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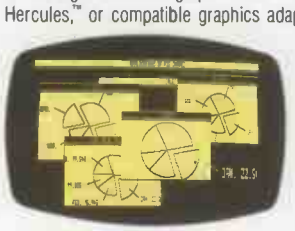

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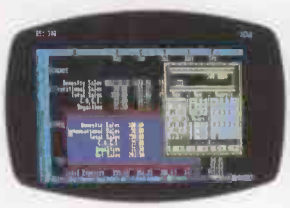

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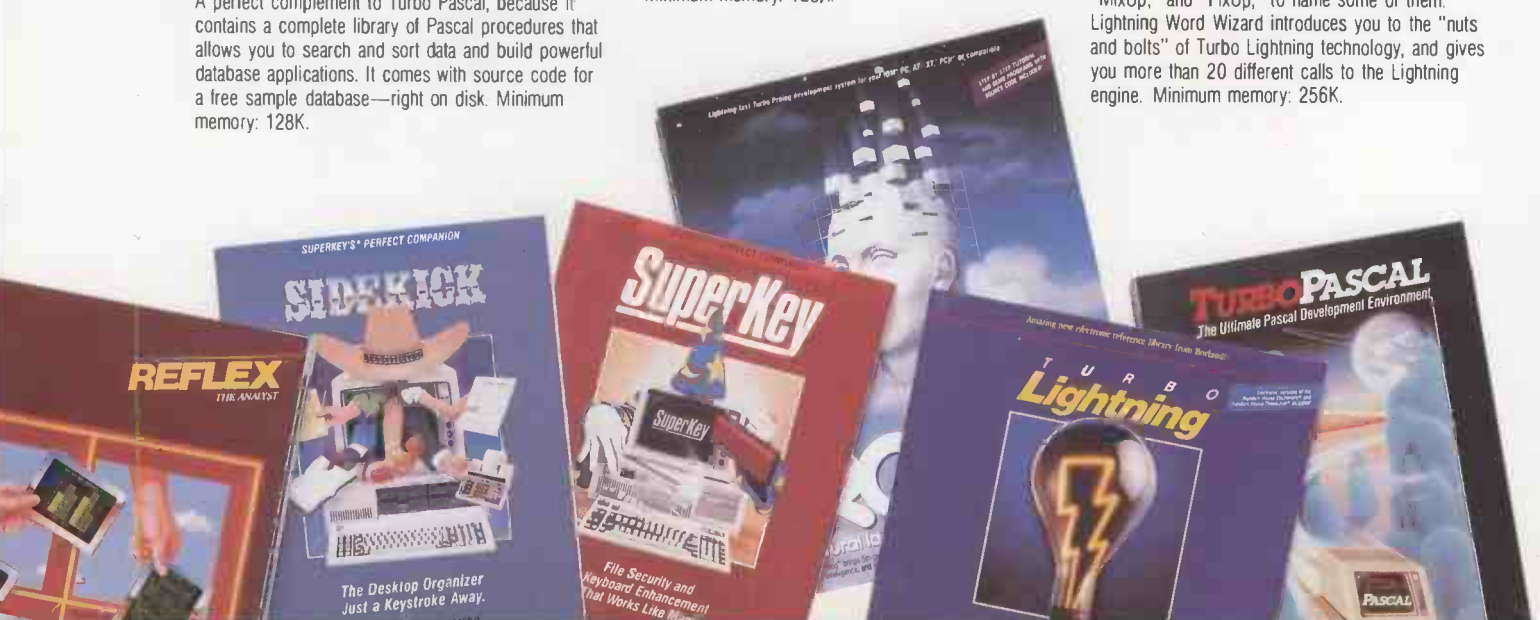

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Business micros are moving on from simply processing data to presenting it as well. In particular, advanced graphics allow you to create impressive presentation charts and slides. We look at the whole market, from the bottom end designed for the Amstrad PC up to the very top-quality presentation-graphics packages, while *Ian Stobie* investigates the options for producing the hard copy from IBM-based packages. Finally *Carol Hammond* rounds up the software that is available in this area for Macintosh users 84

VCN Concorde Impressive results from top-end systems.

Windows Draw Graphics manipulation on the cheap.

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CLONES OF CONTENTION

After a year ago of biding its time, Lotus has moved in on the publishers of two spreadsheets which offer high levels of compatibility with 1-2-3. Lotus's lawsuits, filed in Boston, claim that "Mosaic's The Twin and Paperback Software's VP Planner deliberately re-create, with only trivial variations, the look and feel of 1-2-3." *Practical Computing* reviewed both products back in February 1986 and found them to be functionally very similar in some respects, though both went beyond the Lotus product in areas like graphics and database features. They both cost less than £100.

This is an important test case, since it could go a long way to defining what exactly a software product consists of. It will also determine whether software clones will flourish in the same way as those in the hardware world have. Since the existence of the IBMulators has resulted in dramatic falls in the basic price of a PC, users might fervently wish software clones an equally bright future.

On the other hand, software houses obviously need some form of protection for their investments. For blanket copying to be permitted would be to return to the pre-copyright dark ages. Companies would be unwilling to commit themselves to large-scale projects, and the software industry would grind to a halt.

Determining just what sort of protection software companies should enjoy is no easy task. If and when the courts in the Lotus case arrive at a decision, it will be one based on laws which are frequently proving inadequate and inappropriate in the face of new concepts thrown up by computers.

There seems to be no argument about the sancrosanct nature of a program's code: copying bit for bit is clearly a breach of copyright. Stepping further back from the details there is the question of functionality. It is not possible to copyright general ideas, but there is a grey area where the idea itself becomes an implementation of the idea, which is subject to copyright protection. At the top level there is the user interface — the outward appearance of that implementation. It is with these last two levels, among other things, that the Lotus case is concerned.

As an article on page 80 of this issue suggests, the whole vexed question of user interfaces may become something of a non-issue in years to come. As more and more software houses adopt the mouse and windows approach on both the IBM and Macintosh — and to a lesser extent on the Atari and Amiga — most programs will look the same, superficially at least. Not only the general layout of pull-down menus but also the options which appear on them are likely to be similar. After all, how many different ways are there of saying Save?

From surface details, the emphasis in assessing a program will shift to its performance, just as PC clones are judged by their speed and facilities, not on their similarity or otherwise to the IBM PC in the design of their casings. The range of features and the speed of their implementation will become the yardsticks. For example, it is noticeable that although clones of leading packages by definition offer a similar range of functions, some of them are markedly slower.

The ultimate resort of software houses against cloners must remain the quality of their programming. Provided the product employs sufficiently innovative coding it is going to be hard for rivals — especially fledgling companies — to come up quickly with something equivalent using different code. Indeed, Lotus had a clear two years before the 1-2-3 clones started appearing. The superiority of the programming during this period was enough to protect it from incursions by other companies. The fact that they have started to appear now suggests it is time Lotus brought out the next-generation version of 1-2-3, which will achieve a similar leap-frogging of the opposition.

Comments from Jim Manzi, President and Chief Executive Officer of Lotus, on his company's legal action are of interest in this context. He noted that "in order for the software industry to prosper, innovation is key". He then added: "We are disappointed that so much time and talent in our industry has been spent in imitating rather than innovating." And so say all of us. But whatever the legal position, Lotus would find itself arguing from a stronger moral standpoint if it had a shining record of such innovation. Its performance in this regard is lacklustre at best; after its key product, 1-2-3, successors like Symphony and Jazz have not represented significant advances. Rather than spending money in lawsuits, surely it would be better for everyone if Lotus brought out that super-spreadsheet it has presumably been working on all these years?

5 YEARS AGO...

The Torch Communicator is a new British computer that combines both the Z-80 and 6502 microprocessors in the same machine. The twin-processor machine has 96K of user memory together with powerful communications and network facilities. The basic machine is capable of handling Telex, Prestel and teletext, connecting directly to a dial-up telephone line. A built-in modem services a direct 120cps telephone communicator.

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The Communicator is a joint manufacturing venture between two British companies: Acorn Computer, the manufacturer of the powerful Atom and the BBC Microcomputer, has collaborated with the Climar Group. Acorn provides the hardware expertise gained during development of the Atom, the BBC Micro and the successful Econet. Experience in business software is Climar's contribution.

The machine is entering a highly competitive part of the market and, as a Torch spokesman pointed out, the machine is only half the price of the IBM equivalent. The Torch Communicator retails at £2,500 and will be manufactured in the U.K.

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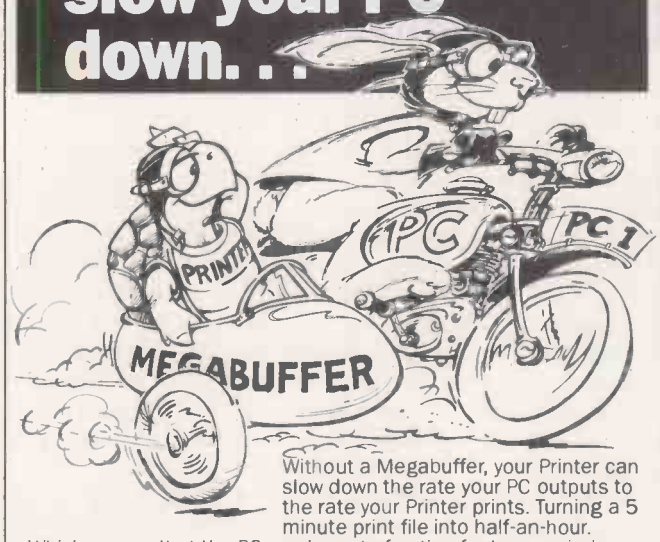
How to make sure your Printer doesn't slow your PC down. . .



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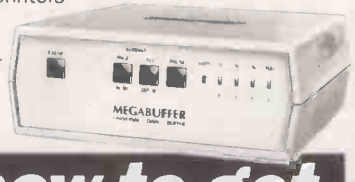

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NEXT MONTH

HARDWARE

We take a long, hard look at the cheap AT-alikes: are there bargains to be had or is it worth spending that little bit extra? Plus a review of what is probably the smallest fully functional computer around, and first details of some of Apple's exciting new machines.

SOFTWARE

The Amstrad PC has spawned a whole class of low-cost word-processing programs — some costing as little as £20. We look at the best of them. There is also a round-up of add-on products that work with dBase.

FEATURES

Mergers are all the rage these days, as are joint ventures in the computer world. We report on who's doing what with whom and why. We also find out what dealers are really like.

TOP 10 SURVEY

Spreadsheets helped start the micro revolution. We pick out the 10 best around today.

SPECIAL SECTION

LOCAL AREA NETWORKS

There seem to be a thousand and one ways of linking micros into a local area network. We get down to basics with an investigation of how it all works, what the standards are and which system is best suited for particular needs.

Don't miss the April issue of

PRACTICAL COMPUTING

On sale at W H Smith and all good newsagents after 18 March.

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

VP-Info — a difference of opinion

AS a fairly experienced dBase — and latterly VP-Info — applications programmer I must take exception to Mike Lewis's review of VP-Info in your January issue. I feel the review in many ways was seriously lacking in objective assessment and accuracy, and therefore quite misleading to the reader.

I can find no reference outside the review to any claim on behalf of VP-Info that dBase II command files can be run without change — indeed quite the contrary. The manual also rightly cautions against simple conversion, on the basis that it would be pointless not to utilise the considerable enhancements available within VP-Info. Perhaps the confusion arose over the fact that existing dBase II and II data files can be utilised without modification, and indeed can be created by VP-Info.

Mr Lewis appears to have misunderstood completely the windowing and screen-handling functions. There is only one active window of variable size enabled on a screen, but three background screens can be stored in RAM in addition to the current display screen. Thus complex screen displays can be created, and popped in and out to the current display as required. It is this capability that allows the incorporation of pop-up windows.

I do not understand the criticism of the compilation process which, once again, appears to be misunderstood. If a command file is run in its PRG form, a temporary compiled version is indeed produced for execution, with an associated unacceptable delay. However, it would seem illogical to persist with this process when a permanent compiled object file can be created at any time. The compiled file can, of course, be run without the presence of the original text source file, and loading and execution is extremely fast.

Date handling is certainly not limited. VP-Info's operations on date-format character fields and variables are more powerful and extensive than those of dBase III Plus, albeit requiring relatively more complex programming.

Procedures inherit the full environment of the command file that calls them. A single procedure such as a standard screen display forms part of a source file and can be called many times from within it. But it is compiled only once, as an integral part of the object file. Although it is not permitted to release or declare variables within a procedure all existing variables are inherited from the calling program and are returned following execution. Subroutines, as distinct from procedures, are written and stored in separate source files, but are compiled automatically within the calling file and executed as overlays. Once again the full environment is inherited and returned. Global declaration is only required should it be required to pass variables between primary command files.

I must also dispute Mr Lewis's criticism of VP-Info's "sluggish performance". I ran the benchmarks as outlined in the review and although confirming test 1, I found the results of tests 2 and 3 to be quite different. However, I do not believe the benchmarks as described have any real relevance to a database application programming situation. Far more serious is the contention that the data display screen is leisurely. I find this impossible to comprehend. My own applications generally call a procedure to write the basic screen followed by @ Says and @ Gets within the main command loop. When declaring and using say, 12 Get variables, the execution is virtually instantaneous. Equally, the Editing and Append commands in the interactive mode produce instant results.

VP-Info's great speed advantage over either dBase package becomes apparent within complex command files by virtue of it establishing pointers during compilation to achieve forward referencing during conditional If and Case structures. The speed improvement compared with similar dBase structures is dramatic.

It would be unfair to criticise the review on the basis of what was not reported but I think more attention should have been given to the enhancements and additional features of VP-Info, compared with dBase II or III, rather than concentrating on an inaccurate comparison of like facilities. Had I read and accepted Mr Lewis's review prior to my own acquisition of VP-Info, it is likely that I would still be searching for the improvement over dBase that I needed.

The one significant drawback to VP-Info is the run-time system which, although advertised, apparently cannot be supplied by the U.K. distributors.

S A LINDLEY,
Andover,
Hampshire.

MIKE LEWIS REPLIES: Like all

(continued on next page)

Our Feedback columns offer readers the opportunity of bringing their computing experience and problems to the attention of others, as well as to seek our advice or to make 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

AMSTRAD'S MISSING LINK

STEVE MALONE is understandably enthusiastic about the new Zorland C compiler in the December issue, and I am sure that many of your readers will be tempted to buy it, especially at such a reasonable price. Owners of the Amstrad PC-1512 should, however be warned that it is at present impossible to use with this machine.

Having just received my 1512 I can confirm that, as reported elsewhere, the version of MS-DOS supplied with it does not include the Link.Exe utility, although it does include Exe2bin.Exe. Unless Amstrad can be persuaded to reinstate Link, Zorland will presumably have to resign itself to missing out on the Amstrad market, or to paying Microsoft for permission to include Link with Zorland C.

R J WILLIAMS,
London NW3.

NEWS FROM PRACTICAL COMPUTING

From this issue the newstrade price of *Practical Computing* is £1.50. This is our first increase for 18 months, during which time great changes have been made to the magazine. The increase will enable us to continue to improve the magazine, making it even more attractive and relevant to your needs. The subscription rate will also be going up, from £16.50 to £19.50. However, as a special offer — for this month only — you can still subscribe at the old price and get two issues free. For details see the special subscription card facing page 114 of this issue.

Back issues of *Practical Computing* make an invaluable reference resource, and we are able to offer stout binders to help preserve them in an orderly fashion and in pristine condition. Each binder will hold about 12 recent issues and costs just £4.80 plus VAT, including postage and packing. To obtain binders, write to Computer Posting, 120-126 Lavender Avenue, Mitcham, Surrey CR4 3HP. Please quote PCOM.0288A01. Cheques should be made payable to Reed Business Publishing Ltd; telephone orders cannot be accepted.

So many people volunteered to participate in our reader panel that we have been unable to include everyone. Therefore we have selected a representative sample from the pool of respondents; if you have been chosen for the panel you will receive a postcard very soon to explain how over the next six months you will answer questions about the magazine.

We would like to thank everyone who responded to our invitation to take part. Even if you will not be participating in the survey itself we would be very happy to hear from you by letter addressed to Feedback if you have any particular comments to make.

(continued from previous page)

reviewers I welcome readers who point out genuine mistakes, but Mr Lindley's letter is so full of inaccuraces and misrepresentations that I wonder if he read the article he is complaining about. Of course VP-Info has more language features than Base II. But it will still run existing dBase II progams with only minor changes, an important point for anyone wishing to upgrade.

The programmer can indeed create three windows. What is a window, in this context, but an area of the screen that can be saved for later recall? Naturally only one of these is active at a time. This is true of all windowing environents.

Of course you can store a compiled program for later use. Nobody says otherwise. My complaint was about the language restrictions imposed by the compilation process. Similarly with procedures inheriting the environment of the calling programs. Nobody is arguing with this. But I do think it a pity that the language does not support local variables or parameter passing.

I checked the benchmarks again after reading Mr Lindley's letter. They are correct. This does not mean that identical results would be obtained in other environments. Like all benchmarks, they are intended for comparison only. As for the slowness of the screen display, I can only believe the evidence of my eyes and my stopwatch.

Finally, what on earth are we to make of Mr Lindley's assertion that if he had accepted my review he would not have bought VP-Info? This was one of the most glowing reviews I have written for months. I concluded that VP-Info is a "remarkably powerful database, crammed with features, and competitively priced."

Zorland C

STEVE MALONE'S review of the Zorland C compiler in your December issue left me with a peculiar impression, not least that he is no great fan of the C programming language. OK, C has lots of pitfalls for the beginner but they should not have clouded the impression of the specific product. It is just as easy to write code that will not run using the Microsoft or Lattice compilers.

Most reviews you publish make some sort of comparison with similar products, and I think that if this product could have been compared to the market leaders in terms of compilation speed, code size, and code execution speed; availability and standardisation of library functions; compatibility with the proposed ANSI standard for C; availability of the extended memory models; clarity of error messages and lack of knock-on errors; and of course price. It would then have had to be a rave review.

I have been using Zorland C for all my development work since the day I received my copy, having previously used a much more expensive version which had better remain nameless. Hopefully the Zorland package can do for C what Turbo Pascal did for Pascal.

STEVE TEALE,
Microcosm Computing,
Harrogate,
North Yorkshire.

STEVE MALONE REPLIES: As Zorland C is aimed at novice programmers I tried to approach it from that angle. From a novice's standpoint the installation and the documentation were the biggest beefs. A program, no matter how cheap, is no good unless you can use it. Despite this — and the fact that the editor could do with improvement — I have also been using Zorland C since I got it, and would recommend it to anyone.

Unreliable statistics

WITH reference to your article on the binomial test in the Business Statistics series, published in the December 1986 issue, I must point out that it is useless to let loose on uninitiated users packaged statistical programs that purport to solve real business problems.

Whenever statistical techniques are employed, a trained statistician should be available for consultation. Why? Because at the end of the day a decision must be made on the basis of the results obtained. The outcome of the decision may be of very great importance, involving perhaps a great deal of money.

In statistics there are two errors a decision maker can make. One is accepting the null hypothesis — for example, that there is no difference between two products — when it is false. The other is rejecting the null hypothesis when in fact it is true. It is quite common to set the probability of the latter at five percent; it is also, sadly, quite common to ignore the former type of error completely, and to be unaware of the probability of making this type of error.

With a sample size of 103, as in your article's Blue or Black example, the probability of making the former type of error is very large. In other words you need a much larger sample to reduce this error to the same probability that you assign to the latter type of error.

JOHN AUSTIN,
Staines,
Middlesex.

Multiple sclerosis research

I AM in need of a word processor and I wonder if any of your readers can help. Action for Research into Multiple Sclerosis (ARMS) is a self-help charity set up by people with multiple sclerosis, their families and friends. It has a research unit at the Central Middlesex Hospital which works with people who have MS on ways of ameliorating the effects of the disease.

Multiple sclerosis is a disease of the nervous system which is highly unpredictable. Some people ultimately lose the use of some parts of their body while others can function fairly normally into old age. Much can be done to prevent or slow down some consequences of the MS, particularly those which are more to do with reactions to the MS than with the MS itself. Part of our research consists in exploring the limits of this.

ARMS came into being partly as a response to the need for information to be made available in a form which could be read and used by people with MS. I am the Counsellor at the research unit and my focus of interest is the emotional and social reactions which can be of vital importance for the course and effects of MS.

Papers I have written — for example, Pregnancy and MS, and Emotional Reactions to MS — have been greeted with great enthusiasm, as they are rooted in what people actually say and how they worry about their MS. This kind of information helps to combat the sense of isolation MS can bring, as well as to provide practical help.

I am writing to you because I need a word processor to continue this work. The number of people referring themselves to us has risen enormously, and professionals such as nurses, occupational therapists, social workers, etc. are asking for courses to be run. Our funds are not able to keep pace. I wondered if any of your readers have an Amstrad PCW-8256 which they would be able to donate to ARMS. We are also in need of an IBM-compatible PC to help in dealing with research data generated by the other members of the team, and of someone to put data on to the very unreliable computer we have at present. No money is available for either.

If anyone can help, could they write to me at ARMS or ring 01-961 4911? We would be very grateful indeed.

JULIA SEGAL,
ARMS Research Unit,
Central Middlesex Hospital,
Acton Lane,
London NW10 7NS.

Master 512

YOUR article in the January issue about the Acorn Master 512 contains a number of factual inaccuracies. Firstly, the price was reduced to £199 plus VAT on 4 November 1986.

With reference to the packages that will not run — for example, Lotus 1-2-3, this is not due to the screen emulation. The Master 512 emulates the IBM screen memory, and any direct calls made to it are redirected down the Tube to the I/O processor. In fact version 1 of Lotus 1-2-3 does work properly. The problem is concerned with disc protection. As the Master 512 does not support the IBM disc-controller chip, programs which employ this type of disc protection will not work.

DAVID TEE,
Acorn Computers,
Cambridge.

REED BUSINESS PUBLISHING

On 1 February the publisher of *Practical Computing* changed its name from Business Press International Ltd to Reed Business Publishing Ltd. As well as this magazine Reed Business Publishing produces a wide range of professional titles including *Computer Weekly* and *Systems International* in the computer field, *Electronics Weekly* and many other market leaders among its 80 magazines and newspapers.

Our new thoroughbred has lots of room for growth.

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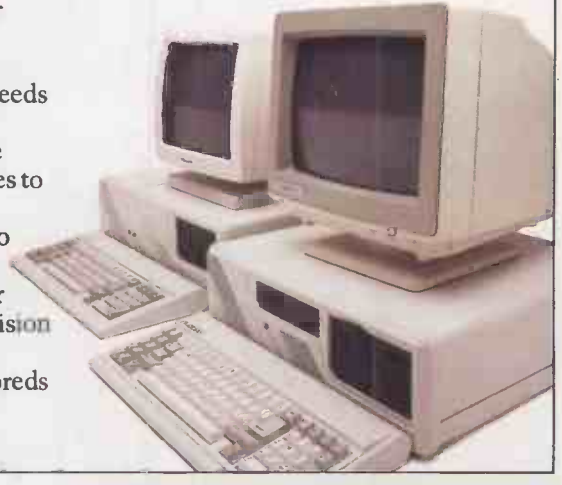

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And of course, it comes with a powerful 8K buffer as standard to free your computer for other tasks even more quickly.

Furthermore, the SQ2500 is exceptionally reliable — even for an Epson. In fact, each of the 24 nozzles on the print head will shoot 2,000 million dots before it needs replacing.

It is also extremely flexible. It can produce graphics as well as text, has an IBM character set and a range of paper feed options available in case you have a large volume of printing to do.

The price of the near-silent SQ2500 is £1345.00 (RRP exc. VAT). This may be more than an ordinary printer costs — but then, silence is golden.

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Extra capacity for the Sprite

JAROGATE is making available an extra high-capacity 5.25in. hard disc for its Sprite 386 series. The new disc provides maximum storage capacity of 780Mbyte with a claimed average access time of 18 milliseconds.

The Sprite 386 Model 780 is intended to be the basis for a multi-user system. Up to 32 users can share the system, or a number of users can be networked to the machine when it is being used as a file server. The basic system is configured to support up to eight users.

To take maximum advantage of the machine's capacity and access speed Jarogate has fitted the disc controller with 1Mbyte of on-board cache memory. It will run both the Concurrent DOS XM and Xenix operating systems.

The Sprite 386 Model 780 comes complete with built-in tape streamer and 2Mbyte of RAM. It is priced at £23,995. For further information contact Jarogate, Unit 2, HQ3, Hook Rise South, Surbiton, Surrey KT6 7LD. Telephone: 01-391 4433.

World's smallest gigabyte drive?

HITACHI has announced what it claims to be the world's smallest 1Gbyte drive. The DK-815-10 measures a mere 259mm. by 216mm. by 550mm. The company claims the drive has an access time of 15ms. and a data-transfer rate of 2.5Mbyte/s.

Internally the DK-815-10 has 1,737 cylinders, nine discs and 15 data heads. The drive is available to OEMs at about $13,500 either direct from Hitachi or from its U.K. distributor, Legend Data Products.

Further information is available from Hitachi Europe, Trafalgar House, 2 Chalkhill Road, London W6 8DW. Telephone: 01-748 2001. Legend Data Products is at Littleton House, Littleton Road, Ashford, Middlesex TW15 1UU. Telephone: (0784) 242924.

ATARI EMBRACES IBM STANDARD

THE Atari Corporation has announced that it is to begin shipping an IBM-compatible micro in the U.S. this spring. The formal U.K. announcement of the Atari PC will be made at the Atari User Show on the 23 April. Atari is also launching a low-cost laser printer.

The Atari PC compatible is expected to be pitched directly at the Amstrad PC-1512 and will be competitively priced. In America the machine is expected to sell for $700. Its specification bears a strong resemblance to that of the Amstrad machine. It will have a 5.25in. floppy-disc drive, 512K of RAM and a Microsoft mouse. The processor is an 8088 switched between 4.77MHz and 8MHz.

Where Atari believes its computer will score over the PC-1512 is in the graphics: the Atari PC will be compatible with the whole range of IBM graphics cards, including the EGA which the Amstrad machine does not support. EGA-compatible circuitry and a monochrome monitor are included in the price.

Few details on the Atari laser printer have so far emerged. Intended as part of Atari's rumoured sub-$3,000 desk-top publishing system, it is expected to sell for about $1,500 in the U.S. It will interface with an ST via the computer's Direct Memory Access (DMA) port.

Atari has also announced plans for its 68000-based range of micros. The company says that the so-called Mega STs will become available in the U.K. after the Atari User Show. They are basically 1Mbyte, 2Mbyte and 4Mbyte versions of the standard ST with an open architecture and a three-box format. The company says that it will also be unveiling its 32-bit Unix work station at the Hanover Fair on 4 March.

In the meantime, Atari has published a set of price reductions for low-end versions of the ST along with a new model. The latter is the 520ST-FM, with 512K RAM, a mouse, Basic and 500K disc drive; it is priced at £400 including VAT.

The 1040ST-F mono system comes down to £700 including VAT from £919, and the colour model now costs £900, dropping from the previous price of £1,149.

Further details are available from Atari Corporation (U.K.), Atari House, Railway Terrace, Slough, Berkshire SL2 5BZ. Telephone: (0753) 33344.

New lap portable on starting grid

GRID COMPUTER SYSTEMS has introduced a new battery-powered portable computer, the Gridlite. It is claimed to be fully IBM compatible, and has a maximum RAM capacity of 1.64Mbyte. The basic model, costing £1,480 and weighing just over 8.5lb. is equipped with 128K of RAM.

The Gridlite features a new 10in. LCD screen which Grid claims has an aspect ratio comparable to CRT screens. It is fitted with a 3.5in. floppy-disc drive for mass storage. There are also facilities for an optional 300/1,200 baud modem.

The second model in the range is a 640K version priced at £1,995. Both models can take advantage of the LIM/EMS memory specification which takes maximum memory to 1.64Mbyte. An additional 0.5Mbyte will cost £255, and a full 1Mbyte extra RAM costs £340. Further memory can be added via plug-in ROM cartridges.

Up to 1Mbyte of application and utility software can be installed inside the machine on EPROM. A variety of software, both proprietary and non-proprietary, is already available. Among the programs available in ROM are Grid's own Gridplan, Management Tools and Integrid multitasking software. Third-party software includes dBase II, WordStar and Multiplan.

For further information contact Grid Computer Systems Ltd, Unit House, 33 London Road, Reigate, Surrey RH2 9HZ. Telephone: (07372) 41211.

Half-card modem from Dacom

UNITY GOLD is claimed to be the first half-card plug-in modem for IBM machines to go on sale in the U.K. Manufactured by Dacom Systems, the modem supports V-21, V-22 and V-23 protocols. It costs £399.

Unity Gold is said to be Hayes compatible and features autodial and auto-answer. It comes with software capable of accessing the full range of dial-up services, including Prestel and Telecom Gold.

For further details contact Dacom Systems, 26-27 Heathfield, Stacey Bushes, Milton Keynes MK12 6HR. Telephone: (0908) 322322.

Decmate with 20Mbyte disc

DEC has launched a new version of its popular Decmate dedicated word processor. The new model, known as the Decmate III Plus, now has a 20Mbyte hard-disc storage capacity.

The Decmate III also includes an RXX-33 floppy-disc drive, a monitor and a keyboard. Bundled with the hardware is Master Menu version 1.2 and Decmate/WPS version 2.2 word-processing software.

Priced at £3,900, the Decmate III is data compatible with the earlier Decmate II and III models. The work station is also able to communicate with the Vax All-In-One office-automation system.

Details from DEC, Digital Park, PO Box 110, Reading, Berkshire RG2 0TR. Telephone: (0734) 868711.

UPGRADED ZENITH DESK-TOP PC

THE Z-159 is the latest budget-priced desk-top computer from Zenith. The XT-compatible machine replaces the earlier Z-158, and is expected to be launched at the Which Computer? Show.

There are four models in the range, each with a dual clock speed of 4.77MHz or 8MHz. The model 1 is fitted with 256K RAM and one 5.25in. floppy-disc drive; the model 2 has two drives. The machines are being built outside the company, and at the time of writing Zenith was unable to supply prices. No firm launch date has been set yet, although Zenith expects it to be in the immediate future.

The other two machines in the range are the models 11 and 12. The model 11 is equipped with 768K RAM, two floppy-disc drives and support for the Lotus/Intel/Microsoft Expanded Memory Specification (LIM EMS). The model 11 is priced at £1,998. The model 12 also has 768K RAM and support for LIM EMS and is bundled with Microsoft Windows.

Mass storage is provided by one 5.25in. floppy-disc drive and a 20Mbyte hard disc. Zenith says that the model 12 will cost £2,359.

Further details are available from Zenith Data Systems, St. Johns Court, Eaton Street, High Wycombe, Buckinghamshire HP11 1JX. Telephone : (0494) 459266.

HARDWARE SHORTS

- Ambar Systems has announced two new half-height drives. The HH-1080 provides 89Mbyte of storage space and is fitted with an SCSI interface, while the HH-2085 is equipped with an ESDI interface. Details on (0296) 435511.
- Ex-Streamer is a cassette streamer aimed at Amstrad PC users. Based around the Teac cassette streamer, the device provides 22Mbyte of backing storage and costs £499. More information on (0782) 813631.
- A new Sharp transportable has been launched. Costing £1,995, the PC-7100 features a super-twist LCD screen and 320K of RAM. Further information on 061-205 2333.
- Compaq has upgraded its Deskpro 286 range by fitting new models with a 40Mbyte hard disc, although the price remains the same at £4,026. More details on 01-940 8860.
- Ferranti has reduced the prices of its AT range. The 20Mbyte version now costs £2,145 and the 40Mbyte model is priced at £3,145. Contact 061-499 3355.
- GDS Speedster is the name of two PC accelerator products from Central Computers. Superswitch is a 6MHz to 8MHz processor improver costing £99, while Turbopower increases the clock speed to 12.5MHz and costs £185. Details 01-943 3922. PC

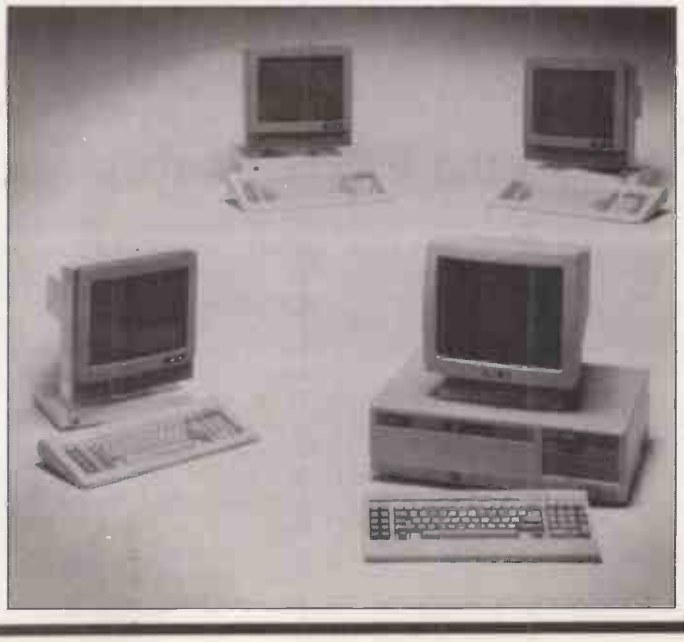
Victor offers Xenix on multi-user system

VICTOR TECHNOLOGIES has introduced a multi-user system to be known as the Multi-Micro, and is teaming up with Xenix specialists Sphinx Ltd to offer a complete turnkey system of hardware and software.

The core of the system is Victor's V-286 AT-compatible microcomputer. It can be connected to up to four PC stations, which together with the V-286 station provide for a total of five users on a single system. The PC stations are able to share the central processor unit and emulate ASCII or Televideo 925/905 terminals.

The base configuration for the processor unit is 1Mbyte of storage, expandable to 10Mbyte. Mass storage for the system is a 1.2Mbyte floppy-disc drive and 20Mbyte hard disc, rising through four configurations to an 80Mbyte hard-disc drive. The RS-232 connection between the V-286 and the PC work stations is based on a plug-in card which will fit inside a 16-bit expansion slot.

Prices for a basic two-user system, including Xenix and 12 months' on-site warranty, start at £3,999. Further terminals can be added at a cost of £500 each. Contact Victor Technologies, Unit 1, Valley Centre, High Wycombe, Buckinghamshire HP13 6EQ. Telephone: (0494) 450661.



Integrid

GRID COMPUTER SYSTEMS has released its integrated multi-tasking applications environment Integrid for MS-DOS lap-portable machines. Developed for Grid's own portable machines, Integrid can be used with a development language called Gridtask to create customised programs.

Integrid is available on 3.5in. floppies at £95, and on an EPROM for £130. More information from Grid Computer Systems, Unit House, 33 London Road, Reigate, Surrey RH2 9HZ. Telephone: (07372) 41211.

PCW-8256 software

EASYPIP is designed to allow easy transfer of files between discs and memory on the Amstrad PCW-8256. It costs £19.95 including VAT. Smartcard is a menu-based card-index system. It costs £59.95 including VAT. For more information on these products contact Focus Computer Systems, 10 Kellaway Avenue, Henleaze, Bristol BS6 7XR. Telephone: (0272) 420109.

Taxation database

FINGER TIP INFORMATION is a menu-driven database which answers a wide range of questions on tax. Areas covered include income tax, corporation tax, capital gains tax, inheritance tax and VAT. It runs on the IBM PC and compatibles; the single-user price is £80 per annum. More from Avante Information Services, 9 Bridge Street, Pinner, Middlesex HA5 3HR. Telephone: 01-868 1144.

LOTUS METRO

LOTUS has announced a memory-resident desk utility program called Metro. It replaces Spotlight, which conspicuously failed to set the world on fire in the face of Borland's Sidekick and similar products. The applications available include a text editor, DOS file manager, clipboard, list manager, calculator, timer, phone book and dialler, and macros. It is not copy protected.

Metro runs on PC and AT machines and compatibles; it requires a minimum of 80K RAM. Metro costs £69. More information from Lotus Development (U.K.) Ltd, Consort House, Victoria Street, Windsor, Berkshire SL4 1EX. Telephone: (0753) 840281.

Borland adds C to the Turbo range

BORLAND has announced an addition to its range of low-cost language packages: Turbo C. The new development system compiles code at 7,000 lines per minute. There is a choice of either a conventional line interface or the standard Borland pull-down menu and window environment.

Unlike its rival, Zorland C, Turbo C has a built-in linker which Borland claims generates the fastest, smallest object code around. Turbo C implements the forthcoming ANSI standard, and supports Kernighan and Ritchie C in full. Special extensions for the PC environment include six memory levels — called tiny, small, compact, medium, large and huge — plus extensions for mixed-language, mixed-model programming.

Turbo C will cost £69.95 when it is launched at the end of March. Borland has also announced a Turbo Prolog Toolbox for the same price, also to appear later this year.

For more details contact Borland International, 1 Great Cumberland Place, London W1H 7AL. Telephone: 01-258 3797.

Extra S&S utilities

THE latest from S&S Enterprises is Print Q, which creates a print queue. Files are printed in the background as you work. Calc is a mini calculator. Both cost £10. More from S&S Enterprises, 31 Holloway Lane, Chesham Bois, Amersham, Buckinghamshire HP6 6DJ. Telephone: (02403) 4201.

Safetynet is a file-recovery system designed to shield users from the harsh realities of DOS. It is memory resident and can be invoked at any time. It displays files which have been erased, and allows you to recover them. The cost is £49.95. More information from Ibex International, 39 Old Bisley Road, Camberley, Surrey GU16 5RE. Telephone: (0276) 65961.

Disktidy is a hard-disc manager. It allows you to partition hard discs and have up to 16 partitions on-line at the same time. It costs £99.95 from Micromods, 8 Regent Street, Long Eaton, Nottingham NG10 1JX. Telephone: (0602) 724264.

SOFTWARE SHORTS

- Popdrop, reviewed in last month's issue, is now available in the U.K. from Ctrl-Alt-Deli. The price is £19.95. More on (0908) 662759.
- The DTP Program Aldus Pagemaker is available on the Research Machines Nimbus. A complete four work-station system with laser printer costs £12,000. Ring (0865) 240373.
- A mouse-driven real-time image-processing package for the IBM PC/AT is available from Data Translation. The cost is £1,628. Details from (0734) 776670.
- Sentinel Software has released updates to Mathplan and Word Perfect. Mathplan 3.0 costs £375 and Word Perfect 4.2 £435. More information on (0932) 231164.
- Jetset is a laser utility for users of Lotus 1-2-3. It costs £66 and is available from 4-5-6 World on (0473) 225951.
- Olivetti has implemented MS-Windows for its Enhanced Graphics Controller. Details on 01-785 6666.
- Southdata has launched a version of its Superfile database for the Amstrad PC and other clones. The cost is £200. More on 01-727 7564.
- Wordcraft has launched version 3 of its word processor. New features include multi-column working. It costs £475. Details on (0206) 561608.

Amstrad PC roundup

A SELECTION from the large PC-SIG library of PC software particularly suitable for the Amstrad PC is being made available by ISD. For £40 you get a computer tutor, PC Write, PC Calc, Deskmate, PC File III and utilities.

PC-SIG is the largest supplier of public-domain software with over 600 discs of 5,000 programs. ISD is the sole authorised distributor of PC-SIG in the U.K. It charges £10 for each disc. For more details contact ISD, PO Box 872, Sutton Coldfield, West Midland B75 6UP. Telephone: 021-378 2229.

K-Spread 2 is a Gem-based spreadsheet. It offers 8,126 rows by 256 columns, and all the usual spreadsheet functions. It costs £79.95 including VAT. More from Kuma Computers, 12 Horseshoe Park, Pangbourne, Berkshire RG8 7JW. Telephone: (07357) 4335.

The Cobol, Pascal, Fortran, Basic and Pilot programming languages are available from In Touch for £49.95 each. More details from In Touch, Fairfield House, Brynhyfryd, Caerphilly, Mid-Glamorgan CF8 2QQ. Telephone: (0222) 882334.

Foxbase + database

FOXBASE+ is a dBase III Plus compatible interpreter and compiler. As well as offering full compatibility with Ashton-Tate's latest release it is claimed to be significantly faster as well.

It is available for MS-DOS, Unix and Xenix systems. Single-user Foxbase+ costs £395, and the multi-user version costs £995. More from In Touch, Fairfield House, Brynhyfryd, Caerphilly, Mid-Glamorgan CF8 2QQ. Telephone: (0222) 882334.

Also available from In-Touch is T-Debug/Plus, a run-time debugging tool for users of Turbo Pascal. It costs £59.95.

Head over wheels.

Finally, a dot matrix head that can put your daisy wheel out to grass.

You're looking at the new 24-pin matrix technology developed by NEC for its latest Pinwriter.

A sample of the letter quality of the PINWRITER P7 printing at 72 CPS.

Firing on all pins, it can deliver a resolution of some 13,000 dots to the square inch. So you'd need a precision microscope to see any dots at all.

It also works too fast to see with the naked eye. In draft mode, it'll print out all the letters of the alphabet eight times in under a second.

So when your reports run into pages, they won't be done at walking pace.

Even better, our new Pinwriter is also quieter than a daisywheel.

There's a choice of carriage widths: 80 column on our P6 model, 136 column on the P7.

And they both come with 20 resident typestyles, double-width and double height characters, subscript and superscript features and many more.

The new 24-pin Pinwriters.

Now the office can take a pride in its work. Without taking all day over it.

NEC Business Systems (Europe) Ltd., 35 Oval Road, London NW1 7EA. Tel: 01-267 7000.

NEC

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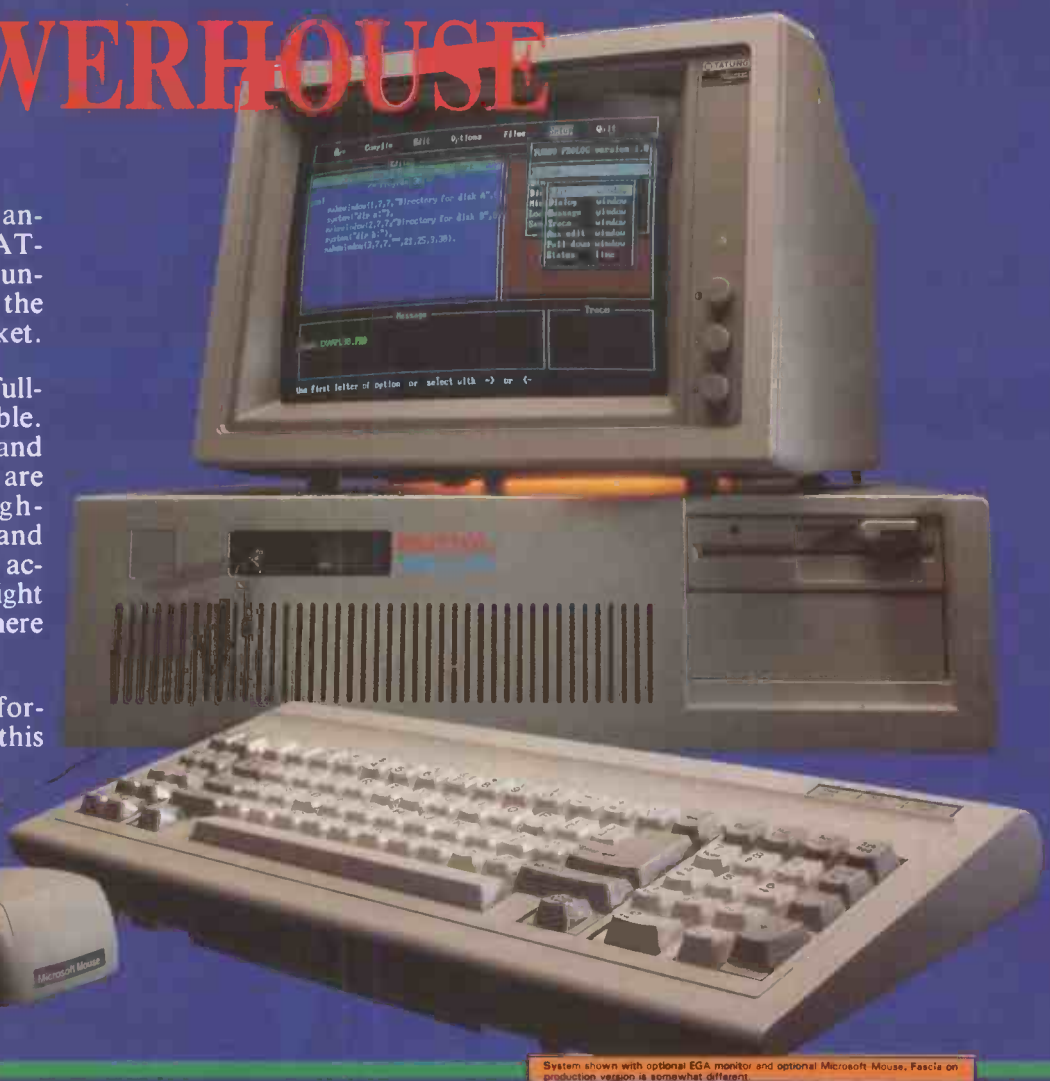
The POWERHOUSE

Bristol Micro is proud to announce its long-awaited AT-compatible, the Micro 286. Running at 10 MHz, this is one of the fastest machines on this market.

Like our XT-compatible, it is full-featured and fully expandable. Serial and parellel ports and battery-backed clock calendar are standard, as are the high-performance 80286-10 CPU and fast 120ns RAM. The case will accommodate up to 5 half-height drives of various types and there are 8 expansion slots.

If you need outstanding performance at a reasonable price, this is the machine for you.

£999



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

The Situation

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

Networking

The Micro 286 offers exceptional p mance and exceptional savings as th server in a low-cost network. The syste be configured with fast Seagate or To hard disk drives to over 100 megaby storage. If disk caching software su MicroCache is used, the performance simply phenomenal.
Bristol Micro can supply a local area ne as a turnkey system. This includes a 286 as file server, network interface cabling, software, and XT-compatible stations. This network can be as chea multi-user system, has the same advan But instead of a terminal, each user h own computer, which can be expande hard drive, printer, etc.; and which is reliable, since it can be run complete dependently of the Micro 286.
If a multi-user system breaks down, eve stops working. If a station in a ne breaks down, some people are inconvenienced. It's a world of difference.

Computer aided design

CAD is another area where a high performance system is essential. The Micro 286 can be configured as an ideal CAD workstation, with high resolution colour graphics, a maths coprocessor, mouse, and high-speed hard disk drive — all for roughly the same price as an IBM PC/XT with 10-15% of the Micro 286's performance!

Unix

Recently, a full port of UNIX System V has become available on AT compatible systems; Bristol Micro is one of the first to offer this system in the UK.

PLEASE SEND ME:

- ☐ standard 512K system, 1.2 MB floppy drive, keyboard . . £999
- ☐ full 640K RAM on motherboard, add £20
- ☐ 1 megabyte RAM on motherboard, add £60
- ☐ monochrome monitor, high resolution graphics card . . . £189
- ☐ RGB colour monitor, colour graphics card £368
- ☐ high resolution colour monitor, EGA card £648
- ☐ second 1.2 megabyte floppy drive £119
- ☐ additional 360K floppy drive £89
- ☐ half-height 20 megabyte hard drive, 65 ms access £329
- ☐ full-height 30 megabyte hard drive, 28 ms access £699
- ☐ full-height 40 megabyte hard drive £849
- ☐ full-height 80 megabyte hard drive £1299
- ☐ 20 megabyte streaming tape backup unit £499
- ☐ 80287 maths coprocessor, hi-speed 10MHz version . . . £349
- ☐ 2 MB RAM card, 256K on board £149
  + ... additional sets of 256K at £30
- ☐ MS/DOS 3.2 (latest version!) £59

Total £_____ Total enclosed £_____
Remember to add carriage; UK, include 15% VAT

Please send more information on

☐ this product ☐ XT-compatible system
☐ AT add-on boards ☐ Borland software

Name . . . . . .
Address . . . . . .
. . . . . .
Town . . . . . Postal code . . . . . .
Telephone . . . . . .

Warranties: a full 12 months on systems and hard drives. 24 months on board products. Software warranties are limited to media defects. Warranties are void where products have been subjected to unreasonable physical abuse.

Terms are strictly cash with order. We reserve the right to allow time for cheques to clear before despatch.

Official orders are accepted from PLC's government and educational authorities.

Dealer enquiries are invited. Ring us on the number below or telex 449 075 MAGGS.

Carriage: £20 per system, £10 per monitor within mainland Britain. Elsewhere: call.

Send your order to Bristol Micro Traders, Systems Group, Maggs House, 78 Queens Road, Bristol BS8 1QX.

BRISTOL
Micro Traders
(0272) 298228

IBM, PC/XT and PC-AT are trademarks of IBM Corporation; 1-2-3 of Lotus Development; MS/DOS of Microsoft; Turbo Expert of Memory Merchants, Ltd. UNIX is trademark of AT&T/Bell Labs. MicroCache of Microcom Research.

Microsoft increases Windows support

MICROSOFT has announced that it is increasing the number of people in its European offices able to give technical support to programmers writing for Windows. Microsoft is aiming to have over 800 people trained to use Windows by the end of the year.

This increased level of activity in the Windows market would support the view that many Windows-based products are about to come through. Many observers also expect Windows to form the basis of future Microsoft operating systems.

Health and safety on CD-ROM

MICROINFO has released an electronic version of the Cambridge Scientific Abstracts on pollution, ecology and toxicology. Some 25,000 abstracts are added to the file annually.

To use the CD-ROM you need a CD-ROM player as well as an IBM compatible with at least 256K of RAM. The price is £1,770 if purchased without back files; with back files the price is £985. Back files for 1980 to 1985 cost £1,965 and for the previous five years £1,770.

More information can be obtained from Microinfo, PO Box 3, Alton, Hampshire GU34 2PG. Telephone: (0420) 86848.

First Computer support

FIRST COMPUTER has announced that it will continue to support its customers with maintenance and software contracts following the announcement of its closure. In addition, any outstanding equipment orders will be honoured by the company. For more information contact First Computer on (0753) 831545.

LOTUS AND THE CLONES

LOTUS DEVELOPMENT CORPORATION has filed suits against Paperback Software of Berkeley, California and Mosaic Software of Cambridge, Massachusetts. It charges that they have infringed copyright and used false advertising and unfair trade practices. The suits were filed in the U.S. district court of Boston and seek "injunctive relief" and damages.

The problems is with products VP-Planner and The Twin, both reviewed in the February 1986 issue of *Practical Computing*. These programs offer extensive compatibility with 1-2-3, together with additional features. Lotus's suits charge that they "deliberately recreate, with only trivial variations, the 'look and feel' and user interface of Lotus 1-2-3 . . . in violation of U.S. copyright law." The suits also charge that advertising and other public statements by the defendants claiming similarity of their products to 1-2-3 are misleading with respect to the performance and quality of these products.

If the case comes to court it could have widespread implications for software houses. The Lotus interface, itself an evolution of earlier menu-driven systems — see page 80 of this issue — is found in many other packages, including some which are not spreadsheets.

Company results are a mixed bag

THE NEW YEAR has brought a flurry of company results — some good, and some not so good. Chief among those in the second category was IBM. Net profits were down 48 percent to $1.39 billion for the fourth quarter: total revenues for the year grew 2.4 percent to $51.25 billion.

To rub salt in the wound, DEC did rather well: net profits were up 98 percent to $270 million in the second quarter of its financial year. Total revenues were up 22 percent to $2.3 billion.

Apple's first-quarter earnings were virtually unchanged from a year ago at $60 million, though net sales were up 24 percent to $662 million. Meanwhile, Tandy announced a 19 percent increase in net profits: sales were up by the same amount.

Unisys lost $43 million, partly as a result of the expense of glueing Burroughs and Sperry together. Wang also lost money, some $79 million, again partly caused by heavy organisational surgery.

On the chip front, Motorola turned in a $194 million profit in 1986, while Intel was $175 million in the red. These figures put the 68020 and 80386 contest in rather an unexpected light.

Out of the ordinary

HEWLETT-PACKARD has announced a printer for its Business Consultant calculator, the HP 18C. The battery-powered unit is unusual in that it receives data via an infrared link. The HP 82240A costs £112 and is available from Hewlett-Packard, Eskdale Road, Winnersh Triangle, Wokingham, Berkshire RG11 5DZ. Telephone: (0734) 696622.

Roland has come up with a three-dimensional modeller — effectively a 3D plotter. The CAMM-3 allows you to make rough models of objects before proceeding to manufacture. The price is £7,995. More details from Roland, Great West Trading Estate, 983 Great West Road, Brentford, Middlesex TW8 9DN. Telephone: 01-568 4578.

APL interpreter for free

A BAND of APL enthusiasts has come togeher under the name I-APL to offer a new APL interpreter. It is available free to those interested in learning more about the language; the only cost will be that of copying it on to a disc. I-APL will be available for the PC family and the Apple II on business machines. It is scheduled to appear in May.

Anyone who would like a copy should send their name and address and details of their machine so that they may be put on the mailing list. I-APL is also interested in hearing from anyone who would like to help with the project.

Write to The Chairman, The I-APL Project, 2 Blenheim Road, St. Albans, Hertfordshire AL1 4NR.

Compulink conference system

COMPULINK, the computer user group, is setting up a computer conferencing system. With the unpronounceable name of CIX, or Compulink Information Exchange, it is a user-supported service. Without incurring a charge, a user may set up and run a conference on any subject they choose.

All the usual communication standards will be supported — V-21, V-22, V-23 and V-22 bis — and access through PSS will be available around Easter. For further information contact Compulink, 67 Woodbridge Road, Guildford, Surrey GU1 4RD. Telephone: (0483) 65895. PC

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In a Class on its own

This little lot ask more of their IBM-compatibles in a day than most users demand in a year. But then this is London's Polytechnic of the South Bank, one of Britain's leading institutes of science and technology.

Here wordprocessing and data storage, financial management and computer-aided design, networking and terminal emulation are all in a day's work.

So you can be sure that when the Polytechnic chose the PC II Turbo from Opus—almost 200 of them in fact—it was only after a great deal of study.

Even with a starting price of £499 the PC II Turbo faced some cheaper competitors but, when it came to speed, compatibility and expandibility, it proved to be in a class of its own. Now its in every class from electronic engineering to administrative studies and from computer services to humanities and social sciences.

With its NEC V20 processor the PC II Turbo is up to three times as fast as the IBM PC/XT and its switchable from 4.77 to 8 MHz Turbo processing at the flick of a keyboard. You can choose high resolution monochrome, colour or EGA systems, single or dual disc drives, 1 Megabyte RAM expansion or 20 Megabyte Winchester. And if you think our options could teach the competition a lesson or two, you'll find the PC II Turbo's standard features a real education.

NEC V20 Super Processor • 360K Floppy Disk Drive • Hercules-compatible Graphics Card • High Resolution Monochrome Monitor • Quality AT-Style keyboard • Highly Compatible BIOS • 256K of RAM Expandable to 1 Mb creating 384K RAM disk • 8 Expansion Slots • Keyboard Security Lock • Parallel Printer and Joystick Interfaces • Real Time Clock/Calendar with Battery Back-Up • 150 Watt UL-Approved Power Supply • Comprehensive User Manual • 12-Month Guarantee.

Should you need more than our 12-month free warranty, we'll even offer you a low-cost on-site maintenance option.

Like South Bank Polytechnic we're sure you'll take a close look at the competition, their options and availability. When you have, call Opus on **0737 65080** and hear about our guaranteed 72-hour delivery. We offer special education and government discounts and welcome dealer and export enquiries. Price quoted exclusive of VAT and carriage.

PC II TURBO

Opus Supplies Ltd,
55 Ormside Way,
Holmethorpe Industrial Estate,
Redhill, SURREY RH1 2LW.

Opus.

IBM is a trademark of International Business Machines Corporation.

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BY MIKE LEWIS

PLEASANT PROGRAMMING

A COMMERCIAL PACKAGE CAN LIVE OR DIE DEPENDING ON HOW PLEASANT IT IS TO USE. THERE IS NO REASON WHY YOUR OWN PROGRAMS SHOULD NOT BE EQUALLY CAREFULLY DESIGNED.

There is a something slightly mysterious about the way software is judged. How is it that of two packages with the same functions and features, one becomes popular and widely used while the other creates hostility and resistance? Performance, lack of bugs and good manuals are all important elements, but there is another factor at work — something which is difficult to define but which is immediately obvious when you come across it. Some programs simply have a better feel than others. They are more comfortable; they are relaxing to use and seem to fit in better with the working environment. Uncomfortable programs, by contrast, are the ones that cause frustration and seem to make life more difficult. If you regularly use a variety of software you will see what I mean.

So how do programmers go about making their products more comfortable? Although there is no formal set of rules, there are certain practices that are worth following. They cover such obvious topics as the layout of screens and the wording of error messages. But the most important area is the way that the user enters data.

Wherever possible, you should avoid the old-fashioned teletype approach to data entry. Too many programs still use scrolling displays, where each entry has to be typed on a separate line, and with no way of moving the cursor up the screen to correct earlier mistakes. A full-screen data-entry form is a much better bet. A well-designed screen will resemble a conventional form, with informative comments, field labels and instructions. The user should be able to move the cursor freely within the data-entry fields, and do simple editing tasks like inserting and deleting characters.

Database packages usually include some form of full-screen editing: the Edit command in dBase is one example. But if you use the traditional languages like Basic and Pascal, you have to program the forms from scratch. Fortunately, it is fairly easy to write a general-purpose form editor. The Microsoft Basic listing on the right shows a bare-bones example. It is hardware-independent, since the codes for the editing keys are held in easy-to-change constants.

This routine supports only a very limited number of editing keys: cursor movement in four directions, destructive backspace, and various keys to exit the form. But you can easily slot in more functions, such as deleting an entire field or toggling Insert mode. The exit keys are not processed in any special way by the subroutine; they are simply passed back to the calling program for further action.

Sensible error reporting is another important ingredient of comfortable programs. Keep your error messages short and to the point — and always polite. Never imply recrimination or blame. After all, we all press the wrong key from time to time. The degree of error reporting should fit the severity of the mistake. If, for example, the user enters a non-existent account code, an informative message is needed. But if he or she simply hits a letter when a number is expected, it is usually enough to ignore the keystroke. The mistake will probably be obvious anyway, and a message is simply a waste of time.

Even a single beep to signal an error can be a nuisance to someone working under pressure. I prefer to make my own programs completely silent. That said, an audible signal is essential if the user is a high-speed data-entry operator who might only give the screen an occasional glance.

The subroutine shown in the listing can easily be extended to provide a consistent method of handling errors. You would have to arrange for the routine to be passed a validation mask for each field, indicating the type of characters that are acceptable — whether they are letters, digits or decimal points, for example. It could also control the conversion of lower-case letters to capitals. Printable characters would then be rejected if they did not conform to the mask.

Less obvious errors, like invalid account numbers, would still have to be checked by the calling program. So it is important that

```
5000    'Simple full-screen editing routine. On entry, FNO is number of
        fields in the form; F$(FNO) is an array holding contents of existing
        fields, space-filled; F(FNO,3) holds the row/col co-ords and lengths
5010    'of each field. On exit, KEYS indicates the key that was used to end
        the edit. ASCII values of control keys are held in constants
        (e.g PAGEDOWN = ^C = 3); LDELIM$ and RDELIM$ are field delimiters
5020    '(eg < and > ). Calling prog is responsible for displaying field
        labels, etc. All variables are integers unless otherwise designated.

5050    FOR J=1 TO FLNO:
          LOCATE F(J,1),F(J,2)-1 : PRINT LDELIM$; F$(J); RDELIM$:
        NEXT J                          'Display existing fields with delimiters

5060    CURRFLD=1: CH=1: ABSX=F(1,1): ABSY=F(1,2): DONE=0:
        LOCATE ABSX,ABSY : WORK$=F$(1) 'Set pointer/move cursor to first field

5070    WHILE NOT DONE:
          KEYS=ASC(INPUT$(1))           'Get keystroke
5080      IF KEYS=LEFTCURS AND CH>1 THEN
            ABSY=ABSY-1: CH=CH-1: LOCATE ABSX,ABSY
                                        'Cursor to left within fields
5090      IF KEYS=RIGHTCURS AND CH<F(CURRFLD,3) THEN
            ABSY=ABSY+1: CH=CH+1: LOCATE ABSX,ABSY
                                        'Cursor to right within field
5100      IF KEYS=PREVFIELD AND CURRFLD>1 THEN
            F$(CURRFLD)=WORK$: CURRFLD=CURRFLD-1: CH=1:
            ABSX=F(CURRFLD,1): ABSY=F(CURRFLD,2): LOCATE ABSX,ABSY:
            WORK$=F$(CURRFLD)           'Cursor to previous field
5110      IF KEYS=NXTFIELD OR KEYS=RTN THEN
            F$(CURRFLD)=WORK$:
            IF CURRFLD<FLNO THEN
              CURRFLD=CURRFLD+1: CH=1: WORK$=F$(CURRFLD):
              ABSX=F(CURRFLD,1): ABSY=F(CURRFLD,2): LOCATE ABSX,ABSY
            ELSE DONE=-1                'Cursor to next field (if not at end)
5140      IF KEYS=BACK AND CH>1 THEN
            ABSY=ABSY-1: CH=CH-1:
            WORK$=LEFT$(WORK$,CH-1)+MID$(WORK$,CH+1)+" ":
            LOCATE F(CURRFLD,1),F(CURRFLD,2): PRINT WORK$; :LOCATE ABSX,ABSY
                                        'Destructive backspace
5145      ' --- Put statements here to process further editing keys ---
5150      IF KEYS>=32 AND KEYS<=127 AND CH<=F(CURRFLD,3) THEN
            PRINT CHR$(KEYS);: ABSY=ABSY+1: MID$(WORK$,CH)=CHR$(KEYS):
            CH=CH+1                     'Printable character
5170    WEND
5180    RETURN
```

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the data-entry routine can easily be re-entered when an error is found. The cursor should then go straight to the offending field, and a suitable message should be displayed. Of course the user should still be able to move the cursor to other fields to make further changes if necessary.

Be sure to remove the error message as soon as the error has been corrected. In fact, all instructions and prompts should be erased after they have been acted upon, as this provides the user with vital feedback. Never leave users in any doubt that the key they have just pressed has in fact registered.

Of course, entering data into the program is only half the story. Often the next step is somehow to get the data into a file. There are two broad approaches to this: you can update the file straight away or you can process the data in a batch. The first method is simpler to program, and is usually easier for the user too. But it can give rise to problems if the user makes a mistake in the data that the program cannot catch. Once the information is committed to the file there is no obvious way of checking it. In practice, however, this will probably cause few difficulties with low volumes of data and fairly small files.

But where large numbers of records are entered at the same time, a batch approach is preferable. Here, the new data is put into a separate holding file which can be printed and altered independently of the main file. Data is transferred to the main file only when the user is satisfied that it is correct.

In deciding between the two approaches, think about what would happen if the user incorrectly typed a key field. Suppose that, on adding a new customer directly to the file, the user typed the wrong customer account number. This would be inconvenient but probably not disastrous. The mistake would come to light the first time someone tried to post a transaction to that account, and if necessary the correct record could be found by searching on the customer's name.

But suppose the user typed the wrong account code while entering details of payments received. If the file was updated straight away, the mistake might never be revealed. Even if the customer eventually spotted the mistake on one of your statements it would be a major task to find the account which actually received the posting.

Batch processing is obviously better for this second example. A printout of the batch file would form part of the company's audit trail, so even if a mistake did creep in it could be traced through the system. As an added safeguard you could use some form of batch totalling to verify the data.

Not all the rules for comfortable programming are concerned with data entry. The behaviour of the software during time-consuming processes is another area to watch. These are tasks like sorting files and global updates, where the user cannot see what is happening just by looking at the screen. In these cases, it is important to reassure the user that something is really going on behind the scenes. Too many programmers think that the sound of a disc drive at work is enough for this.

With tasks that take more than about 30 seconds, putting

PLEASE WAIT

on the screen is good. But

One moment please while the file is sorted

is better. Even better still, display some form of running count, such as the current record number. Never mind if the number itself is meaningless to the user. With experience, people will be able to get a rough idea of how the program is going and when it is likely to finish.

Finally, always give users the chance to change their mind before embarking on a time-consuming process. And where possible, let them interrupt it without loss of data. This is especially important for long printouts. Where an interruption would cause files to be corrupted make sure the user realises this. Most people know better than to switch off a computer while it is in the middle of a job, but a good programmer should allow for every eventuality. KI

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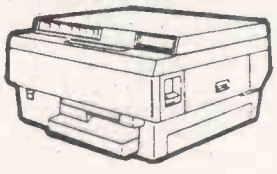

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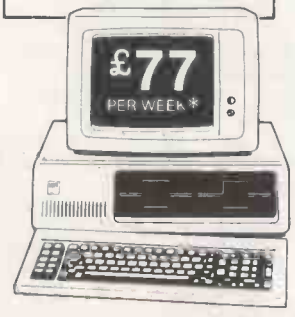

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BY ANNE STAINES

THE LEGISLATION WE DESERVE

DOES THE COMPUTER BUSINESS INFLUENCE THE LAW MORE THAN THE LAW INFLUENCES THE COMPUTER BUSINESS?

The law is frequently cited as one reason for many of the distinctions between the American and British computer industries. Certainly the United States has adopted the more comprehensive strategic approach to the issue of software's legal status.

Congress established the National Commisssion on New Technological Uses of Copyright Works (CONTU) to recommend statutory provisions to deal with computer uses in copyright works. Its recommendations, published in 1979, were enacted in 1980.

The British equivalent is the 1983 Green Paper *Intellectual Property Rights and Innovation*. It virtually ignored computer software. The bill currently under discussion at the Department of Trade and Industry — though omitted from the Queen's Speech at the opening of this parliamentary session — seems to be based on a breathtaking level of ignorance of the industry. At one fairly high-level meeting it became apparent that the officials who drafted it were unsure what computer output was.

Distinctions in the quality — or even the presence — of relevant laws may account for some of the differences between the American and British computer industries, but what influence on the law or its effectiveness has the computer industry itself? In contrast with computer companies in the U.S., which are using litigation to extend the frontiers of copyright law ever further, the British computer industry shows a far less agressive face.

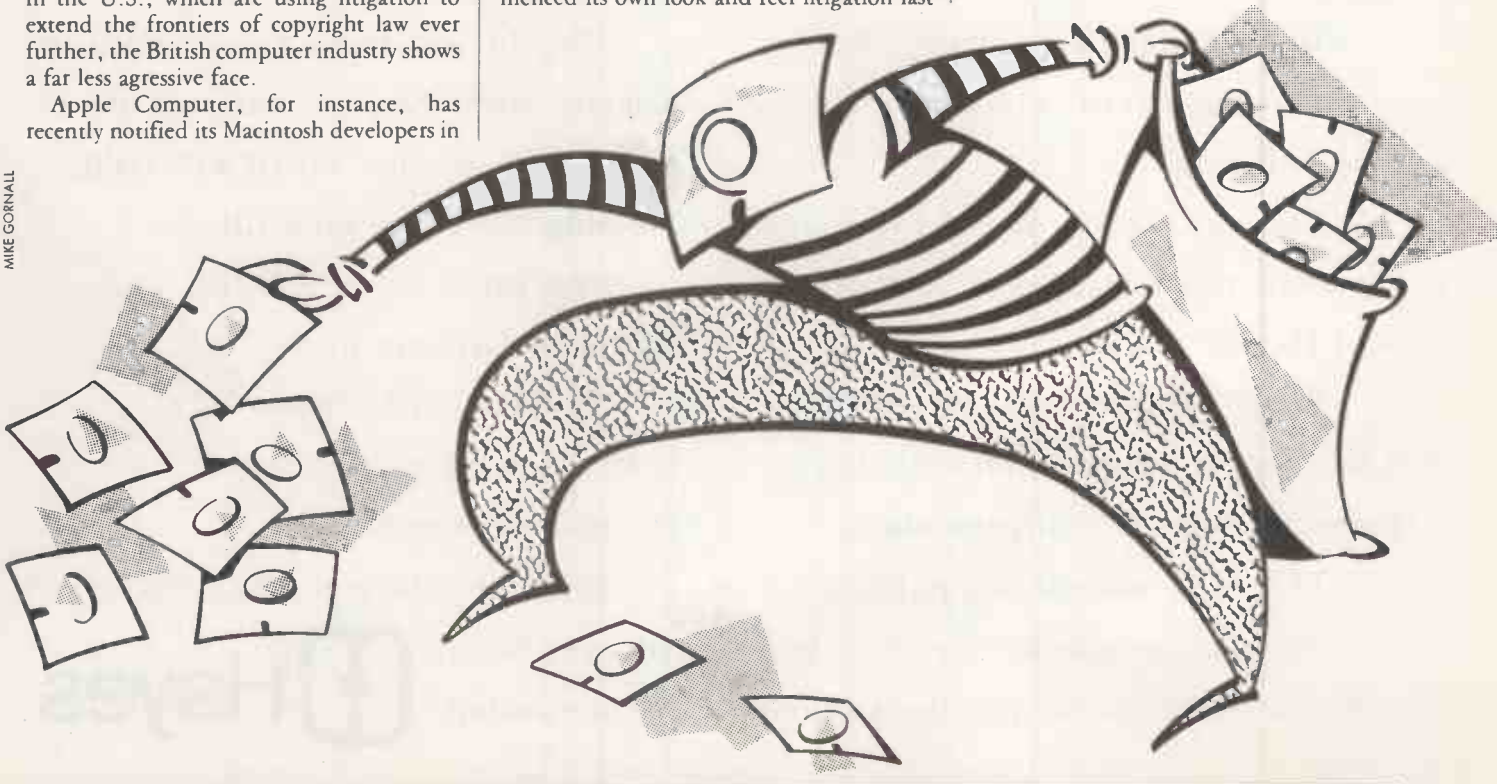
Apple Computer, for instance, has recently notified its Macintosh developers in the U.S. that it intends vigorously to defend its copyright in the look and feel — the "gestalt" — of the Macintosh interface, to prevent it being used or ported on to other manufacturers' microcomputers. In the past, Apple has operated informal agreements with its developers. It is about to formalise them by offering developers limited-use licences in respect of the interface; this will not affect the developer's right to the functions and features of the application. Apple's move follows a series of decisions in American courts extending copyright to the working of programs, as distinct from the coding itself.

Apple (U.K.) has no immediate plans to formalise relations with its British developers, which have always been good. There is no legal reason why it should not try. It is by no means certain that the British courts would uphold copyright in "look and feel" but a developer would in almost every case be bound by a licensing agreement. Clearly Apple strategy is likely to be influenced by the numbers involved. The 40 to 50 key British developers working on the Macintosh are a small proportion of the total and can easily be controlled.

In general British computer companies do tend to conduct their business in a more low-key legal atmosphere than their U.S. counterparts. When Systems Union commenced its own look and feel litigation last year — it is still in preparation — it aroused much interest but little hard support from the rest of the industry. Such support is a must for a litigant airing an innovative argument in an area of the law where a straightforward case will not leave much change from £30,000.

The Federation Against Software Theft (Fast), budgeting for maximum effect and publicity, has to set a low priority on such actions in comparison with operations against counterfeiters. Even in the latter case, however, British computer companies seem slow to take a legal initiative. Trading Standards Officers are empowered to act in counterfeiting cases by both the Trade Descriptions and Copyright Acts. Indeed, they are eager to do so but they report a disappointing lack of interest on the part of the companies themselves.

One recent survey of the British computer industry's attitudes to relevant laws and infringement revealed that the majority of businesses thought — and many knew — their rights were being infringed. Yet very few would consider writing a personal warning letter to the infringer, and hardly anyone would consider taking legal action. Reasons for this attitude were varied, but one comment was repeated frequently: "We don't have time to worry about the law — we're far too busy making money." PC



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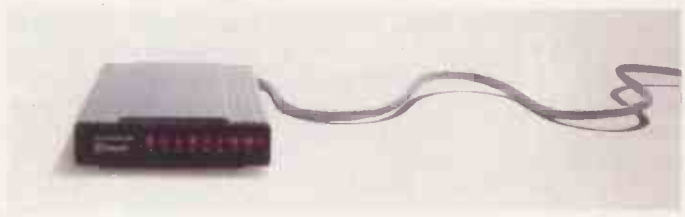

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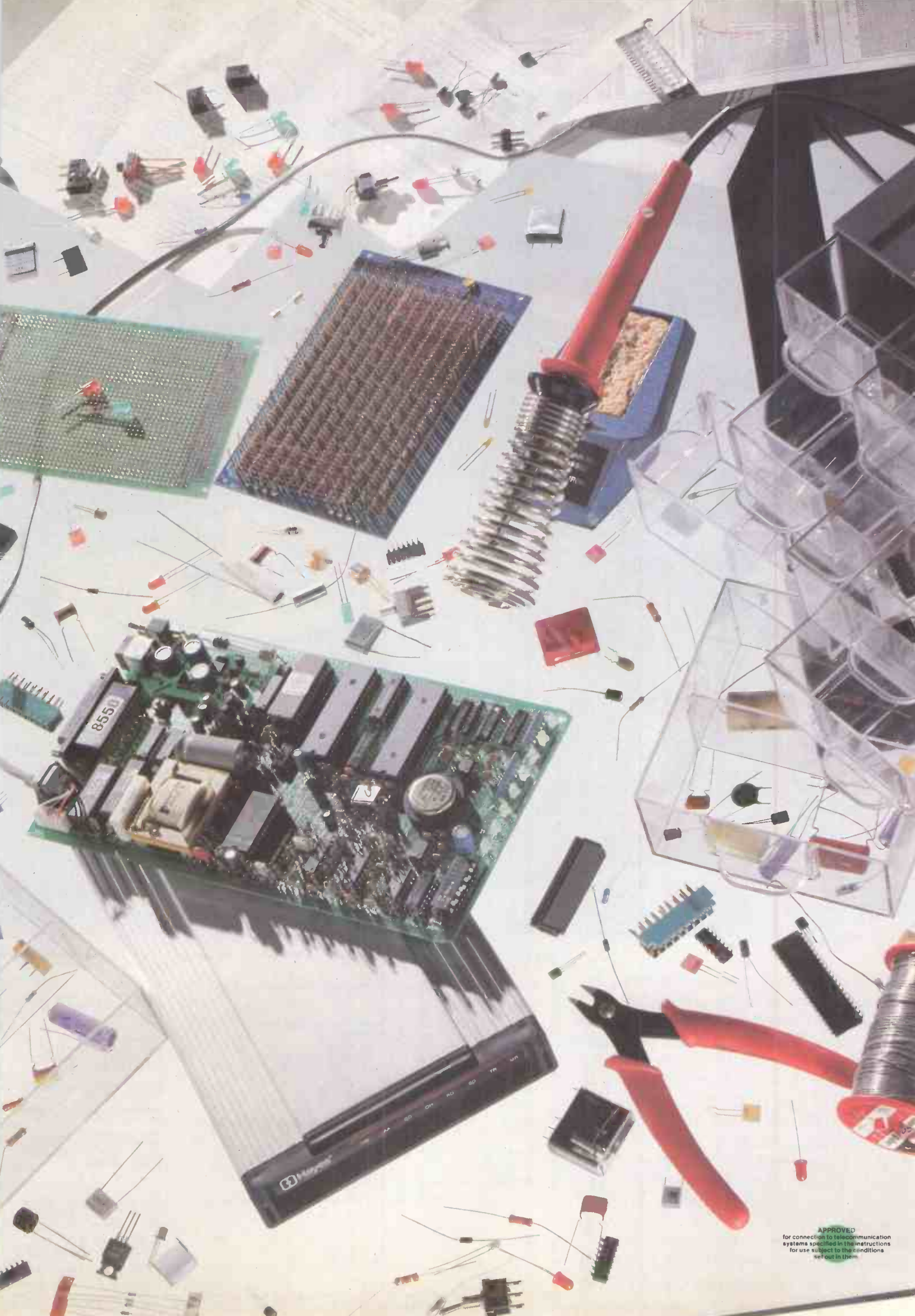
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BY RAY COLES

HIGH-SPEED DISPLAY DESIGN

INTEL'S 82786 CO-PROCESSOR CHIP HELPS TO PROVIDE THE DISPLAY FACILITIES THAT MAKE MODERN PROGRAMS EASY ON THE EYE.

In my day — I'm past it now — display interfaces for microcomputers were relatively straightforward contrivances which could be readily understood at the gates and wire or assembly-language level. The objectives were simple: write on the CRT screen 24 lines of 80 characters, the relevant ASCII file being made available in a display-memory area of about 2K. For bit-mapped graphics, a bigger display-memory area could be made available.

The programmer — and hence the microprocessor — could then write into it whatever they thought appropriate. The whole thing could be controlled directly by the CPU or a display-controller chip. Either way, it was possible to design the circuit before lunch and write the code in an afternoon. Sophistication meant true descenders on p and q, or a dash of colour with your graphics.

But not any more. The yuppies who like to buy the latest personal-computer gear are no longer impressed by good old-fashioned flickering green text and Playschool graphics. They want to be creative: use different character founts, add a picture or two, shuffle everything around instantly on the screen and — can they be serious? — they want to see on the screen exactly what they will ultimately see on the paper when they print it out.

This type of namby-pamby sophistication is already available on expensive graphics work stations, of course. But in my opinion it could lead to anarchy, insurrection and moral decay if such facilities were ever to be made available at low cost to the public at large. Still worse, the overwhelmed, underpaid system designers are going to find it rather tricky to come up with the goods — by lunchtime at any rate.

But the new Intel 82786 display co-processor chip promises to deliver on all the yuppies' requirements. With some trepidation I decided to take a look; after all, if Digital Research has decided that it deserves a special version of its Gem package there must be something in it.

The 82786 is complicated because it is a major subsystem. Hitherto it would have needed a fair-sized circuit board, but it has been integrated on to a single silicon chip and housed in a 25mm. square 88-pin package. Inside the package there are three separate circuit blocks, each rivalling a 16-bit microprocessor in complexity. They are a graphics processor, a display processor and a bus interface unit. The 82786 can operate largely autonomously, and has built-in address and data bus lines to access up to 4Mbyte of dynamic display memory. A system bus interface is provided to establish a dialogue with the system CPU, which would ideally be an Intel 80286 or 80386.

Unlike earlier approaches to graphics-display systems, the 82786 does not pre-allocate the memory it controls to particular physical locations on the screen. Instead it treats it as an elastic resource into which a variety of different images can be stored in the most efficient way. Each image is described by a bit map, which can be of any size and with a pixel depth of from one to eight bits. Multiple bit maps of arbitrary size, containing different types of image data, can be stored and addressed simultaneously by the 82786 coprocessor. All the facilities of sophisticated display-window manipulation are therefore readily available without the need for time-consuming block transfers.

The graphics processor executes commands from the host processor and is primarily concerned with drawing and updating text and graphics in the dedicated display memory. The display processor collects data for display from the display memory, and sends it out as pixels to the CRT, laser printer or other output device. The display processor can jump among several bit maps to create multiple windows, and can expand a sub-image two dimensionally or update it at high speed.

The bus interface unit contains a dynamic RAM controller to keep the large associated memory array refreshed. It also maximises the memory access rate by stage-managing burst-mode operations at up to 40Mbytes/s. The bus interface unit also arbitrates between the memory access requirements of the main system CPU, the graphics processor and the display processor.

The system CPU programs the co-processor graphics and display functions through a block of 128 control registers, which can be located anywhere in the co-processor's address space. Unike the fixed, dedicated screen memory of earlier systems, the 82786's memory area is used flexibly to store display data, character fount information, instruction lists for the co-processor and bit maps which can extend up to 32,000 pixels.

The instruction set used by the graphics processor is based on the ANSI computer-graphics interface (CGI) standard. It includes geometric commands to draw points, lines, circles, arcs and polygons of any size. There is also a set of block-transfer commands to facilitate the transfer of display data to and from a bit-map area. Other instructions specify colour and other attributes, define pixel plane masks and logic operations, and perform non-drawing operations such as unconditional jumps and subroutine calls.

The 82786 graphics processor accepts whole blocks of command instructions. This allows the system CPU to issue a complete blueprint to draw complex shapes such as a set of graphs or a technical diagram into the display memory area. The display processor also has its own set of instructions. They are loaded via 40 separate 16-bit registers to control functions such as cursor style and position, background and border colours, frame size, video interlacing and video speed. All the commands are executed during the vertical display blanking period to ensure a flicker-free display.

The 82786 is certainly a powerful device, and provides almost limitless power to the system programmer. But understanding all the options available and how to use them effectively could be a major headache. This is why Digital Research has produced a higher-level programming environment in the shape of its Gem 786 software package. Running under PC-DOS, MS-DOS, DOS Plus or the Concurrent DOS operating systems, Gem 786 unlocks the latent power in the Intel 82786 co-processor without the programmer having to become fully conversant with the intricate workings of the chip. It provides a set of high-level libraries which offer a virtual device interface (VDI) and object-level graphics functions to the non-specialist programmer.

Gem text handling is particularly sophisticated and is designed to provide WYSIWYG functionality when Gem-based applications output data to any of the wide range of printers, plotters and camera devices supported as part of the Gem library. The Gem VDI provides more than 50 functions fo the system programmer. Many of them relate directly to the hardware functions of the 82786 chip. Groups of functions include control operations for initialising and setting defaults, output operations to display graphics primitives, attribute operations to set colour or style, raster operations to move display data and perform logic operations on it, input operations which allow the use of keyboards and pointing devices such as a mouse, and inquire operations which allow the program to access special device capabilities.

The days of simple display interfaces have gone for ever, so you need not expect to design by lunchtime if you use the 82786. Gem 786 should help to tame the task as far as the programming is concerned, but I suggest you allow at least a couple of weeks to complete the job. PC

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WHICH BASIC?

Q I use two Apricot machines. The first came with MS-Basic, and the second with GWBasic. MS-Basic makes available a number of Escape codes which appear to be quite useful; GWBasic does not appear to have them. I am not a programmer, but I would like to learn one of the languages. Which one should I choose?

H VOSS

A Nearly all the popular versions of Basic were written by Microsoft and so have a good deal in common. The eight-bit CP/M market was dominated by MBasic, sometimes called Basic-80. When the 16-bit machines arrived, the successful eight-bit version was ported across as MS-Basic, and that is probably what was provided with your earlier Apricot machine.

Subsequently a number of improvements and additions have been made by Microsoft, in particular by including an extensive set of graphics commands. The improved version is now sold as GWBasic or Basica; they are effectively the same product, except that GWBasic is supplied by Microsoft while Basica is supplied by your computer manufacturer, who may have customised a few features such as the sign-on message. Since GWBasic has more features than MS-Basic, programs written in MS-Basic should run under GWBasic; the converse is not necessarily true.

You could learn the more limited MS-Basic commands which would give you compatibility on either machine. But a better plan would probably be to run GWBasic on both machines, to make use of its facilities. Most programmers do not use the Escape codes, and MS-Basic does not allow you to do anything significant that you cannot do in GWBasic.

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Q I am currently using an IBM PC running Displaywrite 3 for word processing, attached to a Hewlett-Packard Laserjet printer. Previously all my word processing was done on a Vydec dedicated word processor. I am now faced with the task of transferring all the data files produced on the Vydec 8in. discs on to 5.25in. discs for use on the IBM. If this is not possible, it will mean retyping thousands of pages. Can you tell me if and how this transfer might be done?

K E J CARSE

A The simplest solution is to send your 8in. discs to any one of a number of computer firms that will copy a disc from one format to another. One that has been in the business for a long time is Grey Matter of 4 Prigg Meadow, Ashburton, Devon TQ13 7DF; telephone, (0364) 53499. Grey Matter can copy over 400 disc formats, and can usually find out how to handle any new disc format if you can give them a little help, like the name of a file and a printout of its contents.

If you enjoy using computers and can rise to the challenge of doing it yourself, then the following ideas may help. First, you could ask the dealer who supplied the Vydec how to send a file to a modem, so that you can transmit it down a telephone line to another site.

Alternatively, check if the printer connected to the Vydec plugs into a serial port. The Vydec manual should show this; if the wire connecting the Vydec to the printer is a flat ribbon cable with 25 wires then it is parallel not serial.

If it is serial then it should be possible to print a file on the Videc, but with the printer wire connected to the IBM instead of to a printer. You will find that a 25-pin plug is used, and making a cable to connect the two machines may take a little time. You must connect pin 2 to pin 3, pin 3 to pin 2, and pin 7 to pin 7 on the two machines. If data is transmitted to the printer at a slow speed, say 300 baud, you will not drop any characters on the way, but if the baud rate is 1,200 or more you will almost certainly need to sort out handshake lines. To do this you may have to connect pin 4 at the first end to 5 at the other, and 5 at the first end to 4 at the other; alternatively you might have to connect pins 6 to 20, and 20 to 6. An excellent book, *RS-232 Made Easy* by Martin D Seyer, published by Prentice Hall, should help if you get stuck.

Next you need to set the baud rate of the RS-232 serial port on the IBM to match that of the Videc. You will do this with a command such as

MODE COM1:1200

to set it to 1,200 baud.

Then you must redirect input on the IBM so that it will read data from the RS-232 printer port rather than from the keyboard. You can do this with the command

CTTY COM1

but if you type this there is then no way of getting control back to the keyboard on the IBM when you have finished the transfer. The way round this is to use a batch file that sets the baud rate, redirects input so that it is read from the printer port, calls up your word processor or Edlin to input the file, then redirects input so that it is read once again from the keyboard rather than from the printer port. You can now save the file and quit from the word processor in the usual way by typing commands at the keyboard.

You must create the batch file with your word processor or the Edlin editor. If this file is called Transfer, then to run it all you have to do is type

TRANSFER

After the Mode and CTTY commands, the batch file will contain a command to load your word processor, followed by a command to input a document, a command to save the document, and finally

CTTY CON

to restore input from keyboard.

At the end of the batch file you can type the command to save the document from the keyboard and the command to exit from the word processor.

Finally, if you have access to an optical character reader, you could print pages from the Videc on to paper and use the OCR to read the data into the IBM. You will have to pay about £3,000 for an optical reader, so this probably will not be the most appealing solution.

Q How can I stop WordStar making a .Bak file? Since I am always very careful to make at least two backups myself, this just seems to waste time and disc space.

A P SAUNDERS-DAVIES

A When you type ^KD to make WordStar save your text as a file on your disc several things happen. First the most up-to-date version of the text is saved as a temporary file called, say, Letter.$$$. Secondly, the original file, Letter, is renamed Letter.Bak, and finally the file Letter.$$$ is renamed Letter.

If you have a further editing session on Letter, then when you type ^KD to save the modified text, then even more happens. First the most up-to-date version of the text is saved as a temporary file called Letter.$$$. Secondly the existing file Letter.Bak is deleted. Thirdly the original file Letter is renamed Letter.Bak, and finally the file Letter.$$$ is renamed Letter.

At the first sight this may seem to be a very cumbersome way of handling the files, since except at the very beginning you always have two, and sometimes three different versions of the file stored on disc.

But there is a very good reason for working in this way, and that is security. Suppose that you try to save a file and for some reason it fails. At the very worst you have a backup file which you can use.

Failure to save the file correctly can occur for many reasons, such as failure of the computer or the power supply, or irregularity of the power supply. But probably the most common reasons are insufficient space left on the disc, or the disc directory being full. If you simply overwrite the earlier version of the file any accident will lose both the original and the updated versions.

Don't worry about WordStar making .Bak files, or .$$$ files either. There is nothing you can do about it. PC

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

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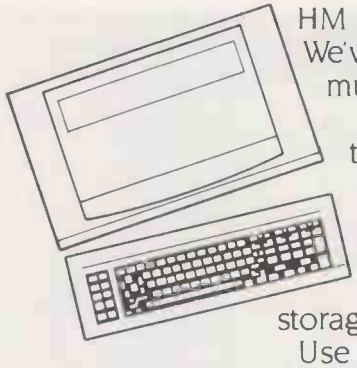

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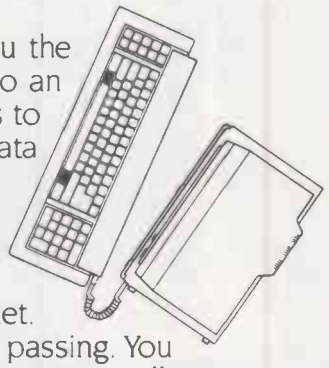

Minstrel PC network cards give you the power to turn your stand-alone PCs into an integrated network, giving users access to a variety of printers, peripherals, mass data storage and communications channels.

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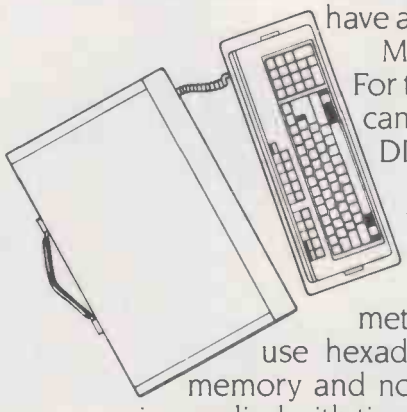
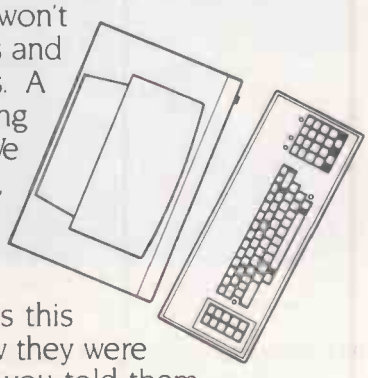


Minstrel PC Network cards use ARCnet. For the technical, that's 2.5 MBit/Sec, token passing. You can network PCs in a star or ring or tree, using Novell, DR–Net, TurboDOS/PC and other leading systems.



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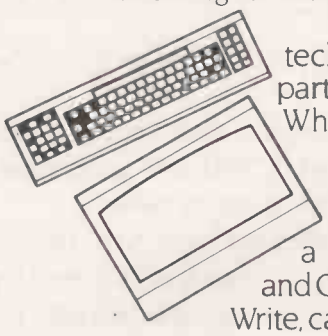

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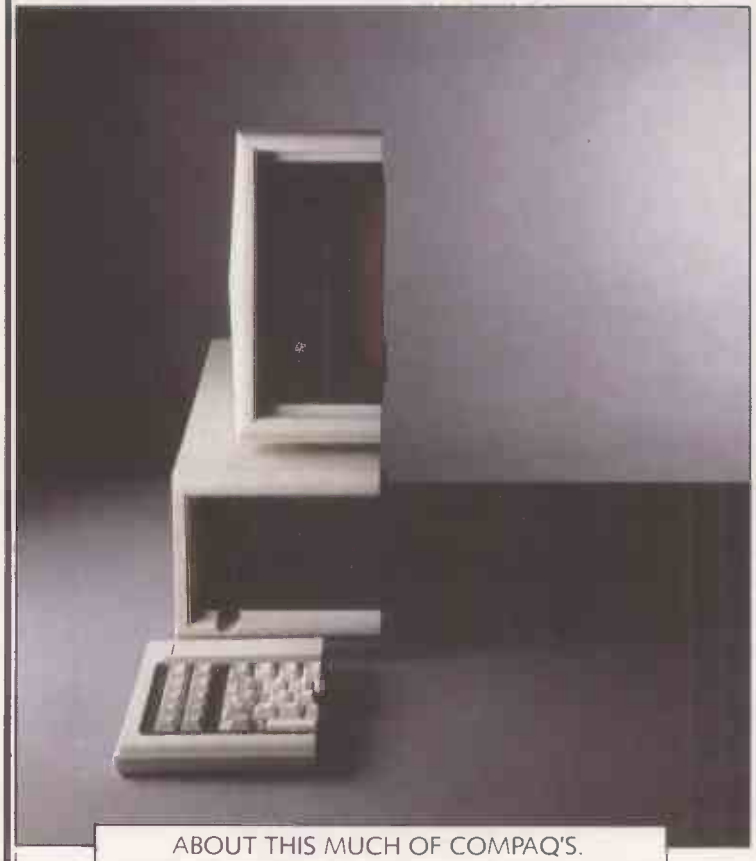

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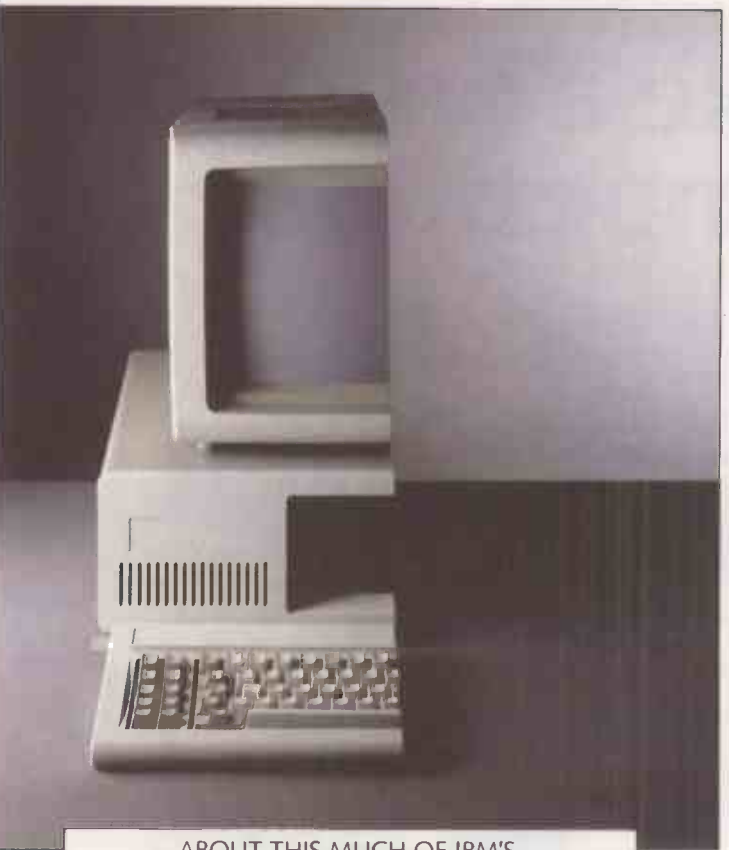

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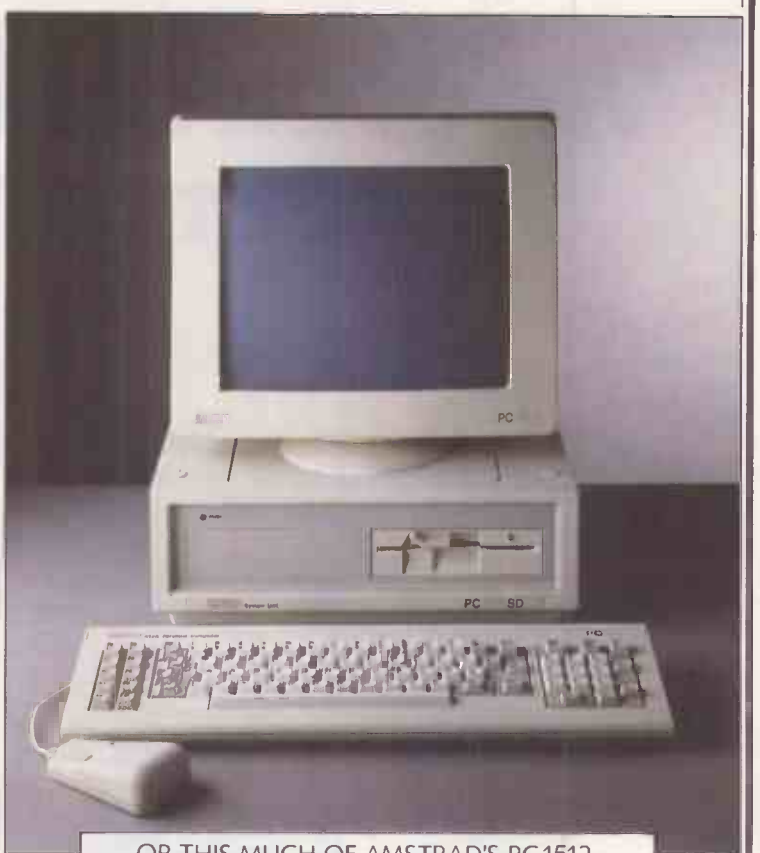

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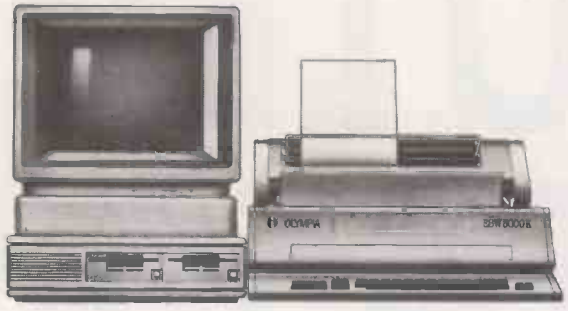

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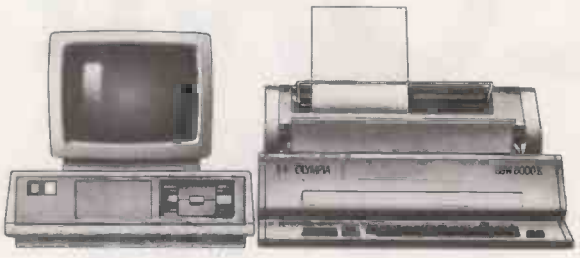

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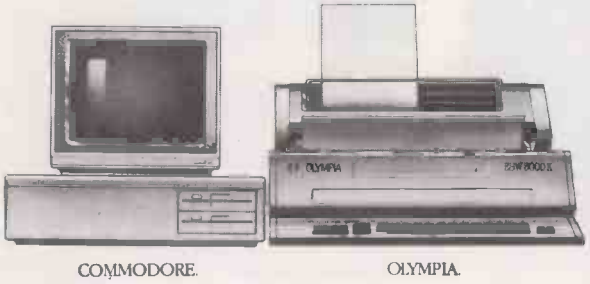

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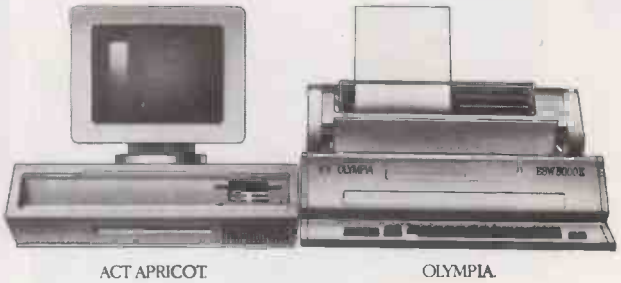

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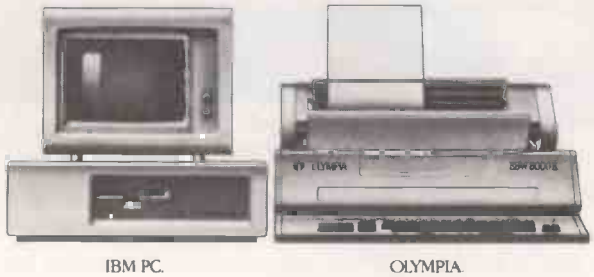

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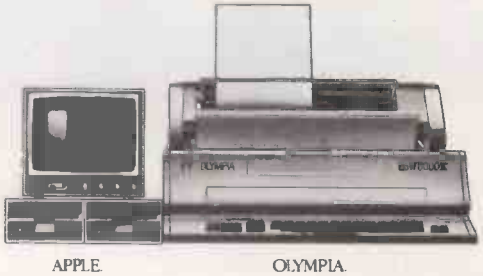

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BY JACK SCHOFIELD

CAN OUR DATABASES SURVIVE?

WHILE AMERICAN ON-LINE SERVICES ARE HAVING A DIFFICULT TIME, THOSE BASED ON THIS SIDE OF THE ATLANTIC WILL FACE TOTAL EXTINCTION UNLESS SOME URGENT REFORMS ARE MADE.

The first ever joint report by Eusidic and Euripa, the two associations which respectively represent European database providers and users, paints a gloomy picture of the future of the European on-line information market. The report*, published at the end of last year, warns that not only will Europe never catch up with the U.S., we may not even reach the limited stage of development where the Americans are now.

As though to illustrate the truth of the report's various fears, this year began with the news that the five-year-old Dutch multilingual database Europe Data has effectively closed down, while Scicon has defected to America. Scicon is a BP subsidiary that includes the Polis parliamentary database among its activities.

European databases are small and weak, and too many of them live off government subsidies. Their markets are restricted by the large number of European languages, by different national telecommunications standards and by pricing disincentives. The database providers themselves are poor at marketing and are certainly not aggressive enough, the report says.

On top of that come the usual problems that ordinary users have everywhere: incompatible modems, micros and keyboards, a confusion of comms software, and variable database search software. But they too are worse in Europe than in the U.S. where for example they do not have to cope with the outmoded 1,200/75 baud comms system wished on us by Prestel.

I got on to The Source in the U.S. within half an hour of phoning up from the U.K. and giving my credit-card number. Wherever I travel in America I now have the choice of several different packet-switch data networks through which I can log on. As the system uses nice, simple teletype (TTY) protocols it does not care whether I am using an IBM PC or a Tandy lap portable. American modems generally detect the speeds you are using and match them. If I have a problem I can call a free help line and people talk to me in English. Alternatively I can mail them on-line — again, free of charge — for help.

Using a European database is far more difficult. Not everyone speaks English and a lot of the data is also in other tongues. Hardly any of the hosts takes credit cards — I only know of one — so arranging payment is a long drawn-out hassle. You are then given three of four different numbers to call, depending on the baud rates used. Sometimes special software is recommended, as for BT Hotline, or mandatory, as for the French Teletel. Prestel software will not quite work with Teletel unless you spend hours programming the function keys to send special codes. You then discover that there is a fatal flaw in the telecomms link, like the fact that British X-25 pads will not talk viewdata to French X-25 pads. You begin to wonder if it is worth the effort.

Travelling in Europe provides even more horror stories. Telecom Gold users, for example, cannot simply log on to the German, Dutch or Italian versions of Dialcom, which are the local equivalent. France does not have one at all. You do not have any of these problems when you cross state borders in the U.S., or travel the 3,000-odd miles from Florida to California.

Simple chauvinism cannot be the cause since a French computer user undoubtedly faces the same problems logging on to British databases — wrong language, wrong software, comms problems — if not worse ones. How many British database providers have fluent French speakers on their help lines?

In spite of their built-in advantages, American on-line information services have had a tough time. For example, in December IBM and Merrill Lynch, decided that International Marketnet was not viable. This two-year joint project was intended to provide information to high-powered stockbrokers, but the *Wall Street Journal* reported that it only had about 50 users among Merrill Lynch's 10,000 account executives — which is like running a restaurant where even the kitchen staff refuse to eat the food. The Source has seen a reduction in its number of users this year, while viewdata-type services have been going down like flies. How much worse it must be, then, for European database providers, with all their extra problems.

Nevertheless some urgent action could help to solve these problems. First we need a Europe-wide agreement on the pricing of data traffic, just as the European Postal Union established common standards for ordinary letters. A call from A to B ought to cost about the same as a call from B to A, not be half or twice the price.

In fact, with packet-switched data traffic, the tariff ought really to be distance independent. Making the British postal charges distance-independent — which is logical with network systems — as Roland Hill did with the penny post in 1840, led to a massive growth in traffic and huge profits for the postal-service provider. Something similar could happen with data traffic.

Secondly, all the database providers ought to get together and agree a single standard for database access. Something like 1,200/1,200 baud full-duplex, Xmodem protocols, a choice of language for search commands and a universal Extended European ASCII character set would do.

Incidentally, this need not be an exclusive offering. Database providers could offer anything they liked, separately or in addition to the basic standard. But it seems to me that holding data in any other form than an agreed European ASCII is doomed. If people want to read it in, say, viewdata pages, then why not use software to construct viewdata pages on the fly?

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(continued on next page)

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Thirdly, database providers have got to adopt an policy of open access which makes it easy for large numbers of casual users to get at their data. The current trend, exemplified by BT Hotline, of charging very high rates and taking a lot of money in advance is also ultimately doomed.

As part of an open access policy database providers should accept credit cards and do group deals: one ID should do for four or five data banks, just as one Access card will get you cash from several different brands of money bank. Open access also means opening systems up to electronic-mail users, just as you can now get World Reporter and the Official Airline Guide by logging on to Telecom Gold. It means linking to the public switched telephone network, to local data services such as PSS, to the Midland Bank's Fastrak, to the Joint Academic Network (Janet) and to whatever else is going to bring in customers.

Finally, pricing has got to encourage usage, rather than discourage it. Charging £1 or £2.50 or more per minute on-line means that systems can only be afforded by a small proportion of business users. The few who do use them will be driven by the overwhelming desire to get off-line as soon as possible; for today's user the whole operation is not about maximising benefits but about minimising costs.

The useful databases of legal, medical and chemical information, patents and full texts of newspapers will soon be sold on compact disc (CD-ROM). The cost of a disc is trivial compared with the saving of on-line time, usage and telephone charges. Further, once a CD-ROM has been installed, everyone will be encouraged to use it as much as possible, since this will lower the real cost of the information. It is the same principle that provides cheap air fares by keeping jumbo jets aloft most of the time.

When this happens — as it surely will with CD hardware prices crashing and new pressing plants opening every month — the on-line database providers are going to find their small numbers of high-paying corporate customers disappearing rapidly. Their hope for future survival must be to broaden their appeal to take in the small businesses, the self employed and the merely curious, who are certainly not going to put £1,000 up front on a £60-per-hour database.

The discussion thus far has merely brought out the implications of the existing technology and the way it is being applied. It might even be considered a statement of the obvious. However, I would like to contribute one original idea, which is that on-line database providers could make a start in the right direction by offering spot pricing of their services.

Today most services charge the same rate whenever you use them. Some have reduced rates for off-peak use, as Telecom Gold does, or offer a cheaper reduced service like the Knowledge Index subset of Dialog. But one thing about computers is that they always know how many people are using them, so there is no reason why the pricing at the time should not be adjusted to match.

Call up at 10.30 on a Monday morning, say, and the price might be £2.50 per minute; call up in the middle of the night and the price might be 20p a minute instead. Users would soon start maximising the value of the database provider's computer, improving response times by reducing peak loads and increasing overall use. The sharper Australian and American companies might also start calling up to take advantage of late-night European rates, though if too many did so this would automatically increase the rate!

What we really need in both Britain and the rest of Europe is the concept of a data highway, putting the data network at the centre, not any particular database offering. The French have got it right with Transpac, to which there are now thousands of databases attached, and to which three new databases are added every day. But then, the French government has shown an insight and a commitment to information technology matched nowhere else in the world, not even in the U.S. PC

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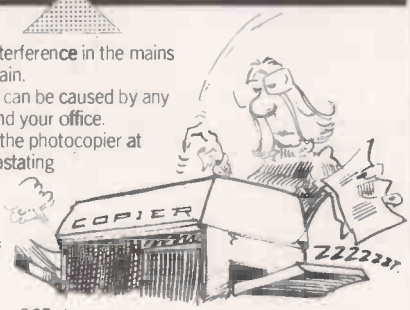

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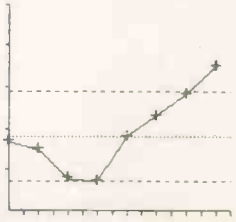

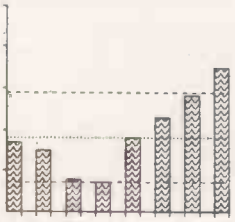

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Programs do not have to be finished applications; useful routines and utilities are acceptable provided they can be tested by the judges on their own. Commercially available third-party toolboxes may be employed, but their use must be clearly signalled.

REQUIREMENTS

ENTRANTS must own the copyright of any programs which they submit. As well as a hard-copy listing, there must be a disc containing source files, executable programs and other relevant files. It must be accompanied by a hard-copy document not more than 500 words long describing the program, its aims, special features, etc. and specifying any sections of the program that are not the entrant's copyright. Entrants will be disqualified if their description exceeds the 500-word limit. Submissions must be complete Turbo Pascal programs which can be run as they stand by the judges — with the assistance of commercially available third-party toolboxes if necessary, though these must be clearly signalled by the entrant.

Copyright will remain with original owner, but it is a condition of entry that *Practical Computing* will have the right to publish illustrative portions of the winning entries.

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£20,000 BRITISH TURBO PASCAL PROGRAMMING COMPETITION

THE JUDGES

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DR. BARRY CLARK is a lecturer in Pathalagical Biochemistry at Glasgow University. He has specialist experience in fast-access multi-user databases, netwarking and labaratory-instrument interfacing, with emphasis on the user interface.

MIKE LEWIS is best-known to *Practical Computing* readers far his saftware reviews and Software Warkshop column. He is also an independent computer consultant specialising in financial applications. He uses Turba Pascal for about 30 percent of his work. He has been in camputing since 1964.

IWAN WILLIAMS is an experienced PC user and software reviewer. He is in charge of the Special Projects Division of the Scattish Develapment Agency, which uses IBM PC and 3270 PC equipment. His particular interests lie in business-praductivity saftware, and he has written extensively on such topics as word pracessing, financial analysis and carparate planning.

IAN STOBIE is Assistant Editar of *Practical Computing*. Before joining the magazine he was a professional computer programmer for five years, with experience of large DEC and IBM systems as well as PCs. One of his jobs on the magazine is selecting software packages for review, as well as regularly writing reviews himself.

RULES

1. The competition is open to all readers of *Practical Computing* normally resident in the U.K., except for employees of Reed Business Publishing Ltd or Altor Ltd, the judges, or the families of any of these.
2. Each entry must be accompanied by an official entry form or photocopy, completed in ink and must conform to the requirements set out opposite.
3. Completed entry forms should be posted to the address shown on the entry form, to arrive not later than 31 May 1987. Envelopes should be clearly marked "Turbo Pascal Competition" in the top left-hand corner.
4. The editor of *Practical Computing* is the final judge of the competition. No correspondence can be entered into regarding the results, and it is a condition of entry that the decision of the editar is final.
5. The winner will be notified by post and the result of the competition announced in the first available issue of *Practical Computing*. Copyright remains with the holder but *Practical Computing* reserves the right to use illustrative examples from winning entries without payment. Entries and discs cannot be returned.
6. The first prize is a trip to California for one week for one person, including a visit to Borland's headquarters in Scotts Valley. Each of the 10 second prizes will consist of all the Borland International products current on 1 January 1987. Third prizes will consist of Borland T-shirts and mugs. Each prize will be awarded to the individual named on the relevant entry form. No cash substitutes will be offered.

ENTRY FORM

This entry form should be submitted with all discs and all relevant documents.

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Declaration: I own the copyright of all the submitted programs except where specifically stated in the documentation accompanying this entry.

Signed

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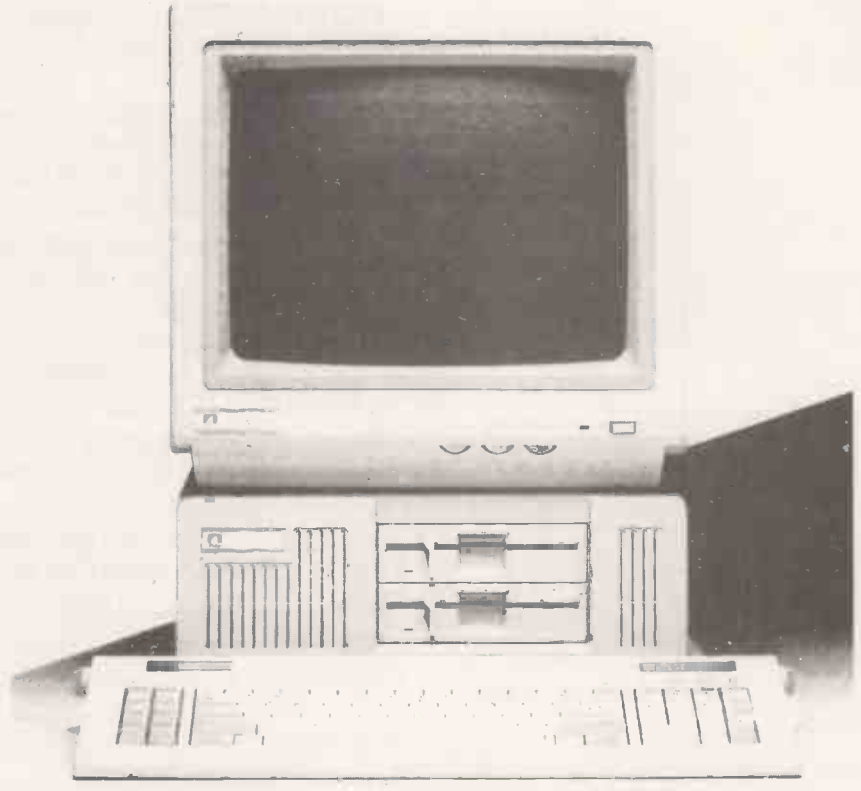

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DEC VAXMATE
LINKING TWO WORLDS

By Glyn Moody

An MS-DOS machine is combined with a Vax work station to bridge the gulf between minicomputers and micros.

More and more DEC seems to be getting things right. Last quarter its turnover was up 22 percent and its profits up 98 percent. Compare this with IBM's recently announced 48 percent fall in its last quarter profits. DEC is also well placed for the future with its totally integrated line of minis, from the bottom-end Microvax all the way up to its multi-million pound superminis.

Not that DEC has had everything its own way. In the micro world it has produced two crashing failures, the Professional and Rainbow. This has been particularly humiliating in view of the runaway success of the IBM PC. The failure was largely caused by a misreading of the market which is common among large, successful companies: they tend to think they can impose solutions in any new sector they enter, just as they do in their established field.

In the light of these mixed fortunes, the launch of the Vaxmate is particularly interesting. It represents the meeting of two worlds: DEC's Vaxes and IBM's PC-DOS. To a certain extent this is something of a humbling for DEC: it has had to admit that the standard set up by its main rival dominates the micro world. On the plus side, it does show that DEC is prepared to be pragmatic and work with the status quo. The idea of bridging two of the most widely used operating systems is undoubtedly very sound: the main question is how successful the implementation has been.

Externally, the Vaxmate betrays its mini roots. It looks just like a terminal, which is what it is in one mode. The main processor board is contained within the display unit and even the single 1.2Mbyte floppy is behind a swing door, as if to hide its presence. The keyboard is a combination of the latest IBM layout and the DEC terminal version. The basic unit comes with an 80286 processor and 1Mbyte of RAM. It costs £3,055.

The model we reviewed included an expansion unit that sits underneath the main display unit: various connectors poke up from the base unit to make the connections into the main box. The whole approach looks slightly Heath Robinson, but it seems to work well enough. Within the expansion unit there is a 20Mbyte hard disc and two standard 16-bit IBM expansion slots. The cards are placed sideways, thus keeping the height of the unit down.

The main unit has an impressive array of ports at the back. There is a printer port for DEC's LA-75 printer and it will also take IBM printers if they are fitted with a suitable plug. Next to it is an asynchronous RS-232 port and an Ethernet connection. Inside the unit there is room for an extra 2Mbyte to be added on a board which slots in at the back of the machine, parallel to the I/O board. The main processor board lies to the right of the machine, as viewed from the front. A disturbingly large number of jumper leads were apparent. In addition to the floppy-disc drive at the right-hand side, there is a built-in tilting mechanism. The monitor uses amber phosphor; a colour version is planned for later this year.

DEC VAXMATE

PC VERDICT

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

☐ A nice idea, but only really of interest to Vax users.

The keyboard is a daunting sight. There are 20 function keys, most of them labelled. Many of the alphanumeric keys also bear additional inscriptions. On the numeric pad, the standard alternative IBM uses are written in blue on the front faces of the keys. There is also a separate cursor pad. The QWERTY keys have similarly positioned orange markings that refer to DEC's standard word-processing packages and to the text editor when in terminal-emulator mode.

Booting up from the hard disc initiates a self-test, followed by a master menu written under Microsoft Windows. This is a special version which has been concocted jointly by DEC and Microsoft. Its appearance on a DEC machine is further evidence of just how far microcomputer concepts and approaches have been taken on board.

The menu offers a range of quick tutorials on the system. Along the bottom of the screen there are the usual icons, such as the clock, notepad and system. Windows works in the normal way but DEC provides it own mouse with the Vaxmate — a pill-shaped beast with three buttons.

In its IBM mode, the Vaxmate ran everything it should, including Lotus 1-2-3, Flight Simulator and Sidekick. The Basic Benchmarks were quite acceptable at an average of 4.5 seconds; this compares with 4.3 for the Compaq Deskpro 286 and 3.7 for the Sperry Micro IT. The discs were also well up with the leaders: 64.1 seconds for the hard disc and 263.9 for the floppy. DEC appears to have come up with an IBMulator which is well ahead of its intended rival, the IBM PC/AT itself.

For most current users of DEC equip-

SPECIFICATION

CPU: 80286 running at 8MHz
RAM: 1Mbyte, expandable to 3Mbyte
ROM: BIOS written by DEC
Mass storage: 1.2Mbyte floppy; 20Mbyte hard disc available as part of expansion unit
Display: amber phosphor; 640 by 400 pixels and 640 by 200 pixels in IBM mode, 800 by 240 pixels in DEC mode
Keyboard: QWERTY with 20 function keys, separate cursor keypad, numeric keypad; compatible with IBM keyboard in IBM mode; numerous secondary assignments on keys for use with DEC programs
Size: 290mm. (11.5in.) × 406mm. (16in.) × 400mm. (16.7in.)
Weight: 14.5kg. (32lb.)
Software in price: MS-DOS 3.1, MS-Windows, MS-Net, Decnet
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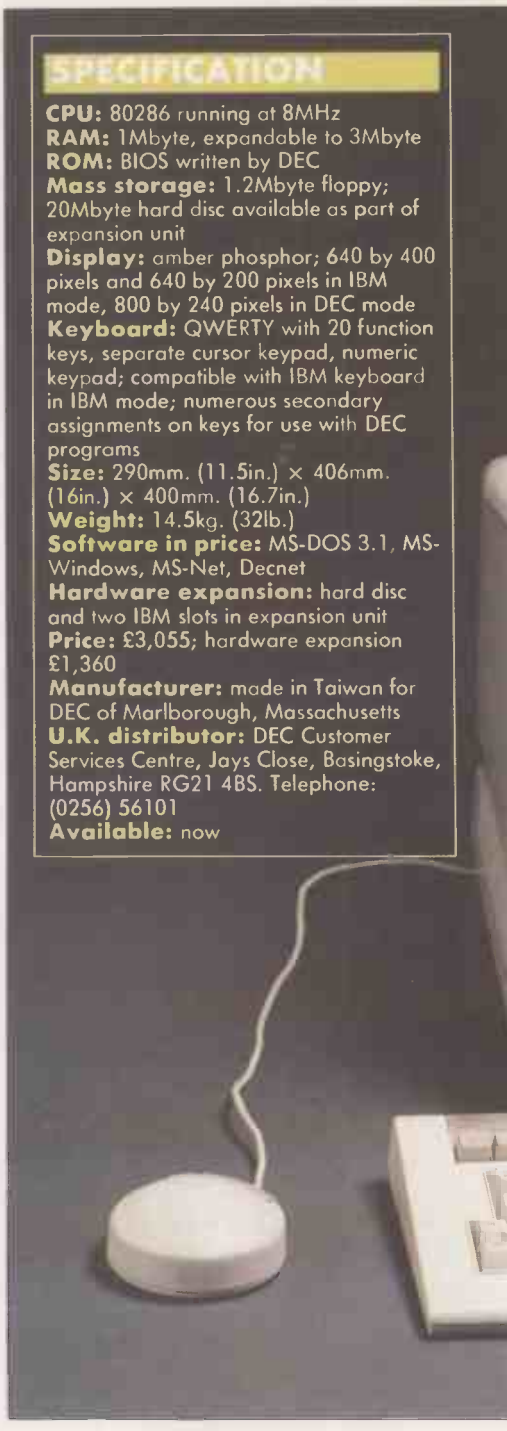
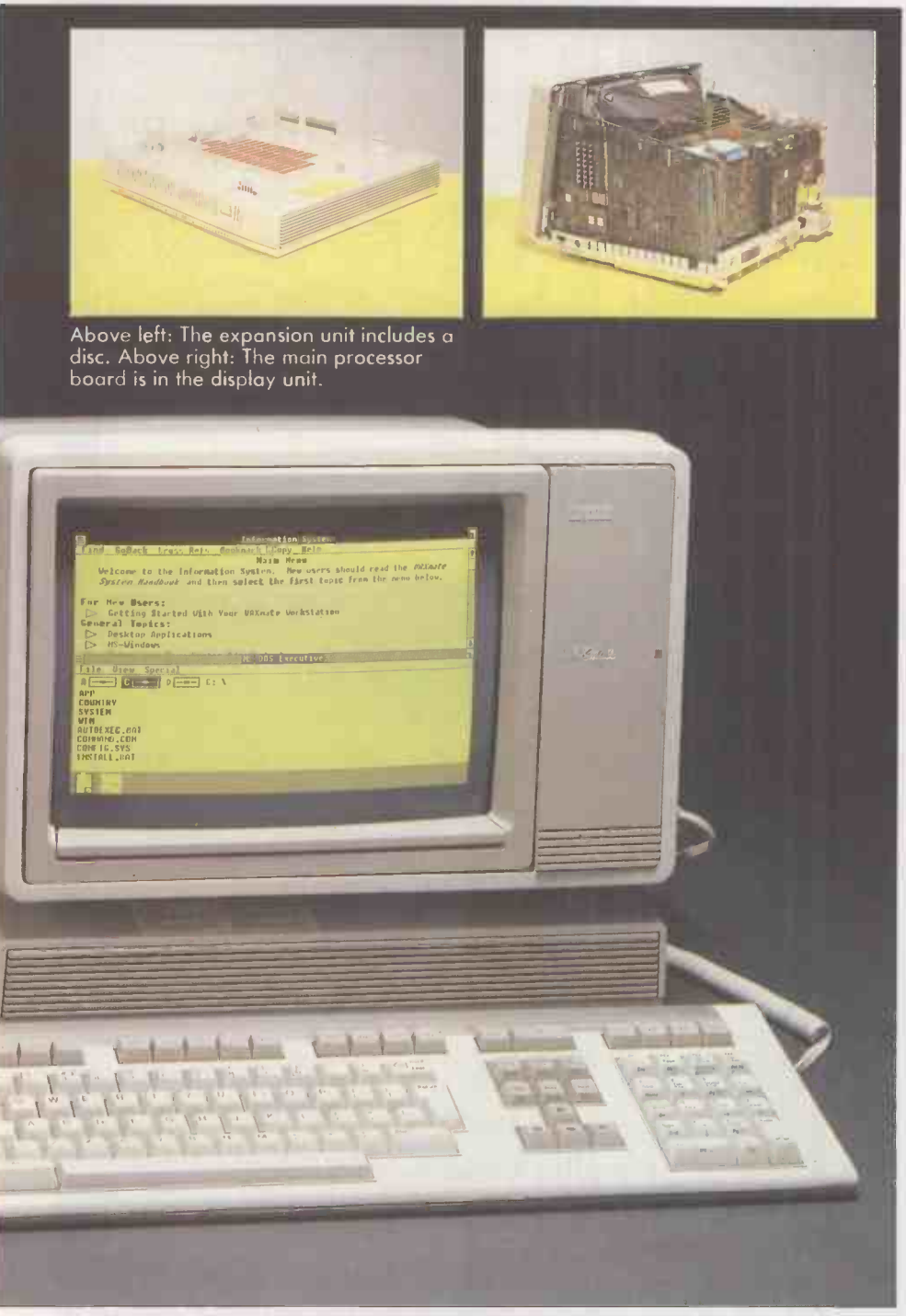




Above left: The expansion unit includes a disc. Above right: The main processor board is in the display unit.

ment, perhaps the most exciting thing about the new machine is the way this microcomputing can be linked in with the standard Vax environment. This is done through terminal emulation which is built into Windows. The main emulation is of the VT-220 terminal, which is text-only. Normally a dumb version would cost around £800. It is invoked as a task under Windows by clicking on its icon.

Up to four windows and tasks can be opened at once, so you can simultaneously log on to four Vaxes in distant locations. But the use of Windows allows you to do rather more. For example, you can cut and paste between a VT-220 window and the MS-DOS window, enabling you to bridge the two worlds very simply.

In addition, there is also a VT-240 emulation, which allows graphics to be displayed as well as text. Windows is not used here; instead, the program runs directly under MS-DOS, so it is not possible to cut and paste between the VT-240 terminal and another MS-DOS application.

One feature which this linking between worlds allows is that enormous virtual discs can be set up on the host Vax systems. This job must be done by the Vax's system administrator — a key individual who keeps on popping up in the manuals. Clearly we are in a different world from the humble micro here.

As far as the Vaxmate is concerned, virtual discs are just like the internal variety. As well as permitting much larger discs to be accessed by each user than would normally be possible, they also allow data to be shared. DEC has produced a translation facility which automatically converts data stored on this virtual disc as an MS-DOS file to a format which can be read by the minis, and vice versa. It is completely transparent to the user. Although it would be quite possible to port DEC's flavour of Unix, known as Ultrix, across to the Vaxmate, the company intends to concentrate instead on using conversion utilities of this type to expedite the transfer of information between micro and mini.

DEC sees as its main market the current and future users of DEC minis. The company estimates that there are about 600,000 IBM XTs and ATs being used as intelligent terminals with Vaxes; it hopes to convert most of them to the Vaxmate, as well as steering new converts to DEC minis, well away from the siren charms of the IBM PC. However, DEC hopes to offer the Vaxmate as an intelligent terminal to IBM mainframes, using networks of them in conjunction with Vaxes.

The Vaxmate is certainly a well thought-out concept which addresses a definite need. However, there are two possible problems. First, people might prefer to stick with the real thing from IBM or, more likely, to buy a very cheap clone and add one of the many terminal-emulation cards. After all, the Vaxmate is not priced particularly aggressively for an AT-alike.

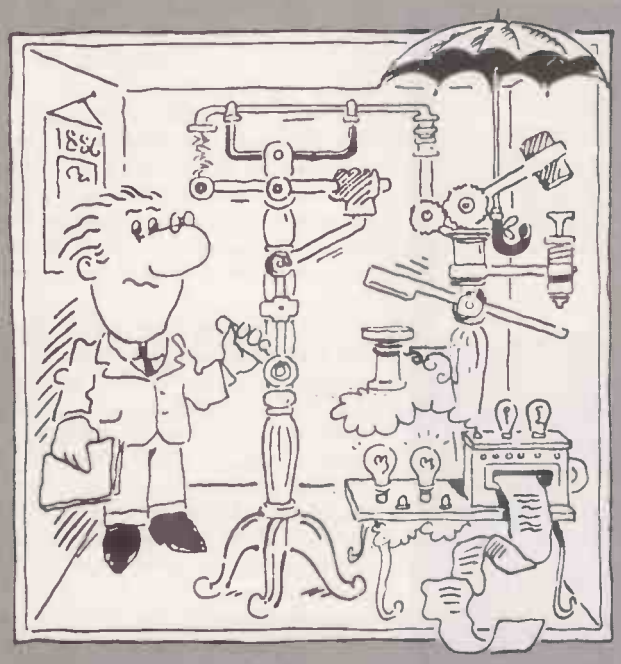
More interesting is the possibility that some of the new machines coming out this year from other manufacturers might offer more in the way of power and functionality for this job. In particular, one of the new Apple work stations could fill the bill nicely. They will probably have IBM compatibility and colour, together with the world's most user-friendly interface, which goes well beyond the current state of Windows as found on the Vaxmate.

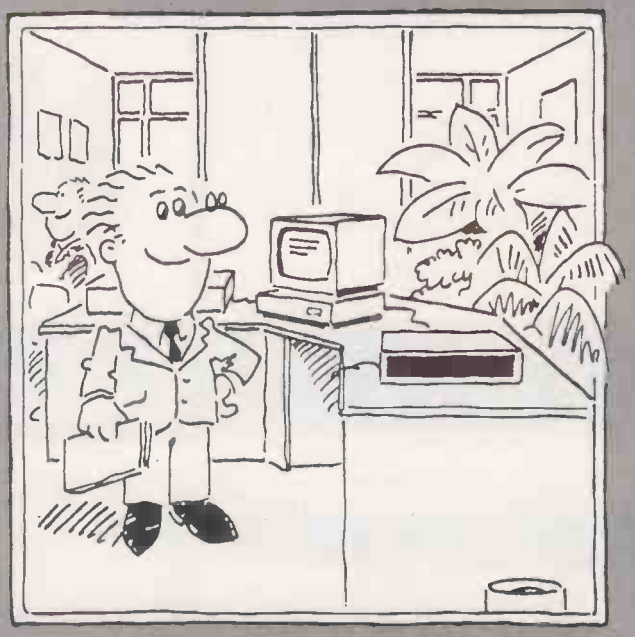
It is far too early to tell which of these threats, if any, will materialise. In any case, it is unlikely that DEC is going to come a cropper as badly as it did with its earlier attempts at micros. The Vaxmate is obviously going to be very attractive for companies with Vaxes, and people who need to get at them but still want their own PC-compatible capability.

In the long term, what is most significant about the Vaxmate is that it bolsters still further DEC's fully integrated range of products. The company now offers machines which go from £20,000 to several million pounds, all capable of running the same program. With the Vaxmate, DEC has now plugged the hole right at the bottom end — that of intelligent PC-compatible terminals.

CONCLUSIONS

- The DEC Vaxmate is a PC-compatible intelligent work station designed for use with Vax minicomputers.
- As an 80286-based AT-alike the Vaxmate is good, though not stunning.
- The ability to encompass both MS-DOS and Vax worlds is a strong selling point.
- Compared to the rest of the AT clone market, the Vaxmate is not cheap. But then neither is it a straight clone. PC





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OKI LASERLINE 6
THE COMPACT LASER

By Steve Malone

A full range of features, neatly packaged and at a reasonable price make Oki's new printer an attractive option.

The Laserline 6 is one of the smallest laser printers we have come across. Measuring just 8in. high and a little over 16in. square it is not much bigger than some of the larger dot-matrix units, and makes the Apple Laserwriter look like a dinosaur by comparison. It is built around a new print engine from Ricoh.

The Laserline is simple to use. You control it from the front panel and Oki should be given a small round of applause for fitting the machine with proper buttons rather than the niggardly touch-sensitive membranes used on some other laser printers. All the usual features are supplied, including a status LED and On-line button.

We found the status error display to be very efficient in indicating the source of any problems the machine encountered. Once an error has been rectified, pressing the Recover or On-line buttons should normally restart printing. However, recovery was not always as complete as it might have been, and the Laserline often continued to show an error even after it had been cured. You then have to turn off and start again, which inevitably delays things for a few minutes while the machine warms itself up.

Unusually for a laser printer, the Laserline allows you to select paper size. Automatic feed is available for A4, A5 and B5 sizes, and you can also feed in paper manually. The paper hopper is on the right-hand side of the machine, where the stack of sheets is held in place by a lever which allows you to load the supply and then lock it ready for printing.

Like all automatic paper feeds the mechanism can be a little truculent at times. Sometimes the machine pulled in half a dozen sheets at once, and sometimes it did not accept any at all. Oki claims a capacity of 150 pages, and although this is possible we think about 100 sheets is preferable. The chances of jamming and paper-feed errors appeared to increase with the amount of paper locked into the input bin.

Once you have got the knack of feeding the paper and have got the mechanism working correctly there are no other problems. This is just as well, because when paper does become jammed it is sometimes not possible to remove the offending sheets from either end of the printer feed. The paper path runs underneath the printing mechanism, so you find yourself having to dismantle parts of it to extract misfed sheets.

An unusual — and welcome — feature of the Laserline is a choice of output feeds, controlled via a switch on the lower left-hand side of the machine. Printed pages can be fed face up out of the left-hand side, or collected face down in an output bin on the top. This allows pages to emerge in forward or reverse order.

In terms of print speed, the Laserline 6 is a bit slow. Oki says that the machine can produce six pages a minute but it can only manage this when reproducing several copies of a single page. When printing a sequence of different pages, the output drops to five pages per minute. But this is still faster than most dot-matrix printers, and way ahead of daisywheels.

OKI LASERLINE 6

PC VERDICT

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

☐ A small machine destined for great things.

The Laserline 6 looks much like any other laser — but a lot smaller.

SPECIFICATION

Resolution: 300 dots per inch
Print speed: 6 pages per minute for repeated pages, 5 pages per minute for new pages
Paper feed: 150 sheets A4, A5 and B5; manual feed for odd sizes
Language supported: Hewlett-Packard Printer Command Language
Price: £1,899
Hardware expansion: 384K memory cartridge, £366; additional fount cartridges, £98
Manufacturer: Oki Electric Industry of Tokyo, Japan
U.K. distributor: Technitron X-Data, 750-751 Deal Avenue, Slough Trading Estate, Slough, Berkshire SL1 4SH. Telephone: (0753) 31292
Available: now

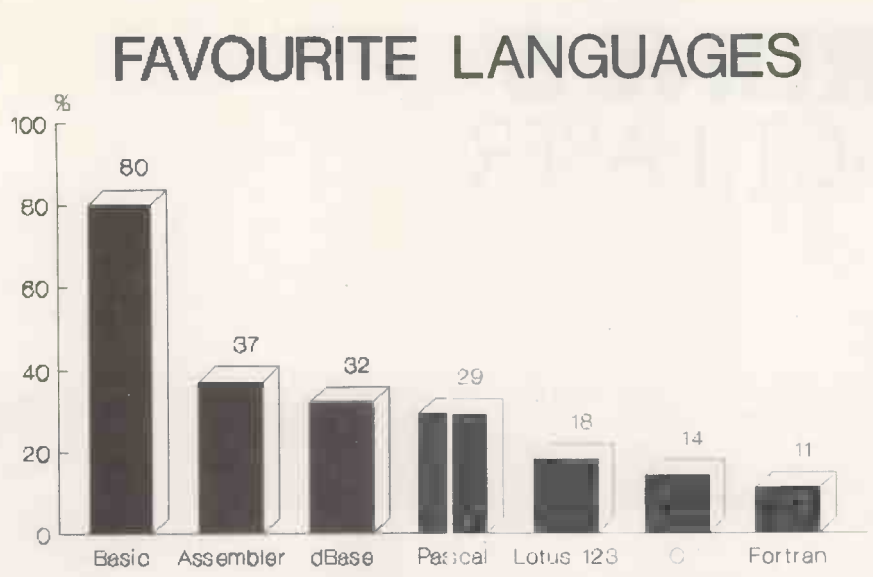
The Laserline 6 emulates the Hewlett-Packard Laserjet, which appears to be establishing itself as the standard laser printer — particularly in the United States where a lot of business software originates. Thus the Laserline is able to take advantage of the increasing number of programs that provide drivers for the Laserjet.

The basic printer is fitted with 128K of RAM, which can be expanded via a plug-in cartridge to a total of 512K. The extra 384K RAM costs a rather steep £366 but it does

14	Helv Bold	ABCDEFGHIJKLMNabcdefghijklmn1234567890
12	Courier	ABCDEFGHIJKLMNabcdefghijklmn1234567890
12	Courier Landscape	ABCDEFGHIJKLMNabcdefghijklmn1234567890
12	Courier Bold	ABCDEFGHIJKLMNabcdefghijklmn1234567890
12	Courier Italic	ABCDEFGHIJKLMNabcdefghijklmn1234567890
10	Tms Roman	ABCDEFGHIJKLMNabcdefghijklmn1234567890
10	Tms Roman Bold	ABCDEFGHIJKLMNabcdefghijklmn1234567890

Helvetica, Courier, Times and Lines Printer founts in roman and italic styles are built-in. Additional founts come on cartridge.

(continued on next page)



Print quality is much improved (right) when the extra memory cartridge is installed.

(continued from previous page)

make a great improvement to the print quality, as can be seen from the examples above. Even then, the Laserline's output quality does not match that of the Apple Laserwriter, though to be fair the Apple machine has 1.5Mbyte to play with.

Next to the memory cartridge at the back of the machine is the input module; you can choose either a serial or a parallel type. The Laserline 6 also has a slot on the right-hand side which accepts fount cartridges. The machine's built-in founts include Helvetica, Courier, Times Roman and Line Printer. Additional founts currently available from Technitron X-Data, Oki's U.K. distributor, include Prestige, Gothic and Elite. The fount cartridges cost £98 each. Although the machine can be driven by Laserjet-compatible software it will not accept HP Laserjet cartridges.

The cost of consumables is an important element of any printer, and with lasers that includes the cost of replacing some major components. Toner can be bought separately at £22.91, and lasts for 1,500 pages. A maintenance kit which is required after 20,000 pages includes a replacement drum and prism, and costs £182.44. Together they represent a cost of something over 2p per page, not including the paper itself. A cleaning kit is available for £93.

The Laserline comes with its own Lasercontrol software which allows you to set the fount, layout and configuration of the printer. Two versions of the program are supplied. The first takes up 35K and can be run from DOS before you enter your application. The second is a 69K pop-up implementation that can be called from within your application program. The pop-up configuration is particularly useful for altering, say, the number of lines on a page or the margin settings, without having to quit the application. Strangely, Oki has opted for the Shift-PrtScr combination as the hot key. This combination is very easy to remember, but it denies you the use of the standard PC screen-dump function. A Ctrl-PrtScr combination would have been just as easy to remember and would be more convenient.

CONCLUSIONS

- The Oki Laserline 6 is the latest in a line of cheap, compact laser printers now entering the market.
- It has a number of useful features which make it stand out from the run-of-the-mill laser.
- This looks like the first laser printer which you could imagine sitting on every office desk. The small size, advanced features and smooth operation could make the Laserline 6 a standard word-processing output device. PC

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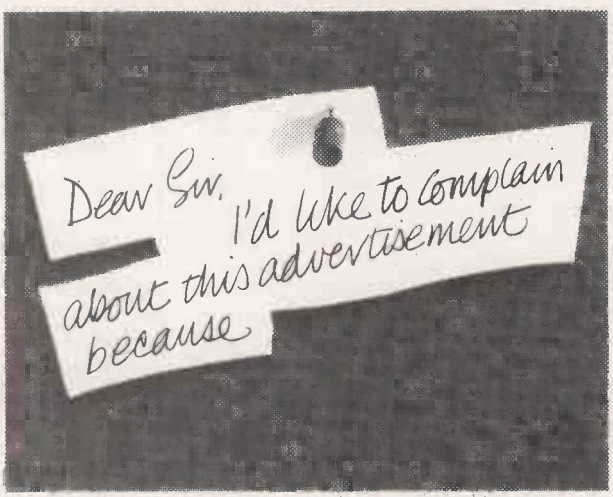

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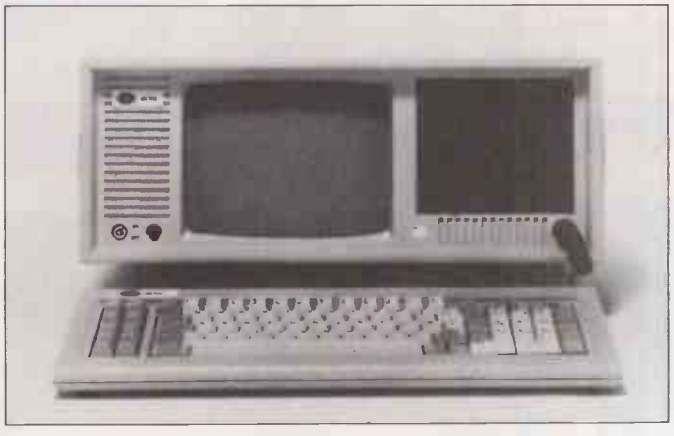

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SHARP PC-7511 & PANASONIC FX-800H

THE JAPANESE ARE COMING

By Carol Hammond

SPECIFICATION/PANASONIC FX-800H

CPU: Intel 80286 running at 6MHz or 8MHz; optional 80287 co-processor
RAM: 512K expandable up to 1Mbyte on board
ROM: 64K BIOS and diagnostics
Mass storage: 1.2Mbyte floppy-disc drive and 40Mbyte hard disc
Interfaces: Centronics parallel port
Expansion: five 16-bit expansion slots, and three half-length and two full-length eight-bit expansion slots; two eight-bit slots are occupied by the floppy-disc controller and display card and the hard-disc controller occupies a 16-bit slot
Dimensions: 500mm.(19.7in.) × 153mm.(6in.) × 405mm.(15.9in.)
Weight: 15kg.(33.1lb.)
Display: 14in. RGB monitor with CGA-compatible display card
Keyboard: 95 keys, old-style IBM PC/AT layout plus 11-key cursor pad
Price: £3,569
Software in price: MS-DOS 3.1, GWBasic 3.11
Manufacturer: Panasonic, Japan
Supplier: Panasonic Industrial U.K., 280-290 Bath Road, Slough, Berkshire SL1 6JB. Telephone: (0753) 73181
Available: now

SPECIFICATION/SHARP PC-7511

CPU: Intel 80286 running at 6MHz and 8MHz; optional 80287 co-processor
RAM: 512K expandable to 640K on board
ROM: 32K BIOS and diagnostics
Mass storage: 1.2Mbyte floppy-disc drive and 40Mbyte hard disc
Interfaces: Centronics parallel port, RS-232C serial port
Expansion: two eight-bit expansion slots and six 16-bit expansion slots; one eight-bit slot occupied by display card and one 16-bit slot occupied by the hard-disc controller card
Dimensions: 540mm.(21.5in) × 167mm.(6.6in.) × 426mm.(16.75in.)

Weight: 16.5g. (36.4lb.)
Display: 14in. colour monitor with EGA-compatible card
Keyboard: 84 keys, old-style IBM PC/AT layout
Price: £3,878
Software in price: MS-DOS 3.11, GWBasic
Manufacturer: Sharp Corporation, Japan
U.K. distributor: Sharp Electronics U.K., Sharp House, Thorp Road, Manchester M10 9BE. Telephone: 061-205 2333
Available: now

Two more Japanese companies are weighing in with well-designed high-performance AT clones.

Japanese computer companies are not famed for innovation. Rather their reputations have been made by imitating what others have pioneered and adding a few extras. They are therefore well placed to manufacture clones, and hot on the heels of the Epson PC AX, which we reviewed last month, we look at two more AT compatibles from large Japanese consumer-electronics firms, the Sharp PC-7511 and the Panasonic FX-800H.

Both are high-quality products aimed at the upper end of the market for desk-top micros. Likely applications are for CAD/CAM, desk-top publishing and other power-hungry applications. They should also appeal to these companies' traditional customers who use their other office products such as photocopiers.

The Sharp PC-7511 we reviewed was the top-of-the-range offering with a 40Mbyte hard disc, one 1.2Mbyte floppy, a colour monitor and a proprietary EGA-compatible display card. It costs £3,878. For the same configuration with a colour monitor and CGA-compatible card the price drops to £3,297, and with a monochrome monitor and mono graphics it falls to £3,122.

Although only 32Mbyte of the 40Mbyte on the hard disc is addressable under the current version of MS-DOS, Sharp has provided the extra in the hope that it will not be long before upgraded versions of the operating system appear. Meanwhile it is possible to partition the hard disc and have an extra nominal drive, possibly running under a completely different operating system such as Xenix or used within a multi-user system as a file server.

Given that the IBM PC/AT is a chunky machine its clone cousins are doomed to be the same. However, Sharp manages to dress up its machine to look almost stylish. The PC-7511 has a neat and tidy air about it: its dull cream and grey plastic casing has unfussy, neatly rounded off corners and an unpretentious appearance.

AT LAYOUT

The Sharp keyboard is slightly smaller than that of the IBM PC/AT and plugs in at the back of the machine. The 84-key keyboard follows the original AT layout, rather than the RT layout that has now become standard. There are the normal 10 function keys down the left-hand side, with Num Lock, Caps Lock and Scroll Lock status indicators positioned above the numeric keypad. The keys are rather shallow but in operation they feel quite springy and are fairly quiet.

At the front of the machine there is a small centrally mounted security lock which deactivates the keyboard and locks the casing on. To the left lie the power and hard-disc status indicators, and on a lip below them a Reset button. The floppy-disc drive is mounted on the right, with space below it for a further mass-storage device. You turn a small lever clockwise to close the drive door.

The on/off switch lives on the right-hand side panel of the system box, as on IBM's machines. The a.c. power inlet is at the back of the machine, along with an auxiliary a.c. power outlet. The fan outlet lies above them. On the right lies the parallel printer port and RS-232C serial port, and above them a switch which changes the speed of the processor between 6MHz and 8MHz. Further to the right are the keyboard connection port and a grille which allows access to expansion cards.

The ability to choose the standard AT speed of 6MHz or a souped-up 8MHz to run software is useful since some software does not run properly at 8MHz. On the Sharp machine you can switch speeds only by using the switch; Sharp does not provide any way of changing speeds from the keyboard. You can only change the speed when the machine is switched off, which can be rather irritating. Sharp says that this may change when the machine is upgraded to a 10MHz clock speed, probably within the next few months.

CRISP DISPLAY

The monitor we used was supplied for Sharp by Eizo. Three dials to control colour, contrast and brightness are positioned on its front along with a fourth switch with which you can select white, amber and green monochrome modes. We were more than happy with its clear and crisp display, which proved well capable of handling Harvard Presentation Graphics and other graphics packages.

Access to the interior or the machine proved fairly straightforward. There are only four screws to undo before sliding the cover backwards and removing it. Inside there are eight expansion slots — two eight-bit and six 16-bit — one of which was occupied by a hard-disc controller card on the review machine.

Installing expansion cards is made easier by the presence of a space between the front panel and the expansion boards support bracket, which provides some valuable extra room to play with when squeezing cards into place. When the cover is removed from the machine it takes the back panel with it, leaving a three-sided box. Once again this creates much needed space when installing delicate cards, and means that it is not too difficult to retrieve any screws or other bits and pieces you inadvertently drop inside.

The floppy drive is controlled from the motherboard, saving an expansion slot. The standard 512K RAM can be boosted to 640K by plugging 64Kbit RAM chips into the empty sockets provided; it should be possible to expand memory capacity up to 16Mbyte using expansion cards. The BIOS ROM is made by Vega in the U.S. There is room for an 8087 maths co-processor.

The Sharp machine ran almost everything we put its way, including Sidekick and Lotus 1-2-3, but we experienced problems with Flight Simulator. Changing the processor

(continued on page 53)

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(continued from page 51)

speed made no difference to its performance. Sharp assured us that Flight Simulator should run on its machine, and suggested that we alter the DIP switch settings to match the EGA card to it.

The Sharp machine proved a reasonable performer when subjected to our standard tests. Running the Basic Benchmark routines with the clock rate set at 8MHz it averaged 4.7 seconds, or 6.9 seconds at 6MHz. The 6MHz IBM PC/AT averages 6.8 seconds and the 8MHz Compaq 286 4.3 seconds; the 10MHz Epson PC AX is now well ahead with an average of 3.4 seconds.

To run the Bagshaw Disc benchmarks the floppy disc registered a total time of 293.4 seconds, and the hard disc 65.8 seconds. These are respectable enough speeds but they are slower than the 40Mbyte Epson PC AX, which turned in a figure of 47.9 seconds for its hard disc.

Running the Norton Utilities Sysinfo program to check out compatibility the Sharp PC-7511 produced a result of 5.7 when the processor speed was set to 6MHz, which is identical to that of the IBM PC/AT. At 8MHz it registered an index of 7.7.

Sharp's documentation is exemplary. It comes in the form of three ring-bound manuals called the *Owners Manual*, the *DOS Manual* and the *Basic User Manual*. They are clearly laid out, well written and easy to understand, with lots of large, helpful diagrams covering everything from taking your kit out of the box to installing expansion cards and changing DIP-switch settings.

40MBYTE HARD DISC

Like the Sharp PC-7511 the Panasonic FX-800H we reviewed came with one 1.2Mbyte floppy-disc and one 40Mbyte hard disc. Including a colour monitor and CGA-compatible card it costs £3,569. This is cheaper than the Sharp machine we looked at, but we were not using such a sophisticated monitor, and Panasonic has yet to produce an EGA card for its machine. However, we were able to use the NEC Multisync monitor together with a Taxan EGA card to obtain results that were comparable to those achieved on the Sharp.

Though it is finished in a similar cream and grey colour scheme to the Sharp PC-7511, the Panasonic did not seem to me to be quite as handsomely styled as its rival. The Panasonic keyboard basically follows the old AT layout with the addition of an 11-key cursor pad between the numeric keypad and the alphanumeric pad. Indicator status lights are built into the Caps Lock, Num Lock and Scroll Lock keys.

The keyboard connects to a socket on the left-hand side of the front of the machine, an arrangement which is liable to leave your desk strewn with wire. There is a duct underneath the keyboard into which you could channel it, but I found there was still plenty to spare. Underneath the front of the main system unit there appeared to be another duct but I could not see anyway of feeding the wire through it.

To the right of the keyboard socket lies a security lock, and above it are three status indicators for power, CPU speed and hard disc. The speed indicator lights up when the machine is running at 8MHz. You can change speed during operations by pressing the Ctrl, Alt and + keys or by issuing the Fast command. The floppy-disc drive is mounted on the right of the machine, beyond the hard disc. There is also space to house extra disc drives or a tape streamer.

On the floppy-disc drive there is no conventional drive door or locking lever. Instead you have to press a small button on the front of the drive to lock your disc in place, and press it again to release the disc. This seemed to me a much less obvious operation than the more usual arrangement, and it may well keep novice users guessing as to why their discs will not load.

SHARP PC-7511

PC VERDICT

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

☐A smart-looking clone suitable for up-market applications,

PANASONIC FX-800H

PC VERDICT

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

☐A robust machine that should perform well.

The power switch is fitted on the right-hand side panel of the machine. At the back there is a fuse compartment, and the mains power inlet and auxiliary outlet. Moving to the right brings you to the fan, the Centronics port and expansion ports. There is no Reset button, so if your machine locks up you have to switch if off and on again, which is time consuming and wearing. An optional stand is available that allows you to work with the system unit on its side.

Opening up the Panasonic revealed a sturdily built machine with a steel brace stretching from front to back. Getting inside, however, proved a fag since 10 screws have to be removed before you can take off the back panel and slide the case to the front. I also found that some of the screws seemed reluctant to go back into their holes, which made the task of replacing the lid even more tedious.

The Panasonic has five 16-bit expansion slots and five eight-bit slots, three of them half-length. One of the eight-bit slots is occupied by a half-length floppy-disc controller card and one 16-bit slot holds the hard-disc controller. The display card takes up a full-length eight-bit slot. I found the inside of the Panasonic somewhat cramped compared to the Sharp when it came to installing expansion cards, largely because the opened up machine still had four sides to it rather than three.

Panasonic has fitted a BIOS ROM made in Japan by its parent company, Matsushita. A slot for a numeric co-processor is provided close by. The power supply is a substantial unit, rated at 220 watts, which should be enough to provide for most eventualities, even when the machine is stuffed with expansion cards.

NORTON RATING

The Panasonic ran all the software we threw at it, including Sidekick, Lotus 1-2-3 and Flight Simulator. It performed equally well in the Norton Utilities Sysinfo test, producing a rating of 5.7 when running at 6MHz and 7.7 running at 8MHz — the same figures as those produced by the Sharp. The Basic Benchmark tests also gave the same speeds as the Sharp: 4.7 seconds when running at 8MHz and 6.9 seconds running at 6MHz. However, the Panasonic's discs appear more sluggish than the Sharp's. The Panasonic's timing for the Bagshaw Benchmarks were 139.9 seconds for the hard disc and 322 seconds for the floppy.

The Panasonic's documentation comes in the form of a single, compact ring-bound manual. I found it a little less clearly laid out and slightly less well explained than the information provided by Sharp, but it did have a useful section for advanced users allowing you to set the machine up quickly without having to wade through pages of intricate detail. A *DOS Reference Guide* and *Basic Reference Guide* are available as options in addition to the *Operations Reference* guide we saw.

CONCLUSIONS

■ Both the Sharp PC-7511 and the Panasonic FX-800H offer a substantial capacity and good processing speed at a reasonable price. If you are looking for an up-market AT clone from a recognised name either of them should fill the bill.

■ The Sharp is the better looking of the two machines, and it also wins out when it comes to installing expansion cards. However, the need to turn the machine off before switching the processor speed is an irritating design fault.

■ The Panasonic provides a few little extras, like the cursor pad and clock-speed indicator, which make it feel a more luxurious machine; the ability to switch speeds from the keyboard is also a convenient feature. However, installing expansion cards is more fiddly than on the Sharp, and I sorely missed a Reset button.

■ In terms of performance there is little to choose between the machines, so detail differences may determine your choice. PC

ORATOR
NOW HEAR THIS

By Steve Malone

With its associated software, this plug-in card allows your PC to serve as a voice and data telephone terminal while you get on with your usual applications.

Wouldn't it be nice if all the telephone answering machines, telexes, fax machines and word processors that clutter up a modern office could be bundled into a single package? The Orator from Lion Systems attempts to do just that. The package consists of a plug-in card known as the Link, plus software for the IBM PC and compatibles, and has the ability to transmit and receive both data and voice signals.

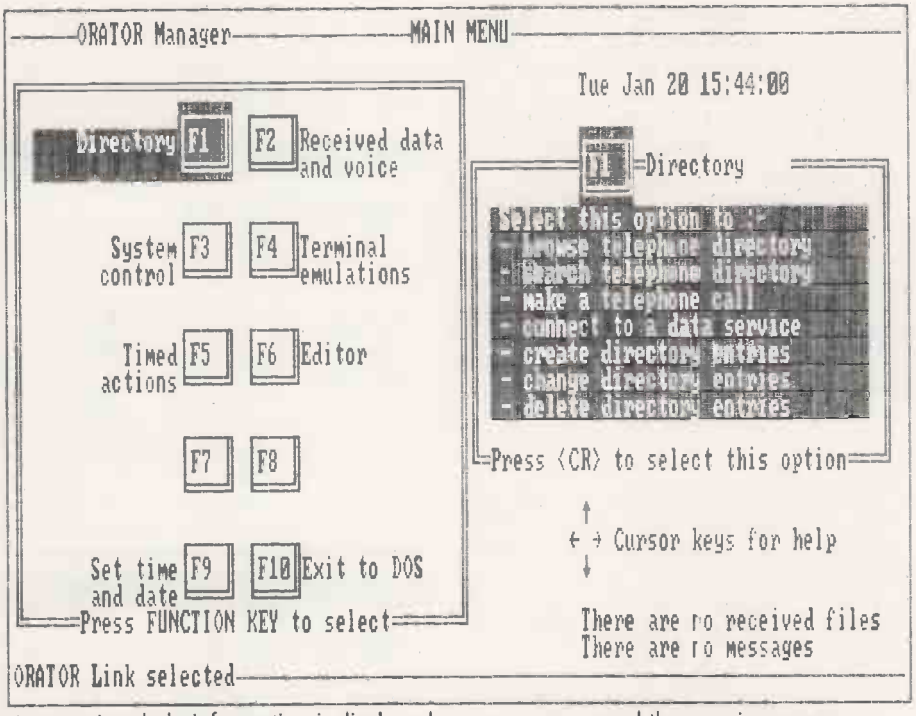
Orator is manufactured by Lion Systems, a company which specialises in corporate networking systems. Lion has decided to use its expertise in digital signal processing to produce a device which takes advantage of current movements towards ISDN systems, in which digital signals are routed through ordinary voice-quality phone lines.

The Link board is two-thirds normal length and is totally enclosed in a blue plastic case. It fits into any eight-bit PC slot, but because it contains two circuit boards it is rather thick and may encroach on an adjacent slot. The back of the card has two interfaces. One leads to the cable which fits into a standard BT telephone socket. The other is a socket for the telephone handset provided by Lion. The Orator software dials automatically, or you can dial manually from the numeric keypad.

Orator's facilities are controlled by a menu-driven program known as the Manager. Lion says that the philosophy behind its design has been to minimise the number of keystrokes, and to that end it makes heavy use of the function keys. In particular, the designers wanted to avoid the use of QWERTY keys, which many managers and other potential users of Orator may be unused to.

The software can be installed for either floppy- or hard-disc machines. The installation process modifies the Autoexec.Bat file to run Manager on power-up. While Manager and Orator can be used as stand-alone applications, they are primarily intended to operate in the background.

When Manager is up and running it remains as a background process, monitoring Orator for incoming calls and supplying any appropriate response. In the meantime, the operator can be getting on with something else, such as word processing or data entry. In this respect Orator resembles Crosstalk in being able to sit in the background and monitor the traffic on a modem, only coming into action when required.



Appropriate help information is displayed as you cursor round the opening screen.

When voice or data information arrives a message appears over the application informing you of modem activity. If you wish you can then switch directly into Manager without quitting the application. Pressing Control and Alt together with the + key on the numeric keypad invokes Manager; to return to your application you press the same key combination again.

HELP DISPLAY

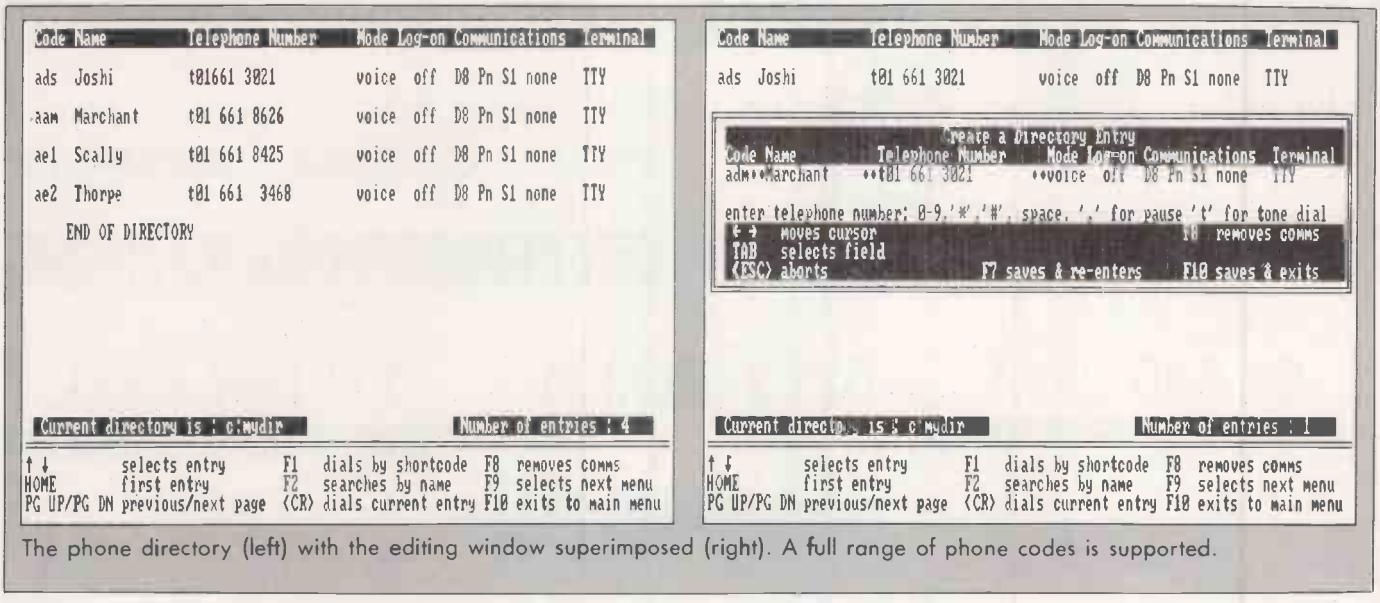
Within Manager, eight of the function keys are displayed on-screen, together with their titles. As you move the highlight around the function keys a separate window displays help and other information about the key. Lion says that it is possible to use a mouse to move the highlight around the screen, although we were unable to test this in practice.

Much of the user's interaction with Manager is likely to be concerned with setting up outgoing data or voice calls. Manager includes multiple directories for storing names and telephone numbers, and can autodial a selected number. The multiple directories allow each directory to remain a manageable size, and permit updates to be made conveniently. In an organisation with a number of Orator-based computers, it would be possible to perform updates automatically from a central machine.

New directories can be created via a sub-menu, accessed from the f1 key. Orator allows you to find a particular directory entry by using a three-letter short code. You can also locate an entry by the full name, or the first few letters of the name.

Directory entries may be matched to the dialling routine of your PABX system by adding the number to obtain an outside line, including a pause before dialling the external number, and so on. The system will also accept special characters such as those used to place a caller on hold. Orator can be configured specifically to a number of PABX systems. Many of Orator's codes follow the Hayes protocols, though full Hayes compatability is not essential as Orator comes with software included.

The logging-on procedure for public databases such as Prestel or Telecom Gold can be automated under Manager, so that passwords are entered without assistance



The phone directory (left) with the editing window superimposed (right). A full range of phone codes is supported.

from the user. The log-on procedures can hold a maximum of 256 characters each.

Manager will support a wide range of communications protocols, including V-21, V-22, V-22 bis and V-23, allowing you to access all the currently available public databases and electronic mail services. Elements such as stop bits, parity checking and data size can be set by the user to meet the requirements of individual systems. Orator can also be used as a remote terminal to a mainframe. Manager can currently emulate VT-100 and TTY terminals, and Lion says it is currently working on 3270 emulation for the device.

If your PC is fitted with a battery-backed clock, Manager can be used to initiate activity at a preset time. For example, you could set Orator to look in your electronic mailbox and retrieve any messages half an hour before you are due to arrive at the office. When you then enter Manager the information will be there, waiting to be examined. Likewise, Manager can transmit data at a preset time. You can then take advantage of cheap-rate email or send information to other computers, perhaps on the other side of the world, which are only online at some ungodly hour.

VOICE CALLS

One of the most intriguing aspects of Orator is its ability to store and transmit voice signals. Incoming calls can be date stamped and stored on disc, and Orator can store and transmit spoken messages. By combining these facilities Orator can be made to emulate a standard telephone-answering machine.

Although the problems of voice digitisation have largely been solved, the efficiency of the sampling and storage are still important factors when it comes to producing a workable machine. In Orator, the sampling is done by recording the frequencies across 10 bands 8,000 times per second. Compression algorithms, including pause compression, condense the information before it is finally stored on disc. We found that an incoming message of 13.4 seconds produced a file 16,238 bytes long, which is an acceptable length for current disc capacities.

While this sampling is not of the highest quality, the system still requires two processors to be fitted on to the Orator Link board. A TMS-320 running at 19.6MHz handles modem acceptance and the digital signal processing for voice storage. Input/output, downloading and modem transmissions are the province of a separate 8051 processor. The resulting speech, when played back, is not exactly high fidelity, but it is comprehensible and does not sound much worse than some of British Telecom's normal transmissions.

SPECIFICATION

Description: general-purpose voice and data communications package
Hardware: Orator Link plug-in board and telephone handset
Software: Orator Manager
Hardware required: IBM PC or compatible with 256K RAM, two disc drives and MS-DOS 2.0 or higher
Terminal emulation: VT-100, TTY, viewdata
Data-transmission modes: V-21, V-22, V-22 bis, V-23
Voice digitisation: digital conversion at 8,000 samples/second
Price: £795
Manufacturer: Lion Systems Developments Ltd, Oxford Road, Stokenchurch, High Wycombe, Buckinghamshire HP14 3SX. Telephone: (024026) 3951
Available: now

The capabilities of Orator raise the prospect of remote access allowing, say, an executive with a home-based PC to pick up telephone messages and data from a machine operating in the office. This kind of setup is obviously open to abuse, but Lion says that its system can be fully password protected.

With its multiple communications facilities, Orator fills a pressing need in the office-automation sphere by bundling the functions of several separate machines into a single package. Lion Systems says it has plans to add fax emulation towards the end of this year.

Many of Orator's possible applications, like viewdata and email, are self-evident; others require a little imagination. For example, it will be possible to send a document over a communications link along with spoken annotations. Once the possibilities of the Orator have been demonstrated it should become a popular add-on for corporate users. It should also be a gift to dealers and value added resellers, who will be able to set up a PC and Orator with specific directories and passwords for different businesses.

CONCLUSIONS

- Lion Systems has used its experience in digital communications to produce a full plug-in integrated work station.
- Orator is capable of storing and transmitting both voice and data communications, and can perform timed actions. It can therefore emulate a wide range of office machines, including telex, videotext and telephone answering machines.
- The menu-driven software makes it easy to use Orator's wide range of features, though a mouse-based interface might have been even better.
- Orator is well placed to fill an important gap in the area of office automation. It is up to Lion to market it effectively, and for businesses to realise its potential. PC

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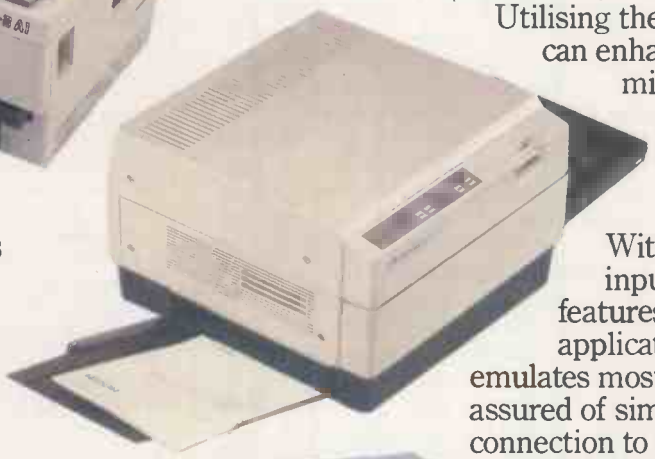

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GUIDE
TWO-DIMENSIONAL TEXT

By Glyn Moody

By hiding detailed text behind key words or phrases this package lets you create interactive and highly flexible documents on the Macintosh.

Written text is sequential: producing it requires you to order your thoughts one after another. Unfortunately the brain is not so sequential, and much of its power and creativity arises because from any idea it can leap off in a hundred directions.

A couple of years back there was a spate of programs with names like Thinktank and Brainstorm, which claimed to let you mimic your thinking processes on a micro. What they actually did was allow you to organise your ideas in a series of nested structures. They were simply outliners which let you step back from the detail to various levels of higher structure. Guide, a so-called "hypertext" program from Office Workstations Limited makes an attempt to go further along the same route. The program proves to have some genuinely innovative features. It runs on the Apple Macintosh and costs £135.

The basic idea is to set up cross references between words or groups of words. For example, a word can be expanded, just as with the outline processors. But Guide does more. It lets you use these expansions in an interactive way, with a range of choices at points in the text. Guide also allows you to use graphics as either the starting or finishing point for these cross references.

A typical Guide document might consist initially of just section headings. Each heading could then be expanded to text and images. Within each section there might be other headings, cross references, notes and more graphical images hidden behind key elements of the text that are known as "buttons" in Guide terminology.

Four types of button are available: Replacement, Inquiry, Reference and Note. A Replacement button can be a word or phrase or image. When you click the cursor over it the button is replaced with more text or images. They in turn may have further buttons within them, and the process may be continued to many layers of nesting.

An Inquiry button is a series of mutually exclusive reference buttons. Choose one and it expands, while the others disappear. This allows you to set up documents interactively. As you move through them, your choices determine the subsequent on-screen appearance and structure. The Reference button takes you to a different part of the same document or even to a different document. This lets you set up complex linkages among files. The Note button causes a window with a note to appear while the mouse button is held down.

For any system of this kind to work properly, it must do two things. It must allow documents written using these complex cross references to look almost the same as straight text; any distracting complications will put the reader off. But it must also be able to signal the presence of interactive elements within the text.

Guide does this in two ways. First, all buttons are highlighted. The defaults are that Replacement and Inquiry buttons appear in bold, Reference buttons in italics and Note buttons underlined. You can alter this highlighting scheme if it does not suit you.

Secondly, the cursor changes as it passes over the text areas defined for these buttons. Over Replacement and Inquiry buttons it takes the form of a pair of cross-hairs in a circle. Clicking this cursor calls up the replacement text, in which the cursor takes the form of a square; clicking again condenses the replacement back to the button. Over Reference buttons the cursor turns into an arrow, and over Note buttons it becomes an asterisk. You can make buttons even more obvious by using one of the pull-down menus to display special signs around them in the text. Although this is distracting for readers, it is a necessity when creating and editing buttons.

Buttons are created by selecting text or graphics, then using the Make menu to choose the type of button required. If you choose Replacement, the button is replaced by a temporary place holder. You must then enter the replacement text that you want this button to call up. You can either do this directly by typing, or by cutting and pasting in the standard way.

One of Guide's great strengths is that the replacement can be an image. For example, if the button is the word "chart", clicking on it could call up the chart itself. Similarly the button itself may be an image — say a map — which calls up more detailed images, according to where on the first map you click.

To create an Inquiry you simply select a group of mutually exclusive buttons, move to the Make menu and choose Inquiry. Thereafter choosing one of the buttons of that group calls up the replacement text and removes the other's buttons. This feature could be used in a document meant for different groups of people. For instance, by creating an Inquiry with buttons headed Management and Sales you could create two different paths in a memo, each one tailored for its particular intended readers.

References are slightly trickier to set up. You must define both a reference and a reference point, selecting text or graphics, and then use the Make menu. References can be made to outside documents; I found that the program required the user to open the document before it would read it in, though Office Workstations says this is not normally necessary. To get back to the point of reference you click on a small chevron placed above the scroll bars.

It may happen that you want to edit the buttons you have created. There is a problem here because the normal way of editing text is to move the cursor to the point in question, then click before entering or

SPECIFICATION

Description: an extended outlining program which allows cross references to be set up between different parts of a document
Copy protection: none
Hardware required: Macintosh or Mac Plus with at least 512K RAM; hard disc advisable
Price: £135
Publisher: Office Workstations Limited, 5 Abbeymount Techbase, 2 Easter Road, Edinburgh EH7 5AN. Telephone: 031-652 2235
Distributor: McQueen, Elliot House, 8-10 Hillside Crescent, Edinburgh EH7 5EA. Telephone: 031-558 3333
Available: now

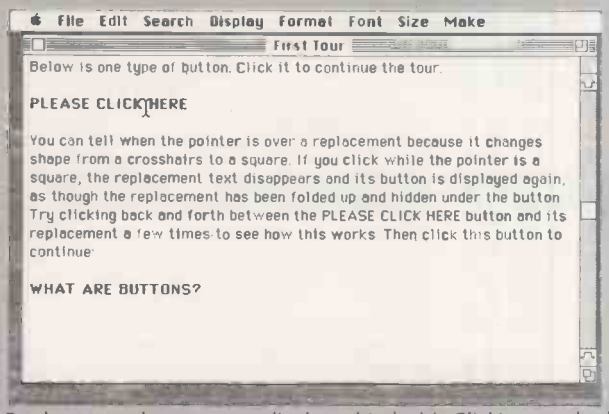
GUIDE

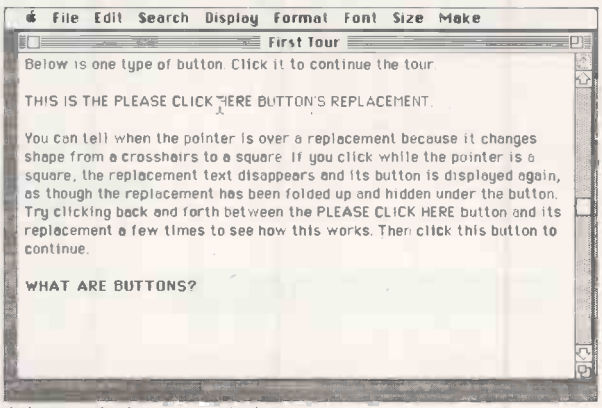
PC VERDICT

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

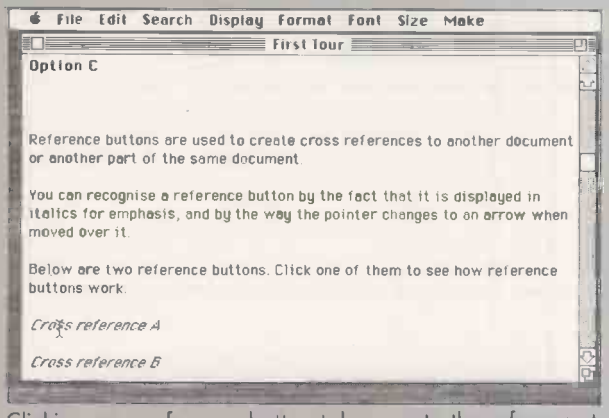
☐ A genuinely innovative product — and a useful one for certain applications.

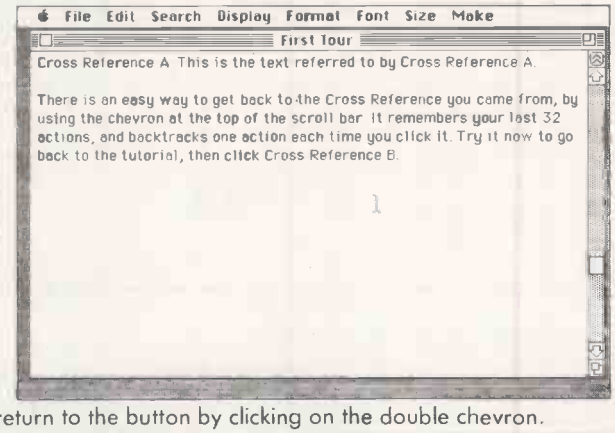
USING GUIDE





Replacement buttons are displayed in bold. Clicking on the button (right) reveals the expanded text.





Clicking on a reference button takes you to the reference text. You return to the button by clicking on the double chevron.

amending text. Clicking within a button will simply cause that button to be activated. However, a special command called Freeze, available on the Edit menu, allows you to turn off Guide for the moment and carry out the editing in the normal way. You can then unfreeze it. It is also possible to collapse down text you have entered into a Guide document so that it is hidden under a Replacement button.

On top of all these button-based features, Guide has most of the functions of a word processor. Thus there are search and replace facilities, fount and type size variations, together with on-line help. If sections containing buttons are moved or cut, the associated text and graphics are moved or cut too. There is also an option to save Guide files in a word-processing format so that they can be used with Macwrite and Aldus Pagemaker among others.

Apart from the Reference button, Guide is very easy to set up. In operation it is very swift, especially for a 126K program. The way it brings up graphic images in the middle of text is especially impressive. But the sheer power of the program is almost its undoing. The structures it is capable of setting up can be as complicated as you wish; the difficulty is keeping track of the levels of nesting, the cross referencing and the alternatives available using the Inquiry option.

Office Workstations could improve its product by introducing some way of signalling the overall structure. For example, small figures could indicate the current level of nesting. Alternatively, it would be useful if a small map of the entire document were available with a signpost saying "you are here". Failing such upgrades, users can make things much easier for themselves if they keep it simple. For all Guide's power, it does not lend itself to immensely complex structures unless you are a fan of three-dimensional chess.

Interactive documents are one obvious application for Guide. They might be used for teaching in schools and universities, or for help sheets, repair manuals and so on. They would allow the user to pull out just the information required, without having to search through reams of irrelevant facts. To encourage software houses to use Guide for on-line help, Office Workstations provides the Miniguide desk accessory which allows users to access — but not alter — Guide files from within other programs.

Managers could also find Guide useful for setting up personal files with numerous satellite documents, and for sending out interactive memos, or memos designed for the needs of several different groups of people. Another potentially valuable area of application is email. If you receive a Guide document you can easily get the general picture first and then, if you wish, refer to more detailed information that can be hidden behind the buttons.

Guide is not a perfect product but it may be a pointer to the way information will be handled in the future. Its links to information behind the document are closely akin to the formulae in spreadsheets, and the button approach has an obvious similarity to pop-up programs. Both of these concepts have been great successes in recent years. Another recent development may be significant: interactive compact discs (CD-I) let you store huge quantities of data and structure it intelligently, just as in Guide. By applying Guide-like techniques it would be possible to create giant interactive databases, cross-linked in a multitude of ways, to overcome one of the main drawbacks of CD-ROMs — the fact that there is too much data and too little structure.

CONCLUSIONS

- Guide is a interesting extension of the word processor and outliner ideas.
- It is mostly easy to set up, though it becomes harder to use with increasingly complex applications.
- Although its appropriateness for the general user is less clear, for tasks like training its interactive and graphical abilities make it a powerful tool.
- The price is moderate considering the product's high level of sophistication. PC

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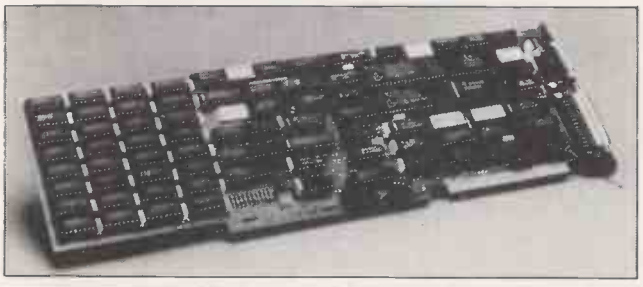

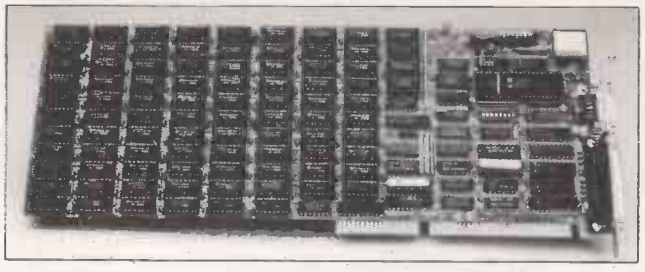

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LIGHTNING & MICROCACHE
DISC CACHE UTILITIES

By Ian Stobie

By setting aside an area of memory to store the most frequently used chunks of data from disc these utilities can speed up your disc operations dramatically.

Disc cacheing programs use a different approach to the disc optimiser utilities reviewed last month, but the object is the same: to speed up your existing disc drives. They are really more sophisticated versions of a RAM disc. Like a RAM disc they work on the principle that reading from RAM is much faster than reading from disc. But with a RAM disc you set aside an area of memory simply to emulate a disc, and you do both reads and writes to it.

This approach is too risky for many applications. Unless you save your simulated disc in memory to a real disc at the end of a session you lose data when you switch off, and you are obviously vulnerable to accidental power failures. A cache is fundamentally safer as you only read from it. Any writes are made straight to a real disc if they involve a change in data. You can still get big speed improvements because many applications repeatedly read in the same information from disc. Cacheing programs also score because they are generally much easier to use than a RAM disc. Once you have specified the cache size and set the program running you can forget about it.

The key component of a cacheing program is the routine which decides what data to put in it. Most programs simply fill the cache with the most frequently accessed sectors of the disc, but some also attempt to predict what you will do next — for example, by pulling in sectors surrounding much-read areas.

Microcache and Lightning both work with either floppy- or hard-disc systems; in fact the slower the disc the greater the potential for improvement. Lightning is available in two versions from different sources. We reviewed the package supplied by Ideal Software; it costs £99 and is not copy protected. The version supplied by Gecas is nearly £30 cheaper, but it is copy protected.

To install the unprotected version you simply copy Lightning across to your system disc, be it Winchester or floppy, and then type L followed by the buffer size. After displaying a brief message which confirms that it is running, Lightning returns you to the MS-DOS prompt. You can then run any of your usual applications in the normal way, leaving the cache in operation on all your disc drives.

Microcache takes slightly longer to install, as it asks you a lot of fairly dumb questions. Each distribution disc carries an individual serial number, but discs are not physically

SPECIFICATIONS

LIGHTNING

Description: disc cacheing program
Hardware required: IBM PC, PC/AT or compatible with at least 128K of memory; supports up to 1.5Mbyte of additional memory provided by boards conforming to the LIM standard
Copy protction: none
Price: £99 from Ideal; copy-protected version available for £70 from Gecas
Publisher: Personal Computer Support Group Inc.
U.K. suppliers: Gecas Business Computers, 249 Cranbrook Road, Ilford, Essex IG1 4TR. Telephone: 01-518 5322. Ideal Software, Tolworth Tower, Surbiton, Surrey KT6 7EL. Telephone: 01-390 6722.
Available: now

MICROCACHE

Description: disc-cacheing program
Hardware required: IBM PC, PC/AT or compatible with at least 256K of memory; supports up to 4Mbyte of additional memory provided by boards conforming to LIM, AST/Qudram/Ashton-Tate or IBM XM standards; versions also available for Apricot and Sirius machines
Copy protection: none
Price: £125
Publisher: Microcosm Research, 26 Danbury Street, London N1 8JU. Telephone: 01-226 9092
Available: now

(continued on next page)

BUFFERS

If you have MS-DOS version 2.0 or above you already possess a rudimentary cacheing system. To get the best from it you need to tinker with the Buffers command. MS-DOS uses a number of different buffers into which it reads data in large chunks, whole sectors at a time. Each buffer may well hold several records. Each time your application program does a read, MS-DOS first checks to see if it already has the record in memory in one of its buffers. Only if it is not already there does MS-DOS actually read from the disc, overwriting the least recently used buffer. This mechanism is therefore a simple but genuine cacheing system.

Left to its own devices MS-DOS uses just two buffers, which does not give you much scope for speed gains. But you can specify more buffers, and it probably is worth doing so. More buffers should give you more speed, though of course they use up memory. MS-DOS allows you up to 99 buffers. Given the relatively crude way it allocates the space there is not much point in going too far; you may be better off leaving more memory for the application itself. It is largely a matter of trial and error.

Many application packages carry somewhere in their manual a recommended setting for Buffers to give optimum performance. In the absence of such a recommendation we generally run our systems with Buffers set to 20, increasing it to 40 for particularly disc-intensive applications. To do this you add the line

BUFFERS=20

or whatever number of buffers you want, to the Config.Sys file. This file probably already exists in your root directory, but if it does not you can create it using the MS-DOS Copy command, or set it up as a straightforward one-line ASCII text file using a word processor. That is all you have to do.

To give an indication of the effects this can have we set up a short benchmark program. With Buffers set to the MS-DOS default value it took 16 seconds to copy a small file backwards and forwards a number of times between different hard-disc directories. With Buffers set to 99 the time fell to 10 seconds. Using the same benchmark to copy between a floppy and the hard disc the gain was more spectacular, the time falling from 31 seconds to 17 with the same change in Buffer setting.

(continued from previous page)

protected, so you can reinstall the program if you have an accident with your hard disc.

The speed improvement you get with these utilities depends on both the buffer size and the sort of application you are running. Many people now have plenty of unused memory available, and Microcache scores over Lightning by allowing you truly enormous caches of up to 4Mbyte and working with a much greater range of memory-expansion boards. The best applications for cacheing are those which continually reread the same data without altering it: a graphics program displaying a carousel of repeating images for example, or a stock-control or billing program which often fetches the same data.

Lightning comes with an interesting demo program that reads at random from a file containing 320 128-byte records. You can toggle Lightning on or off while the demo is running and watch a readout of the number of records read. For the first few seconds Lightning makes little difference, but the speed then improves dramatically as more of the records are found in the cache. On an IBM PC/XT we found that the speed stabilised at about 55 records a second with Lightning on, as against eight per second using the hard disc uncached. This was with the 60K cache that Lightning sets up by default. The gain was even more spectacular on an Epson PC AX. Here the demo showed a 10-fold speed increase to 177 records a second using the cache, as against 17 a second uncached.

We tried both Lightning and Microcache with our standard disc-performance test, the Bagshaw Benchmarks, which include both random and sequential operations, and writes as well as reads. The speed again was more modest than with the Lightning demo, but still worth having. Running the Benchmarks first on the uncached hard disc of the XT produced a figure of 175.4 seconds. This fell to 145.2 seconds with Lightning in operation and 118.5 seconds using Microcache. We used a 128K cache in both cases, though cache size made little difference with this particular application. We had Buffers set to 20 when we obtained these Bagshaw Benchmark timings — see the box above.

LIGHTNING

PC VERDICT

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

☐ An effective speed improver that makes most sense if you use floppies or do heavily disc-intensive database tasks.

MICROCACHE

PC VERDICT

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

☐ Slightly quicker than Lightning but costs more.

It is not surprising that Microcache emerged the faster of the two programs, as it attempts to improve performance during writing as well as reading operations. It does this by putting the record you want to write into the cache and then returning control immediately to your application. It then waits until the system is busy but underutilised before it actually writes the record to disc. There is a small risk that a power failure could occur before Microcache gets round to performing its background write, but only one record is at stake as opposed to a whole session's worth of work as in a RAM disc. If the writing speed-up facility does not appeal to you in a particular application you can disable it, and Microcache will still function as a conventional cacheing system.

For another comparison between the two programs we tried out Lightning and Microcache using the same file-copying benchmark to check out the effect of different Buffer values. This incidentally demonstrated that the speed gain provided by these programs is additional to that obtained by altering the Buffers command. With Buffers set to 40, and using the Epson AT clone, the test took 15 seconds to run on the hard disc with no cache in operation. Lightning improved this to seven seconds and Microcache took just six seconds. When copying between the Epson's floppy and its hard disc, Microcache increased its lead. Uncached our test took 26 seconds, falling to 17 seconds with Lightning and nine seconds with Microcache.

The improvements brought about by these utilities while running real application programs are well worth having. We used both cacheing programs in a variety of applications, finding the speed gain particularly noticeable in real heavyweights like VCN Concorde running a carousel picture display, or Ventura Publisher. The ideal application is probably a database or accounting program which continually checks transactions against a limited body of data held in a fairly static file.

CONCLUSIONS

■ Unlike the disc-optimisation programs we tested last month, both cacheing products we looked at gave real speed improvements.

■ Microcache was slightly quicker and allows you very large cache sizes, but it is also a little more expensive than Lightning. Neither program was at all difficult to use, though Lightning has the edge here.

■ Before buying a cacheing program you may find it worth playing around with the MS-DOS Buffers command, as worthwhile performance improvements are possible this way. PC

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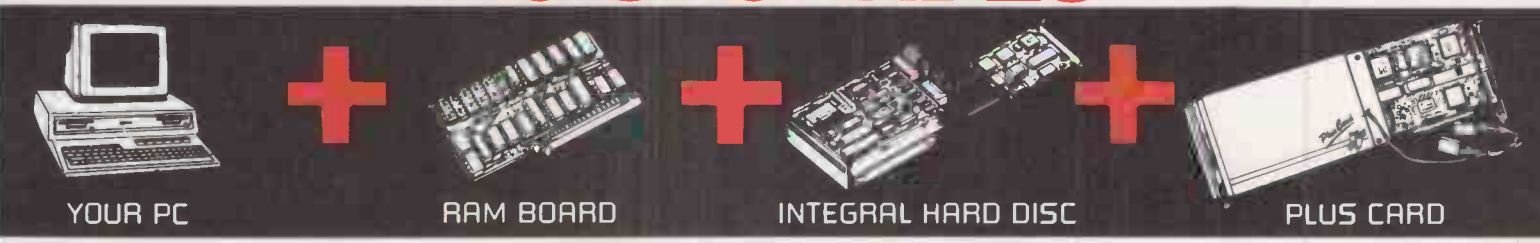

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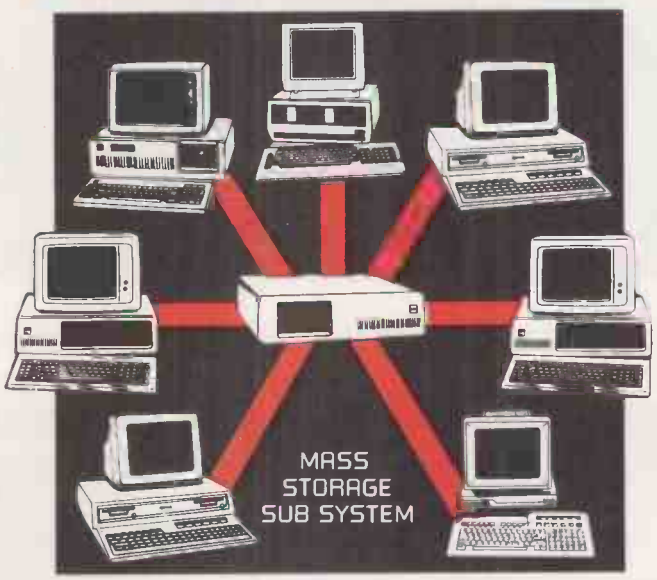

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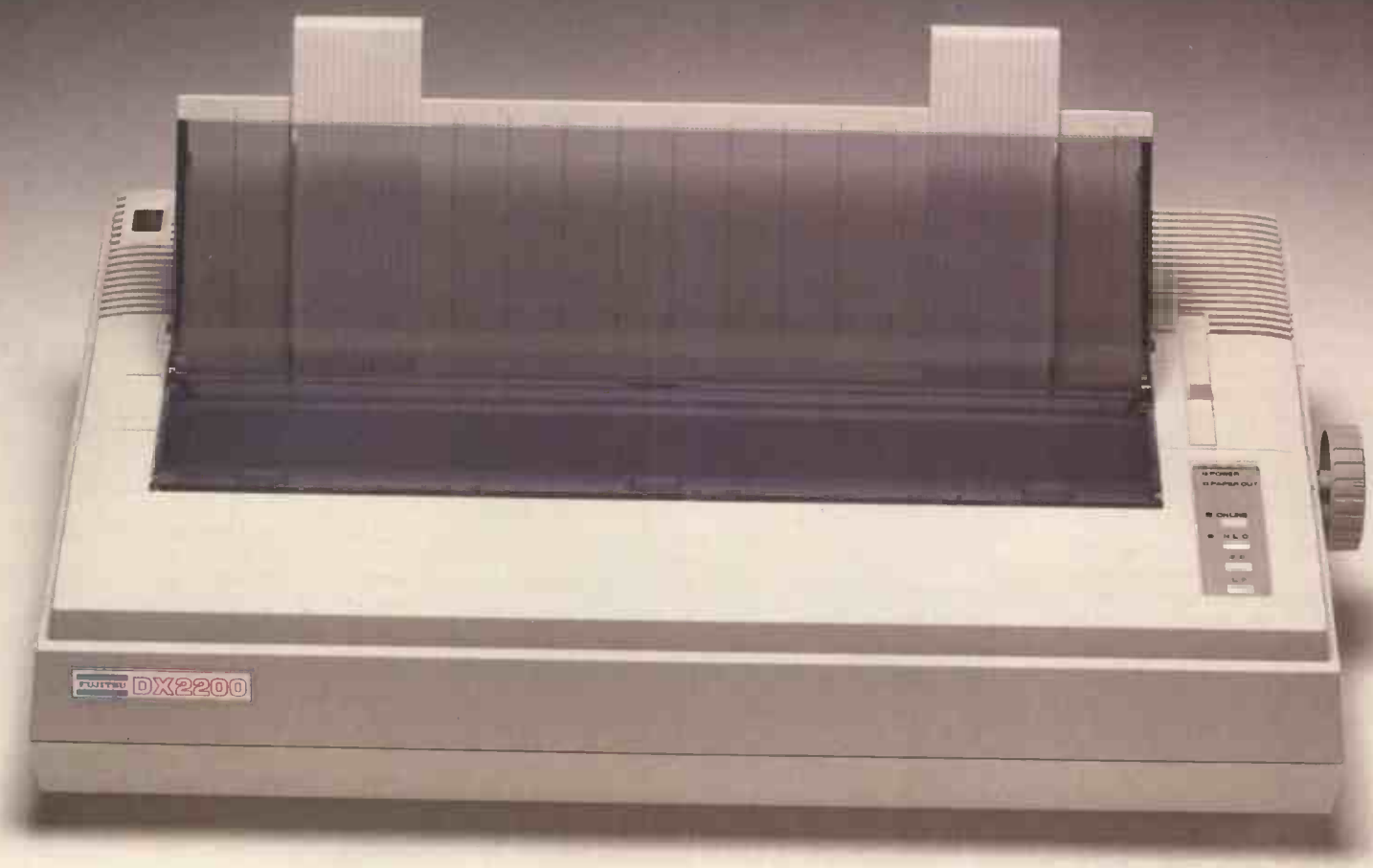

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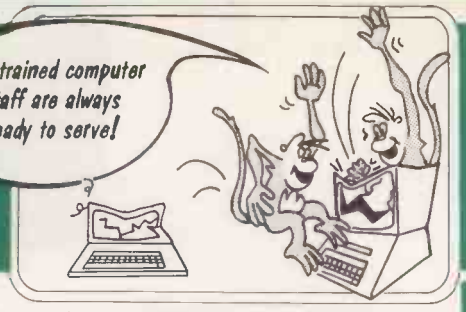

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ABILITY & ABLE ONE
CHEAP ALL-IN-ONE PACKAGES

By Steve Malone

Cheap integrated software packages are now arriving to go with the budget-priced PC clones.

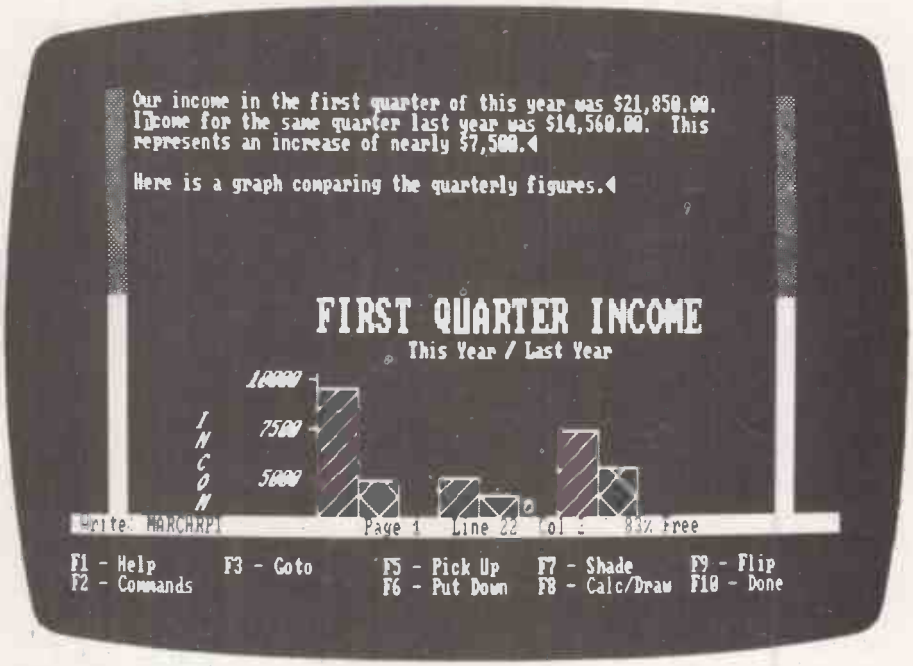
To the new owner of a budget-priced IBM compatible, integrated software must be tempting option. Instead of having to make several decisions on which applications to go for and which particular program to choose, the customer can buy a single program which does everything — often for the price of a single application. It is therefore unsurprising that a number of low-priced integrated packages have recently appeared on the shelves.

Ability from Migent is typical of the kind of integrated package currently struggling for the attention of new PC owners. The program contains all the major applications usually associated with business packages: a word processor, a database manager, a spreadsheet, communications and presentation graphics. With that lot on board you might think 640K would be the minimum requirement for such a program. In fact Ability will run in 256K of RAM, although this can be a bit of a tight squeeze in some circumstances.

Ability is supplied on four discs called System Master, Help, Ability Tutorial and Presentation. As with nearly every integrated package a hard disc and the ability to copy all of the program are virtually essential; otherwise you spend much of your time waiting for disc access or changing floppies.

Running the program displays the system master area known as the library screen from which you choose a particular application or run DOS-like utilities. At the top of the screen there is a list of the available applications, and underneath each heading is a list of files for that application together with a New option should you wish to open a new file. You move between the various files by using the cursor keys on the numeric keypad. If you have a mouse driver installed this will work too, although we found the mouse pointer to be somewhat unstable.

You choose commands and utilities by pressing the appropriate function key. Commands not available at the top level are accessed in a similar way in a series of sub-menus. One of the nuisances about Ability is that once you have reached the bottom of the menu tree and selected the command you require the program may not send you back to the top menu level. This means that having issued the command you have to work back up through the sub-menus by repeatedly pressing the Escape key.



Ability allows you to incorporate charts from the Graph program into its word processor.

When a program fits all of the major business applications into 256K it would be unreasonable to expect to get all the functions available in a dedicated program. Nevertheless, Ability can do some impressive things with the resources it has. To begin with, once a file has been loaded, a copy is retained in memory even when you have quit the application. So if you want to reload the file, much of the data is still there, although the program still has to look at the disc to reload the application.

Another feature is the Flip command, accessed from f9. When you press this key the program jumps out of the current screen and into the previous one. For example, if you are word processing you can jump back to the library screen, rename a file and jump back to the word processor. Of course, all this is dependent on the amount of memory that you have. A bare 256K will not allow you to keep many file images in memory. All the same, it is clear that Ability's programmers belong to the dying breed to whom making economical use of memory is still an important consideration.

The word-processing module of Ability, called Write, is typical of the program's applications. Like the Library screen it offers a list of commands from the function keys. Many of them like the f5 Pick Up, f6 Put Down and f7 Shade Area commands, remain the same between the applications. Other keys, like the f2 Other Commands option, vary in their function.

One thing you will notice from the list of key assignments is that the programmers have attempted to give the keys descriptive names. Thus Shade Area marks a block, and Put Down copies the block to the cursor position. Now maybe we are getting a bit too old, but labels like these are only useful if they accurately describe the function. By and large, Ability's names do not. Shade Area, for example, only tells you what happens when you move the cursor on screen, not its actual function.

SPECIFICATION

ABILITY

Description: integrated package for the beginner and occasional user, comprising word-processing, database, spreadsheet, comms and presentation-graphics modules
Hardware required: IBM PC, PC/AT or compatible with 256K of RAM
Copy protection: none
Publisher: Migent Inc. of Incline Village, Nevada
U.K. supplier: Migent (U.K.), 37 Dover Street, London, W1X 3RB. Telephone: 01-499 4752
Price: £99
Available: now

(continued on next page)

(continued from previous page)

Write has a WYSIWYG display. The pages are set out within borders, and text can be entered anywhere within the area. Attributes like bold and italic appear on-screen as they will be printed. Ability also goes one stage further, and allows you to take charts created by the Graph program to be displayed on the screen as well.

Write supports nearly all the standard word-processing functions, including such facilities as margin settings, choice of printers, centring and justification. But there is no provision for line spacing, apart from the single-line default, and no automatic push-forward insert facility. If you want to insert text, you have to press the Insert key. This drops the following text down a line, providing you with space for the additional text. This was a common technique in older word processors but is hardly appropriate in a new package.

Like Write, Ability's spreadsheet is a basic system with a few surprises — some pleasant and some not. The basic worksheet is a massive 9,999 rows by 676 columns in size. The program uses data-compression techniques so that empty space is not saved with the data. The spreadsheet can also take advantage of a maths co-processor if one is fitted in your machine.

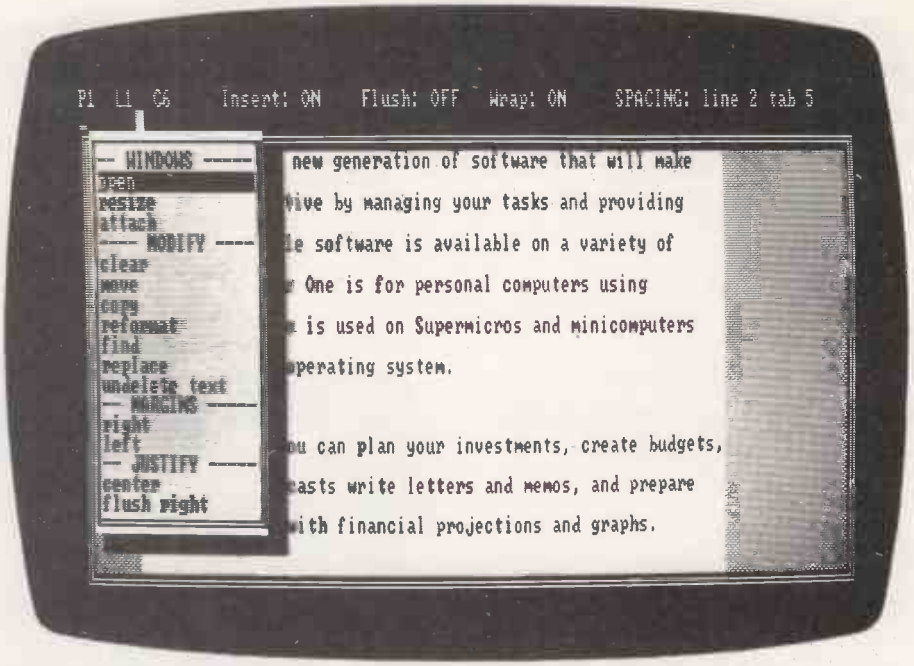
Apart from that, Ability's spreadsheet features are pretty standard, with data, formulae, labels and width settings all supported. The program also has some components which will be helpful to the beginner. Built-in macro commands perform commonly used calculations and formats. For example, the Total function adds a row or a column of numbers. The Format option includes such things as the Money command, which sets up a cell with two decimal places, commas and a currency symbol; it is spoiled by only having the $ sign for the currency symbol.

NO-NONSENSE APPROACH

In accordance with the Ability philosophy, the database takes a no-nonsense approach. You mark fields out on-screen by using the cursor keys, and name and select them with the function keys. A few bells and whistles are included — the program informs you of the length of a field, for example — but otherwise it is perfectly straightforward.

The Ability database should be adequate for the beginner or small system user who requires little more than a simple cardbox-type program. It permits keyword and field searches, as well as producing totals and sub-totals on numeric fields, but it lacks the power of more advanced relational database managers.

One of the best features of Ability is its capacity for transferring information from one application to another. This is most apparent in the Graph module. You can grab data from a single field in the database or from an area of a spreadsheet and graph it, together with labels and titles, with the minimum of fuss. This is where the Pull Up, Put Down and Flip commands come into their own, as it is these keys which are central to the transfer of data.



Able One's f9 key is overworked: 51 commands are available from the f9 WP menu.

Pie, bar and line charts can be drawn along with annotations. Up to 18 items of data can be mapped on to a single graph.

The comms package has a setup routine which allows you to adjust for a variety of mainly American modems, including the Hayes Smartmodem. There are layouts for a number of DEC terminals, but there seems to be no easy way to use Prestel-type view-data information systems as they are almost non-existent in the U.S.

The Presentation module comes on a separate disc and looks as though it was added as an afterthought. The way Presentation is implemented is quite ingenious. After running the program you go to a particular screen in one of the other applications, such as a database entry or Graph. Pressing the + key on the numeric keypad, then dumps that particular screen to disc. Several screens captured in this way can be daisy-chained together to perform a carousel-type show.

Presentation's facilities are limited by other aspects of the Ability program. There are only two colours available for each module, and the presentation part of the program is limited to what can be performed from the other utilities.

The second integrated package we looked at, Able One from Concept Data, takes an entirely different approach to Ability's. The basis of Able One is a system of windows and pull-down menus which allows you to display several different applications on-screen at once.

The opening screen struck us as a trifle unctuous. At the top is the legend "How may I help you, Customer?". If you want to personalise it you enter "My name is . . .". Thankfully the prompt only appears in the opening screen. Lower down the screen is a list of the available options. The five main applications are word processing, database, spreadsheet, communications and graphs, there is also an assortment of utilities. The options are selected by scrolling down the menu with the cursor keys to highlight the desired option.

Within an application, the pull-down menus are accessed via the function keys. As with Ability, some of the keys retain the same function across the range of applications, while others change with the application. Until you become familiar with

ABILITY

PC VERDICT

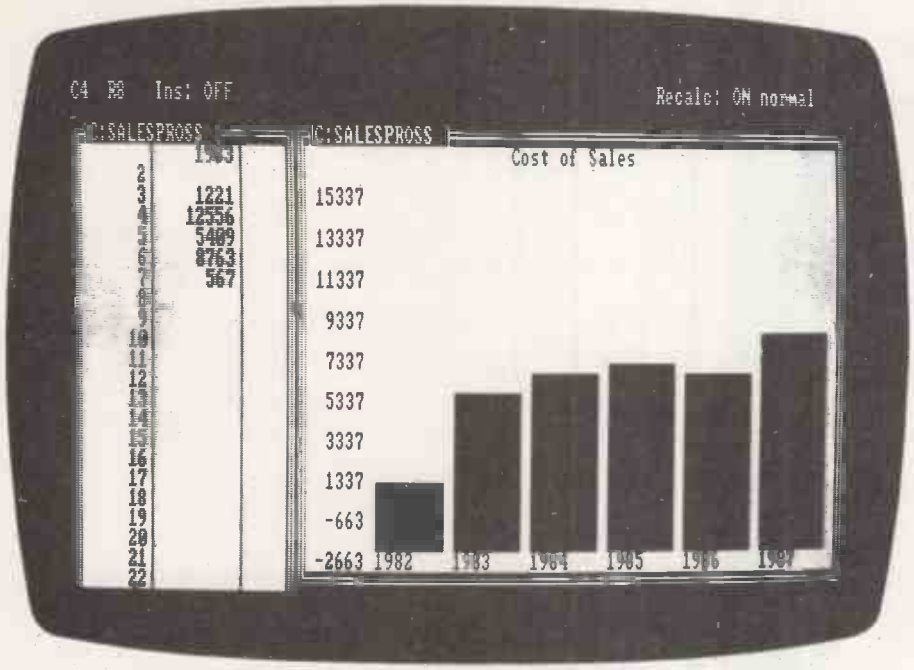
	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	■	☐	☐
Ease of use	☐	☐	■	☐
Documentation	☐	☐	■	☐
Value for money	☐	☐	■	☐

☐ A functional all-round package for beginners.

SPECIFICATION

ABLE ONE

Description: integrated package, comprising word-processing, spreadsheet, database, comms and presentation-graphics modules
Hardware required: IBM PC, PC/AT or compatible with 512K of RAM
Copy protection: none
Publisher: Able International of Pueblo, Colorado
U.K. supplier: In Touch, Fairfield House, Brynhyfryd, Caerphilly, Mid-Glamorgan CF8 2QQ. Telephone: (0222) 882334
Price: £89.95
Available: now



Charts automatically adjust when data is altered in an Able One spreadsheet.

the package, one difficulty with Able One is that there are no on-screen prompts to remind you which key does what. Quite often I found myself pressing the wrong key. Luckily, all the function-key presses require a second input before they perform any action, and if you make a mistake you can always return to the previous status by pressing Escape without any serious damage occurring.

However, most of the key assignments are easy enough to remember. For help you press f1, f3 is for Save and related functions, f10 is for disc status, and so on. Application-specific commands are on f9, although this key also holds the windowing commands that are maintained throughout the suite of applications.

The top of the word-processing screen provides formatting information such as line spacing and the document name. The word-processing area itself is delineated by shaded areas on either side. Line spacing, margin sizes and other information functions are performed via the f9 menu.

At this point it beomes apparent that the f9 key is overworked. There are 51 different commands available directly from the f9 word-processing menu, while other function keys remain distinctly underutilised. When you are editing a document you will find yourself constantly accessing the long list of f9 commands.

The program compounds this problem by requiring the frequent use of a Reformat command. Able One has the same antiquated Insert technique that makes WordStar such a pain to use. Inserting new material into existing text destroys the format of the current paragraph, and you have to do a reformat to straighten things out again. Able One does not even have the Quick command, as found in WordStar, so each paragraph had to be reformatted individually. Modern programs should be able to do better than this.

Unlike Ability, Able One does not let you put graphics directly into a word-processing document. Instead, the Attach command, which links files together, displays a symbol on the screen. This is picked up by the program at print time, allowing it to fetch the relevant information from a separate file and include it in the document.

There is a drawback to this apparently simple merge and print technique. For reasons best known to themselves, Able One's programmers decided not to provide the user with a list of popular printers. Instead they have provided a system whereby the software is configured for a particular printer by asking the user to enter, for example, the full block character code in hexadecimal pairs. This archaic method of configuration should have died out with the Apple I.

In mitigation, Able One can support two printers at once, and this limited multi-tasking extends to polling the modem for traffic. Nevertheless, an awful lot of customers are likely to be put off by the dreadful printer installation.

The spreadsheet also has some peculiarities. The default worksheet size is a mere nine columns by 23 rows — hardly enough for a cigarette-packet forecast, let alone anything serious. The numbers can be increased, and we managed to obtain an empty grid of 143 by 139, although Concept Data says only 10,000 of these 19,877 cells are addressable.

Perhaps we are too used to Lotus 1-2-3 and the like, but we found the method of inputting data a bit odd too. Instead of labelling the cells in the Lotus format of A6, B8, etc., Concept Data has chosen to use the C1R6, C2R8 system. Even odder is that the numbers are marked inside the first row and column, and can be overwritten. You have to calculate where you are from the cell address in the top corner, and to use the top row and left-hand column of the spreadsheet you have to delete the row and column numbers. The other non-standard thing about the spreadsheet is that data and formulae are entered directly into the cell rather than on a command line.

No modern spreadsheet is complete without some method of graphing included, and here Able One's windowing system shows itself to advantage. As in the word-processing module, transfers of data from spreadsheet to graph are performed via the Attach command. Once the link between the graph and the spreadsheet has been made, any change in the graphed fields on the spreadsheet will immediately alter the shape of the graph. By displaying the graph and spreadsheet simultaneously in different windows you can work on the data and see its effect on the graph.

The Able One database manager is more powerful than the Ability equivalent as it provides the capability for a fully relational database. The drawback is that it is somewhat more complicated to use. To create a database you have to resort once again to a long list of f9 commands. The template fields are set by putting square brackets round the number of characters, the key for whether they are alphabetic or numeric, and whether their field is a primary. Once the field has been set you are ready to enter data.

Relational databases can be constructed by specifying master and transactional data items. You can also link, calculate and attach data items to other files. It was probably inexperience in using the database manager that was the cause, but we managed to lose some data items on one occasion and hang up a database after modifying the template on another.

The communications facility provided with Able One only has American modems on its options list, and lacks a Viewdata facility. However, if you have a Hayes modem and a Telecom Gold subscription it should work fine.

ABLE ONE

PC VERDICT

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

☐ An ambitious program marred by its failure to address end-user requirements.

CONCLUSIONS

■ Ability is a good all-round beginner's package. It lacks a number of advanced features but provides an adequate if limited suite of business software.

■ Able One has pretensions to being an advanced, high-quality product at a low price. But you need to be an advanced user to get on with it.

■ There should be a large market for cheap integrated packages such as these. PC

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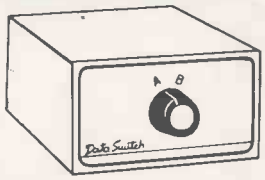

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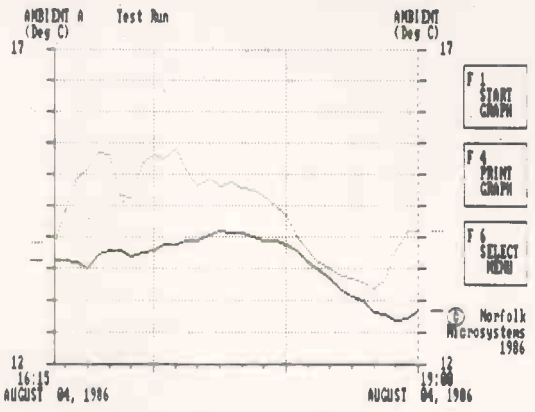

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MEMORY
* 512Kbytes RAM (520ST-M, FM)
* 1024Kbytes RAM (1040ST-F)
* 192Kbytes ROM
* 128Kbytes external plug-in ROM option

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 bsud
* 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

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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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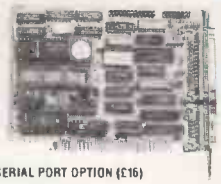

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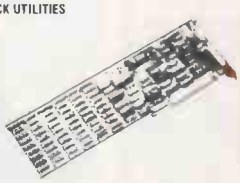

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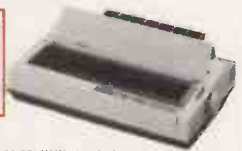

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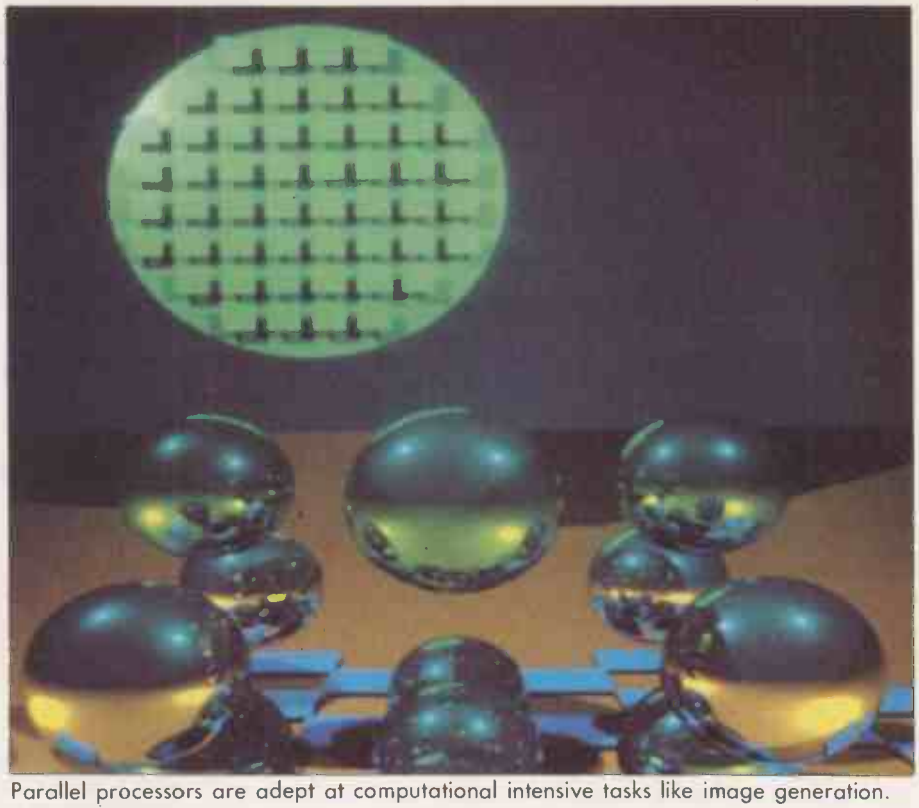


Parallel processors are adept at computational intensive tasks like image generation.

ALL TOGETHER

The most modern systems work so fast that their performance is limited by the time it takes electrical signals to pass through their circuits. **Glyn Moody** looks at the possibilities offered by an approach to computer architecture that differs radically from conventional designs.

Rapid technological change in the computer world continues unabated. What was considered a mainframe 10 years ago became a mini five years back and is now likely to be a desk-top micro. And yet in the 40 years or so of the industry's existence, the basic design philosophy behind nearly every computer has remained unchallenged. The micro that now sits on your desk works just like the earliest machines, only faster.

That state of affairs may be about to end. Certainly the most powerful machines — the so-called supercomputers — are beating against constraints inherent in this old architecture. Further advances in construction techniques will only make these barriers more obvious. The solution is to design machines to operate in a radically different way: that new way of working is parallel processing. Just as developments in the mainframe world soon filter down to micros, so the impact of this latest round of changes is likely to be felt by every computer user.

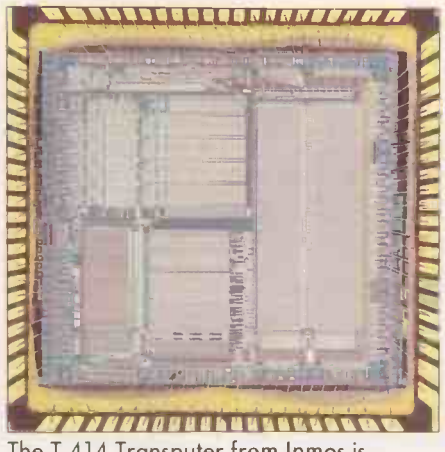
To understand the ideas behind parallel processing it is helpful to review the current architecture it may replace. It is called the von Neumann architecture after the American computer scientist who was one of the first to formalise the principles behind it. The design of conventional computers is based around the idea of a central processing unit which carried out a series of actions one after another. Increases in power are achieved in two ways. You can make the processor unit run faster by speeding up the clock, say, from 4.77MHz to 8MHz. Or you can reorganise the processor to deal with bigger chunks of data: 32 bits instead of 16.

To this day, supercomputers are built using broadly the same techniques. Their tremendous power is a result of their very fast speeds and 64-bit data widths. But there are limits to this approach. For example, some of these machines can carry out an operation in one-billionth of a second. In that time light can travel only 30cm., so if the distance from the processor to the memory is greater than this it is impossible to transfer data in or out.

For this reason supercomputers tend to get smaller the more powerful they are. They then get very hot, and would melt themselves down in operation were they not bathed in liquid nitrogen to remove the unwanted heat. But now even these methods are proving inadequate to meet the insatiable demands of computer users. The power of micros may be doubling every two years, but progress with supercomputers is grinding to a halt.

Parallel processing seems an obvious solution, though it brings its own special problems. The basic idea is simple enough: the more processors you have in a machine, the more powerful it will be. The difficulty is in working out how to distribute a problem among them in the most efficient way possible.

Already the supercomputers have begun to adopt limited parallel processing in an attempt to boost their performance. The Cray 2, for example, uses four processors to achieve its 1,000,000,000 operations per second, and DEC's Vaxcluster supermini system uses similar techniques. Dividing a program between four processors is not too difficult; the problems start with the truly parallel machines which may have hundreds of processors, or even tens of thousands.



The T-414 Transputer from Inmos is designed with parallel processing in mind.

Such systems are usually categorised according to how extensive their parallelism is. The supercomputers and a range of machines called, confusingly, minisupers and superminis, have no more than tens of processors and are referred to as coarse-grained parallel-processing systems. Companies active in this area include Cray and its rival ETA, as well as Concurrent, Convex and Sequent.

The medium-grained systems are of more interest to micro users, especially as many of them are built around common microprocessors. One of the first parallel processors, the Butterfly machine, was launched in 1981 by the Massachusetts-based BBN Advanced Computers. It uses Motorola 68000 chips. Up to 256 of them can be linked together at a cost of $10,000 per processor. Current models use the 68020, and later versions will use the 68030 chip.

Each processor node comes with up to 4Mbyte of memory. A feature of these parallel systems is that each processor has its

own dedicated section of memory. You program them using standard languages like C and Fortran which have special extensions built-in to take account of any parallelism in the problem.

One of the important features of a parallel architecture is how the connections are to be made between the many chips. A popular approach is to use the so-called hypercube geometry, the n-dimensional generalisation of the cube. An ordinary three-dimensional cube can be thought of as a pair of squares, placed parallel to each other, with lines joining each corner of one square to the corresponding corner of the other. In the same way a four-dimensional cube is obtained by joining together the corresponding vertices of two cubes, and so on for higher dimensions.

The hypercube technique was pioneered at Caltech, and is used in several commercially available products. For example, a division of Intel has its own hypercube parallel processor called the Intel Personal Super Computer (iPSC). It uses the 80286 chips found in the IBM PC/AT with 512K RAM for each processor. A seven-dimensional hypercube has 128 processors and costs $525,000. The Ncube from the U.S. company of the same name uses special chips with a DEC Vax-style architecture. The smallest version comes with just four chips and fits inside an IBM PC/AT. The cost for this system is around $10,000 — which would be pretty cheap for four Vax machines.

The most ambitious hypercube machine is being built by Floating Point Systems. The theoretical limit of its T-series is a 14-dimensional hypercube with 16,384 processors. The claimed performance is about 200 times that of a Cray 2 and the cost would be a mere $200 million. Whether or not such a machine is ever built, the T-series is important because it represents one of the first commercial successes for the British Transputer chip.

Practical Computing has written about the Transputer on a number of occasions — see for example the August 1986 issue, page 32. Nobody seems to disagree that it is a wonderful piece of silicon, though many see it as a solution in search of a problem. As the T-series shows, parallel processing could well be that problem.

Several other companies are working on machines based around the Transputer. The British-based Meiko, which was founded by members of the original Transputer team, has a product called the Computing Surface in which any number of Transputers can be connected together. A configuration of about 300 of them would have the power of a Cray and cost around 1/10th of the price. A Transputer project at the University of Southampton also aims to produce a machine of a similar price and power. At the other end of the scale, Transputer add-ons are also available for Atari and Amiga micros, and even the mundane IBM PC — see the December 1986 issue of *Practical Computing*.

The Transputer is a wonderful piece of silicon, though many see it as a solution in search of a problem. Parallel processing could be that problem.

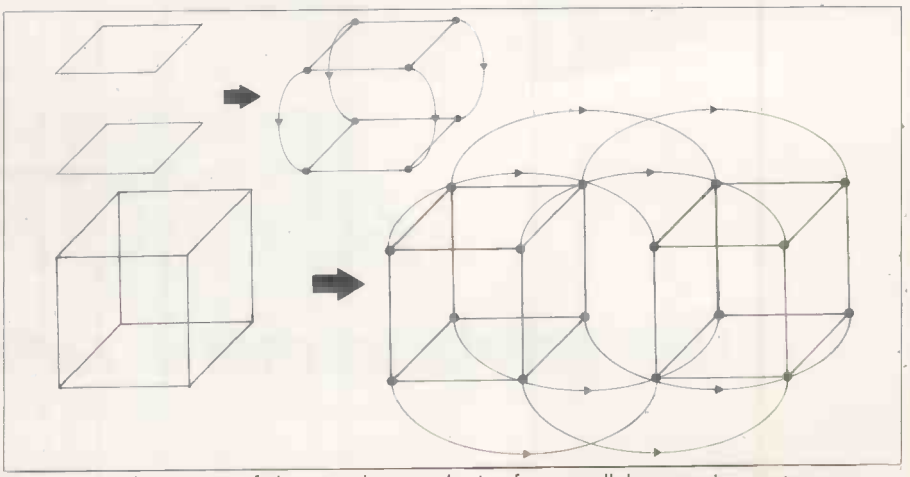
Transputer-based systems work rather differently from other medium-grained parallel processors. To exploit the chip's full power you need to program an application in Occam, the language written specially for it. Getting used to Occam takes some mind-bending effort, but when you apply the language many of the problems involved in programming parallel systems are automatically taken care of.

As well as coarse-grained and medium-grained parallel-processing systems, there are also fine-grained ones. The approach here is to use many thousands of primitive processors instead of a smaller number of powerful ones. So far only a few fine-grained parallel systems have been produced, and all have used processors which handle just one bit at a time. The ideas behind fine-grained processing were developed by ICL back in the early 1970s with something called the Distributed Array Processor (DAP). It consisted of a 64-by-64 array of single-bit chips which could be programmed in a totally different way to the old von Neumann architectures. Only six DAP systems were ever sold — probably because you also needed an ICL 2090 mainframe in order to run one. But the product is now marketed in a revamped version by a company called Active Memory Technology, and will now run with Vax minis and Sun work stations.

The leading-edge product of this technology is the Connection Machine from the U.S. company Thinking Machines. It too uses one-bit processors — 65,536 of them, each with its own local memory. This kind of structure lends itself to applications which themselves have a similarly high degree of parallelism. One typical use is in image processing, where each chip handles one pixel, just like a single cell on the retina of an eye. It also has applications in artificial-intelligence work, where attempts are being made to mimic the way the brain works.

Such machines may seem a long way from micros, but once the problem of programming parallel processes has been solved the lessons learnt can be carried straight across to the bottom end of the market, with immediate gains. Despite the advent of powerful new 80386 and 68030 chips this is still a necessary move. The development costs for the Intel 80386 were around $100 million; future products are likely to cost as much if not more. The chip makers cannot afford to take gambles of this magnitude too often, and when they cry off semiconductor development will slow down.

Parallel-architecture systems offer a continuing, smooth upgrade path. Once the technical problems have been solved, the fast-dissolving distinctions between micros, minis and mainframes will disappear completely. Questions of how to link micros and mainframes will cease to be relevant when both may be variants of a single design. The problem of hooking them up will then reduce to a matter of adding a few more processors to the total system. The day may not be far off when your desk-top machine will be infinitely upgradable. PC



The hypercube is one of the popular topologies for parallel-processing systems.

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SLIPSTREAMING

Amstrad made PC clones respectable but is finding it difficult to meet the demand it has created. **Steve Malone** reports on how the other clone makers are faring meanwhile.

It was a widely held belief in the microcomputer industry that when Amstrad unveiled the PC-1512 last summer it marked the beginning of the end of the Taiwan-built PC clone. The logic was that other manufacturers would be unable to compete with Amstrad's high-profile, high-volume stance and would be overwhelmed by its sheer force of marketing.

Six months on, nothing looks further from the truth. The Taiwanese clones and cut-price OEM machines are thriving like never before. Take, for example, the experience of Walters International, one of the oldest and best known British marques built in Taiwan. Walters' Ron Brand told *Practical Computing*: "Sales over the last three months, compared with the previous three months, have gone up 100 percent. Last week alone, we took orders for 465 machines to be delivered by the end of the month."

So what has happened? While Amstrad had caught the publicity, it looks as though other less well-known manufacturers have also benefited. What is more, while many home users are rushing to buy IBM compatibles, there is also a trend for corporate companies to buy up cheap clone machines.

"We are selling much more now to the corporates, some of whom only used to buy from IBM," Brand went on. "We seem to be an accepted company and are selling to perhaps 20 of the top 100 Stock Exchange companies."

INCREASED AWARENESS

It would be easy to say that many of these companies are travelling in the slipstream of Amstrad. Even though the PC-1512 generated the publicity, awareness of cheap PC compatibles has increased to the point where buyers are willing to accept a PC that does not have a big name on the box. It just has to be capable of doing the job it is bought for.

Iain Parfitt of clone supplier Bristol Microtraders echoes the experience of numerous similar companies: "Before the launch of the Amstrad, sales dropped quite considerably while everyone waited to see what the machine was like. After the launch we received a terrific amount of enquiries from the trade. Dealers said they were not happy with the machine and came to us. This has increased, what with the stories about the difficulties with overheating and power supply."

The rumours of suspect reliability of the Amstrad PC certainly seem to have been a short-term bonus for the other clone manufacturers. While Alan Sugar stoked up the demand for his company's cheap IBM PC compatible, customers hesitated after hearing tales of unreliability. Most of them stem from the story printed in the national press — since retracted — reporting problems at ICI with Amstrad test machines.

In the aftermath of those articles the clone manufacturers made hay. Parfitt says: "We feel that Alan Sugar made too much of the machine. It was a bit like the QL. When it was announced everyone thought it was the bee's knees. When they finally got to have a look at it, it wasn't very much at all. It's not really a business machine — more for high-end home use." Parfitt's remarks are perhaps the sort of thing a direct competitor might be expected to say. The rumours concerning the Amstrad machine have now generally proved to be unfounded.

One factor that undoubtedly has helped clone makers is the backlog of orders that built up after the Amstrad's launch. The extended waiting lists for PC-1512s made many people opt for a machine they could have now rather than in six weeks time, even if it had an inferior specification. As one clone manufacturer put it: "Amstrad, having created the market, cannot deliver. You soon find in this business that people want it now — even large government groups. If you can't deliver, they'll go elsewhere." However, this state of affairs, while still continuing, seems to be easing.

P&P Micro is one of the major distributors of Amstrad PC-1512s. Company spokesman Malcolm Ramsey told *Practical Computing*: "Sales are now going very well and we are getting a good response from people who took initial evaluation numbers. They have come back and ordered vast quantities, sometimes in the hundreds."

Now that Amstrad is getting machines out into the field, life could start to get difficult for its rivals as marketing clout begins to tell. Despite this, Ramsey sees a future for the existing clone makers. "Amstrad has pulled a lot of compatible PCs along in its wake," he remarked. "We also distribute the Epson, and this machine has taken off as well as the Amstrad, as people look towards a more up-market machine."

Before the launch of the Amstrad PC-1512 sales dropped quite considerably while everyone waited to see what the machine would be like.

The trend towards low-cost clones seems to pre-date the PC-1512. Ron Brand says that Walters noticed the beginning of the boom at the PC User Show in July last year, nearly two months before the Amstrad launch. If so, it would seem that many previously commited IBM customers now feel sure enough of the technology to risk experimenting with kit from other manufacturers.

Anthony Cook Associates is a training consultancy for IBM and Microsoft products, and advises corporate customers about their purchases. Cook told *Practical Computing* his reasons for choosing Walters machines: "One of our clients wanted IBM compatibility without spending too much money. They didn't know what they might be doing in 18 months to two years, but they are thinking of buying a mini. Walters machines were cheap enough to use as terminals, or even to throw away after two years. You've still saved money.

"I would always recommend IBM, unless the client is looking for savings, because they are bullet proof. In the larger field, IBM and DEC have got it sewn up, and IBM must have something up its sleeve: the clone killers, and so on."

CONFIDENCE

The mention of IBM always casts a shadow across the future of any clone manufacturer. Yet their increasing confidence is displayed by the number of Compaq-compatible 80386-based machines coming on to the market from a number of firms, most of whom seem unconcerned about the future direction of IBM.

One such company is U.S.-based Zenith Data Systems. On the one hand it is tackling the threat from Amstrad head on with low prices and an aggressive dealer recruitment campaign. On the other hand it has joined the growing list of companies who have launched an 80386-based machine ahead of IBM. Company spokeswoman Jill Dutt told us: "The IBM 386 is not something that Zenith is worried about. We have already announced the launch of our machine, which will be fully compatible, and IBM does not seem to be anywhere near to doing the same."

By falling in behind Compaq the clone manufacturers are forming an industry standard independently of IBM. When IBM's Renegade line of clone killers appears, the industry may view the machines as offering industry-standard compatibility with a few additional IBM non-clonable features thrown in, rather than as a new standard itself. If this happens, the clone will have won their final and greatest victory. PC

WINDOWS ON TO YOUR PROGRAMS

Glyn Moody traces the development of microcomputer software front ends, from the primitive prompts of the earliest programs through to the sophisticated window and icon systems likely to appear on the coming generation of IBM machines.

At first glance, the world of microcomputer software presents a picture of enormous diversity. Between 20,000 and 30,000 IBM PC and AT programs are available commercially, covering every conceivable aspect of human endeavour. Of course, many of them fall into distinct categories like word processors, spreadsheets and databases; but within these groupings there seems to be no limit to the variety of approaches.

What this plenitude hides is some deeper trends which have been developing over the last 10 years. They have to do not with the details of the programs but with the user interface — an aspect which is often ignored completely, since by its nature it is meant to be unobtrusive. Yet it is precisely here that you interact with a program. No matter how powerful a program is, in the last analysis its success will depend critically on how easy it is to use.

As reported on page 19 of this issue, Lotus has instituted legal action against alleged infringement of its copyright on the look and feel of 1-2-3. Clearly Lotus believes that the user interface represents a large element of what constitutes its product.

In the early days of microcomputer software, when memory was limited, the main concern was getting the program working in the smallest possible space. As a result, prompts were often obscure and inconsistent, and user interfaces were not far removed from the naked programming environment. One of the first breakthroughs in user interfaces was that employed by the VisiCalc spreadsheet for the Apple II. Pressing the Slash key called up a short menu of letters, each of which corresponded to one of the command functions like saving or copying. Little help was given on-screen to explain what each one meant, but at least it went some way towards displaying the range of command options and of laying bare the logic of the program.

The next breakthrough came with Lotus 1-2-3. One of its many selling points was the more helpful form the command menus took. Instead of the single letters used in VisiCalc, complete and relatively meaningful words appeared. Options could be selected either by using the cursor keys or by keying in the appropriate initial letter. Even more usefully, as each word was highlighted under the cursor, a subsidiary menu appeared on the row below. The partial map of the structure of the program this provided constituted a major step towards providing a logical and easily understood interface.

While its user interface almost certainly helped to sell 1-2-3 to companies, the commercial success of the program has helped sell the ideas behind the interface to the computing community at large. It has become common to see programs advertised as using the same menu structure as Lotus — the big advantage of this approach being that an unfamiliar package can be used straight away by anyone with experience of the Lotus product.

The Lotus menu approach has the advantage of simplicity, and it does not impose a large computational load on the system. A more advanced development in user interfaces was devised many years ago, but had to wait until sufficient spare processor power was available to service it without bringing the application program grinding to a halt. This is the windows and mouse approach that has become familiar from its implementation on the Apple Macintosh.

This system has a number of similarities with the Lotus menu. There is the same first level of menu, usually along the top of the screen, and from each item on the main menu a subsidiary menu is called up, just as in Lotus. This time, though, the sub-menu hangs vertically over the program. Once more, initial letters or cursor keys are often used, though a mouse pointing device is usually the most convenient way of using such pull-down menus.

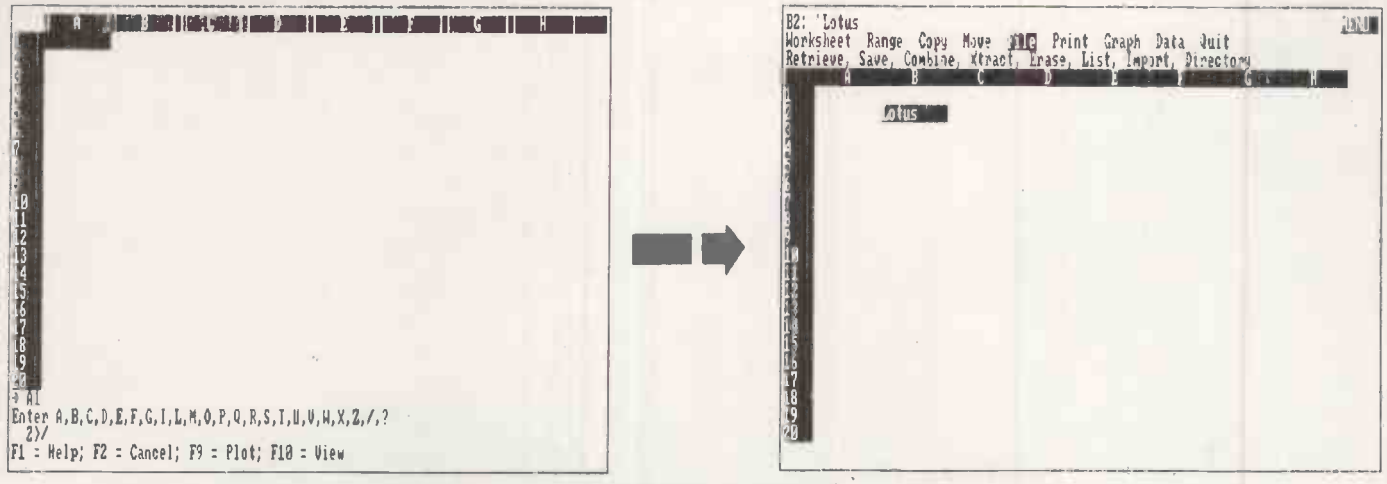
Once the windows approach becomes central to the IBM PC the change from Lotus-type menus to the full-blown pull-down version will take no time at all.

The ideas behind this approach were originally developed at Xerox's Parc research centre. The first full-scale use of them in a micro was the Apple Lisa, a rather overpriced system which never really caught on despite its attractive new interface. But the Macintosh was everything the Lisa should have been; technology had moved on sufficiently to allow windows and pull-down menus to be viable.

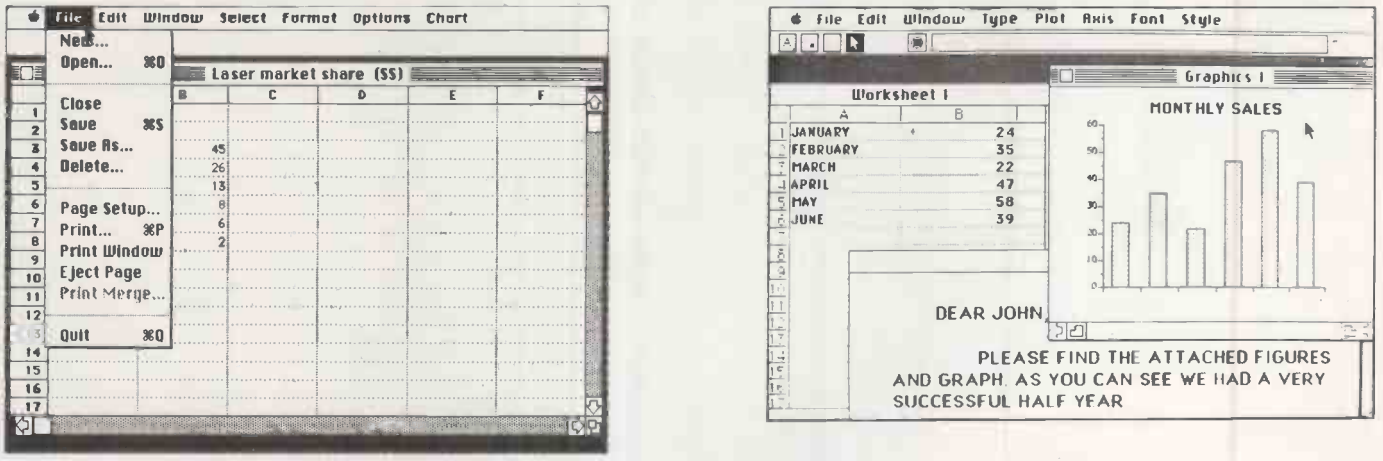
Though sales of the Macintosh were slow to take off, many software companies eyed the interface with interest. A race developed between Digital Research and Microsoft over who could release the first usable pull-down menu environment for the IBM PC. Cynics might say that the race is still on, since neither Gem nor Windows has yet caught on in a big way. Certainly, very few programs have appeared which use either of them as their basic operating environment.

Instead, software authors have chosen to take their most important elements and incorporate them in application programs directly. One of the earliest major packages to do this was Framework, where pull-down menus and windows are central to the whole way it works. Since then many programs have followed suit: for example, the latest release of dBase III has gone this way, Ventura Publisher uses a Gem-like front end, and the most recent releases from Borland and Software Publishing have moved in a similar direction. The absence of Microsoft products from this list is explained by the fact that its most recent releases have been for the Mac. Presumably any products that it subsequently releases for IBM machines will use Microsoft's own Windows environment as a matter of course.

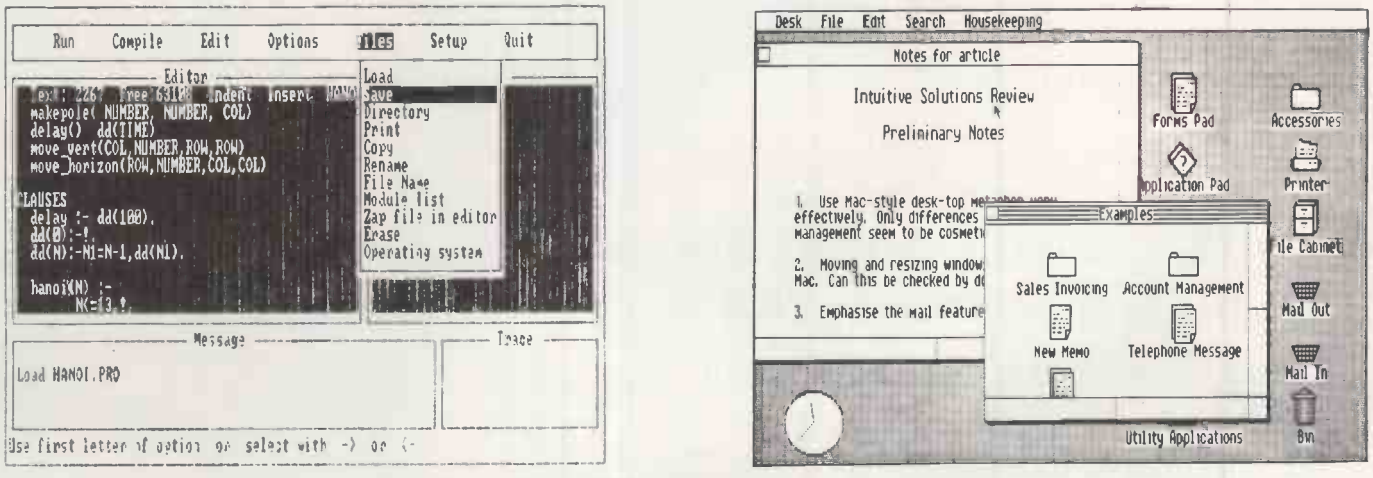
The next generation of new machines



The earliest menus consisted of a simple list of letters. Lotus 1-2-3 made a breakthrough when its command menus contained words.



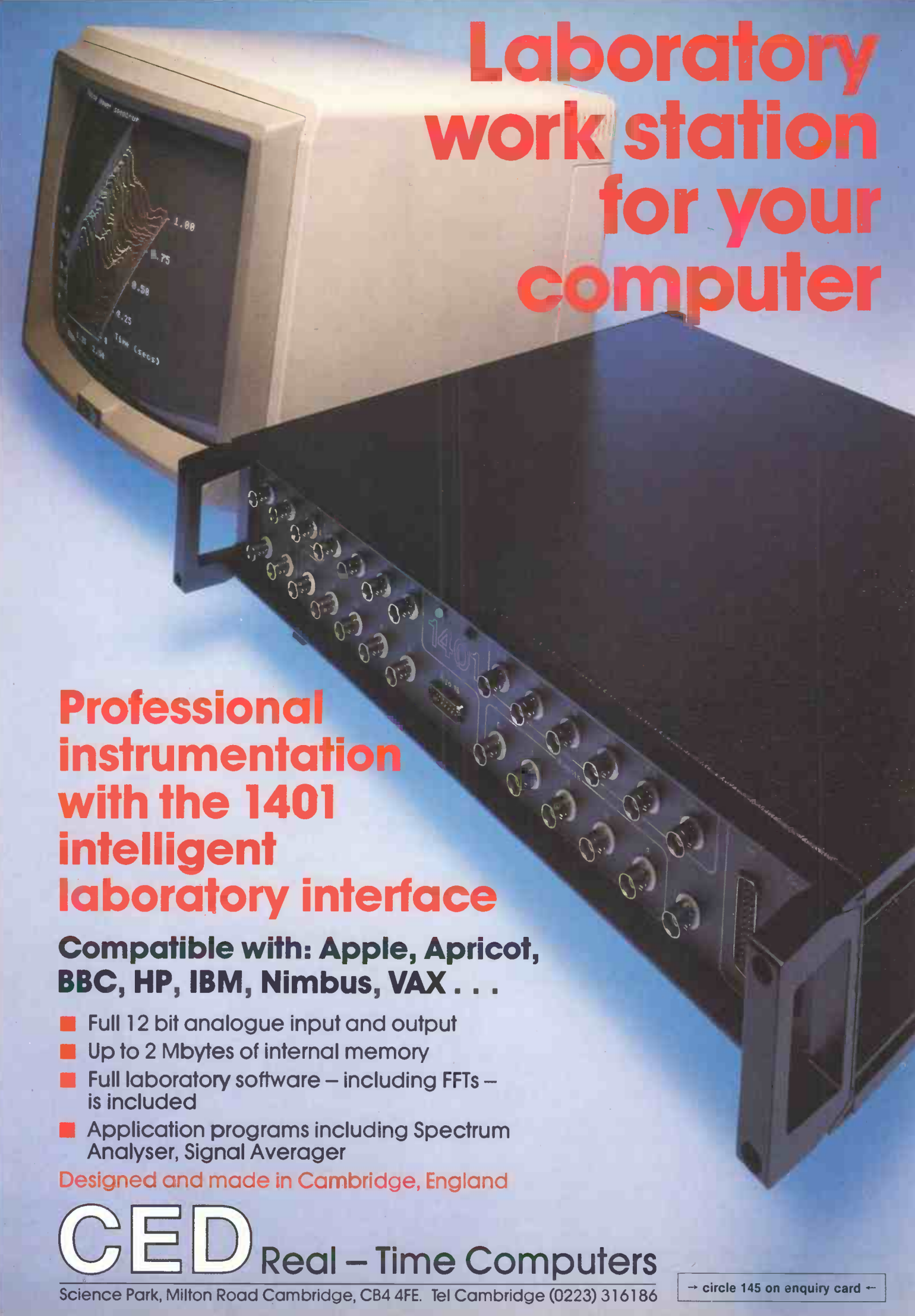
The Apple Macintosh popularised horizontal main menus with subsidiary pull-down menus activated by a mouse-driven pointer.



Now packages for the IBM PC are taking on a Mac-like appearance.

from IBM and Apple should allow the full flowering of the mouse and windows approach. Apple has already shown the way with its Apple II GS, reviewed in *Practical Computing* in November 1985, which has a full-colour implementation of the Mac front end. The new Macintosh machines due out shortly are likely to look very similar externally but will offer far superior graphics.

Similarly the forthcoming micros from IBM are believed to have advanced graphics incorporating many of the features of the Microsoft Windows product as an integral part of the operating system. Once the windows and mouse approach becomes as central to the IBM PC as to the Macintosh, the transition from Lotus-type menus to the full-blown pull-down version will be completed in no time at all — in stark contrast to the long haul it has taken to get to the point where this is possible. Users will then be able to concentrate on the essentials of a program — its features — rather than the details of getting to them. PC



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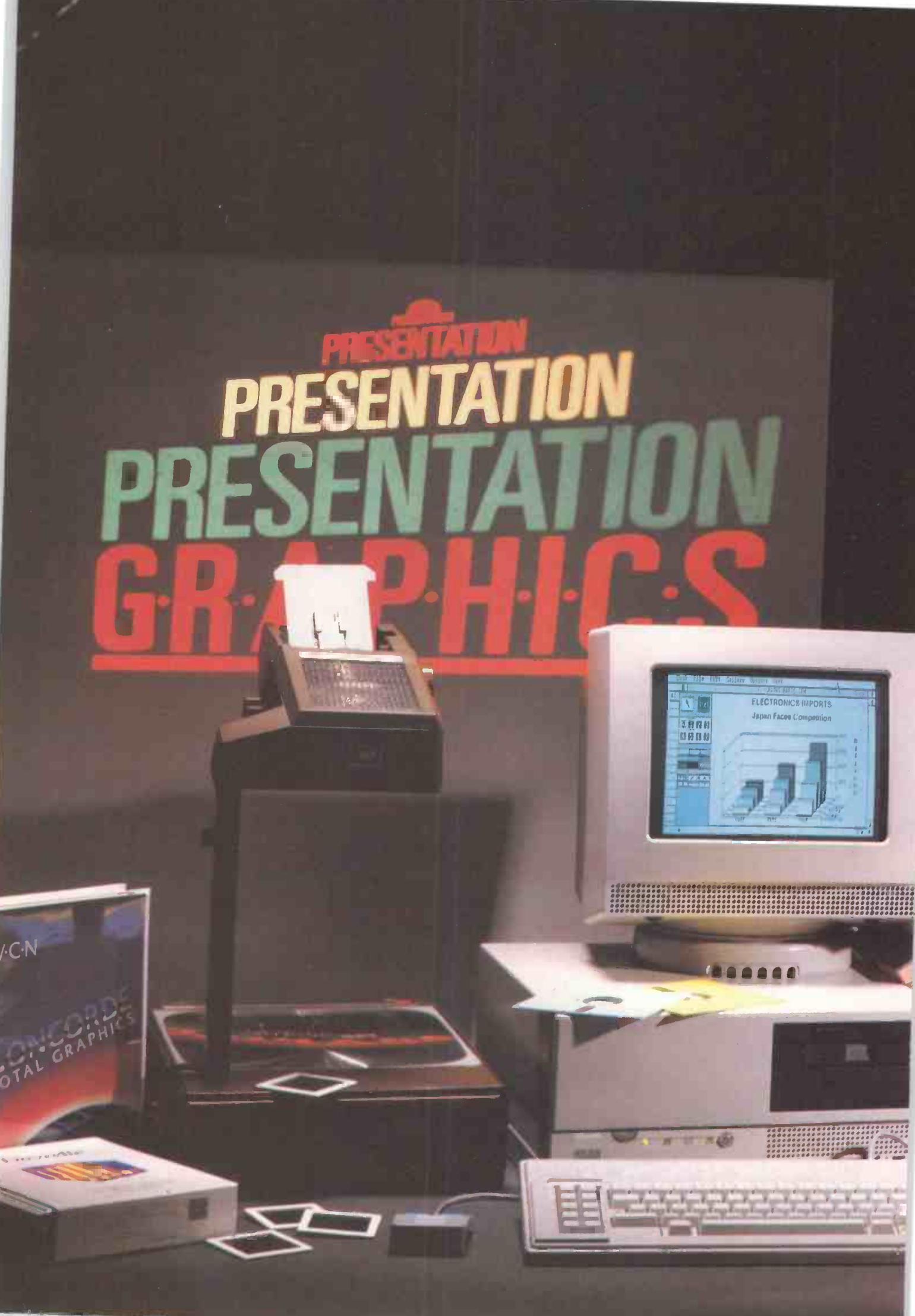
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Presentation graphics is about using a computer to help you communicate business information. Usually this means producing charts of some kind to convince people of something, either at a personal, face-to-face meeting or at a large formal gathering.

For example you might use text charts in a presentation to outline the key features of a new product, organisational charts to show the relationship between the division which produces it and the parent company, bar charts to show historic sales growth and pie charts to show present market share.

Presentation graphics is therefore about adding a visual channel to events otherwise of a largely verbal nature. Where you intend making the presentation purely on paper the application really becomes desk-top publishing. Obviously you could use a graphic artist to produce presentation material for you, but the delay, inconvenience and expense might then put you off using graphics at all. Using a computer for the task seems to make sense.

Presentation graphics has been big business in America for several years, though not in the U.K. Over here it is one of those applications which market-research firms habitually claim is about to take off but which in reality somehow never does.

But maybe its time has now come. We at least have been convinced, and are devoting 15 pages of *Practical Computing* to the subject this month. We start on page 87 by looking at IBM software in three price bands, ranging from about £70 for a simple product like Gem Wordchart to around £300 for a good mid-range package like Harvard Presentation Graphics to more than £500 for a real heavyweight like VCN Concorde. We then examine some of the hardware options available for printing, plotting and displaying the resulting output. Finally we turn to the Macintosh, and consider whether it really has a lead over IBM-type machines for this sort of application.

Presentation-graphics sofiware has to meet rather different requirements to the sort of graphics you would use when trying to make sense of your own data. When analysing data, speed and convenience are more important than appearance — you just want to get the data into a comprehensible visual form as easily as possible. Most spreadsheets and the large integrated packages have graphics built-in for this role: for deeper analysis you can get specialised statistical packages such as Stat-graphics.

With Presentation Graphics what matters above all is what the output looks like, though the ability to enter data quickly and to import it from other application packages are also important factors. It is extremely useful to be able to flip quickly between chart types to see which format displays your data most effectively.

Few presentation-graphics programs require much in the way of artistic skill or manual dexterity, just good taste. Charts are plotted automatically once you have put the numbers in, and many packages come with extensive libraries of background pictures and symbols which you can copy into your chart.

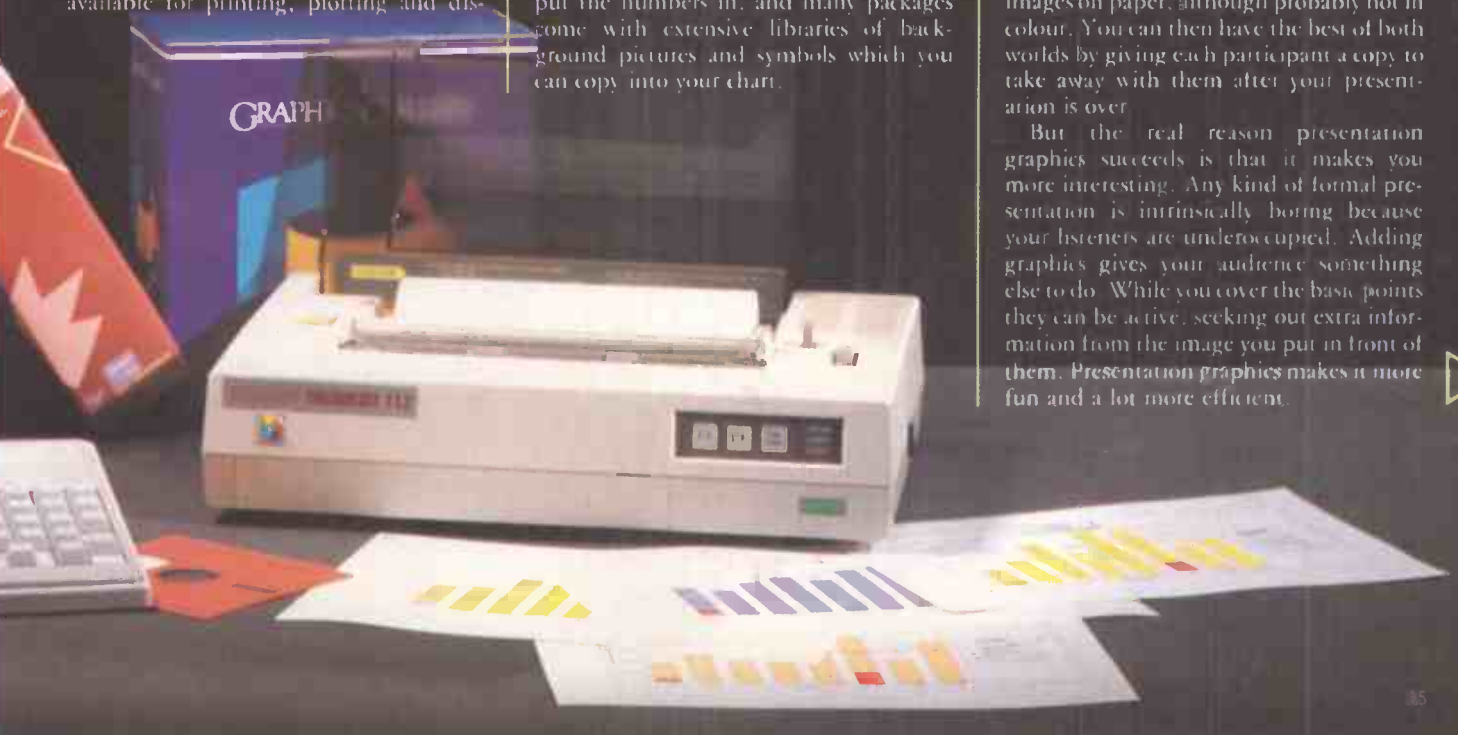
One reason that presentation graphics has not yet taken off in the U.K. has been the substantial cost of beefing up a basic IBM-compatible system to run the software. You usually need at least 512K, probably a Hercules or EGA card and a suitable display. A hard disc is practically obligatory for some of the larger packages, which can arrive on 10 or more floppy discs. Then you start worrying about output hardware. Plotters, film recorders and laser printers do not come cheap: a decent plotter costs about £1,000. But many large organisations now have sufficiently powerful systems, which is one reason for thinking presentation graphics may be ready to blossom.

Visual methods of presentation do work. Monthly sales totals analysed by region can be pretty dull and inaccessible presented as a table of figures. But when the same information is transformed into a coloured bar chart the important relationships become obvious at a glance. Most presentation-graphics packages let you go further by adding arrows and explanatory text to highlight significant points. Some let you make even more impact by dropping in background images behind your chart or using eye-catching symbols in the chart itself.

Text charts are particularly valuable in more formal stand-up presentations. As you go through your talk you can summarise important points on a screen behind you, say, and makes it easier for the audience to grasp what you are saying.

Presentation graphics can also add authority to what you are saying. Merely handing someone a piece of paper with a typed list of product features hardly compels their attention; projecting the same list in large, clear, colourful letters on a screen does. Many packages allow you to produce exact copies of your display images on paper, although probably not in colour. You can then have the best of both worlds by giving each participant a copy to take away with them after your presentation is over.

But the real reason presentation graphics succeeds is that it makes you more interesting. Any kind of formal presentation is intrinsically boring because your listeners are underoccupied. Adding graphics gives your audience something else to do. While you cover the basic points they can be active, seeking out extra information from the image you put in front of them. Presentation graphics makes it more fun and a lot more efficient.



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STYLE AND SPEED

Newcomers to presentation graphics may well plump for one of the mid-range packages capable of producing high-quality results at short notice. **Ian Stobie** looks at two packages which fill the bill.

People are often up against tight deadlines when they are using presentation-graphics software. Speed and ease of use are therefore also of critical importance, and we were shocked how long it could take to produce a finished chart using some of the well-known heavyweight packages. Less ambitious packages in the sub-£300 middle price range can score over their more expensive rivals for experienced users as well as for beginners.

The two programs we concentrate on here are both excellent in their own way. Harvard Presentation Graphics at £295 can handle all the major chart types and is very well documented. It is an appropriate choice for newcomers to presentation software. Perspective at £250 is more specialised. It does not offer text or organisational charts, but it dramatises numeric data in a quite startling and probably unrivalled way.

The first thing to mention about Harvard is its manual, which is one of the best we have ever seen. It is well illustrated with screen shots and output samples, it is technically accurate and complete, and it has a glossary and a proper index. It explains presentation graphics as well as the package itself, making helpful suggestions as to what features to use and when.

As far as we know the name Harvard implies no connection with the academic institution. The program is published by the California-based Software Publishing Corporation, best known for the PFS range of products. Installation is straightforward as the program is not copy protected. Software Publishing is an important recent convert to the cause of non-protected software, and is removing copy protection across its range.

Setting the system up to match your hardware configuration works in the same way as on other PFS packages and is very straightforward. Changing a printer or plotter takes about 30 seconds, which comes as an incredible relief if you have been battling with some of the top packages. A wide range of different types of output device is supported, including film recorders, plotters and laser printers.

Harvard Presentation Graphics lets you graph data pulled in from other packages and add additional remarks.

You can use Harvard to create charts of six basic types: text, pie, bar and line, area, organisational and high/low/close. Within each type you get several options, but not the vast range of variations found in some of the more specialised or heavyweight packages.

Creating a text chart demonstrates a fundamental aspect of the Harvard approach: achieving speed for the user by the intelligent use of defaults. You can choose just to enter text in a free form way or make use of one of the pre-formatted styles provided, such as bullet lists or two- and three-column comparison charts, for example.

The Harvard user interface is based on the concept of typing data into forms. You then hit f2 to display the chart with the default settings provided by Harvard. If you want to tamper with the appearance of the chart you can override many of the defaults, using a combination of function keys, cursor keys and the keyboard. For example, you hit f7 to activate the Text Size function, and then type in size numbers next to the text you want to change.

Compared to a mouse-based interface this seems pretty primitive, and even set against the other PFS programs it is a bit laborious. But when you have tried a few other presentation-graphics packages you realise that by the standards of the field the Harvard user interface is up among the leaders.

With number-based charts you type data into a spreadsheet-like form. You can also import data from other packages, something that is an essential requirement for any presentation-graphics package. You can pull in Lotus data in WKS format for instance, and then rearrange it in the Harvard form.

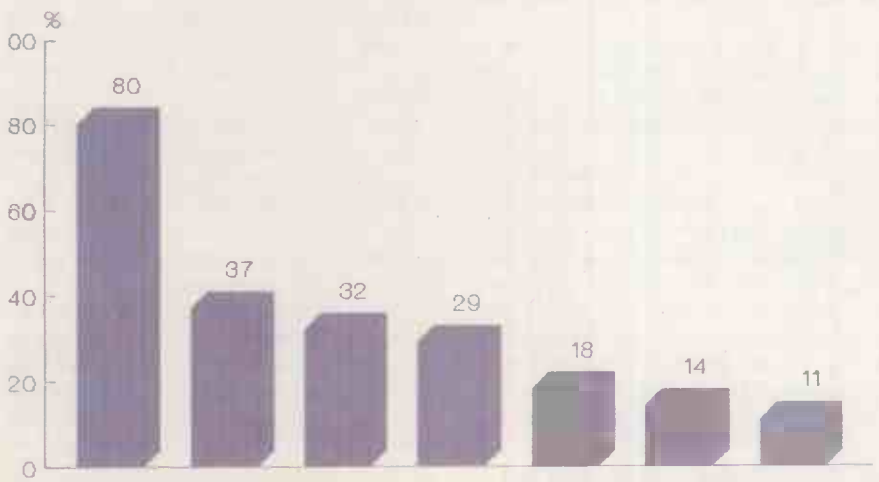
Harvard lets you add additional remarks to a chart once you have it displayed on-screen. You might use this feature to explain a particular high or low point on a bar chart for instance. Harvard lets you put arrows and boxes on to the chart as well as words, but it does not support a vast array of symbols or backdrops like, say, VCN Concorde.

Harvard aims to give you a taste of everything. In terms of control over the final appearance it cannot compete against the best of the heavyweights. But Harvard charts usually manage to look quite attractive, and most importantly they do not take long to produce. Using the defaults we found we could knock out text charts at the rate of about one a minute, not counting printing time. Even with numeric charts, providing the data itself was not too complicated, it did not take much longer. Given the other virtues of the package, this makes Harvard one of the best general-purpose packages in the field.

Unlike Harvard, Perspective does not aim

FAVOURITE LANGUAGES

As used by Practical Computing readers



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at across-the-board presentation competence: it cannot do text or organisational charts for example. And at the moment it is a purely monochrome package, driving only dot-matrix printers or laser printers. But it makes up for this limitation by the startling three-dimensional perspective effects it allows you to achieve.

A colour version of Perspective has been shown in the United States, and first copies are expected in this country in March. This revision may also take care of the few rough edges we found on an otherwise dazzling package. It might be worth waiting for the new version if you already possess colour hardware, although some kind of upgrade deal may be available for existing users.

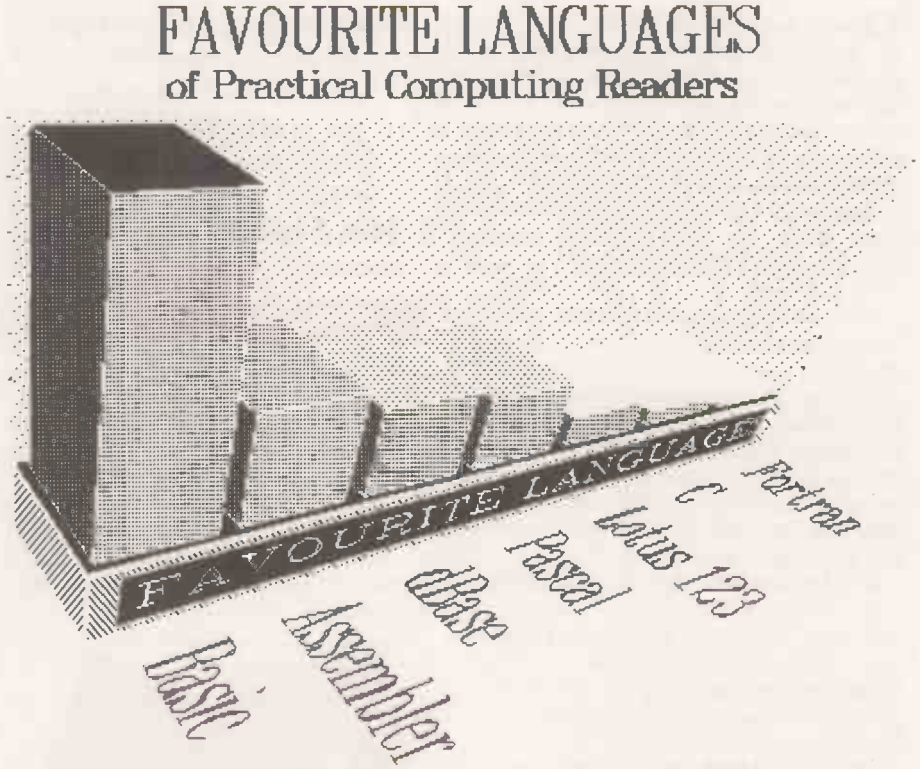
The first impression Perspective gives you is of speed: the program comes straight up with an example chart. On our system this was a sales breakdown by region and time, represented in three dimensions. Three-dimensional graphics makes tremendous sense for presentations as the meaning of the data positively leaps out at you. You can substitute one of your own charts for the opening demo, so we set to work at once to create something equally effective with our own data. The program certainly motivates you.

TOP LEAGUE

The user interface is better than Harvard's, which puts it near the top in the generally archaic presentation league, at least in the IBM universe. It is still based on function and cursor keys, but a template showing the current meanings is displayed on-screen all the time, unless you choose to put it away. Generally only five function keys are active at a time, so it is not confusing. Context-sensitive help is generally available if you get stuck.

Hitting f1 lets you change the chart type. A total of 32 different three-dimensional types is provided, and the effects of some of them are stunning. Having arrived at the most appropriate chart type you hit another function key to change the viewing angle. There are 16 viewing angles preset to show the same graph from above, behind, or to the left or right. You select the preset you require just by moving the cursor and hitting Return. The graph is then recalculated and displayed at breathtaking speed. If you are prepared to forego the speed and convenience of the presets, Perspective will give you 360 degree control and zoom, with pan, tilt and distort options.

The speed with which you can select chart type and viewing angle is very important. Until you have tried it you may not know which way of displaying your data is most effective. With many IBM presentation



Perspective creates breathtaking three-dimensional charts which can be viewed from any angle.

packages it takes a long time to try out a chart a different way; sometimes you even have to go back and re-enter all your data. This effectively eliminates the What-If? approach at which Perspective excels.

Perspective also offers 15 two-dimensional chart types. Along with the standard pie and bar charts there are some interesting additions which suggest the package may find favour with technical as well as business users. Polar co-ordinate area charts and spectral mapped cells are two examples. In two-dimensional mode you can redisplay even more quickly, flipping the same data through the different chart types by hitting a single function key.

You set up your data in the first place by entering it into a spreadsheet-like form. The approach is similar to Harvard, but again slightly better. It is easier to change the data driving a particular set of labels on the chart for instance, merely by redirecting the package to use a different range of cells. The file-importation provisions are also very good. Perspective can read in data from WKS, DIF, Sylk and ASCII formats, covering most database and spreadsheet packages. It can also export in these formats.

One problem we had was getting the labels to fit on the chart. Sometimes when you change the type or viewing angle the words bust out of the sides. Perspective's manual is reasonable, but not very well organised. It took some time to find out that you have to deal with this by zooming and panning, which can be a bit laborious. We also took a long time to find out how to turn off labels selectively.

Once you have arrived at a particularly effective way of displaying your data you can save the chart type and view for later use with different data. The concept is similar to the style sheets used in some desk-top publishing and word-processing packages, and has similar advantages.

The only fly in the ointment with Perspective is that it may be sold in the U.K. in a copy-protected form. It is one package whose sales are sure to be boosted by a few illicit copies floating around. One look would be enough to sell it to many business users.

WHAT PRICE QUALITY?

Glyn Moody looks for extra features in some of the more expensive packages on offer.

The impact a presentation makes depends on the quality of the images it uses. In this respect, top-end graphics packages must represent the product in its purest form. It is an area which is very attractive to software houses: the idea is that true quality is a virtue without price, and you won't mind what you pay for a package which purports to offer it.

Since advanced graphics hardware is almost *de riguer*, a number of micro manufacturers are getting in on the act too by offering software products to go with their machines. For example Olivetti has an Enhanced Personal Presentation System, and Hewlett-Packard sells Charting Gallery and Drawing Gallery.

Like Hewlett-Packard, software publishers tend to see the market falling into two parts: charting and drawing. Charting lies at the heart of all presentations whereas drawing is merely an attempt to enhance — or sometimes to obscure — the figures which are being presented. A good charting package will offer a wide range of graphs, and allow data to be input directly or pulled in from standard spreadsheets and the like.

Ease of use is critical. The whole point of using a presentation package is that it allows you to produce high-quality images quickly. No matter how wonderful a package is, if it requires days of fine tuning to get the best from it you are probably better off getting a graphic designer to do the job.

One of the earliest products at the top end of the market was VCN's Concorde. VCN is an independent privately owned company which was set up about three years ago. Concorde calls itself a total graphics package, and this reflects the fact that it offers charting and drawing facilities plus a number of other features.

MEMORY HUNGRY

The price you pay for this extended functionality is a familiar one. Most of the packages considered here are big and require a fairly lengthy installation procedure. They are also memory hungry: Concorde requires about 2Mbyte of disc space, and as much RAM as the confines of MS-DOS will allow.

There are three basic sections to the program: Graph, Text and Paint. Text and Paint offer the facility to produce text charts and images. It is the Graph function which is mainly of interest for presentation graphics.

The Graph user interface is loosely modelled on the Lotus approach. That is, at each stage there is a small menu of options. As you highlight each one a short explanation is given about the sub-menu it leads to. I found it easy to get lost amid the various levels. The user interface is perhaps

the weakest aspect of Concorde and where it falls down most in comparison to more recent products.

To produce a chart two sets of information are needed: the layout and the data. There are two separate screens for them. The layout screen presents a daunting array of options; it does not inspire you with the feeling that you could knock off a chart in a few minutes. Things are not helped by the bewildering array of keystrokes needed, involving function keys, Alt, Esc and Shift.

Of course this approach does offer the benefits of great power. For example, when producing charts with symbols instead of bars, you can choose the symbol from one of the many files of images Concorde offers. Concorde also allows you to superimpose charts, text and images. It goes even further and provides a memory-resident utility which can be used in conjunction with other programs as an image grabber. Such images can be retouched using the paint facility, and then incorporated in a slide.

Concorde has a carousel facility for scrolling through a number of slides. Although useful, this is not really relevant to mainstream presentation graphics. It is more suitable for demonstrations and training. Overall, Concorde emerges as a very powerful program, but one showing its age in terms of the user interface. If you are prepared to persevere with it you will find that it probably meets your needs.

In complete contrast to Concorde is Davrelle. This is a British product which derives its unmemorable moniker from a conflation of the names of the two authors. It is geared much more closely than Concorde to the needs of persentations conveying figures in the forms of charts. Davrelle runs under Gem, and the use of the Wimp approach pays considerable dividends in terms of ease of use. After all, a graphics-based approach like Gem or Windows clearly lends itself to an application whose basic elements are visual.

Installation is relatively straightforward, and moving around the program will prove easy enough to those familiar with Gem. The only area which is not intuitively obvious is the representation of the chart's raw information. This appears as a spreadsheet-like table, but with enough differences to be off-putting. Other charting functions are well thought out. For example, you can produce three-dimensional charts and alter the point and depth of perspective just by moving a reference point around on-screen.

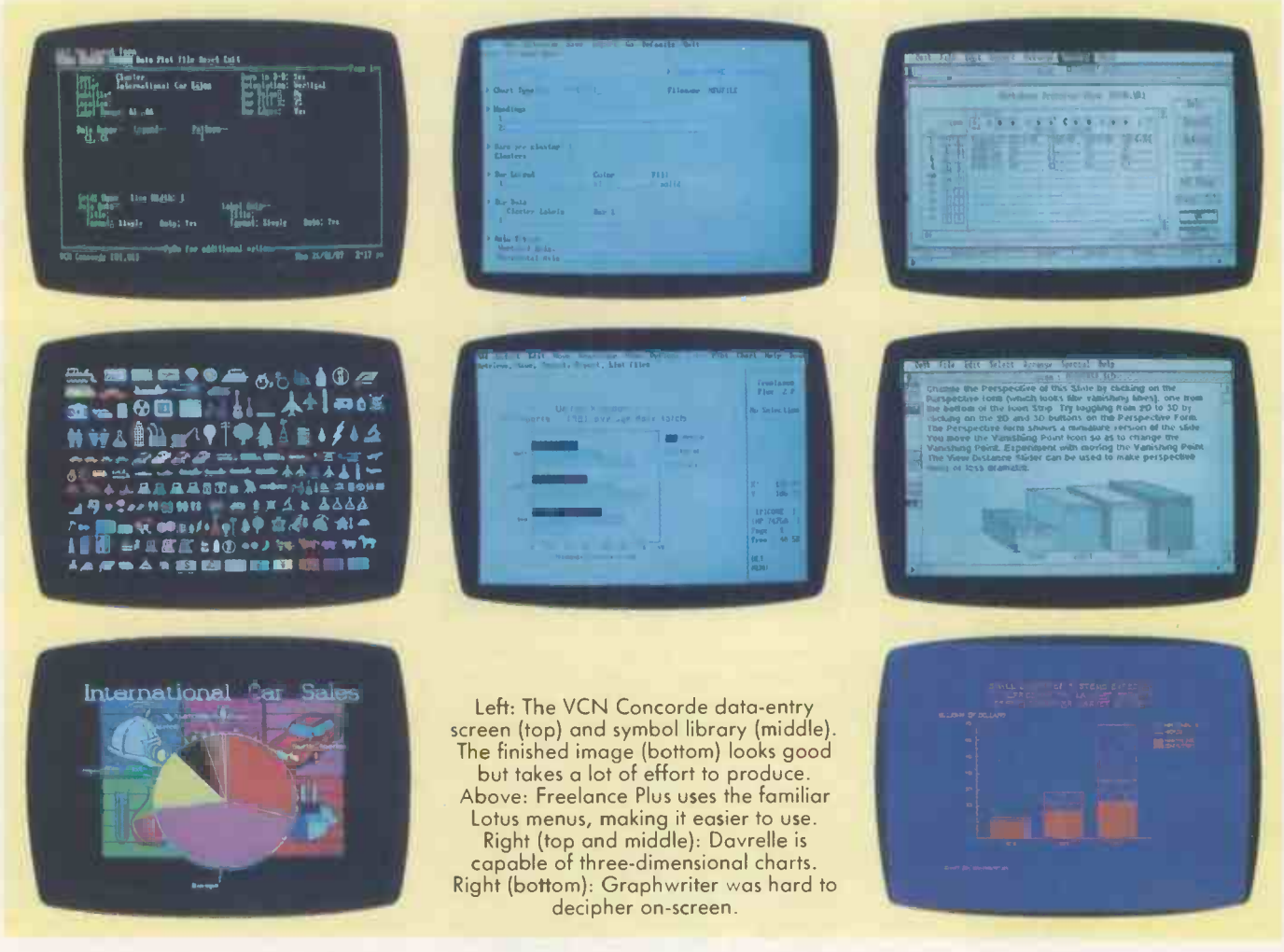
INTERACTIVE SEQUENCES

Like Concorde, Davrelle offers extensive carousel facilities which seem inappropriate for traditional types of presentations. However, Davrelle takes the carousel idea further. For example, you can set up a sequence of slides — Davrelle's generic name for a chart — with links between them. This allows you to set up interactive training sequences.

More important is a facility called Davrellate. The basis of charting packages is that data is imported from pre-existing spreadsheets. Often the data will change, particularly if a lot of What-If? projections are performed. To update a chart you normally have to run the charting package again, pull in the new data, and then produce the image. With a whole sequence of charts this could take a considerable amount of time.

Davrelle has been designed with such situations in mind. By invoking the Davrellate command it is possible to update charts automatically to take in new spreadsheet data. The old charts retain details of where the information came from and appropriate the new data accordingly. This feature is particularly powerful: with just one command you can update a whole sequence of slides stored together as a presentation.

Clearly Davrelle has been put together with some thought about how it can actually be used. Indeed, it grew out of graphics consultancy work undertaken for a large company. Unfortunately what is an interesting product is let down by the worst documentation I have ever seen in a product priced at this level. However, the company assures us that a substantially rewritten illustrated version is imminent.



Left: The VCN Concorde data-entry screen (top) and symbol library (middle). The finished image (bottom) looks good but takes a lot of effort to produce. Above: Freelance Plus uses the familiar Lotus menus, making it easier to use. Right (top and middle): Davrelle is capable of three-dimensional charts. Right (bottom): Graphwriter was hard to decipher on-screen.

The same curse of an appalling manual afflicts Graphwriter, a product acquired by Lotus last year. But its problems are more deep seated than those of Davrelle. Like Concorde, Graphwriter is an old-fashioned program. Whereas Concorde had at least heard of Lotus, and made some attempt to explain what was going on, Graphwriter seems innocent of such knowledge.

Graphwriter is purely concerned with charting. Its range of charts is impressive but producing them is a painful experience. Installing the system is a question of copying across some 250 files — mercifully not one at a time. The user interface is dull and unhelpful. To produce a chart you choose the graph type, then fill in a very complicated table which corresponds to printed tables in the manual. The idea is that you plan out the graph beforehand, then feed in the figures. I found this very hard work and the editing facilities poor.

The graphs Graphwriter produces are not particularly exciting on-screen, if only because the higher resolution of the EGA is not supported. Worse, the error trapping seems faulty. At one point the program dumped me straight to DOS simply because it could not find drive B. Similarly, leaving the program is abrupt and irreversible. All in all it is clear that Lotus has got a lot to do to tame this product. Who knows, behind its user-hostile facade there may well lurk a good program.

Just what is possible in this regard is shown nowhere better than in Lotus's companion product to Graphwriter, Freelance Plus. It is an upgraded and reworked version of another product from the same company which produced Graphwriter. It is hard to believe it, so great is the difference.

Freelance Plus uses the familiar Lotus menu system, but with commendable clarity. Everything seems to have a logical structure, and using the Esc key is a fail-safe way of moving up the command tree. The manual is exemplary — Davrelle could learn much from it. It is comforting to know that Lotus is putting some of its massive financial resources to a good use.

Since Freelance Plus is intended principally as a drawing rather than a charting package, its facilities in the latter area are limited. But they are by no means contemptible. For someone who wants only limited features that are easy to use, Freelance might be a good bet. The charting function is slightly inconsistent in that it uses some pull-down menus instead of the straight Lotus approach. Let us hope that future products from Lotus, perhaps running under Microsoft Windows, will move further in this direction.

Up-market presentation-graphics packages leave a lot to be desired. Perhaps because the market is so young, software houses seem to be unclear about just what is needed. Since this area remains unknown territory we can probably look forward to some interesting products appearing in the near future. For established companies like Microsoft and Ashton-Tate it represents an opportunity to extend their empires to new areas; for the start-up companies it offers the chance to become a new Lotus.

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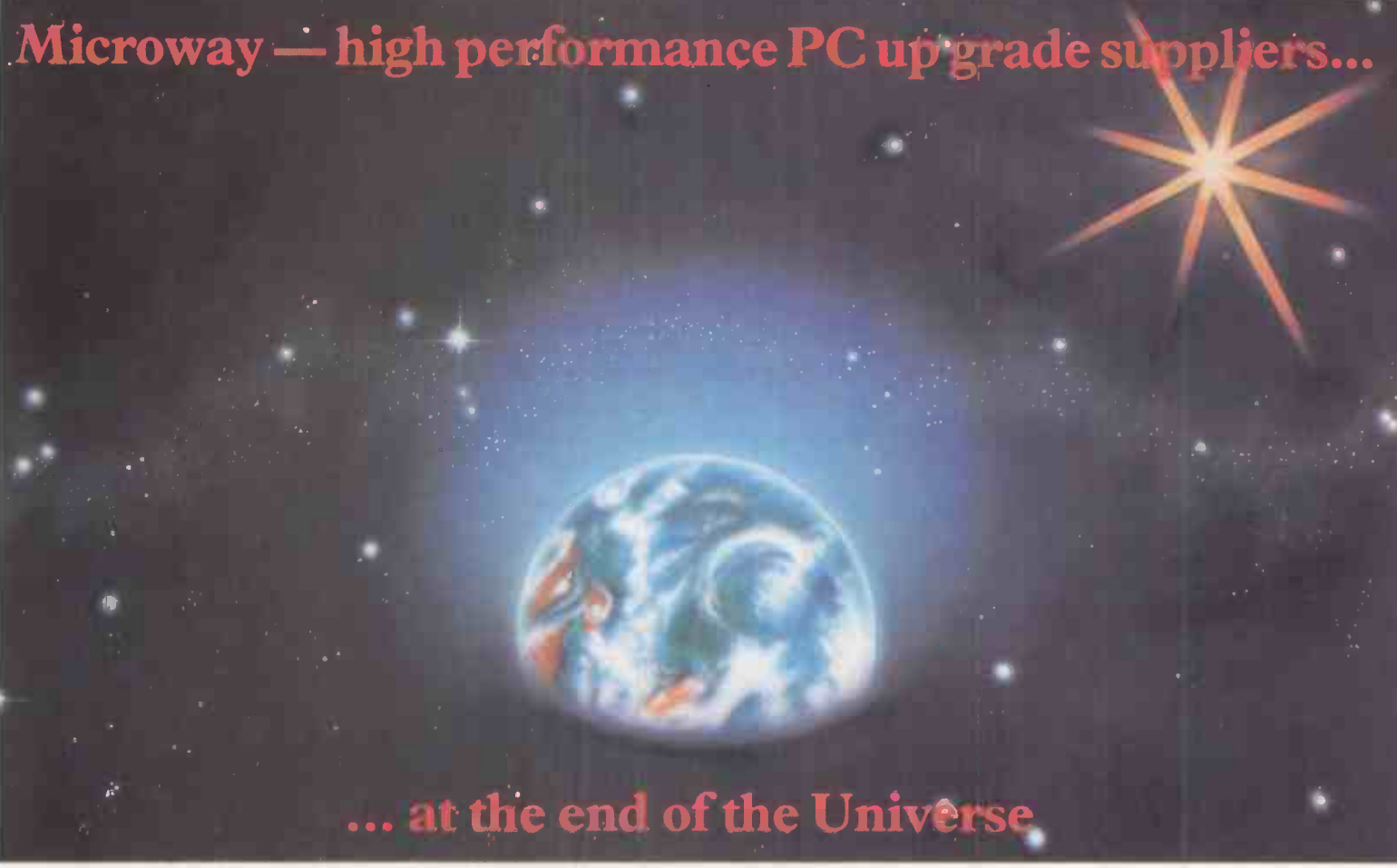

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287TURBO PLUS

Provides a high speed 80287 for the AT in the same way as an 287TURBO — plus motherboard acceleration to increase the performance of the 80286. Actual 80286 speed increase is dependant on the component quality of the individual AT, with a minimum of 9 MHz to a maximum of 11.5 MHz expected.

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NICKELODEONS

Steve Malone looks at some of the cheaper packages available for the IBM and its compatibles.

If the up-market presentation-graphics programs are not selling well then the prospect of big sales at the lower end look even dimmer. You might expect large companies with big marketing departments and a slick image to invest in a presentation program. But a small firm with maybe only a single micro and without a large group of investors or customers to impress has far less need for sophisticated marketing tools.

Yet cheap presentation-graphics programs do exist. When we asked the software houses concerned who their products are aimed at they often produced a vague answer or a simple "not sure". We could not help thinking that some low-priced programs were written because someone saw that there was a market for the top-end product and thought there must also be money to be made in a cheaper equivalent.

But while there is no corporate market for the low-end products there are a number of niche markets. Small businesses may want to include graphs or graphics in their circulars to customers; students may wish to enhance their papers with graphs demonstrating the results of research, etc. All such applications involve printouts and resemble desk-top publishing as much as large-scale presentations. Output is likely to be dumped to an ordinary dot-matrix printer; not many people are going to use a £5,000 camera system in conjunction with a £100 presentation-graphics program.

Like all budget-priced programs, cheap presentation-graphics software works best when it concentrates on performing a few tasks well rather than a number of tasks badly. Thus a program which produces a few graphs and sends them accurately to a printer is preferable to a badly implemented multi-function, multi-output program which cuts corners to achieve a lower price.

With the introduction of the Amstrad PC-1512, Gem Graph has a built-in advantage over other low-cost packages at the bottom end of the market. The bundling of Gem Desktop with the Amstrad computer means that Amstrad users will give the package careful consideration when shopping for a presentation-graphics program.

As you might expect, Gem Graph makes full use of the mouse-and-windows environment implemented under Gem. This makes it far easier to use than some of its competitors. We even manged to insert data and modify a range of different graphs without having to refer to the manual.

Gem Graph does have its limitations. There are a maximum of eight different types of graph supported. You can alter things like patterns and thickness, and assign labels to the graphs, but the package lacks the range of facilities available to the more up-market packages. Even though the package supports multiple founts and symbols, not many are actually included with the program. However it is possible to create your own symbols with Gem Draw, though this adds to the price.

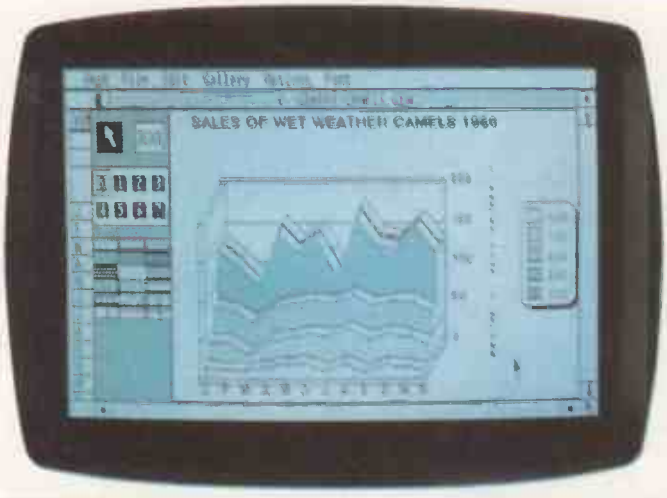
The program performed well, apart from one aberration. We installed Gem Graph on an Olivetti M-28 and loaded a Lotus 1-2-3 .WKS file to examine its performance with imported data. The program worked fine when drawing pie charts and line drawings, but any attempt to create a bar chart caused the machine to hang up. When we tried the same procedure on the Sharp PC-7500 it worked OK. We assume the fault was something to do with the Olivetti's display.

Digital Research's pricing policy is also rather odd. Both Gem Graph and Gem Wordchart are available at two different prices, with the Amstrad version costing much less than that for the IBM. This is not because the Amstrad version has reduced functionality; it is simply locked into the Amstrad range and will not work with other machines. Owners of non-Amstrad equipment may want to complain loudly at such discrimination.

Gem Wordchart, the companion program to Gem Graph, contains some features not supplied with Graph and vice versa. To get a full spread of presentation-graphics capabilities you have to buy both. The program cannot display data graphically as Graph can, but instead can be used to produce organisational charts and banner displays.

The program allows a range of type sizes to be entered into the image. It also has a limited repertoire of graphics drawing styles such as lines, bullets and borders with which

Gem Graph (below left) and Gem Wordchart (below right) provide complementary features.



PRINTOUT

Traditional ways of producing output for presentations are slow and often involve special-purpose hardware. **Ian Stobie** looks for a better alternative.

you can enhance the display. For more advanced graphics it is possible to export the Wordchart files into Gem Draw, although once again this means further expense.

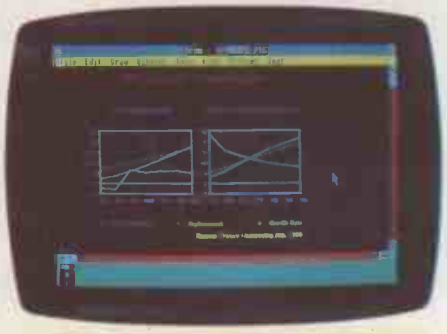
As in Gem Graph, many of the installation parameters are supplied directly from the Gem Desktop program. This includes things like drivers and founts. Only two founts, Swiss and Dutch, were available with this version of Gem Desktop. This is annoying when using Gem Graph, and especially restricting when using Wordchart, which is essentially text-based.

When we were researching the products to be included in this feature, we were surprised to hear from Microsoft that it considers Windows Draw to be a candidate. When we received the program, sure enough on the cover it said "Presentation-Graphics Software". The reality is somewhat different. What you have here is a standard drawing package similar to Gem Draw or Macdraw, but with a cleverly written manual which tries to convince you that this is presentation graphics.

There is no method for importing data into the package at all. If you want to create graphs, the program tells you how to draw them using the standard line and arc commands. On the back of the package, the blurb tells you that Draw "reads and edits Lotus 1-2-3 graph files". The operative word is "graph". The program can read in graphs already created by 1-2-3, and allows you to stick extra labels on them, but it cannot accept raw data from a spreadsheet.

Without the ability to enter data, the package is more or less restricted to word charts. Here the program performs acceptably, although the number of founts is fairly limited and there is no provision for templates of the kind to be had in Gem Wordchart.

Microsoft should be ashamed of itself. Attempting to market the program as a dedicated presentation-graphics product will only discourage the beginner, anger the experienced and damage Microsoft's image.



Windows Draw is a drawing package with no independent graphing facilities.

Plotters are still probably the most common way of getting high-quality colour output for presentation use. Most give good results on both paper and overhead transparency film. The trouble is, it can take up to half an hour to produce a single chart.

Plotters were originally developed for scientific use. The technology is derived from the simple chart recorder. In this kind of application accuracy matters a lot, so most plotters are rather overspecified for business use. Apart from slowness the main drawback to plotters is that they are useless for anything else: you cannot use them for general-purpose printing. They are completely dedicated to plotting. They are also unnecessarily slow, even given their rather laborious method of plotting by dragging a pen across the paper. On most models you have to insert and remove paper by hand, one sheet at a time.

MAKE AN IMPACT

Hewlett-Packard's Colorpro is unusual in that it is designed primarily for business rather than technical use. It is less accurate but faster, especially at filling in blocks of colour. This is important in presentation graphics, where you want to create as much impact as possible. Using hatching generally does not look as good in something like a pie chart.

The Colorpro's paper feed is still manual, but HP does a more expensive version, the £3,651 7550, which is stack-fed. Both models plot on A4-sized paper. The Colorpro draws using one pen at a time, automatically picking up the appropriate pen from the six in its carousel to change colour — it is fun to watch. To plot on to overhead transparency film you load up the carousel with a different type of pen.

All plotters are hopeless at handling bit-mapped images. With the right software you can make a stab at getting one out on a plotter, but it takes hours, the machine jiggering up and down in a simple-minded way, doing a dot at a time. Results look a mess.

This entirely rules plotters out for use with some software — for example, Perspective and many of the Mac programs — which generally use a bit-mapped approach. VCN Concorde will use a plotter for drawing the charts themselves, but not any bit-mapped symbols or background pictures. The Colorpro worked fine with Cricket Graph, but that package is unusual among Mac software in supporting plotters properly.

Of course, if you are not interested in colour you can use a laser printer for presentation graphics. Most laser printers will produce excellent solid blacks on transparency film and they are quick too. But once you start doing complicated graphic images you may need to upgrade the memory in the laser printer and printing can slow down considerably.

We tried out Oki's Laserline 6, which is reviewed more fully on page 47 of this issue. The basic machine costs £1,899, and extra memory to boost its graphics performance another £386. For presentation graphics this printer is a farily basic model, but the results were encouraging. Even without the extra memory we got acceptable good charts from Harvard Presentation Graphics; the extra memory improved the line quality.

With Perspective we got very good results, but were unable to get it to print full size on the paper; the biggest image occupied just under half a page. This difficulty is probably related to the amount of memory needed to map a full page at 300 dots to the inch. There may be some way of getting round the problem by dropping the resolution to 150 dots per inch, but we were unable to find it in the time available. Obviously when using overheads you want the image to be as big as possible.

Many users who know that graphics will be one of their major requirements opt for more expensive laser printers with more memory. For example Xitan does the Turbolaser at £4,250, which will do full-size A4 plots at 300 dots per inch — and quickly. This company has also released a £1,395 upgrade board for Canon-based laser printers such as the Laserjet. It has 1.5Mbyte of memory and a faster image processor. You put it in your PC rather than the printer, and it boosts printing performance to Turbolaser standard.

Lack of colour is the remaining problem with laser printers. It will probably be three years or so before colour-printing mechanisms become cheap enough to find their way into office-level laser printers. Meanwhile there is one fix you can do. Several machines are on the market that let you laminate colour on to finished laser output. You put your printout against a special dye-laden sheet and feed it into the machine, which basically consists of a set of hot rollers.

As it goes through, the plastic-based toner on your laser output is replaced by the coloured dye. You can get special effects by cutting patterns into the dye sheet.

For graphics purposes ordinary dot-matrix printers can be regarded as a lower-cost version of the laser printer. Like the lasers they are good general-purpose printers, doing graphics on the side. Typically they operate at about one-quarter the resolution of laser printers, giving output which looks a little rougher.

In compensation many dot-matrix models offer colour simply by replacing the normal ribbon with a striped four-part ribbon. Such printers are equipped with a modified ribbon carrier which will rock up and down to put the correct ribbon in place. Colour printing is available as either an optional or standard feature on a growing number of printers. On the nine-pin £555 Epson EX-800 it adds £60 to the price, for instance.

You get generally higher output quality with printers that have 18- or 24-pin print heads, so we looked at one of these. We chose the Fujitsu DL-2600 colour, which is about to go on sale at around the £1,500 mark. The DL-2600 is a good general-purpose printer running at 240cps in draft mode and 80cps in letter quality.

PRINT TRANSPARENCIES

Most colour matrix printers will give you an image of sorts on transparency film. You need to use a matt-surfaced film to have any success, and even rather opaque ink makes the image quite thin. What attracted us to the Fujitsu was the special provisions it has for printing transparencies. The trick is to offer a special extra-inky ribbon. It is difficult to manufacturer as you have to come up with some way of preventing the colours running into one another. When you are ready to produce the final version of your charts you remove your normal black or colour ribbon and put in the transparency one. You still need to use matt surfaced material. We found results were much better — almost verging on acceptable.

Matrix printers still do not produce good enough results on transparencies for presentations where quality matters, but they are very quick. The quality you get from a dot-matrix unit printing on to paper is improving all the time. For many business uses a good 18- or 24-pin matrix printer with colour-graphics support is probably a better bet than a cheaper printer and a separate plotter. And because you do not have to wait so long for your charts, you are more likely to produce them.

Ink-jet printers work by shooting ink out of a bank of nozzles directly on to the paper. There is no ribbon. Because you can make the nozzles fairly small and arrange separate ink supplies to different nozzles, the technology has always looked like having good potential for colour printing. The problem has been to develop inks which will emerge from the nozzles in the proper way yet at the same time stick successfully on to a wide range of different types of paper. It has still not been completely solved, and the quality of the results you get varies greatly, depending on the type of paper you use. Getting an ink-jet to print on to transparency film is obviously a tall order.

We chose to look at the £569 Integrex Colourjet 132. It is based on the same Canon colour ink-jet mechanism as several other printers, but the Integrex version is supposed to have the best graphic performance. We were therefore surprised to find the software support for it was rather poor. None of the presentation packages we had supported the Integrex directly.

Normally you solve this problem by getting the printer to emulate some other more common printer. For example, we used the Fujitsu by getting it to emulate an Epson JX-80, and the Oki Laserline 6 by getting it to pretend to be a Laserjet. However, the Integrex does not emulate anything. Instead you use a screen-dump program, which costs an extra £45. The dump routine itself is dreadful: if you want to do anything except dump with the default setting you have to type in one- and two-letter codes with no screen prompts at all. This means you are driving the printer in bit-mapped mode, so you are probably sacrificing some quality too.

The results were OK, but not up to the standard of the Fujitsu dot-matrix printer or even the cheaper Epson EX-800. The printed colours seem to shift to values quite different to those shown on the screen display it is dumping.

The Integrex manual recommends using a double-pass mode when printing on transparencies, but this produced an inky mess when we tried it. In single-pass mode the film was still smeared and covered with sheets of liquid ink. We were using a matt transparency material designed for Xerox ink-jet use. It is possible that with the right film we might have got better results, but if that is so the Integrex must be very sensitive to the type of film used.

Once you are prepared to accept a special-purpose device dedicated just to producing coloured output, other technologies become possibilities. Thermal-transfer printing is the most promising, it works by melting dye on to the surface of the paper from a special ribbon.

While thermal-transfer printers also tend to be fussy about paper, they like it shiny so results are good on ordinary transparency film. Running costs tend to be high though, as you get through a lot of ribbon. We have reviewed two thermal-transfer printers on previous occasions — the £4,135 Mitsubishi G-500, which produced brightly coloured images of very high quality, and the very cheap but slow Okimate 20, which costs £150.

As an alternative to printing on to paper or transparency film some users prefer to use 35mm. transparencies. You can just photograph the screen, possibly using a hood around the front of the camera to reduce reflections. Alternatively you can use a film recorder — a device like a small self-contained projector to which you attach a standard SLR camera minus the lens. The brand leaders here are Polaroid and Hewlett-Packard.

As alternatives to plotters, film recorders do not have a lot to recommend them. Apart from the change of format to a different display they are in fact rather similar to plotters. They can take just as long to produce each chart as they work slowly with exposures. The cost is about the same or greater, starting above the £1,000 mark. A Polaroid Pallette system for the IBM PC, complete with film back, costs £1,395.

SUPPLIERS

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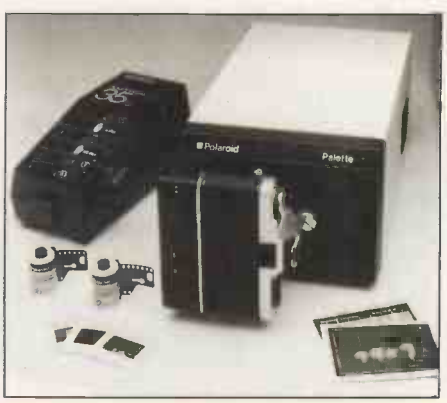
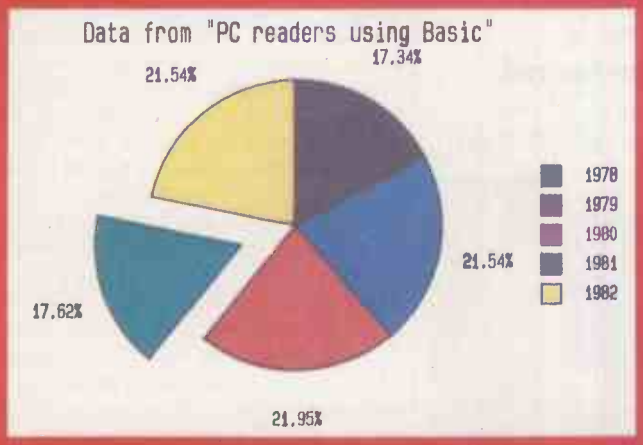
Hewlett-Packard Harman House, 1 George Street, Uxbridge, Middlesex UB8 1YH. Telephone: (0895) 72020
Oki Technitron X-Data, 750-751 Deal Avenue, Slough Trading Estate, Slough, Berkshire SL1 4SH. Telephone: (0753) 31292

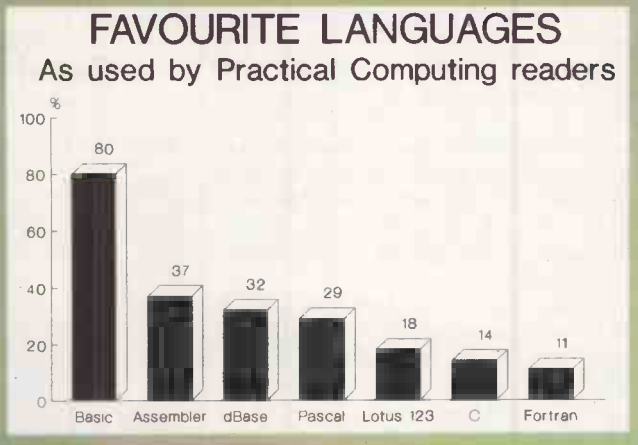


The Polaroid Palette shoots an image straight on to 35mm. film.

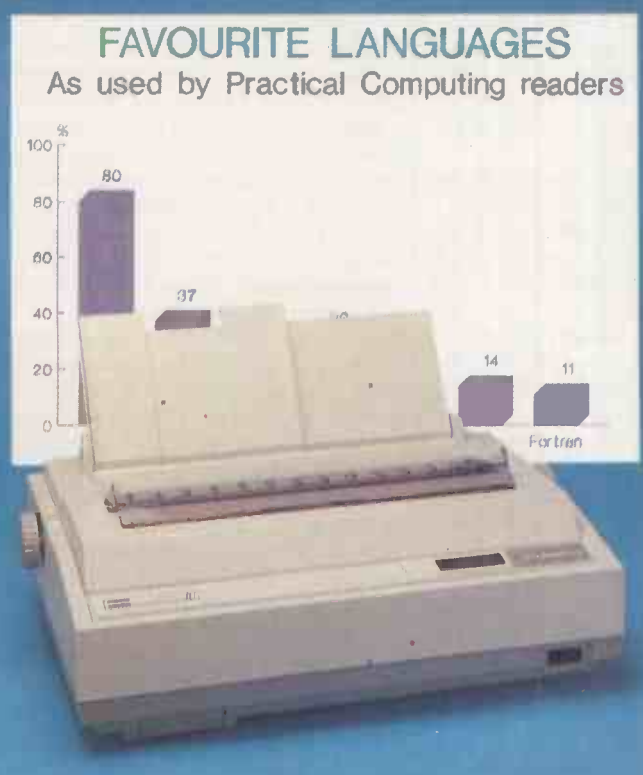
HEWLETT-PACKARD COLORPRO



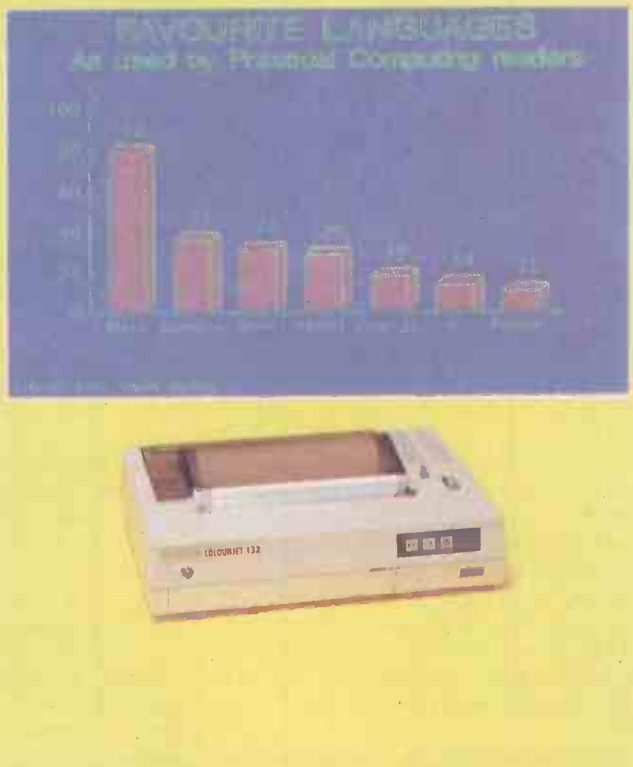
OKI LASERLINE 6



FUJITSU DL-2600



INTEGREX COLOURJET



MADE FOR THE MAC

The Macintosh starts with several advantages when it comes to graphics applications. **Carol Hammond** examines some of the software which exploits them.

When it comes to graphics applications Apple with the Macintosh has been the front runner and IBM has followed in its footsteps. Presentation graphics has proved to be no different. Even the standard Apple word-processing program, Macwrite, offers a sufficient variety of type sizes, styles and founts to make an ordinary document suitable for presentations, especially if it has been embellished with the help of Macdraw or Macpaint. Features that regular Mac users take for granted are likely to be greeted enthusiastically by people more familiar with IBM software.

Another reason the Macintosh has the lead in this type of application is that there is no need to buy extra graphics cards or high-resolution screens to run the software. A basic 512K Mac should prove adequate for most needs, a mouse is already an integral part of the kit and a hard disc is not a necessity.

We looked at two presentation-graphics packages for the Mac. Microsoft Chart comes on one disc and Cricket Graph on two, so in neither case is there any fiddling around with handfuls of floppy discs; the only reason you might want to use a hard disc is to increase your memory capacity. The major hardware cost factor is the output device, which may be a laser printer, plotter, dot-matrix printer or film recorder. Both packages were easy to learn since they adopted the traditional user-friendly Mac interface.

Where the Mac falls down is in its inability to display colour, though Cricket Graph does allow you to produce colour printouts. Cricket Graph supports various Hewlett-Packard plotters as well Apple output devices. Both the packages we looked at are Postscript compatible, so you can produce very high-resolution output using typesetting equipment.

DATA FILES

We saw version 1.1 of Cricket Graph, which was updated in 1986. One of its 400K discs carries the program and two sample data files, while the other holds the system file, device installers for a number of plotters and the Switcher program. Two useful sample data files are provided.

When you open Cricket Graph you are met by a spreadsheet-like window into which you enter your data. A Data window can contain up to 40 columns, each corresponding to a separate field or variable, and 2,700 rows for entries; the number of data items you can enter depends on the amount of free memory available. You can have more than one data window on-screen at a time.

You label variables by entering the name at the head of each column. Row and column numbers are automatically assigned by the program as you enter data, which can be in the form of numbers or text. Up to 15 characters can be held in each cell. Within each column, editing functions are performed in the same way as in Macwrite. You can cut, copy, paste and delete whole rows and columns too.

Double-clicking in the title bar or size box expands the Data window to full-screen size. Clicking in the Home region in the upper left corner of the window puts row 1 column 1 in the top left corner of the window, allowing you to return quickly to the origin of the table.

To transform your data into graphical form you select the Graph menu. The 11 different graph types available are scatter, line, area, bar, column, pie, stack bar, stack column, polar, quality control (QC) and doubley.

of text which you can place next to a graph, or use to create a slide or image that contains words only. You can also place rectangles, ovals, rhomboids, diamonds, lines and arrows in a Text window using the Tools option. It is here that you can paste pictures from the Clipboard into a graph, allowing you to incorporate images that have been created in Macpaint, Macdraw or a similar package.

Once you have selected the type of graph you want a dialogue box appears from which you select the variables to be charted. You click on the appropriate names and then on the New Plot box. The program works very fast, generating a graph or chart within seconds.

Altering an existing graph is equally easy. To change the location of a label you just click on it and drag it to where you want it to go. If you double-click on a label a dialogue box appears in which you can change the fount, style, size and orientation of a label. Double-clicking on a vertical or horizontal scale opens another dialogue box which allows you to recalibrate the chart. Double-clicking on the pattern in a legend brings up a dialogue box of patterns from which you choose any one from a selection of 16.

A Tools option, available from the Goodies menu, lets you add lines, text and arrows to a graph. The colour palette offers eight colours and is also called up from the Goodies menu. You can change the colour of a selected item in a graph by clicking on it and then moving to the palette and clicking on the colour you would like it to be.

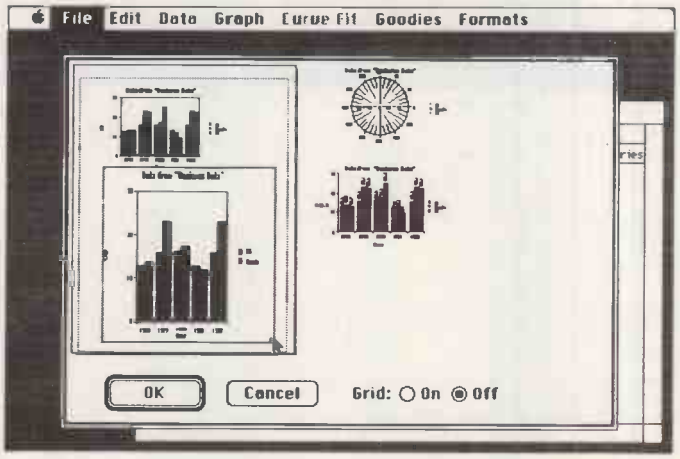
You can also show or hide the legend, remove or add a plot frame, add depth for a three-dimensional effect, switch axes, and add error bars to each data value in a scatter, line or bar graph. Value labels can be added so that, for example, the wedges in a pie chart could be labelled to show what percentage they are of the whole. By choosing Record Preferences you can set the parameters in the currently active window as the default values for all further graphing. If you have a scatter, line or double-y graph you have access to the Curve Fit menu, which offers a variety of regression curves.

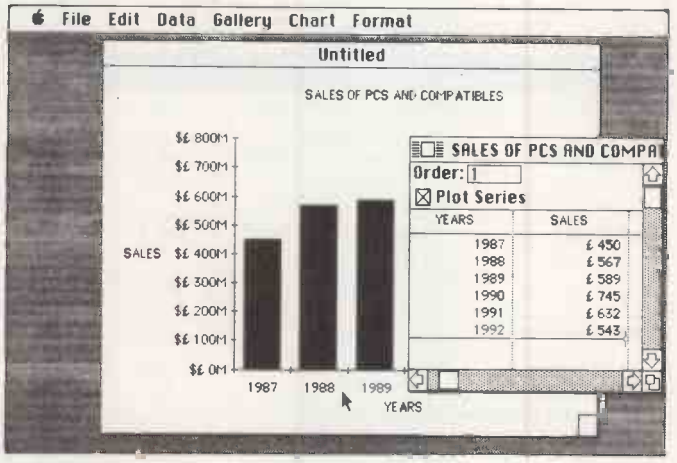
GRAPHIC MACROS

Changes to variables in the Data window are not reflected in a related graph until it is plotted again. To save time when repeating a graph you can make a graphic macro which saves all the information you have previously selected, but allows you to use new data.

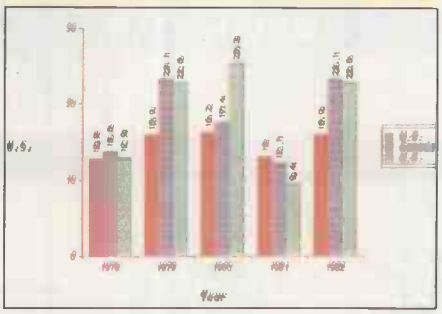
Cricket Graph includes an analytical capability, available from its Data menu, that allows you to sort data in alphabetical, ascending or descending order. You can also manipulate the data in a number of ways. The Recode option allows you to change the values of a set of data and place the new data in a separate column. The Transform and Simple Math options perform mathematical calculations on data. With Count Frequency you can create a sub-table in your Data window which shows how many times a particular item or figure appears in the main data. Finally, the Smooth option lets you perform a sliding avergage smooth on a specified column of data.

To print or plot output from Cricket Graph you go first to the Print or Plot option, where you are presented with a Page Layout window. It shows an image of the page to be printed containing a miniature representation of the graph that is in the





Above left: You can present 10 graphs in any size with Cricket Graph.
Above right: Microsoft Chart allows you to enter one pair of fields at a time.
Below: Colour from Cricket Graph.



foremost active window; graphs contained in other active windows are displayed beside the page. You can move a graph to any position on the page and resize it. Any of the other graphs on the Page Layout window can be transferred on to the page and manipulated in a similar way.

Cricket Graph supports the Apple Laserwriter, Apple Imagewriter II, Apple Color Plotter as well as several Hewlett-Packard plotters: the 7470A, 7475A, Colorpro and 7550A. It will drive Postscript-compatible equipment, and Cricket Software may be able to supply drivers for other devices on request.

Cricket Graph can take in data from the Clipboard, but where whole files need to be imported it can read text or Sylk-format files. You can export graphs from Cricket Graph via the Clipboard or Scrapbook to other Macintosh packages. Files can also be stored to disc in Pict format, which can be read by Macdraw, for example.

The documentation provided with Cricket Graph is clear and easy to understand. It has an introductory section on getting used to the package, followed by sections on each menu, tips on creating graphs, importing and exporting files, using plotters, using Switcher and working with Macdraw.

Microsoft Chart is a slightly older package than Cricket Graph and seemed rather clumsy and limited in comparison. You enter data in two columns into a window called the Series window. One column represents the x axis and is known as the Categories column, the other represents the y axis and is called the Values column. Categories can consist of numbers, dates and words; values can be numeric only. I found Chart's jargon rather confusing and not nearly as easy to understand as the more standard terminology of Cricket Graph. And while Cricket Graph allows you to enter data in several fields from which you can choose the ones you want to plot, in Microsoft Chart you can only enter data for one pair of fields at a time.

You can edit data in two ways. Within the Series window you can click on data items and drag them about, as well as enter new data. I found the process rather fiddly, since there are four different kinds of pointer and it is difficult to remember which does what. The Edit menus gives you access to simple Cut, Copy, Paste and Undo options.

To select the type of graph to be charted you click on the Gallery menu. Seven different types of graph are available: area, bar, column, line, pie, scatter and combination. Within each type of graph you can choose a variety of patterns, grids, labels and so on.

To plot a graph you click on a small box marked Plot Series. The plotting process is quite quick. When you make a change to the data in the Series window you do not need to redraw the graph as in Cricket Draw — it is done automatically, though you can prevent this happening if you wish.

Altering text and labels is a fiddly process. you can move text around by clicking on the text and waiting for it to be surrounded by small black squares. To move text around you click between squares with a four-headed arrow. Clicking on the squares themselves lets you change the size of the text. I found these features awkward to use; it is also easy to delete text by mistake if your cursor is in the wrong place.

You can sort data by category or value in ascending or descending order. An Analyze option offers seven basic ways of analysing data, though Microsoft Chart's analytical ability is nothing like as powerful as Cricket Graph's.

The Format menu allows you to alter the appearance of your graph. You can specify how data should be aligned in a column, whether to have text before or after a category or value, and what date or number format to follow. From the Format menu you can also select Patterns, Legend, Text and Axis, which allow you to control the scaling of the axes, the line weights, the type of tick marks, fount sizes and other features.

The Chart menu contains the Axes option along with Add Legend/Delete Legend and Add Arrow/Delete Arrow options. You use the Axes option to adjust the tick mark labels and grid. Having to switch between different options on separate menus made setting up the axes a confusing business.

I did not find the documentation particularly helpful in dealing with these badly thought-out menus. They are listed in appendices at the back of the book but here, as in the rest of the manual, there is a lot of cross-referencing so that you continually have to flip back and forth between pages. neither were the explanations as clear or as comprehensive as they could be.

Unlike Cricket Graph, Microsoft Chart does not allow you to print in colour. Though it will drive any Postscript-compatible output device, including the Apple Laserwriter, it does not support any plotters or film recorders. Data can be imported and exported via the Clipboard, and files imported when in text or Sylk format. Chart does not support Pict format.

PACKAGES IN BRIEF

	PUBLISHER	PRICE	COPY PROTECTION	RAM REQUIRED	DISPLAY CARDS	MOUSE SUPPORT	PLOTTER SUPPORT	FILM RECORDERS	LASER PRINTERS	SYMBOL LIBRARY	MULTIPLE FOUNTS	CAROUSEL	IMPORT FROM	DIRECT ENTRY OF DATA	SUPPLIERS
IBM															
Davrelle	Soft Image Systems	£495	no	512K	CGA, EGA, Hercules	yes	yes	yes	yes	no	yes	yes	1-2-3, DIF	yes	Soft Image
Freelance Plus	Lotus	£320	no	348K	CGA, EGA, Hercules	yes	yes	yes	yes	yes	yes	no	1-2-3, Symphony, dBase	yes	Lotus
Gem Graph	Digital Research	£180*	no	256K; 320K for DOS 3	EGA, CGA, Hercules	yes	yes	yes	yes	yes	yes	no	Lotus 1-2-3, DIF, PRN, Supercalc dBase	yes	Digital Research
Gem Wordchart	Digital Research	£130*	no	256K, 320K for DOS 3	CGA, EGA, Hercules	yes	yes	yes	yes	no	yes	no	no	no	Digital Research
Graphwriter	Lotus	£475	no	256K	CGA, Hercules	no	yes	yes	yes	no	yes	no	DIF, Sylk	yes	Lotus
Harvard Presentation Graphics	Software Publishing Corporation	£295	no	256K	CGA, EGA, Hercules	no	yes	yes	yes	no	yes	yes	Lotus, PFS, ASCII	yes	Software Publishing
Perspective	Three D Graphics	£250	undecided	512K	EGA, Hercules	no	no	no	yes	no	no	no	DIF, Sylk, ASCII	yes	PCML
VCN Concorde	Visual Communications Network	£550	two installations only	348K	CGA, EGA, Hercules	yes	yes	yes	yes	yes	yes	yes	1-2-3, DIF, Sylk	yes	P&P
Windows Draw	Microsoft	£145	nc	320K RAM	CGA, EGA, Hercules	yes	yes	no	yes	yes	yes	no	Lotus Pic	no	Microsoft
MACINTOSH															
Cricket Graph	Cricket Software	£155	no	128K	–	yes	yes	yes	yes	no	yes	no	ASCII, Sylk	yes	Heyden
Microsoft Chart	Microsoft	£95	yes	128K	–	yes	no	no	yes	no	yes	no	ASCII, Sylk	yes	Microsoft

*Amstrad-only versions cost £100

PC VERDICTS

	PERFORMANCE	EASE OF USE	DOCUMENTATION	VALUE FOR MONEY	
Davrelle	■■■	■■■	■	■■	Combines the mouse and icon approach with a good understanding of advanced presentation graphics.
Freelance Plus	■■	■■■	■■■■	■■	A well-designed product, but with only limited charting abilities.
Gem Graph	■■	■■■	■■	■■■	A limited but useful program.
Gem Wordchart	■■	■■■	■■	■■	Adequate but of limited use on its own.
Graphwriter	■■■	■	■	■	Needs updating from top to bottom.
Harvard	■■■	■■■	■■■■	■■■	Does all the major types of charts in a straightforward way; the perfect package for the newcomer.
Perspective	■■■■	■■■	■■	■■■	Tour-de-force package which does one thing well: dramatising numeric data.
VCN Concorde	■■■	■■	■■	■■	A powerful product that deserves a better user interface.
Windows Draw	■■	■	■■	■	Not really a presentation-graphics package at all.
Cricket Graph	■■■■	■■■	■■■	■■■■	An easy-to-use, fast and powerful tool for business and scientific applications.
Microsoft Chart	■■■	■■	■■	■■■	Fiddly to use, but cheap and functional.

■ = POOR ■■ = AVERAGE ■■■ = GOOD ■■■■ = EXCELLENT

SUPPLIERS

Digital Research Oxford House, Oxford Street, Newbury, Berkshire RG13 1JB. Telephone: (0635) 35304
First Software Intec 1, Wade Road, Basingstoke, Hampshire RG24 0NE. Telephone: (0256) 463344
Heyden & Son Spectrum House, Hillview Gardens, London NW4 2JQ. Telephone: 01-203 5171
Lotus Development Consort House, Victoria Street, Windsor, Berkshire SL4 1EX. Telephone: (0753) 840281
Microsoft Excel House, 49 De Montfort Road, Reading, Berkshire RG1 8LP. Telephone: (0734) 500741
P&P Micro Distributors Carrs Industrial Estate, Haslingden, Rossendale, Lancashire BB4 5HU. Telephone: (0706) 217744
PCML Royal Mills, Esher, Surrey KT10 8AS. Telephone: (0372) 67282
Soft Image Systems 14-16 Brewer Street, London W1R 3FS. Telephone: 01-734 1592
Softsel Computer Products Softsel House, Syon Gate Way, Great West Road, Brentford, Middlesex TW8 9DD. Telephone: 01-568 8866
Software Publishing Europe 85-87 Jermyn Street, London SW1Y 6JD. Telephone: 01-839 2849

TOP 10

So all-embracing has the IBM standard become that it now covers the entire range of computers, from cheap micros for home use to state-of-the-art monsters at more than 10 times the price. **David Barlow** picks out the key machines in each sector.

For better or worse the news in the PC-compatible market over the past six months has been dominated by the launch of the Amstrad PC-1512. It has grabbed the headlines not on its technical merits but, in common with all products from the Sugar camp, mainly because of its superb packaging and devastating value for money. Of course, its popularity has left a sour taste in the mouths of would-be purchasers on dealers' seemingly interminable waiting lists. Not only have they had to wait months for their machines but when they eventually show up most of those long-suffering customers will have to cough up around 12 percent more than they originally expected.

Nevertheless, the launch of the Amstrad has transformed the cheap end of the PC-compatible market. Established business PC manufacturers like IBM, Olivetti and Compaq with machines in the danger zone are all scuttling up-market as fast as their corporate legs will carry them. Only a couple of big names have shown any interest in taking on the Amstrad. Zenith and Tandy are both notching up impressive sales for their PC-compatible desk-top machines, thanks in the main to Amstrad's inability to deliver on time. The prices may not be quite as low and the specs not quite as good, but they are established manufacturers and their products are ready for collection from the dealers' shelves.

The more risky alternative to the Amstrad is to choose one of the many cheap clones imported from the Far East. Product quality and support levels are patchy but there are bargains around for those who need no more than a low-performance PC. One ploy currently used to attract customers to a particular clone is to use alternative high-performance processors such as the NEC V-20 in place of the Intel 8088, or the NEC V-30 in place of the 8086. Though these chips are faster than the Intel originals, the difference is not always decisive. The Epson PC+, for instance, boasts a dual-speed NEC V-30 but is only marginally faster than the Amstrad PC-1512. And you could buy two Amstrads for the price of one PC+, and still have plenty left over for software.

There are several respected manufacturers still asking unrealistic prices for basic PCs, but these machines will probably be phased out within the year, leaving production lines clear for more advanced hardware. Already many such manufacturers are pushing their 80286-based PC/AT compatibles further and further up-market. When the IBM PC/AT was first launched, its Intel 80286 chip was clocked at a modest 6MHz. Now manufacturers are offering 10MHz or even 12MHz operation in an attempt to get an edge on the opposition. High-speed processors can provide single users with much faster response times. Alternatively their resources can be shared out between several users. It is with this aspect of performance in mind that manufacturers and users alike are looking to Xenix as a serious alternative operating system to MS-DOS.

The IBM PC/AT is facing up-market clones with high-speed processors.

The PC/AT scene in 1986 saw the emergence of yet another standard keyboard layout. Just when everyone was getting used to the improved AT layout, IBM came out with an even fancier unit, christened the Enhanced model, which incorporates some notable improvements, in particular a set of dedicated cursor keys. Compatibility with off-the-shelf IBM software should not be impaired as long as the software manuals are modern enough to support the more recently introduced layouts.

Compaq offers both AT and Enhanced keyboard styles on its new flagship, the Deskpro 386. Its 16MHz chip puts it at the top of the PC-compatible performance table, yet many people liken using this machine to running a Ferrari on just two cylinders. The chip has immense power, but the current version of MS-DOS only exploits a fraction of its true potential. Compaq's pre-eminent position may well be threatened by Jarogate's forthcoming PC-compatible Sprite, which is not tied down by as many memory wait states as the Compaq.

When it comes to computing on the move, the Toshiba T-3100 must still be regarded as the ultimate transportable. Its compact dimensions, 80286 processor and integral hard disc are still streets ahead of anything the opposition has to offer. If it is a true portable you are after, then the all-new Zenith Z-181 is the best machine to arrive in 1986. Its back-lit LCD and superb packaging make it a delight to use, though its 3.5in. discs may restrict your choice of software.

What the world of PC compatibles could benefit from now is a decent operating system that will allow multi-tasking and no-tricks memory addressing above the 640K limit currently imposed by MS-DOS. It seems unlikely that this will ever appear on the Intel 8088/8086 chips, but both Microsoft and Digital Research have impressive plans for the 80286 and 80386 chips. With luck these products could surface during 1987. PC

SUPPLIERS

Amstrad Brentwood House, 169 Kings Road, Brentwood, Essex CM14 4EF. Telephone. (0277) 230222
Apricot Apricot House, 111 Hagley Road, Edgbaston, Birmingham B16 8LB. Telephone: 021-456 1234
Compaq Ambassador House, Paradise Road, Richmond, Surrey TW9 1SQ. Telephone: 01-940 8860
Epson Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH. Telephone: 01-902 8892
Sperry Sperry Centre, Stonebridge Park, London NW10 8LS. Telephone: 01-965 0511
Tandy Tandy Centre, Leamore Road, Bloxwich, Walsall, West Midlands WS2 7PS. Telephone: (0922) 477778
Toshiba International House, Windmill Road, Sunbury-on-Thames, Middlesex TW16 7HR. Telephone: (0932) 785666
Zenith St. John's Court, Easton Street, High Wycombe, Buckinghamshire HP11 1JX. Telephone: (0494) 448781

TOP 10

AMSTRAD PC-1512

FOR many people 1987 will see the PC-1512 turn from a myth into reality as supply catches up with demand. Hard-disc machines seem to be in shortest supply but now that Amstrad is talking to alternative suppliers the situation should improve. If you cannot get hold of a hard-disc machine from Amstrad it may be possible to buy the more readily available single-floppy version and fit your own hard disc on a card. As yet few compatibility problems have arisen, and the machine has just undergone minor modifications to cure a bug that arose when it was used in a network. Much play has been made of over-heating problems, so Amstrad has fitted a fan to latest models. Owners of early machines can buy fans from third-party manufacturers if they feel they need it.

PRICE: £450

FOR: Price. Packaging. Performance.
AGAINST: Supply shortages. Flimsy engineering.

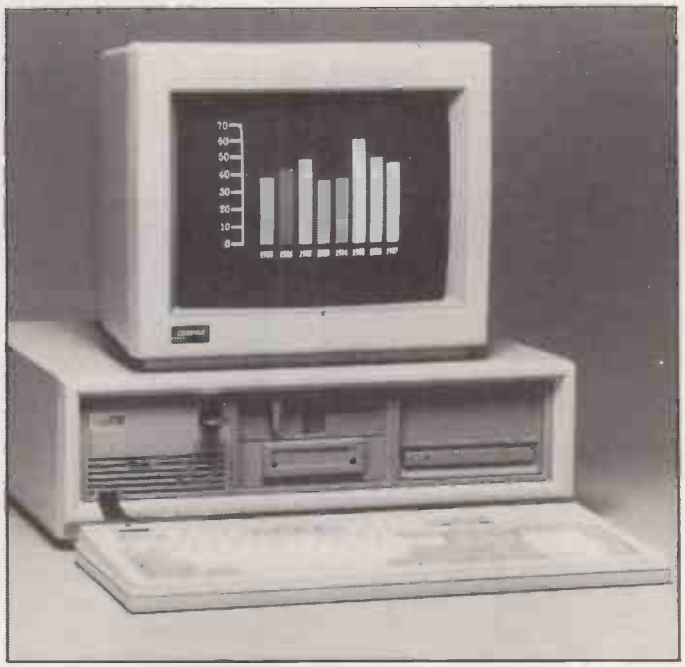
APRICOT XEN-i

THE IBM-compatible version of the pretty Xen is a performance-orientated AT compatible. It features a quick 10MHz Intel 80286 processor switchable between 6MHz and 8MHz. Memory in excess of 640K can be addressed thanks to the Above Memory Mapper which conforms to the now accepted Lotus/Intel/Microsoft (LIM) standard. There is a comprehensive range of display systems to suit all tastes, including paper-white monochrome and medium- and high-resolution colour using the EGA standard. One unusual aspect of the machine is the optional telephone-management system. This comprises a telephone grafted on to the side of the keyboard and software to dial and organise a list of calls while an application package is running. The only real snag with the Xen is a rather tortuous expansion path — a penalty for its pleasing appearance. The basic machine has three rather strange horizontal internal slots which will only take short cards. To expand further it is necessary to buy the XP-i expansion box, which will accept three full-size cards.

PRICE: £2,998

FOR: Looks. Performance. Multi-user potential.
AGAINST: Limited expansion potential. Price.

Above: The Apricot Xen-i. Below: The Compaq Deskpro 386.



COMPAQ DESKPRO 386

COMPAQ's new flagship was the first machine to use the powerful Intel 80386 chip and offer full IBM compatibility. With its processor running at 16MHz the Deskpro 386 is, not surprisingly, a great deal faster than the best of the AT compatibles. Speed apart, it currently offers little real advantage when running normal MS-DOS applications; it makes more sense as a high-performance file server in a large network, or running an alternative operating system like Xenix. The Deskpro 386 includes extended memory management to the currently accepted AST standard. The base model is fitted with 1Mbyte of RAM. The hard discs used are also high-performance units. Compatibility, although not quite up to Compaq's usual standard, is still exceptional when the radically different nature of the processor is taken into account.

PRICE: £6,444

FOR: The ultimate performer. Expansion potential. Build quality.
AGAINST: Needs a decent operating system. Very expensive.

EPSON PC AX

FOLLOWING on from its good but expensive PC+, which offered almost AT performance, Epson's PC AX is a true AT compatible with an Intel 80286 processor running at 6MHz, 8MHz or 10MHz. This combination enables the PC AX to double the speed of a 6MHz IBM PC/AT. The machine is available with hard discs up to 80Mbyte capacity, and is supplied as standard with 640K RAM. Expansion potential is impressive. The motherboard has nine slots and in its base hard-disc version has four AT and three PC slots free, even when serial and parallel ports and screen display are provided for. The price is not rock-bottom but is certainly competitive for a well-built machine from a highly reputable manufacturer.

PRICE: about £2,500

FOR: Performance. Expansion potential.
AGAINST: A new machine. Price is no better than average.

FAR-EASTERN CLONES

NUMEROUS nameless clones built in South-East Asia are being imported by U.K. distributors. As well as low price the machines have a less desirable feature is common: low performance. Fortunately more and more are now being fitted with dual-speed processors or the souped up NEC processor chips, and these are the ones to look out for. Another point to watch is the display adaptor: some of the low prices are only available on text-only units, while others offer the option of IBM-compatible colour or Hercules-compatible monochrome systems. It is probably worth opting for one of the better-known systems, rather than just the one offering the lowest price. You may well need some degree of after-sales support, which a fly-by-night dealer will clearly not supply. Some cheap clones are being offered with maintenance agreements that are almost as cheap as the Amstrad/Dictaphone deal.

PRICE: from £400

FOR: Price. Readily available.
AGAINST: Performance. Possible support problems.

SPERRY MICRO IT

THIS is Sperry's second Mitsubishi-built AT compatible. It is strikingly different to its predessor, the Sperry PC IT, which has been moved into the multi-user market. The Micro IT is surprisingly compact and uses a three-speed implementation of the 80286, running at either 6MHz, 7.16MHz or 8MHz, coupled to 512K of RAM expandable to 3.5Mybte. The performance of the processor under test belies the fairly mundane processor speeds, and the machine turns in one of the best sets of Benchmarks on record. Once again there is a price to be paid for a pretty face as the expansion boards lie horizontally in a limited five-slot bus, three of which are already filled on the base machine. The keyboard is arranged in a modified AT layout, where the Shift and Backslash keys are reserved.

PRICE: £3,250

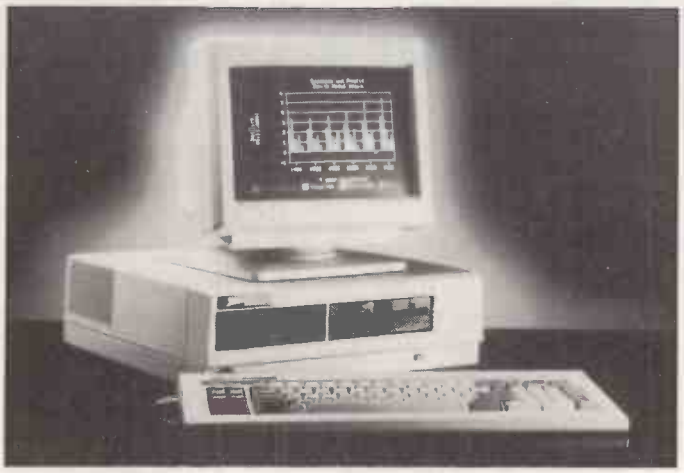
FOR: Compact dimensions. Performance.
AGAINST: Price. Limited expansion potential.

TOSHIBA T-3100

ALTHOUGH this elegantly packaged machine looks like a true portable, its gas-plasma display and hard disc rule out battery operation. But while you remain tied to the mains supply the quality of the T-3100 is unrivalled by other transportables. It is basically an AT compatible, with its 80286 chip running at 4.77MHz or 7.16MHz, coupled to 640K RAM which is internally expandable to 2.6Mbyte. There is a 10Mbyte hard disc and a 720K 3.5in. floppy. The gas-plasma display offers 80- by 25-character text and 640- by 400-pixel graphics. The keyboard is somewhat compressed, but manages to fit in 81 keys in a reasonably usable layout. Expansion is not impossible but limits portability as it requires an internal expansion-bus card coupled to an external expansion box suitable for standard PC boards.

PRICE: £3,695

FOR: Compact, lightweight package. Display quality. Performance.
AGAINST: Expensive. Software restricted by 3.5in. drive. Mains only.



Above: Zenith Data Systems' Z-148. Below: The Tandy 3000.

TANDY 3000

THE 3000 is a conventional machine, with none of the usual Tandy idiosyncrasies that often serve to impair IBM compatibility. It uses an Intel 80286 chip running at 8MHz, and is supplied with 640K RAM. The latest 20Mbyte versions are offered with either a conventional hard-disc sub-system or with the disc mounted on a card — a configuration which actually works out cheaper. There is also the option of a high-performance 40Mbyte hard disc. What makes the Tandy such a sound buy is its price, which starting from £1,795 must be the best value available from a big-name supplier. It also has a massive 10-slot expansion bus, of which five AT- and three PC-compatible slots are normally vacant. There are a variety of display options, and the 3000 is bundled with Tandy's Deskmate integrated software package.

PRICE: £1,795

FOR: Price. Compatibility. Expansion potential.
AGAINST: Mediocre performance.

ZENITH Z-148

WITH its new low price, the Z-148 competes head on with the Amstrad PC-1512. Although not quite a match on performance or price, it is readily available and well made. The monochrome display is undoubtedly superior to that of the Amstrad, however, and an RGB interface is included as standard. Only 256K of RAM is standard, but it can be expanded to the full 640K on the motherboard. The Intel 8088 runs at 8MHz, but the Z-148 cannot match the Amstrad on speed. Expansion facilities are limited to just one board mounted horizontally in a special adaptor. Rather strangely, Zenith has not fixed a recommended retail price — so be prepared to haggle.

PRICE: £690

FOR: Price. Compatibility. Display.
AGAINST: Only one expansion slot. Sluggish performance.

ZENITH Z-181

THE packaging of this portable PC compatible is superb, with twin 3.5in. drives popping out from a panel above the keyboard. The back-lit LCD screen offers excellent legibility with both brightness and contrast adjustment, and also produces distortion-free graphics. For office use a colour monitor can be connected to its standard RGB port. Expansion facilities are understandably limited but a healthy 640K memory is supplied as standard, along with both serial and parallel ports. The main snags with the Z-181 are the rather poor performance of the Intel 80C88 processor and the unusually sluggish 3.5in. disc drives.

PRICE: £1,895

FOR: Superb display. Portability. Build quality.
AGAINST: Slow. Sluggish 3.5in. drives.

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ALL AT C

Steve Malone samples some of the books that will help you get to grips with the high-level programming language that is undergoing a new surge of popularity.

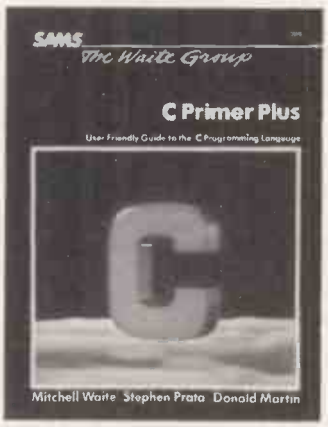
BOOK REVIEWS

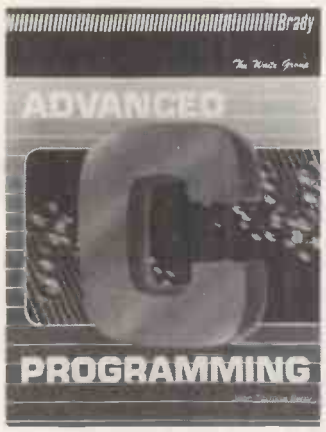
IT IS a rule of computing that the number of books on a subject is the square of how fashionable it is. Over the past two years C has become increasingly trendy, with the number of books about it rising accordingly.

The movement began when systems programmers discovered they could write tight and efficient code using a high-level language which is more adaptable than Pascal while holding on to its structured design. More recently, the release of Zorland's £30 C compiler is bound to ensure a new surge of popularity for the language. The catch with Zorland C is that the documentation is, shall we say, a little sparse.

If you want a tutorial straight from the horse's mouth the book to buy is Kernighan and Ritchie's *The C Programming Language*. Dennis Ritchie is one of the co-inventors of the language, and can be expected to know what he is talking about.

What is less expected, but equally welcome, is that the book is thoroughly readable. Clarity of explanation is dependent on the mastery of the subject, and the way in which Kernighan and Ritchie take you through the various features of C is both painless and interesting. The rather austere style of the writing may not be to everyone's taste, however. The book assumes you know nothing about C and takes the trouble to explain everything. What the authors do assume is that you are familiar with computers and programming in general.





The success of the book is marked by the fact that the Kernighan and Ritchie definition of C expounded in the book is the benchmark by which C compilers are judged. If you are at all serious about using the language *The C Programming Language* is an essential purchase. The only drawback is the price: at £22 for a paperback it is a bit steep.

Kernighan and Ritchie, having written the definitive manual, have made it difficult for other authors to step in. The rest of the books here therefore fall into two categories. First there are books with the amateur programmer in mind, the people at whom Zorland C is targeted. The second category of books deals with advanced techniques for programmers.

The title recommended by Zorland is the *C Primer Plus* by Mitchell Waite, Stephen Prata and Donald Martin. This book is American in origin and veers towards the over-chumminess that characterises so many programming introductions from that side of the Atlantic. But it never crosses the line into actually insulting its readers' intelligence, and provides lots of examples and exercises at the end of each chapter.

C Primer Plus struck me as being ideal for schoolchildren — though that does not prevent it being a good starting point for adults as well. It covers all the ground you are likely to encounter in a logical and entertaining fashion: I recommend it.

A more traditional type of language tutorial is given by *C At A Glance* by Adam Denning — "traditional" in the sense that it reminded me of all those Basic tutorials that Sinclair Spectrum and Commodore 64 owners rushed to buy a few years ago. The book is aimed at home users, and assumes a familiarity with Basic, giving comparisons between C and Basic syntax.

However, its explanation is thorough, if a little formal. Denning has a tendency to introduce several things at once, and this can leave you a little overwhelmed and feeling the need to reread the section. Still, the book covers a lot of ground in its 180-odd pages, and gives plenty of examples to type in. It is good, but a little worthy.

One beginners' manual I did not take to at all was *Introducing C* by Boris Allan. At whom Dr Allan is aiming his book remains unclear to me. It starts off with a chapter on Small-C, and after a brief introduction we are shown a program listing. Without further ado, on page 13 the book turns its attention to converting a program to assembly language. It is page 40 before we are told what an operator is.

Allan then goes on to talk about

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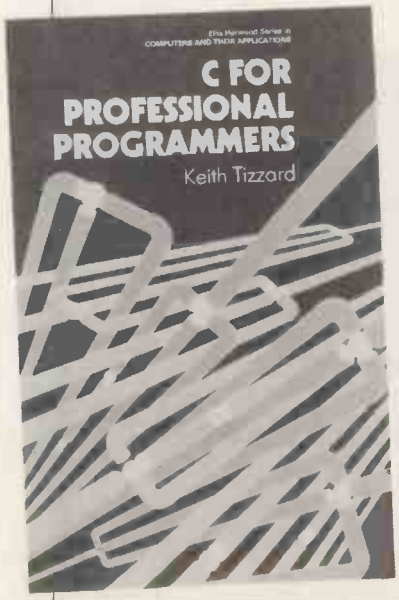

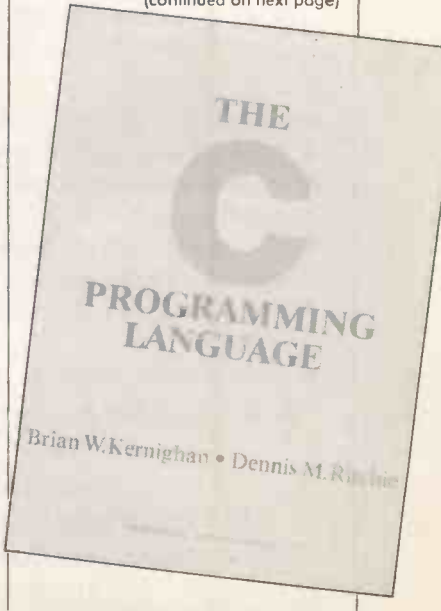

BOOK REVIEWS

(continued from previous page)

what the full version of C is, and then turns his attention to Microsoft C. By chapter 5 "Constructing a Language Translator", the beginner should be thoroughly confused — I know I was.

If you need a good intermediate book you could try *The C Compendium* by David Lawrence and Mark England. The blurb on the back says it is an "ideal . . . practical introduction". I wouldn't go that far, as the book lacks the kind of explanation of commands and syntax that the beginner needs. What the book is good at is providing a large number of programs for novices to cut their teeth on once they have read a basic introduction to C. One of the best ways to learn a language is by typing in, debugging and adapting other people's programs. *The C Compendium* gives you a wide range of listings to type in and muck about with.

The authors give explanations for each of the programs and the purpose of each of the variables used. An accompanying note says what each line or block of code actually does. All this helps you with your tinkering, and at the end of it all you end up with a useful library of routines and a good knowledge of practical C programming.

One book which attempts to address the same readership as the Kernighan and Ritchie manual is *C for Professional Programmers* by Keith Tizzard. The book has been written as an introduction to the language for working programmers. Much less hand holding is thought necessary than in some of the other books we have looked at, and this allows the explanations of the various features of the language to be straightforward and concise. But you are expected to understand the ramifications of what you have read, without having it pointed out to you. Tizzard's book is not for beginners — it is more for Pascal programmers who want to add another string to their bow.

One thing that worries me about this book is that there are a number of misspellings and even omitted words. The listings are typeset rather than reproduced from a printout, and I couldn't help wondering whether there might be errors there too. I typed in a couple of listings chosen at random, and they worked OK, but it still makes you feel uneasy.

To my mind, a better exposition of the language for experienced programmers is to be found in *Advanced C Programming* by John Berry. Although intended for users already familiar with the syntax and structures of C, the book is written in much the same style as the *C Primer Plus*, although the tone is slightly more serious.

Much of the book is dedicated to giving the reader an idea of how things ought to be done in the real world. Thus there are sections on I/O in C, how it works and how to use the library routines provided, file manipulations, pointers and interfacing to the operating systems.

Advanced C Programming uses the best techniques of American educational books. Each chapter starts with an introduction and list of goals the reader is expected to attain by the end. There are plenty of examples and diagrams to help you along. After reading the book, you feel confident you know how C operates in a computer, and how to use it to the best possible advantage. PC

ALL AT C

The C Programming Language by B W Kernighan and D M Ritchie. Published by Prentice-Hall, £22.95. ISBN 0 13 110163 3

C Primer Plus by M Waites, S Prata and D Martin. Published by the Waite Group, £19.50. ISBN 0 672 22090 3

C at a Glance by Adam Denning. Published by Chapman and Hall/Methuen, £7.95. ISBN 0 412 27140 0

Introducing C by Boris Allan. Published by Collins, £9.95. ISBN 0 00 383105 1

The C Compendium by David Lawrence and Mark England. Published by Sunshine Books £12.95. ISBN 0 946408 86 6

Advanced C Programming by John Berry. Published by Prentice Hall, £19.10. ISBN 0 89303 473 8

C for Professional Programmers by Keith Tizzard. Published by Ellis Horwood, £18.50. ISBN 0 7458 0092 0

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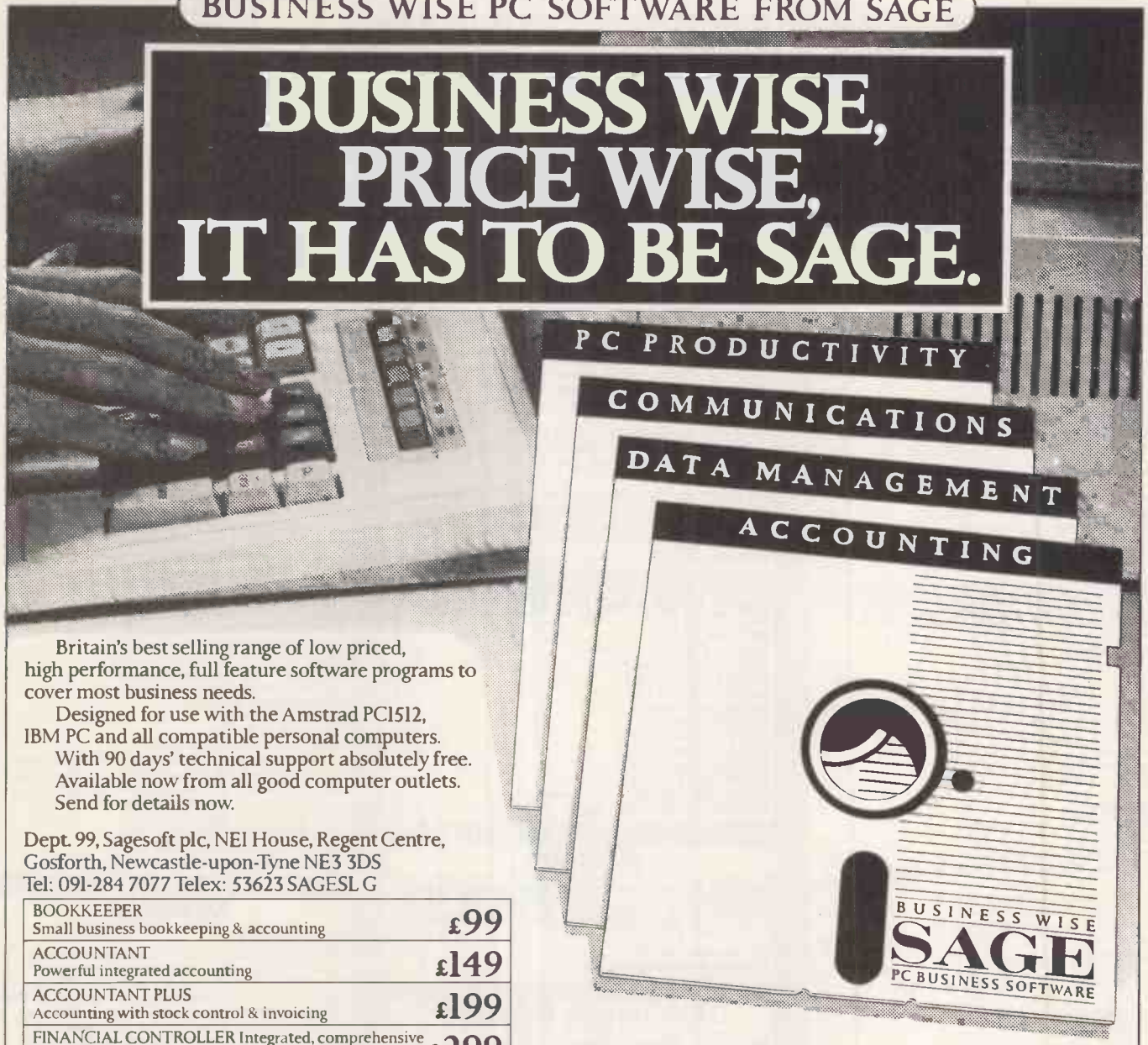

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▪ O P E N F I L E ▪

Open File offers programming tips and software to key in. We welcome submissions from readers. We are interested in business programs for any of the main machines such as IBM, Apple, Amiga, Atari 520ST, BBC and Amstrad PCW-8256. We are also interested in applications written in dBase, or for standard spreadsheets like 1-2-3. Utilities are also welcomed.

Submissions should include a brief description which explains what your program does and how it does it. This should be typed with lines double-spaced. The program should be printed with a new ribbon or at double-intensity; the width should be between 75mm. and 90mm., or between 105mm. and 135mm. Also include a disc of your program.

Please send your contributions to

Open File, Practical Computing, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

APPLE II

SLIDE DISPLAY

Graham Wilson presents a program to set up screen displays suitable for conversion into projection transparencies.

MOST people have to give a talk or lecture from time to time. Whatever the purpose, it can usually be improved by good, clear transparencies projected during the talk. While white-lettered, blue-background diazochrome slides are often provided by large companies and institutions, they are difficult if not impossible for the amateur to produce. But anyone with access to an Apple II and a camera can use the Lecture Aid program to make good-quality presentation slides.

The program uses part of the Applesoft Toolkit package, sold originally as the DOS Toolkit and now known as the Programmers' Toolkit Workbench. It provides a clear screen on to which text in a variety of founts can be placed and modified.

To use the program you will need a disc containing the Lecture Aid program itself and the following parts of the Toolkit: B005 RLoad, B003 RBoot, R012 HRCG, B005 ASCII.Set, B005 Straight.Set, B005 Byte.Set, B005 Count.Set, B005 Flow.Set, B005 Gothic.Set, B005 Outline.Set, B005 Roman.Set, and B005 Slant.Set. When the program is run each fount is installed, and then a menu appears.

Option 1 allows you to change the parameters. Up to 40 items can be used, and there are four columns to hold the details needed to display them. Entering a number from 1 to 40 allows you to change the information about a particular item. The program prompts you for a string of text, the number of the fount that it is to appear in and the horizontal and vertical positions of the first character in the string.

There are 22 rows and 39 columns on the standard screen. The 10 founts provided by the High-Resolution Character Generator (HRCG) packages with the DOS Toolkit are ready for selection. Answering 0 to the Change Item prompt returns you to the main menu.

Options 2 and 3 are use to maintain a disc file of the parameters entered, so that they can be changed later. The program tells you how to avoid losing or altering data accidentally so you should follow the instructions carefully.

Option 4 uses the information you have entered to display your frame, while the picture can be moved horizontally and vertically using options 5 and 6. You can centralise the completed images before preparing a transparency by performing a complete shift in the column or row of the picture.

Initialisation loads and prepares the founts and creates the necessary variables. The RBoot Toolkit routine BLoads between addresses $208 and $3CF. It is used to load the program RLoad above the Applesoft variable table, and sets the USR(0) function to the entry address of the HRCG.

Line 150 of the Lecture Aid program protects the space for the founts to be loaded by setting Himem below them. Lines 165 to 205 place a single character set into each of the nine blocks of memory that are reserved. Line 210 then calls the HRCG program to use them.

A fount is activated by the command

PRINT Ctrl-A;n

where n is the number of the fount required; CHR$(1) is Ctrl-A. Throughout the program the Caps Lock can be toggled using Ctrl-K or CHR$(11), and lower case selected with Ctrl-L or CHR$(12).

When setting up your screen displays bear in mind the conditions under which your slides will be shown. A good rule of thumb is that the height of the slide should be at least one-eighth the distance of the viewer, and you should follow the same rule when designing your artwork. For example, if your screen has a text area that is 12cm. high you should view it from a distance of about one metre. Individual letters should never be less than 1/25th the height of the artwork, so you should never have more than 25 lines of text at a time, preferably less.

Once you have got your presentation set up properly you will have to photograph it. As well as a suitable camera you will need a tripod and a piece of black cartridge paper or lightweight card.

Any camera will work as long as it focuses closely enough for your screen display to fill the frame. A long-focus lens is best as it minimises the curvature of the screen. Any sort of film will do too, but a slow speed is preferable. Cut out a disc of cartridge paper about 50cm. in diameter, with a smaller disc removed from the centre. Fastened with a couple of paper clips it makes a shallow cone around the lens, preventing any stray reflections entering the camera.

Turn the brightness control on the monitor right down, leaving the image just visible on the screen. Each line of the monitor is normally scanned electronically only once every 1/50th of a second, so you should make sure that your shutter speed is no faster than 1/30th.

SUPPLIERS

The Applesoft High-Resolution Character Generator is available through most Apple dealers and forms part of the DOS Programmers' Workbench.

Anyone interested in learning more about the art and science of audio-visual presentations can get two excellent leaflets produced by Kodak: *Let's Stamp Out Awful Lecture Slides* (S-22(h)), and *Legibility — Artwork to Screen* (S-24) from their local Kodak Regional Sales Centre.

LECTURE AID

```
1   REM
2   REM   APPLE.LECTURE-AID
3   REM
4   REM   GRAHAM B. WILSON
5   REM
6   REM   25/2/85
7   REM
50   TEXT : HOME
55   PRINT "APPLE LECTURE-AID"
60   PRINT "=================="
65   PRINT
70   PRINT "PLEASE WAIT...."
100   REM  ROUTINE TO USE HRCG FON
      TS
105   REM  G.B.W. 29/3/84
110   ONERR  GOTO 6000
115 ADRS = 0
120   PRINT  CHR$ (4);"BLOAD RBOOT
      "
125   CALL 520: REM  EXECUTE RBOOT

130 ADRS =  USR (0),"HRCG"
135   REM  BRING IN HRCG, ADRS=STA
      RTING ADDRESS
140 FTNB = 9
```

(listing continued on next page)

LECTURE AID

(continued from previous page)

```
  145  IF ADRS <  = 0 THEN ADRS = A
       DRS + 65536: REM  MAKE ADRS
       POSITIVE
  150 CS = ADRS - 768 * FTNB: HIMEM:
       CS
  155 CH =  INT (CS / 256):CL = CS -
       256 * CH
  160  POKE ADRS + 7,CL: POKE ADRS +
       8,CH
  165  PRINT  CHR$ (4);"BLOAD ASCII
       .SET,A";CS + (0) * 768
  170  PRINT  CHR$ (4);"BLOAD BYTE.
       SET ,A";CS + (1) * 768
  175  PRINT  CHR$ (4);"BLOAD COUNT
       .SET ,A";CS + (2) * 768
  180  PRINT  CHR$ (4);"BLOAD FLOW.
       SET,A";CS + (3) * 768
  185  PRINT  CHR$ (4);"BLOAD  GOTH
       IC.SET,A";CS + (4) * 768
  190  PRINT  CHR$ (4);"BLOAD OUTLI
       NE.SET,A";CS + (5) * 768
  195  PRINT  CHR$ (4);"BLOAD ROMAN
       .SET  ,A";CS + (6) * 768
  200  PRINT  CHR$ (4);"BLOAD SLANT
       .SET  ,A";CS + (7) * 768
  205  PRINT  CHR$ (4);"BLOAD STRAI
       GHT.SET,A";CS + (8) * 768
  210  CALL ADRS: REM  INITIALIZE H
       RCG
  500  REM
  505  REM  INITIALIZE
  510  REM
  515  DIM A$(40),X(40),Y(40),F(40)

  520 D$ =  CHR$ (4)
  525  FOR I = 1 TO 40
  530 X(I) = 1
  535 Y(I) = 1
  540 A$(I) = ""
  542 F(I) = 0
  545  NEXT I
 1000  REM
 1010  REM  DISPLAY
 1020  REM
 1030  REM  MENU
 1040  PRINT  CHR$ (16)
 1050  PRINT "APPLE : LECTURE-AID"

 1060  PRINT "==================="

 1070  PRINT
 1080  PRINT "1...CHANGE PARAMETER
       S"
 1090  PRINT "2...LOAD FROM DISC"
 1100  PRINT "3...SAVE TO DISC"
 1110  PRINT "4...DISPLAY PICTURE"

 1120  PRINT "5...MOVE PICTURE HOR
       IZONTAL"
 1130  PRINT "6...MOVE PICTURE VER
       TICAL"
 1140  PRINT "7...CATALOG"
 1145  PRINT "8...DEMO FONTS"
 1150  PRINT "9...QUIT"
 1160  PRINT
 1170  VTAB 15: INPUT "SELECT ONE
       : ";I$
 1180 I =  VAL (I$)
 1190  ON I GOTO 2010,4010,3010,15
       10,9000,8000,7010,10000,5010

 1200  GOTO 1170
 1500  REM
 1510  REM  PICTURE
 1520  REM
 1530  PRINT  CHR$ (16)
 1540  FOR J = 1 TO 40
 1550  VTAB Y(J)
 1560  HTAB X(J)
 1570  PRINT  CHR$ (1);F(J); CHR$
       (12);A$(J); CHR$ (11); CHR$
       (24)
 1575  PRINT  CHR$ (26)
 1580  VTAB 1
 1590  HTAB 1
 1600  NEXT J
 1610 A =  PEEK ( - 16384)
 1620  IF A <  > 141 THEN 1610
 1625  PRINT  CHR$ (16)
 1630  GOTO 1000
 2000  REM
 2010  REM  INPUT
 2020  REM
 2030  PRINT  CHR$ (16)
 2040  FOR I = 0 TO 20 STEP 20
 2050  PRINT  CHR$ (16)
 2060  PRINT "ITEM";
 2070  HTAB 6
 2080  PRINT "STRING";
 2083  HTAB 28
 2085  PRINT "FONT";
 2090  HTAB 33
 2100  PRINT "COL";
 2110  HTAB 37
 2120  PRINT "ROW"
 2130  FOR L = 1 TO 40: PRINT "=";
       : NEXT L
 2140  PRINT
 2150  FOR J = 1 TO 20
 2160 K = I + J
 2170  PRINT K;
 2180  HTAB 6
 2190  PRINT  CHR$ (12);A$(K); CHR$
       (11);
 2193  HTAB 28
 2195  PRINT F(K);
 2200  HTAB 33
 2210  PRINT X(K);
 2220  HTAB 37
 2230  PRINT Y(K)
 2240  NEXT J
 2250  INPUT "CHANGE ITEM <0 TO CO
       NTINUE> : ";IP$
 2260 IP =  VAL (IP$)
 2270  IF IP$ = "0" THEN 2310
 2280  IF  VAL (IP$) = 0 THEN 2310

 2290  GOSUB 2500
 2300  GOTO 2050
 2310  NEXT I
 2320  GOTO 1000
 2500  PRINT  CHR$ (16)
 2510  PRINT "CHANGE ITEMS"
 2520  PRINT "============"
 2530  PRINT
 2540  HTAB 10: PRINT "OLD";
 2550  HTAB 30: PRINT "NEW";
 2560  PRINT
 2570  PRINT "ITEM   : ";IP
 2580  PRINT
 2590  PRINT "STRING : "; CHR$ (12
       );A$(IP); CHR$ (11)
 2600  PRINT
 2603  PRINT "FONT   : ";F(IP)
 2605  PRINT
 2610  PRINT "ROW    : ";Y(IP)
 2620  PRINT
 2630  PRINT "COLUMN : ";X(IP)
 2640  PRINT "NEW DATA <RETURN-SKI
       PS>"
```

APPLE II

LECTURE AID

```
2650  PRINT "BLANK : ££"
2660  VTAB 8: HTAB 30: INPUT "";I
      P2$
2670  IF IP2$ = "" THEN 2692
2680  IF IP2$ = "££" THEN :A$(IP)
      = "": GOTO 2692
2690 A$(IP) = IP2$
2692  VTAB 10: HTAB 30: INPUT "";
      IP2$
2693  IF IP2$ = "" THEN 2700
2694  IF  VAL (IP2$) < 0 OR  VAL
      (IP2$) > 9 THEN 2692
2695 F(IP) =  VAL (IP2$)
2700  VTAB 12: HTAB 30: INPUT "";
      IP2$
2710  IF IP2$ = "" THEN 2740
2720  IF  VAL (IP2$) > 23 THEN 27
      00
2730 Y(IP) =  VAL (IP2$)
2740  VTAB 14: HTAB 30: INPUT "";
      IP2$
2750  IF IP2$ = "" THEN 2780
2760  IF  VAL (IP2$) > 39 THEN 27
      40
2770 X(IP) =  VAL (IP2$)
2780  PRINT  CHR$ (26);
2785  INPUT "ANY FURTHER CHANGES
      <Y OR N> : ";IP2$
2790  IF  LEFT$ (IP2$,1) <  > "Y"
      THEN : RETURN
2800  GOTO 2500
2810  END
3000  REM
3010  REM  SAVE
3020  REM
3030  PRINT  CHR$ (16)
3040  PRINT "SAVE DATA"
3050  PRINT "=========="
3060  PRINT
3070  INPUT "FILE NAME : ";IP$
3080 FL$ = IP$ + ".LA"
3090  PRINT
3100  PRINT "IF FILE : ";FL$
3110  PRINT "EXISTS IT WILL BE ER
      ASED"
3120  PRINT
3130  PRINT "PRESS <RETURN> TO AB
      ORT"
3140  PRINT "PRESS <ESC> TO CONTI
      NUE"
3150 IP =  PEEK ( - 16384)
3160  IF IP = 141 THEN 1000
3170  IF IP = 155 THEN 3190
3180  GOTO 3150
3190  PRINT D$;"OPEN";FL$
3200  PRINT D$;"WRITE";FL$
3210  FOR I = 1 TO 40
3220  PRINT A$(I)
3230  PRINT X(I)
3240  PRINT Y(I)
3245  PRINT F(I)
3250  NEXT I
3260  PRINT D$;"CLOSE";FL$
3270  PRINT D$;"VERIFY";FL$
3280  GOTO 1000
4000  REM
4010  REM  LOAD
4020  REM
4030  PRINT  CHR$ (16)
4040  PRINT "LOAD DATA"
4050  PRINT "=========="
4060  PRINT
4070  INPUT "ENTER FILE NAME : ";
      IP$
4080  PRINT
4090  PRINT "LOADING NEW DATA CLE
      ARS"
4100  PRINT "THE EXISTING DATA"
4110  PRINT : PRINT "PRESS <RETUR
      N> TO ABORT"
4120  PRINT "PRESS <ESC> TO CONTI
      NUE"
4130 IP =  PEEK ( - 16384)
4140  IF IP = 141 THEN 1000
4150  IF IP = 155 THEN 4170
4160  GOTO 4130
4170 FL$ = IP$ + ".LA"
4180  PRINT D$;"OPEN";FL$
4190  PRINT D$;"READ";FL$
4200  FOR I = 1 TO 40
4210  INPUT A$(I),X(I),Y(I),F(I)
4220  NEXT I
4230  PRINT D$;"CLOSE";FL$
4240  GOTO 1000
5000  REM
5010  REM  QUIT
5020  REM
5030  PRINT  CHR$ (16)
5040  PRINT  CHR$ (9);"WARNING"; CHR$
      (14)
5050  NORMAL
5060  PRINT : PRINT "QUITTING WIL
      L LOSE DATA"
5070  PRINT : PRINT "<ESC> TO QUI
      T"
5080  PRINT : PRINT "<RETURN> TO
      CONTINUE"
5090  PRINT : PRINT "<SPACE> TO R
      ESTART"
5100 IP =  PEEK ( - 16384)
5110  IF IP = 141 THEN 1000
5120  IF IP = 155 THEN 5150
5130  IF IP = 160 THEN 525
5140  GOTO 5100
5150  PRINT  CHR$ (16)
5160  END
6000  REM
6010  REM  ERROR
6020  REM
6030  PRINT : PRINT  CHR$ (9);"ER
      ROR HANDLER"; CHR$ (14)
6050 ER =  PEEK (222)
6060  PRINT "ERROR CODE : ";ER
6070  IF ER = 9 THEN : PRINT "DIS
      C FULL": GOTO 6120
6080  IF ER = 6 THEN : PRINT "FIL
      E NOT FOUND": GOTO 6120
6090  IF ER = 8 THEN : PRINT "I/O
       ERROR": GOTO 6120
6100  IF ER = 4 THEN : PRINT "WRI
      TE PROTECTED": GOTO 6120
6110  PRINT : PRINT "LINE NUMBER
6020  REM
6030  PRINT : PRINT  CHR$ (9);"ER
      ROR HANDLER"; CHR$ (14)
6050 ER =  PEEK (222)
6060  PRINT "ERROR CODE : ";ER
6070  IF ER = 9 THEN : PRINT "DIS
      C FULL": GOTO 6120
6080  IF ER = 6 THEN : PRINT "FIL
      E NOT FOUND": GOTO 6120
6090  IF ER = 8 THEN : PRINT "I/O
       ERROR": GOTO 6120
6100  IF ER = 4 THEN : PRINT "WRI
      TE PROTECTED": GOTO 6120
6110  PRINT : PRINT "LINE NUMBER
      : "; PEEK (218) +  PEEK (219
      ) * 256
6120  PRINT
6130  PRINT "PRESS <RETURN> TO CO
      NTINUE"
6140  INPUT "";IP$
```

(continued on next page)

LECTURE AID

(continued from previous page)

```
 6150  GOTO 1000
 7000  REM
 7010  REM  CATALOG
 7020  REM
 7030  PRINT  CHR$ (16)
 7040  PRINT D$;"CATALOG"
 7050  INPUT "PRESS <RETURN> TO CO
      NTINUE";IP$
 7060  GOTO 1000
 8000  REM
 8010  REM  MOVE PICTURE VERTICAL
 8020  REM
 8030  PRINT  CHR$ (16)
 8040  PRINT "MOVE VERTICAL"
 8050  PRINT "=============="
 8060  PRINT
 8070  PRINT "NUMBER OF ROWS <+/->
       : ";
 8080  INPUT "";IP$
 8090 IP =  VAL (IP$)
 8100  FOR I = 1 TO 40
 8110 Y(I) = Y(I) + IP
 8120  IF Y(I) > 23 THEN :Y(I) = Y
      (I) - 23
 8130  IF Y(I) < 1 THEN :Y(I) = Y(
      I) + 23
 8140  NEXT I
 8150  GOTO 1000
 9000  REM
 9010  REM  MOVE PICTURE HORIZONTA
      L
 9020  REM
 9030  PRINT  CHR$ (16)
 9040  PRINT "MOVE HORIZONTAL"
 9050  PRINT "================"
 9060  PRINT
 9070  PRINT "NUMBER OF COLUMNS <+
       /-> : ";
 9080  INPUT "";IP$
 9090 IP =  VAL (IP$)
 9100  FOR I = 1 TO 40
 9110 X(I) = X(I) + IP
 9120  IF X(I) > 39 THEN :X(I) = X
      (I) - 39
 9130  IF X(I) < 1 THEN :X(I) = X(
      I) + 39
 9140  NEXT I
 9150  GOTO 1000
10000  REM  DEMO FONTS
10010  PRINT  CHR$ (16)
10020  VTAB 1: HTAB 1: PRINT  CHR$
      (1);0;"FONT"; CHR$ (24)
10030  FOR I = 0 TO 9
10040  VTAB ((I * 2) + 3)
10050  HTAB 1
10060  PRINT  CHR$ (1);1;I; CHR$
      (24)
10070  NEXT I
10130  FOR I = 0 TO 9
10135  PRINT  CHR$ (1);I; CHR$ (2
      4)
10140  HTAB 5
10150  VTAB (3 + (I * 2))
10160  PRINT "ABCDEFGHIJKLMNOPQRS
      TUVWXYZ"
10170  HTAB 5
10180  VTAB (3 + (I * 2) + 1)
10190  PRINT "1234567890"
10200  NEXT I
10205  PRINT  CHR$ (1);0; CHR$ (2
      4)
10210  INPUT "PRESS <RETURN> TO C
      ONTINUE";IP$
10260  GOTO 1000

]80COL
```


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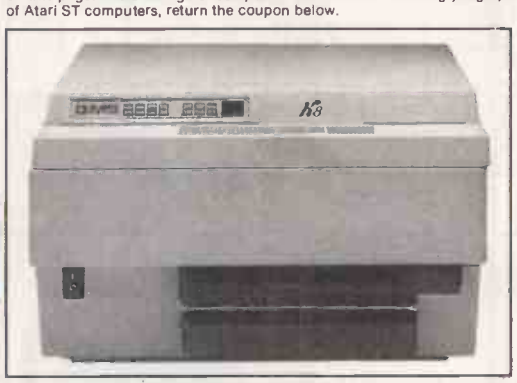

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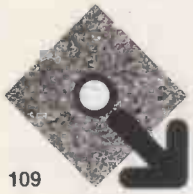

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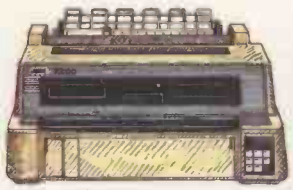

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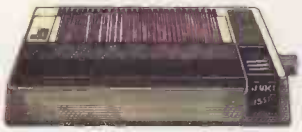

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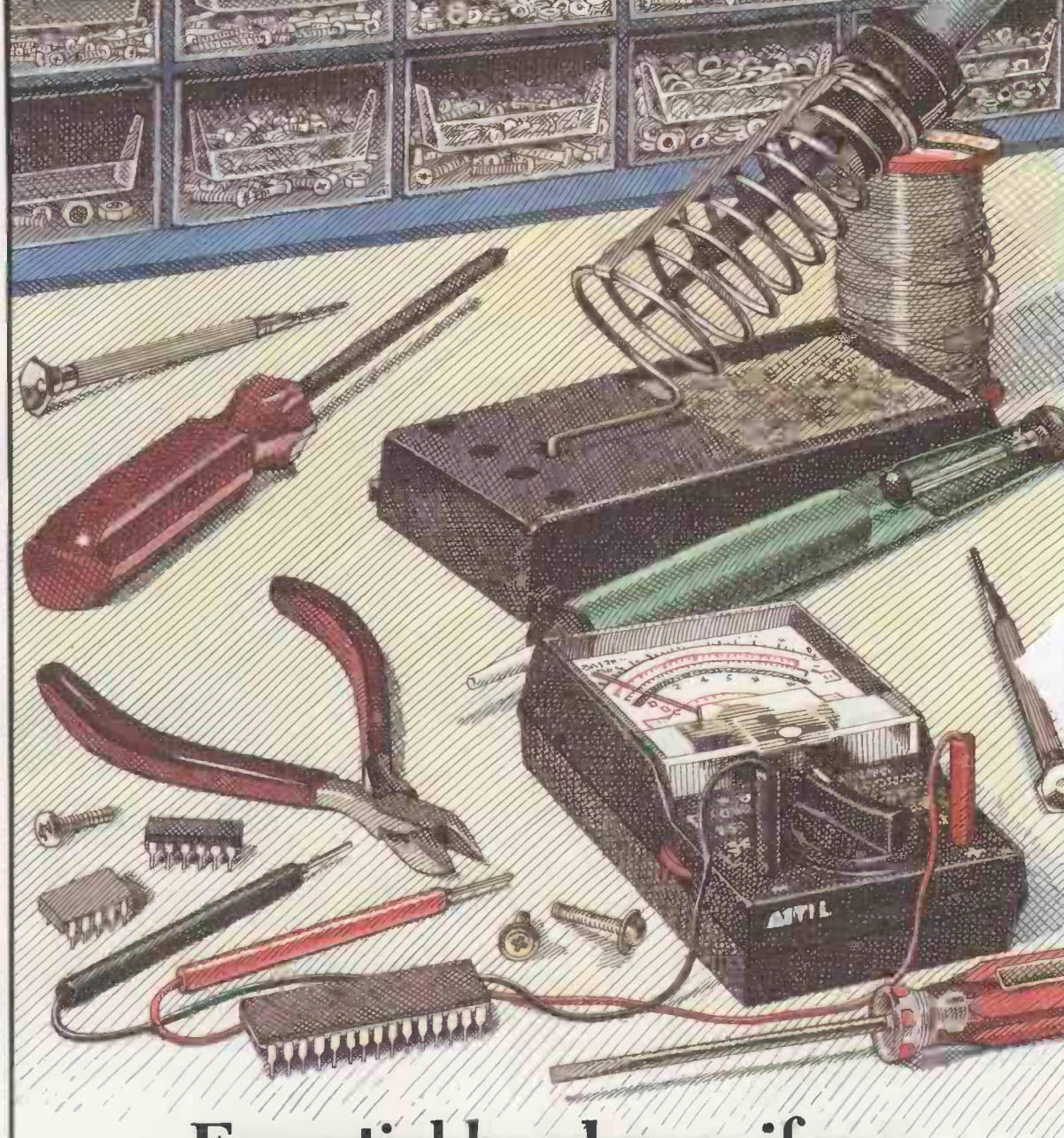

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