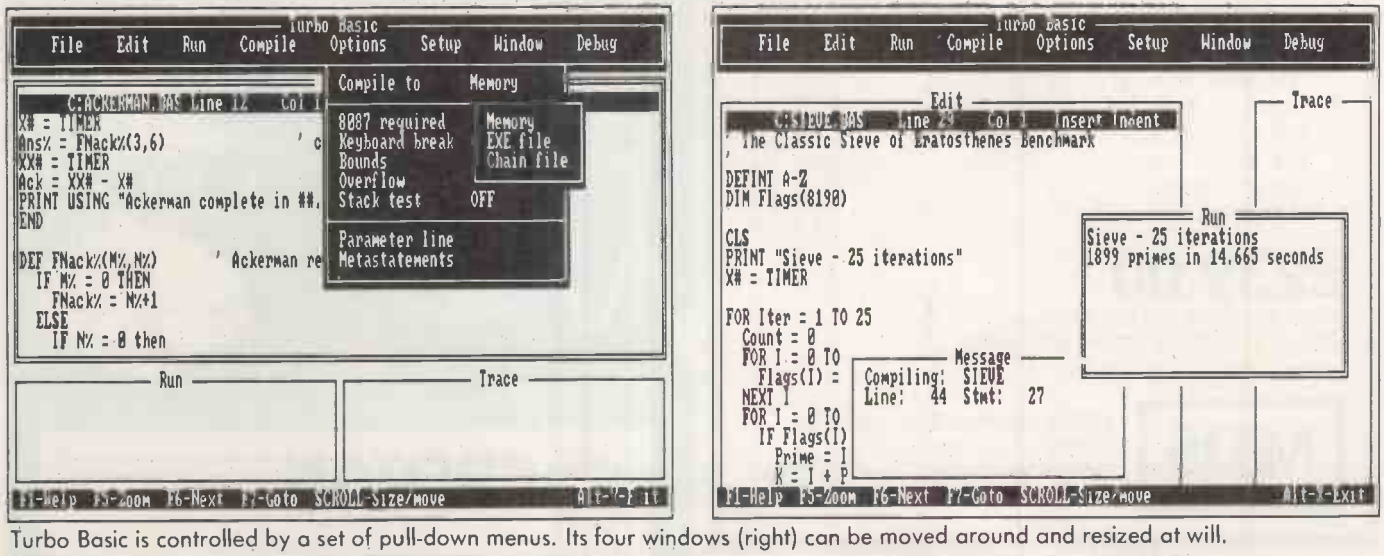

Turbo Basic is controlled by a set of pull-down menus. Its four windows (right) can be moved around and resized at will.

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Like Turbo Basic, Quick Basic sports a built-in editor and in-memory compilation. Its windowing system is less sophisticated, with user programs taking over the entire screen, which many programmers will prefer. A useful feature is that its menus and windows can be bypassed, with compilation invoked from the DOS prompt or a batch file. Version 3 has a sophisticated debugger, similar to Code View in Microsoft C.

The language elements that Quick Basic introduced, and which Turbo Basic has now borrowed, include many commands aimed at making Basic a more structured language. Optional alphanumeric labels replace mandatory line numbers. There are new ways of avoiding Goto statements, such as Select Case, Do-While, Do-Until, Loop and Exit. And the If-Elseif-Endif construction means that you need not squeeze an entire If command on a single line.

Perhaps best of all, both compilers allow you to write real multi-line functions and procedures, as you would in Pascal or C, complete with global, local and static variables. With Turbo Basic you are not forced to place these routines before the statements that call them, which means that you can put the top-level logic at the top of the program. This is not possible with Quick Basic.

Other Turbo Basic plus points include recursion, easier access to machine register and interrupts, and an improved assembler interface. On the negative side, it does not support file and record locking, which Quick Basic does. Both compilers allow arrays to be allocated and released dynamically, and both have 8087 support.

One feature missing from both products is direct language support for the mouse. The joystick and light-pen are both well provided for, so why not use the same On-Event syntax for what is a far more popular pointing device? This omission is especially surprising in Quick Basic, which does support the mouse in its own user interface but not in the language.

For many users the key factor in choosing a compiler is speed. Turbo Basic makes your programs run faster than they would under an interpreter, but the amount of speed-up is very variable. In our tests we noted improvements ranging from almost nothing to a factor of 60:1. A program containing a good assortment of Basic commands ran in 100 seconds under GWBasic, 36 seconds with Turbo Basic, but just 14 seconds after compiling with Quick Basic.

As far as compilation times are concerned, the results are much clearer. Turbo Basic clocked a consistent 5,000 statements per minute for memory-to-memory compilation, compared to 3,300 for Quick Basic and 4,500 for Turbo Pascal. All these tests were carried out on an 8086-based Olivetti M-24.

One performance statistic in which Turbo Basic compares badly is in executable program size. A minimum program, which simply displays a greeting and exits, generates a 28K Exe file. In Quick Basic, the figure is just 3K, while in Turbo Pascal the equivalent Com file is 11K. This would not matter in a large application such as a payroll, where programs could be chained to minimise this overhead. But it does make Turbo Basic unattractive for small utilities such as file listers and directory programs.

TURBO BASIC

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	■	☐
Ease of use	☐	☐	☐	■
Documentation	☐	☐	■	☐
Value for money	☐	☐	☐	■

☐ If you are committed to Basic, this compiler is well worth considering.

CONCLUSIONS

■ For Basic programmers, or for users with a large investment in Basic programs, a compiler like Turbo Basic could be a much better option than changing languages.

■ Turbo Basic is fast, easy to use, inexpensive, and rich in new commands and functions.

■ In comparison with its obvious rival, Microsoft's Quick Basic, it scores well in terms of user interface, compilation speed, language features and memory model, but less well in execution times, program size and debugging aids. PC

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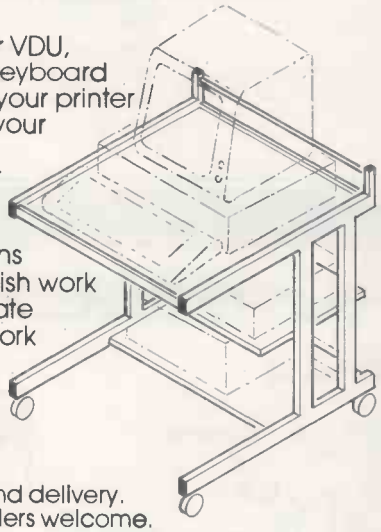

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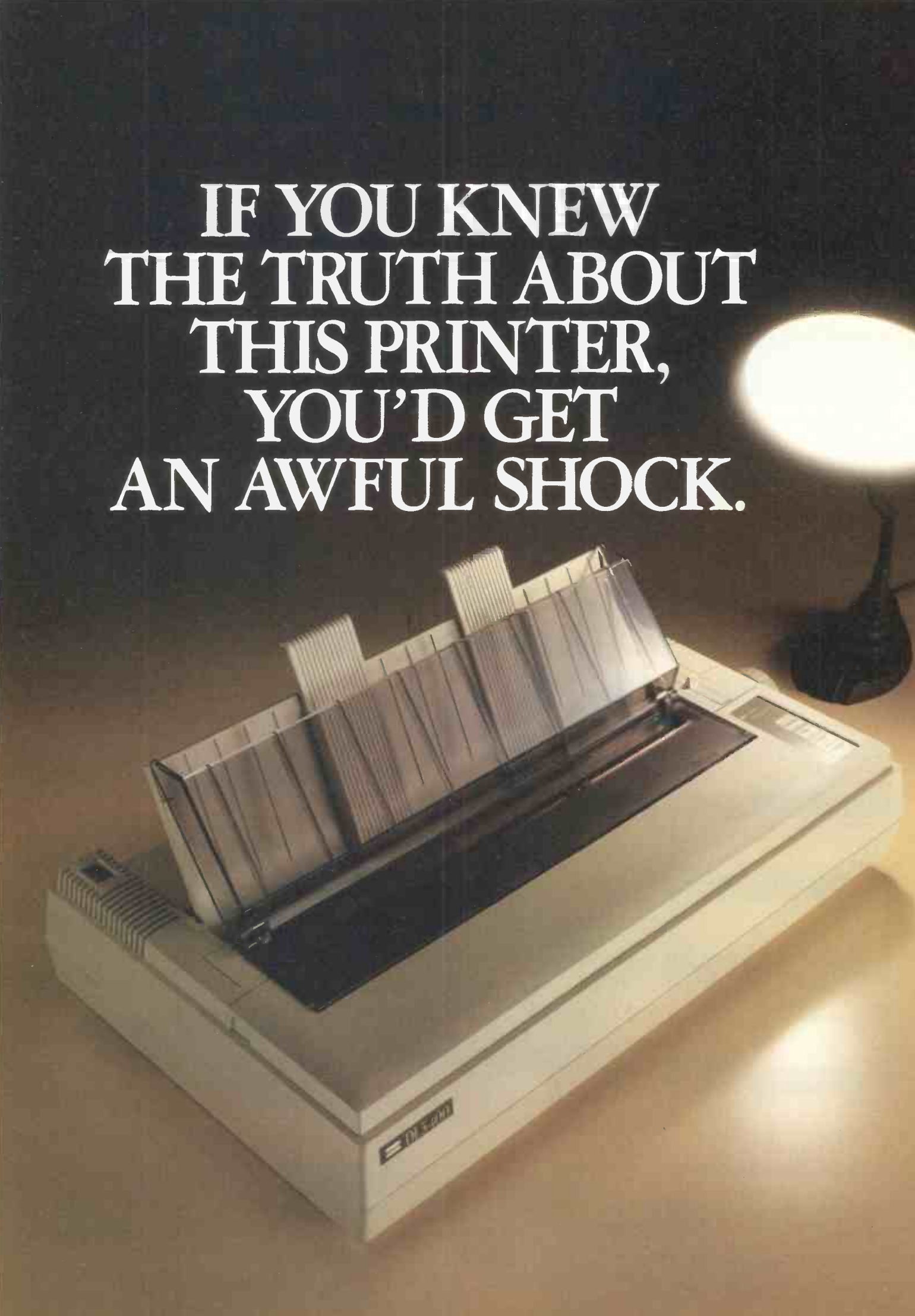

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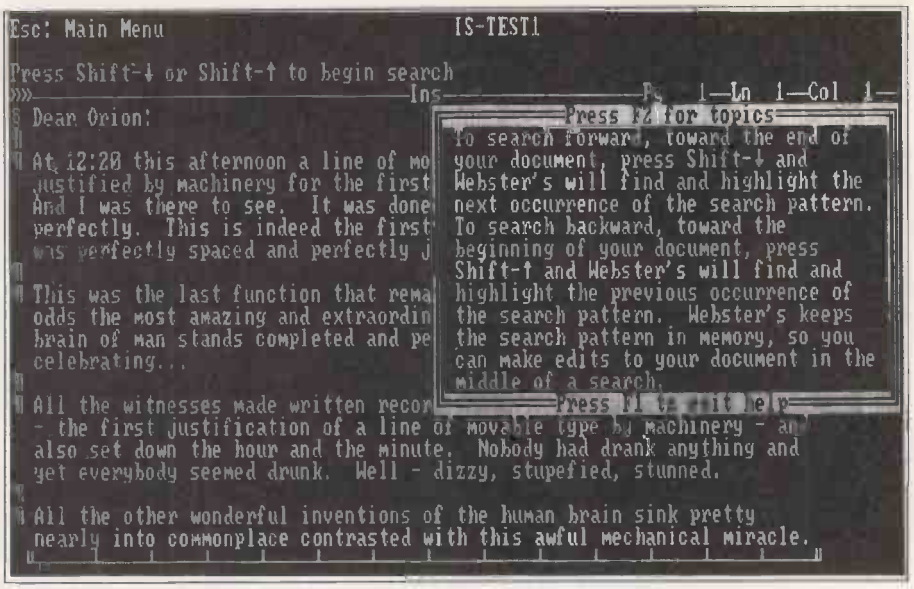


WEBSTER'S NEW WORLD WRITER
FOR AUTHORS ONLY

By Susan Curran

Creative writers have different needs from the ordinary office WP user, and this package sets out to address them.

Though numerous word processors are available, the economics of the industry still seem to dictate that virtually all of them are multi-purpose programs. Word processors are rarely angled to a specific group of users, and the only significant differentiation is by price. Webster's New World Writer attempts to buck this trend. This package is aimed specifically at writers; the special needs of secretaries, producers of form letters and the like are ignored.

Webster's is described as a "writing system". It combines basic word-processing capabilities with a spelling checker, a thesaurus and a writer's guide. It should be emphasised, though, that the only style checker included is in the manual, and that the capabilities of this program do not in any way exceed those of a good all-round word processor such as Word Perfect or WordStar 4.0. But Webster's is the only program costing less than £150 that I know to have a thesaurus, and this alone may make it very attractive to certain users.

Webster's is a relatively compact and simple program. The full package, including thesaurus and spelling checker, comes on just three unprotected floppies. It requires only 256K of RAM, which is modest for a package with these capabilities. The program is neatly presented, with a very sturdy 200-page spiral-bound manual and a quick-reference card. The manual is well laid-out, though it is occasionally confusing in the way it presents topics. It contains an excellent Writer's Guide, covering style points under headings like "Punctuation and Manuscript Preparation", "Trite Expressions", and "Words Likely to be Misused or Confused". There is full in-context help on-screen.

The editor itself is a single-document program. You have to name the document you are going to work on as soon as the program loads. A simple directory of file names in alphabetical order is available, but only on demand. Only one document at a time can be worked on.

There is no windowing or dual-document capability, and I think this restriction is a serious one. Surely creative writers of all kinds have a particular need to be able to move text from file to file, to keep notes online in a separate file from their document, and to compare successive drafts of a document. I know I do all these things, and the inability to do them would make me reluctant to settle for this program.

SPECIFICATION

Description: word processor with spelling checker and thesaurus
Hardware required: IBM PC, PC/AT or compatible with at least 256K of memory and two disc drives; PS/2 version in preparation
Copy protection: none
Price: £110
Publisher: Simon & Schuster, Prentice Hall International, 66 Wood Lane End, Hemel Hempstead, Hertfordshire HP2 4RG. Telephone: (0442) 58531
Available: now

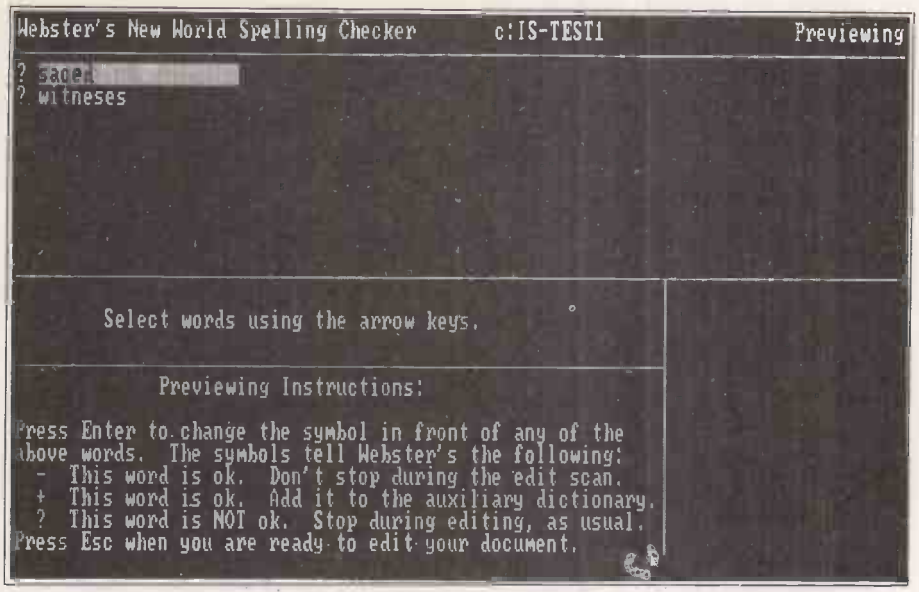
Once a document has been selected, the program comes up with a fairly plain editing screen. There is a four-line section at the top which provides menus and prompts, and a ruler at the bottom. These features are not removable, which is unfortunate as they clutter the screen. Though the menu names are always on display, you do not need to use them all the time to access commands, as most are also available through Alt-key combinations.

The menus are heavily nested, and you can move from level to level either by pressing initial-letter keys or by highlighting. The choices are mostly self-evident, though not always so: you have to select End, for example, to do a security save, and Appearance in order to start a new page. Some of the key sequences are a little cumbersome. To change both margins, for example, you select Appearance followed by Format followed by Left Margin, then fix the margin using the cursor before you select Right Margin and do likewise, and finally select Use to apply the new settings.

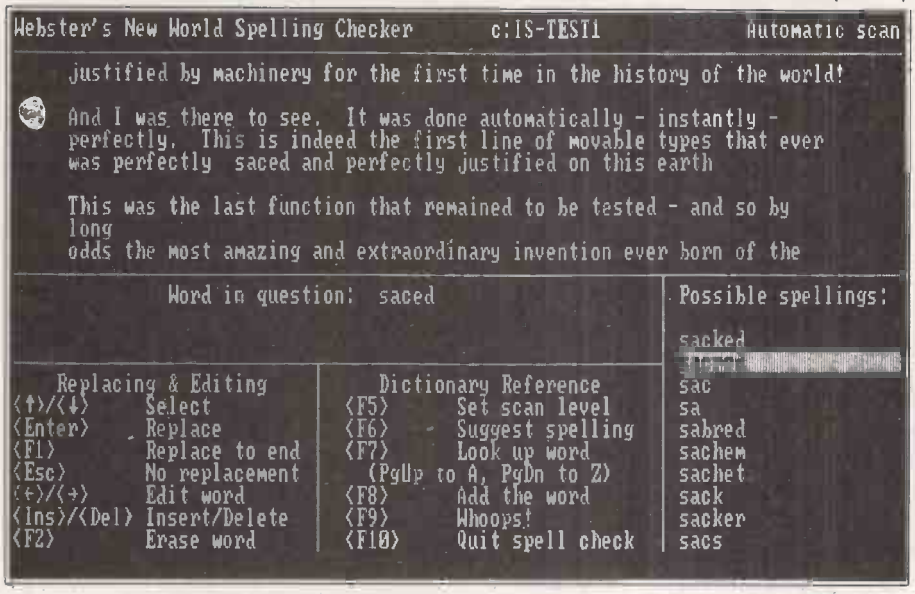
Format changes within a document are handled by so-called "fences". A fence-mark is a special indication at the start of a paragraph that a format change is required; changes made at that point apply until the next fence-mark. This is a neat and flexible system once you have understood it. The program performs margin changes and other formatting adjustments efficiently and swiftly.

Up to three formats can be held with a document, allowing complex formatting changes to be applied automatically. This is a neat idea, though three is not a very generous provision, considering how cumbersome it is to define a format from scratch. Format definitions contain data on line spacing, margins, whether justification is required, and headers and footers. They do not cover as full a range of stylistic data as some more expensive packages; the style-sheets in Microsoft Word, for example, hold more comprehensive style definitions.

Webster's reacts smoothly on-screen. It scrolls vertically, and when you move the cursor after an editing change it reformats text automatically. It does not scroll hori-



Webster's editing screen (left) with the help window. The spelling checker first lists doubtful words (above). You select each one to show its context and alternatives (below).



THESAURUS ENTRIES

Webster's entry for "secret"
secret, mod.
1. mysterious, ambiguous, hidden, unknown, arcane.
2. latent; see hidden
3. clandestine, underhanded, stealthy, surreptitious, furtive; see also secretive, sly, taciturn
secret, n.
1. mystery, something veiled, something hidden, confidence.

Word Perfect's entry for "secret"
secret (a)
1. clandestine *confidential, *private, undisclosed
2. *cryptic, *mysterious
3. concealed, hidden, isolated, secluded
secret (n)
4. *confidence,
5. enigmo, mystery, puzzle
6. formula, *method, *plan, recipe
Words with * are cross-references

WEBSTER'S

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	■	☐	☐
Ease of use	☐	☐	■	☐
Documentation	☐	☐	■	☐
Value for money	☐	☐	■	☐

☐ Cheap and handy for journalists and creative writers, but lacking some important facilities that many such users will value.

zontally at all, as the maximum allowable right margin is at column 77.

The usual basic set of editing functions is provided. There is a good search and replace, with case, whole-word and backward/forward options. Block options include Copy, Move, Delete, and Change Case functions. You can save a block to file, but it is not possible to print a block direct. Boldface, underline and other typefaces can be obtained by inserting printer codes. The program supports tabs but not decimal tabs. You can have two lines of header and one of footer. There is also provision for drawing boxes.

All Webster's features are adequately implemented, but they do not compare in scope with the more complete capabilities of top-level programs like Word and Word Perfect. There is no outlining, no indexing, no automatic footnoting and no paragraph numbering, although they are all things which many of Webster's intended users would find extremely useful. Perhaps more understandably there are no maths capabilities, no columnar capabilities and nothing for handling form letters.

File-management capabilities are limited, but there is a disc directory from which Webster's allows you to copy, rename or delete files. Webster's will handle alternate characters: you can display any character in the IBM set on-screen and send an ASCII code to a printer. However, the printer drivers are not sophisticated enough to ensure that in every case what appears on-screen will also appear on the printer. There is no in-built subscript or superscript mode, and this is a sad loss.

The program's printer support is uneven. There are 24 printer drivers, including Dumb Printer, Standard Printer and Standard Typewriter — not many compared with a lot of top-class programs. The program does not allow you to define your own drivers, or to adapt the existing ones except in set ways.

Webster's claims to micro-justify text on supported printers, but as the drivers are nowhere described in the documentation, and my own printer is not supported, I was unable to test this feature. I found the limitations of the printer drivers annoying. Only by inserting control codes in each document could I send a necessary initialising code to my printer, for example, and I could see no way to tell the program that I was using port 2 for my printer.

It is possible to revise the printer setup — and other setup details — at any point, but not to set up two printers at the same time. If you want to change printers you have to go through the full setup process each time. One neat option in the printer menu makes it easy to print your document on both sides of the paper. The program first prints all the odd-numbered pages, then prompts you to turn the paper over to print the even-numbered pages. Webster's only prints the document in memory: it does not do background printing and has no queuing capability.

The speller and thesaurus are both heavily emphasised features of Webster's. The

(continued on next poge)

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speller has an in-built 114,000-word dictionary, and lets you build up your own auxiliary dictionary. A major failing is that only a single auxiliary dictionary is permitted, and you cannot capitalise proper names in it. The speller is not memory resident, and it saves the document before performing a spelling check on it. Therefore it will not check words as they are entered, and there is no quick way of checking the spelling of a word while you are editing.

The checker sorts the words in the document, and then compares them alphabetically with its dictionary entries. It presents you with a list of suspect words to review, and if you choose to correct a word the program displays it in context. The out-of-context review brings up a few anomalies: a word followed by a full stop is treated as different to the same word without the full stop, and an additional character appears in hyphenated words that are split at the end of a line. This two-stage process makes proofreading reasonably fast, though inevitably not nearly as fast as with a resident routine.

For the in-context check you can select any of four different scan levels, allowing you to control the time the program spends looking up alternative spellings. A very full range of options are available, including Ignore Once, Ignore Throughout, Erase and Edit Word. It is a small annoyance that for manual editing of a word the program defaults to overstrike mode; it is also annoying that it does not automatically reformat after the spelling check changes line lengths. Alternative word suggestions are comprehensive, and it is claimed that the full scan takes into account your past spelling errors in the current document.

SPELLING CHECKER

Webster's suggestions for correcting "teh" tech, tech., techs, ted, tee, teeth, ten, teak, teal, team
Word Perfect's suggestions tea, tech, ted, tee, tel, tem, ten, tex, th, the, eh

Webster's suggestions for "nyte" ny te, ny, nth, nut, nyx, np, ns, nu, nude, nutmeg
Word Perfect's suggestion note
(I was actually looking for "byte")

Webster's suggestions for "retreive" retrieve, retrieved, retriever, retrieves, retire, retried, retries, retrieval, retrievers, retrim
Word perfect's suggestion retrieve

The thesaurus is on-line. It automatically looks up the word on which the cursor is positioned, or the word typed immediately after it is called up. It is also able to identify and look up whole phrases such as "bring about" and "point of view". A page of data is displayed for any word you select, and any words on the page can be highlighted and selected for further browsing. Two pages can be displayed at once. You can browse alphabetically through the thesaurus, and there is even a special Notes page on which you can put suggestions.

My only reservation about the thesaurus is that it is actually more like a dictionary in its entries than an intelligent word finder. Take, for example, the entries reproduced on the previous page for "secret". Though Webster's gives plenty of cross references, there are not many alternative words which a writer might reasonably want to substitute for the original one. Word Perfect's thesaurus entries for the same two words are much more satisfactory, and WordStar is even richer. The Webster's thesaurus is fine if you want to distinguish between alternative meanings of a word. But picking an alternative word to put into your documents takes a lot of browsing, and much of it is difficult to direct.

CONCLUSIONS

- Webster's is very professional in its programming and production; for the user it is competent, reliable and easy to learn.
- The program's actual word-processing capabilities are fairly limited, though they are adequate for a bargain-priced program.
- Though the spelling checker and thesaurus increase the appeal of the program for creative writers, even these users will regret the lack of other facilities such as dual-document or windowing capabilities.
- Webster's does not offer anything to the creative writer that Word Perfect cannot match or improve upon — though at much higher cost.
- It is a pity the style checker has not made the transition from the manual to the program itself.
- Office users may need form-letter capabilities, which Webster's lacks.

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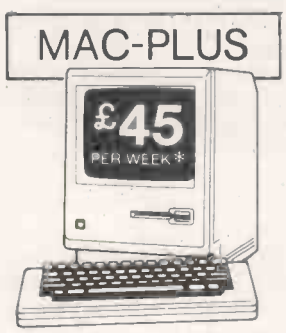

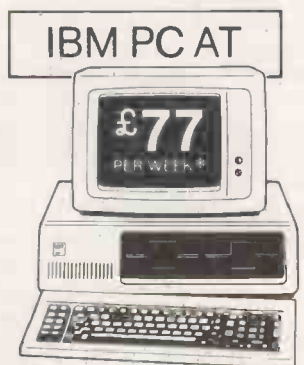

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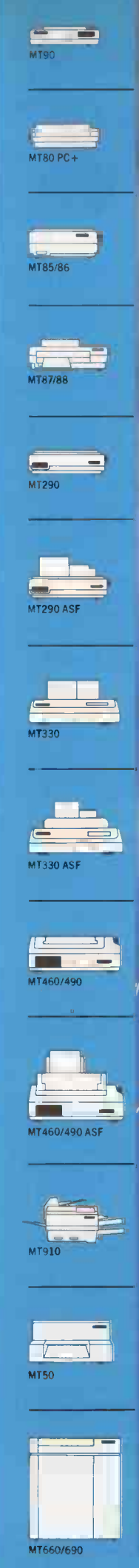

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Originally descended from the pocket calculator, the use-anywhere computer is well on the way to the ultimate vision of an electronic book. **Glyn Moody** plots its progress.

Portable computers seem to represent something of a Bermuda Triangle for the manufacturers. Year after year they blithely sail into this area with their latest machines, convinced they are about to take the world by storm. Instead they disappear, often without trace. In some ways this dedication to a phantom market is touching: it shows an almost non-commercial faith in the ultimate personal computer — one you take with you everywhere. There must be a winning machine out there waiting to be constructed but the technological barriers remain considerable, as the relatively slow and painful evolution of the portable machine shows.

Portable computers can be seen as the coming together of two ideas which both blossomed about five years ago. On the one hand there were the pocket calculators. Companies like Hewlett-Packard and Casio turned the calculator from a simple arithmetical aid into a wallet-sized box of tricks which did everything bar making tea. In fact, the level of sophistication that these devices attained was grossly at odds with the small packages in which they were confined.

On the other hand, there were the new personal computers. Adopting a significantly larger format of roughly typewriter size, the first micros packed a processing punch which had hitherto only been found on cabinet-sized minis. At the heart of this lay advances in chip technology which brought in their wake reduced power consumption and smaller size.

It was only a short step to marry the total portability of the calculator with the flexible power of the micro. Transportables such as the Osborne 1 and its successors were essentially desk-top PCs with handles. They were clumsy compromises that hardly fitted the bill. The first company to come up with a viable package — and in the process to go some way to solving the basic technological problems inherent in the concept — was Epson with its HX-20.

Epson tends to be thought of as a printer manufacturer pre-eminently, and one noted more for breakthroughs in marketing and price than in technology. As the launch of the innovative HX-20 shows, this is somewhat unfair. The HX-20 set many aspects of the format which persist to this day. The basic A4 size was in part dictated by the keyboard: beyond a certain point, small keyboards become unusuable by touch-typists, and so lose much of their usefulness. The display, always the bugbear of portables, was a 20-character by four-line liquid crystal unit. The same display technology remains dominant today, though screens have become much larger.

Disc-drive storage at this time was still fairly primitive and certainly too power hungry for a portable. On the HX-20 a miniature cassette was used instead. Later, many alternative storage technologies were used in an attempt to improve on this crude solution.

The HX-20 was a great success in its time, and it continues to sell even now. It has been especially successful in vertical markets, where it has frequently been sold in conjunction with speciallly written software. To this extent, the initial vision of the truly portable and useful computer has been fulfilled, though not in as thoroughgoing a manner as had originally been hoped. Once the pattern had been established, other manufacturers were prompted to move in.

Epson was first with a viable lap portable: the HX-20.

The next machine, built by Kyocera, was marketed in three versions: the Tandy 100, the Olivetti M-10 and the NEC PC-8201. Although externally the trio were quite different from each other, their internal design was the same, as was the pricing. The basic format took Epson's LCD further in the direction of matching the full VDU. Its eight lines of 40 characters have remained something of a standard width for portable eight-bit machines.

Meanwhile, the PC revolution was continuing apace. After the eight-bit machines had led the way, the new 16-bit processors started to trickle through. One of these chips found its way into an interesting near-portable, the Grid Compass. Although designed as a mains-powered transportable, the Compass could function off batteries for several hours, and could be carried around and used in this state. Many features of its overall design proved prophetic of later 16-bit machines which were truly portable.

One problem with the LCDs hitherto used on portables was their poor contrast and dependence on ambient lighting conditions. The electro-luminescent display used on the Grid was one of the first attempts to get round this difficulty, though its high power consumption has so far made it impractical for true portables. The mass-storage medium used was also exotic: bubble memory. Like RAM discs, it has not been taken up by the mainstream portables, largely because developments in disc-drive technology have solved most of the problems associated with earlier units. Grid later came out with the Gridcase, a truly portable plasma-display machine which used a conventional floppy-disc drive.

Ordinary floppies first appeared on the Data General One, another innovative machine which has never really received its due. It was a battery-powered portable which was IBM compatible — if you allowed its use of the then non-standard 3.5in. disc drives. Apart from their embarrassing lack of software, they offered enormous advantages for portables. They were light and small, and drew far less power than their 5.25in. siblings. They soon became standard on 16-bit portables.

By then the main emphasis had shifted away from the earlier eight-bit machines to

First of the 16-bitters, the HP Portable eventually acquired a proper disc drive.

the new generation of 16-bit IBM compatibles. To be sure, development in this other sector did not cease altogether; improvements were made to the Kyocera machine and Epson came out with its PX-8, the successor to the HX-20. All these machines continue to sell as text-gathering devices which can be slipped inside a briefcase. But the general portable market had moved on, at least in the manufacturers' eyes. IBM compatibility was the order of the day, and so most companies gradually came out with an entrant in the contest.

But whereas the earlier eight-bit portables seemed to have defined a real niche for themselves, these later machines are proving more of an enigma. Who exactly needs full IBM portability? The implicit assumption seems to be that computing needs to be done on the move, or at least in two locations. While the former certainly requires a portable but is surely a very small market, the latter could be equally well served by using a full-function mains-powered transportable system, or even two PCs, particularly with the advent of the cheap clones.

Nonetheless, manufacturers have rushed pell-mell to enter this 16-bit world of portables, as the table shows. One benefit of this excessive enthusiasm has been a steady progression in technologies. After the Data General machine and a similar model from Texas had established the basic form of an 80-character by 25-line LCD with 3.5in. floppies, successive machines built on this. They offered two drives, more RAM and, with the Wang Portable, even a hard disc and printer, both built-in. Zenith has recently matched this by including a hard disc with its Z-183 machine.

Of all the manufacturers it is probably Zenith that has the strongest commitment to portables. In addition to the Z-183 and its Z-181 dual-floppy version, there is the Z-171 — an older machine which uses a vertical rather than horizontal format along with 5.25in. floppies. Only Toshiba, with its highly successful T-3100 mains-powered portable and battery-driven T-1100, seems as convinced of the viability of this market sector.

Inevitably, IBM's endorsement of the portable came late and seemed rather grudging. Its Convertible machine was the same in outline as its predecessors, but by the time it appeared most competing machines had moved on some way, and the Convertible lacked many of their features. It was mainly of importance for signalling IBM's official blessing of the 3.5in. disc format and for using advanced production techniques which would bear greater fruit in the later Personal System/2.

Hand in hand with improvements in disc-drive technology has gone a marked improvement in displays. Apart from tweaks to the basic LCD design such as the super-twist technology, back-lighting has become the most popular way of improving visibility. Although battery-powered plasma displays have appeared, it seems likely that back-lit LCDs will remain the dominant technology. They hold out the hope that

(continued on next page)

The Tandy 100 (above) and Olivetti M-10 (left) were both built by Kyocera. The Epson PX-8 (right) featured a flip-up 80 column display.

Tandy 200: larger screen.

EIGHT-BIT PORTABLES

	WEIGHT	LCD SIZE	RAM	LAUNCH PRICE	LAUNCH DATE
Epson HX-20	1.7kg	20×4	16K	£411	Nov 82
Tandy 100	1.4kg	40×8	8K	£499	Aug 83
Olivetti M-10	1.7kg	40×8	8K	£499	Nov 83
NEC PC-8201	1.7kg	40×8	16K	£475	Jan 84
Epson PX-8	1.75kg	80×8	64K	£798	Apr 84
Sord IS-11	2kg	40×8	32K	£750	May 84
Tandy 200	1.36kg	40×16	24K	£800	May 85

DG One: first with discs.

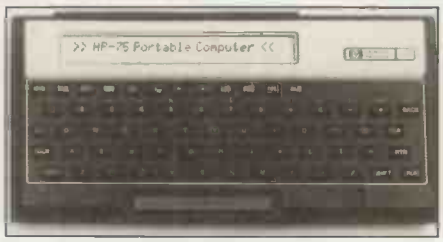
Toshiba T-1100 PC compatible.

16-BIT PORTABLES

	WEIGHT	DISCS	RAM	LAUNCH PRICE	LAUNCH DATE
Hewlett-Packard Portable	3.0kg	—	272K	£2,995	Jun 84
DG One	4.3kg	1×3.5in.	128K	£2,490	Sep 84
TI Prolite	4.8kg	1×3.5in.	256K	£2,995	Feb 85
Kaypro 2000	5.0kg	1×3.5in.	256K	£1,711	Apr 85
Grid Case	5.4kg	1×3.5in.	128K	£4,350	Apr 85
Zenith Z-171	6.8kg	2×5.25in.	256K	£1,995	July 85
Toshiba T-1100	4.5kg	1×3.5in.	256K	£1,495	July 85
Bondwell 8	4.5kg	1×3.5in.	512K	£1,150	Sept 85
Datavue 25	5.5kg	1×5.25in.	640K	£1,659	Oct 85
Olivetti M-22	7.5kg	1×5.25in.	256K	—	not launched
IBM Convertible	5.6kg	2×3.5in.	256K	£1,697	Nov 86
Zenith Z-181	5.3kg	2×3.5in.	640K	£1,795	Sep 86
Wang Laptop	6.5kg	10Mbyte hard	512K	£2,535	Jan 87
Goupil Club	6.5kg	2×3.5in.	768K	£1,895	Feb 87
Olivetti M-15	5.7kg	2×3.5in.	512K	£1,295	Feb 87

Grid's Gridlite.

Zenith Z-181: back-lit LCD.



HP-75C: calculator-sized computer.

Datavue 25 with 5.25in. discs.

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one day colour versions will be available, allowing the full functionality of ordinary monitors to be reproduced.

Outside this mainstream 16-bit world, there has always been a healthy alternative market. Rather than trying to cram the full functionality of a desk-top PC into a briefcase-sized box, several manufacturers have continued along the path first trodden by Epson and its successors. Eight-bit technology predominates and the machines are designed with particular markets in mind.

One of the most successful examples of the specialist approach has been the British Husky Hunter. Built to work in harsh environments, this CP/M machine arrives at portability as a solution to a particular problem rather than taking it as an abstract starting point. More recently, the same company has come out with the Husky Hawk, reviewed in the April issue of *Practical Computing*. The rationale behind this portable seems to be ultra-light computing without the constraints of ruggedness. In one respect the machine lies outside the scope of this article. Whereas the other portables described here have in common a minimum size imposed by the need for a usable keyboard, the Hawk drops to an A5 size and hence is virtually unusable for touch-typing.

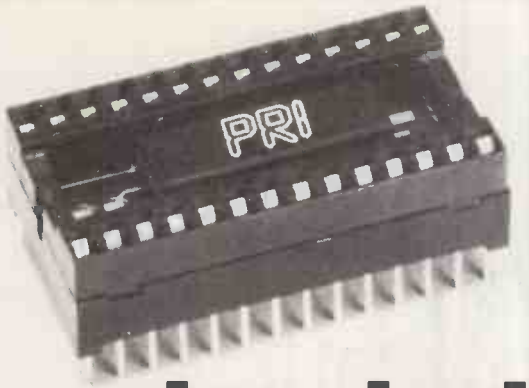
Another British machine catering for a niche market is the Thorn Liberator. Ultra-slim and very light, it was conceived as a text-gathering device and all aspects of its design have been subordinated to this role. Once more the basic scale is set by the keyboard.

Beyond these low-weight but full-size machines there is the Psion Organiser, a hand-sized and hand-held device. Naturally it lacks the minimum-sized keyboard and so is only really suitable for single-finger typing.

Recently, there has been an increase in the pace of development of the portable market, at least in the 16-bit arena. There is even a portable Vax available. And yet the lingering doubts remain. Do many people really need truly portable computing power? And if so, are we anywhere near solving the packaging problems inherent in realising such a machine? Now that the pattern of the micro market has been set for the next five years or so — with old-style PCs and ATs at the bottom, and the new PS/2s at the top — it may well be a time for a final push to overcome the remaining difficulties in the relatively uncharted world of portable computing.

Against this background it will be interesting to see whether the new 16-bit machine rumoured to be coming through from Epson in the near future manages to give the industry a boost in the way the HX-20 did nearly five years ago.

Then there is Apple, perhaps the joker in the portable pack. A battery-powered version of the Macintosh is due to appear next year. The Mac itself transformed the way we use PCs; it is possible that a portable Mac could do the same again. It is worth remembering that working at Apple is Alan Kay, who pioneered the original mouse and window approach which ultimately led to the Mac. He sees as the final goal of micros the Dynabook concept: a full-function portable computer as powerful and as easy to use as a book. Perhaps that is what everyone is waiting for. PC



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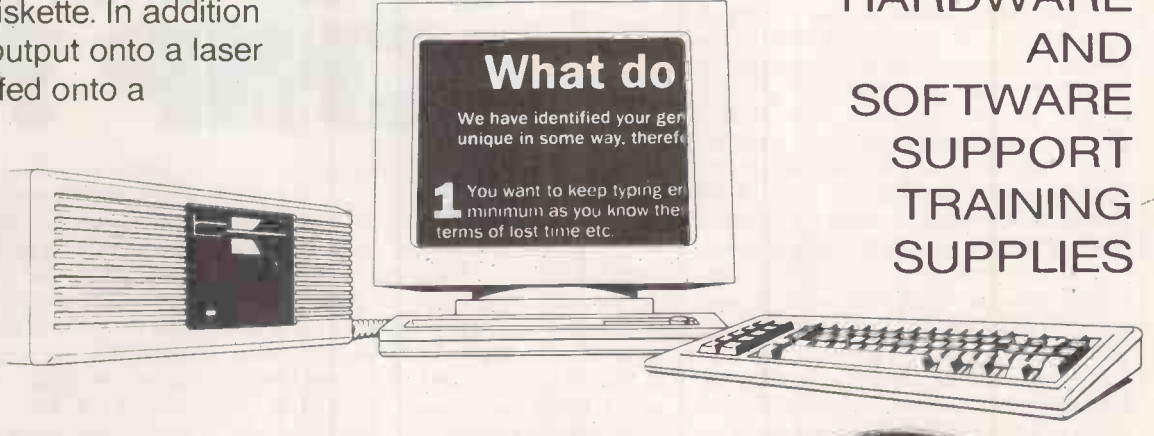

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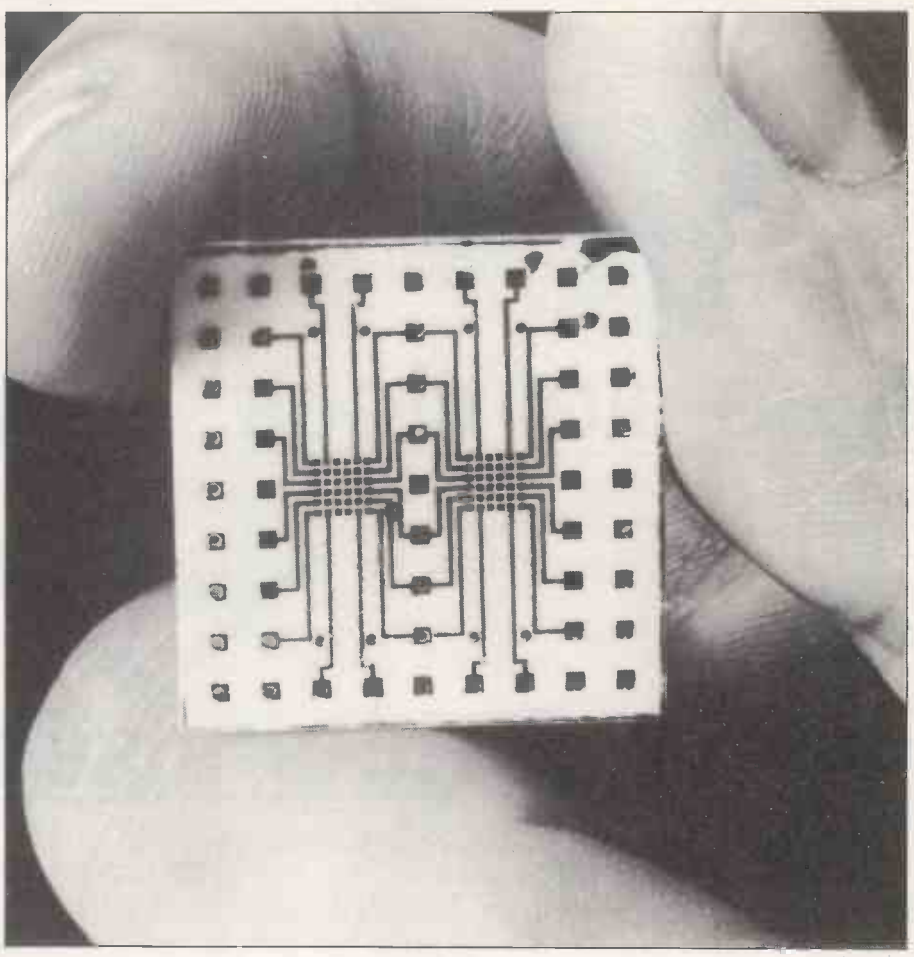
A flurry of announcements reporting materials which are devoid of electrical resistance has set the computer community speculating about the ultra-high performance logic devices that they could be used to make. But as **Mary Fagan** reports, there is still a long way to go before such science-fiction dreams become engineering reality.



A ceramic substrate patterned with superconducting wires.

GOODBYE TO THE SILICON CHIP?

Materials that offer zero resistance to electricity when cooled to a certain temperature are causing a huge stir in the scientific community. They are the superconductors that are being hailed as the catalyst in a new technical revolution, opening up prospects such as super-fast magnetically levitated trains running at 500km/h and transmission lines that could carry electricity for several hundred miles underground with scarcely any losses.

The concept is not new. Superconductivity was discovered as long ago as 1911 when a Dutch scientist, Heike Kamerlingh Onnes, discovered that mercury cooled to within a few degrees of absolute zero — that is 0°K or −273°C — could conduct with no resistance. Physicists have been excited about the possibilities ever since.

The reason for the current euphoria is that superconductors can now be made that operate at much higher temperatures. Last year Dr Alex Mueller at IBM's laboratories in Zurich discovered a ceramic that was superconducting at 30°K (−240°C). Then in March, Paul Chu at Houston University reported absolute superconductivity in a ceramic at 77°K.

What makes these high-temperature superconductors important is that they can be made and used with liquid nitrogen as the coolant. Until now, superconductors needed liquid helium, which boils at 4°K, as the coolant. Liquid helium is hugely expensive, as is the cooling equipment needed to handle it. The pumps and piping to recover and recirculate the precious helium gas would alone cost around £10,000. Superconductors have therefore been confined to applications where the expense can be justified; the coils of the powerful electromagnets needed for medical imaging are one example. High-temperature superconductors will change this. Liquid nitrogen, which boils at 77°K, costs about 40 pence per litre — around the same as milk.

It is easy to see what the pundits are getting worked up about. Superconducting coils can carry huge currents, and so can be used to make electromagnets that produce correspondingly large magnetic fields. The Japanese believe that magnetic levitation trains (Maglevs) using such magnets will be in operation by 1995. In medicine, the cost of magnetic-resonance imaging devices could plummet.

The power industries hope that cheap superconductors will mean loss-free power transmission. In America, up to 15 percent of the electricity that is generated is reckoned to be lost during transmission as a result of the resistance of the wires that carry it from place to place. Superconducting power cables could carry about 3GW — more than five times the capacity of conventional cables. They could also carry power underground for 100 miles — much further than is currently possible — opening up the prospect of taking electricity cheaply to remote regions.

Just as attractive is the idea of using superconductors to store electric current without losing power. Generators could operate continuously, producing power throughout the night for use at times of peak demand. The energy would be stored as a magnetic field in a coil of superconducting material, and tapped out as needed. Even the humble battery could be under threat. At a field strength of 100 tesla, a superconductor energy store could hold 4Kjoule of energy per cubic centimetre — about 100 times the energy density of a conventional battery.

In computers, the possibilities seem endless — superconducting links between devices on a chip, and between chips and

other devices on a substrate along with much reduced power requirements to operate the circuits are all on the cards. Superconductors used in transistor devices would respond to tiny voltage signals. The benefits would be enormous, because the smaller the voltage signal needed, the closer elements can be packed on to a chip. It therefore takes less time for the transistor to switch, and less heat is generated.

Dataquest, an American firm of electronics industry analysts, says that with one micron chip geometries, switching speeds could be less than 0.1 picosecond. Even today's most advanced computers have switching times of around one nanosecond, and even gallium arsenide chips — which are much faster then silicon — have switching speeds of a few hundred picoseconds.

Around 10 years ago, IBM began a programme of work on superconducting computers, based on a technology called the Josephson Junction (JJ) — itself the brainchild of Dr Brian Josephson at Cambridge University. This research showed that JJ technology was capable of fulfilling all the logic requirements of a chip. IBM eventually managed to develop chips with hundreds and even thousands of logic gates.

The switching times achieved were of the order of a few picoseconds, and the power requirements only about a femtojoule switching energy — 1,000 times less than is needed by conventional semiconductor devices. In other words, IBM had developed logic chips that worked so fast and at such low energies that they were about 1,000 times more efficient in those respects than extrapolations of what could be achieved with silicon or gallium arsenide.

But in 1983 IBM dropped the work. Its JJ devices needed liquid-helium temperatures and repeated cooling. The expense involved and the continuing improvement in conventional semiconductor technology resulted in the work being axed. Other workers interested in JJ computers took largely the same line, with the exception of some Japanese companies who kept up their interest.

Ironically, it was probably disgust at the decision to drop the JJ project that prompted the IBM scientists in Zurich to search for higher-temperature superconductors. IBM has also used the JJ technology in its recently launched superconducting quantum interference devices (Squids). These highly sensitive magnetic detectors use thin-film superconductors.

Another IBM researcher, Dr Sadeg Faris, left the company to continue JJ work on his own. He set up a new venture called Hypres, which has now launched a high-frequency — and very expensive — oscilloscope that uses superconductors. Even with the new high-temperature materials, however, it seems likely that superconducting logic chips are a good five to 10 years away.

Among the many other applications for superconductors, one of the most important could be magnetic shielding, as superconductors are impervious to magnetic fields. This property should make them useful in military projects, where they could be used to stop interference between electronic circuits, and even to make it impossible to bug a room.

Superconductors are characterised not just by their zero electrical resistance, but by something called the Meissner effect. A superconductor placed in a magnetic field generates its own internal field that tends to expel the external one, so the magnetic lines of force go around rather than through the superconducting object. The effect was demonstrated recently to journalists visiting IBM's laboratories in Almaden, California. Researcher Paul Grant cooled a piece of ceramic superconductor in a cup of liquid nitrogen and then dangled it between the poles of a horseshoe magnet. While it remained cold it stayed in mid-air, a centimetre out from the poles. As it warmed up, and its superconducting properties were lost, it just dropped back down between the poles.

All the current enthusiasm and hype cannot hide the fact that there are many problems to be overcome before high-temperature superconductors can be of any real use. There is particular concern over how much current they can carry, and about how difficult it will be to manufacture them in usable forms.

All the new superconductors belong to a family of ceramic oxides called perovskites. They are coarse-grained, brittle compounds with a surface that looks something like matt black paint. Many sceptics say that although the material itself may be superconducting, the boundaries between crystals will interfere with the flow of the current and therefore make them useless.

Although many organisations have

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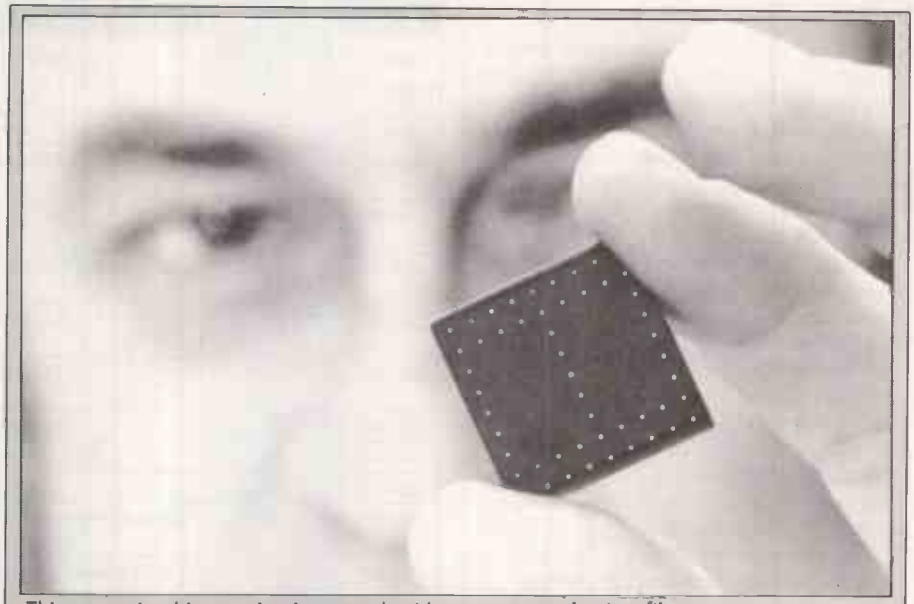

This ceramic chip carrier is coated with a superconductive film.

CERAMIC SUPERCONDUCTORS

One of the most surprising facts about high-temperature superconductors is that they are ceramics, a class of substances that is normally associated with insulation rather than conduction. Until the discovery by Alex Mueller last year of a matt black ceramic made of copper, oxygen, lanthanum and barium, researchers had concentrated mainly on metal and semiconductor-based materials.

Mueller's ceramic was found to superconduct at 30°K. This was the biggest news since 1973, when scientists made an alloy of niobium and germanium which was superconducting at 23.3°K. Then came Paul Chu's dramatic breakthrough: complete superconductivity at 77°K and strong evidence of the onset of the phenomenon at 93°K. Chu's material was a ceramic oxide of barium, copper and yttrium. Both Chu's and Mueller's materials are in the same perovskite family of ceramics.

Since the original IBM discovery, the company has made many variations on the perovskite theme. All have transition temperatures — the temperature at which they become superconducting — of around 90°K, which is well within the limits needed to use cheap liquid nitrogen as coolant. The latest round of reports claims that superconductivity has been achieved at up to 300°K, and the scientific community eagerly awaits the magic words "room temperature". But it has to be noted that the measured characteristics of the material — how they react in a magnetic field and so on — are hard to reproduce and unstable.

The reasons why activity has reached fever pitch are understandable enough. The ceramics are not actually hard to produce. They can be made by grinding the ingredients in a pestle and mortar, baking in a furnace and cooling. Paul Grant at IBM's Almaden laboratories even claims that schools could carry out basic superconductor experiments with them for as little as £1. It is the engineering problems to come that could prove to be the great challenge.

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announced the development of superconducting wire and tape over the past months, the maximum current densities they could support have hovered in the region of 1,000 amperes per square centimetre. Connections within chip devices, for example, need current densities of 100 times as great. Estimates are that a wire measuring 1 millimetre in diameter could carry 10 amps. For the powerful electromagnets people are talking about, 1,000 times more than this would be needed.

In May IBM said that it had managed to send huge electric currents through a special film of superconductor. The film is just one single crystal layer in thickness, about 1/100th the thickness of a human hair, and was made using a technique called vapour deposition. At temperatures of 77°K the film could support current densities of 100,000 amperes per square centimetre.

Professor Colin Goodman at STC's laboratory in Harlow points out several problems that could hamper the use of the materials in computers. He claims that no one yet knows how to make really good electrical contact to link the new materials to ordinary conductors such as aluminium, gold, copper and silver. "The act of putting metal down on superconductors creates a high resistance, in the region of 10 to 100 ohms, between the normal conductor and the superconductor," he explains. "It's not clear why this happens, and it's crucial that it should be sorted out, because if we are going to use superconductors we need to know how to interface to them." Goodman also believes that the grainy nature of the ceramics will make it difficult to manufacture very small devices.

Another problem for would-be chipmakers is that the materials, once exposed to moisture, turn into more normal oxides that do not conduct electricity at all. This means they cannot be etched in traditional wet etching processes. The alternative might be to use costly and sophisticated dry etching techniques such as plasma etching and ion milling. Unfortunately the new materials are easily damaged if bombarded by high-energy ions.

But despite his reservations, Goodman believes that the ceramics have huge potential as the substrates and leads used to link chips and other electronic devices, and to stop crosstalk between circuits. He also cites interest in the use of superconductors in aerials, where they can increase efficiency sharply. He claims that gains of around 20 decibels can be achieved, making them much more efficient transmitters and receivers than today's devices.

For more widespread applications, the limitations of current density and the difficulties of forming the ceramics are perhaps more serious. To be practical they will have to be made into wires, coatings and so on. Getting them into useful shapes will in many ways be a bigger breakthrough than developing them in the first place.

In April, Toshiba claimed to have developed the world's first ceramic wire that can superconduct at −179°C. In the same month both Bell Laboratories and Argonne Laboratories in America said they had also produced flexible, current-carrying superconducting wires. The Argonne workers pointed out that even though the ceramics are brittle, if made into thin enough wires they can be relatively flexible.

Not to be outdone, IBM announced in April that it had developed a way of spray-painting large and complex surfaces with the materials. The company uses a technique called plasma spraying, in which the material is heated to thousands of degrees and deposited instantly on a surface where it solidifies. The coated objects are then heat treated to anneal them, after which they become superconducting.

ANNOUNCEMENTS IN SUPERCONDUCTIVITY

DATE	TEMPERATURE (°K)	INSTITUTION	MATERIAL
1911	4	—	N/A
1973	23	—	niobium-germanium alloy
Apr 86	30	IBM Zurich	barium, lanthanum, copper oxide compound
Dec 86	28	Tokyo University	barium, lanthanum, copper oxide compound
Dec 86	28	University of Houston	barium, lanthanum, copper oxide compound
Dec 86	35	Tokyo University	barium, and oxides of lanthanum and strontium
Dec 86	36	AT&T Bell Labs	lanthanum, strontium, copper oxide compound
Dec 86	37	Tokyo University	N/A
Dec 86	40	University of Houston	undisclosed
Jan 87	39	IBM Zurich	N/A
Jan 87	43	Okazaki National Research Institute and Tohoku University	N/A
Jan 87	46	MITI Agency of Industrial Science and Technology, Tsukubo Loboratory	lanthanum, stronium, and copper oxides
Jan 87	70	Chinese Academy of Sciences, Beijing	N/A
Feb 87	98	University of Houston	N/A
Feb 87	100	China	N/A
Mar 87	100	MITI National Research Institute for Metals, Tsukuba	N/A
Mar 87	123	MITI National Research Institute for Metals, Tsukuba	Oxidised barium, yttrium, and copper
Mar 87	240	Wayne State University	Two-phose ceramic material bosed on a barium-yttrium-copper oxide compound

SOURCE: Dataquest Inc., April 1987

SPRAY-ON WIRING

IBM says that the technique opens up the prospect of spray-on computer wiring and magnetic shielding. It claims to have already laid down thin lines and coated tiny holes in the type of ceramic substrates used to carry chips in computers. But even these advances draw warnings from many observers, some of whom believe that manufacturing the necessary shapes in bulk will turn out to be too expensive and difficult to be useful.

There are also many critics of the idea of loss-free power transmission. One of them is the Brookhaven National Laboratory in New York, which has been studying the use of superconducting underground cables for some time. The Brookhaven people point out that an alternating current inevitably generates radio waves, whatever the material through which the current is being conducted, so it is untrue to say that losses could be reduced to zero. Brookhaven work on traditional superconductors showed that, at best, the a.c. losses were about the same as in an ordinary overhead cable. Once the cost of cooling has been taken into account, the benefits of even the new ceramics may not be so startling after all.

Perhaps the biggest overall criticism is that the superconducting materials have yet to be proved stable over long periods of time. Even if the scientific and engineering problems can be solved, there is still the question of supplying the basic raw materials. A dearth of one of the main components, yttrium, is already hindering research in the Britain. Yttrium costs £300 per kilogram, and the entire world production is only about 500 tonnes every year. Investment in new plants to make yttrium and other materials will be needed if superconductors are to catch on in any big way.

When any new technology appears, there will always be arguments between its supporters and its critics. No one doubts that the scientific achievements of the past months are remarkable, and that they could well change the face of many industries. But the revolution proper is yet to come. As Colin Goodman comments: "People now have to settle down and do the real engineering work." PC

Mary Fagan is Technology News Editor on New Scientist.

TECHNOLOGY SO ADVANCED ...

MEMORY
- 512Kbytes RAM (520ST-M, FM)
- 1024Kbytes RAM (1040ST-F)
- 192Kbytes ROM
- 128Kbytes external plug-in ROM option

ARCHITECTURE
- Motorola 68000 Central Processing Unit (CPU) with a clock speed of 8MHz
- 16-bit external data bus
- 32-bit internal data bus
- 24-bit address bus
- 8*32-bit data & address registers
- 7 levels of interrupts
- 56 instructions
- 14 addressing modes
- 5 data types
- DMA (Direct Memory Access)
- real time clock as standard

GRAPHICS
- full bit-mapped display
- palette of 512 colours

Using Atari Monitors (on 520 & 1040):
- 640*400 high resolution - monochrome
- 640*200 medium resolution - 4 colours
- 320*200 low resolution - 16 colours
- 80 column text display (40 col low res)

Using Domestic TV (on 520):
- 640*200 medium resolution - 4 colours
- 320*200 low resolution - 16 colours
- 40 columns * 25 line text display

SOUND AND MUSIC
- 3 programmable sound channels
- frequency programmable 30Hz - 125KHz
- programmable volume
- wave & dynamic envelope shaping
- programmable attack, decay, sustain, release
- Musical Instrument Digital Interface (MIDI)
- MIDI allows connection of synthesisers etc

MOUSE
- high precision
- 2 button control
- free with 520ST-FM/1040ST-F
- non slip ball motion sensor
- removable ball for easy cleaning

STANDARD SOFTWARE
- GEM desktop + TOS operating system
- ST BASIC interpreter/language system

INPUT/OUTPUT
- MIDI out ..... (5 pin DIN) 31.25K baud
- MIDI in ..... (5 pin DIN) 31.25K baud
- audio out ... 1.0V DC peak to peak, 10K ohm
- audio in ..... 1.0V DC peak to peak, 10K ohm
- RGB monitor ..... 1.0V DC, 75 ohm
- mono monitor ..... 1.0V DC, 75 ohm
- mono horizontal scan rate 35.7KHz
- mono vertical scan rate 71.2KHz
- sync ..... 5V DC (active low) 3.3K ohm
- modem/serial ..... RS232C, 50 to 19,200 baud
- floppy disk ..... 250 Kbits/s
- hard disk ..... 11.3 Mbits/s
- mouse ..... standard Atari connector
- joystick ..... standard Atari connector
- cartridge port ..... 128K capacity
- RF output (520ST-FM) ..... for TV use

OPERATING SYSTEM
- TOS with GEM environment in ROM
- hierarchical file structure with sub-directories and path names
- user interface via GEM, with self explanatory command functions
- multiple windows + icons
- window resizing, re-positioning and erasing
- drop down menus (selected by mouse)
- GEM virtual device interface

COMMUNICATIONS
- RS-232C serial modem port
- 8-bit parallel printer port
- MIDI port (also for networking use)
- VT52 terminal emulation

KEYBOARD
- standard QWERTY typewriter format
- 95 full stroke keys
- 10 function keys
- 18 key numeric keypad + cursor keys
- variable auto-repeat & key click response
- keyboard processor reduces CPU overhead

... IT'S AFFORDABLE

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When you purchase any Atari ST keyboard, you will not only receive the best value for money computer on the market, but you will also receive the following from Atari Corporation as part of the package:

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1Mb RAM UPGRADE: Our upgrade on the standard Atari 520ST-M or 520ST-FM keyboard will 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).

TV MODULATOR UPGRADE: Silica can upgrade the 1040ST-F to include a TV modulator so that you can then use it with your TV set. This is an internal upgrade and does not involve any untidy external boxes. A cable to connect your ST to any domestic TV is included in the price of the upgrade which is only £49 (inc VAT). The upgrade is also available for early 520ST computers at the same price.

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AFTER SALES SUPPORT - Only From Silica

Rest assured that when you buy your ST from Silica Shop, you will be fully supported. Our free mailings give news of releases and developments. This will help to keep you fully up to date with what's happening in the Atari market. And in addition, our sales staff are at the end of a telephone line to service all of your Atari requirements. If you purchase an ST from Silica and would like any programming or technical advice, we have a full time technical support team to help you get the best from your computer. Because we have both the staff and the systems specifically dedicated to providing after sales service on Atari ST computers, we are confident that our users enjoy an exceptionally high level of support. This can be received **ONLY FROM SILICA**.

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At Silica Shop, we recognise that serious users require an in-depth information service, which is why we mail free newsletters and price lists to our ST owners. These are up to 48 pages long and are crammed with technical details as well as special offers and product descriptions. If you have already purchased an ST and would like to have your name added to our mailing list, please complete the coupon & return it to us. The information service is available **ONLY FROM SILICA**.

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We hope that the combination of our low prices, FREE UK delivery service, FREE Starter Kit and FREE 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, then please contact our sales department, providing us with our competitor's name, address and telephone number. If our competitor has the goods in stock, we will normally match the offer (on a 'same product - same price' basis) and still provide you with our normal free delivery. We realise that we are not the only company who will match a competitor's price. However, if you come to us for a price match, you will also be entitled to our after sales service, including free newsletters and technical support. This makes our price match promise rather special, something you will receive **ONLY FROM SILICA**. We don't want you to go anywhere else for your Atari products. So shop at Silica, the UK's No1 Atari Specialist.

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520ST-M

The affordability of Atari computers is reflected in the price of the 520ST-M keyboard, which is a mere £259 (inc VAT). This version of the ST comes with 512K RAM, as well as a modulator and lead for direct connection to any domestic TV. The price does not include a mouse. In addition, when you buy your 520ST-M from Silica, you will also receive the FREE Silica 'ST Starter Kit'. During 1987, many software houses will be producing games software on ROM cartridges, which will plug directly into the cartridge slot on the 520ST-M keyboard, giving instant loading without the expense of purchasing a disk drive. With the enormous power of the ST, you can expect some excellent titles to be produced, making this the ultimate games machine! If your requirement is for a terminal, then the 520ST-M can fulfill this role too. Leads are available to connect the ST to a variety of monitors, and with the imminent introduction of terminal software on ROM cartridge, the ST provides a low price terminal for business use. If you wish to take advantage of the massive range of disk software available for the ST range, you will need to purchase a disk drive. Atari have two floppy disk drives available, a ½ Mbyte model £149 and a 1Mbyte model £199. Full details of these drives, as well as the Atari 20Mbyte hard disk are available on request. If required at a later date, the mouse may be purchased separately.

£259

520ST-FM

The 520ST-FM with 512K RAM and free mouse, represents a further breakthrough by Atari Corporation in the world of high power, low cost personal computing. This model is the latest addition to the ST family, and is not only powerful, but compact. It is priced at only £399 (inc VAT) a level which brings it within the reach of a whole new generation of computer enthusiasts. When purchased from us, it comes with the FREE Silica 'ST Starter Kit' see paragraph on the left. To make the 520ST-FM ready for use straight away, Atari have built into the keyboard a ½ megabyte disk drive for information storage and retrieval, allowing you easy access to the massive range of disk based software which is available for the ST. This new computer comes with all the correct cables and connections you will need to plug it straight into any standard domestic television set. You do not therefore have to purchase an Atari monitor. If you do require a monitor however, these are available with the 520ST in the following money saving packages:

520ST-FM Keyboard Without Monitor - £399 (inc VAT)
520ST-FM Keyboard + High res mono monitor - £499 (inc VAT)
520ST-FM Keyboard + Low res colour monitor - £599 (inc VAT)
520ST-FM Keyboard + Med res colour monitor - £699 (inc VAT)

Because the 520ST-FM has its own power transformer built into the keyboard, there are no messy external adaptors to clutter up your desk space. You are left with only one mains lead, serving both the disk drive and the computer. You couldn't ask for a more stylish and compact unit.

£399

1040ST-F

For the businessman and the more serious home user, Atari have their most powerful model, the 1040ST-F with 1028K RAM. This low cost powerhouse can be introduced into a business environment as a stand-alone system, or can support a mainframe computer as a terminal. The 1040ST-F not only features twice as much memory as the 520ST-FM, but also includes a more powerful built-in disk drive. The drive featured on the 1040ST-F is a one megabyte double sided model. The extra memory facility of the 1040ST-F makes it ideal for applications such as large databases or spreadsheets. Like the 520ST-FM, the 1040ST-F has a mains transformer built into the console to give a compact and stylish unit with only one mains lead. The 1040ST-F is also supplied from Silica Shop with a free software package and 'ST STARTER KIT'. In the USA, the 1040ST-F has been sold with a TV modulator like the 520ST-FM. However, for the UK market, Atari are manufacturing the 1040ST-F solely with business use in mind and it does not currently include an RF modulator, this means that you cannot use it with a domestic TV (Silica Shop do offer a modulator upgrade for only £49). The 1040ST-F keyboard costs only £599 (inc VAT) and, unless a modulator upgrade is fitted, will require an Atari or third party monitor. There are three Atari monitors available and the prices for the 1040 with these monitors are as follows:

1040ST-F Keyboard Without Monitor - £599 (inc VAT)
1040ST-F Keyboard + High res mono monitor - £699 (inc VAT)
1040ST-F Keyboard + Low res col monitor - £799 (inc VAT)
1040ST-F Keyboard + Med res col monitor - £899 (inc VAT)

The 1040ST-F comes with a mouse controller and includes 1Mbyte of RAM. It has a 1Mbyte double sided disk drive and mains transformer, both built into the keyboard to give a compact and stylish unit, with only one mains lead.

£599

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dBase is still Ashton-Tate's biggest money earner

Despite praise, Framework's sales are slow to grow.

MORE THAN JUST dBASE

Ashton-Tate has grown rapidly over the last few years, its success being largely due to dBase. It now intends to have a presence in all major application areas and to shake off the "one-product company" image. **Mike Lewis** takes a look at its history and its prospects.

Even by the standards of the software industry, Ashton-Tate looks like a remarkable company. Not many firms have seen faster growth and few have sustained that growth over such a long period. Set up in 1981 by two men working from home, the business has enjoyed a near doubling of turnover every year since. Today its sales are running at over $200 million per year, with profits of around $30 million.

This success is due almost entirely to one product. Despite valiant attempt to diversify, the dBase database manager still brings in more sales than the rest of Ashton-Tate's range put together. In 1986 those sales amounted to $133 million, against just $23 million for its other leading package, Framework. For many people, Ashton-Tate and dBase are virtually synonymous.

This is hardly surprising. Ashton-Tate did not actually write dBase, but it was set up with the specific aim of exploiting it and bringing it to market. Until Framework was launched in 1984, dBase was the company's only offering.

It was in 1981 that George Tate and dBase first came together. Tate's background was not in software — he had worked as a technician for a Californian stereo chain — but he did have business flair and a knack for selling. In the late 1970s he felt that he could make money in the emerging micro software market simply by applying better marketing techniques than those of the typically amateurish dealers of the day. In 1980 he went into business with an accountant named Hal Lashlee to form the Discount Software Group.

At the same time, Wayne Ratliff was struggling to sell a home-grown program called Vulcan. Vulcan's roots were in a data-analysis program for the Univac 1108, called JPLDIS. Ratliff had come across it while working at the Jet Propulsion Laboratory in Pasadena. Its aim was to let the user design and manipulate databases, using English-like commands. Ratliff was convinced that he could create something similar — or better — on his Imsai 8080 micro, and that he could make money by selling it.

Unfortunately, Ratliff was the archetypal programmer-turned-entrepreneur. He set about writing Vulcan, often working late into the night and enjoying every minute of it. But he resented the time he would later be forced to spend on marketing and paperwork. By late 1980 he had sold only 50 copies of Vulcan — not enough to pay for his advertising. He was sick of the whole thing and was about to chuck it in when George Tate's company requested an evaluation copy.

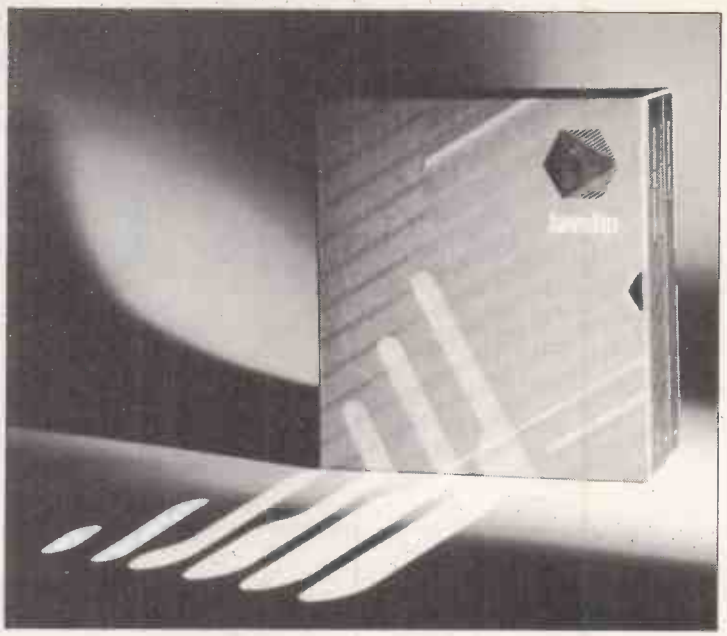
That was the turning point. Tate saw the potential of the program. His advertising man, Hal Pawluk, suggested a new name: "dBase" because it sounded suitably technical; "II" because it suggested a new, improved version. Ratliff's awful manual was rewritten, money was raised for an advertising campaign and a new company was formed to publish the program. That company later became Ashton-Tate. Like dBase I, there was never an Ashton — the name was chosen to give the firm an established, conservative image.

"We aim to become a software conglomerate, and we are well on the way. We plan to have a presence in all major application areas and all types of machine."

Success was immediate for dBase II, which had two things going for it. First, it enabled dealers and consultants to build bespoke applications for their customers, without recourse to programming. That was something new in the micro world. Its second advantage was sheer marketing know-how. A key factor was the offer of a free-trial demonstration version. Provided you kept the full version in its sealed envelope, you could send the package back and claim a refund if you did not like it. Few people bothered to claim the refund.

In time, dBase II became dBase III and then III Plus. Wayne Ratliff continued to receive a per-copy royalty until this year, when he surrendered this right for an extremely large cash sum. Today Ratliff is a very rich programmer. Tragically, George

Rapid File is the only product Ashton-Tate developed in-house.



Ashton-Tate markets the Javelin super-spreadsheet in Britain.

Tate did not see his company become the international giant that it is now: he died in 1984 at the age of 43.

For Tate's successors, the main priority has been to diversify. Of all the software packages that were leaders of their categories in the days of the Z-80 standard, like WordStar, Supercalc and CP/M, dBase is the only one that still enjoys that lead today. But this cannot last. Newer, more sophisticated databases have emerged, and the sales of dBase are constantly under threat from its many imitators.

On the surface, diversification has not been very successful. True, Ashton-Tate now has four main groups of products: dBase, Framework, Multimate and the Graphics Master range. It also has non-American marketing rights to Javelin. But the dBase family continues to account for the bulk of the company's turnover.

Of course, this is not necessarily a bad thing. Ashton-Tate's UK managing director, Paul Sloane, is quick to point out that the company's other products all have healthy sales in their own right. "It is the strength of dBase that makes us look like a one-product company, rather than any weakness in the rest of the range," he insists.

To support this, he points out that Multimate is one of the world's half-dozen best-selling word processors. And in France, Framework outsells Lotus 1-2-3 by a factor of two to one. That said, a careful reading of the company's accounts shows Framework's sales growing much more slowly than any of its other products, despite the critical acclaim which it has received.

Whatever the company's success so far, the policy of diversification will continue. "We aim to become a software conglomerate," Sloane told us, "and we are well on the way. We plan to have a presence in all major application areas and all types of machines."

This will almost certainly involve more acquisitions. Apart from Rapid File, none of Ashton-Tate's current products was originally developed in-house. They were all obtained by purchasing the companies that wrote them: Multimate International for the word processor, Forefront for Framework and Decision Resources for the graphics family. The Multimate deal was, and still is, the largest takeover of its kind in software history.

This does not mean that Ashton-Tate is not in the business of software development. It has an aggressive policy of updating and enhancing its acquisitions and of producing versions for new hardware. This is especially true of the dBase family, where sales are at risk from a barrage of clones and compilers.

PAUL SLOANE

"Imitators do not bother us too much. Provided that customers stick to the dBase language they will come back to us when we bring out new versions."

Of course, Ashton-Tate is not going to admit to such worries. "Imitators do not bother us too much," says Paul Sloane. "Provided customers stick to the dBase language, they will come back to us when we bring out new versions." Since it is Ashton-Tate that decides what is to go into those new versions, the clone makers will always be one step behind.

Sloane has a similar attitude to compilers. "Although we tend to frown on compilers, we recognise that they further the cause of the dBase language. Users of compiled applications often end up buying dBase as well. They already have their data in the right format, and they appreciate the value of interactive working."

The compilers have at least taught Ashton-Tate the need for improved performance. Although the company's development plans are a closely guarded secret, my guess is that the performance issue is currently a major preoccupation. The argument for Ashton-Tate producing its own compiler must be irresistible, especially now that Nantucket and Wordtech have proved the market.

Other developments in the dBase area — or perhaps in a new generation of database products — will probably include a structured query language, micro-to-mainframe links and features to take advantage of the power of the 80386 processor. At the other end of the scale, the success of Rapid File will have encouraged the company to offer more enticements to the first-time user. Its recent announcement of First Framework is an example of this.

Whatever direction it takes, diversification is vital to Ashton-Tate. There is no reason for thinking that the rapid growth of the last six years will not continue, but it can do so only if the company can become a major force outside its traditional database arena. PC

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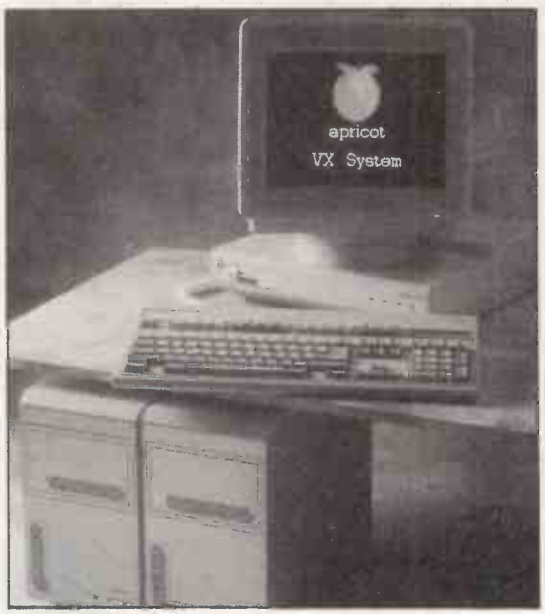

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DAVID FATHERS

ARE YOU A GOOD USER?

The Data Protection Act could be only the start of many users' problems. **Anne Staines** looks at the pitfalls awaiting those who use electronic data.

In theory we are all good data users now. Or are we? It is almost impossible to be unaware of the Data Protection Act of 1984. After a slow start, applications to register under the Act have now topped 133,000 and are increasing at a rate of 900 a month.

According to the National Council on Information Technology (NCC) the good data user can be recognised by three practices: keeping data secure, keeping data accurate and limiting disclosure. The need to ensure accuracy presents users with a familiar problem: everyone makes a mistake from time to time. Security is proving a more difficult theory to understand, let alone to put into practice.

The problem stems from the Data Protection Principle number 8. The Principles are intended to provide a code of practice against which the behaviour of individual users can be judged. Their chief objective is to assure the data subject that his or her data will be treated correctly, and thus to inspire public confidence. Principle number 8 provides that: "Appropriate security measures shall be taken against unauthorised access to or alteration, disclosure or destruction of personal data and against accidental loss or destruction of personal data."

What is considered appropriate will vary according to the nature of the data and the number of persons having access to it. Viewed rationally, this requirement should present little difficulty to most users. But two factors are causing users to panic. One is fear of penalties imposed under the Act as the date approaches upon which the Registrar's powers come fully into operation. The other arises from the increasing number of security devices on the market. Advertising for some of them suggests that users who do not employ physical security devices are in breach of the Data Protection Act.

Users with sloppy security practices risk not only fines and other penalties but also civil proceedings by injured subjects. So far, 300 subject complaints have reached the Registrar and the number is rising rapidly. Complaints about lack of security, however, are uncommon. Most users complain about the presence of their names on direct-mailing lists.

The Registrar's office issues no general guide on security, although the Department of Trade and Industry is currently funding the NCC to put some guidelines together. In the meantime, many users are investing in fireproof safes and encryption codes. Whether this is really necessary remains open to doubt.

The NCC has always advocated that attitudes to security should be tightened up through staff training. All staff in contact with personal data should be instructed never to bypass security regulations, always to keep printouts locked away when not in use, to return old printouts for destruction, and not to discuss personal information with

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unauthorised persons. Giving staff this type of training, says the NCC, is evidence that an organisation is taking reasonable care of its data.

Managers and DP staff should also be made aware of their responsibility for security through controlled access, sensible siting of terminals, organised collection and storage of printouts and control of media containing personal data. The NCC emphasises that the most any organisation can do is to take reasonable care to prevent disclosure.

Backup copies are kept in fireproof safes in the Registrar's office and this is a practice of which the Registrar generally approves. In many cases, however, it will be reasonable simply to lock discs, etc. in a drawer after use. The Registrar recommends that only users who hold what he calls "pretty sensitive information" need consider encryption; most users do not.

Until recently many software houses attempted to protect their programs against casual copying by encrypting security codes on to the medium. In 1985 a survey was carried out which revealed that over half the software houses in Britain were employing this method. A survey of software users at the same time found that this was unlikely to deter would-be copyists; the fact of encryption was easily detected and the code easily broken. In view of the contempt with which "serious" copyists treated these devices, users with "pretty sensitive" data might think twice about the level of security they guarantee.

Security measures shall be taken against unauthorised access to or alteration, disclosure or destruction of personal data and against accidental loss or destruction.

It is possible to insure against claims for compensation arising from unauthorised disclosure, and this is becoming fairly popular. It is worth bearing in mind, however, that users cannot insure themselves against the Data Protection Act's criminal penalties. In most cases, precautions that are adequate to secure the user against action by the Registrar should also secure the data subject against the user.

As a result of the Data Protection Act's publicity campaign users are generally more aware of the threats posed by insecure office management. They may also be conscious of the risk of hacking and other forms of misappropriation of data. Guarding against these risks makes users better stewards of their data.

Surprisingly few users are good owners, and they are likely to run into a whole series of problems; the Data Protection Act is only a start. For example, personal data for many businesses means information about their customers, which they invariably regard as their confidential property.

Automating customer lists may involve a simple transfer of information from a manual file on to disc. In many cases, however, personal data will be input directly into the computer, without having appeared in a fixed form before. Thus it is only when stored in memory that it becomes intellectual property and thus capable of attracting copyright protection. Whoever has the copyright in this material has control over it. He or she can copy it or sell it, and can prevent others doing so without authority.

Clearly, the copyright owner should be the data user. But if the system is under licence from a supplier who retains copyright in the software, it can be difficult to separate the data from the program. Wide-ranging provisions of this type are more common in bespoke than off-the-peg software, and are unusual at that.

However, as copyright laws receive wider interpretation, some contracts are being used to see how far they can be pushed. The effect of provisions of this nature is far from clear. Yet it is comparatively simple to deal with this problem before the contract is signed by distinguishing between two sources of information and providing for each separately, retaining copyright and confidentiality for the user's data. This is an additional type of security device that is all too easily overlooked. PC

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LASERS TAKE OVER

With laser printers becoming commonplace **Ian Stobie** looks at how the specific needs of different types of users are being met.

Laser printers are becoming commonplace. No longer an expensive and exotic alternative to the daisywheel they are coming to be an increasingly normal part of the ordinary office. Laser printers are now second only to matrix printers in the amount of money that is spent buying them.

At the same time the laser market is becoming fragmented. There is no longer a single kind of laser printer, but several different categories designed to match the needs of different kinds of user.

The base-line laser printer is probably now best represented by machines like the Epson GQ-3500 and the Oki Laserline 6. Both these machines are aimed at the mass office market, as adjuncts to stand-alone PCs. They cost around £1,800. Compared to earlier laser printers they are very compact, taking up no more desk space than a standard AT, and weighing about 35lb. Their speed is rated at six pages per minute, though as we explain on page 92 the speed claims of all printer manufacturers should be taken with a pinch of salt.

Slightly higher in both specification and price are the new machines from the companies that led the first wave of laser printers, Canon and Hewlett-Packard. Bulkier and heavier at about 50lb, these machines cost over £2,000 — with the HP the more expensive at just over £2,600. They are rated at eight pages per minute rather than six, and come with slightly larger standard paper trays that hold 150 sheets rather than 100.

Mannesmann-Tally 910.

Epson GQ-3500.

All these machines — both the compact Epson and Oki offerings and the new Canon and HP models — are more than simple daisywheel replacements. They have 512K of memory as standard, which gives them considerable graphics capability. You can generally print a full page at 150 dots per inch (dpi) resolution, or smaller areas at the full 300dpi limit of the engine. All laser printers cope well with overhead-transparency film as well as with ordinary A4 office stationery and photocopier paper.

A bigger jump in capability occurs when you go up above the £3,000 mark to machines like the Mannesmann-Tally 910

CITIZEN OVERTURE 110

Like Epson, which is part of Seiko-Epson, Citizen is an offshoot of a watch company. Its first laser printer, the £1,995 Overture 110, shows evidence of a determination to push into the laser market, as it offers a very good specification for the money.

It is a fairly compact machine, despite its 70lb. weight, and it fits neatly on to a desk alongside an AT. Citizen has used a 10 page per minute engine made by Mita, an established photocopier maker. But the most pleasing thing about the Overture 110 is that it really is quick. A 15-page report took 1 minute 33 seconds, which works out at 9.68 pages a minute. On a 25-page document the machine slightly exceeded its rated 10 pages a minute.

Of course, on more typical, shorter documents the average page speed goes down, but it is still good — faster than the more expensive HP Laserjet, for instance. The first page takes about 16 seconds, corresponding to a rate of 3.75 pages per minute. Our various three-page benchmarks average out at about six pages per minute.

Oki Laserline 6.

Kyocera F-1010.

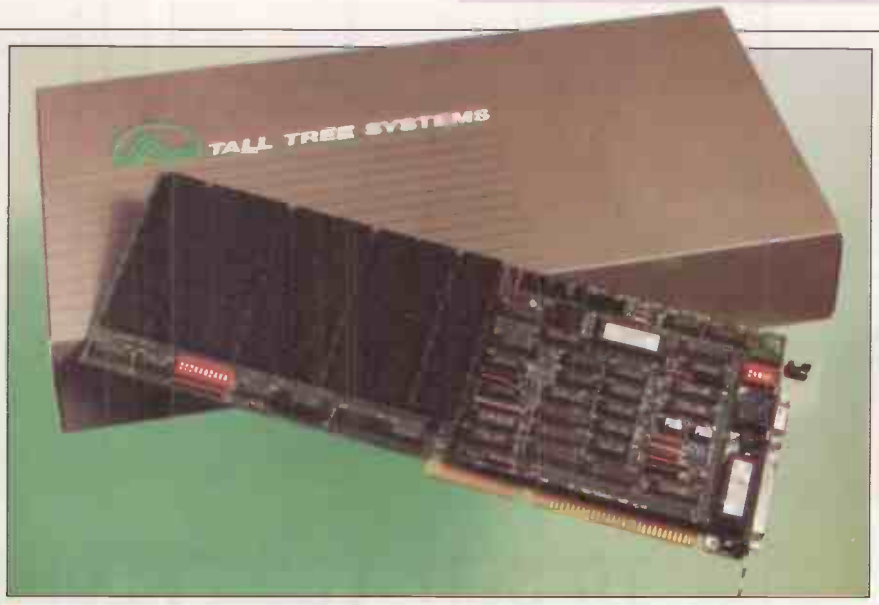
Qume Laserten Plus.

and the Kyocera F-1010. These machines are rated at 10 pages a minute, and they are noticeably faster. But probably their main distinguishing characteristic is their improved paper handling. At least one 250-sheet paper-input tray will be included in the price, often two. Other options are usually available too, including collating output stackers.

Above this £3,000 price level also come machines designed primarily for desk-top publishing and advanced graphics applications like CAD. They differ from ordinary office machines in the ease with which they can handle multiple founts and mixed text and graphics. For many users the ordinary office machines are quite sufficient, so we discuss the DTP lasers separately, starting on page 90.

There are an enormous number of new entrants to the laser field, and virtually every major printer company now has a laser offering. These new machines differ far more from one another than did the first generation of laser printers, largely because Canon has lost its near-monopoly position as supplier of the laser printer's key component, the basic printing engine.

At the same time not all manufacturers see the market in precisely the same way.



ENHANCEMENT BOARDS

Print enhancement boards are designed to increase the performance and range of founts available from basic laser printers. They go inside your computer rather than the printer, taking the form of a full-length PC or AT expansion card containing a fast processor and usually a great deal of memory. You connect them via a cable directly to the engine, bypassing the printer's own built-in controller. The enhancement board then takes over the job of preparing the full 300 dpi page image needed for printing. This approach is well worth investigating if you already possess one of the older generation of laser printers and now want to do DTP or graphics.

	PRICE	FUNCTION	SUPPLIER
J-Laser Plus	£1,084	speeds up a Canon CX- or Ricoh-engined laser printer and provides extra founts using a non-Postscript bit-image approach; also has scanner port and will speed up scanners	Headway
Lasermaster Turbocharger	£1,395	speed-up board for Canon CX-engined laser; uses a similar non-Postcript bit-image approach to the J-Laser, but claims greater fount flexibility	Xiton
PS-Jet	£2,568	turns a Canon CX-engined laser printer into a Postscript machine, using full Adobe-licensed version	Pragma

Two things let the machine down. Its running costs are rather high and it has a shoddily constructed and badly thought-out front panel. When you average out the costs of the various things you have to replace periodically, such as toner, drum and fuser, the cost comes to 3.13p per page. This is more than most other laser printers.

The front panel takes the form of a flat membrane touch-panel rather than proper keys, along with a two-digit display. You set parameters by pushing the key areas marked out on the membrane till the right numbers come up on the display. On our machine the top plastic layer was already coming away from the rest of the panel.

An equally serious problem is that the whole system is logically rather confused, making it difficult to figure out what is going on. We still have not discovered how to force a page throw, for example. This kind of system need not be difficult to use. The Epson GQ-3500 also makes do with a two-digit display which works in a similar way, but by contrast to the Overture 110 it is a triumph of clear design. Using the Epson is very straightforward as a result. Citizen must improve this aspect of the machine.

Fortunately the Citizen works quite well in the default settings it assumes at power-on, so you do not need to have frequent dealings with the front panel. Three emulations are offered as standard: Epson FX, IBM Proprinter and Diablo 630. Unless you tell it otherwise, the Overture 110 pretends to be an Epson FX-series printer. In this emulation, print quality is not up to the very high standard set by HP and Canon, but all laser printers are pretty good and you would need a critical eye to tell the difference. The typeface is more pleasing in Diablo mode.

Despite its few rough edges, the Overture 110 is a real breakthrough in price terms — a genuinely fast machine at a budget price. All things considered it is hard not to recommend it. It is particularly suitable for anyone who produces fairly long documents to a tight schedule and we have found the ability to produce quick drafts of 20- or 30-page documents extremely useful.

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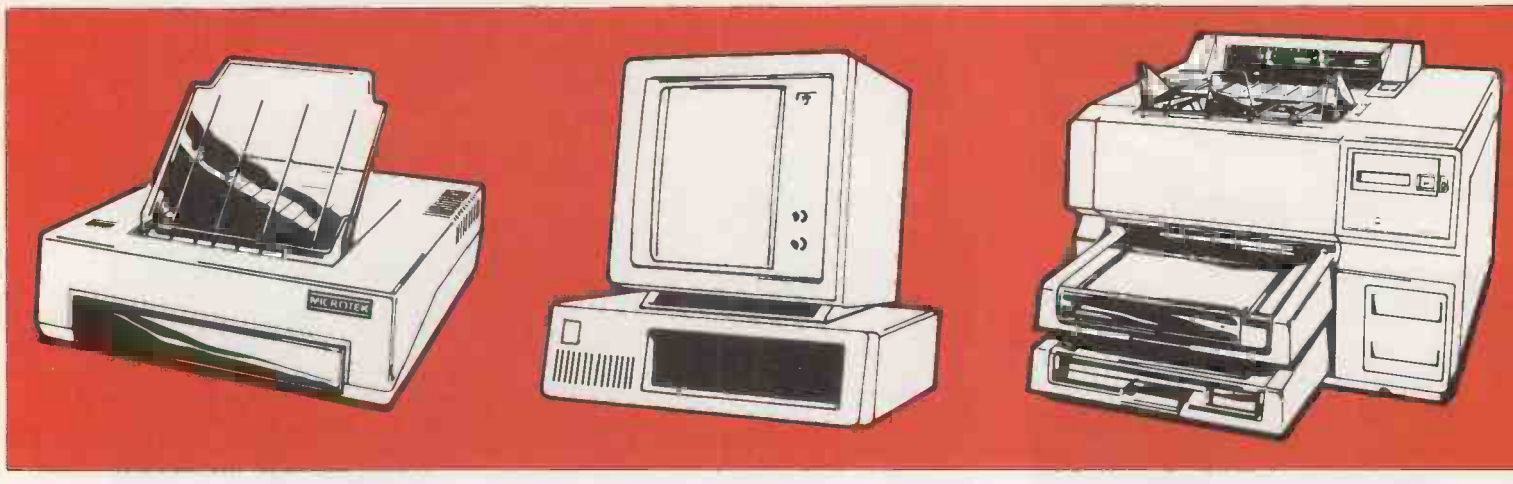

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ALTERNATIVE TECHNOLOGIES

Lasers are quieter than most other kinds of printer, print well on ordinary A4 office stationery and have the ability to handle a wide range of typefaces and graphics. But they are still expensive, the cheapest machine being in the £1,500 to £2,000 price bracket. This leaves a gap for other print technologies which are capable of producing good letter-quality output.

The most attractive alternative options are ink-jet, thermal transfer, dot matrix with 18 or 24 pins, and that old faithful, the daisywheel. The first two technologies in this list — ink-jet and thermal transfer — share one of the laser printer's most attractive characteristics, that they are quiet. Matrix and daisywheel machines offer a benefit none of the others do, that you can use carbon paper and print on to multi-part forms. All four non-laser technologies are superior to the laser in that you can get wide-carriage models at little extra cost.

Ink-jet printers are enjoying something of a resurgence. They are quiet, and the more expensive models are fast too. In the past they have been plagued by an inability to print on ordinary office paper, but this has now almost been licked, at least on the more expensive machines. The Epson SQ-2500 at £1,345 and the Siemens PT-88S at £735 are examples of this new omnivorous breed. As we go to press, Siemens is about to launch a higher-spec machine which competes more directly with the Epson offering. Other major ink-jet players are Hewlett-Packard, Canon and Diconix.

Speed obviously depends on price, but the fastest ink-jets are almost up there with the lasers when printing short documents. Unlike a laser printer, ink-jets give you at least two quality levels, so you can run off draft documents more quickly than final output. Laser printers still offer better print quality than an ink-jet, even in its top-quality mode. But with 24 nozzles in the print head, machines like the Epson SQ-2500 can produce output which is completely acceptable for business use.

Thermal transfer is a technology which has promised great things for several years, but many of the major printer manufacturers, including Epson, have stepped back from it recently. Only IBM has really committed itself to thermal transfer for the general office market. This is because IBM has probably the only thermal-transfer printer worth considering. The £1,070 Quietwriter III is the latest in a line of machines which uses a unique proprietary variant of thermal technology, with a special type of ribbon. The machine has 40 elements in its print head, so the print quality is good — almost as good as a laser printer, in fact.

IBM itself is scrupulously honest in its speed claims for the Quietwriter, qualifying all the figures put forward as burst speed, Shannon speed or whatever. We have therefore been a little unfair to it in our Credibility Gap chart on page 93, but the 160cps draft figure is sometimes used by dealers. Real speed at our tests is still fairly good for the price and print quality involved: about 40cps in draft mode and 30cps in letter quality. This is far below a laser's speed, of course.

The real problem with the Quietwriter, and with most other thermal-transfer printers, is running costs. Ribbons do not last long and cost about £15 to replace. On the basis of 250 words per page in light correspondence use, the running cost works out at about 8p a page. This is far more expensive than a laser printer, so the Quietwriter only makes sense for low-volume use.

Matrix printers have obvious drawbacks in noise and print quality, but they are cheap and increasingly fast. Few matrix printers manage to get much quieter than 55 dB(A), so they are on the margins of acceptability in an office, though better than the typical daisywheel. The big progress in matrix printers has been in print quality. The 18- and 24-pin machines taking over at the top end for word-processing use offer much more acceptable results than the traditional nine-pin models. Leading manufacturers in the 24-pin stakes are Epson, NEC and Toshiba. Oki and several non-Japanese manufacturers favour 18-pin models, but they are generally more expensive.

Brother's HR-40: one of the few remaining top-end daisywheels.

A typical 24-pin machine is the Epson LQ-800, which costs £625. It has a pleasing letter-quality typeface and turns in fairly respectable speed figures in both draft and LQ mode, of 69cps and 35cps respectively in the Worldwide test. As a general workhorse machine the wide-carriage LQ-1000 version is probably a better bet.

With daisywheel printers the big problem is noise. In this respect they are worse than matrix printers, and for a normal office an acoustic hood is virtually obligatory. Daisywheels also have very limited graphics capability, and do not allow you to use more than one fount on a page unless you are prepared to go to the trouble of changing the printwheel by hand. You are obviously limited to the 100 or so characters on the printwheel, and the maximum fount size is also severely constrained.

This formidable list of drawbacks ought really to knock the daisywheel off anyone's shopping list, but the machines refuse to die. This is partly because of people's desire to print on to multi-part stationery and the availability of wide-carriage machines, though these advantages are shared with impact dot-matrix printers. But print quality comes into it too. A good daisywheel fitted with a carbon ribbon actually gives better print quality than a laser at straightforward correspondence work, although whether the average reader can tell the difference is another matter.

What seems likely is that daisywheel printers will linger for a long time at the very low end of the printer market. Here many people are looking for the best possible quality at the lowest possible price, probably just for occasional low-volume letter-writing applications on home machines. The high-end daisywheel market is already shrinking, and as it does so Brother is becoming increasingly dominant within it. On page 93 we chart the speed of its newly launched HR-40 office daisywheel. At 20cps for nearly £1,000 it is not a very impressive performer in terms of speed. In the office, the days of the daisywheel must surely be numbered: the other options are better.

Citizen has one of the most interesting new entrants, the Overture 110, which is based around a new engine from Mita. This machine is rated at 10 pages a minute but is priced at only £2,000. The standard model has a single paper-input tray, but it takes 250 sheets. These features would seem to suggest that it is targeted at users with a fairly high-volume requirement, but on the negative side the running costs are not low. Citizen is probably going for precisely the same mass market as Epson and Hewlett-Packard, but offering a different package of features.

The situation is complicated still further by the large number of different machines around that are based on the older Canon CX engine. They go under a variety of different names but are easy to recognise by their size and general appearance. They generally weigh about 70lb and look like the original HP, Canon or Apple machines. Provided the price is low — well under £2,000 — these machines can still represent good value for money. Discounting is widespread on older machines, so it pays to shop around.

Apple Laserwriter Plus.

GRAPHICS APPLICATIONS AND DESK-TOP PUBLISHING

Desk-top publishing (DTP) is one application area that could hardly exist without laser printers. Computer-aided drafting (CAD) software also works well with lasers, although here plotters are available as an alternative output medium. But both these areas require laser printers with quite different characteristics from an ordinary office printer, and until recently, getting a machine for serious desk-top publishing or graphics use meant laying out nearly £6,000 on an Apple Laserwriter. Apple had a dominant position as the supplier of printers equipped with the Postscript page-description language, with few effective high-volume competitors.

Three developments have changed this. First, the graphics capability of the general-purpose office laser printer has improved. Ordinary office lasers now nearly all come with 512K as standard, and you can quite often upgrade them to over a megabyte and in some cases a good deal more. In DTP or CAD use you need the extra memory to hold a full page at 300dpi, which requires about 1.2Mbyte.

Memory is also useful for holding extra soft founts which can be bought on disc and downloaded into the printer. A beefed-up standard laser will meet many people's desk-top publishing and graphics requirements, particularly if they are not interested in unorthodox text effects and are prepared to stick to a small number of founts.

Secondly, Apple now has several competi-

Hewlett-Packard Laserjet II: lighter and more compact than its predecessor.

	PRICE	APPLICATION	SPEED	PRINT ENGINE	PAPER FEED	RUNNING COST
Agfa P-400 PS	£18,950	high-quality DTP	18ppm	Agfa	2,000	1p
AST Turbolaser	£3,200	DTP	8ppm	Ricoh	250	3.65p
Canon LPB-8 II	£2,195	low-volume use	8ppm	Canon	200	2.25p
Centronics PP-8	£1,595	low-volume use	8ppm	Sharp	100	1.7p
Citizen Overture 110	£1,995	medium-volume use	10ppm	Mita	250	3.13p
Dataproducts LZR-2665	£14,950	A3-format DTP	26ppm	Toshiba	250+500	2.28p
Epson GQ-3500	£1,795	low-volume use	6ppm	Ricoh	150	2.5p
Genicom 5010	£3,234	medium-volume use	10ppm	Hitachi	250	2.3p
Hewlett-Packard Laserjet II	£2,618	low-volume use	8ppm	Canon	200	2.25p
Kyocera F-1010	£3,395	medium-volume use	10ppm	Kyocera	2×250	2.8p
Lasermaster CX	£3,395	DTP	8ppm	Canon	100	2.86p
Mannesmann-Tally 910	£3,195	medium-volume use	10ppm	Kyocera	2×250	2.3p
Oasys Express	£1,810	medium-volume use	8ppm	Tec	250	2.4p
Oki Laserline 6	£1,899	low-volume use	6ppm	Ricoh	150	2.9p
QMS K8	£2,105	low-volume use	8ppm	Canon	100	2.3p
Qume Scripten	£4,595	DTP	10ppm	Hitachi	250	2.58p
Ricoh Postcript 8	£5,195	DTP	8ppm	Ricoh	250	3.03p

NOTES

SPEED is quoted in pages per minute and is the theoretical maximum speed claimed by the manufacturer. PAPER FEED is the maximum number of sheets that the input paper tray(s) will hold. RUNNING COST is given in pence per page. RESOLUTION is 300 dots per inch verticolly and horizontally in all cases unless otherwise stoted. PAPER SIZE is A4 in all cases unless otherwise stoted. NOTE This list is not comprehensive. We hove concentrated on the likely brand leaders ond technically interesting machines.

tors offering Postscript machines at lower prices. The price of Postscript lasers has fallen to around the £4,500 mark, with the Qume Scripten and QMS PS-800 among the better-value machines.

Postscript still has its attractions for desk-top publishing though, as it offers very great fount flexibility. Not only can a large number of different founts be obtained for any Postscript laser, but once you have such a fount you also possess it in all its variations. For example, if you buy Times Roman in 12 point, most desk-top publishing software can simply blow it up to 48 point without it looking unsightly. With the right software Postscript allows all sorts of creative effects: merging images into each other or into text, rotating or smearing text across the page, and so on.

Postscript or any other page-description language works by describing the objects on a page in a vector form. Founts too are held as vectorised descriptions. This is why it is so easy to manipulate a fount, expanding it,

LASER PRINTERS

OTHER FEATURES	COMMENT	OTHER MODELS	SUPPLIERS
400dpi resolution; Postcript compatible; 73 founts standard and awn built-in hard disc; weighs 190kg; HPGL compatible	higher quality ond speed means a big jump in price and sheer size which will only be worthwhile far ambitious DTP users; Agfa's printing engine uses an LED array rather than a scanning laser	Agfa makes full scale typesetting machines, but nothing cheaper than the P-400 PS	Agfa-Gevaert
1.5Mbyte RAM	far fast printing in DTP and graphics applications; uses bit-image as oppased to PDL approach; contraller comes an a separate card which you plug into your PC	nane	AST
—	Canan's secand-generatian machine, similar to the HP Laserjet II but with a different cantroller	older Series I Canon machines may still be an sale, aften at very gaod prices	Canan
fairly campact	Centronics has recently been acquired by Genicam, and the PP-8 is being sold off cheap; check on the availability of cansumables	see Genicam	Mekam
12 manth an-site warranty in price	brand new with very high spec far the price	DTP versian likely by end of year	Citizen
Postcript, high duty cycle	double the narmal paper size; fast; resolution is the usual 300dpi	£2,995 LZR-1230 12ppm general-purpose A4 printer without Postscript	Dataproducts
weighs only 16kg; HP and Diablo emulation available	very compact, gaod-value office laser designed far general-purpose low-valume use	—	Epsan
weighs 38kg	similar specification to Qume's Laserten Plus, but more expensive	same machine with HP emulatian is £3,560	Genicom
weighs 23kg; 12 months on-site warranty	successor to the successful Laserjet and Laserjet Plus; well supported by HP, but not startling value for money; extra memory to 4.5Mbyte	Laserjet 2000, £16,500, is high-volume 20ppm printer whose paper-handling options include 2,500-sheet paper feeder; older Series 1 Laserjets still on sale	HP
weighs 25kg; emulates wide range of other printers	good all-round printer; well suited for higher-volume users	F-2020 has twin input trays and an output collator; NCR, Unisys, Hermes and various other companies offer badged versions of Kyocera machines	Mekom
weighs 25kg	cheap, fast printer for DTP and graphics applications; uses a similar approach to the AST Turbolaser, with a separate controller card which you plug into your PC; bit image, not Postscript	Lasermaster RX, based on Ricoh engine and with better paper handling and a similar spec to the AST Turbolaser, costs £4,100	Xitan
weight 20kg; emulates wide range of other printers	good all-round printer far higher-volume users	—	Mannesmann-Tally
weighs 23kg	high duty cycle for the price	Silver Express, £2,181, has its own built-in PDL called Express; the £5,528 Oasys 1510 is rated at 15ppm	Pragma
weighs only 16kg; standard memory now 512K, equalling its Epson rival	similar to new Epson — neat and compact, and well suited for general-purpose low-volume use	—	Technitron X-Data
—	basic low-end laser printer built around the original Canon engine	QMS Smartwriter, £2,683, supports more founts and emulates more printers; QMS PS-800, £4,342, is a competitively priced Postscript printer aimed at DTP users	Pragma, Headway
Postscript suppart; weighs 37kg; 1.5Mbyte RAM	competitively priced for a Postscript printer, and quite fast	£2,683 Laserten Plus is Qume's non-Postscript affering, intended for less ambitious office use	ITT-Qume
emulates HP plotters as well as other laser printers; weighs 35kg	for both DTP and graphics applications; Postscript gives more faunt flexibility than a bit-image approach, but makes it slower	Ricoh Postscript 15, rated at 15ppm	Aptec

rotating it, distorting it. The vectorised description is not turned into a bit image until it gets into the printer, where a powerful processor takes the Postscript code and expands it.

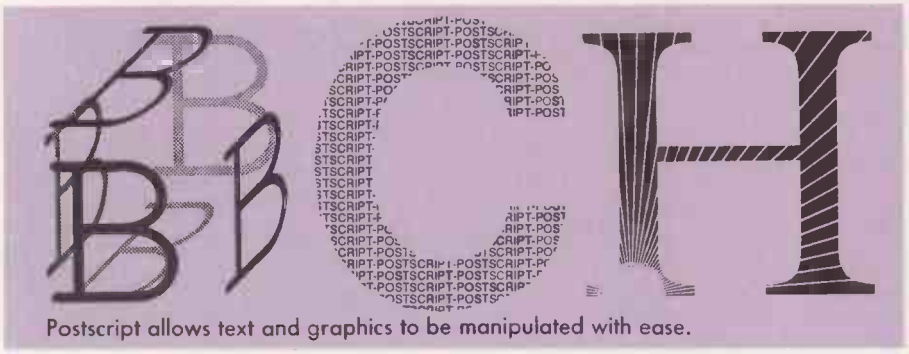
The alternative is to hold your founts from the start as bit images. This has been done for years in matrix printers and screen displays, and of course is the approach used in ordinary office laser printers. What now makes it viable for the much more demanding task of DTP in a vast variety of different founts is the falling price of memory and the growing amount of disc space people have on their systems. It is possible now to hold a large number of founts on disc.

Each size and variation of fount — 12 point roman, 12 point italic, 14 point italic, and so on — needs to be held separately, so you need a few megabytes for a working DTP system. You still need to build up an image of a page in memory before printing, but this process is simplified if you are using bit-mapped founts.

The normal approach with bit-mapped laser printers is to prepare the page image not inside the printer but in the PC. The printer comes with a card which you fit inside your PC. It will generally contain 1.5Mbyte or 2Mbyte of memory along with a fairly powerful processor such as a 68020.

The reason for adopting this solution is that most of the founts you will be using will be held on your PC's hard disc. They are bulky in bit-image form, so transferring them across a standard serial or parallel link to the printer would be very slow. Doing most of the work in the computer also means that the printer itself can be kept simple. Centronics Page Printer 8.

In speed terms, the performance of these board-based systems is very good; indeed for most DTP or CAD work they are faster than the Postscript alternative. Where you might wait 10 minutes for a Postscript laser to print a complex graphic image, a bit-image machine such as the AST Turbolaser might do it in just over a minute. Many simpler images will print at close to the maximum


Postscript allows text and graphics to be manipulated with ease.

speed of the laser engine. This machine is particularly suitable for graphics.

At £3,200, the AST Turbolaser looks like a pretty good deal. What is more, there are even cheaper options open to you if you already own one of the older laser printers based on Canon or Ricoh engines. Since the bit-image approach uses a separate board that goes into your PC and takes much of its resources from the PC, it is fairly easy to make it available as an upgrade board to boost the performance of an existing laser printer. You plug the speed-up board into your PC and then connect it directly to the engine of your old laser printer, cutting out its built-in controller.

Postscript retains one big advantage over the bit-image approach and it is one which may be decisive for some users: it is device-independent. This means that the same Postscript file you use to drive your 300dpi Apple or Qume printer will also drive the Agfa at 400dpi or even a Linotronic typesetter at a full 1,200dpi. It will do this unchanged, giving exactly the same image but at higher resolution. This allows you to use your cheap desk-top laser in the office and then send a disc out to an external typesetting company which has full-scale kit.

With bit images you cannot do this. Your founts are held at 300dpi and there is nothing you can do to change that, so the bit-image approach is not much use if you know you will want to use higher-resolution devices at some stage. Postscript is probably worth the extra money and the probable drop in speed. CAD as well as DTP users are affected, as CAD users often want to hold drawings on file for several years, by which time printer resolution will have changed.

But even here there is a way out. Some packages — Ventura Publisher is one — will support several different output devices at the same time. This allows you to print to a bit-image printer such as the AST Turbolaser or J-Laser, and also prepare a Postscript file for sending on to your typesetter.

All the machines discussed so far, whether they use bit-image founts or Postscript, are similar in that they have a resolution of 300dpi and print on to A4 paper. To get the ability to print on to larger paper sizes or at higher resolution involves considerably more expense. A3 printing is really a minority requirement for ambitious DTP users, but if you need it you can get a laser to do the job as long as you are prepared to pay £15,000 or more. Higher resolution starts at about £19,000, the cost of Agfa's 400dpi machine.

One day higher resolution will doubtless come to the general office market, though it is not yet clear what the new standard will be. It may not be a symmetrical 400 by 400 dots like the Agfa, as an asymmetric 300 by 480 or 300 by 600 could be technically easier to achieve. But for the time being A4 and 300dpi look like being a sufficiently good platform from which DTP and graphics applications can take off.

SUPPLIERS

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Canon UK Canon House, Monor Rood, Wallington, Surrey SM6 0AJ. Telephone: 01-773 3173
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With the great range of different types and makes of printer on offer, one of the first things you need to know is their speed. But this is surprisingly hard to find out. Most of the published figures are badly misleading.

Manufacturers typically quote speed in different ways, depending on the technology the printer employs. They use pages per minute for laser printers, lines per minute for line printers and characters per second for serial printers such as dot-matrix and daisywheel machines.

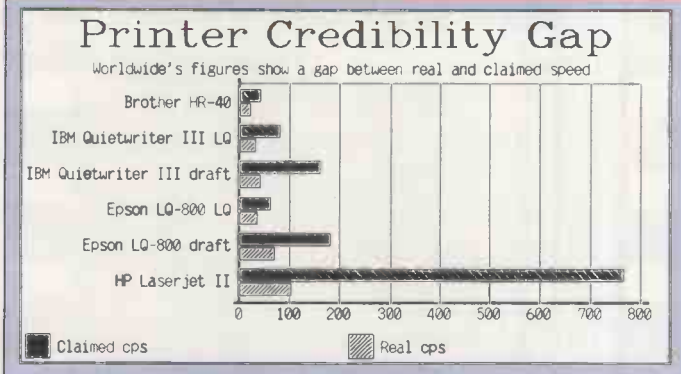
This makes comparison between different printers more difficult, but it is really only the beginning of the user's problem. The figures themselves cannot be taken at face value — they do not mean what they appear to mean. The situation is particularly bad with laser printers, which are being heavily hyped on the basis of their speed. Products are routinely described as going at six, eight or 10 pages per minute — these are the most popular numbers to claim at the personal-computer end of the market. Most of the time you are unlikely to get anything like this performance in practice.

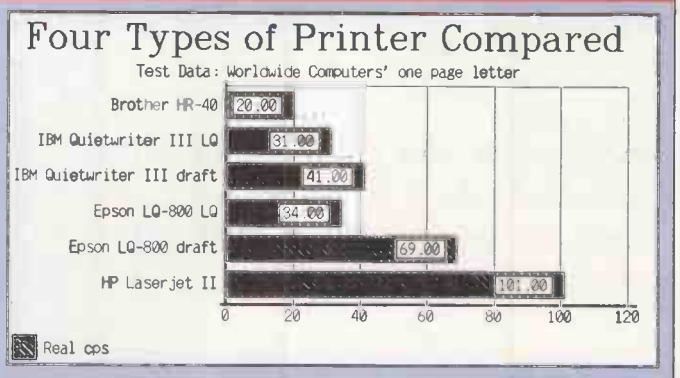
The pages per minute figure quoted by manufacturers is in reality the maximum speed of the laser engine. You are only ever likely to achieve it when doing one specific thing — printing repeat copies of the same page. Yet these maximum speed figures are bandied around frequently without any kind of qualification. Running our own tests, we have found that you typically get about five pages per minute or less from a laser printer supposedly rated at eight pages a minute. Real speed is lower in a comparable way for manufacturers claiming six and 10 pages a minute.

A laser's speed depends a great deal on what you are printing. Our figures are based on printing straightforward two- to three-page text documents. Since you generally have to wait at least 20 seconds for the first page to emerge, if you print a lot of short documents you would be getting less speed — closer to three pages a minute from a machine such as the HP Laserjet II which is rated at eight pages per minute. Under these circumstances, the laser's speed advantage over the faster types of matrix and ink-jet printer is becoming marginal.

One of the great attractions of laser printers is their ability to handle mixed text and graphics, or to put several different founts on the page. But if you use the machine this way, printing can take much longer than for more uniform text. For complicated desk-top publishing or graphics work you need to allow several minutes per page on most machines. We consider the Qume Scripten

THE CREDIBILITY GAP





We asked Worldwide Computers to run its one-page test letter on four machines which all use different print technologies. The Quietwriter III, at £1,069, is the latest version of IBM's resistive-ribbon thermal-transfer printer, a proprietary variant on the usual thermal technique. The Epson LQ-800, which sells for £625, is a letter-quality 24-pin matrix printer. Some companies are still bringing out new high-end daisywheels — Brother's HR-40 at £995 was only recently launched.

Finally, we have the Laserjet II at £2,618, the most recent laser printer from Hewlett-Packard. This machine is rated at eight pages a minute by HP. We have converted this, somewhat arbitrarily, to a claimed 765 cps, based on the number of characters you could get on a fairly full page.

As expected, the machines come nowhere near their claimed speed: they are not even half as fast as their manufacturers claim. But once the griping about that is over, one of the most interesting things is that the other printers do not do too badly compared to the laser printer, given their much lower price. The Quietwriter and Epson LQ are about one-third of the speed in their high-quality modes, and obviously quicker in draft mode. Only the daisywheel looks bad, trundling along well behind the others and with no draft mode to boost its speed on occasions when time is more precious than print quality.

The IBM Quietwriter III emerges particularly well, given its very quiet operation and the quality of its output even in draft mode, where it turns in a respectable 41cps. This is over twice the speed of the earlier Quietwriter II, so IBM has done a good job in boosting performance. The drawback of this printer remains the cost of replacing the special ribbon, and hence a high cost per page making it unsuitable for high-volume work.

For sheer value for money it is still hard to beat a matrix printer. At this test, the Epson goes at one-third of the speed of the laser in its top-quality mode, and over two-thirds of the speed in draft mode. Obviously matrix printers have their drawbacks, but for many straightforward applications lack of speed need not be one of them.

HOW FAST DO THEY REALLY GO?

Manufacturers usually quote their machines' printing speed, but establishing their true performance is no easy task. **Ian Stobie** explains what to look for when assessing competing models.

to be a pretty snappy performer for a Postscript laser printer, but even it took three minutes to print a complex sample from Ventura Publisher.

It is worth remembering that dubious speed figures did not arrive with the laser printer. They have long been part of the printer marketeer's armoury. Take the characters per second (cps) figures quoted for daisywheel, ink-jet and dot-matrix printers. They again are wildly optimistic in the manufacturers' favour.

The figure normally given is the speed of the print head, ignoring all line skips and page throws. In effect, it tells you the speed the printer could achieve if it were printing an infinitely long line. Needless to say, this is not a very useful piece of information in practice.

Printer distributor Worldwide Computers recently published its own speed figures for a number of popular daisywheel and dot-matrix printers. The standard document used for these tests was a one-page business letter just over 300 words in length. In all cases the manufacturer's claimed figures grossly overstated the printer speed. On the basis of Worldwide's results you would need to halve or even quarter the claimed cps figure to get a real indication of throughput for these kinds of serial printer.

Another dubious practice to watch out for on dot-matrix and ink-jet printer spec sheets is artful confusion over the printing pitch. These machines usually print at 10 characters per inch (cpi), which is 80 columns across standard paper. But many of them can also print at a more compressed 12cpi, which gives you 96 characters on a line. The point is that with this technology it takes about the same time to print a line either way.

So by working out the cps figure at 12 characters per inch instead of 10, you get an instant gain of 20 percent in the apparent speed of the matrix printer. Most people assume that an unqualified cps figures refers to 10cpi printing, because this is what they themselves use most of the time. This gives the more unscrupulous vendor scope for a bit of modest deception.

Of course, none of this statistical chicanery is likely to be illegal. With all the types of printer we have mentioned there is always at least a tenuous basis in fact for the numbers quoted, however much they may appear to be misleading. The problem is that to the average punter the figures do not mean what they appear to mean.

It is interesting to note that in the line-printer market, manufacturers' quoted speeds seem to be more accurate. This could of course be because the technology makes it easier to find a less arbitrary speed measure. But it also probably has a lot to do with the nature of line-printer users. The machines are normally purchased by technically sophisticated DP department staff who have the means — and probably the inclination — to check up on speed claims before they

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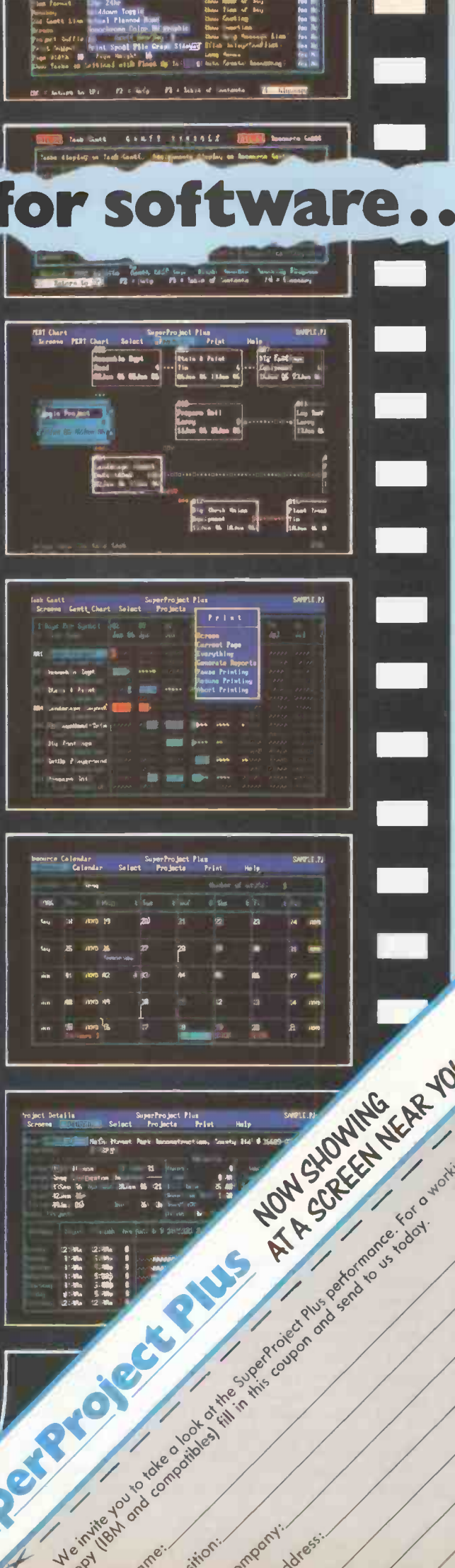

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commit their company to handing over the cash.

This raises the whole question of how you check up on a printer's speed. The best and simplest way is to assemble some typical examples of the work you do and run them off, stopwatch in hand. This only works, of course, if you have the printer in your office to do the test.

At this point it would be nice to point to a widely accepted independent third-party benchmark. Unfortunately there isn't one. The market research company Dataquest has a very thorough test, but it is designed only for serial printers, and the results are not generally made available to anyone other than clients. In the February 1987 edition of *Practical Computing* we published another benchmark, designed by Eric Bagshaw, then at the NCC. But again, this is only suitable for serial printers.

The problem with most of the benchmarks that are in common use is that they really belong to an engineering rather than a user-orientated tradition. They tend to measure fairly specific technical features, and the results can be very hard to interpret. Put alongside manufacturers' bold claims, they are not sufficiently simple.

Worldwide Computers' test has the virtue of being simple, but it only relates to one sort of application — printing letters. You can learn a good deal from it, but different types of printer are good or bad at different things. You also need to see how printers do at things like spreadsheets, listings and longer reports.

These problems have led us to develop our own tests, which we have been using in *Practical Computing* printer reviews in recent months. We have not got the formula quite right at the moment, but we are moving in the right direction.

The most urgent need now is to be able to compare between different printer types. Anyone interested in buying, say, a letter-quality office printer could choose between at least five fundamentally different types of printer — laser, daisywheel, 18- or 24-pin matrix, ink-jet or thermal transfer.

What you need is one general, average, all-round indication of a printer's speed, expressed in a way that is independent of printer type and easy to understand, such as pages per minute. It would help to provide a separate set of figures, breaking the performance down for different kinds of printing jobs.

To take all this into account things could get very complex, but there is little point in extending the number of tests beyond the minimum necessary to establish a reasonable benchmark. The aim is to separate out common tasks which are significantly different, and then perform your tests with realistic data.

Most business letters are only one or two pages long. A good test would be to put several typical examples through to get an average time per page. We use three letters, all different but laid out in a fairly standard way, and one page long.

Because laser printers take longer to do the first page of a document than subsequent ones, it makes a difference how you conduct the test. If you send one big document with all the letter text in it, it will overstate laser performance. To get a more realistic simulation of typical work patterns you would need to print the letters separately, then average the time. We ignore this problem, so our letters test gives a laser's speed at printing a three-page letter. However, we give the time to print the first page separately in laser reviews, and again use a one-page letter as the sample document.

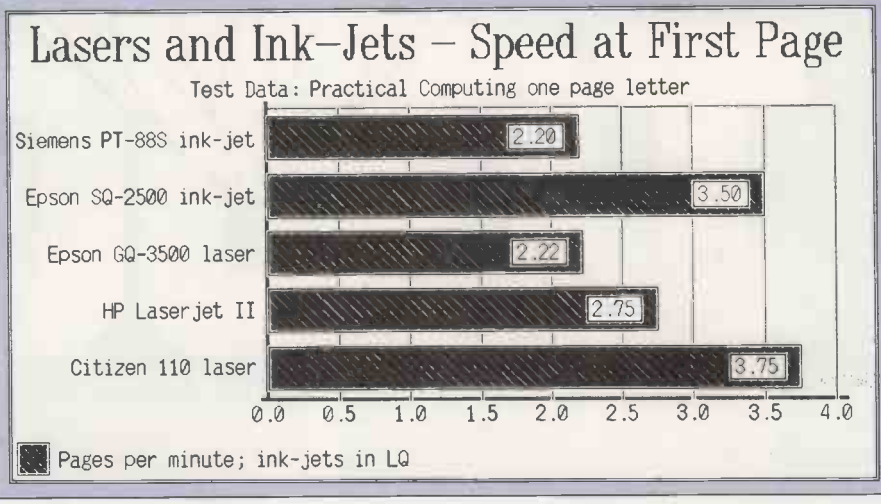
Spreadsheets involve quite a lot of white space, horizontally positioned between groups of figures. This has little effect on the speed of a laser, which is not affected much by the positioning of text on the page. But serial printers are affected. There are significant differences between machines in how fast they can skip over horizontal white space. This makes it worth testing separately for spreadsheet speed.

If you print a large number of invoices or statements the problem is similar. Often there are plenty of blank lines on the form, but with a total or other terms written near the bottom, so the printer cannot simply eject the page. Serial printers differ in how well they can skip vertically. We do not have a separate benchmark for testing this.

We do think it is worth having a separate test for output which involves a high propor-

SHORT DOCUMENTS

Lasers always take longer at printing the first page of any document, whereas ink-jets and most other types of printer start straight in. On short documents this reduces the laser's speed advantage to vanishing point. We have given the ink-jet figures for quality mode. In draft mode they are faster, the Siemens managing 4.30 and the Epson SQ-2500 5.10 pages per minute. The test used is a short one-page letter.



SHANNON TEXT

One figure you sometimes see on specification sheets is a cps value for Shannon text. This is a benchmark of sorts, although it is only of much relevance to daisywheels. Daisywheels print characters one by one like a typewriter, rotating the relevant character into position before whacking it down through a ribbon. As a result, it is far quicker to print a string of the same character repeated several times than it is to print a real word of the same length. Different real words take different lengths of time, even if they have the same number of characters.

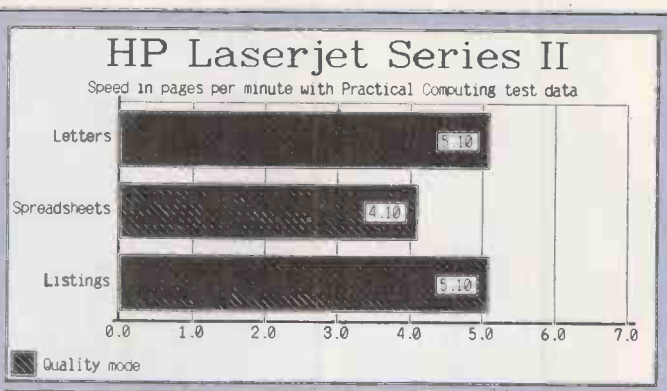
Shannon text is a nonsense sentence originally devised in 1949 by Claude Shannon, one of the key figures responsible for laying the theoretical groundwork for modern computing. At the time he was interested in designing telegraphy systems rather than benchmarking printers. The text is composed of words which are supposed to embody commonly occurring letter sequences:

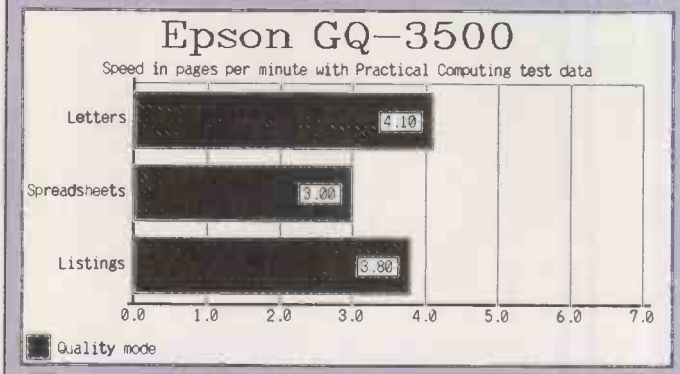
> The head and in frontal attack on an english writer that the character of this point is therefore another method for the letters that the time of whoever told the problem for an unexpected.
>
> The Mathematical Theory of Communication
> Claude Shannon, 1949

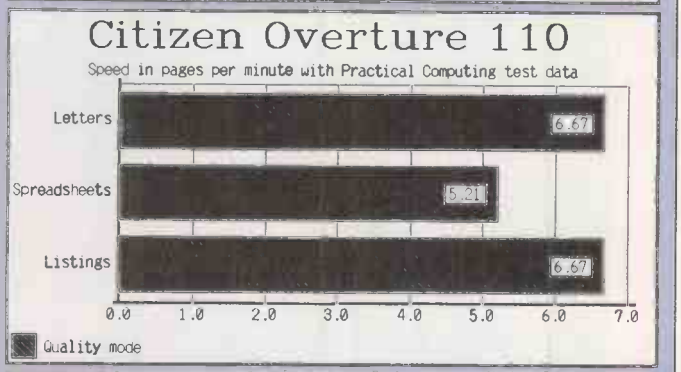
For daisywheels, the Shannon sentence is a convenient, short speed test, although you would probably get a better measure of real throughput by putting a few genuine documents through and timing them. Speed is not affected by the particular characters you print on most other types of printer, so Shannon text is now little more than a curiosity.

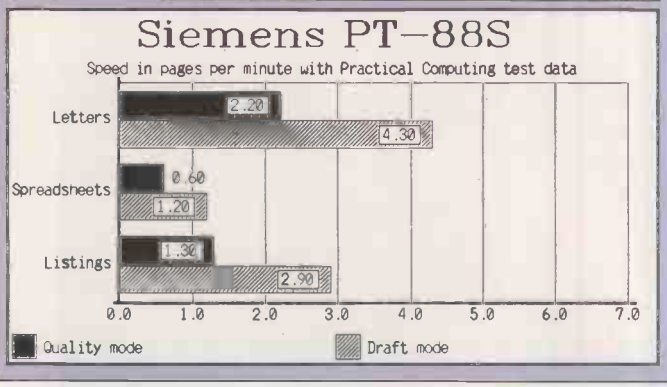
SPEED TESTS

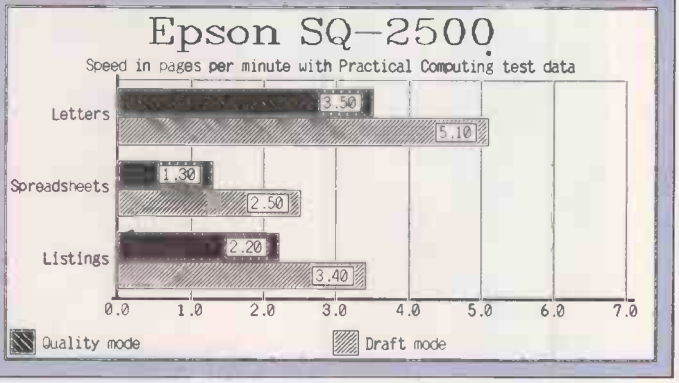
Ink-jets are the obvious machines to compare with laser printers because they are equally quiet. The longer the document the better the relative performance of the laser, as the average speed of a laser goes up while that of ink-jets remains the same. Here the test data takes the form of three pages of letters, two one-page spreadsheets and a continuous listing about three pages long. The ink-jets still do reasonably well considering their lower price: £735 for the Siemens PT-88S and £1,345 for the Epson SQ-2500. But with really long documents of 10 or 15 pages or more, the lasers would begin to get close to their claimed speeds of six pages per minute for the Epson, eight for the Laserjet II and 10 for the Citizen.











tion of short lines. Listings are the obvious example, which is why we have called it the listings benchmark, but there are many other occasions when you might want output with a similar format, ranging from single-column address labels to data logging. This kind of application tends to penalise the relative performance of line- and page-based printers but boosts that of serial printers, which can skip well.

If you are going to do the benchmarking job properly, reports are always worth testing out separately. They are typically much longer, and have a very different format. With laser printers, as the first page always takes a long time, the difference in speed between printing reports and one-page letters is enormous — 7.3 pages per minute for a 16-page report as against 2.7 pages per minute for a letter on an HP Laserjet II.

With other types of printer, the effects may work the opposite way, with reports printing at a slower average speed than letters. With serial printers, the important factor in determining speed per page is not the overall document length, but the length and format of each page.

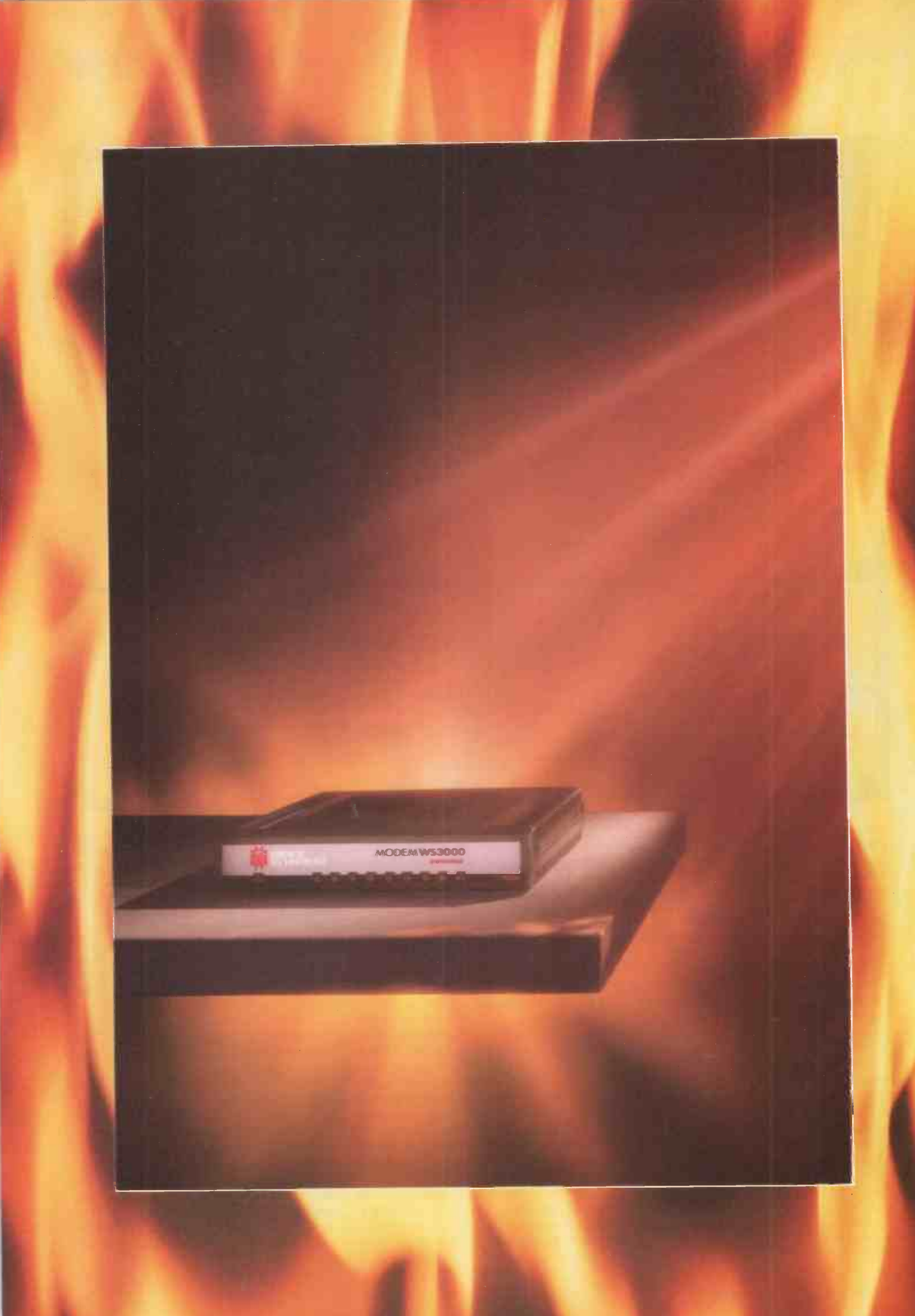
The typical report page is fuller than a letter and often has something printed at the top or bottom, so you get less benefit from the serial printer's ability to skip rapidly or eject the page early. Reports often have words or headings picked out in bold or underlined characters, or some other effect which requires double striking, and while lasers take these features in their stride they can slow a serial printer down.

On our reviews we typically quote a time in seconds for printing a longer document. Usually this will be the text of the review itself, printed in a double-spaced report format with header and footer at top and bottom. This is not a proper benchmark, as the task obviously differs for each printer. But we think it is worth doing as people can easily see how much work the printer has got through in the time. In future we hope to introduce a proper report benchmark, expressed in pages per minute, based on a standard 15-page report.

There are enormous practical difficulties in benchmarking printers. For example, most printers now have fairly large memory buffers. This means you cannot time the printing job accurately from a computer, because the printer hands back control before physical printing is complete. You cannot simply set the benchmark running and walk away; you have to stand over it with a stopwatch.

This reduces the attractions of using a Basic program to run the tests. You might as well use an appropriate software package. There are pitfalls in this approach — the aim is to test the printer, not the software or the computer it runs on. We run our tests from an 8MHz AT and use PFS Professional Write, but we have not found significant difference using faster or slower PCs or changing word processor.

But a standard setup becomes vital if you want to benchmark graphics or desk-top publishing applications. Here the power of the PC and the efficiency of the software can make a tremendous difference to the speed. The obvious setup here is to use an AT again and Aldus Pagemaker or Ventura Publisher. But the speed of printing will depend on the version you are using. We plan to use Ventura as our desk-top publishing benchmark once version 1.1 comes through. PC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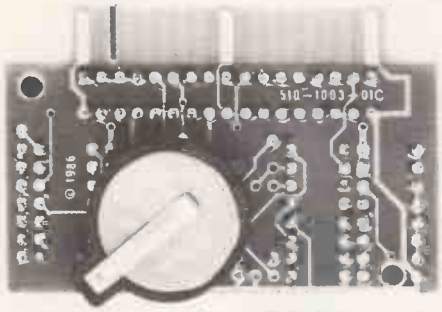

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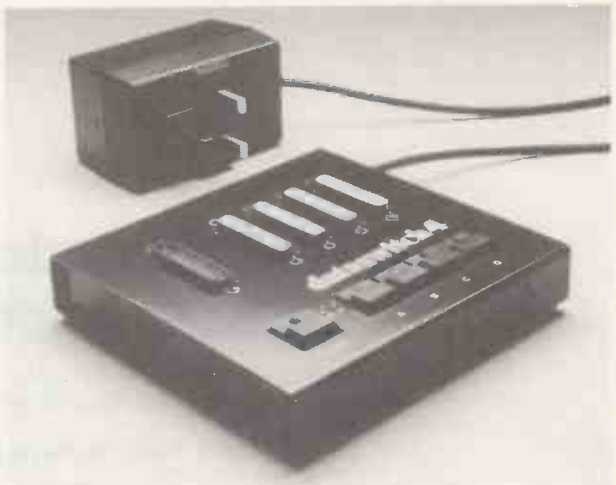

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TOP 10

There is a growing number of utility programs which will add to or improve the functions of MS-DOS. **Jim Bates** provides a guide to the advantages you can gain and the pitfalls you are likely to encounter with these programs.

The Microsoft disc operating system (MS-DOS) software is the nearest thing to a universal standard that we have in the microcomputer industry today. The IBM PC and the hordes of clones that followed it provided an enormous user base for the various versions of MS-DOS. The fact that this one software package has survived and grown over the past few years is a tribute both to the original concept and to the original authors. Remember that 99 percent of all the software that you see running on these machines uses the MS-DOS environment and you will begin to appreciate the size of the achievement.

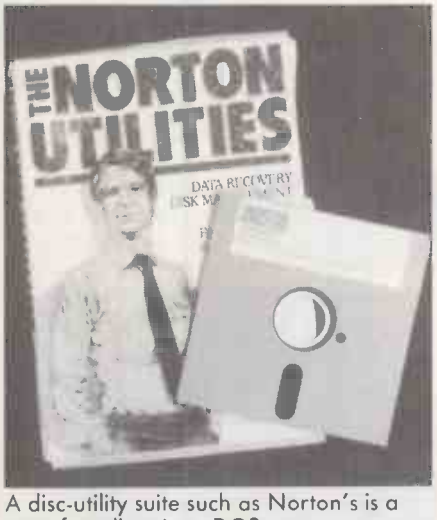
Since different users require different facilities, a thriving market has grown for producing add-on software that will improve the performance of MS-DOS in various areas. For instance, new users might need software that gives them instant access to the more common DOS functions without the need to learn the sometimes cumbersome syntax involved. Technical users might require more intricate control of the capabilities of DOS, and others will want enhancement of specific functions that they use a lot.

These widely varying requirements are being met by a growing number of utility progams, and it is becoming difficult for the average user to decide which are best for their own purposes. Utility programs either add a totally new function to DOS or provide a useful improvement to an existing function. They fall broadly into two categories — resident and non-resident. Resident programs should sit quietly in memory, interfering as little as possible until their function is called — either by the operator or by a special condition being met during operation. Non-resident programs are usually loaded as required to complete their function and are then discarded.

Most of the successful resident utilities provide instant access to just one extra facility, although one or two — like Borland's Sidekick — supply a range of convenient functions. Experienced users generally avoid the multi-function resident programs, since there is more chance of software conflict when a number of such utilities are loaded simultaneously. It is now possible to set up a customised environment using a number of different resident utilities that provide just the facilities that you require and no more.

Non-resident utilities are usually run from the DOS prompt and offer almost unlimited variations on the themes of file, disc, screen, keyboard and printer management. Programs that offer facilities to undelete files, protect files, modify dates, sort directories and so on will invariably rewrite sections of the disc directory and sometimes the File Allocation Table.

These areas of the disc are fundamental to data storage and recovery, and if they become corrupted for any reason, some or all of your data may be lost. Reasons for corruption can be anything from a simple power failure to downright bad software. Unfortunately, it is not unknown for corruption to occur and remain undetected until the relevant files or directories are accessed during normal use. It is no fun trying to extract intelligible information from a hard disc that has been damaged by an errant utility program.



A disc-utility suite such as Norton's is a must for all serious DOS users.

Many software suppliers are now offering comprehensive ranges of utility programs at widely varying prices, and there are huge numbers of programs available through the shareware and user-supported schemes from bulletin boards all over the UK. Be extra cautious when trying user-supported programs. Some of them are first class but others may be the software equivalent of cleaning your hard disc with a Brillo Pad. Remember also that you may have to pay a registration fee to get full versions of certain programs.

Utility programs occupy probably the largest single section of the PC software market in terms of quantity, so it would be presumptuous to suggest that the programs mentioned here are the best available. I decided to choose from three general areas: printer control, general convenience and performance enhancement. Within these areas, these programs are certainly the best I have encountered.

The printer-control utilities Metatext and Nuepson both allow instant control of printing modes. I have found this type of control to be essential if your computing involves producing much printed output. Metatext is obviously much more sophisticated in allowing differing type styles to be produced on demand, whereas Nuepson is limited to the standard Epson typefaces.

The general convenience programs come in two flavours — resident and non-resident. Sidekick and One-Key DOS are the resident programs, designed to provide maximum access and convenience to a range of functions, regardless of what other software you may currently be using. I have included Popdrop in this group because if you start using a lot of resident programs, some type of efficient memory management will become essential.

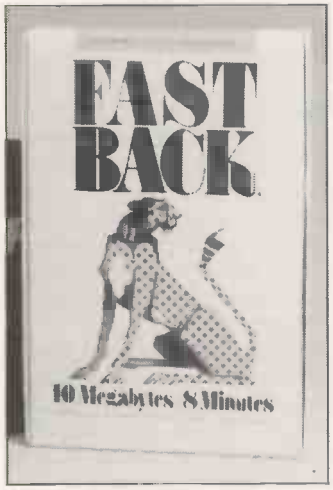
The non-resident programs, Util, Norton and Palomar, are really sets of programs which provide more intricate control and information from within the MS-DOS environment. Some of their facilities are so good that you end up wondering why they were not included in MS-DOS in the first place. Others are less useful but can provide interesting information about the workings of your machine.

My last two choices, Fastback and Microcache, produce such time savings in important areas of operation that they had to be included in order to complete the overall picture of just what a boon good utility programs can be. All of these programs are well written and well behaved, easy to use and good value for money.

SUPPLIERS

Fastback Riva Terminals, 9 Woking Business Park, Albert Drive, Woking, Surrey GU21 5JY. Telephone: (04862) 71001.
Metatext Image Computer Systems, 27 Cobham Road, Ferndown Industrial Estate, Wimborne, Dorset BH21 7PE. Telephone: (0202) 876064.
Microcache Microcosm Research, 26 Danbury Street, London N1 8JU. Telephone: 01-226 9092.
Norton Utilities Softsel, Softsel House, Syon Gateway, Great West Road, Brentford, Middlesex TW8 9DD. Telephone: 01-568 8866.
Nuepson bulletin boards.
One-Key DOS Power Up, Imperial House, Lower Teddington Road, Kingston-upon-Thames, Surrey KT1 4EP. Telephone: 01-943 4366.
Palomar Utilities Palomar Systems, 84 Cedar Road, Botley, Oxford OX2 9ED. Telephone: (0865) 723392.
Popdrop Infostructures Inc., PO Box 32617, Tucson, Az 85751, USA. Telephone: (US area code 602) 323-4600.
Sidekick Borland International, 1 Great Cumberland Place, London W1H 7AL. Telephone: 01-258 3797.
Util Mutant Software, PO Box 765, Bellaire, Tx 77401, USA.

TOP 10



FASTBACK

NOW in version 5.14, this is one of the best and fastest file back-up programs I have seen. No one disputes the need for regular backing up of files on a hard-disc machine, but with existing programs and even with tape-streaming hardware, backing up 10Mbyte or more of data can be a time-consuming chore. Fastback cuts the time taken to make backups by as much as 90 percent. It does so by using its own disc format and actually formatting the floppy disc as data is transferred. The improvement in speed over the MS-DOS Backup program is quite astonishing. Look on the high price as an insurance premium: Fastback encourages you to take more frequent backups, and hence improves the security of the valuable data on your files.

PRICE: £164

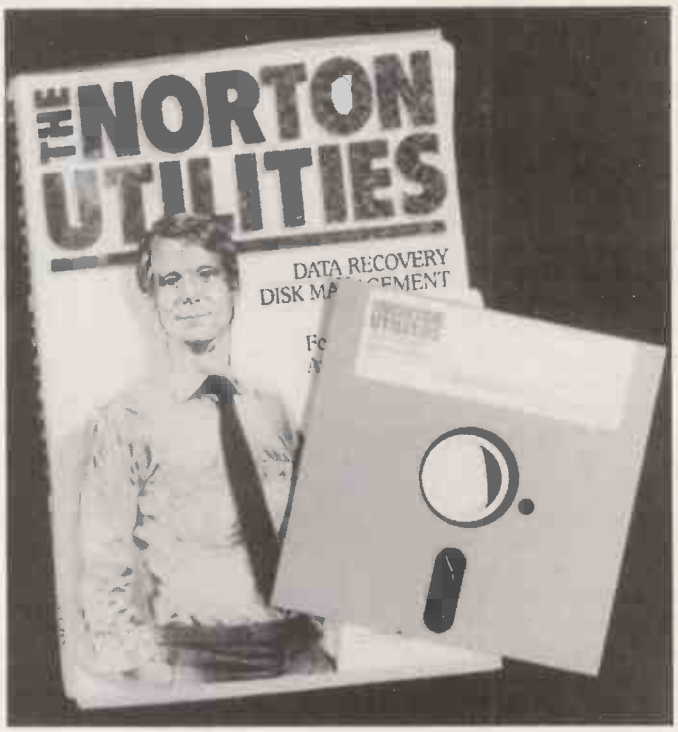
FOR: Big time saver.
AGAINST: Expensive.

METATEXT 2

THIS is a printer-enhancement utility that allows a straight choice between high-speed draft quality and slower high-quality printed output, even on printers that do not normally support NLQ printing. It consists of a resident program controlled by an external device called a puck. The puck is about the size of a packet of cigarettes and is connected by a thin cable to a plug that fits into your computer's printer port; your existing printer cable piggy-backs on to the Metatext plug. Once the program is loaded, you select print quality simply by turning the puck to display the word Quality on one side or Draft on the other. A gravity-sensitive switch detects the orientation of the puck, and Metatext does the rest. Most Epson-type printers are supported. Up to three different print styles can be selected for use — from 10 styles supplied — when the software is installed.

PRICE: £75

FOR: Easy to use and install.
AGAINST: Price.



NORTON UTILITIES

THE Norton Utilities have become established as the standard set of extras that all serious users of MS-DOS should have around. It covers simple functions like changing screen colours or listing system information as well as the more serious applications like recovering deleted files or testing your discs for potential errors. This group of programs is now essential equipment; the latest release is version 3.10. The utilities are all well written, well behaved and easy to use. Each one is a stand-alone program in its own right. Utilities are used either directly in the MS-DOS environment or from within batch files. The program that allows you to recover deleted files and directories can easily recoup the cost of the package the very first time that you need to use them.

PRICE: £62

FOR: Ease of use. Good value for money.
AGAINST: Not much.

MICROCACHE

DISC CACHEING works by keeping copies of the most frequently accessed parts of disc files in RAM buffers. This allows an application program to read from RAM on the second and subsequent data accesses, thus improving access speed. Microcache is one of the better implementations of this technique, although its price is a little high. It is extremely efficient, and produces noticeable speed improvements on most disc-intensive applications. An added bonus is the ability to set

extremely large cache buffers using up to 4Mbyte of additional memory. Microcache supports boards meeting the IBM XM, AST and LIM standards. It is most useful for heavy users of large database or accounting programs.

PRICE: £125

FOR: Good performance. Easy to use.
AGAINST: Price.

NUEPSON

A LITTLE gem of a program, this resident printer control utility is the best advertisement for the Shareware concept that I know. Nuepson is a true pop-up program that enables you to change the print mode of your Epson printer from within an application program. Once installed, the program waits for you to press the Alt and Caps Lock keys simultaneously. It then pops up on your screen as a little box prompting you to select compressed, double-strike, emphasised, italic, tiny or wide print. You can also elect to throw a full page up in the printer, move a single line up or select unidirectional printing. It does not seem to be possible to configure Nuepson for any other printers, but you can send your own sequence of Escape codes to the printer. It is absolutely essential if you do a large amount of printing, and I do not know a program that is easier to use.

PRICE: shareware

FOR: Ease of use. User supported.
AGAINST: Only supports Epson printers and compatibles.

ONE-KEY DOS

IF you have ever needed to format a disc or check a directory while you are in the middle of something else, then you will appreciate One-Key DOS. It is an excellent resident utility program that puts some of the DOS commands at your fingertips from within most applications programs. Once installed, One-Key DOS can be quickly activated to freeze the operation of the program you are currently using and allow you access to many of the usual DOS commands like Dir, Format and so on. You can even run small utility programs like Find and Sort. Typing Exit returns you to your program at exactly the point where you left it, leaving One-Key DOS still waiting in memory for the next time you require it. Its biggest drawback is that it is copy protected, making installation difficult and time consuming.

PRICE: £14.95

FOR: Easy and convenient to use. Good value.
AGAINST: Copy protected. Documentation not too good.

PALOMAR UTILITIES

THERE are two collections of DOS-enhancement utilities from Palomar, respectively called the Disk Utilities and the File Utilities. The Disk Utilities include programs for protecting files from accidential deletion, global file searching and disc indexing. There is also an excellent backup utility for the hard-disc user, and a host of other useful facilities. The File Utilities give you a high degree of control over your files, including the ability to encrypt, protect, hide, undelete, redate, change attributes or even completely annihilate any files. These are very comprehensive utility collections representing excellent value for money.

PRICE: £17.35 per set

FOR: Easy to use. Good value.
AGAINST: Nothing much.

POPDROP

IF YOU are an enthusiastic user of RAM-resident utility programs, or you intend to become one, Popdrop will help you to manage them conveniently. The program allows you to set up to eight layers of resident utility programs, loading in the programs as each layer is created. The advantage is that successive layers and their resident utilities can be discarded whenever you need to free memory for your current application program or data. Layers can be peeled back individually or in groups, as required. Memory organisation of this type is becoming increasingly necessary as more and more resident utility programs come on to the market.

PRICE: $20

FOR: Easy to use. Good value for money.
AGAINST: Only available in the US.

SIDEKICK

SIDEKICK was the first commercial pop-up utility to catch the imagination of MS-DOS computer users. It is a true pop-up program, in that it can be called to the screen at any time. Sidekick provides a calculator which can convert between hexadecimal, binary and decimal as well as offering all the normal calculator functions. The program's on-screen notepad will also function as a text-file editor, and there is a calendar with appointment-logging facilities. An autodial facility is available for use with a modem and serial port. Sidekick is extremely easy to use. Its comprehensive on-line help facility enables even novice users to make the maximum use of its capabilities.

PRICE: £69.95

FOR: Easy to use.
AGAINST: May conflict with other RAM-resident programs.

UTIL

LIKE Nuepson, this first-class utility is available from bulletin boards. Util is run from the MS-DOS prompt to provide enhancements to the standard DOS. Several features are available, the most useful being the ability to display a sorted directory listing. Once the listing is displayed, the sort criteria can be changed by a single keystroke; file names can be marked individually or collectively for deletion or copying. It is also possible to display text files on-screen and send selected sections to the printer. The program makes clever use of the Set environment in MS-DOS and can easily be configured to allow text files to be edited on your favourite word.processor. Util is a joy to use, though there is one minor bug when copying files: no error is given when the floppy disc is full, and subsequent files are not copied. Instructions are contained in a 70K document file.

PRICE: user-supported; $20 fee

FOR: Range of Features. Easy to use.
AGAINST: A few bugs.

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BOOK REVIEWS

CD-ROMs

CD-ROM 2: OPTICAL PUBLISHING

Edited by Suzanne Ropiequet with John Einberger and Bill Zoellick ● Published by Microsoft Press, £19.95 ● ISBN 1 55615 000 8

LIKE its predecessor, *The New Papyrus*, which was published by Microsoft last year, *CD-ROM 2: Optical Publishing* is based on the writings of several people. This time it is people involved in CD-ROM publishing. The book is a handbook for publishers, librarians, authors and anyone else who wants to know about publishing using optical discs.

CD-ROM 2 covers some of the same ground as its predecessor, especially where it outlines what a CD-ROM does, but because it is more recent it provides a useful update. The book is primarily devoted to ways of using CD-ROMs in publishing and gives information on preparing text, images and sound, producing the discs, data protection and updating. There are some case studies of how publications were put on to CD-ROM, together with a useful glossary of terms and a list of addresses.

The book is a detailed and worthwhile guide for anyone wanting to put data on to CD-ROM. It gets down to the nitty-gritty of how to match the organisation of your data to the methods that will be used to access it. However, since much of the book is given over to detail and it costs almost £20, it is expensive for anyone who just wants to use it as a casual reference book. *CH*

EMAIL

USING AN ELECTRONIC MAILBOX

By J A T Pritchard ● Published by the NCC and John Wiley, £14.50 ● ISBN 0 85012 601 1.

EMAIL costs being what they are, those about to start should find that this little book quickly pays for itself. In its 148 pages John Pritchard provides a comprehensive view of electronic mail for the business user, dipping into security aspects and the new Messaging Handling Service at the end. It contains a lot of practical advice, though it wastes some space by dealing with Easylink — now Mercurylink — and One to One as well as Telecom Gold.

Changes in Telecom Gold over the last year have made some parts of the text wrong. For example, you now type DS to gateway to the whole of Datasolve, rather than using WR for the World Reporter part. The major problem is that the short telex section is out of date — see Comms Link, February for the latest on Gold's new telex software. The author also uses

>MAIL SELF

for uploads after defining Self in his Mail.Ref file. Someone should tell him that

>MAIL ME

works perfectly well on its own.

It is a shame the book does not reflect today's powerful micros and easy-to-use software. I don't want to knock the Apple II — I used to have one on my desk five years ago — but to users of Atari ST and Fastcom, Apple Macintosh and Vicom, or Amstrad PC-1512 and Gemcomm it seems rather archaic.

But Mr Pritchard should not worry about minutiae. Perhaps surprisingly, his is the only book covering this field. Be grateful for it. *JS*

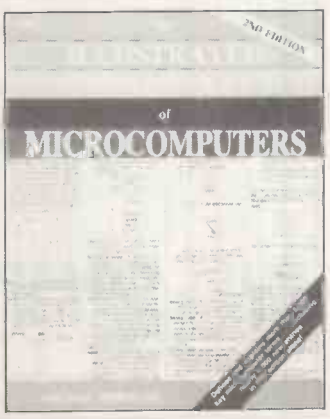
REFERENCE

THE ILLUSTRATED DICTIONARY OF MICROCOMPUTERS 2ND EDITION

By Michael Hordeski ● Published by Tab Books ● Distributed by John Wiley, £11.90 ● ISBN 0 8306 2688 3

THERE is clearly a need for a good dictionary of computer terms; ours is a jargon-laden field. But unfortunately many of the books on the market do not seem to be much good.

Michael Hordeski's *Illustrated Dictionary of Microcomputers* certainly looks promising from the outside. It is big — 352 pages long — and the blurb on the back claims it has 8,000 entries. But as soon as you start thumbing through it, disappointment sets in. Most of the illustrations that justify the title take the form of circuit diagrams.



This bias towards electronics is even more in evidence in the text itself. Terms like superheterodyne, weber, Wheatstone bridge and yig filter are there. But IBM, the IBM PC, Apple, Macintosh, dBase, Lotus and even mouse are lacking. This is an American book, so there is really not much point in looking for BABT, Prestel or Oftel, but if you do you will find that they too are missing.

Obviously this book is not much good for the business micro user or specifier. Worse, the impression I get is that most of the entries are basically filler items derived from fields far removed from computing. Why else are there eight different entries for variations on the word "servo", all totally irrelevant? Why do we get told about the Wullenweber, a type of directional aerial consisting of 960 reflecting wires in a 995-foot circle? How many micro users are likely to want to know?

A definite thumbs down is in order for Michael Hordeski's *Illustrated Dictionary of Microcomputers*, a book that does not have a single picture of a microcomputer. Still, if you have always wondered what a yig filter is, this is the book for you. *IS*

THE A-Z OF BUSINESS COMPUTING

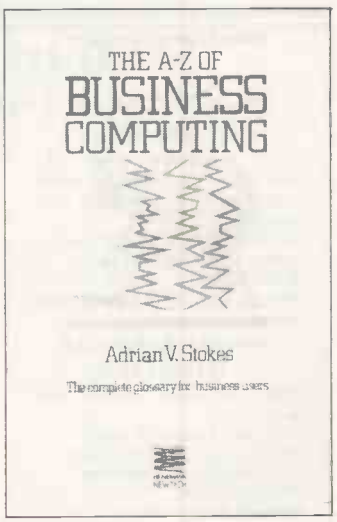
By Adrian V Stokes ● Published by Heinemann New-Tech, £12.95 ● ISBN 0 434 91875 X

THANKFULLY, Adrian Stokes' *A-Z of Business Computing* is very different to Hordeski's book. It is much shorter at only 185 pages, but Stokes' writing style is clear and his selection of subject matter and illustrations far better.

The A-Z of Business Computing has entries for all the headings I have castigated Hordeski's book for lacking, including the British ones. It also has plenty of other useful terms like NLQ, OEM, DIP switch and descender, all of which crop up frequently in the literature of microcomputers. Stokes uses illustrations properly, to help the explanation. You get to see an acoustic coupler and a mouse, for example, and the entry for ASCII has a table of the ASCII character set alongside.

However, even in Stokes' book there are some omissions. Laser printer does not make it in, even though other types of printer are defined. Page-description language or PDL is also lacking, and the entry for DDL does not mention the HP language.

In a few cases you could fault the definition. Though Stokes does acknowledge the common micro industry usage, database is still pedantically defined as a collection of data items. But generally the entries are excellent. I finally learned why bits per second and baud rate are not exactly synonymous — apparently it depends on the number of signal levels the comms line uses. The real benefit of the book is that it correctly gauges what ordinary micro users need to know, and then delivers simple, clear explanations. *IS*



PCs FOR BEGINNERS

COMPUTERS IN BUSINESS

By Larry Long ● Published by Prentice-Hall International, £16.95 ● ISBN 0 13 164518 8

AS you might expect from a book with such a general title as this, *Computers in Business* is aimed squarely at the tyro. Though it is designed primarily for American students this need not disqualify it completely for business users, although its heritage is sometimes obtrusive.

(continued on next page)

BOOK REVIEWS

(continued from previous page)

The structure certainly betrays its original audience. In addition to exercises and self-tests, there are chapters on job prospects in the information technology industry, as well as a lengthy introduction to Basic. Both these topics are unlikely to be of much interest to the average business user.

On the plus side, the whole approach is very strongly geared to the practical use of computers in business. To this end, there is a running case study which proceeds from general information about a fictional company, down to detailing most aspects of its computer needs. These sections may well prove enlightening for executives who are not entirely sure what micros can do for them.

Perhaps the best is a series of supplementary chapters which provides an introduction to the main generic packages: spreadsheets, word processors and the like. Again, for the sceptical professional, they provide a handy glimpse of what is possible and available.

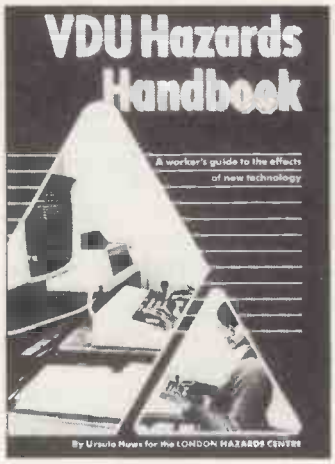
Another plus of the book's pedigree is that it is well written, managing to be simple without condescension; it is also very well illustrated, with colour diagrams throughout. Clearly, though, the book is limited in its applicability. Experienced PC users will find little of interest — apart from a picture of the very first bug, found by the Cobol pioneer Grace Hopper. It turns out to have been a moth. *GM*

HEALTH

VDU HAZARDS HANDBOOK

By Ursula Huws ● Published by the London Hazards Centre Trust, £4.95 ● ISBN 0 948974 02 8

AFTER the London Hazards Centre opened in 1984 it became apparent that a significant part of its work would involve dealing with requests for information about the health effects of working with new technology, particularly the hazards of VDU work. The



VDU Hazards Handbook is a response to this and covers implications for the employment, health and safety of VDU workers.

The book is sub-titled "A worker's guide to the effects of new technology". It is primarily concerned with keyboard operators doing a large amount of repetitive work and being subjected to scrutiny about their error rates, hours worked and so on. This is because these workers are at most risk. But it also takes into account anyone who may have to spend a long time staring at a monitor as they rush to meet deadlines.

The book has a left-wing flavour to it. The author champions the rights of women and black workers and strongly advocates trade unions as organisations people should go to for help and support with any problems. However, this does not dominate the book; it does not scaremonger but gives a lot of sensible advice. Huws looks at the social aspects of people's jobs because she is aware that you cannot divorce a job from the social climate the employee works in. For example, it may contribute to stress and make people less likely to ask for fair working conditions.

The book is easy to understand and contains a wealth of information on what the possible hazards are, and how to go about redesigning your job and physical working conditions to avoid them. It gives legal advice on workers' rights along with addressess of equipment suppliers and details on trade unions.

The *VDU Hazards Handbook* combines a lot of useful information in one place. It has a campaigning tone to it, which is no bad thing in an area where a lot of research still could be done. At only £4.95 it is certainly worth a read. *CH*

Reviewers this month: Carol Hammond, Glyn Moody, Jack Schofield and Ian Stobie.

System Science

Programming and system support software

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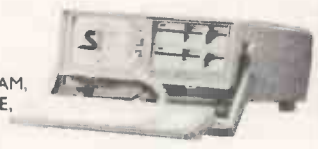

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KEYLITES

Jim Bates describes a utility that makes up for the lack of key-status indicator lights on the IBM PC and certain compatibles.

MUCH has been said of the capabilities of the IBM's PC series of machines and I have no wish to become involved in arguments for or against them. I am, however, acutely aware that one of their most annoying pecularities is the absence of any indication of the status of the lock keys. This has been rectified on later machines — as well as on most clones — by the addition of lights inside the particular keys on the keyboard. There are nevertheless many machines in use which still suffer from this problem and so this month I have provided a resident utility program which gives an indication on-screen of the status of these keys.

I have called this program Keylites. It simply displays the letters I, C, N and S on the right of the bottom line of the screen when the Ins, Caps Lock, Num Lock and Scroll Lock keys are active. You can change the position of the letters on the screen by altering the relevant equates in the assembler listing. The program checks the hardware on which it is running, and functions equally well with monochrome or colour monitors. To avoid conflict with those programs that display text information in exactly the same position as Keylites I have provided a key combination that turns off the program output.

You may recognise many similarities between Keylites and the Clock program listed in the May issue of *Practical Computing*. Once again it hooks into the interrupt 8 vector, and examines the condition of the Control Keys byte, both for producing program output and for toggling it on and off. Since Keylites is a resident utility, the installation section is similar to that of the Clock program. If you do not have access to an assembler you can use the data in listing 2 in conjunction with the Basic Loader program, also published in the May issue.

The status of the Control, Alt, Caps Lock, Num Lock, Insert, Scroll Lock, and right and left Shift keys is stored in one byte located near the bottom of the PC's memory at location 00:0417 hex. Within this one byte, the state of each of the eight keys is indicated by the setting of one bit. The mapping is as follows : bit 0 represents right Shift, bit 1 represents left Shift, bit 2 represents Control, bit 3 represents Alt, bit 4 represents Scroll Lock, bit 5 represents Num Lock, bit 6 represent Caps Lock and bit 7 represents Insert. The adjacent byte at 00:418hex carries the same mapping for the high four bits, but in this case the indication is simply whether the key is pressed or released.

Keylites functions simply by checking the setting of the individual bits in the Ctrl_Keys byte and displaying the results accordingly. I have split the equates section of the assembler listing into two parts. The first part allocates names to the locations in segment 0 of RAM that the program will need to access. Int8_Off and Int8_Seg are addresses where the relevant parts of the pointers to the current interrupt 8 routine are stored. Ctrl_Keys is the name given to the address of the keyboard status byte. The second part of the equates section names the screen locations where the displayed letters will appear. To keep the

LISTING 1. KEYLITES

```
COMMENT *
==================    KEYLITES    ============================


Program remains resident after loading
Intercepts INT 8H  Time of Day routine

Routine occurs 18.20445 times per second.

Toggle ON/OFF occurs when <Alt> and left shift key are pressed
together.   This puts 0A in 00:417H and causes toggle routine to
toggle the FLAG1 byte between 00 and FFH.

Installation uses INT11H to poll the equipment and decide
whether MONO or COLOR Screen is in use.

Once installed - program can only be removed by reboot.

If used with other resident utilities - load KEYLITES first

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May 1987  -  Jim Bates

*

;=========================
;       EQUATES
;=========================

; Page Zero Address Offsets

INT8_OFF   EQU  20H     ; Position of Interrupt 8 Offset
INT8_SEG   EQU  22H     ; Position of Interrupt 8 Segment
CTRL_KEYS  EQU  417H    ; Position of Control Keys Byte

; Screen Address Offsets

INS        EQU  0F98H   ; Position of 'I' display
CAPS       EQU  0F9AH   ; Position of 'C' display
NUM        EQU  0F9CH   ; Position of 'N' display
SCRL       EQU  0F9EH   ; Position of 'S' display

;============================================================

CODE    SEGMENT

MAIN    PROC  FAR

          ORG      100H          ; MUST BE 100H FOR .COM FILE

        ASSUME CS:CODE,DS:CODE,ES:NOTHING

BEGIN:
        JMP      START

;=========================
;      DATA AREA
;=========================

FLAG1:  DB       0              ; Flag1 indicates Key status
FLAG2:  DB       0              ; Flag2 indicates Program Status
STATUS: DB       0              ; Holds current CNS Status

;=========================

NEW_INT8:
     PUSH    BX                      ; Save registers
     PUSH    AX
     PUSH    CX
     PUSH    DX
     PUSH    DS
     PUSHF                           ; and Flags
     PUSH    CS
     SUB     AX,AX                   ; Quicker than XOR AX,AX
     MOV     DS,AX                   ; Access Page Zero of RAM
     MOV     AH,DS:[CTRL_KEYS]       ; Keyboard access
     PUSH    AX                      ; Save it
     AND     AH,0AH                  ; Is <Alt> <LShft> pressed?
     CMP     AH,0AH
     JNZ     INT8_2                  ; No - so goto the program
     POP     AX                      ; Clear the Stack
     POP     DS                      ; Now point to our Segment
     CMP     BYTE PTR [FLAG1],0FFH   ; Check FLAG1
     JZ      QUIT                    ; Keys active - so jump out
     MOV     BYTE PTR [FLAG1],0FFH   ; Set FLAG1 to active
     XOR     BYTE PTR [FLAG2],0FFH   ; Toggle FLAG2
     JMP     QUIT
INT8_2:
     POP     BX                      ; Restore Keyboard flags
     POP     DS                      ; Restore Data Segment
     MOV     BYTE PTR [FLAG1],0      ; Set FLAG1 - keys released
     CMP     BYTE PTR [FLAG2],0      ; Check Toggle
     JNZ     QUIT                    ; Jump if TOGGLE is 0FFH
     MOV     CH,BYTE PTR [STATUS]    ; Get the CNS keys status
     CMP     BH,CH                   ; Any change?
     JZ      QUIT                    ; No change so quit
RAM:                                 ; Mono Screen RAM
     MOV     AX,0B000H               ;  (See INSTALL)
     MOV     DS,AX                   ; Point DS to screen RAM
     TEST    BH,43H                  ; Caps Lock and Shift bits
     JZ      CAPS_OFF                ; Not Set
     MOV     BYTE PTR DS:[CAPS],43H  ; Display 'C'
     JMP     NUM_CHECK
CAPS_OFF:
     MOV     BYTE PTR DS:[CAPS],20H  ; Display ' '
NUM_CHECK:
     TEST    BH,20H                  ; Num Lock bit
     JZ      NUM_OFF                 ; Not set
     MOV     BYTE PTR DS:[NUM],4EH   ; Display 'N'
```

code simple, I have made no attempt to cater for 40-column or graphics screen displays.

Each character on a text screen occupies two bytes in memory. One represents the character itself while the other defines its attribute — that is, whether it is bright or dim, its colour and so on. The character bytes are the even-numbered ones, counting the top left-hand corner as bytes 0 and 1. For a standard 80-column, 25-line screen a total of 4,000 bytes is required. All these addresses are used as offsets into the screen RAM segment. The address of the screen RAM segment varies depending upon whether colour or monochrome output is in use.

The code section proper begins with a jump to the Install section. As usual with resident utilities, you have to be able to leave the required part of the program in an area of memory protected by DOS. The data area contains just three bytes. They are referred to by the program to indicate the state of the keyboard, the state of the displayed characters and whether the program is toggled on or off.

The Install routine first collects the old interrupt 8 address and checks whether Keylites is already installed. If it is, then the program aborts with an appropriate message. Otherwise this address is inserted into the code so that when Keylites is finished it will jump back whatever other routines may be hooked into interrupt 8.

The hardware is then checked to find out whether a monochrome or colour monitor is in use. If a monochrome monitor is being used, then no change is made. Otherwise the segment address of colour RAM is inserted into the program code at label RAM, making the instruction at RAM read

MOV AX,0B800H.

The final step is to put the start address of the New__Int8 routine into the correct memory area. This is done using the 25hex function call into interrupt 21hex.

The Install routine now displays the "Installation Complete" message and exits to DOS via the Terminate and Stay Resident interrupt, which invokes protection of the memory area up to the address placed in DX and returns to DOS. The program is now installed and functions every time interrupt 8 is called.

Interrupt 8 is called by the processor around 18 times per second, regardless of what else may be happening. This means that Keylites is constantly monitoring the state of the keyboard and, if toggled on, will display the relevant letters when required.

The new interrupt routine first saves the registers and then collects the contents of the Ctrl__Keys byte in low memory. This byte is checked to see if the Alt and left Shift keys are pressed. If they are, the Flag1 byte is checked to see if the keys have been released. When this key combination is first pressed, Flag1 will contain 00 and the program will promptly put 0FFhex into both Flag1 and Flag2 and then quit. Since this routine is called over 18 times per second, it is quite likely that the keys will not have been released by the time the program runs again. This time, Flag1 still contains 0FFhex, and so the program quits straightaway. Without this section of code, the toggle on/off process would occur 18 times per second as long as the keys are held down.

If the keys have been released, processing will jump to label Int8__2 where the contents of the Ctrl__Keys byte are recovered from the stack into BX, and the DS register is reset to address Keylite's own segment. Flag1 is reset to 00 to indicate that the toggle key combination has been released.

The program continues by checking the Flag2 byte, which will be either 00 or 0FFhex, depending upon whether the program is toggled on or off. Anything other than 00 in this byte will result in a jump to quit, thus disabling any further processing. If the program

(continued on next page)

```
     JMP     SCR_CHECK
NUM_OFF:
     MOV     BYTE PTR DS:[NUM],20H   ; Display ' '
SCR_CHECK:
     TEST    BH,10H                  ; Scroll Lock bit
     JZ      SCR_OFF                 ; Not Set
     MOV     BYTE PTR DS:[SCRL],53H  ; Display 'S'
     JMP     INS_CHECK
SCR_OFF:
     MOV     BYTE PTR DS:[SCRL],20H  ; Display ' '
INS_CHECK:
     TEST    BH,80H                  ; Insert bit
     JZ      INS_OFF                 ; Not Set
     MOV     BYTE PTR DS:[INS],49H   ; Display 'I'
     JMP     UPDATE                  ; Quit
INS_OFF:
     MOV     BYTE PTR DS:[INS],20H   ; Display ' '
UPDATE:

     PUSH    CS
     POP     DS
     MOV     BYTE PTR [STATUS],BH    ; Update STATUS
QUIT:
     POPF                            ; Restore Flags
     POP     DS                      ; and Registers
     POP     DX
     POP     CX
     POP     AX
     POP     BX
     DB      0EAH        ; This is a dummy JMP to old INT8
JSEG:
     DB      0,0         ; Segment collected from Vector Table
JOFF:
     DB      0,0         ; Offset collected from Vector Table

MAIN    ENDP

PROTECTOR  LABEL  BYTE
;================================================

INSTALL    PROC    FAR
; Installs the above code, adds the JSEG and JOFF words as
; copied from the Vector Table at Interrupt 8.  Checks which
; CRT Mode is active and alters RAM accordingly.  Finally
; leaves all code from Offset 100H to PROTECTOR
; resident and protected.

START:
     PUSH    DS                  ; Save register
     LEA     DX,MSG1             ; Sign-on message
     MOV     AH,9
     INT     21H                 ; Display it
     SUB     AX,AX
     MOV     DS,AX               ; Access Page Zero of RAM
     MOV     SI,DS:[INT8_OFF]    ; Interrupt 8 Offset
     MOV     DX,DS:[INT8_SEG]    ; Interrupt 8 Segment
     MOV     DS,DX               ; Start of current INT 8
     CMP     WORD PTR [SI],5053H ; Already installed?
     JNZ     NEXT1               ; No - continue
     POP     DS                  ; Yes - so Quit!
     LEA     DX,MSG3             ; "Abort" message
     MOV     AH,9
     INT     21H                 ; Display it
     MOV     AX,4C00H            ; Terminate Function Call
     INT     21H                 ; Return to DOS
NEXT1:
     MOV     DS,AX               ; Access Page Zero of RAM
     MOV     AX,DS:[INT8_OFF]    ; INT 8 Offset (Original)
     MOV     DX,DS:[INT8_SEG]    ; INT 8 Segment (Original)
     POP     DS                  ; Restore our Data Segment
     MOV     [JSEG],AX           ; Set up final Jump Segment
     MOV     [JOFF],DX           ; and Offset
     INT     11H                 ; Poll the hardware
     AND     AL,30H              ; Check Video Mode
     CMP     AL,30H              ; Is it Mono or Color?
     JZ      NEXT2               ; Mono - make no change
     MOV     BYTE PTR [RAM+2],0B8H ;Set to RAM to Color
NEXT2:
     LEA     DX,NEW_INT8         ; Point INT 8 to our Code
     MOV     AX,2508H            ; Function Call 25H
     INT     21H                 ; Change Interrupt
     LEA     DX,MSG2             ; "Installed OK" message
     MOV     AH,9
     INT     21H                 ; Display it
     LEA     DX,PROTECTOR        ; Set program length
     INT     27H                 ; Terminate and stay resident

;END of Program Code

;================================
;        Message Area
;================================

MSG1    DB      'BATES Associates - Copyright 1987',13,10
        DB      'KEYLITES Indicator ',13,10,'$'

MSG2    DB      'Installed  OK.',13,10,'$'

MSG3    DB      'INSTALLATION ABORTED',7,13,10
        DB      'KEYLITES already installed',13,10,'$'

;END OF CODE SEGMENT

INSTALL ENDP
CODE    ENDS
        END     BEGIN
```

(continued from previous page)

is toggled on, the next step is to compare the state of the bits in the Ctrl_Keys byte — which is now in BX — with the status byte in the program. The two will only be different if one of the lock keys has been pressed since the last time that the routine ran. If there is no change then the program exits.

If there has been a change, the program must find it and display the appropriate letter — or a blank if the key has been deactivated. It prepares for this by setting the segment address of screen RAM into the DS register. Remember that this address may have been modified by the Install routine.

The program will now check the settings of the bits in BH using the Test instruction. It is only necessary to check the high bits, but I have included a test of the two low bits so that the Caps Lock and either Shift key will cause the C to be displayed. The first test is for these three bits, and if any one of them is 1 the result of the Test instruction will not be zero. The result will be to insert character 43hex — capital C — into the Caps position on the screen. If the Test instruction does produce a zero, a space will be inserted into the Caps position. Checks for the Num, Scroll and Insert keys continue in a similar way, although only one bit is checked at a time.

LISTING 2. KEYLITES DATA

```
Line  1  233, 165,   0,   0,   0,   0,  83,  80,  81,  82,  724
Line  2   30, 156,  14,  43, 192, 142, 216, 138,  38,  23,  992
Line  3    4,  80, 128, 228,  10, 128, 252,  10, 117,  22,  979
Line  4   88,  31, 128,  62,   3,   1, 255, 116, 118, 196, 1000
Line  5    6,   3,   1, 255, 128,  54,   4,   1, 255, 235,  942
Line  6  106, 144,  91,  31, 198,   6,   3,   1,   0, 128,  708
Line  7   62,   4,   1,   0, 117,  91, 138,  46,   5,   1,  465
Line  8   58, 253, 116,  83, 184,   0, 176, 142, 216, 246, 1474
Line  9  199,  67, 116,   8, 198,   6, 154,  15,  67, 235, 1065
Line 10    6, 144, 198,   6, 154,  15,  32, 246, 199,  32, 1032
Line 11  116,   8, 198,   6, 156,  15,  78, 235,   6, 144,  962
Line 12  198,   6, 156,  15,  32, 246, 199,  16, 116,   8,  992
Line 13  198,   6, 158,  15,  83, 235,   6, 144, 198,   6, 1049
Line 14  158,  15,  32, 246, 199, 128, 116,   8, 198,   6, 1106
Line 15  152,  15,  73, 235,   6, 144, 198,   6, 152,  15,  996
Line 16   32,  14,  31, 136,  62,   5,   1, 157,  31,  90,  559
Line 17   89,  88,  91, 234,   0,   0,   0,   0,  30, 141,  673
Line 18   22,   8,   2, 180,   9, 205,  33,  43, 192, 142,  836
Line 19  216, 139,  54,  32,   0, 139,  22,  34,   0, 142,  778
Line 20  218, 129,  60,  63,  80, 117,  14,  31, 141,  22,  895
Line 21   82,   2, 180,   9, 205,  33, 184,   0,  76, 205,  976
Line 22   33, 142, 216, 161,  32,   0, 139,  22,  34,   0,  779
Line 23   31, 163, 164,   1, 137,  22, 166,   1, 205,  17,  907
Line 24   36,  48,  60,  48, 116,   5, 198,   6,  76,   1,  594
Line 25  184, 141,  22,   6,   1, 184,   8,  37, 205,  33,  821
Line 26  141,  22,  65,   2, 180,   9, 205,  33, 141,  22,  820
Line 27  168,   1, 205,  39,  66,  65,  84,  69,  83,  32,  812
Line 28   65, 115, 115, 111,  99, 105,  97, 116, 101, 115, 1039
Line 29   32,  45,  32,  67, 111, 112, 121, 114, 105, 103,  842
Line 30  104, 116,  32,  49,  57,  56,  55,  13,  10,  75,  567
Line 31   69,  89,  76,  73,  84,  69,  83,  32,  73, 110,  758
Line 32  100, 105,  99,  97, 116, 111, 114,  32,  13,  10,  797
Line 33   36,  73, 110, 115, 116,  97, 108, 108, 101, 100,  964
Line 34   32,  32,  79,  75,  46,  13,  10,  36,  73,  78,  474
Line 35   83,  84,  65,  76,  76,  65,  84,  73,  79,  78,  763
Line 36   32,  65,  66,  79,  82,  84,  69,  68,   7,  13,  565
Line 37   10,  75,  69,  89,  76,  73,  84,  69,  83,  32,  660
Line 38   97, 108, 114, 101,  97, 100, 121,  32, 105, 110,  985
Line 39  115, 116,  97, 108, 108, 101, 100,  13,  10,  36,  804
```

The final step, at label Update, is to place the current value of Ctrl_Keys into the programs's own status byte, thus providing a reference when the routine is next called. This prevents the program continually updating its display when in fact there has been no change. The registers and flags are restored before the routine returns control to the original interrupt 8 routine.

Keylites will only update your screen display when any of the specified keys are pressed. The display will be lost if another program changes the screen areas that Keylites uses. Thus if you are in DOS and type in Dir to display a directory on-screen, then the Keylites letters will scroll up the screen and will not be replaced. When this happens you can restore the correct display by tapping one of the non-locking control keys to update the display without changing the current settings.

The Keylites program may be toggled on or off by pressing Alt and left Shift simultaneously. Any status letters displayed when the program is toggled off will remain on the screen until some other program or function removes them. Some software may read the state of the lock keys in a reverse sense to conventional programs. Thus you might find, for example, that Keylites indicates that you are in Insert mode while the application you are running insists that you are not, and vice versa. If this does happen, it is comparatively easy to change the relevant JNZ_Off instruction to JNZ, but remember that other applications could then be back to front. PC

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24 PIN DOT MATRIX (360×180 Res)

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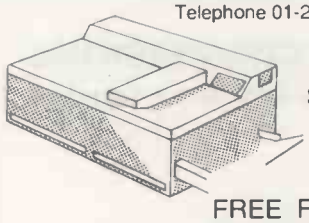

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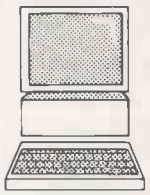

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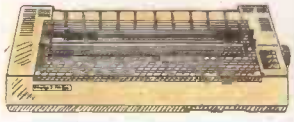

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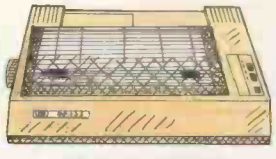

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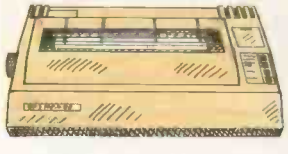

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