AUGUST 1986 • Volume 9 • Issue 8

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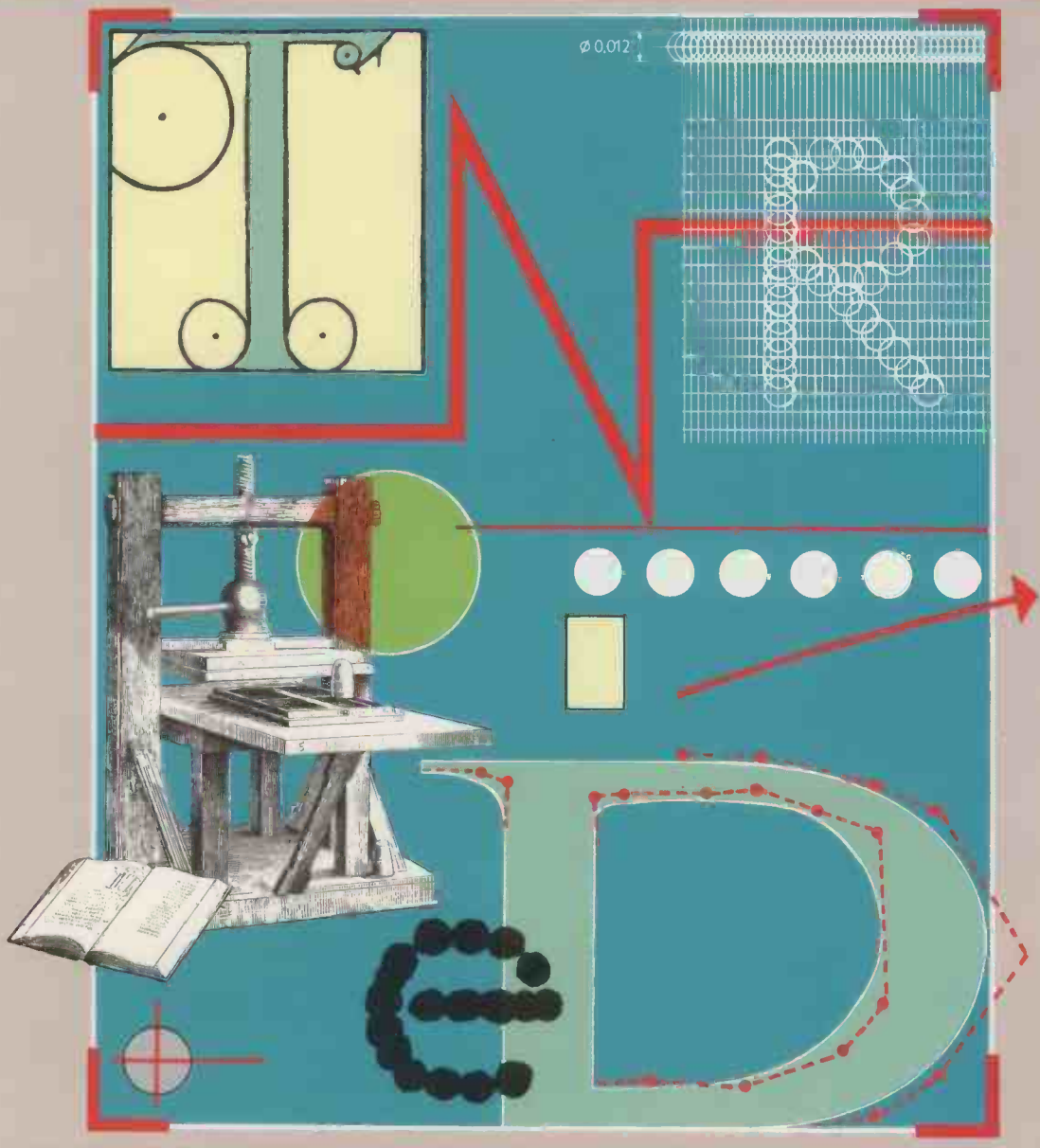

TOWARDS THE PERFECT PRINTER

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HARDWARE Amiga Sidecar • Qwertyphone

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FEATURES Pop-up programs • Static

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PRACTICAL COMPUTING

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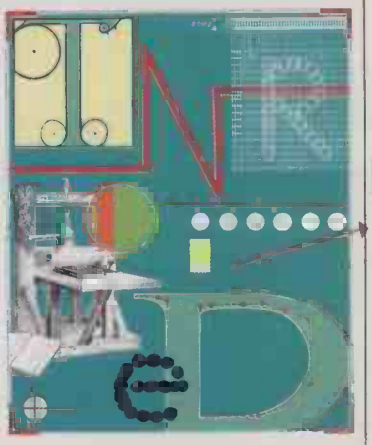

TOWARDS THE PERFECT PRINTER

With the arrival of integrated software and graphics-based computing, flexibility is becoming as important a requirement for a printer as good print quality and speed. Matrix printers have this flexibility, but do they have the output quality for every task? On page 94 we look at the new wave of 18- and 24-pin matrix printers which claim to offer it, and on page 99 we review the cheapest and the fastest of the new laser printers. Finally, when the ultimate in graphic quality is required for an important presentation users often abandon their everyday printer and turn to a plotter. On page 103 we examine the different options **93**

HP Colorpro The industry-standard plotter — page 103.

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Qwertyphone Telephone meets terminal — page 50.

Turbo Prolog Do-it-yourself AI at last? Page 58.

NEWS

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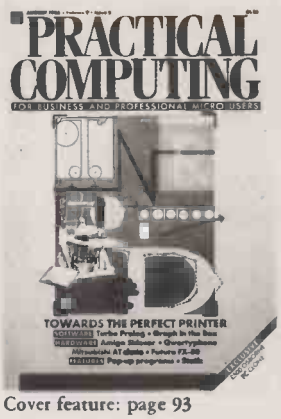

ILLUSTRATION: MIKE GORNALL

Cover feature: page 93

PUBLISHED by Electrical-Electronic Press, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Tel: 01-661 3500. Telex/grams 892084 BISPRS G
DISTRIBUTED by Business Press International Ltd, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS
SUBSCRIPTIONS: UK £16.50 per annum; overseas £30.00 per annum; selling price in Eire subject to currency exchange fluctuations and VAT; airmail rates available on application to Subscriptions Manager, Business Press International Ltd, Oakfield House, Perrymount Road, Haywards Heath, Sussex RH16 3DH. Tel: (0444) 459188
PRINTED in Great Britain for the proprietors Business Press International Ltd by Ben Johnson & Co. Ltd, York. Typeset by Lithotype Design, London EC1

ISSN 0141-5433
Would-be authors are welcome to send articles to the Editor but *PC* cannot undertake to return them. Payment is at £35 per published page. Submissions should be typed or computer-printed and should include a tape or disc of any program.
Every effort is made to check articles and listings but *PC* cannot guarantee that programs will run and can accept no responsibility for any errors.

THE RISE OF BORLAND

You could be forgiven for thinking that this month's special feature was memory-resident programs, rather than printers. This has more to do with chance than conscious planning. It is also a reflection of the fact that pop-up programs seem to be an idea whose time has come. Riding on the back of that success is a company whose time also seems to have come: Borland International.

Borland has always been the Cinderella among the big software houses. Everybody has heard of it, but few regard it as a serious rival to giants like Lotus and Ashton-Tate. One of the reasons for this is that the company seems to want it like that, preferring to beaver away quietly rather than spend time and energy beating its drum. However, there are indications that Borland has the makings of a top-notch player in the software market, and that it is about to become one.

Its track record is impressive. It began with Turbo Pascal, when it turned what was an academic's hobby-horse about the untidiness of Basic into a fully fledged industry and culture. To date, some 400,000 copies have been sold. Not content with sweeping away the cobwebs from many people's programming habits, Borland then went on to popularise, if not invent, the concept of memory-resident or pop-up programs.

Another company might have been content to sit back and take it easy at this stage, but not Borland. It has continued to launch new products at a prodigious rate. The most recent of these are Travelling Sidekick and Turbo Prolog.

Turbo Prolog may well turn out to be Borland's most important product so far. If, as Borland believes, everyone has at least one expert system in them, any product which is easy enough to use will open the floodgates of DIY artificial intelligence. A factor in Turbo Prolog's favour is Borland's aggressive pricing. Where other manufacturers have priced as high as they think the market will stand, Borland has firmly believed in pricing down. A notable case was its acquisition of the Reflex database package. Before it was bought by Borland the price was $495; today it sells for $149.95, and very profitably no doubt.

Borland has a similarly mature attitude to copy protection and licensing agreements. The standard Borland licensing agreement is a model of its kind. It says that software should be regarded like a book: anyone can use it, but only one person at a time — there should be no photocopies.

Clearly Borland has a lot going for it, but its achievements are even more remarkable when you take into account a number of other factors. For example, it has only been in existence for three years and during that time it has had no injections of capital from outside sources; all its research has been financed out of retained earnings. Also, it was set up and is run by a Frenchman, and it is still three-quarters owned by Europeans — hardly the typical U.S. software corporation.

What this adds up to is a tremendous potential. With credentials like these, Borland is well placed to shake up the software industry to the end-user's advantage. Indeed, Lotus, Ashton-Tate and Microsoft would do well to look to their laurels. As Philippe Kahn, the president of Borland points out in our interview with him on page 86 of this issue, for all their financial strength and marketing clout, both Lotus and Ashton-Tate remain essentially one-product companies. Likewise, Microsoft has yet to shrug off the yoke of IBM and prove that it can stand on its own two feet.

Borland suffers from none of these problems. It has shown a fecundity of ideas which is second to none, and it has maintained a fierece independence. In fact it has defended this isolation perhaps a little too jealously. Last year it recorded a profit of $8.6 million on a $27 million turnover; both figures were three times as high as the previous year. It is probably now at the stage where to progress further it must evolve from a company run by one man's vision to a well-structured corporation.

There is evidence that Borland also sees things this way. Recently it has applied to have its first shares traded on the Unlisted Securities Market in London, though this is as much a matter of raising European consciousness as raising cash. But anyone lucky enough to get their hands on a piece of Borland will be unlikely to regret it, as it cannot be long before the shares, like the company, are well and truly on the up and up.

5 YEARS AGO...

Professor S G van der Meulen pointed out at a recent conference on Algol 68: "The important boost for Pascal has come from its widespread implementation on microcomputers. Pascal is becoming one of the standard languages that every programmer should know, for that reason."

There are deficiencies in Pascal as indeed there are in almost any programming language including Algol 68. While there are advocates of Prolog who maintain it stands for PRObably the Language of God, I think we are still quite a way from the days of a perfect programming language. Constructive criticism is important; polemical attacks are unlikely to make a positive contribution.

Finally, Pascal is an evolving language and the proposed ISO standards for Pascal overcome several of its problems.

Feedback, *PC* Volume 4 Issue 8

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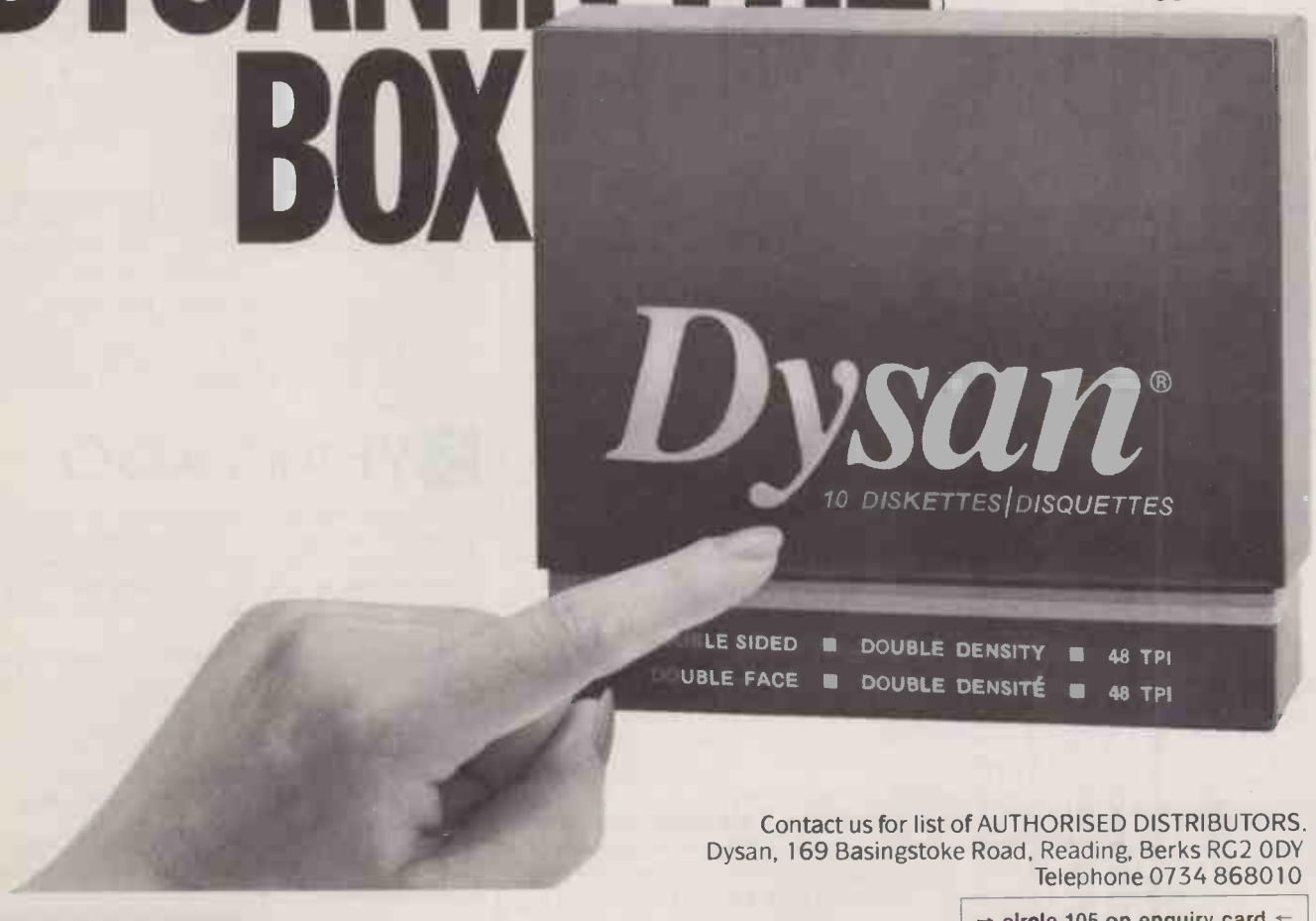

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dBase compilers

HAVING used the Nantucket Clipper dBase III compiler for the last eight months, I was interested to see that at last my favourite British computer magazine had realised that an important advance in the dBase field had been made and had published a review — see page 76 of the May issue. Mike Lewis is one of your contributors for whom I normally have a high regard, but in this instance I feel he has given Clipper an unfair review.

Mike's main criticism of Clipper seems to relate to the copy-protection system. He states that he had great difficulty installing Clipper on his Olivetti M-24. If he had read the first appendix in the manual, he might have had an easier time of it. Clipper, in common with dBase III itself, uses the Softlok copy-protection system; I have installed both these products on many IBM clones, including the M-24, without encountering any problems. The batch files supplied are all important to the installation program. Also, contrary to the review, it is perfectly possible to use the single floppy to make a working copy of Clipper, by using the supplied batch file One_DR.

Another criticism levelled at Clipper was that its index file extensions were different to the default dBase extension of NDX, and that this would mean "numerous adjustments to source code". I do not understand why having different extensions presents a problem, as I have never seen dBase command files which specifically use file extensions, except where these are not the defaults. These command files will still work, as Clipper will allow you to specify alternative file extensions if you wish.

I feel that the main difference between the two compilers was not clearly brought out. With the dBIII Compiler you are not in control of the compilation process. dBIII decides for itself how many overlays it is going to create, and does not take into account any extra memory above 256K. This means that in a large application, consisting of 200K source files, dBIII will happily produce anything up to 10 overlay files, whereas with Clipper it is possible to compile all this code to one single Exe file of around 210K. A program of this size will obviously not run on a 256K machine, but will run quite happily in 512K.

I agree with Mike that Clipper is more difficult to use than dBIII, but for the trade-off between ease of use and control over what the compiler is doing it is worth making the effort. The ability to compile individual program modules and then link them is invaluable when developing larger applications. dBIII forces the programmer to recompile the entire suite every time a small change is made in the code.

The tests conducted on the two compilers seem to me to be unrepresentative of the use to which a compiler is likely to be put in the real world. I work for a software house and the typical applications that we develop tend to be medium to large bespoke programming jobs, consisting of 120K to 230K of source code, with anything up to 50 command files and 25 data files and indexes. This, along with the corporate users, is surely the market that dBIII and Clipper are aimed at.

A major consideration in the equation of dBase III versus a compiler for us is execution speed, integrity of program code and locking the user into using the system as you intend it to be used. If you give users access to programs and data directly with dBase III, not only do you have to sell them a copy of dBase, but you are leaving yourself open to code being interfered with and data files being directly modified under the interpreter. In any serious application, these eventualities can and will happen, along with all the attendant problems of trying to rectify the damage after the event. This attitude may seem a little hard on users, but in our experience the further you can keep users away from direct access to programs and data, the fewer the problems that can occur.

Finally, in answer to Mike's problems in making contact with Xat, they have now moved to Rochester, Kent, telephone (0634) 814931. I have always found Phil Usher responsive to queries and problems, however obscure.

In conclusion, I am very happy with Clipper, as it seems to be alone in promoting dBase as a proper programming language. For this sort of advance, one expects to pay a price in having a non-standard implementation of dBase, even if useful additions and features have been added. I feel that price is well worth paying, and I can't wait to get may copy of the latest release of Clipper.

NICK RAMSAY,
Focus Microsystems,
Headington,
Oxfordshire.

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

LASER PRINTING

THE advent of laser printing has opened up an era of quiet, quick printing. However, the present design of equipment leaves something to be desired. The most practical and economic use of the laser printer would apear to be within multi-user situations to give centralised printing.

The idea of creating special founts to produce letterheads/logos is of particular interest — we use two different printed letterheads — and appears practical but the size of the paper magazines is inadequate. I do not see any difficulty in having, at the very least, a ream of plain paper per tray as can be had in most photocopiers. After all, 200 sheets being used at the rate of 12 per minute will require frequent refilling with consequent frustration, and this does not fulfil the enormous potential of the laser printer.

J H ADAMS,
University Hospital,
Nottingham.

Kermit and the frog

I WAS most amused to read J Richardson's ludicrous acronym for Kermit in the Feedback column in your June issue. Any person with some culture and common sense, or anyone who reads *Byte* magazine, will realise that the file-transfer protocol called Kermit is indeed named after the small green frog, star of the television series *The Muppet Show* and that the name is used with the permission of Henson Associates Inc. The disbelievers among you should read "Kermit: A file-transfer protocol for Universities" parts 1 and 2, *Byte* June and July, 1984, which was written by Frank Da Cruz and Bill Catchings, the chief systems programmer and principal designer of Kermit.

HUW ROBERTS,
GEC Software,
London WC2.

I WAS interested in your recent articles on Kermit which gave a reasonable introduction to the system for new users.

There are a few points concerning our own BBC implementation, though. It is a little unfair to describe it as "one of the simpler Kermits"; in terms of micro implementations it is actually one of the most versatile. It allows more control over the protocol than the CP/M-80 version does, and differs from the MS-DOS implementation only in not having server mode, repeat-prefix encoding and command macros.

From the description of BBC Kermit in your article it would appear that you have been using a very old version. The current release is now version 1.33; version 1.40, which is fully compatible with the Master 128, is on test release and due out in the next few weeks. From version 1.30 onwards there has been a disc-based version in addition to the EPROM version for those with no free ROM slots.

ALAN PHILLIPS,
Kermit Distribution Service,
Department of Computing,
Lancaster University,
Lancaster. PC

Database Experts

THE address given for Database Experts in our June issue, page 101, was incorrect. It should have read 1 Thames Avenue, Windsor, Berkshire SL4 1QP.

NEXT MONTH

SPECIAL SECTION

MASS STORAGE

Prices of storage continue to fall dramatically. Where yesterday you had kilobytes, today you have megabytes; tomorrow it will be gigabytes and beyond. We look at some of the exciting new technologies coming through like CD-ROMs, and examine the various ways you can break through the 640K barrier on your PC.

SOFTWARE

Farsight is a Lotus 1-2-3 clone with a difference. We look at the special features of this low-cost program. The IBM PC has collected about itself a huge range of utilities which let you tweak and twist it in various ways. We pick out some of the best.

HARDWARE

The Amstrad PCW-8256 has revolutionised the low end of the business micro market. Its success as a word processor is indisputable, and it is proving very useful in the spreadsheet and database field. But what about comms? We find out.

FEATURES

Site licensing is one of the hot issues of the moment. What is a fair way for a company to pay when it is using many copies of the same program? We compare and contrast current attitudes. Plus an introduction to the expanding world of integrated data networks.

TOP 10 SURVEY

Word-processing programs are becoming increasingly sophisticated. We pick out the key packages.

Don't miss the September issue of

PRACTICAL COMPUTING

On sale at W H Smith and all good newsagents after 13 August

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

ATARI ST

Power Without The Price!

FREE SOFTWARE

When you buy one of the new Atari ST computers from Silica Shop, you will receive a large and varied software package free of charge. This package covers several applications and comprises a total of nine titles. All ST's now have TOS/GEM on ROM, and the total list of free software is as follows:

1) GEM - *DR Desktop environment with WIMP (in ROM)*
2) TOS - *Tramiel Operating System (in ROM)*
3) 1st WORD - *Word Processor by GST using the GEM environment and multiple windows*
4) BASIC - *Personal Basic by DR (with manual)*
5) LOGO - *Logo language by DR (with manual)*
6) DOODLE - *Simple paint/doodle drawing package (works on mono or colour systems)*
7) MEGAROIDS - *Asteroids type game by Megamax*
8) NEOCHROME - *A powerful colour paint and graphics package (only useable with colour systems)*
9) CP/M EMULATOR - *Allows the use of DR's Z80 C/PM software to run on any ST system*

3rd PARTY SUPPORT

The power and potential of the ST range of computers is causing a flood of new software titles, peripherals and accessories from third party manufacturers. Titles range from word processing to spreadsheet programs, from graphics and games to database management - all with those easy drop-down menus and windows. With the list of companies producing ST software including dozens of top names, you can expect some first class titles for the new ST range. The following includes a selection of the third party manufacturers who have developed, or are working on, products for the ST range:

ABACUS	EXTENDED S/W	MICRO-ED INC	ROBINSON SYS
ACADEMY	FIDELITY	MICROPRO	SCARBOROUGH
ACCOLADE	FIRST BYTE	MICROPROSE	SIERRA ON LINE
ACTIONSOFT	FIRST PUBNG	MICROPRO ENG	SM SOFTWARE
ACTIVISION	FLIP 'N' FILE	MIGRAPH INC	SOFTEK
ADVENTURE INT	GLENTOP PBNG	MILES COMP	SOFTLABS
ANTIC	GST SYSTEMS	MIRACLE	SOFTLOGIK
AMERICAN COVERS	HABA	MIRAGE	SOFTWARE COMS
ARTWORX	HAYDEN	MIRRORSOFT	SECS
ASHTON TATE	HIPPO	MONARCH DEV	SOFTWARE PUNCH
ATI	HISOFT	MOSAIC	SOFTWORKS
AUDIO LIGHT	INFOCOM	MULTIFORM	SORCIM/RUS
AZTEC	INSIGHT	MULTIMATE	SPINNAKER
BATTERIES INC	INSOFT	OCEAN	SST SYSTEMS
BAYVIEW	ISLAND LOGIC	OOIN	STONEWARE
BECKEMEYER	KNOWLEDGWARE	OMNITREND	SUBLOGIC
BETTER WORKING	KUMA	OSS	SUNDATA SERVICES
BLUE CHIP	LASERSOFT	OTHER VALLEY	SUNSHINE BOOKS
BOS	LEHRNER	OXXI	SUPPLEMENTAL
CASHLINK	LEVEL 9	PAPERLOGIC	SYSTEMATICS
CHANG LABS	LIONHEART	PARADOX	TALENT
CHELTEK SYST	LLAMASOFT	PENGUIN	TDI
CHIPSOFT	LONGMINSTER	PHILON	TELARIUM
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DATA SYSTEMS	MARTIN CONSU	PRYORITY	UNISON
DELTRON	McGRAW HILL	PSION	VIP
DILITHIUM PRESS	MEGAMAX	PSYGNOSIS	WASON MICROCHIP
DRAGON GROUP	MEMOREX	QUICKVIEW SYS	WHITENDALE
DUFOSE PUBNG	METACOMCO	RAINBIRD	WINDHAM CLASSICS
ELECTRONIC ARTS	MICHTRON	REGENT	WORD of GOD COM
EXECON	MICRODEAL	RISING STAR	XLENT

520ST-M

NEW 512K 520ST-M KEYBOARD: The new 520ST-M keyboard costs only £346.96 (+VAT=£399) and is yet another price breakthrough for Atari Corporation. The keyboard now includes both an RF modulator and cable, allowing you to connect it to an ordinary domestic television set. In addition, the keyboard is supplied with 512K RAM, a mouse and a free set of 3½" disks containing applications software. The TOS operating system and the GEM graphics package are now supplied on 192K ROM chips which are already installed in the keyboard. This means that the operating system will automatically boot in when you switch the power on. In addition to the keyboard, you will also need to purchase either a ½Mbyte disk drive (RRP £130+VAT) or a 1Mbyte disk drive (RRP £174+VAT). Either disk drive will provide you with fast information retrieval and a vast amount of storage space. If you prefer not to use your own TV set, you may connect your ST to a monitor. You may purchase the Atari SM124 monochrome monitor (RRP £130+VAT), or one of Atari's two Thomson colour monitors. Alternatively, you may choose one of the many third party colour monitors which are available.

NEW 1024K 520ST-M+ KEYBOARD: In addition to the standard 520ST-M, we have a new keyboard which we are calling the Atari 520ST-M+. The M+ is a 520ST-M keyboard which has been enhanced by a third party RAM upgrade to 1 megabyte of memory. The 520ST-M+ is available from Silica at a retail price of only £433.91 (+VAT=£499). This product will provide you with an alternative to the 1040ST-F, but at a lower price. Additionally, it features the advantage of the 520ST-M's built in modulator.

£347

1040ST-F

For the businessman and the more serious home user, Atari have introduced the 1040ST-F, a low cost powerhouse which can be introduced to a business environment as a stand-alone system, or can support a mainframe computer as a terminal. The new one megabyte 1040ST-F enhances Atari's 'value for money' reputation in the marketplace as it is the first personal computer available with one megabyte of memory for less than £800. You can purchase the 1040ST-F as a monochrome or colour system. The price of the monochrome system is £799 (+VAT = £918.85), with the colour system at only £999 (+VAT = £1148.85). The new 1040ST-F not only features twice as much memory as the 520ST-M, but also includes a one megabyte double sided disk drive and mains transformer, both built into the console to give a compact and stylish unit with only one mains lead. The 1040ST-F is also supplied with a free software package. Unlike the 520ST-M, the 1040ST-F was manufactured solely with business use in mind and as such is supplied with a monitor. It does not include the RF modulator or lead. We now have stock of the 1040ST-F at all four branches of Silica Shop. Call into your nearest branch for a demonstration.

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THE ATARI EXPLOSION!

If you read the specialist computer press, you will have noticed that there is one company which is getting a large slice of editorial space at the moment, that company is Atari Corporation. Atari have been making the news since the launch of their new 16/32 bit range of ST computers. Led by the powerful figure of Jack Tramiel and under the banner 'Power Without The Price', Atari are manufacturing new computers at unheard of prices, with the power to challenge firmly established market leaders. With the introduction of IBM compatibility, a CP/M emulator, a powerful networking system and a communications package for their new low cost powerhouses, it doesn't look as if it will be long before there is an explosion of the magnitude which will see Atari placed firmly besides such names as IBM and Olivetti in the personal computer marketplace. Read on for more details of what Atari are doing, and how they are putting their 'Power Without The Price' computers beyond the reach of the competition.

FREE CP/M EMULATOR

This newly annouced CP/M Emulation Package, will enable software written under Digital Research's Z80 CP/M operating system to be run on the ST family of computers. There are several thousand applications written for CP/M in the UK alone, and several of the major CP/M software development houses may convert their programs to 3½" disk format for the ST range. The CP/M emulation package is supplied FREE OF CHARGE by Silica Shop with all ST computers.

IBM COMPATIBILITY

To make the ST available to those businesses who currently run IBM systems and are looking for a low cost expansion method, Atari have announced a co-processing unit for ST computers. This processor will open the ST range to all IBM or IBM compatible software applications. The unit, which attaches to the ST computers via the DMA (Direct Memory Access) port, contains an Intel 8088 processor with 512K of RAM and will accept a 5¼" disk drive. In it's ST mode, the unit will also act as a second disk drive, offering the user an additional 500K of memory. The IBM co-processing unit should be available in late Summer 1986. If you would like to be informed when it is released, please complete and return the coupon below. We will send you further details as soon as we have them.

20Mbyte HARD DISK £739

The new Atari hard disk for the ST range has just been released. All ST computers already have a hard disk interface built into them so there is no external interface required. The memory size of the disk is a massive 20 megabytes (unformatted) with a data transfer rate of 1.33 Mbytes per second. At a price of £739 (+VAT=£849), the 5¼" hard disk offers massive storage with fast access at a very reasonable price.

NEW ST SOFTWARE PACKAGES

There are now hundreds of software packages which have been announced for the Atari ST range. Titles available now include DB Man, a DBase 3 clone as well as H & D Base, a DBase 2 clone. In addition, PC Intercomm is a VT100 emulator which enables you to use any ST keyboard as a terminal connected to a mainframe or mini. Other programs include a Lotus 1-2-3 clone (see paragraph below).

VIP PROFESSIONAL - LOTUS 1-2-3™ CLONE

This is probably the most impressive program to have been released so far for the ST range. VIP Professional is an extremely easy to use, integrated spreadsheet, database and graphics program which is identical both in features and commands to Lotus 1-2-3™. The same spreadsheet analysis, information management and extraordinary business graphics are all combined in one easy to learn, affordable package. What's more, VIP Professional not only has all the features of 1-2-3™, you can also type the same commands to do the same things. Probably the most surprising feature of VIP Professional is not its total compatibility with Lotus 1-2-3™, nor its ease of use, but its price. Lotus 1-2-3™ for the IBM PC/AT costs £395 (+VAT=£454.25), whereas VIP Professional for the ST is a mere £169 (+VAT=£194.35). That's less than half the price! If you would like further details, of VIP Professional, please return the coupon below.

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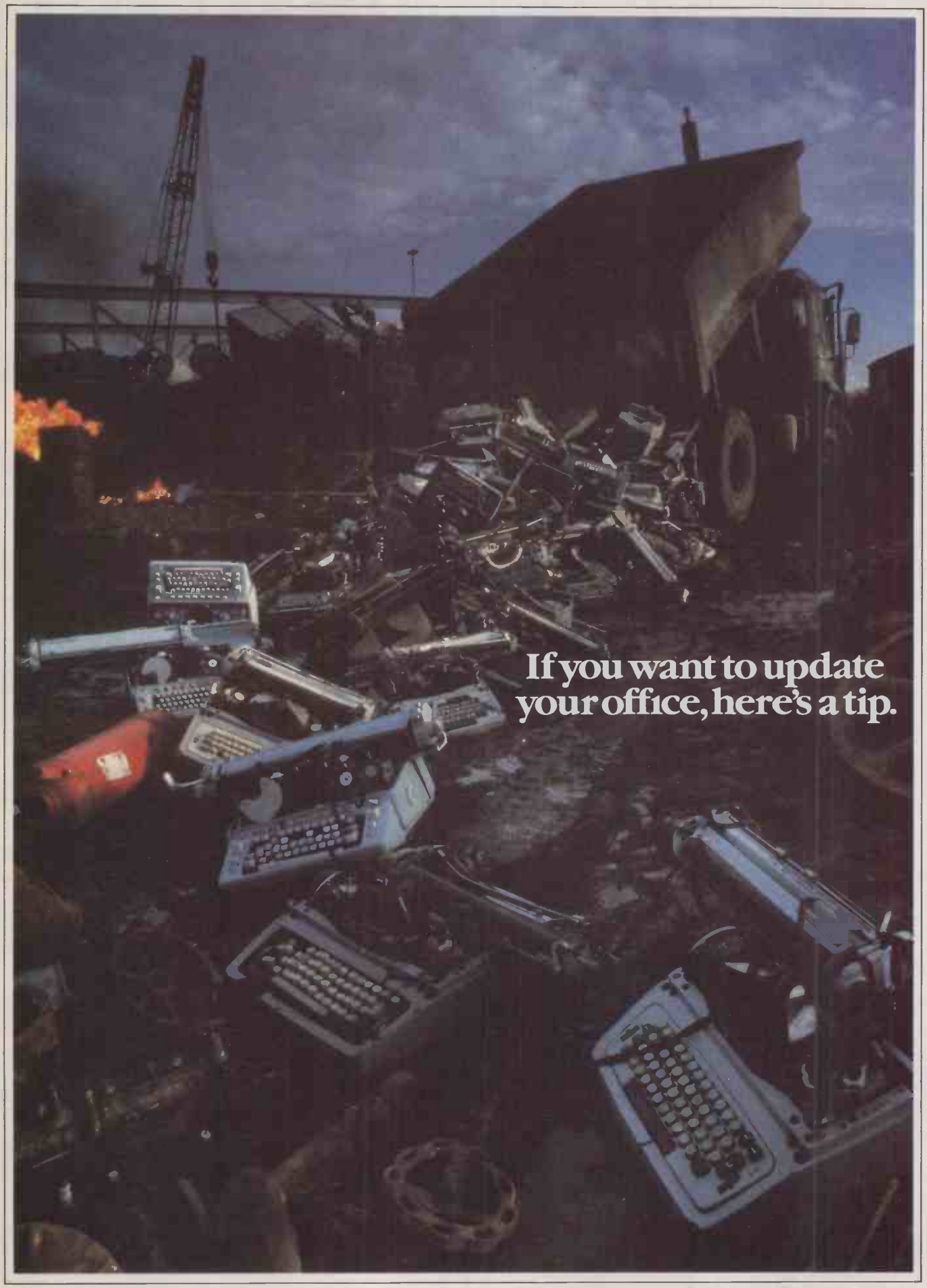

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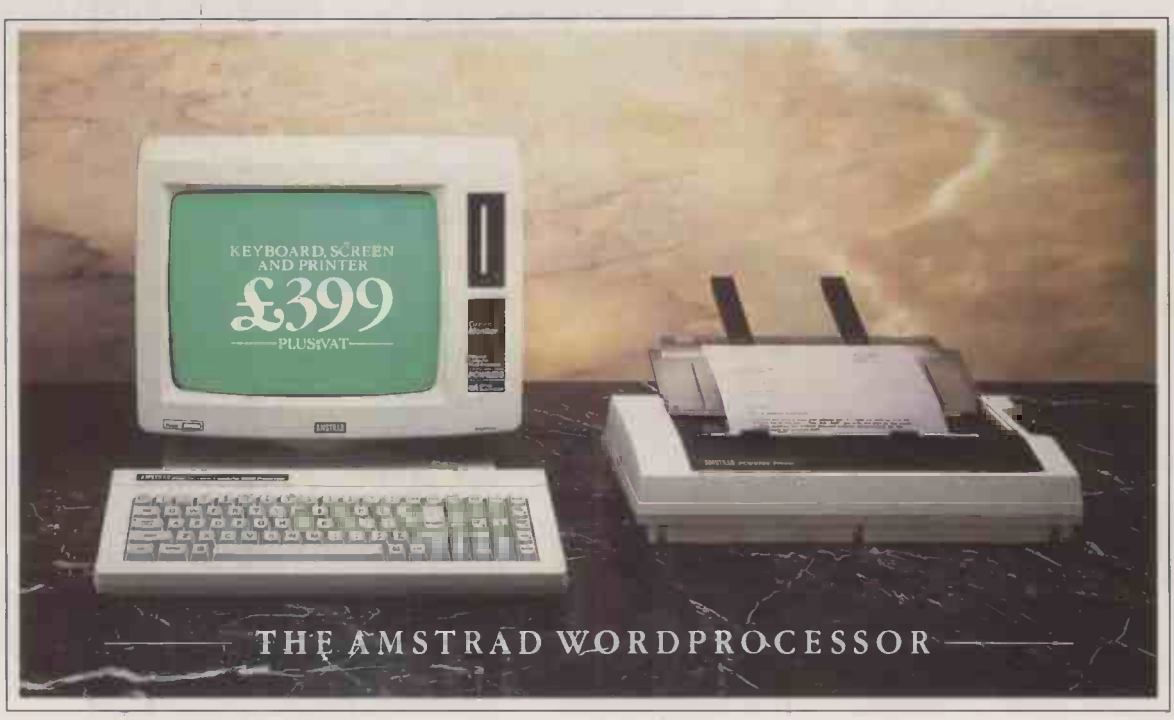

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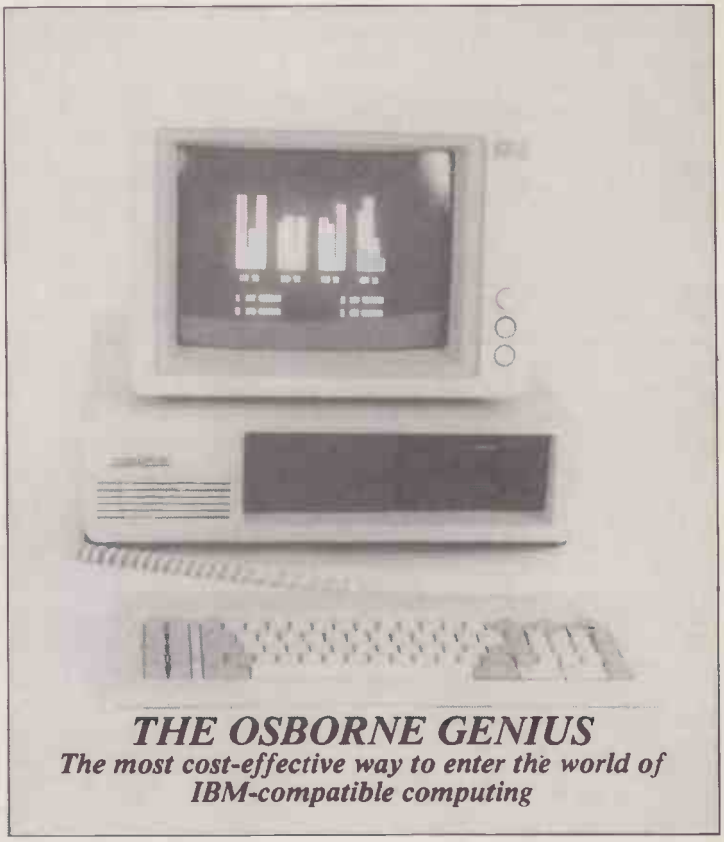

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PC clones from Honeywell

HONEWELL INFORMATION SERVICES has launched a range of micro-computers compatible with the IBM family. They are the EP Entry Processor, XP Extended Processor and the AP Advanced Processor. The machines are based around the NEC system board.

The PC-compatible EP is available with one or two floppies or one floppy and a 10Mbyte hard disc. Running on an 8088 processor, the EP has 256K of RAM as standard. It is fitted with a parallel printer port on the motherboard, and there is also the option of a serial port. The processor can be run at 4.77MHz or 8MHz. Prices start at £1,335, including keyboard and monitor.

The XP Model is also based around the dual-speed 8088 but is fitted with a 20Mbyte hard disc and parallel and serial ports as standard. Prices start at £2,480.

At the top of the range, the AP is based on the 80286 running at 8MHz. It is available with either 256K or 512K of memory and with serial and parallel ports supplied on an expansion card. The price of the standard AP with 20Mbyte hard disc is £3,645.

Further details from Honeywell Information Systems Ltd, Honeywell House, Great West Road, Brentford, Middlesex TW8 9DH. Telephone: 01-568 9191.

Expansion card with 7.5Mbyte RAM

VERGECOURT LTD has managed to put a quart into a pint pot with its Ramxtra card. Designed to provide extended memory for the AT and 6150 micros, the single slot card can incorporate up to 7.5Mbyte of RAM in 1Mbyte or 2Mbyte increments.

Although not directly addressable by MS-DOS, extended memory can be addressed by the 80286 in protected mode and utilised by Unix as virtual memory. Prices for the Ramxtra range from £395 for the basic 512K model to £3,750 for the complete 7.5Mbyte configuration.

Details from Vergecourt Ltd, Lyndean House, Queens Road, Brighton, East Sussex BN1 3XB. Telephone: (0273) 728551.

APRICOT LAUNCHES XEN PERIPHERALS

APRICOT has begun distribution of a number of peripherals intended to extend the flexibility of its Xen micro. Among the devices available are a Xenix serial card and terminal, and a 5.25in. floppy-disc drive and IBM-compatible expansion box.

The T-30 is a dumb terminal designed for use with the Xen running under Xenix. The terminal features a 14in. monochrome monitor and a keyboard with 83 keys. I/O for the T-30 is provided by two RS-232 ports.

Interfacing the T-30 to the Xen is the Quad Card. Supplied with four RS-232C channels, the card has a maximum of four I/O addresses, allowing up to 16 users access to the CPU. Transfer rates can vary between 75 baud and 9,600 baud with each channel supporting a 1K RAM buffer. The Quad Card is priced at £299 including cables, and the T-30 terminal costs £499.

Two new devices enable the Xen to move closer to the IBM world. The XP expansion box can contain two full-length IBM expansion cards which can accommodate PC or AT connections. Costing £199, the XP is intended for use with specialist cards that are not available in the Apricot range.

The introduction of the external 5.25in. floppy-disc drive will enable the Xen to read IBM data discs. The drive is capable of reading both 360K and 1.2Mbyte discs. The external drive is connected to the Xen via a ribbon cable and draws its power from the Xen's d.c. power outlet.

Apricot has also launched Xen-Tel, a telephone styled to match the Xen. Priced at £149, the Xen-Tel features redial and last-number storage. It supports Earth Recall PBXs and can only be used with the Apricot autodial modem, which costs a further £249.

Details from Apricot U.K. Ltd, Apricot House, 17 Westbourne Road, Edgbaston, Birmingham B15 3TR. Phone: 021-501 2284.

Upgrade and price cut for A-200

CANON has introduced a high-performance version of its A-200 personal computer. The A-200II has been fitted with no-wait-state RAM chips to improve performance, and the optional hard disc has been uprated from 10Mbyte to 20Mbyte. At the same time the price has dropped by around £300.

In order to access the faster memory, the 8086 processor inside the A-200II has dual clock speeds of 4.77MHz for standard use and 7.16MHz for optimum performance. An extra expansion slot has been fitted, bringing the total to six. Like the A-200 it includes serial and parallel interfaces plus 256K RAM as standard.

The standard A-200II with a monochrome monitor costs £1,595; the colour version costs £2,045. The extra cost for the hard disc is £1,000.

Canon has also announced an image-input device called the Image Scanner, which is intended for use in electronic publishing. It is compatible with the IBM PC range and comes in two forms. The £950 IX-8 has a resolution of 203 dots per inch, which Canon says makes it ideal for dot-matrix printers. At 300 dots per inch, the IX-12 is suitable for use with laser printers; it costs £1,450. Both models are monochrome only.

Details from Canon U.K. Ltd, Canon House, Manor Road, Wallington, Surrey SM6 0AJ. Telephone: 01-773 3173.

Worm disc system

MAGSTORE has introduced a 400Mbyte write-once optical-disc sub-system for the IBM PC. The device uses double-sided cartridges which contain a 5.25in. optical disc in a plastic casing.

The sub-system includes software and Lattice-C library routines, and is claimed to have a 130 millisecond access time. It supports read during write operations for real-time verification. Magstore aims to sell to OEMs, and expects the device to have a retail price in the region of £5,000. Details from Magstore Ltd, Sales & Marketing Group, Erith Business Centre, Erith, Kent DA8 1SR. Telephone: (0322) 339922.

DIY IBM

THOSE handy with a screwdriver and with an eye for a bargain might like to look at the AZ PC-Kit. For £499 AZ Computers will supply you with a case, keyboard, monitor, disc drive and 256K of RAM plus all the bits required to let you assemble your own PC.

AZ says the configuration will be changed shortly to exclude a monitor, but with memory increased to 512K. The new kit will cost £479.

Details from AZ Computers, Unit 1, 5 Milbrook Industrial Estate, Crowborough, East Sussex TN6 3DU. Telephone: (08926) 65606.

IBMulator prices fall

THE recent rush of price reductions among IBM-compatible manufacturers continues with three more clone makers announcing cuts in their ranges.

Sperry has cut the price of its base-model XT-compatible PC/HT Model 200 to £1,754, with the hard-disc PC/HT Model 400 falling to £2,238. The PC/HT Model 400 with colour monitor has also been reduced, and is now £2,709. Also down in price is the AT-compatible PC/IT at £4,109. Details from Sperry Ltd, Information Systems Group, Sperry Centre, Stonebridge Park, London NW10 8LS. Telephone: 01-965 0511.

Tandy Computers, already noted for its low prices, has made further reductions for the Tandy 1000. The standard monochrome-monitor model costs £795 and the colour version £995. The hard-disc version with mono monitor is £1,495. Details from Tandy Corporation, Tameway Tower, Bridge Street, Walsall, West Midlands WS1 1LA. Telephone: (0922) 648181.

Walters International has cut the price of the hard-disc AT mono system to £1,999 and the colour version to £2,199. Prices have also been reduced across a range of AT and XT models and add-on equipment. Details from Walters International Ltd, Lincoln Road, Cressex Industrial Estate, High Wycombe, Buckinghamshire HP12 3RD. Phone: (0494) 32751.

The portable Sprite

JAROGATE LTD, the manufacturer of the ultra-fast Sprite, has launched a portable version of the machine. The Sprite Compact is aimed at the multi-user section of the market and costs £3,995.

The Sprite Compact is equipped with the Intel 80286 processor and 1Mbyte of RAM. Mass storage is provided by a 790K floppy-disc drive and a 20Mbyte hard disc. In common with a number of manufacturers of multi-user systems, Jarogate has chosen Digital Research's Concurrent DOS as the standard operating system.

Details from Jarogate Ltd, Unit 2, HQ3, Hook Rise South, Surbiton, Surrey KT6 7LD. Telephone: 01-391 4433.

TCL BOARD MAKES AT MULTI-USER

A BRITISH development firm, Technology Concepts Ltd (TCL), has launched a plug-in board for the PC/AT which allows up to five users to access the computer. The multi-user system is known as the TCL + 4 and costs around £1,000.

The price includes the board, software and the Concurrent DOS 4.11 operating system. The system is currently being sold through the First Computer chain of retailers; TCL is looking for a distributor to handle the corporate market.

The TCL + 4 board is based around the 80286 processor and 128K of RAM. When the software is loaded it provides the drivers for up to four dumb terminals, which are connected to the main computer via four asynchronous ports on the TCL + 4 board.

Application processing is performed within the AT itself, with the data being passed to the TCL board for transfer to the remote terminal. At present the number of users is restricted by the 640K limit of the PC/AT, but TCL hopes to have a system which utilises the Rampage memory-expansion system in the near future.

Further details from Technology Concepts Ltd, Raglan House, Llantarnam Park, Cwmbran, Gwent NP44 3AX. Telephone: (06333) 72329.

Seiko's range of wristwatch micros

SEIKO has introduced a series of wristwatch-sized computer devices. The UC-2000 comes with its own keyboard which allows the direct input of information to the watch, while the UC-3000 also provides a built-in memo/diary.

The UC-3000 is supplied with a pocket-sized QWERTY keypad and a four-line screen. In order to maintain the maximum amount of memory space the watch automatically deletes scheduling data when it is finished with.

The UC-2000 includes a system box with ROM software, QWERTY keyboard and printer. This allows data to be transferred to and from the watch via its built-in RS-232C interface and permits users to write their own software with the system's Microsoft Basic.

The system is made up of three units: the UC-2100 keyboard, the watch, and the UC-2200 controller which contains 26K of ROM and 4K of RAM. Built-in programs include scheduling software, games and utilities. Data transfer is achieved by fitting the watch to the UC-2200's serial interface. The watch also serves as the monitor.

The complete package of keyboard, controller and watch costs £129.95. Details from Consumer Products Division, Hattori (U.K.) Ltd, Hattori House, Vanwell Road, Maidenhead, Berkshire SL6 4UW. Telephone: (0628) 34655.

A separate keyboard feeds information to the UC-3000.

HARDWARE SHORTS

- Husky Computers has introduced a back-lit LCD screen on to its range of hand-held Hunter computers. The company claims that the display can be read even in dim light. Details on (0203) 668181.
- Ferranti dealer Microbe Computer Systems has introduced the Taskmaster hard-disc card priced at £799. Microbe has launched the card because other plug-in hard discs have proved incompatible with the Ferranti and Advance computers. Ring (0468) 62333.
- One of the biggest names in disc systems, Western Digital, has upgraded its Filecard plug-in hard disc to 20Mbyte. The Filecard 20 is priced at £895. Details on (03727) 42955.
- First Software has reduced the price of the Hercules colour card to £129. The card also comes with a two-year guarantee. For details ring (0256) 463344.
- The Micahdrive AT from Cristie Data Products is an internal hard-disc system for the 512K Macintosh and Mac Plus. It is available in 10Mbyte and 20Mbyte versions. Contact (04536) 79821.
- The Jdiskette from Tall Tree Systems is a disc controller which upgrades the IBM PC and XT to handle 1.2Mbyte and quad-density discs. Details on (0252) 33375.
- The 3086 Supermicro from Altos Systems is now available with a 16MHz clock speed. Users with the previous 12MHz version of the machine can obtain a CPU upgrade. Ring (07535) 50712.

HP revamps portable

HEWLET-PACKARD has released an improved version of its lap portable. The new model of the Portable Plus features a new black-on-yellow LCD screen which has a wider viewing angle than the previous display. The machine also has additional memory.

Two versions of the new Portable Plus are being made available. The 256K version is priced at £2,427 and the 512K model costs £3,061. Details from Hewlett-Packard, Eskdale Road, Winnersh Triangle, Wokingham, Berkshire RG11 5DZ. Telephone: (0734) 696622. PC

Pocket products

MICROPRO has announced details of how its products other than WordStar will be sold. Calcstar, Supersort, Datastar, Reportstar and Infostar are being sold by Software Classics for machines other than the Amstrads. Products for that machine are available through Software Classics' distributor, CSD Ltd.

Micropro has also announced Pocket WordStar Deluxe for the 8256. This is an improved version of Pocket WordStar, and comes with the Spellstar spelling checker. The price is £69.95 including VAT.

Software Classics is at 2 Schoolbell Cloisters, Arbery Road, London E3 5DD. Telephone: 01-981 4224. CSD is at Armstrong Mall, Unit B-11, Summit Centre, South Wood, Farnborough, Hampshire GU14 0NP. Telephone: (0252) 522200.

Stella

STELLA stands for Structural Thinking Experimental Learning Laboratory. It is claimed to be an example of computer-aided lateral thinking by its U.S. authors. The U.K. distributor of this package for the Macintosh describes it as a kind of menu-driven three-dimensional pictorial spreadsheet.

Stella is essentially a way of formalising problems, and is designed to help determine whether a proposed strategy will generate the desired effects. If it will not, the system provides an anlaysis of why not. The program requires 512K RAM and costs £249.

Stella is available from Logotron Ltd, Ryman House, 59 Markham Street, London SW3 4ND. Telephone: 01-352 1088.

C link to dBase III

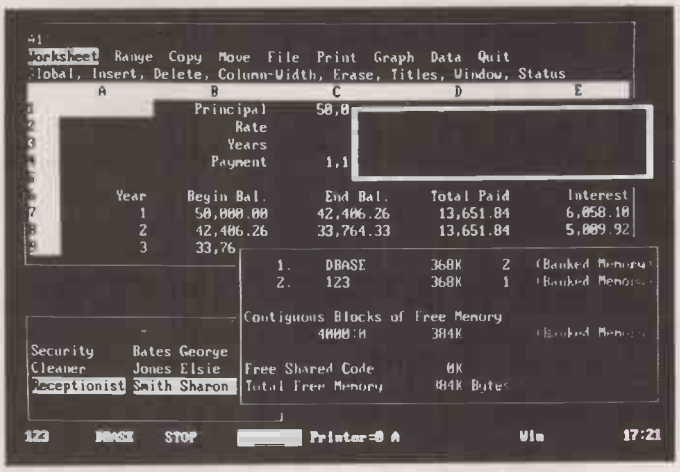
ASHTON-TATE has announced a C to dBase III Plus link called Programmer's Library made up of a series of ready-to-use routines for finance, statistics and programming. Aimed at software developers, the package is able to call and execute compiled C functions and routines as part of normal dBase operation. The price is £89. More details from Ashton-Tate U.K., 1 Bath Road, Maidenhead, Berkshire. Telephone: (0628) 33123.

CONCURRENT DOS FOR BIG MEMORIES

DIGITAL RESEARCH has announced that it will be shipping Concurrent DOS XM at the end of July. The new version of the multi-user/multi-tasking operating system has been written to take advantage of the AST enhanced expanded memory specification used on the Rampage memory board.

Until now, multi-user applications under Concurrent DOS have been severely restricted by the 640K DOS space on the IBM PC. The XM version will now be able to exploit up to 8Mbyte of memory. Digital Research has chosen the AST system rather than the Lotus/Intel/Microsoft standard as it allows programs as well as data to be held in the expanded memory area.

Concurrent DOS XM has a recommended retail price of £295. Contact Digital Research (U.K.) Ltd, Oxford House, Oxford Street, Newbury, Berkshire RG13 1JB. Telephone: (0635) 35354.



Databases for Amstrad PCW-8256

DATAFILE has produced a range of cheap databases for the Amstrad 8256. A major achievement is that they can carry out mail-merges straight from Locoscript files. Normally you have to use a word processor which uses more conventional encoding methods.

Datafile One is a single-file database with automatic formatting and range checking. Label reports can be produced directly, or merged with documents produced by Locoscript or by other word-processing programs. The cost is £29.95 including VAT.

Datafile Two adds multiple indexes and spreadsheet calculations. The upgrade from Datafile One costs £19.95. Datafile Three also has linked files and user-defined prompts. The upgrade from Datafile Two costs £19.95.

More details from Datarun, 55 Huntingdon Drive, Castle Donington, Derby DE7 2SR. Telephone: (0332) 810789.

SOFTWARE SHORTS

- Prospero has announced versions of its Pascal and Fortran languages for the Amstrad 8256. The cost is £75 each. More information on 01-741 8531.
- Mace+ is a set of utilities for the Mac which allows you to undelete files and tidy up directories. It costs £65, and is available from P&P on (0706) 217744.
- A new version of the Master Modeller planning package has been produced by Planning Sciences for £975. More information on 01-741 9620.
- The Benchmark is the name of an integrated package produced by Metasoft in the U.S. based around a word processor. The price is £595. More information from Jentech Data Systems Ltd on (07462) 61458.
- Smalltalk 80, the object-orientated AI language, is available for the IBM PC/AT for £995. An EGA graphics adaptor is required. More from Smalltalk Express on (0256) 461155.
- PC-Map Utility is a program that lets you monitor and control DOS directories. It costs £49 and is available from Systems Workshop on 061-431 8008.

Disc encryption

THE PS-3 data-encryption package converts characters in files to jumbled versions, but it does so as data is written to disc so the data stored there is safe.

This makes PS-3 suitable not only for transmitting files safely over networks, but also for holding sensitive information. It is available for the IBM PC and Apricot families, and costs £90. Contact Stralfors, Unit 11, Techno Trading Estate, Bramble Road, Swindon, Wiltshire SN2 6HB. Telephone: (0793) 37837.

DR Gem Presentation Master

THE Gem Presentation Master from Digital Research is a complete hardware and software system for producing 35mm. slides, overhead-projection acetates and business presentations using Gem running on an IBM PC or compatible.

As well as Gem Draw, Graph and Wordchart the package includes an image-conversion system which allows eight colours from a spectrum of 72 to be used, even if the monitor is monochrome. The package also comes with an automatic 35mm. camera, an instant-print camera and instant slide-processing system.

Gem Presentation Master costs £1,695. Details from Digital Research (U.K.) Ltd, Oxford House, Oxford Street, Newbury, Berkshire RG13 1JB. Telephone: (0635) 35304. PC

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At Borland our philosophy is best described in four words: **Quality, Speed, Power and Price.** Two of our products were recently nominated for a "British Micro Award". One, Sidekick, received a "British Micro Award". In the United Kingdom, Borland products are now available at your local dealer or through Softsel (01) 568 8866, P & P Micro Distributors (0706) 217744, Altor Ltd (041) 226 4211 and First Software (0256) 463344.

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Turbo Lightning £69.95
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Lotus bi-monthly

LOTUS DEVELOPMENT has launched a bi-monthly news pack which it intends to send to all registered users. Called *Lotus In View* it consists of news and information on Lotus products and third-party add-ons. The first edition contains a sheet of information from Lotus plus a number of leaflets from British Telecom, 4-5-6 World and others.

Lotus Development has also announced that it is to acquire Graphic Communications Inc. This move will give it exclusive rights over GCI's product range, which includes the Graphwriter and Freelance graphics-enhancement packages for Lotus's 1-2-3 and Symphony.

Further details from Lotus Development (U.K.) Ltd, Consort House, Victoria Street, Windsor, Berkshire SL4 1EX. Telephone: (0753) 846110.

WordStar amnesty is over

MICROPRO has announced that the amnesty for people using pirate copies of WordStar is at an end. The company says that the amnesty, in which users could register their unlicensed copies, has been highly successful.

The amnesty period ran from last November to 30 May. In that time a large number of organisations — from small firms to big corporations — have come forward to legitimise their programs by registering them.

Micropro has no plans to pursue users who have not come forward with illicit copies. But any cases that do come to light, probably through the Federation against Software Theft (FAST), will be prosecuted.

Details from Micropro International Ltd, Haygarth House, 28/31 High Street, London SW19 5BY. Telephone: 01-879 1122.

IBM SPREADS ITS NETWORKS

IBM has released a series of products intended to enhance its range of networking systems. The Token Ring LAN can now be upgraded and a new Information Exchange is available.

The IBM Token Ring network is now able to accommodate the System 36 minicomputer via a PC/AT network controller. The system also provides for a range of interfaces which allow up to eight Token Ring networks to be joined together. IBM has also announced the availability of fibre-optic and copper repeaters to extend the network's maximum length.

Information Exchange is IBM's first entry into value-added networks. Based upon the Managed Network Service, a multi-node network that is also managed by IBM, Information Exchange is designed to provide on-line data transfer between customers. The system will also provide storage facilities so that recipients can download the data at a time that suits them.

Details from IBM U.K. Ltd, PO Box 41, Baltic House, Kingston Crescent, Portsmouth, Hampshire PO6 3AU. Telephone: (0705) 69491.

Midland Bank chooses Windows

MICROSOFT WINDOWS has been adopted by Midland Bank plc to provide on-line information for its currency dealers. The package will be used to open several windows on the screen, each of which can display different information.

The multi-tasking aspects of Windows will allow dealers to monitor information on one window while working on other windows. It will also enable the users to call up different programs to analyse information as it arrives.

Midland Bank wants to expand the use of Windows. It hopes to install around 200 IBM PCs in its branches in the U.K. to enable customers to monitor currency fluctuations.

Further details from Microsoft Ltd, Excel House, 49 De Montfort Road, Reading, Berkshire RG1 8LP. Telephone: (0734) 500741.

The return of paper tape?

THE strip of paper shown below is not the latest in op-art but rather the latest storage medium. Known as Softstrip, the system is the brainchild of Cauzin Systems Inc. It is intended as a way of providing machine-readable programs or data in printed form.

Softstrip is a development of the optical scanning technology that is used in conventional bar codes. The strips are fed into a reader which decodes the fine black-and-white images and translates them into digital data. Cauzin says that a single strip can contain up to maximum of 5,500 bytes.

The Softstrip System Reader is compatible with the Apple II, IBM PC and Apple Macintosh computers. It is priced at $199.99. Details from Cauzin Systems Inc. 835 South Main Street, Waterbury, Connecticut 06706. Telephone: (U.S. area code 203) 573-0150.

Apricot makes distribution deal

APRICOT COMPUTERS has signed distribution deals with Apricot In Canada (AIC) covering Canada, the Caribbean and Central America.

AIC has agreed to take 1,000 machines in the first year rising to 4,000 in the third. In return Apricot has given AIC exclusive distribution rights in the areas concerned.

AIC is a Toronto-based company backed by the Merrill Lynch financial giant. It was formed by ex-employees of Delta Marketing which, until nine months ago, handled the distribution of Commodore products in Canada.

Further details from Apricot Computers plc, Apricot House, 17 Westbourne Road, Edgbaston, Birmingham B15 3TR. Telephone: 021-454 9091.

SHORTS

- Commodore U.K. has announced that its first shipment of 1,000 Amigas was sold within two weeks of the machine's launch. For details ring (0536) 205555.
- Victor Technologies (U.K.) is offering customers a free on-site warranty for its VPC-2 and V-286 PC and AT compatibles. The offer applies to machines purchased after 1 June. Details on (0628) 72727.
- *Olivetti File* is a monthly newsletter aimed at users of Olivetti IBM compatibles. The newsletter is a sister magazine to *Apricot File* and *Victor Sirius File*, and is independent of Olivetti. The yearly subscription rate is £60 for U.K. users. Ring 01-833 3501.
- The electronic-mail service Monodata is now offering a 1,200/1,200 baud rate to its customers. Details on 01-405 4442.
- British Telecom's Cable Interactive Service is now able to deliver teletext services anywhere in Europe. The system, developed by Metrotel Viewdata Systems, potentially allows teletext frames to be transmitted to teletext generators anywhere in the world. Details on (0892) 42834.

Air Call Teletex

A NEW information service, known as Air Call Teletex, has been launched. It is broadcast over the ITV transmitter network and may be downloaded via a modem into a computer.

The system is owned jointly by Air Call plc and Oracle. It transmits information in the same manner as normal teletext services. The broadcast is received by a Sugtext modem which decodes the signal and downloads the data.

Air Call Teletext does generate its own information but acts as a carrier for independent information providers. The service went live on 2 June.

Users pay for the service by direct subscription to the information providers; Air Call charges IPs 3.75p per Kbit transmitted. The Sugtext modem costs between £500 to £550. Further details are available from Air Call Teletext, Imperial House, The Hyde, Colindale, London NW9 5AL. Phone: 01-205 0005. PC

BY MIKE LEWIS

GETTING AROUND THE TABLE

Table searching forms a substantial element of many programs, so any time saved is likely to have a big effect on overall execution speed.

It appears to be an iron law of programming that however fast a piece of codes runs, there is always some way of chopping off a few more microseconds. Nowhere is this more true than in the familiar world of look-up. tables. You might think that the extraction of an item of data from an array would be as simple a programming task as any, yet it is one that seem to lend itself to constant refinement.

Perhaps this is just as well, given the importance of tables in most software applications. In fact, in one form or another array handling often accounts for the largest portion of the processing time of many programs. So it is not surprising that progammers should put a lot of effort into finding ways of speeding it up.

That said, you can make some substantial improvements just by slightly modifying the brute-force method. This technique — which is simply a matter of looking at each table entry in turn until you find the one you want — can be coded with a very short For-Next or While-Wend loop in Basic, or an equivalent construct in other languages.

PROPORTIONAL

Given a table of size N, the brute-force approach requires you to look at an average of N/2 entries for each successful search, and N entries whenever the searched-for value is not present. Both figures are based on the assumption that the table is in no particular sequence. The running time of the search is therefore proportional to the size of the table.

You can obtain an immediate speed improvement by adding dummy values at the head or foot of a table. The dummy values — which are known as sentinels — are used in a number of searching and sorting techniques. Their purpose is usually to stop a sequential process from running off the end.

In this case, the sentinel is a copy of the searched-for value, which is stored in an extra slot at the end of the list. The search then proceeds as before, but with the important difference that you no longer have to test for the end of the table. This is because the routine can guarantee always to find a match. If the entry which is found happens to be the last one in the array, then the search has failed.

The listing shows how this might be implemented in Basic. Although the number of comparisons is the same as with the brute-force method, the running time is likely to be much less because there is less work to do in each iteration of the loop. Using interpreted Basic on a Z-80, I timed a search for the 500th element in a 1,000-entry table at 2.3 seconds, compared to 4.2 seconds without the sentinel.

Another way of improving a search is to use a technique called percolation. This works on the assumption that certain entries will be required more often than others. As each hit is found, it changes places with the entry immediately before it. So the more frequently used values gradually percolate to the top of the list, making each subsequent search a little bit faster.

SORTED TABLE

So far, I have only talked about unordered tables. If you can sort the table to the sequence of the searched-for values, you open the door to many faster look-up techniques. However, before doing so you must decide whether the time saved in the searching is enough to compensate for the extra time needed for sorting.

Once you have sorted the table, even the brute-force method can

(continued on next page)

SEARCH ROUTINES

```
1000    'TWO SEARCH ROUTINES. In each case, we are
        looking for the value TARGET in an arry called
        TABLE, which has N entries. All variables are
        defined as integers.
1010    'On exit from each routine, FOUND indicates if
        the search was successful. If so, POINTER
        points to the required value.
1020    'First, define two constants:
1030    FALSE=0: TRUE=NOT FALSE


2000    'SENTINEL SEARCH. The table does not have to
        be in sequence. It is DIM'd to N+1 entries.
2010    POINTER=1
2020    TABLE(N+1)=TARGET          'Store dummy value
2030    WHILE TABLE(POINTER)<>TARGET:
                POINTER=POINTER+1:
        WEND
2040    IF POINTER=N+1 THEN
                FOUND=FALSE
        ELSE
                FOUND=TRUE
2050    RETURN



3000    'BINARY SEARCH. In this case, the table must
        be in the correct sequence.
3010    LOW=0: HIGH=N: FOUND=FALSE
3020    WHILE (LOW<=HIGH) AND NOT FOUND:
                POINTER=(LOW+HIGH)/2
3030    IF TARGET<TABLE(POINTER) THEN
                HIGH=POINTER-1
        ELSE
                IF TARGET>TABLE(POINTER) THEN
                        LOW=POINTER+1
                ELSE
                        FOUND=TRUE
3040    WEND
3050    RETURN
```

(continued from previous page)

profit by it. In fact, the time needed for a successful search is exactly the same as before, but on average a failed search will be twice as fast. This is because the program can stop the loop as soon as it passes the first entry which is greater than the target, rather than having to go right through to the end.

But if you go to the trouble of doing a sort, you might as well go a little further and apply the classic look-up technique for an ordered list: the binary search. This is only slightly trickier to code than the other methods mentioned here, but it is by far the fastest of the popular searching algorithms.

In the binary search, you start by comparing the target value with the entry at the middle of the list. If it is higher, you can confine your attention to the upper half of the table. If it is lower, you need only deal with the lower half. You then compare it to the middle entry in the relevant half, moving to the appropriate quarter of the list. This process is repeated, halving the area of search each time, until either you have found the required value or the sub-list has been reduced to a single entry.

Although the coding of this search is very short, as the example in the listing shows, even experienced programmers occasionally have difficulty with it. A common mistake is to program the routine in such a way that it fails at the boundary — that is, that the search does not find an entry which happens to lie at the very beginning or end of the table.

DUPLICATE KEYS

Another problem with the binary search is that it cannot find duplicate keys. Usually this is of no consequence, since you are only interested in knowing if a certain key exists in the table. But if you need to extract every occurrence of the value, you will have to resort to scanning the entries on either side of the one that the search recognises.

In spite of these minor difficulties, this is still the best look-up technique for the majority of cases. While the other methods discussed have running times proportional to N, that of the binary search is proportional to log N. If the table has around 4,000 entries, the worst case requires just 12 comparisons. And the larger the table, the greater the improvement.

However, there is further scope for fine tuning. One useful idea is to try to guess where the searched-for value lies within the current sub-table, rather than simply starting at the mid-point. This is analogous to the way most people use a telephone directory. If the name you wish to find begins with D, you open the book about one-fifth of the way through. If it starts with Y, you commence your search near the end.

For this to work, you need to be able to estimate the probable subscript of the target within the table, based on the assumption that the keys are evenly spread. You then use this calculation in place of the existing method of obtaining the subscript, which is merely to halve the value each time round the loop — see line 3020 in the listing. In all other respects, the processing is the same as for a normal binary search. It does, of course, assume that the data can be converted to some numeric form.

DISC FILES

With this method, there is a saving in the time needed for comparisons, but at the cost of more calculations. How much time — if any — it saves overall will depend on the relative performance of these two operations in the target system. It comes into its own when the table is a disc file. That said, no form of binary search is really suitable for files, because it involves fetching items of data that are far apart, and so increases the number of physical accesses and the amount of movement of the read/write head.

One look-up technique which is equally useful for disc files and RAM tables is the use of a thumb index. This is named after the indexes that you sometiomes see cut out of the edges of the leaves of a large dictionary, which help you to go straight to the initial letter of the word you want to look up.

The idea is to arrange for the program to create a second table, containing just 26 items. Each of these is a pointer to the first entry in the main table that starts with each of the letters of the alphabet, so providing a very rapid way of getting to the section of the file you want.

The technique is often used with very long lists of words, such as the dictionaries supplied with spelling checkers. You will have to work out whether you can justify the overhead of setting up the index. You might even decide to go further, and have another level of indexing, pointing to the second letters of each word — but at this point you are in danger of moving away from simple table searching and entering instead the world of tree structures. PC

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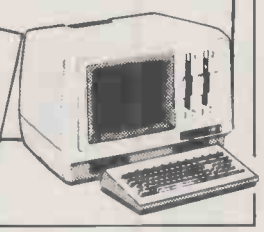

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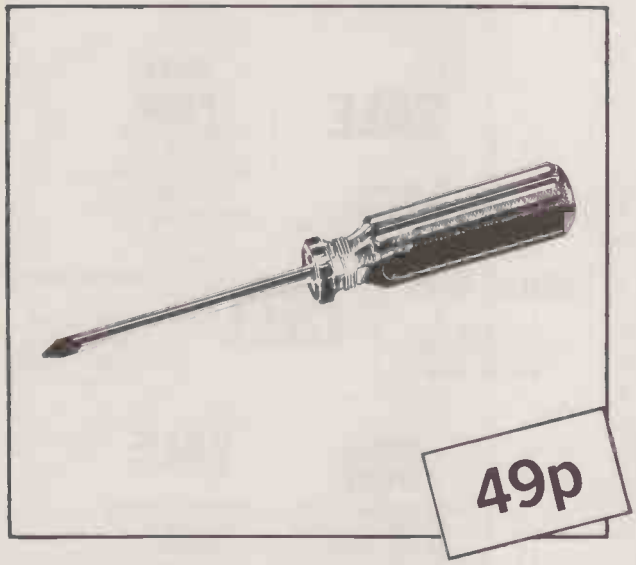

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BY BEN KNOX

WHICH NETWORK?

British Telecom offers several different ways to carry your computer data.

The public switched telephone network (PSTN) is the system you use whenever you pick up your telephone. It is not strictly a data network because it is not solely for use by computers, but it is still useful for cheap link-ups between computers where there is little time for more formal data networks to be set up, or where the high cost of setting up a dedicated data network makes it uneconomic.

The PSTN also acts as an access vehicle for some true data networks, where dial-up ports are supplied. The main disadvantages of using the PSTN are that it is prone to line noise, causing data to become corrupted, and it is not very economical for long-distance connections.

The PSTN can handle speeds of up to 9,600 bits per second, though at speeds above 2,400 bits per second line noise becomes a significant problem. The alternative is a leased line, which gives higher quality though at greater cost.

The public data network (PDN) is the generic name of all the British Telecom data networks that are available for use by the general public. The core of the PDN is the packet switch stream (PSS).

The PSS and its international link, international packet switch stream (IPSS), is the most commonly used system through which people access electronic-mail systems. These include Telecom Gold and One-to-One, databases like Dialog, Compuserve and The Source, and other services.

PSS is provided solely for the use of computers. There are two ways to link up to PSS: first by dialling up one of its ports on the normal telephone system and connecting your modem; secondly by using a dedicated data line between your computer and the PSS network. The latter option is mainly of use to large organisations with mainframes or minicomputers. Companies which have a number of mainframes around the U.K. often use PSS to enable them to share their data.

PSS is much cheaper to use than long-distance telephone calls, and many times cheaper than international phone calls. The quality is much higher too.

USER GROUPS

A number of features are available on PSS. A closed user groups (CUG) permits members to communicate freely across PSS, but all other calls are excluded. Call redirection allows non dial-up users to specify a second address which calls can be routed to if the first address is unavailable. Multiline allows non dial-up users to have several lines with the same address. This is of particular use to multi-user services such as database systems, where they only need to give out one address which everyone can use at the same time. Transfer charge allows users to request and accept transfer-charge calls on the network. It works in a similar way to the operator-controlled transfer-charge calls on the PSTN, except that on PSS it is all automatic.

However, PSS does have its disadvantages, the main being that it is very difficult to use. The logging on and command sequences are quite complex, and the error messages are far from clear. Users who access PSS by dial-up will still suffer some line noise because they are using the PSTN to make the initial link. Finally, users have to register and rent an ID on each PSS exchange in the places they want to access. So if you wanted to use PSS in both London and Birmingham you would have to rent two IDs, one in each city.

To solve these problems, British Telecom introduced Multistream as a kind of user-friendly interface to PSS. Multistream users are presented with a menu of services when they log on from which they can choose the one they require. The entering of addresses and so on is automatic from then on.

Multistream also provides error-correction protocols for dial-up users. Error correction ensures that all the data which you send and receive is uncorrupted. The error-correction facility is called Epad. Vpad is an alternative option which allows Prestel terminals to access other systems.

Among their features, Epad and Vpad provide an Auto-Call facility. This gives immediate access to one particular address as soon as the correct ID is entered, instead of displaying a menu or asking for an address to be entered. Menu Selection provides a simple menu which gives quick access to a number of PSS addresses. Open Network allows the user to enter any PSS address as on the basic PSS system. The Password facility allows users to use a single password on any Multistream exchange.

Multistream also provides a number of other options. Tpad is mainly for use by credit-card companies. It is the system used when a shop assistant wipes a credit card through a reader to get authorisation for a purchase. Bpad, Spad and Rpad are specialist services used for the interconnection of IBM terminals and mainframes.

OTHER CARRIERS

In addition to the public data-network services provided by British Telecom, there are two systems from other companies which can be used for data transmission. The first of these is Kilostream, which provides private networks using synchronous speeds of 2,400, 4,800, 9,600, 48,000 and 64,000 bits per second. It is used where high speed and reliability of data transmission is required. It enables users to mix voice and data transmissions, and can be used for high-speed facsimile, slow-scan television and video-conferencing. Though Kilostream is an entirely digital network it provides a voice-transmission facility by encoding speech as a digital signal.

Megastream, an even faster version of Kilostream, can reach speeds of up to 8Mbit per second. Speeds of up to 140Mbit per second are being developed. The main uses for Megastream include video-conferencing, CAD/CAM, linking installations on different sites, and security video systems.

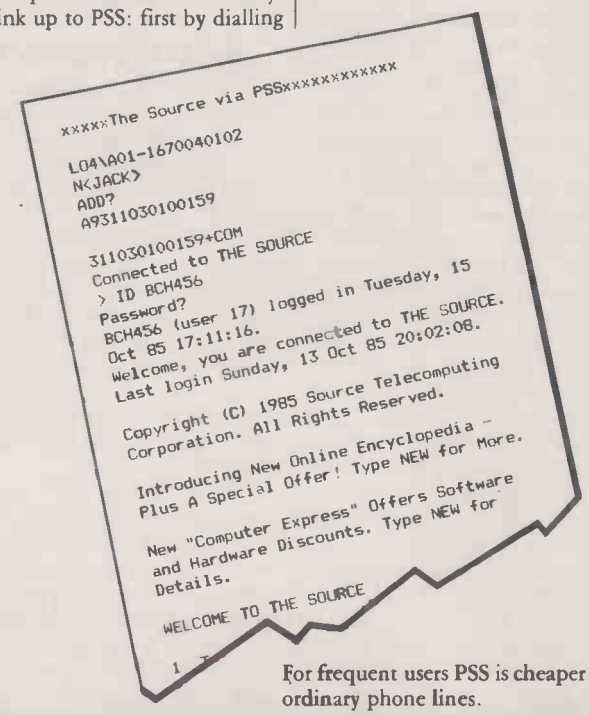
In the future, we will see the introduction of the integrated services digital network (ISDN). At present there is a pilot scheme operating in London, Birmingham and Manchester. In effect, ISDN links the data network services currently provided into a single system.

INTEGRATE SYSTEM

But before ISDN comes into operation, the next major step in networks will come later this year, when a new access system will be introduced for Prestel, Telecom Gold and other British Telecom value-added services. The new system, often referred to by its code name, Vasscom, will allow more reliable access at 300, 1,200/75, 1,200/1,200 and 2,400 bits per second with greater reliability. It will replace the current Prestel network, and will be almost invisible to the user, except for a menu display at the initial log-on.

The Vasscom service will also provide 96 percent of telephone users with local-call access to Prestel, Telecom Gold and the PSS system. This is a distinct improvement on the previous system where local-call access to Telecom Gold was only available in London.

More information about British Telecom's network services is available from Freefone 6460. PC



For frequent users PSS is cheaper than ordinary phone lines.

BY RAY COLES

BRISK RISC BUSINESS

Britain's very own Risc-architecture Transputer is already a technical triumph. It remains to be seen whether the commercial benefits will be reaped at home or overseas.

On last October's Chip-Chat column I made some rather facetious remarks concerning the technology-averse, risk-averse British stock market. At the time it was behaving true to form in treating the only jewel in the U.K. semiconductor industry's crown as a pariah rather than a saviour.

Now, I do not pretend to understand the detailed machinations of this vital source of funding for British industry, but one thing seems very clear to me. Most of the money invested in the market comes from institutional shareholders such as insurance companies and pension funds. These institutions will be judged by the profits they have made by buying and selling shares, and that can hardly be conducive to investment in high-risk, long-term undertakings like the development of new microprocessors.

There is also an element of self-fulfilling prophecy in the way the market reacts. High technology has been bad news for investors in the past — probably since Arkwright's Spinning Jenny. So when Thorn EMI makes the wise technical decision to acquire the highly innovative and potentially world-beating Inmos semiconductor concern, the market tipsters fall over themselves to say "Sell Thorn EMI, the price is bound to fall." And fall it most certainly does, as the fund managers queue up to ditch the stock.

So are the British investors the ruination of British hi-tech industry? Well, you can hardly blame them for their behaviour. How would you feel if your endowment insurance or pension fund were all invested tomorrow in one of Sir Clive Sinclair's new projects?

One alternative is to provide state backing for such risky fledgling industries, where being in the game can be seen as vital to the national interest. This is, of course, exactly how Inmos got started in the first place. But before any golden eggs were squeezed out of that particular goose, it was considered to be costing far too much in feed and so it was slaughtered for the table.

Unfortunately, the involvement of the state in industry also has an appalling track record, and I would find it difficult to recommend this as a solution. MPs with constituents to look after are far more likely to invest public money in ailing sunset industries than they are to provide funding for risky start-ups. Another relevant point is that the capitalist system seems to work reasonably well in the U.S. and Japan — certainly a lot better than the well-known socialist alternative, where industry is still trying desperately to filch the designs of Western semiconductors so that it can copy them.

I prefer to go back to basics and put our problems down to two simple factors. First, we British — or at least those of us who run pension funds and get elected to Parliament — are just not very interested in high technology. This is a socio-economic problem which goes back a long way; I regret that I have no solutions other than electing Alan Sugar as prime minister and encouraging British journalists to praise our innovations rather than poke fun at them.

FAILURE EXPECTED

Secondly, nothing succeeds like success, and we have come to expect failure in semiconductor technology. In the U.S. and Japan they expect success, and investors there know a good thing when they see one.

The only solution must be to succeed, so what we need is a breakthrough which will prove the depressingly reliable predictors of failure to be quite wrong for once. I happen to believe that such a success is within our grasp.

Despite headlines such as "Inmos losses pull down Thorn" I am firmly of the opinion that the Inmos Transputer can be a rip-roaring worldwide success, provided that we do not lose heart at this critical moment in its development. Unfortunately there have already been signs of a beleaguered Thorn EMI seeking to reduce its commitment to Inmos in order to curry favour with the city. One interesting proposal — can you believe it? — has been to seek a Japanese partner to shoulder 49 percent of the Inmos burden.

The Transputer is a microprocessor which breaks the traditional mould and offers a mind-boggling potential for the development of the next generation of supercomputers. It is not just a new mix of all the old ingredients, but a totally new approach to computer architecture and software design. It is set to bring the artificial-intelligence capabilities of the so called "fifth-generation" a great deal closer than anyone dared to expect.

TRANSPUTER

The Transputer is a reduced instruction set computer — Risc for short — which performs simple operations at very high speed. More importantly, its internal architecture is optimised for communication with other processors. This permits large arrays of Transputers to be used to increase the performance of a system by carrying out many tasks concurrently.

Conventional computer languages like Basic and Pascal are not suited to the construction of programs which must execute concurrently on arrays of processors in an organised co-operative way. To remove this obstacle, Inmos has also produced its own language, called Occam, which provides all the necessary structures to support the concurrent operation of Transputer arrays.

Inside each Transputer chip there is 2Mbit of fast RAM and four high-speed serial links in addition to the 32-bit Risc processor itself. With internal memory for programs and data, and the ability to communicate rapidly with neighbouring processors or the outside world, each Transputer can be used to implement a self-contained process, and multiple inter-linked processes can run simultaneously on arrays of Transputers.

The Transputer chip was designed specifically to facilitate the concurrent execution of multiple processes by the incorporation of the required process synchronisation constructs directly into the instruction set. The Occam language provides full control over concurrency and the communication between processes and, thanks to the design of the Transputer chip, the actions of stopping, starting and linking processes can be performed at very high speed.

The power of the Transputer approach is clear. It provides for the first time a general-purpose computing element that can overcome the bottleneck inherent in the single-processor single database architecture of today's machines. At the recent launch of the Transputer range, Inmos announced a machine using 40 Transputer chips called Item 400 which can process 400 million instructions per second (mips) at a cost of only £100 per mip. IBM's biggest machine, the 3090 model 400, is rated at 50mips and costs more than £100,000 per mip.

Such stark comparisons are not entirely fair to the IBM machine because it is, after all, a fully fledged computing system designed for general-purpose application. The bare-bones Item 400 is intended only for research into concurrent processing; it could not be used to replace the IBM machine in its present form. But the world is now taking notice of the Transputer, and many commercial systems are in design or are becoming available.

The U.S.-based company Floating Point Systems, already famous for its number-crunching array processors, has recently announced its new T series of supercomputers. They combine the attributes of the Transputer with the floating-point arithmetic capabilities of the Weitek arithmetic chip. A possible medium-sized machine using the FPS architecture will be able to carry out 1,000 million floating-point operations per second. This is a processing power equivalent to that offered by the Cray 2 computer, but at a fraction of the cost.

HUMBLE PRODUCTS

Coming down to earth for a moment, Inmos also has products to allow more humble machines to be created. For example, the IMS B-004 board, which plugs into the IBM PC, has a 32-bit Transputer with 2Mbyte of RAM. The best way to start is to get the IMS D-701 package, which includes the Occam software and an IMS B-004 board. Also available is a 16-bit version of the Transputer chip, the T-212, which costs a mere $400. The M-212 disc-controller chip uses a similar Transputer architecture.

Despite the obvious technical triumph of the Inmos Transputer, and the fact that the whole world wants to buy it, as yet it is not a commercial success. So there is still time to sell the whole thing to the Japanese to avoid the embarrassment of actually being seen to do it right for once. PC

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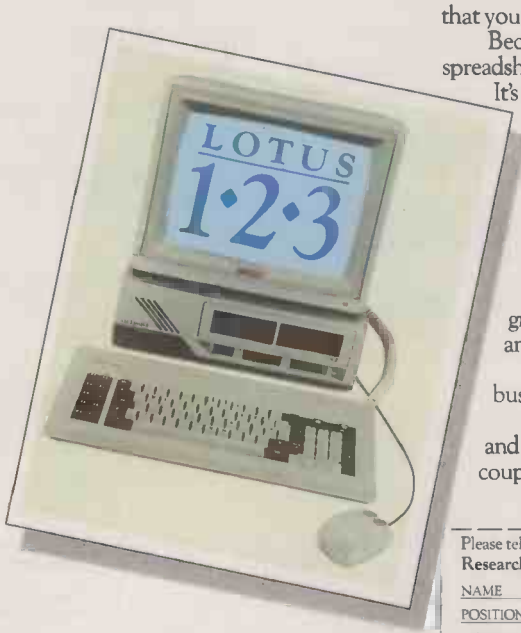

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INSTALLING AN 8087 CO-PROCESSOR

Q I recently bought a PCC IV-VIII IBM-compatible personal computer of the type reviewd in the April issue of *Practical Computing*. I want to fit an 8087-2 maths co-processor chip, but I do not know what switches need changing on the motherboard after the chip has been fitted in the appropriate socket. Can you help?

K HADRI

A We have no direct information on this machine and have not used one ourselves, but at under £1,000 for an 8088-based machine with a 20Mbyte hard disc it has to be excellent value for money. The last we heard was that the manuals were not ready.

The switches on the motherboard of most IBM clones are similar, and it is probable that the switches are the same as on a Ferranti PC-860 or an IBM PC. On the Ferranti there is a switch block on the motherboard, which you ignore, and another on the small daughter board. You must change one switch on the daughter board: SW2 must be in the On position when an 8087 is not fitted, and Off when an 8087 is fitted. The manufacturer of your machine confirms that there is a small blue switch block with eight switches on the motherboard, and that switch 2 must be moved to the Off position when an 8087-2 chip is fitted.

Fitting an 8087 will appreciably speed up the running of those programs that involve a lot of arithmetic or trigonometric calculations, provided that the program has been compiled, and that the compiler that can utilise the features of the 8087. There will be no improvement in speed with interpreted programs or with compilers that implement these functions in software. If you find that the 8087 chip runs very hot you would be well advised to fit a heat sink.

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Q I have followed the instructions on rescuing WordStar you gave on page 105 of the February issue, but they do not seem to work. All I get is garbage. Can you comment?

R S BRIDGES

A The instructions should work on all eight-bit CP/M machines running a conventional WordStar. The principle is very simple. When you get a crash, the computer memory contains the CP/M operating system, the WordStar program and the text being processed. If you reload CP/M and use DDT to move the text from its present position to start at 100hex, then you can save the contents of memory starting from 100hex into a disc file.

The only real problem is the address at which the text starts and finishes. If a special version of WordStar has been made for your particular machine, extra modules will have been added to the end, and consequently your text will start at a higher address in memory. If this is the case, then saving from the starting address suggested in the article will in fact save the extension to WordStar, which appears as garbage, followed by the real text. The garbage part could contain a Control-Z end-of-file marker or a number of other characters that would upset the computer or the printer.

You could experiment saving from progressively higher starting addresses until it works. Have confidence: it will work. We have done this successfully on a variety of different machines.

The memory from 0 to 100hex is reserved by CP/M for jumps to BDOS and BIOS, and for buffers. The transient program area (TPA) lies immediately above it, and may be used for any transient program and data that you care to use; this could be one of the CP/M transient programs such as Stat or Pip, WordStar, or a Basic interpreter. The rest of the TPA may be used for WordStar data, that is the text you type, or for a Basic program you have written. The size of the TPA varies from one computer to another.

Q We have recently acquired an Apricot XI-10 operating under MS-DOS 2.11 with WordStar Professional version 3.3, and have encountered the following problem. The WordStar cursor movements Ctrl-A and Ctrl-F are extremely slow, particularly when the text exceeds 80 columns and continues off the screen. We have discovered that there is a delay of approximately seven seconds when using Ctrl- F to move past column 80. The cursor actually jumps to column 70 and waits, though the status line at the top of the screen immediately indicates the column that the cursor should be on. In this intervening time it is quite possible to type a character where the cursor is, rather than where it should be.

We have previously used WordStar 2.0 on a CP/M machine for three years. The two computers share the same Diablo printer, each at the same baud rate, yet the Apricot is very much slower and has a pronounced delay at the start of a print job. My supplier tells me that WordStar is configured correctly for the Apricot. Have you a solution to this problem?

G BROWN

A Your problem is not related to the horizontal scrolling feature that was introduced with WordStar version 3.0, nor is it because you are using a 16-bit version of the program. The reason is simply that the program has seven different time delays built-in, and one or more of these are set to give too long a delay.

Some delay is necessary to allow the program to work on certain slow terminals, to make the cursor blink at a sensible speed, and to display messages for long enough to give you time to read them. If you don't like the way your program is set up you can customise the time delays to make the program work faster.

The quick answer to your problem is that the time delays Del4 and Del5 are unacceptably long. These are used to control, among other things, the time to wait for a full screen refresh during horizontal scrolling, and the delay for a full screen display during horizontal scrolling. These features are not included in the menu shown by the installation program Install or WInstall, but despite this it is quite easy to alter the program.

Before doing so it is prudent to make a copy of your working version of WordStar, just in case you make a mistake. Then run the Install or WInstall program to alter the version of WordStar that you have already installed and actually use. As you answer the questions the installation menu will invite you to choose from a menu of terminals, custom installation of terminals, menu of printers, custom installation of printers, menu of WordStar features, or Exit from Install. Instead of typing the letter for one of these options, type a + instead. This takes you to the Patcher routine, which you can use to alter specific bytes in the program, including any or all of the time delays built into WordStar.

There are five delays called Del1, Del2, Del3, Del4 and Del5, which are probably set to 1, 4, 8, 16 and 9 respectively. These decimal values correspond to the number of milliseconds delay on a 5MHz 8086; each may be reset to between 1 for the minimum delay up to 127 for the maximum delay. Since the values are stores in hexadecimal, they will actually appear as 1, 4, 8, 10 and 9. Their uses are as follows.

Del1 is a short time delay used to control the rate at which the cursor blinks, for example when performing a find and replace command Ctrl-QA.

Del2 is a medium-short time delay also used to control the rate at which the cursor blinks. Changing Del1 and Del2 will not make the program run faster, but merely has a cosmetic effect on the cursor.

Del3 is a medium-long time delay used to control the delay between pressing one of the prefix keys Ctrl-J, Ctrl-K, Ctrl-O, Ctrl-P and Ctrl-Q, and displaying the appropriate menu. For example, typing Ctrl-O would give the On-Screen menu, then selecting C would centre the text on that line. WordStar will allow you to type the commands together. For example, if you type Ctrl-OC fairly quickly, the text will be centred much faster than before, since the menu will not be displayed. This time delay sets the time after typing Ctrl-O that you are given to type the C without getting the menu displayed. The default value allows for a very slow typist to type the next part of the command without getting the menu displayed, and the value can usefully be reduced.

Del4 is a long time delay used to control the time the sign-on message is displayed, and also the time messages such as "New File", or "Abandon" or the time delay during horizontal scrolling when you are using a line length wider than the screen display. Displaying the sign-on message for a long time, or waiting a long time before scrolling is irritating, and the value can be reduced.

Del5 is used to control the time delay between a keystroke

(continued on next page)

(continued from previous page)
and refreshing the screen during horizontal scrolling.

On our own IBM PC version we left Del1 unchanged at 1, changed Del2 to 2, Del3 to 3, Del4 to 3 and Del5 to 3. The improvement is remarkable. However, the choice is largely personal. Altering Del3 and Del4 will cure your slow scrolling, and will speed the running of the program quite dramatically.

When the Install program asks you to enter the starting address type

:DEL1

and press Return. A list of values for Del1 and the next 15 bytes is displayed. These are in fact the values of Del1, Del2, Del3 and so on. If these are the default hex values they will be 1, 4, 8, 10, 9, etc. You will be asked if this is the address you require. Type Y for yes, and the Patcher will display the location of the term Del1 and the value stored there, 01. If you do not want to change this, simply press Return. The Patcher then displays the location of the next byte, the term Del2, and the value 04 stored there. If you want to change this to 2, type

,2

and press Return. The comma is important, as it indicates that the number following is in hex. The terms Del3, Del4 and Del5 may be displayed and altered in a similar way. After altering Del5, the next byte will be displayed, and to leave the Patcher you must type a full stop and press Return. At this point you may either type X to leave the Patcher routine or press Return to continue and make more alterations.

There are two more time delays that you may care to alter. They are used after setting the cursor position or other screen functions. A delay is necessary because some terminals may behave erratically, lose characters or display rubbish if a character is output too soon after a cursor-positioning sequence has been used. The values stored in the mnemonics Delcus and Delmis determine the duration of these delays and correspond to the number of milliseconds delay on a 5MHz 8086. These terms are probably set at 10 and 5 milliseconds respectively, to ensure that the terminals behaves properly. Type

:DELCUS

and see the current value. The value of this and the next 15 bytes will be displayed, probably A, 5, FF, etc. Try decreasing the value A to 5 or even 0 and see if the terminal still behaves. If the terminal misbehaves, repeat this patching procedure and raise the value slightly. Then try altering the term Delmis in a similar way.

Delcus and Delmis were designed to make WordStar work properly on free-standing terminals where a time delay is needed. Computers with a video board inside the computer connected to a monitor usually do not require these time delays, and our machine runs perfectly reliably with both terms set to zero.

When you have made all the changes needed, type X to return to the installation menu and X again to exit from Install, followed by A to save the changes.

Q **I use WordStar version 3.3 with a Juki 6100 daisywheel printer, which has a proportional-spacing option as well as the Diablo 630 control codes. Once I install the Diablo printer driver in WordStar I have full control over fixed-increment printing but cannot use proportional spacing. The program insists on setting a fixed character width at the first opportunity, usually the first Carriage Return. Please can you suggest anything. In case there is not much that can be done, I would like the ruler line to default Off, and maybe a few other things too, if I knew what the patches referred to. I know someone who would give the earth for the "Pause for paper change between pages?" option to default to Yes. This would have been a much more useful option than "use form feeds".**

J ABBOTT

A We do not have a Juki printer, but from your description it seems not to be implementing the Diablo 630 codes exactly. You should be able to set proportional spacing on and have it stay on, whereas you find it is cancelled at the end of the first line. The printer may revert to fixed spacing after each Carriage Return, or when the printer changes the direction in which it prints. If the former is the case, there is nothing you can do about it, but if the latter then printing uni-directionally by putting a

.BP 0

at the beginning of the file might help.

WordStar lacks two features that some more sophisticated users would like: multi-column printing, and the use of true proportional spacing. A new package called Printmaster provides a simple and cheap remedy to these deficiencies for existing WordStar users. A text file produced with WordStar or any other word processor may be printed with Printmaster, rather than from the word-processing package itself. The dot commands used by WordStar are implemented and work as usual, but there are some additional dot commands to change the layout, produce several columns on a page, or print with true proportional spacing. Printmaster is a British product that costs £49.50 from Script Software Products, 61 Cliffe Road, Glossop, Derbyshire SK13 8NT. It could be an alternative solution to your problem over proportional spacing.

The display of the ruler line is controlled by the contents of:

:INITWF+6

which can be reached from the Install program. If this parameter is set to FF, the ruler is displayed; this is the usual default. If you change it to 0 then the ruler will not be displayed on the screen. The setting for the "Pause for paper change between pages?" option is located at

:PODBLK+3

Here FF means do not pause, and 0 means pause between pages.

You may also be interested in a few more patches.

:PODBLK+1

contains FF if a series of Linefeeds is used at the end of a page to wind on to the next page, or 0 if a Formfeed is to be used instead. The location

:NOUFF

contains 0 if a message "Use form feeds" is to be displayed, and FF if the message is not to be displayed. The location

:HZONE

is normally set to 4; this is the number of blank spaces permitted in a line before WordStar attempts to split a word by hyphenation. Increasing this number will reduce the chance of hyphenation.

We have written a book on how to use WordStar, called *WordStar and CP/M Made Easy*, and we could easily write another one on patching the program. The ability to personalise WordStar is one of the reasons for its success.

Q **We have published some 500 titles of Arabic and Farsi books here in our print house. Now we want to transfer the text to discs for some word-processing jobs, such as making word indexes and editing for a reprint. To carry out such a job by normal typing takes much time and labour, so we want to take optical images of the books using a video camera, and translate them into characters by software.**

I have no knowledge about this sort of process being done elsewhere. Would you please advise me if this procedure is practical and fast enough, and where I can find people who have experience in this field.

E HASSAN

A There are two problems: feeding in and finding a word processor that handles the Arabic and Farsi characters. There are devices called optical scanners which can read printed text from a page and store it on the computer's disc. Wong International has recently announced a sophisticated image scanner and optical character recognition unit that works with an IBM PC and costs around £3,000. You put in a page of A4 paper and it reads the text. The program in the computer has to translate what has been read into characters. For this it requires fixed spacing of letters and so cannot read proportionally spaced text. I doubt if it can cope with non-Roman text, as you require, but you can get details from Wong International, 72 Capitol Park, Edgware Road, London NW9 0EW. There are also other optical scanners/readers on the market, but they cost £10,000 or so.

There are not many word processors which can handle Arabic or Farsi characters. A firm called Techware based in Eugene, Oregon, has a software package called Pangloss that modifies WordStar so that it can handle Arabic, Farsi, Greek, Greek/Hebrew, Hebrew or Russian characters. It shows the characters correctly on-screen and prints them using a variety of dot-matrix printers. A graphics screen is required for the characters and in some cases a special character PROM must be added to the computer. Machines presently supported are the Kaypro, Osborne, Apple II, CP/M machines using a Zenith Z-29 terminal, North Star Advantage and Televideo. PC

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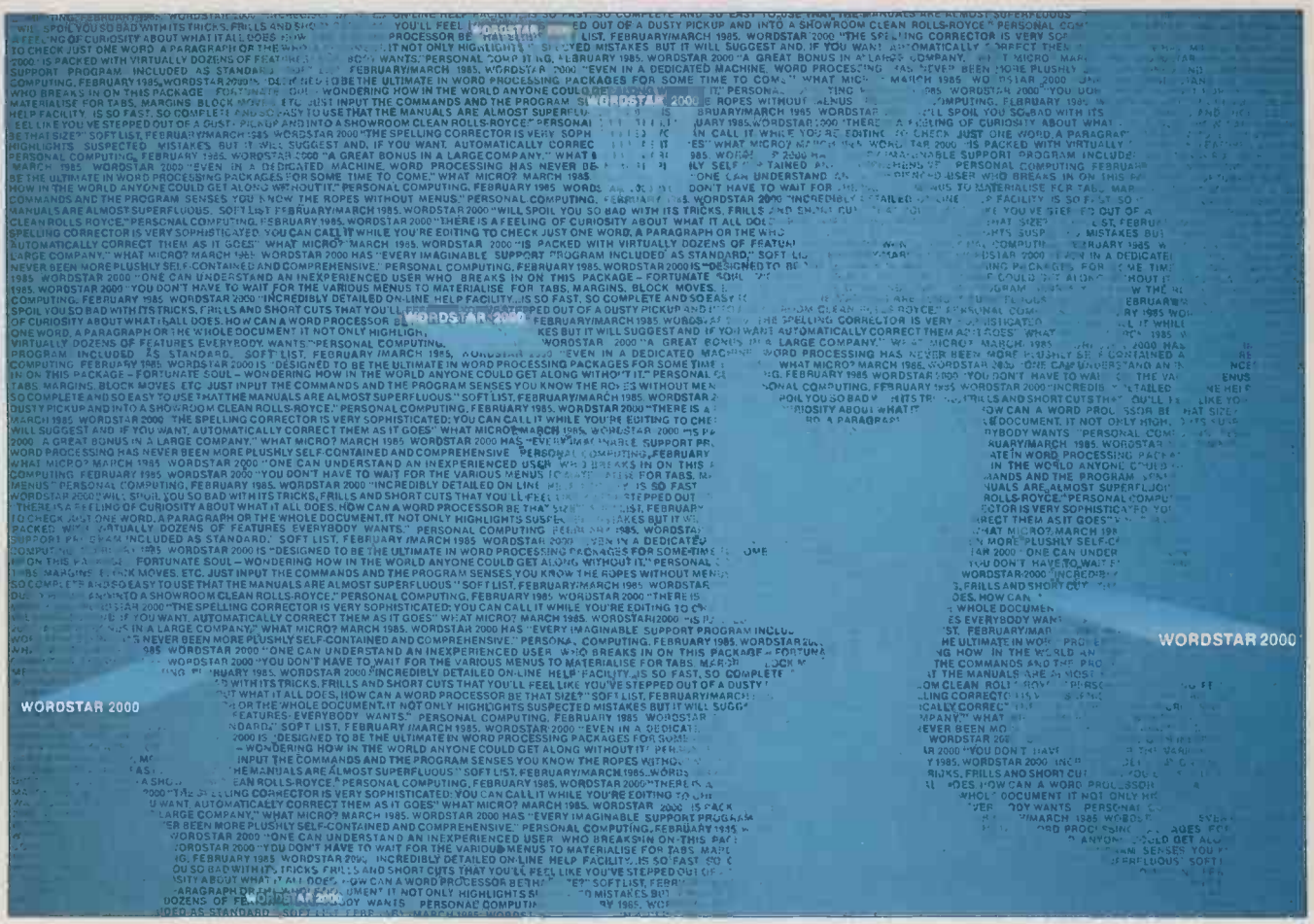

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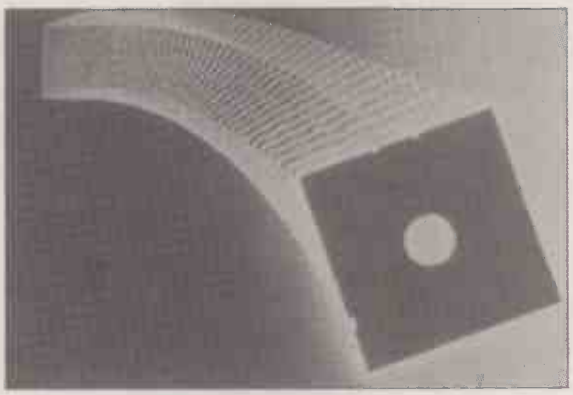

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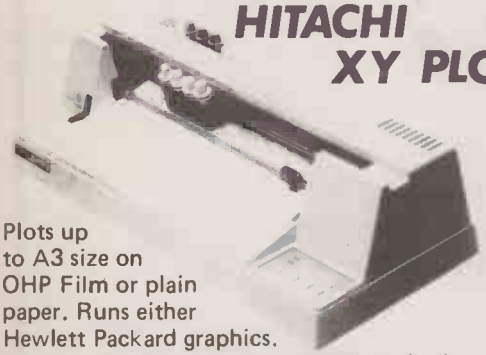

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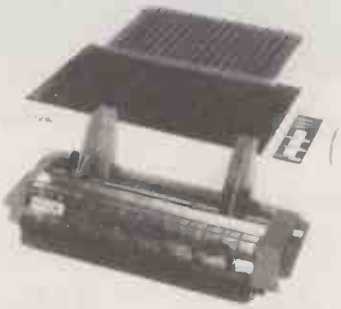

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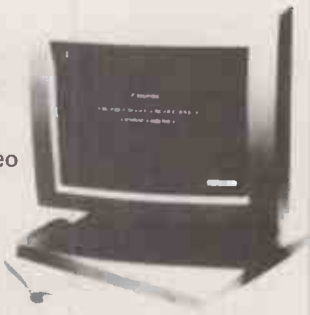

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Simon Beesley checks out some guides offering business advice for would-be software publishers.

IMAGINE that you have just completed a book which you are convinced is a sure-fire best seller. Do you now consider setting up a publishing company to produce and market the book yourself, or do you approach an established publisher? Almost certainly, you would take the latter course.

In this respect, you might think there are strong parallels between software publishing and book publishing. Nonetheless *Microcomputer Business Software* by R J Rapkins assumes that marketing your own program is still a viable option. The book is in two parts. In the first, it discusses how to develop a saleable program: what sort of application you should develop, in what language and for what operating system. As far as it goes, the advice it gives on these points is sound, if a little obvious.

The second part is all about selling the product. A wide range of topics are covered under headings such as advertising, market research and the importance of financial control, but they are all dealt with in a superficial and breezy fashion. For example, in the section on direct selling there is a brief rundown on different personality types — Mr Shilly-Shally and Mr Merryweather — and on how to close the sale.

It is hard to imagine that this book could equip someone with enough business acumen to set up and run a company. Even harder to swallow is the idea that one and the same person can occupy the roles of programmer, sales director and company manager.

As if aware that the project is basically infeasible, R J Rapkins does not give the sort of advice that would be really practical. For instance, there is no indication of how much capital is required to get a product on the market. And once initial capital is secured, how much more will be needed to keep going? As the author points out, distributors' terms in the home-computer market can be punitive. Software companies should be prepared to give a 60 percent discount, to accept a sale-or-return arrangement, and to wait up to 60 days for payment.

Writing Software for Profit by A J Harding is slightly more sensible. It is aimed at programmers working at home who want to be published. After a potted history of microcomputing, the author talks about the problems of choosing the machine, the subject and the publisher. Much of the information given here is either commonsensical or redundant. Do programmers really need to be told that software should be submitted on disc? And if they know how to program they are presumably already familiar with the range of micros available and the different categories of software.

More importantly, the book exaggerates the opportunities open to the software author. The number of best-selling business packages that are not developed within a software company must be comparatively few. Even in the games market, programs which make the charts are more likely to be written by a team of programmers and screen designers than by someone working from their bedroom.

Both authors seem to be locked into a vision of the software industry as it was four or five years ago. A J Harding mentions VisiCalc as an example of program which earned its author a fortune, but he would be hard-pressed to cite a more recent success story.

What arouses scepticism is the underlying suggestion that it is easier to make money in software publishing than in any other field. Part of the problem is the way these books are presented. For example, the blurb on the back of R J Rapkins' book calls the software industry the most exciting in the world.

Anyone foolhardy enough to want to become a software publisher, should first read *How to Make Money from Your Software* by Anne Staines. Without deciding on the question whether to publish or be published, the book at least outlines the problems involved in either option. It is particularly strong on the legal aspects of software publishing. For example, it covers what should be included in a licensing agreement if you approach a publisher, and how to form a company if you go it alone.

Probably the major problem for a small software company is acquiring a retail outlet. On this score Anne Staines' book, which was written in 1984, is by now too sanguine about the chances of success. For business packages, it stresses the importance of finding a distributor, but plays down the difficulty. In the games market, it suggests that it is worthwhile approaching the chief buyer for one of the large retail chains. Assuming the Boots or W H Smith buyers will grant you an audience, the likelihood of them accepting your product is extremely small. Reasonably enough, retail chains always favour established companies because their products have a brand identity and will be backed by substantial advertising.

None of these considerations trouble the pages of *A Workbook for Software Entrepreneurs* by A L Frank. Instead, it tries to reduce the entrepreneur's task to a series of formulae and check-list mechanisms. Thus chapter 10, entitled "Sales Planning", consists of a list of questions along the lines of "What administrative support mechanisms can I put into place to make the sales effort more efficient?"

Doubts about the value of this approach set in with the first chapter. Here we are told that self-communication, which involves decision making and analysis, is one of the three types of business communication. One wonders at the state of mind of anyone who needs to communicate their decisions to themself. Further on, we are informed that "most communication events are serial in nature and often short in nature". In other words, people in business spend most of their day on the telephone.

The main objection to thinking in these terms is that rather than smooth the path to business success, it is likely to impede it. Britain's most successful computer entrepreneur, Alan Sugar, started his career selling car aerials in a London street market. At the time, you can be sure, he did not think of himself as engaging in a serial — or in this case, parallel — communication event.

Legal Care for Your Software by Daniel Remer is written explicity for programmers and publishers. This time the emphasis is on making lay people less dependent on the services of a lawyer, even to the extent of providing a number of contracts ready to be used. Apart from the fact that the book deals mainly with U.S. law, for most readers a glance at the contents will be enough to convey the intricacies of contract and copyright law; enough at least to convince them that trying to do it yourself may not be altogether a wise move. PC

GOING IT ALONE

Microcomputer Business Software by R J Rapkins. Published by Sigma Press, £10.95. ISBN 1 85058 009 X

Writing Software for Profit by A J Harding. Published by Virgin Books, £4.95. ISBN 0 86369 057 2

How to Make Money from Your Software by Anne Staines. Published by ESC Publishing, £6.75. ISBN 0 906214 31 9

A Workbook for Software Entrepreneurs by A L Frank. Published by Prentice-Hall, £32. ISBN 0 13 965302 3 01

Legal Care for Your Software by Daniel Remer. Published by Gower Publishing, £25. ISBN 0 566 02518 3

Advertisement

"We want you to show how much our new £505 printer can produce in 60 seconds," said Epson. "Oh good," we thought, "a short-copy ad." Then they told us their EX800 could print 300 characters a second - and we were as happy as two ducks in a duvet factory. "Half a minute," I said, tapping out SOS messages on a calculator, "if you think we're writing all that, I'm a monkey's uncle." "Have a banana," they said. Hmph. Such sympathy. We were moved to tears. Anyway, here we are, faced with writing War and Peace Part One and completely on our own into the bargain. Well, not completely alone - after all, you're still reading, aren't you? Of course you are. You're not the sort of namby-pamby who's put off by a bit of eyestrain when there's half a chance of some decent writing, I can tell. You don't need any of those dreadful 'hi-tech' shots with lasers, grids and dry ice wafting all over the shop to grab your attention. The riff-raff might have cleared off already in search of those ads where big, busty women suggestively stroke some product or other under the headline 'Look at the big features on our new model', but have you? No, of course not. Nor are you impressed by any of those corny gimmicks that are just second-rate substitutes for the genuine interest that only the printed word can generate. After all, does 'Animal Farm' need a scratch 'n' sniff card to make it live? Would 'Lady Chatterley's Lover' be any more interesting as a pop-up book? (Well, come to think of it ...) No, you read to improve yourself, to learn about the world around you - and even if you don't manage either here, at least there's a chance that you'll learn a thing or two about computer printers. This is Epson's ad, after all, so I really should tell you about the big features on their new mod ... oops. What I mean is, the EX800 has a far greater list of specifications than any other printer in its price range (which is just as well for us, given the amount that we've got to write). As we said earlier, the EX800 costs only £505 (RRP exc. VAT) - which just so happens to remind me of an extremely amusing and interesting fact about money. Now you really are going to learn something about the world! This could even be your big chance to improve yourself. All you have to do is casually drop this into conversation at parties, and zap pow, instant success! It's far easier than learning how to play the piano, after all. (You must remember the ad I mean - 'They laughed when I sat down at the piano - someone had nicked the stool.' Yes, that one. What a load of old rubbish.) Anyway, where was I? Oh yes, this extremely amusing and interesting fact. Did you know - and not a lot of people do - that the unit of currency in Vietnam is the dong? It's true, it really is! Look it up if you don't believe me. And just think, but for a quirk of geography, it could have been the unit of currency here. Then even our innocent little nursery rhymes would have turned out completely different, e.g.: 'Said Simple Simon to the pieman, "Let me taste your wares!" / Said the pieman unto Simon, "Show me first your ..."' well, you get the idea. We'd better get back to the printer before the Advertising Standards Authority cottons on. The most important feature of the EX800 has to be its speed. It whizzes along at 50 c.p.s. in letter-quality mode, but can manage an astonishing 300 c.p.s. in Elite draft. To give you an idea of how quick that is, we'll count up what we've written and then let you know how long the EX800 would have taken to get this far. Meanwhile, name that tune. Rumpty tumpty tumpty tum, rumpty tumpty tara, rumpty tumpty tumpty tum, piddley piddley pom. No idea? Here's the rest. Rumpty tiddley, tumpty tiddley, rumpty tiddley tum. Rumpty tumpty tumpty tum, rumpty tiddley pom. Yep, it's the Archers. And at the third stroke, the EX800 would have been printing for twenty-seven seconds ... beep ... beep ... beep. Here, hold on a minute. That means we haven't even reached the bottom of the first page. Gordon Bennett, we're going to be here writing all night at this rate. Still, that's all the more reason to get on with it, I suppose. The new Epson EX800 is remarkably easy to use. The new Epson EX800 is remarkably easy to use. (Yes, that was deliberate repetition, as this is an important feature - and OK, it does use up a few more characters.) The thing is, when you want to change typestyles on an ordinary printer, you have to go through the whole rigmarole of making software commands. (Dragsville, Arizona.) The Epson EX800, on the other hand, has a 'Selectype' panel on the front. (Freaky City, Florida.) All you have to do to choose

a style from the wide - or to use a longer word, extensive - range of print options (N.B. there are two NLQ fonts) is push one or two of the eight backlit switches. Now that's what I call simple. It's certainly far simpler than, say, balancing a packet of frozen faggots on your head, hopping up and down on one leg, flapping your arms and shouting, "Yib hoy, snig floy, I am an inter-continental ballistic rissole," - and that's a dead cinch. In fact, I just did it right here in the office. There, I did it again! It's wild! Come on, you have a go. It'll give you a bit of a break - and if you're reading this on a train, it certainly ought to break the ice in your carriage. "But no, enough of all this frivolity," I hear you say. "Does this new EX800 have an integral push-feed tractor and short tear-off bar as standard, with the option of a cut sheet feeder also available?" Wow! What a question. Are you sure you're not in the computer printer business yourself? Hmm. You sound pretty clued-up to me. Anyway, the answer's yes. And before you start asking any more smarty-bottom questions, yes there is an optional colour unit available. For only an extra £55 (RRP exc. VAT), you, yes you, can print in seven, yes seven, glorious colours. Get your reports red! Give your accounts a purple patch!! Send blue suggestions to your business associates!!! Well, maybe not. Still, it's about time we had another character-count to see how far we've got. Any requests for music this time? Something grand and inspirational, perhaps, to lift our hearts and bear us on in triumph to the successful completion of our epic labour? Something that expresses fundamental optimism in the boundless potential of the human spirit? You've got it. Here we go, here we go, here we go. Here we go, here we go, here we go-o. Here we go, here we go, here we go. Here we go-o, here we go. All together now, verse two - here we go, here we ... oh all right, we'll spare you the rest. The news is, the Epson EX800 would have got here in forty-five seconds. Just fifteen seconds to go! (I was always red-hot at maths.) I'd better stick in a couple more product benefits before I finally run out of space. The Epson EX800 has a very large .. err .. umm .. thingy. I mean whatsit. That is to say, a doodah. Oh very well, a large memory - an 8K buffer to be exact, with the option of an additional 32K also available. (The point of this is to free your computer for other tasks more quickly - but of course I'm forgetting again, you probably know that already.) The EX800 is IBM-compatible ... though why you aren't using an Epson computer I don't know. I mean, what's the point of us going on about how good Epsons are if people don't take a blind bit of notice?? Oh look, I'm sorry. Perhaps I wouldn't get so angry at having to mention a rival outfit if they had a name that took up a reasonable amount of space, but one that uses an abbreviation? That Is Truly Sickening. The final point to make is that the EX800 boasts the proverbial reliability of all Epson printers. Not that the word 'proverbial' means an awful lot, of course. Have you noticed how many proverbs actually contradict each other? There's 'Look before you leap' and 'He who hesitates is lost'. There's 'Many hands make light work' and 'Too many cooks spoil the broth'. Weird. It really is time some of these were brought up to date. How about 'Where there's a will, there's a lawyer'? Or 'A friend in need is a pest'? Yes, that's it. He who laughs last has no sense of humour, people who live in glass houses shouldn't take baths, a bird in the hand is better than one overhead, see a pin, pick it up - all day long you'll have a pin ... but I'm wandering again. What I should have said in the first place was that you can count the mistakes the EX800 makes on the fingers of one foot. But look, we're almost there. The coupon is looming up at last! And the great thing is, we've made it together. We've had our ups and downs, it's true, but you've stuck with us to the bitter end. Terrific. Can't you just feel that bond of comradeship, that deep empathy between us now? Of course you can. And now we've shared so much, we'd do anything for each other, I'm sure. For instance, if we asked you to fill in the coupon and send it to Epson, you'd do it for us, wouldn't you? What do you mean, no?

To: Epson (U.K.) Limited, Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH. (Telephone 01-902 8892) Please send me less information on your EX800 printer - quick. 45

Name _____ Company/Address _____

_____ HPC 1 Telephone: _____

BASIC BENCHMARKS

When run at 7.16MHz, the Mitsubishi gives even the speedy Compaq Deskpro 286 a run for its money, but at other clock speeds performance is likely to be somewhat reduced. The Future FX-50 turns in somewhat less sparkling results but still outperforms the 6MHz IBM PC/AT. The Basic Benchmark routines were published on page 102 of the January 1984 issue of *Practical Computing*. Timings are in seconds.

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
Mitsubishi 816F — 80286, 7.16MHz	0.3	1.2	2.8	2.9	3.1	5.7	8.9	9.2	4.3
Future FX-50 — 80286, 10MHz	0.4	1.4	2.9	2.9	3.6	7.0	1.1	1.2	5.2
Compaq Deskpro 286 — 80286, 8MHz	0.3	1.2	2.8	2.9	3.2	5.7	9.1	9.2	4.3
Ferranti PC-2860AT — 80286, 8MHz	0.3	1.3	2.9	2.9	3.2	5.8	9.2	9.3	4.4
IBM PC/AT — 80286, 6MHz	0.5	1.9	4.6	4.7	5.2	9.1	14.6	13.5	6.8

MITSUBISHI 816F FUTURE FX-50

ADDED-VALUE HEAVYWEIGHTS

By Steve Malone

SPECIFICATIONS

MITSUBISHI 816F

CPU: Intel 80286 running at 7.16MHz, switchable to 6MHz or 8MHz
RAM: 1Mbyte on the motherboard
Mass storage: one or two 5.25in. 1.2Mbyte or 360K floppy-disc drives, one 40Mbyte hard disc; optional tape steamer
Interfaces: one RS-232C serial and one Centronics parallel interface
Display: colour graphics and colour monitor included in the price
Software in price: MS-DOS 3.0
Price: £3,400
Manufacturer: Mitsubishi Electric U.K., Hertford Place, Maple Cross, Rickmansowrth, Hertfordshire WD3 2BJ. Telephone: (0923) 770000
Available: now

FUTURE FX-50

CPU: Intel 80286 running at 6MHz, switchable to 8MHz or 10MHz
RAM: 640K on the motherboard
Mass storage: one 5.25in. 1.2Mbyte floppy, one 40Mbyte hard disc
Interfaces: one Future-format RS-232C and one IBM-format RS-232C; one Centronics parallel port on graphics card and one Centronics port on motherboard; one Future-format keyboard port on monitor and one IBM-format keyboard port on motherboard; two network sockets
Display: monochrome monitor and Hercules-compatible board as standard
Software in price: Concurrent DOS 4.11, Spellbinder 5 word processor, Commissionaire front end
Price: £5,200
Manufacturer: Future Computers Ltd, 7 Imperial Way, Croydon, Surrey CR0 4RR. Telephone: 01-680 6040
Available: now

Two manufacturers — one Japanese, one British — have launched top-specification, high-capacity machines that could form the core of office multi-user or networking sytems.

Outside Japan, Mitsubishi is almost unknown as a manufacturer of computers, though the company has a long-established reputation as a supplier of monitors and disc drives. But Mitsubishi has recently launched a complete range of IBM-compatible computers: the 816F is an AT clone that sits at the top of the range. Priced at around £3,500, it is definitely not in competition with the Taiwanese clones. Mitsubishi sees itself rather as offering a high-performance machine along with a high degree of support for its customers.

The FX-50 from Future Computers has a very different pedigree. The machine is manufactured and distributed almost entirely in the U.K. and Future has aimed its micro more towards the small- to medium-sized company which requires a multi-user or networking capability.

The Mitsubishi 816F provided for our review was equipped with a single 1.2Mbyte floppy drive and an internal 40Mbyte hard disc. The machine also had 1Mbyte of RAM fitted to the motherboard, although the internal DIP switches had been set to allow for only 512K. The review machine was actually a demonstration unit rather than a production model.

At first glance, the most striking feature of the 816F is its size. It comes in the usual three-box format, but the CPU box is even larger than that of the IBM PC/AT. Unless you are the managing director, this is no desk-top machine; it is perhaps better suited to being mounted sideways on the floor. The box is made of mild steel, which fits together well and sets a tone of sound engineering and manufacture.

The keyboard layout is in the style of the old AT design, with the 10 function keys on the left and the combined numeric keypad and cursor-control pad on the right. The keys feel slightly plastic, but overall the feel is adequate. American key assignments were used on the review model; a British layout will be available for production machines.

HARD TO SEE

The front of the CPU module looks a little bare. The key and lock system for securing the keyboard from interference is placed out on its own on the left of the front panel, with the power and hard-disc indicator lights shunted away towards the bottom right. The light is very difficult to see through its small slit in the casing, and if the unit is on the floor it is almost impossible to tell whether the light is on or not.

The 816F can be fitted with either one or two half-height floppy-disc drives of either 1.2Mbyte or 360K capacity as well as the 40Mbyte hard-disc drive. A Techmar tape streamer can be fitted in place of one of the floppy drives.

At the back of the 816F there are the usual array of ports, along with the on/off switch, the power input, and the power output to the monitor. Also on the rear casing of our machine there was a curious hole, which on production models will be covered by a door that gives access to an eight-pole DIP switch.

There are three types of monitor available for the 816F: a high-resolution monochrome display, and two graphics monitors. A colour monitor was supplied with the review machine, and a combined monochrome and RGB composite-video interface is fitted as standard. Our setup supported the full range of graphics programs that we ran on it.

The 1.2Mbyte drive performed no better or worse than most other floppy-disc drives available on AT clones from well-known manufacturers. Its total timing for the Bagshaw Disc Benchmarks was 249 seconds, compared with 285 seconds for the PC/AT. The hard-disc performance was also about average: 68 seconds for the Benchmarks compared with the PC/AT's 60 seconds. But the hard-disc system is among the smoothest and quietest that I have come across on any machine. Instead of the usual creaks and groans one has come to expect of a hard disc, you have to strain to hear the Mitsubishi drive running, even in a quiet room.

MITSUBISHI 816F

PC VERDICT

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

☐ A well-built and reliable machine, tailor-made for the corporate market.

A look inside the casing explains all. The 40Mbyte hard disc has the kind of heavy-duty mounting and casing that would do credit to a Victorian engineer; other hard-disc fittings look flimsy by comparison, especially the recent card-mounted variety. The other thing that strikes you about the inside of the 816F is the size of the power supply, which takes up almost a quarter of the available space.

The rest of the interior is given over to electronics. The motherboard of the computer lies at the bottom and carries the 80286 processor and RAM chips. By changing the relevant DIP switch settings you can make the processor run at 6MHz, 7.16MHz or 8MHz. Other switches allow you to configure the memory, and define the monitor and the keyboard to either a PC or AT type.

The 816F has a total of 10 expansion slots. Six are of the AT type, three are of the PC type, and one is unused. In the standard configuration, one of the PC slots is filled by the video interface card and another is occupied by an I/O card that provides a parallel port and two serial ports. A disc-controller card occupies one of the AT slots. This leaves a single PC slot and five AT-sized slots available for user expansion — although of course the AT slots can be used for PC cards. All the slots are full length.

All the standard misbehaved software like Sidekick, Lotus 1-2-3 and the Microsoft Flight Simulator ran quite happily on the 816F. In terms of speed as measured by the Basic Benchmarks, the 816F is up with the best of the opposition, even when running at its default speed of 7.16MHz instead of the more usual 8MHz.

NO WAIT STATES

The reason for the machine's performance lies with the RAM. Mitsubishi has fitted the computer with RAM chips that have no wait states at 7.16MHz, and this cuts dramatically the time it takes to access the main memory. Performance is reduced substantially at 6MHz and at 8MHz, since the RAM chips do require wait states at these speeds.

For repairs and other disasters Mitsubishi has signed a contract with a third-party maintenance contractor. At the moment this service is included in the price of the machine. The actual terms of the agreement will vary between customers, depending on their requirements — Mitsubishi assures us that this flexibility will work to the users' advantage.

Future Computers has adopted a very different approach from Mitsubishi's in the design of its machine. While Mitsubishi has concentrated on providing features that are superior to those found on the IBM PC/AT, Future has been more concerned about compatibility — with the AT itself and especially as a file server for Future's own range of machines.

The FX-50 is equipped with a 40Mbyte hard-disc drive; a version with a 120Mbyte hard disc is currently undergoing final testing. AT compatibility is maintained by the provision of a 1.2Mbyte floppy drive. As on other machines which conform to the AT standard, the FX-50 drive can read both 1.2Mbyte and 360K discs. Future has its own 800K disc format, and is currently putting the final touches to software which will add compatibility with the Future format to the floppy-disc drive.

Though it is a fully functional AT compatible, the FX-50 is considerably smaller than the PC/AT and in fact measures about the same size as the IBM PC. The three-box system comes complete with serial and parallel ports, a keyboard and a monitor. Future Computers only supplies a monochrome monitor with the FX-50; if you need colour capability you will have to look elsewhere for a suitable display.

To maintain compatibility with earlier FX models, Future sells the FX-50 with the same keyboard that is provided with the FX-20 and FX-30 machines. The layout is

(continued on page 49)

THE ULTIMATE BUSINESS TOOL

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The excellent 350-page tutorial and reference manual will teach you step-by-step how to use the source code editor and expand your programs to support multiple files and screens including the "fancy stuff" such as pull-down menus and TAS-windows (we're the ONLY database that can do this). TAS-Plus has 128 colour combinations available and can display all IBM graphic characters. You can even get at or set the system time and date. TAS-Plus allows you to produce programs that are more professionally looking and with more "polish" than even the very expensive so-called "professional" software packages.

Finally, when it comes down to the speed of writing and more importantly running your programs (because that's what you do every day) you will find that the compiled code makes it load, read and write data quicker than any other database we know of. And don't feel sorry for yourself if you already have dBase, TAS-Plus can read and write those files as well. Now, you must agree that's respectable at any price, at £69.00 its awesome. And if you still need convincing that this is the bargain of a lifetime we offer a 60-day money back guarantee*.

AT £69 TAS-PLUS IS COMPLETE

It consists of the Relational Database, 4th Generation Language, Source Code Editor, Runtime Compiler, Screen Painter, Program Generator, Database Browser, Report Writer and 350 Page Tutorial and Reference Manual. TAS-Plus has over 86 commands and over 200 options available in its source code editor. TAS-Plus supports 16 simultaneous open files, each with up to 16 indices and a total of 65,000 records per file with up to 10,000 characters per record.

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SYSTEM REQUIREMENTS

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

TAS-PLUS FOR THE TECHNICALLY MINDED

Because TAS compiles down to intermediate machine code your programs will execute fast, TAS itself is written in Assembler. TAS uses B-Tree multi-key file access and is the fastest database we know of. It provides an incredible, but easy to learn, 85+ commands including IF, DO, WHILE, FOR/NEXT, GOTO, GOSUB, ON statement etc. Excellent array handling and string manipulation.

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Excellent 350 page tutorial and reference manual. Totally automated menu-driven, syntax-checking Source Code Editor which even tells on which page in the manual to get help. Create pull down menus and 10 overlapping windows. Up to 128 colour combinations. All IBM business graphics supported. Set video highlight/normal/reverse. Powerful scroll and wrap commands. User definable printer control characters. Full Function Key access and control. Not Copy Protected. So . . . at £69.00 it's a must.

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(Apologies, there are at present no brochures available for TAS-Plus).
***Previously the software division of NEWTONS Laboratories.*
All trademarks are recognized.

→ circle 115 on enquiry card ←

(continued from page 47)

radically different to the PC/AT's, and many of the keys have been reconfigured to conform to the IBM format. For example, on the FX keyboard the PrintScr function is implemented by pressing Shift-Do. Most of the missing keys have been reconfigured in a similar way, the current exceptions being Num Lock and Sys Req. Future will be implementing Num Lock by using the FX's Linefeed key, and says that when someone finds a use for the Sys Req key it will gladly implement it too.

There is certainly no shortage of spare capacity on the keyboard. In addition to the usual QWERTY keys and the standard complement of control keys, Future has included 20 function keys, a numeric keypad and a separate cursor-control pad. The price to pay for this is that the keyboard is rather cramped. The row of function keys along the top is hard up against the top line of QWERTY keys, for example. To keep them apart, the top row of QWERTY keys has been mounted slightly higher than the rest.

The FX keyboard is connected to the computer via a socket on the back of the monitor. If you want to use the computer purely as an AT clone you can plug an IBM-style keyboard into an IBM-format five-pin socket fitted at the rear of the system box. For the IBM keyboard to work, you will also have to replace the keyboard ROM inside the computer. Because the standard keyboard is interfaced via the monochrome monitor a further adaptor is required if you are using the FX keyboard with a colour monitor.

The schizophrenia involved in maintaining compatibility with both the FX and the AT formats also extends to the FX-50's I/O. The computer boasts two different RS-232C sockets: a 23-way D connector configured to comply with earlier FX models and a nine-pin D connector in IBM format. A similar situation exists at the moment with the parallel interfaces. The Hercules graphics card that is fitted as standard has a parallel printer port, and this is currently the default interface. The FX-50 also has a printer port connected directly to the motherboard and configured to Future's own format. Future says it is working on a Hercules-compatible card that will not have a printer port connected; the default will then become the motherboard port.

25 STATIONS

The final two ports on the FX-50 are telephone-type jack sockets that support Future's own token-passing ring network. They are connected to the network card that is supplied as standard, piggybacked on to the motherboard. The token-passing ring runs under DR-Net and has a transfer rate of 800Kbit/s. In theory it can accommodate up to 255 stations, but the practical limit lies between five and 25 stations, depending on the applications used.

Getting inside the FX-50 is a two-stage operation. The system box is finished with plastic panels that simply unclip at the sides to reveal two metal casings that are screwed together. The smaller of the casings encloses the expansion area. A gap in the side provides access to the four card slots, which in the FX-50 are mounted horizontally rather than the standard upright position.

In the standard configuration, one of the slots is occupied by the disc-controller board, and another holds the Hercules card. This leaves only one PC slot and one AT slot available for expansion, and provision of additional slots ought to be an urgent priority for Future.

The motherboard is housed inside the larger metal casing which, despite Future's denials, looks as if it was designed to discourage users from fiddling with it. The case contains the motherboard itself, the floppy-disc drive and a sturdily mounted hard disc.

The FX-50 is, naturally, based around the Intel 80286 processor, and has 640K of RAM fitted as standard on the motherboard. The processor can be programmed to run at 6MHz, 8MHz or 10MHz. The default speed in this machine is 6MHz, and if you want it to run at maximum speed the 10MHz setting has to be programmed on power-up. It would be better if the speed were held in a programmable ROM rather than purely through software.

FUTURE FX-50

PC VERDICT

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

☐ A good machine that suffers from an identity crisis.

At the 10MHz rate, the hard disc comfortably outperforms the Mitsubishi — and practically everything else around. The hard-disc Bagshaw Benchmarks timing was 40.6 seconds. The next fastest hard disc we have tested was in the Compaq Deskpro 286, which turned in 47.8 seconds — and that for a drive of only 30Mbyte. The FX-50's 1.2Mbyte floppy recorded a Benchmark time of 217 seconds.

The standard operating system supplied with the FX-50 is Digital Research's Concurrent DOS 4.11. The DR-Net networking software has to be bought separately. For customers who invest in networking, Future has developed Commissionaire as a friendly front end to Concurrent DOS. This menu-driven program allows you to select applications, and also steers you round the more confusing aspects of Concurent DOS. Commissionare also supports a simple email facility, which transfers documents between stations and issues a warning whenever a message arrives.

The choice of Concurrent DOS as the operating system emphasises the way Future sees the potential market for the FX-50. Concurrent DOS is among the best multi-tasking operating systems around. Used together with DR-Net it provides a superior package to the rival MS-DOS/MS-Net configuration, which requires windows to provide a similar multi-tasking capability.

The main drawback of Concurrent DOS is that it is not fully compatible with MS-DOS. An example of this mismatch occurred when we tried to run Sidekick: the program crashed and displayed the message "Unknown version of PC-DOS, please contact Borland." Digital Research expects to have put the matter right in time for the next release of Concurrent DOS.

Rebooting the FX-50 with MS-DOS allowed us to run Sidekick, Lotus 1-2-3 and most other packages normally considered to be good tests of compatibility. The exception was Microsoft's Flight Simulator, but that was due more to the presence of the Hercules card than any incompatibility.

Both the Future FX-50 and the Mitsubishi 816F are being presented by their manufacturers as multi-user, multi-tasking machines. As well as the standard MS-DOS 3.0, Mitsubishi is offering Xenix on its machine. But while the FX-50 comes equipped with a networking board, no additional kit is yet available from Mitsubishi to expand its system into a multi-user or networked environment. Mitsubishi's sales staff are happy to discuss any expansion with customers and point them in the right direction, and the company expects to be providing the requisite hardware later.

For the Future machine, the next step will be to provide a real multi-user capability. This will be achieved with the release of an eight-line RS-232C card, which will allow Future's FX-0 dumb terminals to share the processor. The company claims that the device should be in full production this summer.

The ability to run dumb terminals from a single processor unit is one of Concurrent DOS's main selling points. One of the major developments in the Future FX series will be the much heralded Concurrent DOS XM, which will cope with up to 16Mbyte of RAM in a single machine. Memory capacity like this will be vital if the machine is to make any serious inroads into the multi-user market, and Future is preparing to make room in the casing for more slots to accommodate it.

CONCLUSIONS

■ The 816F is a well-built and well-engineered product which plays to Mitsubishi's traditional strengths.

■ The FX-50 performed well in tests but it lacks an obvious upgrade path.

■ Both machines lack a final polish; the 816F's problems appear easier to solve than those of the FX-50.

■ The 816F and the FX-50 are both well tailored to their respective target markets. The Mitsubishi machine is likely to do more business in its chosen corporate sector than the Future machine, which is likely to remain tied to the company's existing user base. PC

QWERTYPHONE
MEMOS DOWN THE WIRE

By Steve Malone

British Telecom's new device combines the functions of a full-feature telephone with a keyboard and modem.

The Qwertyphone is the latest product from British Telecom intended to enhance the functions of the telephone as an office productivity tool. As in the earlier Tonto — which was a badge-engineered version of the ICL One Per Desk — the idea is to provide the telephone with the ability to send and receive data and communicate with other digital machines.

The Qwertyphone is about the size of a small office telephone switchboard. Like any other telephone, it is installed simply by plugging the standard BT jack cable running from the back of the machine into a wall socket. It will then run from its internal batteries, although for regular use it is advisable to plug the Qwertyphone into the mains, using the lead supplied. The Qwertyphone is designed to be left switched on 24 hours per day, so batteries would be used up quite quickly.

The telephone handset is in the modern, light, angled style, which makes it fairly difficult to hold under your chin while you are typing or performing some other two-handed task. It is supported on a sloping rest to the left of the main unit. A groove in the stand fits a ridge on the bottom of the mouthpiece to hold the handset in place.

In place of the conventional mechanical switches which connect a normal telephone when the handset is lifted from its cradle, the Qwertyphone uses a magnetic system which detects when the handset is in proximity to the rest. So even if the handset is not actually touching the rest, the circuit is shut down. The push-button dialling keys for the telephone are in the top right-hand corner of the Qwertyphone panel. They are laid out in the standard telephone format, and include the * and # recall keys.

KEY ACTION DEAD

The central area of the Qwertyphone's top panel is occupied by a standard set of typewriter keys. The key action is adequate, although they feel a bit dead; they would not really be suitable for a light touch-typist. BT has promised a lighter keyboard for production units. A range of function keys, including Control, Shift and Alt, are provided to the side of the alphabetic keys so that the Qwertyphone can be configured for terminal emulation. Another row of function keys along the top of the keyboard handles the Qwertyphone's built-in applications, programmable functions and cursor controls.

The four-line by 32-character LCD screen mounted at the top of the Qwertyphone is angled slightly upwards. Surrounding it are nine so-called soft keys which allow you to select the machine's operating functions from an on-screen menu. The screen displays the current status. At the base of the LCD mounting are two thumbwheels to adjust electronically the LCD display angle and the volume of the ringing tone.

While you would normally put a standard telephone to one side of your desk, the Qwertyphone has to be placed centrally where you can use the keyboard. To reach the screen soft keys you have to lean over the typewriter keys. Another problem with the soft keys is that they are crammed a little too closely around the screen, and I sometimes found my hand obscuring the menu prompts.

QWERTYPHONE

PC VERDICT

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

☐ Some good ideas, but unlikely to have widespread appeal in its present form.

At the rear of the Qwertyphone is a removable pod which contains the connection to the telephone jack. The pod is interfaced to the Qwertyphone via a standard 64-way bus. Additional pods are planned; initially they will simply be different configurations to allow the Qwertyphone to be used on foreign phone systems.

An eight-pin socket at the back of the Qwertyphone provides a port which enables it to be used as a PC keyboard. On the face of it, this seems like a good idea, as it would allow office workers to combine the features of the PC and Qwertyphone in a single system. But the current keyboard is not really up to the task, as neither the layout nor the functions are really suitable. It is possible that the promised improvements to the keyboard may solve some of the problems, though space restrictions make it unlikely that the Qwertyphone will ever provide a full PC keyboard layout. As a programmable serial port, the PC output can alternatively be configured for use with external modems. In particular, BT is looking at the possibility of adapting the Qwertyphone for use with Hayes protocols.

A second eight-pin socket provides a serial interface for a printer to produce hard copies of messages. BT will be offering a small dot-matrix printer as an option with the Qwertyphone. However, having a printer with the Qwertyphone means that your desk becomes even more cluttered.

The essence of the Qwertyphone is in its desk-top utilities, most of which are called from the function keys on the top row of the keyboard. They include conventional functions like a memo pad and calculator plus others dedicated to the telephone.

Once the system is installed, pushing the Config key provides a series of menus which allow you to reset default values. The Time and Date values, once set, are continuously maintained by the main power supply and a set of backup batteries inside the Qwertyphone.

It is likely that the majority of Qwertyphones will be installed in large organisations with their own PABX switchboards.

SPECIFICATION

Description: telephone/terminal with built-in modem
RAM: 8K dedicated to text storage; 8K dedicated to directories, expandable to 16K
ROM: 16K for programs and driver software
Dimensions: 380mm. (15in.) x 240mm. (9.4in.) x 100mm. (3.9in.)
Display: four-line by 32-character LCD
Modem: 300 baud with variable duplex, parity, stop bits, words and protocols
Keyboard: QWERTY with seven programmable function keys, programmable terminal-emulation keys and separate telephone keypad
Interfaces: 64-way bus for telepone transmission, serial printer port, serial PC keyboard port, BT telephone jack
Price: under £400; cable for PC £80; additional directory modules £15 for two
Manufacturer: BT Business Systems, 23 Howland Street, London W1P 6HQ. Telephne: 01-631 2345
Available: autumn 1986

Qwertyphone provides a telephone, keyboard and modem in one unit.

To configure a Qwertyphone with the rest of the system there are a number of presets covering a range of commonly used switchboard systems. Among those supported are the Regent, Monarch and Merlin DX systems. The IBM switchboard system used in the *Practical Computing* office is not among the presets, but we found no problems setting up the Qwertyphone to work with it. Functions of the PABX system which can be set include the pause times — the time it takes to get an outside line — and the access code for an outside line.

AUTOMATIC REDIAL

Once the system has been set up you can dial from the Idle screen, which is displayed when the system is not in use. The top line of the Idle screen indicates the current date and time, and provides a record of how long the current call has taken. A soft key underneath the LCD allows you to dial a number without lifting the receiver. Another soft key provides automatic redial of a previous number.

The Qwertyphone can store up to 250 names and numbers in a personal directory. The information is stored in an 8K EPROM fitted underneath the handset mounting with the batteries. An EPROM is ideal for this kind of application, as it means that different directories can be installed in the machine simply by changing the chip. In addition, an empty ROM socket is provided to allow users to double their directory capacity or copy one directory to another.

It would have been useful if the memory modules could have been made more accessible. BT says that the EPROMs had to be tucked away under the handset to comply with regulations intended to prevent fingers touching the telephone electronics directly.

The directory is called by the Dir function key in the top left-hand corner of the keyboard. Calling the directory displays a menu which allows you to search for an existing entry or add a new name and number. The search facility can use the name, address or telephone number fields, and works even with partial entries. Once the record is displayed on-screen, pressing the soft key next to the name dials the number automatically, including any access code. You add new names to the directory simply by pressing the New Entry soft key and following the prompts on-screen.

The Qwertyphone is capable of sending messages and memos to other Qwertyphones and similarly configured devices like the Tonto. Messages can be typed direct or stored in memory for transmission later. You can also hold a typed conversation with someone at another station.

You enter a message into the machine's memory by pressing the Memo function key. Messages of up to 128 characters — the total number of characters on a single screen — can be sent if the receiving terminal has no printer attached. If the target Qwertyphone is connected to a printer there is no limit to the size of the document which can be received. The Qwertyphone has an auto-answer mode, which allows it to receive incoming messages automatically and store them, to be recalled and viewed later.

The trouble with all this is that a Qwertyphone can only talk to another Qwertyphone or a similar device. However, its built-in modem allows you to log on to other computers and databases. The data rate is fixed at 300 baud, so it cannot be used for Prestel or other viewdata services, but it is capable of handling most email services, including Telecom Gold. Parameters such as word length, stop bits and parity can be altered if necessary, though the Qwertyphone messaging settings are identical to those used by Telecom Gold.

To receive messages from Telecom Gold a printer is essential, since text passes across the Qwertyphone's tiny screen too fast for you to get more than a vague idea of what a message is about. It is a pity that the Qwertyphone's memory is too small to store the mail on board so that you could download it on to a printer once you had logged off. A capability of that kind would cut down the time that you remain logged on to Gold, which would reduce its cost. This would be a clear advantage for the user, though perhaps not to BT.

CONCLUSIONS

■ The concept behind the Qwertyphone is a good one: people are asking much more of the telephone system nowadays, and it seems sensible to provide all the facilities required in one unit.

■ The Qwertyphone's potential would be improved by some fairly minor design changes: in particular, an improved handset rest, a larger screen and the ability to store larger documents would increase its appeal.

■ Because of its limitations, the Qwertyphone is likely to end up as an executive toy rather than as a serious piece of business equipment. BT would do well to consider building a revamped version. PC

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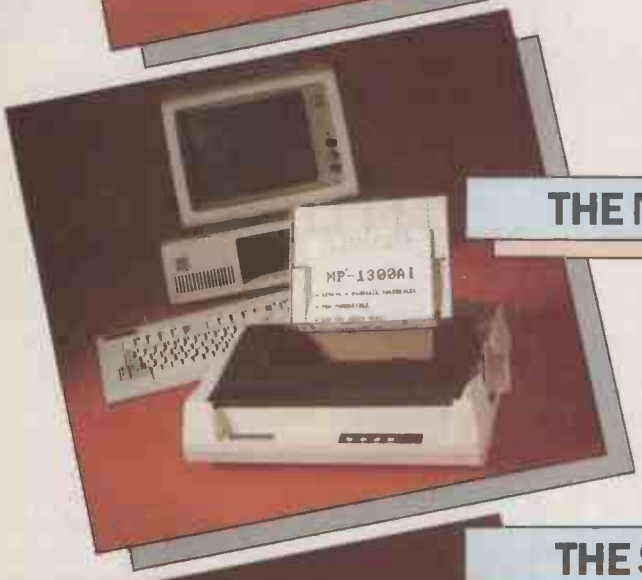
Whatever the size of your business, the Seikosha range of advanced, high-performance printers will suit your requirements.
This exceptional range of dot matrix printers reflects the craftsmanship, advanced technology and reliability that you would expect from the 'House of Seiko'.
For heavy-duty use, the robust BP Series offers very fast speeds, low noise levels and multi-function features – at low cost. The recently introduced MP Series will suit the PC user who wants exceptional speed at an unbeatable price. And for the growing business looking for a budget printer compatible with all the popular micros, the SP Series is the ideal choice.

THE BP-SERIES

Around **£1449.00** + VAT

Top of the range, the BP5420AI is fast, quiet, strongly built and suitable for use with micros, minis, and networked multi-user systems. It has a print speed of 420cps (draft) and 104cps (NLQ) and other features include:

- Parallel and Serial Interfaces as standard.
- Front panel selection of NLQ, Fonts, Pitches, etc.
- 2 Selectable modes (IBM PC or Epson compatible).
- 18K Buffer as standard.



THE MP-SERIES

Around **£433.00** + VAT

The latest addition to Seikosha's range, the MP1300AI offers not only high speed – 300cps (draft) and 50cps (NLQ), but high-quality printing with an optional "clip-on, clip-off" colour upgrade kit (Epson JX80 compatible). Features include:

- Parallel & Serial Interfaces as standard.
- 2 Selectable modes (IBM PC or Epson FX compatible).
- Automatic cut-sheet loading and ejection after printing.
- Standard friction and detachable tractor. 10K Buffer as standard.

THE SP-SERIES

Around **£250.00** + VAT

The SP-1000 is the first in this series of professional printers. A combination of high performance (100cps draft, 25cps NLQ) at low cost puts the very best of printers within easy reach of the smallest business. Its impressive list of advanced features includes:

- Automatic cut-sheet loading.
- Friction and detachable tractor as standard.
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OSBORNE PC
BREAKING THE £500 BARRIER

By Glyn Moody

A good price and a reasonable standard of construction are key points in favour of this IBM clone.

The Osborne saga has been one of the more entertaining over the last few years — provided you have not been part of it. But the cycle of boom and bust, followed by a phoenix-like resurgence from the ashes, seems finally to have been broken now that the Osborne Computer Corporation is in the hands of the American receivers. But in the U.K. at least, the name lives on. Future Management, once the distributor of the earliest Osborne transportables, has brought out the Osborne PC, an IBM clone for under £500.

The parentage of the Osborne PC is slightly complicated. After the final demise of the U.S. outfit, rights to the Osborne name were held by the German subsidiary, Osborne Computer Company GmbH. This company put together an IBMulator, using mainly Taiwanese components, which it sells under the Osborne name. The U.K. model is assembled in Britain, with disc drives from Mitsubishi.

Future Management already makes a clone, which it sells as the Spirit. In contrast to the Osborne PC, this model is a high-performance unit aimed mainly at the corporate market. The Osborne PC is geared to the personal market, sales will be largely by mail-order only, cutting out the dealer and so allowing a lower end-user price. For £495 you get one floppy, 256K of RAM, a monochrome monitor and DOS 2.11. For £325 you can add a 10Mbyte Winchester, and for £445 20Mbyte.

EASY ACCESS

Externally, the Osborne holds no surprises, though unlike the IBM PC the unit has a lift-up lid that is freed by two buttons at the side, rather than the less convenient slide-off cover. Inside, there is a Multitech motherboard carrying a standard — and legal — ERSO BIOS ROM.

With the first few prototype machines there was a problem with the power-supply unit caused by a long screw dangerously close to live circuitry, but Future Management says this has been fixed on later models. On the review machine the on/off switch was located at the rear; on production units it will be moved to the side, as on IBM machines.

The keyboard layout is modelled on the AT rather than the PC. The feel is quite good, though the space bar is rather clattery. The 12in. green monitor supplied with the review machine had tilt and swivel; this costs an extra £75. The entry-level machine comes with a simple 12in. screen.

The Osborne PC turns in pretty much the sort of performance you would expect from a cheap clone. The average timing for the Basic Benchmarks was 16.8 seconds, which is identical to that of the IBM PC itself. For the Bagshaw Disc Benchmarks it totalled 828 seconds — rather slower than the already tardy IBM PC, which clocks in at 742 seconds. Even though the price of the Osborne PC is dramatically lower than the going rate, the performance is not, and there were no real problems with compatibility.

OSBORNE PC

PC VERDICT

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

☐ About the cheapest IBM clone around — for the moment.

The overall standard of construction similarly shows no signs of corner-cutting. Future Management has sufficient confidence in its product to include a 12-month warranty covering parts and labour in the selling price. This attractive feature may well prove key in enabling the Osborne PC to stand out from the crowd. Too often, clone makers are content to shift boxes and then wash their hands of later problems. Future Management also says that it will carry out upgrades free of charge at its workshops. This makes the upgrade prices particularly attractive. The only area where the Osborne falls down is in the rather skimpy documentation, which is of interest chiefly for its broken-backed English.

Clone makers have hitherto been reluctant to breach the psychologically important £500 price barrier. An exception has been in the area of kits, but while they certainly provide a very cheap way of obtaining a PC, anyone who has cursed their way through putting do-it-yourself furniture together will know the pitfalls of this approach. Where Future Management is leading, others are bound to follow: £500 is widely touted as the cost of the fabled Amstrad PC. Given the way the IBMulator market is shaking out, it would not be surprising if the £400 mark were passed before the year is out. If you need to save that extra money, you could wait, but in the meantime the Osborne PC fits the bill for a reliable clone at a rock-bottom price.

SPECIFICATION

CPU: 8088 running at 4.77MHz
RAM: 256K, expandable to 640K
ROM: ERSO BIOS
Mass storage: one 360K 5.25in. floppy as standard; second floppy and hard discs can be added
Display: 12in. monochrome monitor, Hercules-compatible colour-graphics display adaptor
Keyboard: IBM PC/AT-style
Software in price: MS-DOS 2.11
Hardware options: 8087 maths co-processor
Prices: system with one floppy and monochrome screen £495; second floppy £95; 10Mbyte hard disc £325; 20Mbyte hard disc £445; 8087 maths co-processor £225; colour monitor £325
U.K. distributor: Future Management, 38 Tanners Drive, Blakelands North, Milton Keynes MK14 5LL. Telephone: (0908) 615274
Available: now

CONCLUSIONS

■ The Osborne PC is an ultra-cheap IBMulator which offers a complete working system for £500.
■ Its performance is not brilliant, but then neither is that of the IBM PC itself.
■ The weakest element of the bundle is the documentation, which is pretty feeble. PC

SIDECAR
IBMULATION FOR THE AMIGA

By Francis Jago

To help the Amiga find a niche in the business market Commodore has released an add-on which makes it IBM compatible.

Rightly or wrongly, Commodore has aimed the Amiga at the mainstream business market. In order to allow Amiga users to tap the existing IBM software base, Commodore has announced two products to make the Amiga IBM compatible. The first, Transformer, is a piece of software which enables the Amiga's 68000 processor to emulate the 8088 processor of the IBM. It is described fully in the box below.

The second product, called Sidecar, takes the more direct hardware approach. The Sidecar box plugs straight into the Amiga's expansion bus, adding about 250mm. to the overall width. It contains an 8088 processor, a 5.25in. disc drive and three full size IBM-compatible expansion slots. Sidecar is similar internally to Commodore's own PC clone, the PC-10.

Sidecar does not merely use the Amiga as an input/output device but runs IBM software in an Amiga window, giving you a truly hybrid computer. The 8088 actually co-processes with the Amiga's 68000 and custom chips. Consequently the Amiga treats an MS-DOS program on Sidecar as just another task, and Amiga programs can continue to run independently in another window.

To run Sidecar you must have the Amiga's system software and a current version of MS-DOS. When you boot up the Amiga, you are presented with all the usual icons plus additional options for mono or colour PCs. You can change from monochrome to a colour display by typing Mode Colour.

When you click on either PC icon the screen clears and Sidecar starts to search for MS-DOS in its built-in drive. The Amiga cannot multi-task in an IBM PC environment, but you can suspend execution of a PC task while you run another program.

Although Sidecar emulates the IBM PC you can still use the Amiga's ability to adjust the size of the window. Data is exchanged

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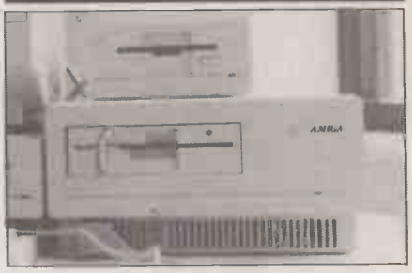
SPECIFICATION



Description: add-on unit for Amiga to provide IBM compatibility
CPU: 8088 processor running at 4.77MHz; optional 8087 co-processor
RAM: 256K expandable to 640K; provision for Amiga RAM expansion to 6Mbyte
ROM: 16K BIOS
Dimensions: 250mm. (9.8in.) x 350mm. (13.8in.) x 130mm. (5.1in.)
Weight: 8kg. (17.6lb.)
Display: emulates IBM monochrome and colour-graphics modes
Mass storage: 360K 5.25in. floppy disc; optional 20Mbyte hard disc
Interfaces: accesses Amiga parallel and RS-232 ports
Expansion: three full-size IBM card slots
Price: under $1,000
Manufacturer: Commodore Business Machines, 1 Hunters Road, Weldon, Corby, Northamptonshire NN17 1QX. Telephone: (0536) 205555
Availability: summer 1986 in U.S.

TRANSFORMER

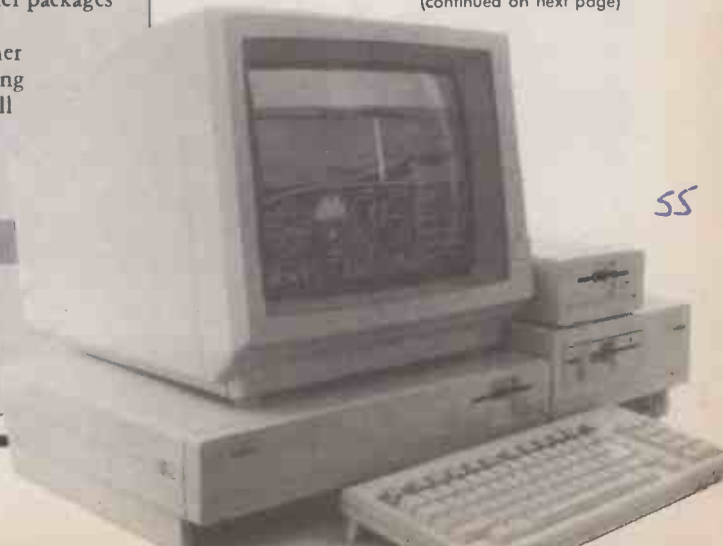
Even before the Amiga was officially released in the U.S. last November, there was talk of a piece of software that would allow it to run IBM PC software using an optional 5.25in. disc drive. This product was eventually released as Transformer. It was packaged with the 1020 5.25in. drive and sold for $199. More rumours suggested that a piece of hardware would follow which would accelerate the Transformer to operate at the speed of an IBM PC, but this was eventually shelved in favour of Sidecar.

Transformer acts as a layer between Amigados and the Amiga's Intuition front end, translating all 8088 calls into 68000 code. Not surprisingly, this tortuous path makes some of the packages run ridiculously slowly. Unlike Sidecar, Transformer can only emulate a monochrome 256K IBM PC with no graphics, which limits the software that it will run. Commodore guarantees that the following programs will run using Transformer: Lotus 1-2-3 version 1a, Symphony 1.0, dBase II, dBase III, Friday, Framework II, Spotlight, Sidekick, Word Perfect, WordStar, Amber, Fortran 77 version 3.04, Turbo Pascal, Dataflex, Tim, Visawrite version 1.41, Supercalc 3, CP/M-86 version 1.1, Wordcraft PC and Enable. It is likely that some other packages not tested by Commodore will work too.

For someone who needs IBM PC capability only occasionally, Transformer might be suitable. But having seen WordStar run — or rather walk — using Transformer, I would suggest that anyone who wants to use it seriously will have to be very patient. Transformer is a substantial programming feat and at $199 including a disc drive it is hardly expensive, but even at that price its long-term worth must be doubtful.

SPECIFICATION

Description: 5.25in. disc drive and emulation package to allow Amiga to run IBM PC software
Hardware required: Commodore Amiga
Copy protection: none
Price: $199
Manufacturer: Commodore Business Machines
Availability: summer 1986



(continued from previous page)

between the IBM PC and the Amiga using 128K of dual-ported memory, which allows both systems to operate with little speed depreciation.

IBM PC graphics are taken care of as the video portion of the memory is mapped directly into the dual-ported RAM. The video display is compatible with applications that use the ROM BIOS as well as with applications that work directly with the video memory. The software provided with Sidecar emulates both the monochrome and the colour-graphics adaptors in standard Amiga windows. As the two adaptors use different portions of the interface memory both can be emulated simultaneously.

You can use the Amiga's standard keyboard with Sidecar. The four keys found on standard IBM PC keyboards but missing from the Amiga can be accessed using a combination of other keys. Sidecar also has full access to the Amiga's serial and parallel ports. This can also work the other way round, and the Amiga can access any of the hardware you install in Sidecar.

One of the useful facilities of Sidecar is its ability to hold a hard disc in one of the three expansion slots. The hard disc can be partitioned so that half goes to Sidecar itself and half to the Amiga. With the uncertain status of Amiga hard discs this could prove invaluable. Another bonus is that you can add an extra 6Mbyte of RAM for the Amiga using a daughter board in Sidecar.

One of the nicest features of Sidecar is its ability to provide a customised PC display. You can change the colour of the screen, text and graphics, alter the size of the screen, show or hide the Amiga-style border, and set the cursor blink rate. Once you have set up Sidecar to suit your particular tastes, you can save these options and have them installed automatically the next time you boot up.

Sidecar comes with one built-in 360K 5.25in. drive, but you can also use the Amiga's 720K 3.5in. drive for PC programs. Commodore says that Sidecar will have no difficulty running the PC Convertible's software when it becomes available.

ADVANTAGES

Commodore is also eager to point out the advantages of having software written specifically for the Sidecar/Amiga system. For example, the 8088 could be used as a number-crunching processor while the Amiga works on graphics or sound.

One area in which IBM compatibility is incomplete is its inability to run an accelerator card. This is because an accelerator would interfere with the interrupt timings that the Amiga uses to access Sidecar. Another problem is that it has to sit directly next to the Amiga, because the Amiga's bus does not put out enough power to send signals along a cable. Commodore says this fault will be rectified with the next batch of Amigas.

However, Sidecar can run anything that the Commodore PC runs, including Sidekick, WordStar and Symphony. Sidecar even comes with a 765 disc controller to cope with programs that take advantage of the PC disc controller's idiosyncrasies.

For anyone who already has an Amiga and now needs to use standard business software, Sidecar may be an attractive option. It could also appeal to executives who have an IBM PC at work and who need to be able to run IBM software at home on their Amiga — which they use for its graphics, sound and multi-tasking abilities. Yet even for these people, a cheap IBM clone might well offer a more practical solution.

The crunch for Sidecar — as for the Amiga itself — comes down to price. At the Comdex electronics show in America, Commodore put the price of Sidecar as "considerably less than $1,000"; it is hoped that the actual release figure will be nearer $600. Technically, Sidecar is a wonderful product. Combined with the Amiga it really shows the direction in which computing will go, with co-processors allowing tasks to be completed faster than ever before.

CONCLUSIONS

- Sidecar provides a complete hardware setup to allow the Amiga to run IBM applications software.
- It works well, using the facilities of the Amiga to provide an enhanced front end for the PC-compatible system.
- Sidecar's very existence underlines the shortage of Amiga business software. PC

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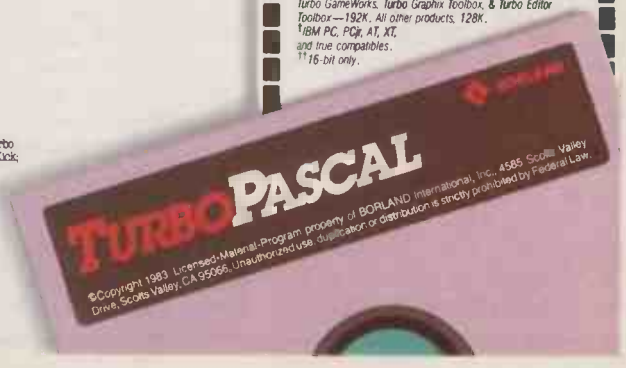
††16-bit only.



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TURBO PROLOG
AI FOR ALL

By Glyn Moody

Borland has brought its techniques for producing easy-to-use software to bear on this powerful but hitherto daunting programming language.

Prolog is widely touted as the programming language of the future and the Japanese have chosen it as the software engine for their fifth-generation computer. Now Borland International has brought out Turbo Prolog for the IBM PC family.

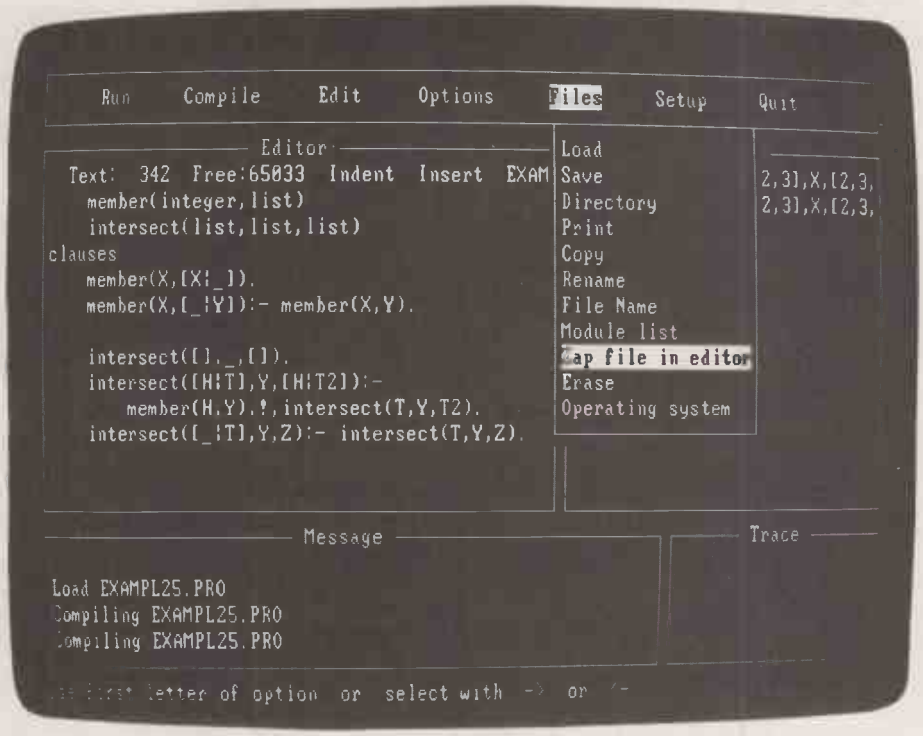
Like Borland's earlier Turbo Pascal program, which did so much to promote that language's success, Turbo Prolog is cheap at only £70. It is designed specifically as a mass-market product rather than a narrowly academic one. One of Borland's hopes is that this new program could be the springboard from which the long-awaited AI revolution takes off.

Prolog differs from languages like Basic and C in that it is declarative rather than procedural. This means that a Prolog program consists of pieces of information and rules rather than a series of instructions. The beauty of Prolog is that once you have specified the problem you can leave the language to solve it. This is in stark contrast to Basic, where you have to work out the steps needed to solve a problem and then tell the computer how to carry out those steps.

EASY DEBUGGING

The first official version of Prolog — the name stands for Programming in Logic — was developed at the University of Marseilles in the early 1970s. Turbo Prolog broadly follows the approach of the Clocksin and Mellish implementation, though there are a few differences. It is a compiled language, and is therefore much faster than interpreted versions, but it retains interactive elements to allow easier debugging. Borland claims that it is far more memory-efficient than earlier versions. Borland has drawn on its earlier experience of producing easy-to-use and popular programs in an attempt to dispel Prolog's daunting reputation as a cerebral and difficult language.

Turbo Prolog is pretty hungry for memory, requiring a minimum of 384K, but it loads quickly from the unprotected disc. After the initial start-up screen you pass to the main windows display. There are



The main Turbo Prolog screen has four windows and uses a menu bar along the top of the screen with pull-down menus.

four windows altogether, called Editor, Dialog, Message and Trace. Windows form one of the key elements of Turbo Prolog, and go a long way towards taming what is often a hostile programming environment.

The other element in Turbo Prolog which is comfortingly familiar is the use of pull-down menus. Pressing Escape takes you to the top menu, where using the cursor keys or first letters selects from the options. These are Run, Compile, Edit, Options, Files, Setup and Quit. Edit takes you to the Edit window where you write your progams. Compile converts it to code which can be run using the Run command. Files handles the import and export of Prolog files, and Setup lets you do things like resizing and repositioning the on-screen windows.

To enter a program, you select the Edit window and type in the Prolog code. The editor uses the same commands as WordStar to move around entered lines, carry out block moves and so on.

The basic concept which lies at the heart of all Prolog programs is that of the predicate. The dictionary defines a predicate as "a term, property, characteristic or condition that is affirmed or denied concerning the subject of a proposition". In Prolog, predicates are centrally concerned with stating information about things; often a computation reduces to finding out whether predicates are true or false.

For example, the predicate

man(John)

states that John is a man. The predicate

owns(Jill,book)

states that there is a relationship between Jill and the book. Nothing is said about the detailed nature of what the owning predicate is.

Closely allied to predicates are clauses. They contain information which helps to define or establish the properties of a predicate: for example, how someone is

SPECIFICATION

Description: Prolog compiler making extensive use of windows and pull-down menus
Hardware required: IBM PC family, with MS-DOS 2.0 or later and at least 384K RAM
Copy protection: none
Price: £69.95
Publisher: Borland International, Scotts Valley, California
U.K. suppliers: Softsel, telephone 01-568 8866; P&P Micro Distributors, telephone (0706) 217744; Altor, telephone 041-226 4211; First Software, telephone (0256) 463344
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related to something by the owning predicate. Typically they allow Prolog to deduce something.

Deductions are called goals in Prolog. Goals can either be built in from the start, in which case the program once run will try to attain that goal, or you can feed it in later. If no goal has been included, a prompt will appear in the Message window asking for one. Thus you might enter

owns(X,book)

and Prolog might then deduce from its clauses that

X = Jill

is a solution.

Predicates are the main structure in Prolog. This can make Prolog programs rather confusing to read, because they are also used as functions to carry out operations including arithmetic and various screen-handling tasks. Similarly, some goals are trivial and involve only the mandatory searching through a series of clauses, in the same way that other languages might run through a sub-program.

If this sounds difficult, it probably is. Prolog requires you to think in a totally unfamiliar way. The manual is a great help here: it is very well written, with plenty of examples which you can type in or load from one of the discs provided. There are also exercises, but no answers.

The first few chapters provide a general introduction, followed by more detailed explanations of things like domains, as well as how to handle input and output. Further into the manual the explanations become less detailed, and you are left to manage as best you can. At the end of the book there is a programmers' guide and a full reference section, as well as useful appendices, a glossary and an index.

After you have entered your program you can run it from the main menu. As the program is being compiled, a message to that effect appears in the Message window. Any errors thrown up are signalled in the Edit window, together with an error message. This allows you to debug them as you go along. Once a program is bug-free its output normally appears in the Dialog window. You can also run programs with a trace on; as you step through each line the Trace window shows the line currently executed.

SPEED BENEFITS

The overall implementation of Turbo Prolog is hard to fault. The pull-down menus are easy to use, and the whole process of compilation and running is amazingly fast, though it is hard to make direct comparisons with other languages. The same goes for the performance speed, but the fact that programs are often shorter in Prolog than in other languages may in itself bring speed benefits.

Turbo Prolog is well endowed with extra features. For example, rather surprisingly for this type of language, it has graphics and sound capabilities, including a Logo-like turtle, and lots of string-processing features. It has a useful predicate called

```
domains
    file = input
predicates
    start
    inspect_positions
goal
    start.
clauses
    start:-
        write("Which file do you want to work with ?"),
        readln(FileName),
        openread(input,FileName),
        inspect_positions.
    inspect_positions:-
        readdevice(keyboard),nl,write("Position No?"),
        readreal(X),
        readdevice(input),filepos(input,X,0),readchar(Y),
        write(Y),inspect_positions.
```

In addition to predicates and clauses a Prolog program may contain a goal.

TURBO PROLOG

PC VERDICT

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

☐ Could be the start of the personal AI revolution.

system( )

If the name of a DOS-executable file is contained within the brackets, that file will be run without directly exiting from Prolog. If there is no name, it produces the DOS prompt. These features allow Turbo Prolog to act as a front end and windowing manager to DOS.

Turbo Prolog has been sensibly designed so that you need never hanker for a Goto or anything so crude as a procedure or sub-routine. It can be an interesting challenge to devise code in Prolog which reproduces — usually far more neatly — the familiar tricks of Basic.

The question remains as to what practical uses Turbo Prolog will have. Expert systems spring to mind, and the manual shows you how to set up your own. Basically an expert system consists of a few predicates and lots of clauses. You interrogate the system by specifying various goals — that is, asking questions.

I remain unconvinced that everyone is going to rush out and formulate whatever expertise they have in this way. For an expert system to be reliable a lot of careful analysis is required; this and the inputting of clauses takes time, which will put most people off. But for anyone interested in setting up an expert system, Turbo Prolog provides a far cheaper means of doing so than investing in some costly expert-system shell. It also has the advantage that you can tailor the expert system exactly to your requirements.

Borland cites a number of other possible applications. One of the most interesting is the translation of other programming languages. For example, Borland has written a Turbo Prolog program to translate Basic to C. Borland also mentions the possibility of control and monitoring of industrial processes and, unlikely as it may seem, it could be in these areas that the strength of Prolog emerges. For ordinary programming too, Prolog has some substantial advantages, as it takes all the sweat out of coding: once you have specified the problem, the language does the rest. Of course, producing the specification is no light task, but no language, no matter how well implemented, can do away with the need for clear analysis.

Another plus is that Turbo Prolog is so beautifully constructed that it forces you to program elegantly and efficiently. It is sufficiently full and well thought-out that there will be few tasks which cannot be accomplished in it. I therefore expect that it will — as Borland predicts and hopes — be the same runaway success as Turbo Pascal.

Practical Computing welcomes submissions of business programs written in Turbo Prolog to its Open File. For details of how to submit programs see page 107 of this issue.

CONCLUSIONS

■ Turbo Prolog is a compiled version of the AI language. It is very cheap and very well produced.

■ Prolog is a declarative language rather than a procedural one, and as such it requires very different programming techniques. Though initially disconcerting, the language is well worth persevering with.

■ The documentation is good, but demands a fair degree of commitment.

■ Apart from obvious applications like expert systems, Turbo Prolog can be used for just about any problem. Its potential is only limited by the user's imagination. PC

WP WITH LASERS
THE PARTS OTHERS CANNOT REACH

By Susan Curran

To exploit the exceptional flexibility of laser printers you need software that is designed for the job.

Support for laser printers is becoming an important selling point for top-range word-processing programs. I tested three that advertise laser support: Word 3.0, Word Perfect 4.1 and Wordcraft. I was particularly interested in seeing how well their printer support works, and whether "complete support" really means what it says.

For these reviews I used a Canon LBP-A1 laser printer, which falls somewhere around the middle of the laser-printer range. Canon provided me with printer drivers for Word Perfect and Wordcraft, though without any documentation for them; Word III comes with a Canon printer driver. I was prepared to do a fair amount of experimenting and adapting — even to amend driver codes if I could understand them — but not to invest days of work in extracting maximum performance from the printer.

The Canon has only one built-in type style, a Courier typeface which is available in four variations; in laser terminology they rate as four founts. Regular, bold and italic are available in 10-pitch, and there is a 15-pitch footnote fount. Each of these founts can be doubled in size horizontally or vertically, or both, and they can be printed on shaded backgrounds or in reverse. Underlining is also available, but not double underlining.

Though I can understand Epson documentation pretty well, the Canon manual was largely incomprehensible to me. I gathered from it that the graphics capability of this model is limited or non-existent; if you need this sort of thing the A2 has more memory and fares much better. The A1 does handle forms, with line-drawing and shading, though the basic programs have only limited support for this feature.

You can buy additional fount cartridges to give the Canon a wider range of type styles, including proportional spacing and sideways printing. The printer also has the capability to accept downloaded founts from a computer, but none of the printer drivers I tested stretched to these heights.

It is theoretically possible to combine founts on a single page. But with the word-processing programs I reviewed it would be difficult to create a single printer driver that will handle a variety of fount cartridges. Different drivers are provided for each one, but they cannot easily be combined to print a page except by using the manual paper feed to overprint it.

The printer we used for this test was configured for attachment to a serial port. Wordcraft works to a fixed communications protocol; Word III expects you to set the protocol using the DOS Mode command; and Word Perfect has good in-program support for different protocols. Once I had set the DIP switches on the printer all the interfacing worked fine. The printer itself also worked smoothly, with no paper jams except when I made the mistake of trying to print an envelope. It has touch-switches for selecting founts, but they did not work reliably with the word-processing programs, which tended to reinitialise automatically.

Wordcraft is a British word processor, with a heavy-going manual style to prove the point. It is strongly orientated to office work, and has excellent support for boiler-plating and mail-merging. Among its optional extras are good comms features. Wordcraft has adopted a commendable policy of openness, encouraging end-users to adapt the help screens, the command key assignments the printer drivers and just about everything else to their own requirements.

On-screen Wordcraft is again slightly heavy. A minimum of five screen lines — and a maximum of seven — are taken up by

PRINTWORKS FOR LASERS

If you are already heavily committed to a WP program that does not offer laser support you could use this utility program to provide the necessary functions. Softstyle's Printworks for Lasers offers enhanced support for the Hewlett-Packard Laserjet and Laserjet Plus, and the Canon LBP-A1 and A2. It is a co-resident program that runs on an IBM PC, PC/AT or compatible with at least 256K of memory.

Once installed, Printworks replaces the usual Shift-PrtScr command with its own menu. This allows you to determine founts, margin settings, character sets and other printer features, and then either to print the screen that existed before you called up the menu, or to return to your program to carry out printing tasks.

I found the Printworks menu to be confusingly laid out, and it is poorly explained in the manual. Founts must be chosen from a preset selection. You can edit this selection via a separate program to eliminate founts you do not want and to create fount combinations that are not in the default collection. Up to 100 founts can be defined. The main drawback of this procedure is that all chosen attributes — such as bold type, a particular fount, margin settings and so on — must apply to the whole of the text that is printed. Among the minor drawbacks, it is impossible to access the double-height and double-width features on the Canon, so you lose three-quarters of the fount variations.

These deficiences are largely remedied by a special mode called Power Printing, which enables you to put individual printer codes into your documents. They select

WORDCRAFT

PC VERDICT

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

☐ Not elegant, but an impressively solid and versatile word processor well-orientated to the corporate market.

Wordcraft has the usual printer support for underlined and bold text. No other printer features are apparent in the basic program, but the printer drivers provide support for features that can be discovered by reading them or through auxiliary documentation provided with them. This Canon printer driver provides support for:
Shaded text.
Reverse printing
Italic font.
The footnote font.
Vertically enlarged print, either bold roman or *italic*.
Horizontally and vertically enlarged print, either bold roman or *italic*.

Using Wordcraft with printer drivers enables you to access a number of features.

features such as bold and emphasised print, italics, subscripts and superscripts, and high and wide characters, alternative character sets, fount cartridge slots, and so on. The printer codes are inserted into the text, and you have to be careful to ensure that they do not ruin document formatting as determined by the application program.

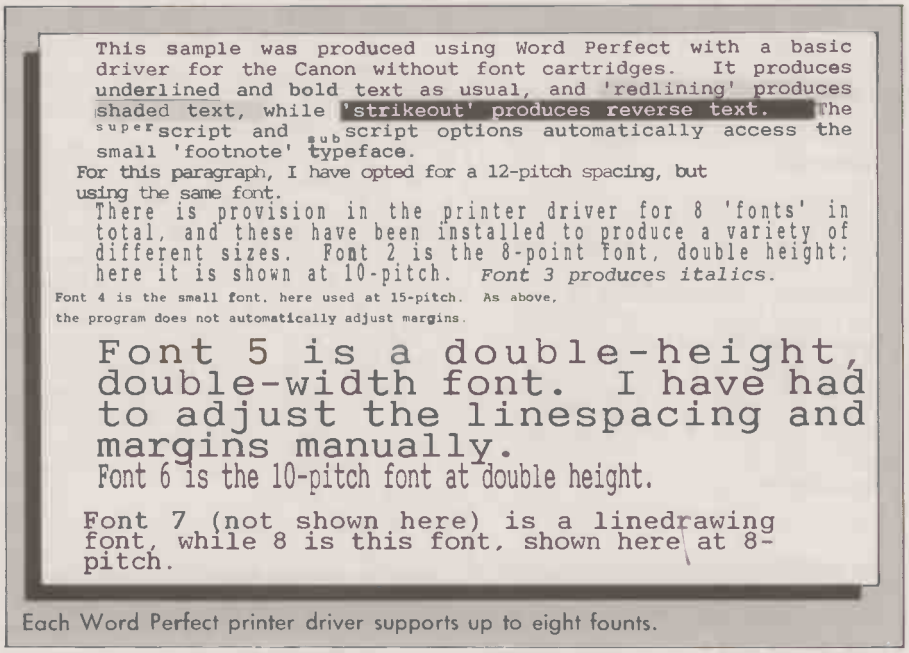
With the Power Printing feature you can use Printworks to access virtually all the text features of a printer like the Canon A1. There is nothing miraculous about the process, however, and the program does not provide its own downloaded founts or anything else that a word processor with good printer support could not manage. In fact it is likely to be most useful not with word processors at all, but with databases, spreadsheets and other programs with very limited printer support.

Another handy feature of Printworks is its ability to redirect output from one port to another, to switch quickly and simply between alternate printers, and to cause the laser to emulate either a Diablo 630 or an Epson MX-80.

The macro feature could be used to print a logo or heading on every sheet, or to set up special margins. There is also a very simple text editor, which could be used to print an envelope while you are running a spreadsheet application.

Printworks really comes into its own for graphics applications, and on a laser printer with sufficient memory it will enable you to combine graphics and text on the same page, and to enlarge or shrink screen graphic images and position them at any chosen point on the page.

Description: memory-resident utility providing support for Hewlett-Packard and Canon laser printers
Hardware required: IBM PC, PC/AT or compatible with at least 256K RAM
Copy protection: none
Price: £110
Supplier: First Software, Intec 1, Wade Road, Basingstoke, Hampshire RG24 0NE. Telephone: (0256) 463344
Available: now



Each Word Perfect printer driver supports up to eight founts.

control information and menus. The program reformats text automatically after changes, and works smoothly and reasonably fast. It displays only one page of a document at once, and has no windowing or alternate-document capability. It will only handle documents that fit completely into RAM. This provides a maximum capacity of around 60,000 characters, which is eaten into by phrase storage and the like. There is a small but extendable spelling dictionary. All in all Wordcraft is competent, though not outstanding.

The program lets you swap between printers using a Setprinter command, so you can use several printers alternately. It does not do automatic background printing, though you can spool print files to disc.

The printer drivers are all readable as Wordcraft documents, and are as amendable as any other document. They include some narrative, but to get full documentation you have to fork out an additional £140 for the Toolkit program.

WORD PERFECT 4.1

PC VERDICT

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

☐ My favourite word processor: a great program.

The 15 different Canon drivers covered several of the fount cartridges, and included two for label printing in two or three columns. The driver that worked best with the basic printer proved to print in 11cpi spacing. Wordcraft defaults to a wide, 77-character page.

Wordcraft's normal command sequences provide underlining and bold print, as usual. The printer driver and special documentation pointed me to sequences which allowed me to access italics, shaded print and reverse print, the footnote fount, and variations with double vertical size and double horizontal and vertical size.

Wordcraft has good support for alternative founts and special characters, though there is no general sequence in the program for sending commands to the printer. Among the other special features is variability in the criteria for microspace justification, between inter-word and inter-character spacing.

Word Perfect has been my regular word processor for a year and a half. I reviewed version 4.0 in the August 1985 issue of *Practical Computing*. Version 4.1 provides better printer support, line-draw features, good sort capabilities, windowing for a second document — but not for two views of the same one — and a wonderful thesaurus that on a hard-disc machine lets you browse for alternative words more rapidly than would be possible using a standard *Roget*. Though Word Perfect has its idiosyncrasies, it is a flexible and well thought-out program. It is consistently economical in its keystrokes and clean in its screen display.

Word Perfect's printer support can be confusing, since the manual does not always make crystal clear the difference between temporary and permanent printer changes. But once you understand its subtleties you can set up a selection of alternative printer drivers and change many aspects of printer support — including port assignments and baud rates — without exiting from the main program. You can select an alternative printer for a single document or a session, amend the default choice, or print any section of a document quickly and easily. There are also quick and simple ways of managing the print queue.

The range of printers supported by Word Perfect is now very comprehensive. There are also clear and well-documented procedures

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for setting up new drivers for unsupported printers, or for increasing the range of features supported. I have used them successfully to set up character-width tables for microjustification on a daisywheel.

Each Word Perfect printer driver supports up to eight founts, but the Canon drivers I received proved to be depressingly uninformative on the surface. Almost every fount was labelled as A1 Normal. In fact they provided access to a sensible variety of fount sizes and styles, including the italics, the footnote fount and a selection of big founts. It is possible to select independently the fount and the pitch, changing the settings as often as necessary within a document, and this again allows for plenty of variety.

Underlining and bold print worked as usual, while subscript and superscript made good use of the small 15-pitch fount. The Redline and Strikeout commands give access to shaded backgrounds and reversed text. You can define Alt and Control sequences to send special character commands, or any other special commands, to the printer. These sequences should provide access to any character you require.

I reviewed Microsoft Word 2.0 in the September 1985 issue of *Practical Computing* and found it an impressive, highly professional, hi-tech program. Word 3.0 is more impressive, just as professional, and even more hi-tech. I still find it a little forbidding, but it is not unduly difficult to learn considering the range of features it offers. In some aspects it remains well ahead of all the competition.

WORD 3.0

PC VERDICT

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

☐ Outstanding next-generation word processor.

Among the special features new to Word 3.0 are sort capabilities and excellent columnar maths. There is also a remarkable outliner that can expand and compress text outlines selectively or globally; it supplants the Ready ideas processor recently bundled with the previous Word.

Also new is a greater degree of support for laser printers. Printer support is so comprehensive that it rates a 97-page manual of its own. It includes full support for the Adobe Postscript language that handles founts on the Apple Laserwriter and produces Macintosh-style output from the IBM and compatibles. You can also download founts for the Hewlett-Packard Laserjet Plus. Canon laser support does not reach these giddy heights, but it is more than adequate.

Word is unique in taking a radical approach to the problem of combining fount sizes within a document. Instead of working to a given number of characters per line it deals with line widths — say a 6in. wide line of text. Within the preset width, pitch changes are fully allowed for and properly justified. This simplifies immensely the job of combining different founts. Although page-maker programs have a similar facility, it is not found on any other conventional word processor.

It does, however, put great strain on a WYSIWYG program. Word goes to enormous lengths to simplify the process: most settings can be given in inches, centimetres, points or pitches, as you choose, and you can view a document in normal and printer mode. But it remains a tricky business to handle very complex layouts on a program that takes a basically non-graphic approach to the whole business of text processing. Consequently I had to run several test prints of complex layouts before I was satisfied with the results, though the end result was very good indeed.

Word's printer support is generally based on the philosophy of offering a standard range of print features. You select the feature you require and if the printer does not support it you get the next best alternative. This ensures that any document can then be printed by any printer; the drawback is an occasional uncertainty as to just how instructions will be interpreted. For example, if you choose a 14-point fount size you get what seems to be the 15-pitch (8 point) fount at double width; selecting 14.5 point gives you the same but with double height.

Shaded backgrounds and reverse text are not supported at all, as far as I could tell, and the 15-pitch fount is only used for subscripts and superscripts if it is specifically selected for them. Alt key sequences give access to the IBM extended character set, but there is no real scope for programming them to obtain access to special printer character sets or other control features, and there is no other way of sending control sequences to the printer.

All in all, Word pushes the conventional word processor as far as it can go in the direction of variable layout. It is flexible, admirable and forward looking — but sometimes inevitably difficut to use.

The Canon A1 Laserprinter using Microsoft Word III

Word III has support for a good range of the Canon's features. Here are some of them: boldface, *italic type*, underlining (but not double underlining), ~~strikethrough~~. All show in as near to WYSIWYG format as possible, depending upon the display used.
Word's star turn is its ability to cope with different font sizes in the same paragraph. This little font is specially useful for superscripts and subscripts. This is a 14-point font, as opposed to the usual 12-point. Again, the justification is perfect.

Word 3.0 is able to handle different fount sizes in the same paragraph.

SPECIFICATIONS

WORDCRAFT

Description: WP package with mail-merge; optional comms and networking facilities
Hardware required: IBM PC, PC/AT or compatible with at least 128K RAM
Copy protection: none
Price: £475
Supplier: Wordcraft International, Norman House, Heritage Gate, Derby DE1 1NU. Telephone: (0332) 371428
Available: now

WORD PERFECT 4.1

Description: WP package with mail-merge and built-in thesaurus
Hardware required: IBM PC, PC/AT or compatible with at least 256K RAM
Copy protection: none
Price: £425
Supplier: Sentinel Software, Wellington House, New Zealand Avenue, Walton-on-Thames, Surrey KT12 1PY. Telephone: (0932) 231164
Available: now

WORD 3.0

Description: WP package with mail-merge, mouse and graphics screen support, outline processor and network support
Hardware required: IBM PC, PC/AT or compatible with at least 256K RAM
Copy protection: none
Price: £425
Supplier: Microsoft, Excel House, 49 De Montfort Road, Reading, Berkshire RG1 8LP. Telephone: (0734) 500741
Available: now

CONCLUSIONS

■ Using printers like this, your first concern should be to ensure that your chosen printer is supported by the program.
■ Wordcraft supports an adequate range of printer features. For those willing to do some work, it is highly adaptable in its printer support.
■ Word Perfect has competent printer support, and is more easily adaptable.
■ Word has by far the most advanced support for different-sized founts within the same document. PC

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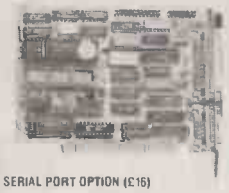

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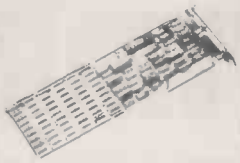

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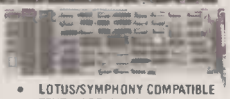

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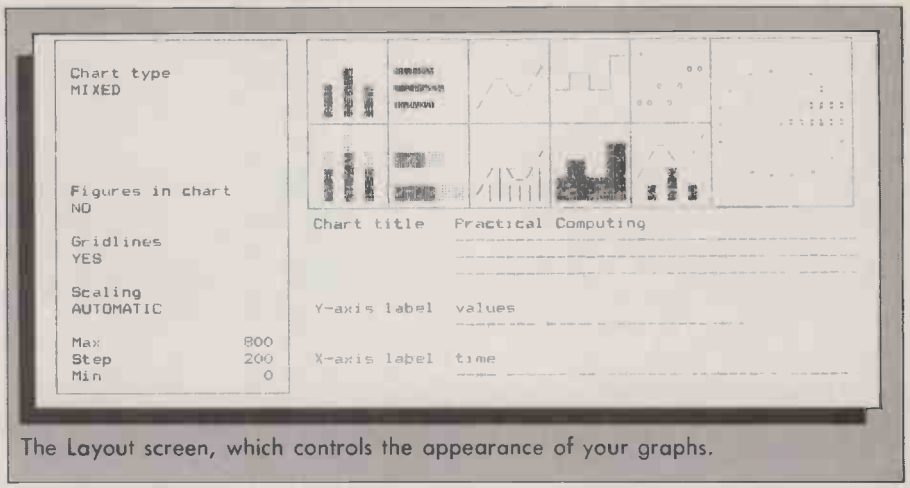
With this memory-resident program you can produce instant graphs from data held in other applications.

GRAPH IN THE BOX

POP-UP PICTURES

By Glyn Moody



The Layout screen, which controls the appearance of your graphs.

There is something very appealing about the convenience provided by memory-resident programs. You can access software at the touch of a button from inside other applications without having to exit to DOS. They are a kind of cheap alternative to multi-tasking.

The first pop-up program was the Sidekick desk accessory, and perhaps it will one day come to be seen as the same kind of key product as VisiCalc was in its time. For like the first spreadsheet, the original pop-up program has spawned a host of imitators and successors. By their very nature, they tend to be utilities designed to work with another application rather than as fully fledged programs in their own right. Steve Malone gives a more detailed explanation of how memory-resident programs work on page 74 of this issue.

The latest in this line is Graph in the Box. It allows you to create a variety of graphs from numerical data which has been generated in other applications. Obvious uses are quick graphing from spreadsheets like Lotus 1-2-3 where the built-in graphics functions are relatively cumbersome. The program takes up 128K of RAM and requires a graphics display or colour board; the cost is £95.

Using the package is straightforward. Once you have produced a set of figures which you want to graph, you invoke Graph in the Box by pressing Alt and G simultaneously. The program asks you to define the figures to be graphed by painting a block with the cursor keys. You press Return once to mark the beginning then move the cursor to the end of the block and press Return again. One aspect of the program that could be worrying for beginners is that as you begin to move the cursor the program's overlay disappears. As soon as the block has been defined, Graph in the Box produces a chart representing it. Initially default options are used to define the graph; refinements can be made later.

Detailed control is provided from the main menu, which can be accessed at any time from within Graph in the Box by pressing Esc. The package's functions control data capture and graphing, and allow graphs to be saved and retrieved. You select commands by using the space bar, the arrow keys or by pressing the first letter of the name of the command.

The two most important commands are Data and Layout. Pressing D will take you to the Data screen, which is a tabular representation of the data captured so far. Each graph element is presented as a column of figures. You can edit them, add labels such as months to each set of figures, and change the colour of the graph line. The same screen is also shown after a data block is defined subsequent to an initial capture. This allows you to append later data to the same graph or add new elements to it.

The Layout screen controls the on-screen appearance of the captured data. You can select the chart type and insert the chart title together with the y- and x-axis labels. Chart types include bar, stacked bar, line, filled line, step, scatter, mixed and pie. Simple icons are used to indicate which type is currently selected.

It is possible to capture text as well as figures. You go through the same process of painting the area to be captured, and once you have captured the text you want, you move to the Data screen. Pressing Control-L takes you to the Layout screen in which you can mark where you wish the text to go.

The Printout option on the main menu lets you produce output on either a printer or a plotter, with the option of producing overhead-projector transparencies. You can choose between two sizes.

Although Graph in the Box is not totally user-friendly in operation, its basic techniques are very simple. It does what it is supposed to do reliably and relatively quickly. You can even capture numbers from DOS, provided they have been arranged in a tabular form. Graph in the Box sensibly ignores any text which cuts across such tables.

Graph in the Box is a sensible idea well implemented; quick graphs are often useful and a graphing facility lends itself to the memory-resident approach. Unfortunately, the product is let down by muddleheaded documentation. It has no index, and some important aspects, like the use of function keys, are poorly signalled. The package is also seriously flawed by being copy protected, though it is at least possible to install and uninstall it to and from a hard disc. Copy protection is really contrary to the whole spirit of cheap and accessible pop-up programs.

GRAPH IN THE BOX

PC VERDICT

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

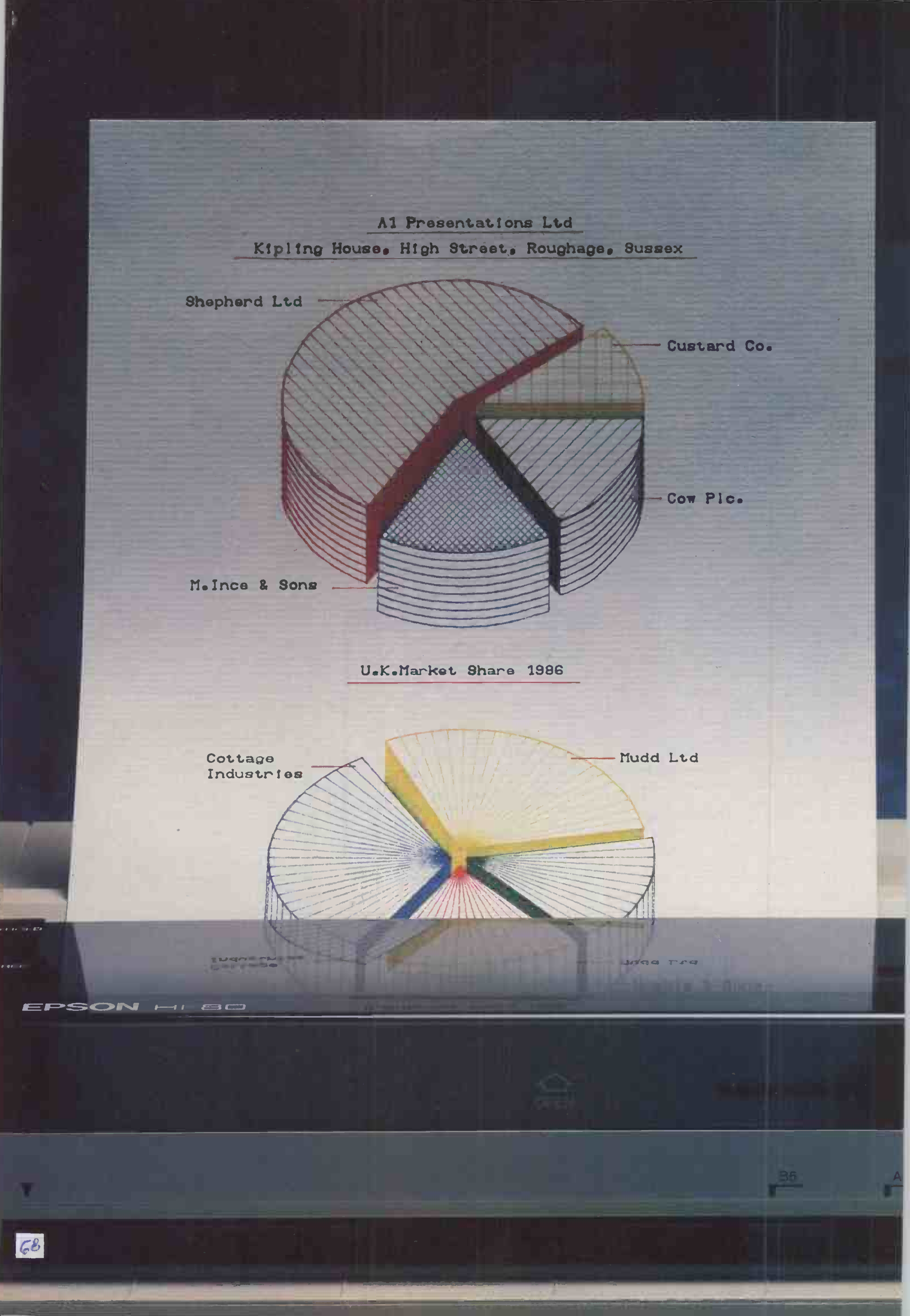
☐ A neat use of pop-up techniques; slightly too specialised for most users.

SPECIFICATION

Description: memory-resident utility for producing a variety of graphs from figures generated within other applications
System required: IBM PC, PC/AT or compatible with at least 256K RAM
Copy protection: yes; may be installed on only one hard disc at a time
Price: £95
Supplier: Zygos International Ltd, Suite 9A, Intec 2, Wade Road, Basingstoke, Hampshire RG24 0NE. Telephone: (0256) 25927
Available: now

CONCLUSIONS

■ Graph in the Box is a memory-resident program which allows you to produce a wide range of graphs from figures generated in other applications.
■ The program is easy to use, though let down by its documentation and absurd copy protection.
■ The product is something not everyone will need, but for those who want simple graphing functions it works well. PC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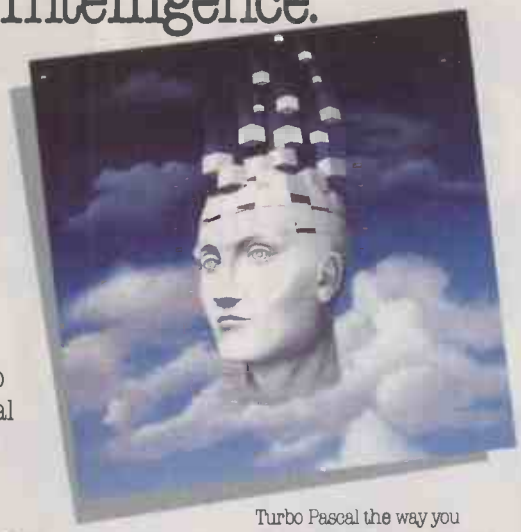

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SUPERKEY
KEYBOARD ENHANCER

By Mike Lewis

With this memory-resident utility you can set up complete routines to run automatically from a single keystroke.

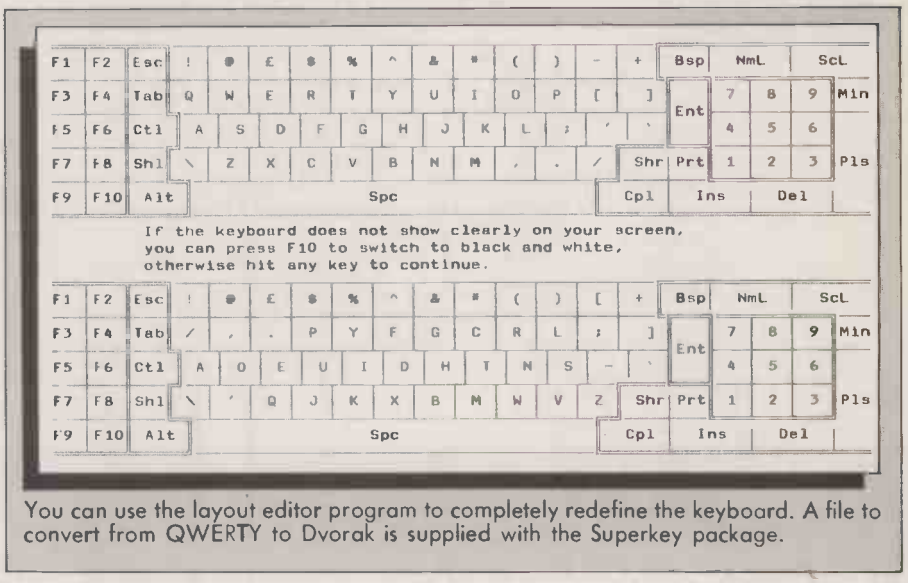
Of all the productivity aids and utilities written for the IBM PC, my personal favourites are the keyboard enhancers. At their simplest, these handy programs allow you to assign any character string to a single key, thus cutting down repetitive typing. You can also use them to automate long sequences of commands and to perform various other tricks.

Over the last couple of years I have tried several keyboard enhancers, including Smartkey, Prokey and Keyswapper. More recently I have been exploring Borland's offering, Superkey, which seems to me to be the best of the lot. Not only does it have far more features than any of its rivals, it is also somewhat cheaper.

Because Superkey is memory resident you can get at it from inside any other program. It is driven from a set of pull-down menus which you call up by pressing the Alt and Slash keys together. If you prefer, you can use various key combinations to bypass the menus, or you can pass commands to it from the DOS prompt. Superkey works in perfect harmony with Borland's other memory-resident programs, Sidekick and Turbo Lightning.

Borland has adopted the term "macro" for a string of keystrokes attached to a single key. A macro can contain any combination of printable characters, cursor controls or function keys. Obvious examples include such frequently used phrases as "Yours sincerely" or perhaps your own name and address. One of my own macros is the series of keys which I use whenever I am about to start writing a new article. This invokes my word processor, sets the margins and tabs to the way I like them, types the various preliminaries, and moves the cursor to the start of the text. It is a joy to be able to do all this just by pressing the f10 key from the DOS prompt.

In this respect, Superkey is not so very diferent from other programs of its type. What makes it stand out is the way in which its macros can contain commands and functions. They act rather like subroutines that return a value or perform a task such as clearing the screen or sounding a tone. With a little imagination you can use them as building blocks that will turn your macros into mini-programs.



You can use the layout editor program to completely redefine the keyboard. A file to convert from QWERTY to Dvorak is supplied with the Superkey package.

A good example is a macro called Tape, one of the samples that come with Superkey. It cleverly uses the cut-and-paste features of Sidekick to add an audit tape to the Sidekick calculator, recording each value and result in the notepad. It is a good illustration of the way in which Superkey can enhance other software.

Other functions allow you to find the current date, time, logged disc drive or active directory. You can cut and paste information from the main application's screen into a macro, and you can set macros up to be run at a specified time. Another useful feature of Superkey is a device called the display macro. Instead of generating keystrokes it opens a window and displays any text that you care to specify. The text can be as large as memory allows and can also include boxes. On its own, this allows you to superimpose your own help screens on other people's programs.

SPECIFICATION

Description: memory-resident keyboard enhancer
Hardware required: IBM PC, PC/AT or compatible, with at least 128K RAM
Copy protection: none
Price: £59
Publisher: Borland International of Scotts Valley, California
U.K. distributor: Altor, 11a Anderston Centre, Glasgow G2 7PH. Telephone: 041-226 4211
Available: now

But you can go much further. It is possible to arrange for the user to enter a keystroke into a display macro, which can then be passed to the main program, so you can create a fairly complicated system of menus to drive other applications. You could probably use Superkey to set up, say, an interactive tutorial without any other application being present. Superkey macros can even contain data-entry fields into which the user can type information while the macro is being played back. A certain amount of validation and formatting can be applied to these entries, which are then passed to the main program.

KEEPING TRACK

One of the snags of all this power is that it can be very easy to lose track of exactly what your macros do, and which ones are assigned to which keys. To get round this, Superkey allows you to give each macro a descriptive title. The Show Titles command from the pull-down menu can then be used to display a reminder, giving the name of each redefined key and its associated description.

Another minor problem might be deciding which keys to use for macros. In theory, you can redefine any of the 83 keys on the IBM keyboard, along with Control, Alt and Shift. You cannot assign macros to the Control, Alt and Shift keys themselves, nor can you alter Caps Lock, Num Lock and Scroll Lock. The 250 allowed combinations should meet the demands of most users, but there might still be times when you need even more flexibility. You might, for instance, wish to overcome a

(continued on next page)

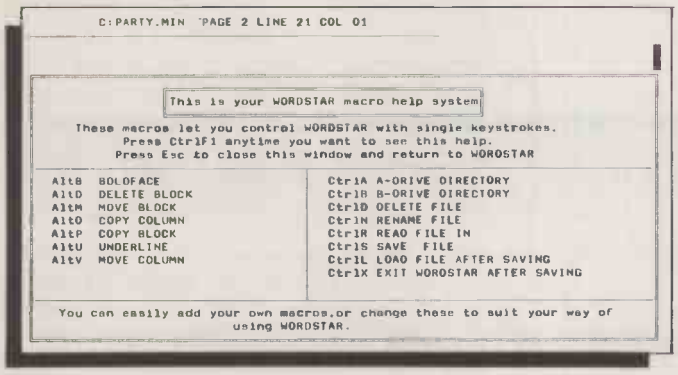
Each of these dBase III macros has a descriptive title which can be displayed at any point, providing a useful reminder of what is going on behind the keyboard.

```
DO CASE

CASE ACTION="M"
        RETURN                          && master menu

CASE ACTION="G"
        * Search for genus
        SET COLOR TO W/B, W/N
        @ 10,23 CLEAR TO 17,56
        @ 10,23 TO 17,56 DOUBLE
        @ 11,25 SAY "To go straight to a particular"
        @ 12,25 SAY "genus, enter its name here (or"
        @ 13,26 SAY "the first few letters of it)"

        OK=.F.
```

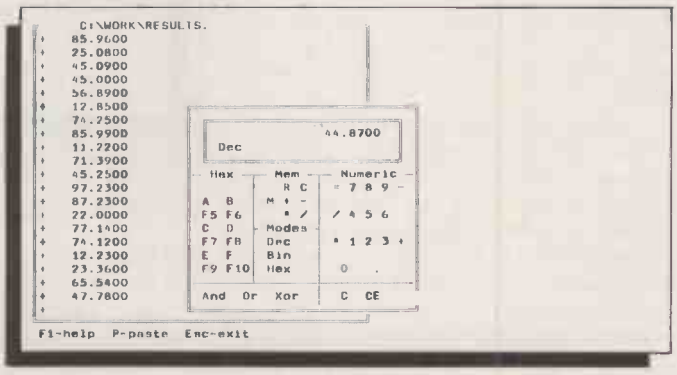
DEFINED MACROS

AltM	Modify current command file	from user
AltS	@ ..,.. SAY "	&& clear "not found" message
AltG	@ ..,.. GET ... PICT "	
AltC	Set preferred colours	
AltT	Standard program title block	US
AltD	DO SETUP	
AltP	SET CONS OFF/SET PRINT ON	
ShftF1	Run word processor	

PgUp/PgDn-page ESC-exit



Superkey lets you add your own menus and help screens to other programs, as this WordStar example shows.



Superkey and Sidekick work well together. Here Superkey is used to add an audit tape to the Sidekick calculator.

(continued from previous page)

notorious problem of the IBM keyboard by swapping the Slash and Backslash keys with the right and left Shift keys respectively. Or you might want to redefine the entire keyboard, perhaps to adopt the Dvorak layout.

By itself, Superkey does not allow you to do this. The Shift keys cannot be redefined, and you would need an awful lot of determination to alter every key on the board. The answer is a separate program, called a layout editor, which is included in the price of Superkey but which works completely independently of it. When you invoke the layout editor you see two keyboards displayed on the screen. To redefine a key, you first move the cursor to the new value on the top keyboard, then to the key to be altered on the lower board. That is all there is to it: you can alter any key in this way, including the toggles, and the new layout can be saved to a file. The Dvorak layout is already set up as a pre-defined file.

Not all of the features of Superkey are directly related to keyboard definitions. For example, there is a Key Click option for those who like audible feedback while they are typing. There is also a Screen Protect function which makes the screen go blank if the machine is idle for a specified time, so preserving the CRT phosphor.

One function that seems out of place is file encryption, which provides a mechanism for encoding and decoding files against a password supplied by the user. No doubt it will be welcomed by the security-conscious, but I have no idea why Borland decided to tag it on to a keyboard enhancer. But it is there, and it works; so if you need it you might as well use it.

With all these features — and there are quite a few more that I have not mentioned — you might think that Superkey would be a daunting program to learn. In fact a pleasant hour at the computer was all that I needed to master it, and the 200-page manual is by no means heavy reading.

The only serious drawback of the program is the demand that it makes on memory. Superkey itself eats up about 50K of RAM. An additional 5,500 bytes are normally reserved for macros, and if you want to make good use of the program you will probably need to allocate more. On my 640K machine I still have around 480K free after loading Superkey and Sidekick, but with a smaller system there would clearly be problems.

SUPERKEY

PC VERDICT

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

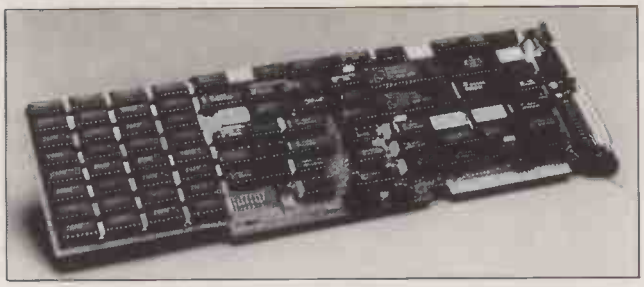
☐ Probably the best keyboard enhancer for the IBM PC. Well worth having, provided that memory is not too tight.

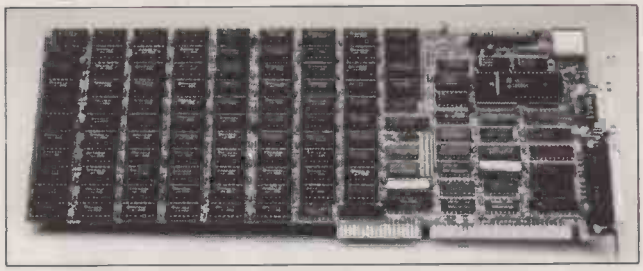
CONCLUSIONS

■Superkey is a remarkably useful program. Even if you only used it to save typing repeated phrases it would probably be worth the cost.

■Its real power lies in the functions and commands that can be placed in the macros. With careful planning you can use them to automate many keyboard-intensive jobs and to make your software do things that would not otherwise be practical.

■Superkey runs quite happily with other memory-resident programs, but you will need to keep an eye on spare RAM. PC





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HIDDEN EXTRAS

Pop-up accessory programs are a supremely convenient way of adding extra facilities to standard applications software. **Steve Malone** explains how they work and why they have become so popular.

Conventional applications software is held in the computer's memory only while it is actually in use. When you quit the application it is eliminated from RAM, and to get it back you have to reload it from disc. This is fine for a spreadsheet or a word processor: they are likely to be used for quite long sessions, so you are not forever loading and reloading them from disc.

Accessory programs are different. They are typically used quite frequently, but only for a short time. It would be unacceptably tedious to have to close down your main application and load the accessory every time you wanted to use it — and then reverse the process to get back to your application.

Memory-resident accessories or pop-up programs avoid this difficulty by remaining in memory at the same time as the main application. They are invoked simply by pressing a particular key combination. You return to the application simply by pressing another key — often Escape — leaving the accessory in memory to be recalled at any time. It is on this basis that the Americans have coined the term Terminate and Stay Resident (TSR) to describe these programs.

SIDEKICK

The first of the memory-resident accessories for IBM machines was Borland's Sidekick desk accessory. The arrival of the Apple Macintosh, with its friendly front end, had suddenly made the IBM PC seem very old-fashioned. While PC users could get along without the mouse and icons, the range of desk utilities like notepad and calculator made the Mac a much better proposition as a productivity tool than the PC. It was inevitable that someone would provide Mac-like desk facilities on the IBM PC, and sure enough when Sidekick appeared in 1984 it was a runaway success. Sidekick is still thought to take 80 percent of the accessory-program market in the U.S.

The IBM version of Sidekick provides most of the facilities PC users envy in the Mac world. It includes an instantly accessible notepad, diary planner and calculator in a single package. It also establishes the technique of demons, which continuously monitor the keyboard for a unique key combination — in this case double-Shift — that invokes the pop-up utility. Nearly all TSR progams are invoked by special key combinations of this kind.

When control is passed to the TSR program, it usually overlays a window on top of the current application. This is done by buffering the screen area that the window replaces before the TSR program writes its own window into video RAM. When the user quits the utility, the TSR program moves the contents of the buffer back into video RAM.

It is this facility of being able to move graphics directly in and out of video memory that makes programs like Sidekick misbehaved. The IBM PC sets aside a certain area of memory which is dedicated solely to video RAM. Because Sidekick directly addresses this area, on a less than 100 percent compatible machine it might find itself writing to non-video memory, with possibly disastrous results.

Although it might seem desirable to include the largest possible number of bells and whistles in accessory software, programmers find themselves in a dilemma. By their nature, memory-resident accessory programs cannot hold overlays on disc; the entire program has to be held in memory. At the same time, it has to remain small enough to leave room for an application program. Typically, accessory programs are about 60K, which is small by modern standards, but they could not have come into being before the era of cheap memory and 16-bit processors.

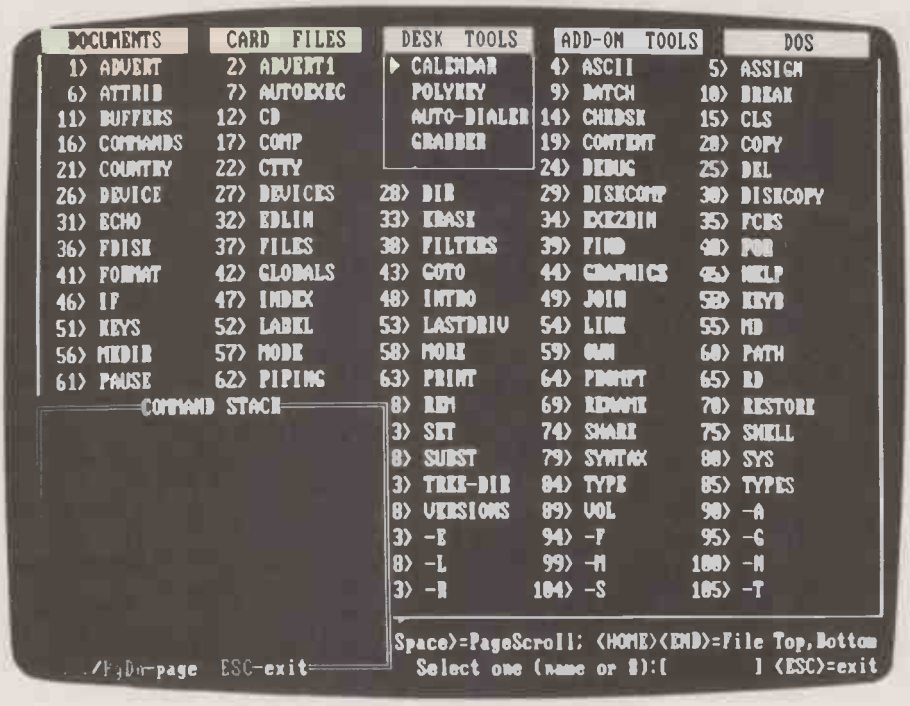
Despite the seemingly unstoppable growth of memory configurations over the past few years, compromises still have to be made. For example, DOS-Helper, a program intended to provide an on-screen DOS manual, has to load overlays from disc. This makes it impractical for use with an application unless you have a hard-disc system.

The increasingly crowded field of pop-up accessory programs might be expected to produce some headaches for programmers as regards compatibility. Software that clashes with a near-universal accessory program is not going to last long. Even Lotus had to make changes to its latest version of 1-2-3 because it clashed with Sidekick. But in practice there are remarkably few clashes between programs, though systems crashes do occur when the memory becomes full. This is possibly because of the way TSR programs stake out areas of memory for themselves.

MEMORY PARTITION

TSR programs are obviously rendered useless if they are overwritten when the application program is loaded. They therefore have to make use of a routine in the operating system which partitions off an area of memory and prevents anything else from loading into it. Despite this, problems can still occur. If Superkey is loaded before Polywindows, then the latter cannot be invoked. But if you load Polywindows first, both programs will run.

The snags lie with the demons rather than as a result of programs attempting to occupy each other's space. This is particularly true of Borland products like Sidekick and Superkey, which have particularly fearsome demons that intercept the appropriate keyboard interrupt before any other program. This was originally intended to allow Sidekick to be used with applications programs that use the same interrupt. If you are using non-Borland accessory programs with Superkey and Sidekick, it is best to load the Borland programs last.



The menu bars and pull-down menu of Polywindows displayed above DOS-Helper, with Superkey in the window at the bottom left-hand corner.

Although major collisions have been avoided so far, the time is fast approaching when some kind of order will have to be imposed. Both publishers and users want guarantees that new TSR programs will not clash with existing or future software. At present this means that before launching its latest TSR accessory, a software house spends many hours laboriously loading the program with existing software to ensure compatibility. TSR programmers have recently agreed to use the good offices of Microsoft to establish a set of standards for pop-up programs. Microsoft is the obvious choice for arbitrator: it is the publisher of MS-DOS, but it does not produce accessory programs itself and so has no axe to grind.

A set of programmers' guidelines is expected within a few months. Microsoft also hopes to be able to define a system which will enable TSRs to reside in extended memory outside the standard 640K boundary. Finally, it is planned to create an interface which will allow other applications to use TSR functions.

The preliminary guidelines insist that programmers use the recommended BIOS routines and do not hog the keyboard interrupts 9 and 16. It is also made mandatory that a routine which modifies any of the DOS or BIOS routines should clean up after itself and leave the operating system as it found it, resetting the BIOS interrupt pointers, for example. The guidelines have already been distributed to a large number of software houses, and this should ensure that compatibility will be maintained in the future. However, many early programs — Sidekick in particular — would be completely disallowed if written now.

While Sidekick has dominated the IBM PC desk-accessories market, many other programs have come up with variations on the theme. The range of TSR programs now stretches from general-purpose desk accessories to highly specific programs dedicated to working with a single major application.

It is in the second group that the greatest growth is currently occurring. As users increasingly surround their micros with all kinds of peripheral gadgets, they find that their favourite application program lacks the means to access the device. In the case of laser printers, for example, the relevant drivers may be missing because the peripheral was still only a twinkle in someone's eye when the program was written.

TSR accessories are ideally suited to making good such deficiencies. The necessary code to configure the device is small, and is only required occasionally. It is also usually cheap, so that when you upgrade yet again, you are not writing off several hundred pounds worth of software — not to mention application-specific data — with the outdated peripheral.

ENHANCEMENT

A further category of TSR software is not dedicated to a particular program but is instead intended for use within a range of applications. Used principally to enhance the capabilities of existing applications, these TSR accessories generally add features which have been overlooked by the original programmers, or have been developed since the package was introduced. They might also be used to customise a package for a particular market.

An example of this kind of program is Graph in the Box, reviewed on page 67 of this issue. It allows graphics to be produced from a set of figures from any part of the screen. Although the program can be used in isolation from an application, it is at its most useful when producing graphs from spreadsheets or databases.

There is also a growing market for accessory programs which work with a single application like dBase or Lotus 1-2-3. For example, Zap is intended solely for use with the Pegasus accounts packages, to which it adds on-screen help information. It cannot load without the application because it requires certain Pegasus command files to configure itself.

Like the general enhancement TSR programs, this type of program is often used to provide functionality not available within the host application. For example, Sideways lets you print text down the side of a spreadsheet; Note-It allows you to mark cells, and makes cumbersome beasts like Lotus 1-2-3 almost a pleasure to use.

FILLING GAPS

As in many other aspects of computing, it is hard to say whether accessory programs have any long-term future. The most likely fate of accessory programs is that they will tend to be written by small software houses which perceive a gap in the market. The most successful of these will be adopted by the major software houses and incorporated into their own programs. Already Microsoft is bundling the Ready TSR outline processor with Word 2. Similarly, Carrera says that a number of software houses have expressed interest in the DOS-Helper accessory with a view to incorporating it within its own programs.

Despite the prospect of being swallowed by the big software houses the TSR program looks like being with us for a long time to come. Nowadays, you can tell when a program has arrived when it has a TSR dedicated to it. Borland has recently announced a program called Mom which tells the user which accessory programs are in memory and where and how to access them. With its own TSR dedicated to it, the accessory program has arrived. PC

SUPPLIERS

DOS-Helper Carrera Computing, 12 Lyons Avenue, Hetton-le-Hole, Tyne and Wear DH5 0HS. Telephone: (0783) 267816

Graph in the Box Zygos, Suite 9A, Intec 2, Wade Road, Basingstoke, Hampshire RG24 0NE. Telephone: (0256) 25927

Polywindows Polytron Corporation, PO Box 787, Hillsboro, Oregon 97123, U.S.A.

Ready Softsel Computer Products, Softsel House, Syon Gate Way, Great West Road, Brentford, Middlesex TW8 9DD. Telephone: 01-568 8866

Sidekick, Superkey Altor, Unit 11A, Anderston Centre, Glasgow G2 7PH. Telephone: 041-226 4211. Softsel Computer Products, Softsel House, Syon Gate Way, Great West Road, Brentford, Middlesex TW8 9DD. Telephone: 01-568 8866

Sideways 4-5-6 World, Saracen's House, 25 St. Margaret's Green, Ipswich, Suffolk IP4 2BN. Telephone: (0473) 225951

Zap Zorland, 144 Griffin Road, London SE18 7QA. Telephone: 01-317 7240

WHOLESALE CHANGES

Jerry Sanders plots the chequered history of software distribution.

To start up as a software distributor you need cash, telephones, shelves, a good delivery system, a tight credit policy — and then lots more cash. If you can train your staff to support the products you sell, you might even stay in business long enough to learn what you really need to know.

In the good old days, there were four or five main distributors. They were also importers, since none of the U.S. companies had U.K. offices before 1982. This select bunch held informal meetings to swap notes about devious dealers, hosted usually by Xitan's Jeff Lynch. "There were an awful lot of startup dealerships who would run up a big bill with one software distributor, not pay, and move on to the next," says Telesystems' Ian Fitzpatrick. Lately the sharp operators have been more likely to recommend their bad payers to each other, stand back with venture capital at the ready, and hope to pick up the pieces.

But the established names in U.K. business software distribution are: Softsel; P&P Micro, formerly Pete & Pam; Reflex, which trades from Basingstoke as First Software; Software Ltd; and Xitan. Some larger companies are trying to get into the field, but though lots of cash is needed to get started, market knowledge is important too. For example, Thorn EMI came unstuck last year when it signed to distribute Scorpion's Easy accounting software. A company official admitted afterwards: "We believed everything Scorpion told us about the demand for its product. We didn't bother to audit its performance ourselves."

Alongside the major players are smaller companies such as Telesystems, Sphinx, Interam and Paradigm, with specialist areas or exclusive distribution rights to particular products. Sphinx was founded three years ago by Dr Pam Geisler, once Zilog's European marketing manager, and concentrates on Unix software.

Paradigm's David Mayes, one of several ex-Intel staffers now working in software distribution, offers lesser-known U.S. companies a specialist knowledge of the U.K. market. Paradigm brought in Innovative Software's Smart packages. If Mayes gets it right and the software works in the U.K., then he takes the credit.

"Our position has not been eroded by the addition of bigger distributors once a product is established," notes Mayes, who you might expect to be upset at having made a name for Smart only to find that Softsel has signed up too, once it was well known. "You have to be cautious when you walk in the steps of the elephant, but you can attack its soft underbelly." The soft underbelly in the case of larger distributors can be their inability to handle products as other than commodities.

But Paradigm, established in 1984, and Sphinx are wet behind the ears compared to Telesystems, which went from nothing in 1979 to a £100,000 turnover in 1982, and around £300,000 in 1986. Admittedly this is not astonishingly rapid growth, but Telesystems has survived nearly 10 years — the equivalent of a Queen's telegram in software distribution. The roll call of those who laid down their balance sheets starts long before Tradesoft bit the dust earlier this year. Lifeboat Associates, SBD Distribution, Micro Products International and Tamsys are just some of the better-known names to have gone before.

Other pioneers such as Xitan and Software Ltd also survived. Their turnovers grew to millions of pounds, their growth financed either by venture capital, as in the case of Software Ltd, or by becoming absorbed into larger groups, as Xitan did when it became part of the Kode group. Telesystems handles a dozen product lines at most, the majority from one supplier, DMA. Its products include Ascom, Anywhere and Formula IV, which is "a multi-user database that works" in the words of Ian Fitzpatrick.

"I knew that one trick to distribution was having money, so we put in £30,000 and got £100,000 in bank loans plus another £600,000 from 3i."

MARTIN BLANEY, FIRST SOFTWARE

By way of contrast, the U.K.'s largest software distributor, Softsel, has a stock list of over 1,500 product lines. Indeed it was the appearance of Softsel in Britain in that critical spring of 1983 that changed the face of U.K. software distribution. Nowadays Softsel majors in business software and add-on boards, but an adventure game for the TRS-80 and a divorce started the ball rolling.

Scott Adams, a Florida computaholic, advertised his Adventureland program in a hobbyist magazine in 1979 and got an order for 50 tapes from a Radio Shack dealer. To meet it, Adams and his wife made the copies on an audio-cassette recorder, packed them in plastic bags and stapled them together with an Adventure International business card. As more and more orders came in, the couple felt robbed of valuable programming time. So they gave a friend of theirs, Ken Williams, distribution rights to the product.

Williams ran his distribution business from his car boot, but he really wanted to promote his own software. In early 1980 he sold out to Bob Leff, a mainframe programmer at Transaction Technology, and started Sierra On-Line with the $1,300 proceeds.

Two months later, Leff, who had just been divorced, charged a friend at Transaction Technology, Dave Wagman, $10,000 to buy in as a partner in Softsel. So with an empty house, an Apple II micro, Wagman's dollars and the help of the UPS door-to-door delivery company, Softsel was born.

UNDERCAPITALISED

In those days, most micro software companies were undercapitalised. Business was run from front bedrooms by hobbyists with programming skill. The companies were the programmers. Such software publishers could not establish a network of retail dealers for their products, while retail dealers could not really evaluate the software they received.

So Leff and Wagman creamed off the best share of the market. The first month after his divorce, in July 1980, Leff earned $6,000 gross. In August the figure was $12,000, by December $15,000. A year later, sales were running at $1.5 million, 1983 sales came in at $85 million and so it went on.

The conditions enjoyed by Leff did not last long, and venture capital was soon pouring into the industry. But Softsel continued to make money, as do a few other distributors, because today's larger software houses still face much the same dilemma as Ken Williams did back in 1979. Running a dealer network costs manufacturers a fortune. The only reward is that each copy

sold to a dealer grosses you more than each copy sold to a distributor.

The big penalty for the software houses is that they have to support the dealers with hot lines and they have to warehouse stock for them. These are two services that distributors — who have no program research and development commitments — are perfectly placed to specialise in. But it was to be another year still before Softsel started up in the U.K., killing off Lifeboat Associates and SBD Distribution almost immediately, and preparing for the slaughter of many more.

PHASE TWO

U.K. distribution by late 1982 had settled down in the hands of several companies. These were Pete & Pam, which began as a partnership between Mr and Mrs Fisher; SBD which was already living on borrowed time; and the Xitan, Tradesoft, Software Ltd, Tamsys and Telesystems gang of five.

"I was working for a firm of accountants, and during a consultancy with a micro dealer I noticed he was quoting three and four weeks delivery on WordStar, ordering it from the U.S.," says Software Ltd managing director Martin Blaney, whose company started trading part-time in September 1982. "I knew that the one trick to distribution was having money, so we put in £30,000 and got £100,000 in bank loans and £600,000 from Investors in Industry."

Xitan, which today is one of the big five software distributors, was then a hardware distributor, majoring in North Star, Comart and Cromemco micros. A major source of supply for end-users, was Lifeboat Associates, whose mail-order catalogue included over 200 programs on over 100 microcomputers. If the days of mail-order software were not exactly numbered, the countdown was certainly about to begin. How many people now remember Lifeboat Associates?

Someone who certainly does is Ian Fitzpatrick: "We had the idea of setting up a software dealership — in those days there was really no distinction between dealers and distributors — early in 1979, after I had visited the States and seen Lifeboat Associates' ads in *Byte* magazine. But because of a strike at Companies House that summer, we didn't get going until August, a month after Lifeboat started placing its first ads in *Practical Computing* and *Personal Computer World*, which had just been launched."

In 1982 Software Ltd tempted dealers with its "wide selection of the best micro software on many disc formats; a discount schedule that makes it possible for the dealer to buy a single product; and a determination never to back-order our customers."

On the other hand, SBD was advertising "one dealer price for everything", which meant that no matter how many copies you ordered, the price was the same. It was nice for the smaller dealers to know that even their biggest rivals could not buy cheaper. But there is no room for fairy godmothers in this game, and it was Software Ltd that survived Softsel's impact on the market.

"I had been offered Supercalc from a large number of people in the U.K. who had an exclusive with Sorcim and I had stocks that were just not selling."

PETE FISHER, P&P

Another key distributor to appear on the market a little later was ACT Pulsar, whose parent company had acquired U.K. distribution rights for Chuck Peddle's 16-bit micro, known in Britain as the Sirius 1 and and in the U.S. as the Victor 9000. ACT Pulsar had a ready-made dealer network in the shape of ACT's own Sirius dealers. Pulsar bought in popular programs such as WordStar, Cardbox and dBase II, putting them out on Sirius- and Apricot-format discs in Pulsar packaging. All this extra work of special packaging and reprinting manuals to be ACT-specific had to be done by any manufacturer who wanted a popular piece of software to run on its computer.

In the days before IBM chose MS-DOS, and thus Microsoft's standard for organising the contents of a floppy disc, distributors who wanted to offer dealers software for a range of micros needed a disc-formatting machine. This enabled dealers to produce orders for any popular micro from a single master, and so reduce stock holdings by up to 80 percent.

The Sirius enjoyed a glorious but short-lived reign as the U.K.'s leading 16-bit business micro, and Pulsar shared that glory. At one point, in July 1983, Pulsar negotiated what was alleged to be an exclusive U.K. agency for all Sorcim products. At the time P&P's Pete Fisher commented: "I've been offered Supercalc from a large number of people in the U.K. who have had an exclusive with Sorcim, and I have stocks which are just not selling."

As the *coup de grâce* Fisher added: "If I were to go for an exclusive on anything it would be Multiplan or Lotus 1-2-3." Although Pulsar did eventually diversify into IBM software, it was really too little too late, and the company's fortunes remain inextricably linked to those of the Apricot range of micros. Had ACT produced an IBM-compatible a couple of years ago, Pulsar might now be the U.K.'s largest software distributor.

In fact, Peter Fisher's anticipation of what Lotus 1-2-3 could do for a distributor was absolutely correct. But the U.K. honours went to Reflex, a company set up by people who had masterminded the U.K. success of VisiCalc at distributor Rapid Terminals, part of the Rapid Recall group. Says David Mayes of Paradigm: "John Weatherhead, who formed Reflex, was previously MD of Rapid Recall, Intel's largest European distributor. Sevin Rosen, the venture capitalists who first-round financed Mitch Kapor's Lotus product, had ex-Intel people on board too. In fact, there's an old boy network of former Silicon Valley jockeys who have moved out into different parts of the industry, but keep in close touch with each other."

After Softsel and then Lotus, it was Ashton-Tate in 1984 which produced the next shock wave. It signalled the end of distributor power and the start of the trend which sent many — including Tamsys and now Tradesoft — out of business.

Dealers have always liked distributors who do not compete with them by selling to end-users. In October 1984, Ashton-Tate decided to encourage its dealers by agreeing with them. It invited its 10 distributors to apply for new contracts. The catch was that they had to undertake not to sell to end-users, or else forfeit the right to distributor discounts. In addition, Ashton-Tate imposed a minimum order of £100,000-plus on the new distributor contracts. At a stroke, Ashton-Tate halved its dependence on distributors, yet got increased business from each of the five remaining while saving valuable margin points on the rest.

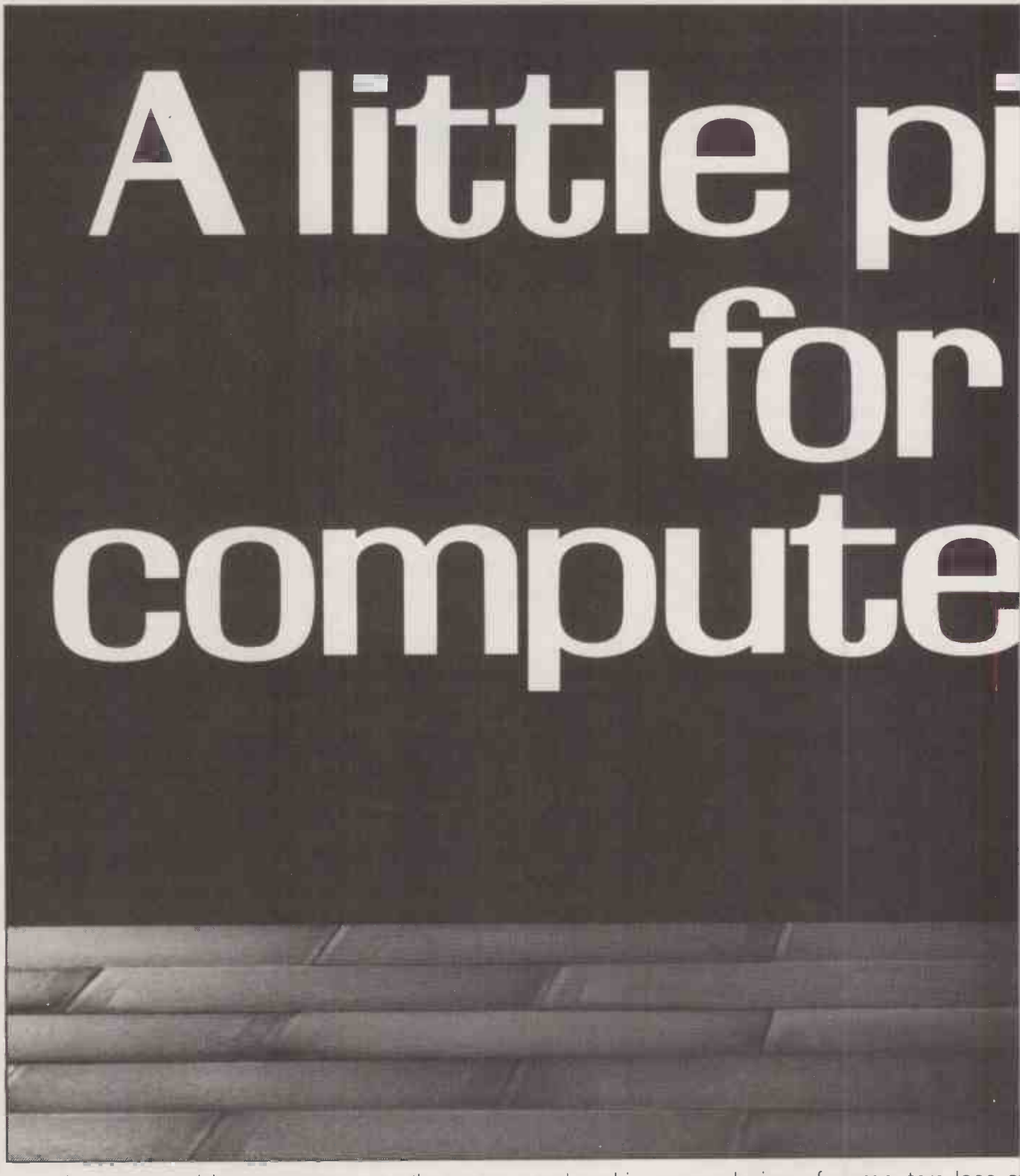
DIRECT SELLING

A few months later, in February 1985, Microsoft confirmed the trend towards closer relationships between the software houses and their dealers by offering to sell software direct to any dealer able to commit to an annual purchase of £24,000.

That trend is likely to continue, and many distributors are now looking to hardware as an alternative source of income. In the U.S., Softsel now does 44 percent of its business in hardware. But nothing is permanent in software distribution, and the current power of the main software houses can easily be reversed.

Frank Wagman, Dave's brother and a founder member of Softsel U.K., points out: "What's so interesting is that there has always been someone new coming up with an important product — and they'll always need a distributor willing to start them off. Ultimately, it's the marketplace that makes decisions." And, portentously perhaps, Wagman's last word was: "If all of a sudden Paradox outstrips dBase III Plus, it will be because it's a better product, not because of any distribution operations!"

Jerry Sanders is editor of Microscope. PC



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SERIOUS CHARGES?

Is damage from static a menace or a myth? **Martin Eccles** takes a neutral look at the evidence.

"Every person in your company constantly puts all your hardware and software at risk. Today . . . tomorrow . . . anytime . . . you could walk across a synthetic carpet with leather-soled shoes, touch a computer keyboard — and instantly deliver a 'knockout blow' of ESD." This dire warning about the effects of electrostatic discharge (ESD) comes in a booklet published by Formica, one of a number of companies who have products designed to keep static charge at bay.

There is no doubt that certain components are highly susceptible to damage by ESD. Chips that incorporate field-effect transistor (FETs) are particularly vulnerable. There are FET chips in almost all micros. Memory chips and microprocessors contain thousands of transistors — there are 17,500 transistors in a Z-8000 microprocessor, for example. Damage to any one of them could result in a complete system failure.

A bare chip without its legs and package can fail when subjected to discharges as low as 25V. Static discharges are often many thousands of volts, so a great deal of care has to be taken when these devices are being handled.

Static electricity is an electrical charge, either positive or negative, that is attached to a particular object. Normally objects are electrically neutral or uncharged, but when two bodies made of different materials are rubbed together their charges may become unbalanced. A negative charge can pass from one object to the other, leaving a positive charge behind.

Usually this does not mater. An electrically conducting material dissipates the electrical charge as it passes through and runs away to earth. Only insulating materials will hold the charge.

Shoe soles are good insulators, and simply walking on a carpet can generate a charge of several thousand volts, especially in a dry atmosphere. The charge passes into your body, and as long as you are not touching a conducting surface it stays there, building up with each step you take.

Monitor screens are also a good source of static electricity. Colour monitors have a 25,000V generator inside them, and black-and-white monitors use between 11,000V and 20,000V. Touching the screen can pass a significant charge on to your body.

Chip manufacturers use a zap test on new designs and a chip that breaks down under 2,000V is usually redesigned.

But the problems really start when the charge in your body comes close to a conducting path through which it can discharge itself. There are various discharge paths in an office, including metal door frames and large filing cabinets, but the very best are metal objects connected to the mains outlet terminal — like the metal bits of your computer.

When the air gap between the conductor and your fingertip becomes too small to insulate the charge on your body, the whole of the charge passes over the gap at once, causing a tiny spark. This is an electrostatic discharge. The charge itself may represent only a minute amount of energy, but this energy is concentrated into a very small area and is dissipated in a very short time.

Given that your computer is packed full of ESD-sensitive components, it might seem that you have real cause to worry about static. But in fact things are not nearly as bad as the story so far and the manufacturers of anti-static equipment might lead you to believe.

First of all, it is only bare chips that are damaged by very small ESD levels. When mounted in their packages, chips are

designed to cope with a certain amount of ESD. On most chips only one or two pins are unprotected, and the data sheets make it clear which pins these might be so that manufacturers can take suitable precautions.

To test their new designs, chip manufacturers use a zap test involving discharges of several thousand volts. In the test used by Motorola, similar to one covered by a British Standard, a high voltage is discharged directly from a human-body model into the chip's pin. The discharge voltage is stepped up from about 100V and the test is repeated until the chip begins to show signs of damage. A chip that breaks down at under 2,000V is usually redesigned.

When a chip is connected to a circuit board it becomes much less susceptible to damage by ESD. If you really wanted to damage a chip on a circuit board, the best way would be to try and pass a charge through it via the board's connector pins.

With the circuit board is sealed in an enclosure, it is virtually impossible to damage a chip by ESD, except either by passing a charge through a connector on the enclosure or by subjecting the casing to such a large charge that it cracks. What is more, a good design avoids connecting delicate chips directly to external pins. The signals from external connectors are buffered by more robust chips before being passed to the delicate chips from the outside world. The main purpose of this buffering is to provide protection from electromagnetic interference, but as a bonus it makes the design less susceptible to the effects of ESD.

For ESD to damage computer chips in an enclosure there has to be a hole for the charge to pass through, and the enclosure must be an insulator. Enclosures made from conducting materials are invariably connected directly to the mains earth. Any electrical discharge takes the path of the least resistance through the casing down to earth, bypassing the circuit inside the enclosure.

In fact things are not nearly as bad as makers of anti-static equipment might lead you to believe.

There are stories of ESD passing through the gaps between keys on a keyboard, but I have never experienced this phenomenon first-hand. Even on low-profile keyboards, the key tops are quite a long way above conducting parts of the circuit board, so the discharge would have to be large enough for you to experience a slight shock or hear a click. On every keyboard I have seen, the keys are supported by an earthed metal frame beneath the plastic housing, which drains any ESD.

ESD could also be a problem on the less drastic level of data loss, as opposed to permanent failure. Static discharges into metal parts connected to the computer can result in interference pulses being produced in the computer circuit. When I tried discharging a 12,000V light-current generator into two working computers standing on a plastic surface I observed no ill-effects. But I have no doubt that a large enough discharge will cause a computer to malfunction temporarily by altering memory or register states.

Flat cables like those connecting the computer and printer might be vulnerable. The insulation on these cables is not designed to cope with extremely high voltages, and problems could occur when you touch them.

In principle, ESD will damage the surface of a floppy disc. But in practice it is difficult to cause damage in this way because the working surfaces are never touched. If you touch a disc lying flat on a conductive surface it is conceivable that a large enough discharge from your finger could pass through the disc envelope, through the disc and into the conducting surface. This would certainly damage the disc. But these circumstances are somewhat far-fetched. ESD damage is not one of the six hazard warnings commonly found on disc envelopes. Clearly, disc manufacturers do not consider ESD to be a problem.

Like most electrical equipment, computers can suffer from intermittent faults. Since such faults are notoriously difficult to trace, it may be tempting to attribute malfunctions to ESD. But before you spend a lot of time and trouble on remedies for ESD, you should check out some of the more mundane reasons why your system is giving trouble. Loose connections, mains-borne interference or foreign bodies inside your machine are more likely to be at the root of your problems. Certainly, if you have never had a problem with electrostatic discharge in the past there is no need to start worrying about it now. PC

Martin Eccles is Technical Editor of Electronics and Wireless World magazine.

PREVENTING ESD

Though ESD is unlikely to pose a serious threat to your day-to-day computing, static is not desirable, if only from the point of view of your personal comfort. There are a number of steps that you can take to keep static to a minimum.

- Low humidity allows high levels of static to build up, while high humidity helps to dissipate static charges. But humid air also helps to corrode chip and connector pins and other exposed metal parts within the computer. In extreme cases, minute amounts of moisture can seep into a chip package and damage the micro-circuit. So be sensible about humidity levels: if you think that dry air might be causing ESD problems, try lightly dampening the carpet from time to time using water from a plant leaf spray. If your office is air-conditioned, have a chat with the heating service engineer about humidity levels. Having plants around the office improves the atmosphere too.
- Before using your computer, touch the largest metal surface you can find. But do not touch a surface that is directly connected to the computer. After touching the surface, do not shuffle your feet.
- All fabrics can generate electricity when rubbed, so never put on or remove clothing near the computer. Artificial fibres are the worst, so avoid synethic-fibre clothes and carpets. Brushing your hair can also generate static. Plastic-coated furniture and plastic computer covers that do not appear to be treated for charge dissipation are also possible sources of ESD.
- Some types of wheeled office chair can also generate static electricity, and this passes straight into you. It is difficult to avoid using the wheels, so you might need to use a mat if the other precautions do not work.
- Polishing a plastic surface with a duster causes static build-up. Use a paintbrush to remove dust from plastic keyboards and peripheral housings. Use a static-reducing furniture polish on the desk. Many polishes are now being designed to reduce static electricity — mainly because static electricity attracts dust, especially on glass or plastic surfaces.
- If you are convinced that you have ESD-related problems and none of these prevention methods helps, follows Larry Mascall's sensible advice on page 7 of the January 1986 issue of *Practical Computing* and make your own ESD-prevention mat. Mascall's mat is essentially an earthed conductive sheet placed under the computer, and projecting out at the front. You touch the mat to discharge yourself immediately before you touch the computer keyboard. Ideally you should rest your hands on the mat while you are typing.
- Avoid touching the monitor screen, especially if it is a colour monitor. Do not wave discs about near the screen, and if you have a negative-ion generator, fan or dust-particle extractor, do not put it anywhere near the computer or its peripherals.
- Finally, if you are still having problems with ESD you may want to turn to one of the commercial suppliers of anti-static sprays and conductive mats.

3M (U.K.) 3M House, PO Box 1, Bracknell, Berkshire RG12 1JU. Telephone: (0344) 426726

Farnell Electrical Components Canal Road, Leeds LS12 2TU. Telephone: (0532) 799123

Formica Coast Road, North Shields, Tyne and Wear NE29 8RE. Telephone: 091-259 3000

Inmac 16 Silver Road, London W12 7SG. Tel: 01-740 9540

On-line crime

The law has not yet come to grips with the difficulties of dealing with the misappropriation of information stored on a computer. **Anne Staines** looks at the problems highlighted by the recent much publicised case.

In Britain it is not possible to steal information held on computer. An eight-year-old Crown Court ruling holds that information is not property within the meaning of the 1968 Theft Act, and that its appropriation cannot, therefore, form the basis of the crime of theft. The contents of your data files may well be your most valuable asset. So it is disquieting to find that the law will not adopt the same approach to unauthorised breaking and entering into your data files as it would to burglary of your house or theft of your car.

This difference is partly due to the special qualities of information. For someone to commit theft they must intend permanently to deprive the owner of his or her property. But when information is misappropriated, its owner may be permanently deprived of its commercial value without having been deprived of the information itself. This essential difference between information and other forms of property is one reason why hacking is such a difficult phenomenon for the law to tackle.

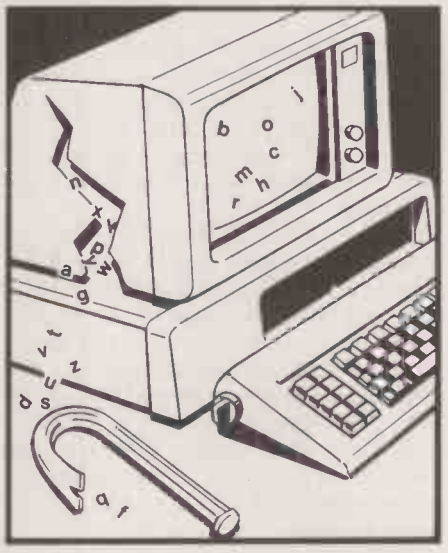
HARD TO CATEGORISE

The object of most computer frauds is, of course, to appropriate some other property — typically money — using the computer as a tool in much the same way as a traditional burglar would have used a jemmy. These cases fall squarely within the law of theft, provided that commission of the crime can be proved. But computer misuse takes a number of forms which are less easily categorised within the existing law.

If the purpose of falsifying data is not to obtain money but, for example, industrial espionage, the hacker may be said to have gained a pecuniary advantage. The Theft Act makes this an offence, provided a deception has been used to obtain the advantage. A number of English cases have held that a deception requires a human mind to be deceived; in at least one case it has been ruled that a computer cannot be deceived in this sense.

Computerised information may be confidential for personal rather than commercial reasons. In the recent case of *R* v. *Gold*, the prosecution faced the difficult decision of how to charge hackers who had gained unauthorised access to HRH Prince Philip's Telecom Gold mailbox. Nothing had been permanently appropriated and no one had been deceived. Arguably, all the hackers had done was to highlight the by now legendary insecurity of British Telecom's lines.

Once the incident came to light, however, there were two reasons why a prosecution



was inevitable. First, because confidence had to be maintained in the security of the public telecommunications systems, upon which so much of Britain's commercial interests depends. Secondly, the European Court of Human Rights in Strasbourg had ruled that the methods of phone tapping used by the British police violated the fundamental human right of privacy. A climate of political embarrassment over interception of communications prevailed, and action was clearly thought necessary to show that security in communications was a matter to be taken seriously.

Improper use of a public telecommunications system such as Telecom Gold may be an offence under the Telecommunications Act 1984. Offences of modifying or intercepting Telecom Gold messages, however, can only be committed by BT employees. Hackers can only be convicted under this Act if they have sent an indecent, obscene, menacing or false message.

Eventually the hackers were charged under the Forgery and Counterfeiting Act 1981, which makes it an offence for a person to make or use a false instrument with the intention a of inducing somebody to accept it as genuine and thereby to do some act to his own or any other person's prejudice. The Act provides that the somebody who is induced to accept the false instrument may be a machine, and that the instrument may be "any disc, tape, sound track or other device on or in which information is recorded or stored by mechanical, electronic or other means".

In this case it was not the storage medium which was false, but rather the information introduced into the system by the defendants. Could information — an intangible, emphemeral thing — be an instrument? The fact that the judge did not consider this point makes the conviction of the two hackers an unsatisfactory result, and one which is likely to be appealed.

In any event it is arguable that the blame in cases such as this should not rest entirely on the hacker. The 1985 Computer Fraud Survey, produced by the Audit Commission for Local Authorities in England and Wales, indicates the extent to which losses caused by leaking security systems in commercial organisations go unreported. The reason is obvious: not only would the admission of such lapses undermine the confidence of clients and investors, it would be a declaration of open house to other hackers.

Where a carrier offers a service such as electronic mail, however, users are bound to expect privacy for their communications. The Data Protection Act 1984 obliges those who control the use of personal data held on computer to take appropriate security measures. What is appropriate depends upon factors such as the sensitivity of the data and the number of staff who might have access to it. Failure to comply with this, as with any of the eight data-protection principles, can result in deregistration. In addition, the Data Protection Act provides that a data user whose data relating to a data subject is inaccurate must compensate that subject for any damage or distress thereby suffered. Inaccuracies caused by hackers are not exempt.

LAW REFORM

There are two possible approaches to the problem. The first is to create specific new offences of obtaining unauthorised access to a computer and making unauthorised use of computer time or facilities. The Scottish Law Commission recently published a consultative paper seeking comment on this approach. Law reform of this nature is likely to be a lengthy process. The whole question of how the criminal law deals with intangible property is central, and will require lengthy debate.

The alternative in the meantime is to let market forces provide a solution. No matter what the eventual outcome of *R* v. *Gold*, the case has thrown up some fundamental questions which must be answered fast. Carriers such as British Telecom will need to consider whether an insecure system is worth having at all. To avoid falling foul of the Data Protection Act they may have to warn customers that their information could be open to prying eyes or even to manipulation by outsiders. And how many people will want to use a service like that? PC

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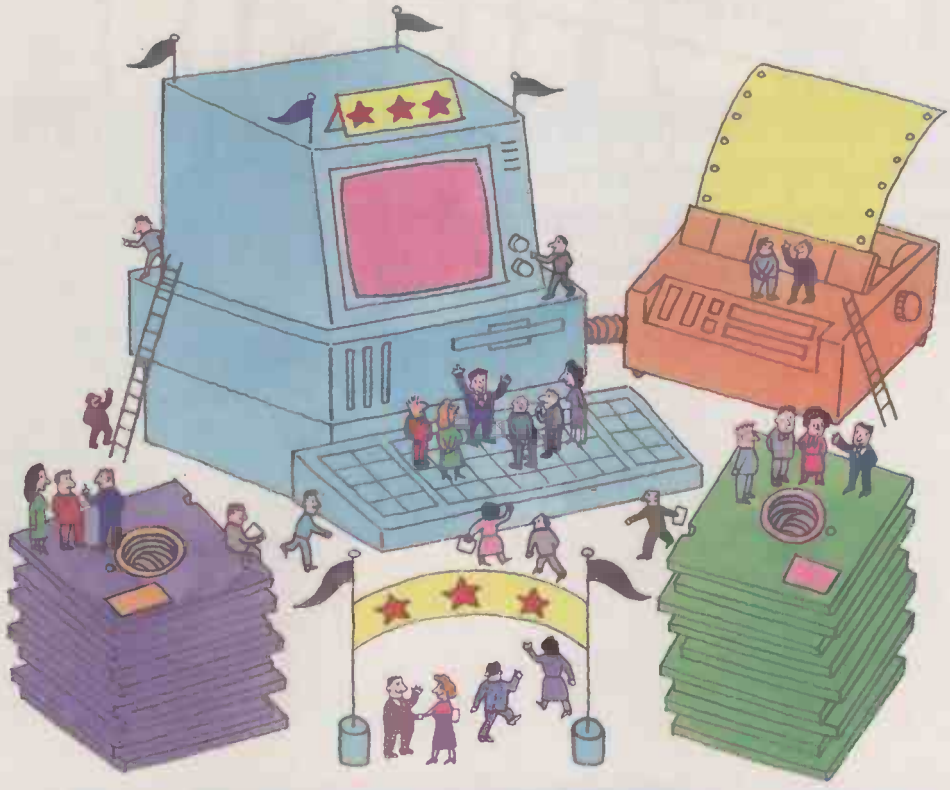
Somehow you have to learn how to use your equipment and programs. **Carol Hammond** explores the options, from self-tuition to expensive commerical training.



CHRIS WINN

A MATTER OF COURSE?

When you have bought a new do-it-all machine or package it is disheartening if you find that you are unable to get it to do anything very much. The obvious panacea is to go on a training course which will teach you to use it to its full potential. But training does not come cheap, and you may end up spending more money and time on a course in a wasted effort trying to learn how to use the very tool which was meant to save you time and money.

The kinds of training and number of courses on offer are multifarious, and deciding which one to choose can prove difficult. Also, the question may remain as to whether you should train at all. It might be better to try and get to grips with your acquisition through a process of trial and error; after all, manufacturers extol their products as being user friendly. Or is it that users are unreasonable and naive, and expect too much for too little effort? Perhaps having to be trained is only to be expected, but if so why is training not included in the price of a micro or software package?

Obviously training is a bone of contention among micro users. They have to organise it themselves and then foot the bill. But the fact remains that training is a necessary evil. One advocate of training is Dr Chris Brotherton, chairman of the Occupational Psychology section of the British Psychological Society, who is doing research into how information technology is being employed in small businesses. He believes that manufacturers need to be more conscientious and show more consideration for buyers. All too often a manufacturer puts most of its efforts into selling micros to a company, and not much into a proper after-sales service. The result is that micros become dust gatherers, as people do not use them properly.

HAPPIER WORKERS

One solution he suggests is that training should be included in the basic price of the system you buy. And training does not only mean that underutilised machines will get a new lease of life; trained staff should be happier and less likely to make errors. Training helps to increase the involvement of workers in their job, and they become less likely to be bored and apathetic.

Even when you decide that you or your employees need training, your problems are not over. True, there is no lack of people willing to provide training; the rise of the micro has seen the birth of a plethora of training companies. But there is no sure-fire way of knowing who is worth going to. Though anyone can decide to train someone else, there is no official monitoring body and there are no nationwide exams to help you assess a company's teaching proficiency. All you have to go on is whether other people who have attended a course felt they learnt something worthwhile from it.

This is partly because courses are so diverse, but also because the micro market itself is new and technology is advancing too rapidly for standards to have been set. What would be the point of setting standards for teaching this year's popular word-processing package when it may be superseded by another program in a few months time?

It it also not yet in anyone's interests to set standards. Micros are still being sold and people are still desperate to learn how to use them. That is enough to keep the manufacturers and the training companies happy. A recent survey conducted by the International Data Corporation (IDC) reveals that expenditure on data-processing training by U.K. companies in 1985 was about $132 million, and it is projected to reach

$164 million this year. The National Computing Centre (NCC) reports a similar increase in training revenue this year of around 25 percent.

So far the best way of going about choosing which course to go on is to use your common sense. You will have to choose between educational establishments, manufacturers, independent training companies or dealers. The problem with educational establishments is that they may only offer courses that are convenient for them, depending on the skills and interests of their staff. Manufacturers should be able to provide up-to-date technical information more easily than anyone else; the hardware or software being covered should also be freely available, allowing valuable hands-on experience. Manufacturers may find it more difficult to provide the type of course you want, so you may find independent training companies more flexible in tailoring a course to suit your specific needs. You also have the choice of going to one of the larger organisations such as the NCC, BIS, Hoskyns or Datasolve, or you could go for a smaller one. A one-person outfit may well prove to be just as good as a large firm, and it could well be cheaper too.

FEWER FACILITIES

Small organisations will not generally be able to offer the range of facilities and expertise that is available in a large company. Neither may cost-cutting prove to be such a good thing in the long term. A company that is starving itself of funds may have disappeared in six months time when you want to go on part 2 of your course.

The desire to improve computing skills has spawned so many different courses that now some manufacturers have decided to give their seal of approval to particular schemes. This may well be worth taking into consideration when you are trying to decide which course to choose. One point of view is that manufacturers are rightly concerned that if users want training in how to use their products then recommending certain companies is one way of ensuring that they get taught properly and get their money's worth.

Lotus Development is one manufacturer which has decided to authorise training centres. Just over 60 have been running for about a year, and around 500 people a month are going on the courses. Lotus says its initial desire in approving courses was to provide an additional benefit to users and establish some sort of standard, since courses vary widely in quality, it was unable to say whether the scheme made a profit or a loss for Lotus itself. Lotus designs its own course material which authorised trainers use to teach users. The centres have to meet a number of criteria before Lotus approves of them: it vets the trainers, the facilities and equipment available and the range of courses on offer.

However, sceptics suggest that manufacturers are primarily concerned with selling their products. Seen from this standpoint training is simply a further incentive

Perhaps having to train is only to be expected, but if so why is training not included in the price of a micro or software?

to users to buy their product. BIS, one of the largest independent training companies, has not sought accreditation from Lotus because, it says, it does not need it. As an independent company which does not sell equipment, it does not require authorisation from software houses who are interested in selling products.

The Micro Training manager of BIS, Howard Benbrook, believes that Lotus has done the correct thing in that an officially sponsored training scheme gives valuable support to dealers. He says that BIS has not joined the Lotus scheme because to do so you need to run the Lotus course, which he does not think is "all that brilliant". In his view it is orientated more towards explaining the capability of the package than teaching people how to use it.

Lotus is not the only software house to approve training courses. Ashton-Tate and Microsoft operate similar schemes, and Ashton-Tate operates its own Train a Trainer course, which gives tips to trainers in how to teach its products in the best way. Such actions may well seem reasonable but users will no doubt feel jaded as it seems that manufacturers are benefitting from both sides of the coin. On the one hand they are exhorting people to buy their products because they are easy to use; on the other they are encouraging users to pay an extra £100 to £150 per day to go on a training course. But Phil Peters of Lotus sees no contradiction. He says that "easy" is not an absolute but a relative term, and that what manufacturers are really saying is that their product is easier to use than some other products.

Ashton-Tate's training manager, Charles Eames, says that although manufacturers may provide a learning section in the manual accompanying a package, together with an on-disc tutorial, different people learn in different ways. Some people find it difficult to set aside the time needed to learn from a manual, and prefer to go on a course where they have to commit their time. Some find a classroom environment conducive to learning, some prefer to learn off-site, away from the demands of work, and others find the exchange of ideas between other tutees invaluable in suggesting new ways of using the product.

David Fraser, managing director of Microsoft, also supports training, since no matter how easy a product is to use, if you want to get the best out of it you have got to consider training. He points out that different people also have different abilities. He cites driving a car as a comparison: someone may well be able to teach a novice how to drive a car in a straight line on a deserted piece of land; some people may even progress to going round in a circle. But equipped with only the Highway Code and a car manual, few people are then going to be able to manage to drive well on a motorway without going to a driving instructor.

Asked why they themselves did not offer training, many manufacturers said they lacked the resources to train people all over the country. Most left it up to the dealer to promote it as another after-sales service.

Micro manufacturers adopt a similar approach to software houses. Compaq prefers training to be handled on a local level, between dealers and users. Others, such as Apple, ICL, Olivetti and IBM, offer training; but it if still an expensive activity, and users in large companies are most likely to benefit where a deal has been arranged between the buying company and the manufacturer to bundle in training.

When you decide who to train you, you will have to decide whether to opt for an on-site or a residential course. You may choose a course of video- or audio-based self instruction or a disc-based package you can use at your own keyboard. When choosing a course it is best to find out what the pupil-to-teacher ratio is, what the facilities are in the way of how big classrooms are, and whether there is sufficient hardware and software available to allow you hands-on experience when you want it.

You can check up on the qualifications of tutors, but since there is no established way of training a trainer this may prove a waste of time. Just having the right knowledge does not necessarily mean you can impart it in the clearest way. You will have to trust in the ability of the training company to recruit the right people. It is also worth checking on the brochure which lists the courses and ringing up the lecturers about anything that appears ambiguous. If they do not feel a particular course is suitable for you they may well advise another one.

MICROS MUCH THE SAME

The main problem at the micro end of the computer market is that hardware and software tends to be sold because of the techniques and facilities it offers. Gordon Ewan of the Computing Services Training Council, a voluntary body set up to improve the quality and standards of training in the U.K., points out that in the micro market most of what is on offer is much the same and cutting costs is one way of competing. Published costings therefore do not usually include the associated charges of setting up systems.

When the number of new products available dries up, and manufacturers have to pay more attention to the backup services they offer, training will become a marketable asset. Customers will take into account the training on offer when they are deciding which micro or package to buy. But until market forces dictate otherwise and users become more worldly wise, customers will have to fend for themselves. PC

INTERVIEW

PHILIPPE KAHN

Founder and President of Borland International

INTERVIEWED BY GLYN MOODY

Kahn was born in Paris in 1952. After studying mathematics, he attended courses given by Niklaus Wirth — the author of the Pascal language — including the first course ever given on that language. At the age of 30 he went to the U.S. It was while acting as an engineering consultant there that he decided to join the burgeoning micro industry in Silicon Valley. Rather than joining an established name, in May 1983 he set up his own company, Borland, to market Turbo Pascal, which was launched in June 1984. Since then, a host of language-related and utility products have been produced, most recently Turbo Prolog reviewed on page 58 of this issue. Borland International employs some 160 people. Sales for the year ending March 1986 were $27 million with a profit of $8.6 million. Borland has recently obtained a listing on the London USM.

Why is the company called Borland?
BECAUSE it's a good-sounding name for an international software publisher.

But where did it come from?
WE just made the name up. It sounds very classy.

Were you surprised by Turbo Pascal's success?
OF course. We thought it would sell, but we never thought it would be so successful. Over 400,000 copies is unheard of for a programming language, but is also unheard of for lots of applications.

Over the years, have you been able to work out why?
MORE people than one thinks want to take control of their PC. As a matter of fact, something that is said many times is that programming is of no interest to people. But look at who's using spreadsheets; isn't that a programming tool? What about dBase III; isn't that a programming language? So potentially all those people could program in Pascal, and a lot of them do. When you have people really getting into the PC, they start getting interested in the nuts and bolts of the machine, and try to do things which commercial programs which are ready to consume won't do. And then they have fun with Pascal, and experiment and do unique things.

How is the end product evolved: does it come mainly from you, or from a committee?
DO you know what a camel is? It's a horse designed by a committee. So we don't do camels. We sit down, discuss things, but ultimately a very small group, that can be an individual or two, build the product. Committees build monsters.

How did Sidekick come about?
OUR mission was to be a software publisher, but we didn't realise it was going to be that quickly that we would need a second product to pursue the growth of the company. You have to understand that this company never had outside capital investment. Everything was financed through retained earnings.

I remember it happening at two or three in the morning, on the last night of February at my house. We were three, four people discussing this. The other guys wanted to do a word processor; I was really against that because it's a very difficult market to enter. That doesn't mean there is not room for a very good word processor because nowadays there is nothing that really dominates that is great in all respects. But it means for small companies it's a market that is almost impossible to enter. Suddenly we realised that what people want, even people who already have a word processor, is a resident word processor — something they can pop up at any time and do some word processing of notes and come back. That is on top of Lotus, on top of dBase, on top of Turbo Pascal, on top of anything. We said: This is great, because we already have the Turbo Pascal editor, and if we can succeed in making it pop up — which wasn't obvious at the time — there's a good product. And the next natural idea was why don't we put in a calendar, why don't we put a calculator, why don't we put a dialler — oh, and we really need an ASCII table all the time. So the idea came, and the product was built in four months.

I believe that Turbo Lightning represents the first of a new family of products. What sort of direction do you see them moving in?
LIGHTNING was built as a look-up engine. About a year ago we started looking at book publishers and the immense databases these gentlemen have. There's going to be the CD-ROM thing where you can put 500 million characters on a disc; but all these things only need to be read, they don't need to be updated. So that's the ideal medium for all those reference materials. We looked at that stuff and said, let's make a look-up engine which is transparent — it can be used with magnetic media or optical media. Then we started playing with it and building models and we said hey, wait a minute, if we're going to look up information we could maybe look up the style of the words which are typed in at the keyboard. And we tried it. It worked, then we realised that this had immense applications.

In the U.S., electronic mail is very important. When you are logged on to an electronic service like that, what can you do but real-time spelling checking? Because as you type, the thing's gone in electronic mail. So it's a great tool for real-time computing. And it's the only way to do it, and it has become extremely popular with all the electronic-mail users.

Are there any other products which will come along later using these techniques?
WELL, it's no secret that we are working on an encyclopedia, large thesauruses and all that. There are going to be at least one or two before the end of the year.

I believe Borland has hopes that the recently launched Turbo Prolog will do even better than Turbo Pascal. Talking to one of the main distributors, this seems to be the case. Why do you think that is?
WHAT we believe with Prolog is the following. Everybody knows artificial intelligence is getting a thing of actuality. Now it's not obvious that artificial intelligence would become something on PCs. If you look at the other areas — say database management — dBase III was successful because it was a programmable environment. Now who's going to set up expert systems? Essentially no two expert systems are going to be set up the same. People can use shells and so on, but they are so clumsy; what you really want is the programming language behind.

Well, what do you get when you get Prolog? You get the inference engine built into Prolog, which is what you want from your expert-system shell. On top of that you get all the real

programming from Prolog. That's a lot of power. And the great interest is that suddenly people can do AI in a very quick, very powerful way, for $99.95 in the U.S. and £69.95 here. It's an amazing deal. It's also a way, I hope, for hundreds of thousands of people to step into the brave new world of artificial intelligence.

Obviously one of the reasons for your success is the pricing. Is this something which has been central to your philosophy from the start, or has it just come about?
IT came about because in the beginning no one wanted to distribute our products. So we didn't have a choice. We didn't have store distribution and all that. So the idea was to distribute by direct mail, which is very popular around the U.S. and isn't in Europe. So when we decided to do mail order, I went and bought the book, a mail-order book. The book said price breaks are $50, $100 and $150, and if you want to generate impulse buying for this type of buy it has to be below $50. So I said $49.95. The book is very simple, I still have the book; it's called *Success in Direct Mail*, or something like that. Obviously it worked. I should send something to the author. Nowadays direct mail is not as important to the company as it used to be; it only represents about 15 percent of our business. But we started that way, and naturally the products evolved in this price range.

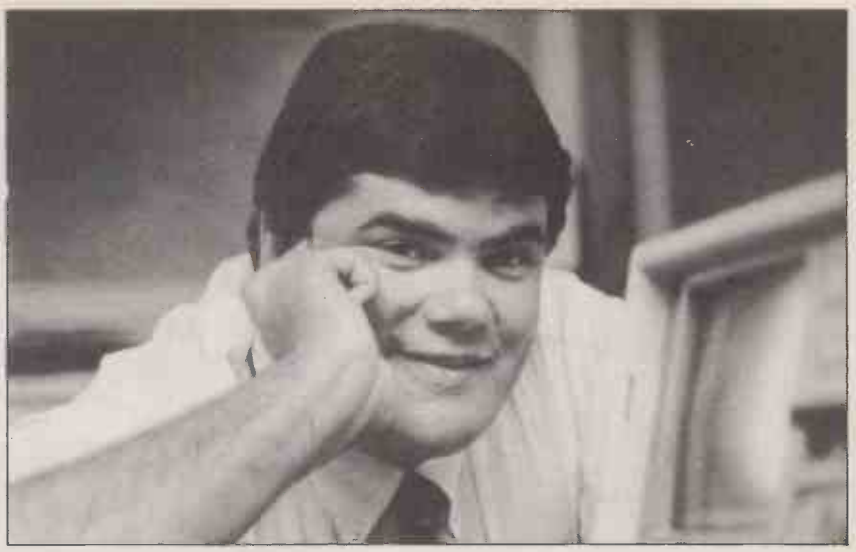
The market is catching up with our idea because you will have PC clones which will be around £400. And so if someone made a total hardware investment of £500, is that person going to buy a single software package which costs £500? No way.

So what is your attitude to the people who are still charging these sorts of prices?
KEEP on doing it. We are not here to teach the world, we are here to do business. As long as they keep on doing it, we are safe.

So far you seem to have avoided head-on confrontations with people like Lotus over a spreadsheet. Are you prepared to move into these sorts of markets?
WE are prepared to move into any market where we can bring something to the table — not only price cuts, but bring performance, speed, better user interface. We won't do it just for the sake of doing a Lotus clone or WordStar clone.

Is it likely that such products are going to involve AI techniques?
I DON'T know what you call AI techniques. I always say that AI is what hasn't been done yet; once it's done it's called programs. But sure.

How do you see Borland developing? For example, will it become more like Microsoft?
MICROSOFT is a good company. However, we hope that we will not follow its tracks in certain respects. Microsoft has been very successful, but what made Microsoft was their contract with IBM. It is absolutely not our intent to tie ourselves to a manufacturer such as IBM, and depend so much on them. Also if you look at Microsoft today, none of their applications are leaders in their category. So we're very different: most of our products are leaders in their category. But they're a good company — in our opinion they're the best company in the business because they have a broad range of products. It's not the case at companies such as Lotus or Ashton-Tate, which are still essentially one-product companies.

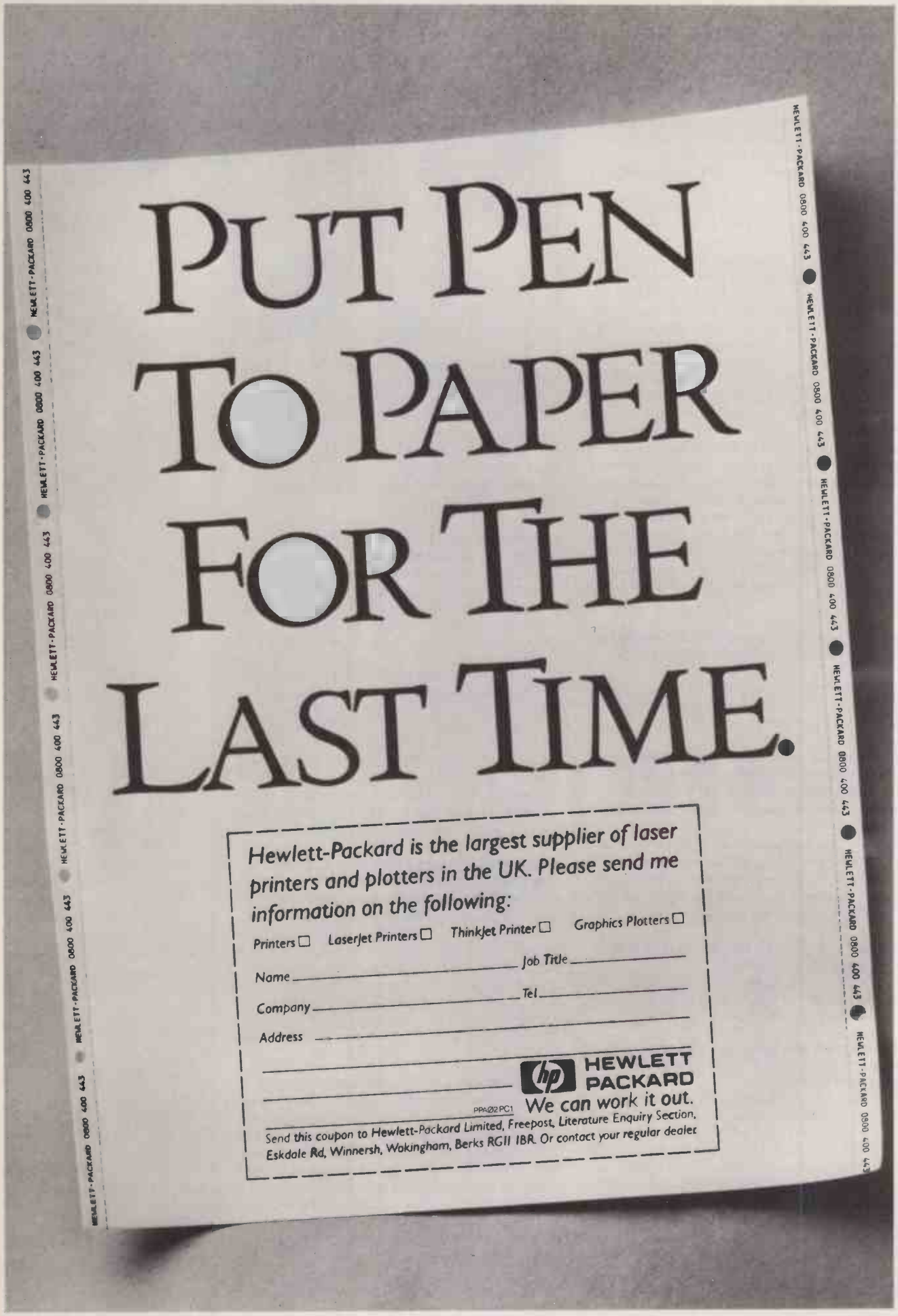


Would you ever contemplate moving outside micro software?
WHATEVER makes sense and fits in our strategy. You saw Travelling Sidekick. Travelling Sidekick is really a step to something else: it's what we call "binderware". We're suddenly in the Filofax world. We're working with very well-known French and Italian designers to build a special designer leather look.

More generally, how do you see software developing?
I THINK that the press and people in the industry want revolutions every three months. Everybody wants IBM to dump Microsoft. I think the market has much more inertia than that. After all, we're in the tools business. We sell our tools which are used by people, and people get used to their tools and don't want to change them. So I don't think you are going to see great revolutions in the next five years. The Mac will stay what it is, and the PC will maybe gain a graphics user interface which looks a bit like the Mac — Gem style, whatever. But then how many people will use that? It is paradox that in order to use DOS you only need to know five commands: Copy, Delete, Rename, Dir, Format. Is that that complicated? The problem is probably that it hasn't been explained simply enough.

From your geographically American perspective, what do you think of the state of the European micro industry?
WELL, that's one of the reasons we're here. The density of PCs in the U.S. is way higher than here. Somehow Europe is going to catch up, whether it is through Amstrad or somebody else. We see the growth of the market in Europe much steeper than in the U.S. So for us it's time to really come into the European markets — which is principally the U.K., then France and Germany — and do something serious.

What about on the software front?
THE software front is different. Over here we have a development team in London at Borland U.K., and they do great software. We develop a lot of software here. I believe that the talents that are here are excellent for software. Because of our presence and because 75 percent of the shares of the company are still owned by Europeans, we believe in development here. We also have a development office in Copenhagen where we have 12 programmers, and that's been going for two-and-a-half years. I think that software is one of the biggest strengths of Europe — particularly the U.K., which has a tradition for that even on mainframes. So there's a great chance for indigenous software here. PC



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It is a natural commercial response to try to follow up one successful product with another. In the software world, this has meant that programs which started out as one-offs have been joined by other generic packages to form a group of related products. Perhaps the first instance of this was the Visi family. After the runaway success of VisiCalc, there followed VisiPlot, a graphics package, a database-type product called VisiDex, and others. The Star group, which grew out of WordStar's early dominance of the word-processor market, is another example.

In the early days of microcomputing, before software standards had evolved, there seemed to be enough room for many such families. At that time what was needed was the full range of applications; functional details were less important. This approach was aided enormously by the practice of bundling generous quantities of software with hardware.

Alan Osborne was largely responsible for the bundling price war. Initially the approach was beneficial, because the user obtained a complete working system instead of just inanimate hardware. However, the discounting became more and more cut-throat until that sector of the market was bled white by competitive price cutting. Software families rode on the back of this craze, since it was convenient for both the bundling manufacturer and the end-user to have a complete set of related products.

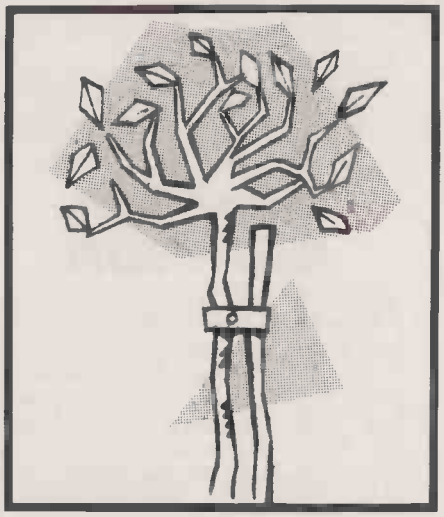
The demise of the bundling craze, and the arrival of second-generation 16-bit software, ended the heyday of the software family. As Lotus 1-2-3 and dBase began to dominate their respective markets, the appeal of sibling products diminished, as their only real virtue was that they formed part of a series. Software houses were forced to concentrate on producing packages which could establish them as market leaders in a particular sector against increasingly aggressive opposition. This meant that resources for developing subsidiary products were limited, and most of the software houses which thrived were effectively one-product companies.

INDUSTRY STANDARDS

Those companies have since established themselves, and their products have become de facto standards. They are now able to gather a range of complementary products around their original, central package, drawing in part on its strength and market visibility. These families of products are different from the first generation. Gone is the unitary approach whereby all the programs shared common characteristics of on-screen appearance and operation. What is more important now is to produce an application which can compete with the market leaders and is fully compatible with the company's own central product.

A good example of the modern approach is provided by Ashton-Tate. After dBase II and then III had established themselves as the database standards the company was keen to launch other products to build on its success. Rather than waste valuable time on developing other programs itself, it bought Framework and then Multimate, and incorporated them into its product range.

The idea of a set of related products has always been appealing. **Glyn Moody** welcomes the revival of this convenient way of meeting your software requirements.



Lotus has also been engaged in the acquisition game, though this has given rise to few products as yet. Instead it has developed Symphony and Jazz. Although the latter is for the Macintosh you can swap data among all three packages. This illustrates how modern family is defined in terms of data exchange rather than, say, a common interface.

Microsoft has perhaps gone furthest along the IBM and Mac route. Most families concentrate on the PC world, but Microsoft is taking a longer-term view, supplementing its PC software with a comprehensive range of products for the Apple machine.

In the context of software families and the leading players, Borland is the odd one out. Obviously memory-resident products like Sidekick and Superkey are designed to work with all other programs, so data exchange is no problem. However, what is most striking is how Borland continues to launch new products with a similar approach. Turbo Lightning, for example, could be the first of a range of associated applications.

Recently there have been two other interesting trends. First, there is a tendency for the distinction between a software family and an integrated package to blur. Some of the integrated packages are no longer single, monster, do-everything programs, but are made up of five programs that fit together well and can be bought separately.

The other noteworthy development has once again been brought about by Adam Osborne. His Paperback Software series is unashamedly modelled on the market leaders in their respective fields. For example, VP Planner is a Lotus 1-2-3 look-alike with extra functionality, and VP Info is similar to dBase III. Likewise, Practicorp has produced a series of clones in the form of Practibase, Practiword and Practicalc.

Perhaps we are seeing the evolution of the ultimate family which will offer all the features of the market leaders' products but for a fraction of the price. If so, it can only be a matter of time before somebody starts the bundling game again. After all, who could resist a clone package with the functionality of an IBM plus Lotus 1-2-3, dBase III and WordStar, all for £500? PC

SUPPLIERS

Ashton-Tate Ashton-Tate (U.K.) Oaklands, 1 Bath Road, Maidenhead, Berkshire SL6 1UH. Telephone: (0628) 33123.
Borland Altor, 11a Anderston Centre, Glasgow G2 7PH. Telephone: 041-226 4211. Softsel Computer Products, Softsel House, Syon Gateway, Great West Road, Brentford, Middlesex TW8 9DD. Telephone: 01-568 8866. First Software, Intec 1, Wade Road, Basingstoke, Hampshire RG24 0NE. Telephone: (0256) 463344.
Lotus Lotus Development (U.K.), Consort House, Victoria Street, Windsor, Berkshire SL4 3DD. Tel: (0753) 840281.
Microsoft Microsoft, Excel House, 49 De Montfort Road, Reading, Berkshire RG1 8LP. Telephone: (0734) 500741.
Open Access Software Products International (U.K.), 13 Horseshoe Park Estate, Pangbourne, Berkshire RG8 7JN. Telephone: (07357) 4081.
Paperback Software Computer Frontier (U.K.), Business and Technology Centre, Bessemer Drive, Stevenage, Hertfordshire SG1 2DX. Telephone: (0438) 310163.
PFS Softsel and First Software — for addresses see Borland above.
Smart Innovative Software, Southampton House, 192-206 York Road, London SW11 3SA. Telephone: 01-223 3876.
SSI Sentinel Software, Wellington House, New Zealand Avenue, Walton-on-Thames, Surrey KT12 1PY. Telephone: (0932) 231164.
Star Software Classics, 2 Schoolbell Cloisters, Arbery Road, London E3 5DD. Telephone: 01-981 4224. For WordStar, Micropro International, Haygarth House, 28-31 High Street, London SW19 5BY. Telephone: 01-879 1122. For Pocket products, CSD Ltd, Armstrong Mall, Unit B-11, Summit Centre, South Wood, Farnborough, Hampshire. Telephone: (0252) 522200.

TOP 10

ASHTON-TATE

After its initial success with dBase II, and then dBase III, Ashton-Tate seems to be pausing before its next attack on the market. But this has not stopped it adding several products to its range. It has proceeded by acquiring companies rather than launching internally developed programs. But compatibility has been retained, thus allowing the benefits of a software family to be reaped. The more recent products are Framework, a tightly integrated multi-function package, and the Multimate word processor. Data can be swapped between all of them. More recently Ashton-Tate has taken the Javelin spreadsheet on board. As yet it is only distributing Javelin outside the U.S. and Canada, but it may eventually form part of the whole suite. Other programs, including some for the Mac, are rumoured to be on the way.

RUNS ON

IBM PC and compatibles

PRICES

dBase III Plus £595, Framework £550, Multimate Advantage £495, Multimate 3.3 £375, Javelin £595

BORLAND

Borland is not an obvious candidate as a purveyor of software families, but it has been so prolific during its short existence that there now exists a full portfolio of products, many of which work together. Of course memory-resident programs like Sidekick are designed to work with anything anyway. But as we report on page 71 of this issue, Borland's Superkey works well in tandem with Sidekick. There is also the recently launched Travelling Sidekick, reviewed in last month's issue, which was conceived as an add-on to Sidekick itself. Turbo Lightning is another Borland program with wide applicability, and it too is likely to spawn a whole family of packages which work with it. All these programs are united by Borland's totally reasonable pricing, if by nothing else.

RUNS ON

IBM PC and compatibles; Sidekick also on Macintosh

PRICES

Sidekick £57, Travelling Sidekick £47, Superkey £47, Turbo Lightning £67

LOTUS

On the basis of turnover, Lotus is the largest software house in the world. Its profits are pretty healthy too. You might therefore expect there to be a gaggle of associated products clustered around 1-2-3, but in fact Lotus has surprisingly few such packages. There is Symphony — a kind of 1-2-3-4-5 — and Jazz, its Macintosh equivalent. Data can be swapped around between the latest versions. Lotus also has some auxiliary products like Report Writer for 1-2-3, and a spelling checker and outliner for Symphony. Lotus has been active in acquiring companies with products that complement 1-2-3, and there have been numerous rumours of word processors and databases on the drawing board. The Lotus standard is such a strong one that there will always be a cluster of products around it.

RUNS ON

IBM PC and compatibles; Jazz on Mac

PRICES

1-2-3 £395, Symphony £550, Jazz £295, Report Writer £120, Symphony spelling checker and outliner, £95 each

MICROSOFT

Microsoft has built up an impressive array of related software, but it has been accrued piecemeal and is certainly a far cry from the old-style families exemplified by PFS. On the IBM front there are four totally compatible products: Multiplan, Word, Chart and Project. Rbase 5000 is only being distributed by Microsoft outside the U.S., and is not fully integrated into the family. On the Mac there are Excel, Word, Multiplan, Chart and File, as well as the brand-new Works, reviewed in last month's *Practical Computing*. Excel is about to migrate to the IBM, running under Windows.

RUNS ON

IBM and compatibles; Macintosh

PRICES

IBM Multiplan £245, Word £425, Rbase 5000 £495, Chart £245, Project £345, Macintosh Multiplan £175, Excel £395, Word £175, Chart £125, File £175, Works around £295

OPEN ACCESS

Open Access from SPI started life as a monster package but has now been dispersed into separate modules. The database offers a full programming language, and the word processor offers most standard options. In many ways the spreadsheet with its extensive Sidekick-type utilities lies at the heart of the system: its diary, calendar, alarm, and appointment book are all memory resident and can be called up from other modules of the system. More are on the way, including a statistics package, project management, risk analysis and Monte Carlo simulation. There is also a networked version.

RUNS ON

IBM PC and compatibles

PRICES

word processor £130, spreadsheet £295, database £350, comms £100; £595 for complete set

PAPERBACK SOFTWARE

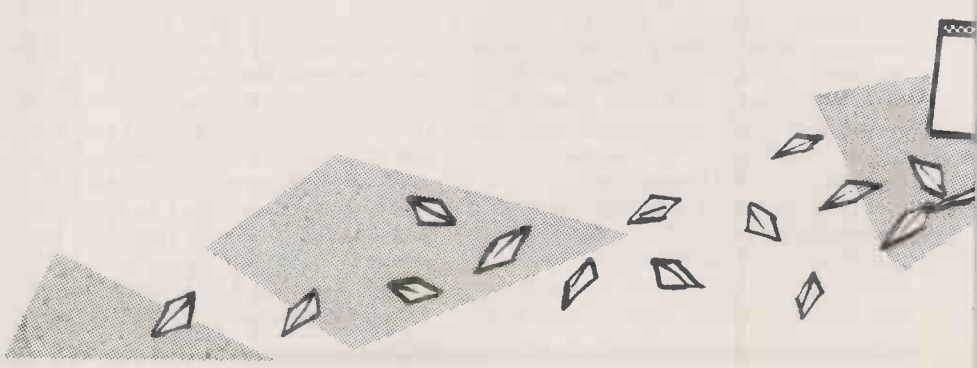
Adam Osborne is accustomed to sending shivers down the spines of industry leaders. He did it first with the Osborne portable, which at the time offered an almost unrefusable bargain of CP/M machine with bundled software. Now he has come up with Paperback Software, a family that falls into two main groups. Executive Writer, Executive Filer, Number Works and Draw It are low-end products. The more recent VP Planner is a 1-2-3 clone with many extra features at one-third the price of the original. It was reviewed in the February issue of *Practical Computing*. The latest in this line is VP Info, a dBase III Plus clone with added features such as a built-in compiler, LAN support as standard, and automatic support for the 8087 maths co-processor. There are also plans to bring out an advanced WP product.

RUNS ON

IBM PC and compatibles

PRICES

Executive Writer, Executive Filer, Number Works, Draw It, all £60; VP Planner, VP Info both £99.50



PFS

The PFS family from Software Publishing Company has earned an enviable reputation for being genuinely easy to use. The range consists of Write, Plan, Graph, File and Report. On the IBM and Apple IIe and IIc, File and Report are bundled together, while on the IBM Plan and Graph are also sold as a combined package. On the Macintosh, only File and Report are available, and they are sold together. Although not part of the PFS family, Harvard Total Project Manager and Harvard Presentation Graphics have recently been acquired by Software Publishing Company, and form a sort of mini-family themselves.

RUNS ON
IBM PC and compatibles; Apple IIe and IIc; Macintosh
PRICES
for Apple IIe and IIc, £95 each; for IBM, Write £112, File plus Report £165, Plan plus Graph £165, Harvard Total Project Management £332, Harvard Presentation Graphics £295; for Macintosh, File plus Report £165

SSI

Word Perfect, now the cornerstone of SSI's range, began life as a product running on Data General minis. Its latest upgrade version 4.1 has brought acclaim from several quarters; many regard it as the best word processor around. Today it has been joined by the Mathplan spreadsheet and SSI Database. Unifying all these there is Word Perfect Library, which acts as a shell environment. There are also a number of built-in facilities, rather along the lines of Borland's Sidekick, including a calendar with a To Do list, an appointments scheduler with alarms, memos, a multi-function calculator, a file manager and list manager, as well as an extensive program editor. Menus can also be created, and non-SSI products can be hooked in.

RUNS ON
IBM PC and compatibles
PRICES
Word Perfect £425, Mathplan £195, SSI Database £195, Word Perfect Library £149

STAR

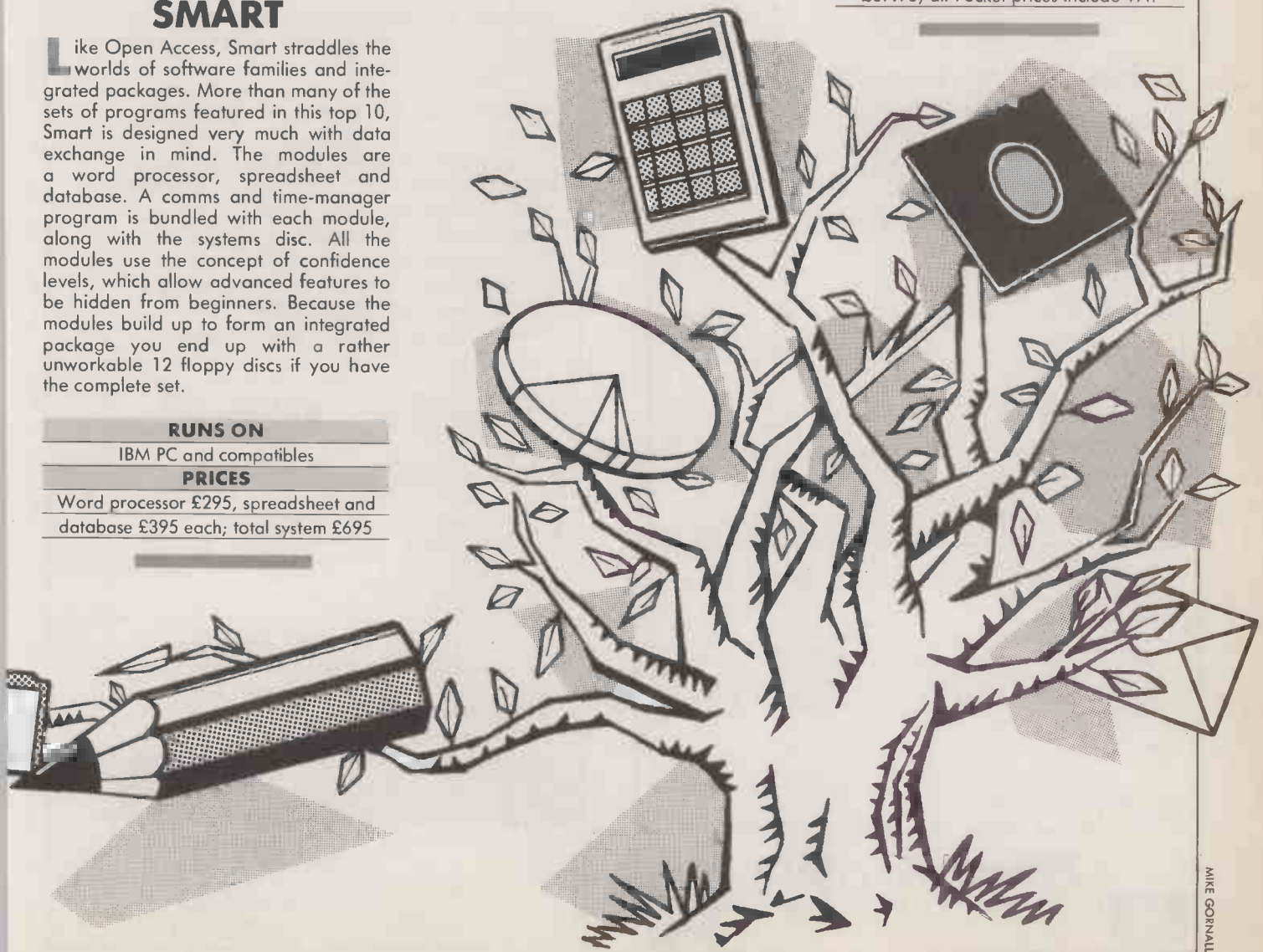
Everybody knows WordStar, but the other members of the family have fared less well in the public consciousness. As a result, Micropro has sold the marketing rights for the other members to Software Classics. Calcstar is the spreadsheet; the database is Datastar, which has an associated report writer called Reportstar. There is also a stand-alone sorting package Supersort. Datastar and Reportstar are also sold together as Infostar Plus 1.6, which also contains a menu-building system called Starburst. Similar products are available for the Amstrad machines in the Pocket versions. The programs are partly integrated so that it is possible, for example, to run Calcstar without leaving WordStar.

RUNS ON
IBM and compatibles; Amstrad 8256 and 6128
PRICES
WordStar £295, Calcstar £99, Datastar £175, Supersort £145, Infostar £245, Infostar Plus 1.6 £275; Pocket WordStar £49.94, Pocket Calcstar £39.95, Pocket Supersort £49.99, Pocket Datastar £49.99, Pocket Reportstar £39.95, Pocket Infostar £69.95; all Pocket prices include VAT

SMART

Like Open Access, Smart straddles the worlds of software families and integrated packages. More than many of the sets of programs featured in this top 10, Smart is designed very much with data exchange in mind. The modules are a word processor, spreadsheet and database. A comms and time-manager program is bundled with each module, along with the systems disc. All the modules use the concept of confidence levels, which allow advanced features to be hidden from beginners. Because the modules build up to form an integrated package you end up with a rather unworkable 12 floppy discs if you have the complete set.

RUNS ON
IBM PC and compatibles
PRICES
Word processor £295, spreadsheet and database £395 each; total system £695



MIKE GORNALL

The latest refinements in technology have radically changed the face of the printer market. **Ian Stobie** looks at what this means for office PC users.

TOWARDS THE PERFECT PRINTER

It has taken some time for manufacturers to come up with printers that properly match the needs of business personal-computer users. Before PCs arrived on the scene, the impact matrix printer and the daisywheel were already well established, the one in data processing and the other attached to dedicated word-processing equipment.

In the past, PC users have had to make do with the printing technologies on offer, and this has presented them with a stark choice. You could buy a daisywheel printer for the output quality it offers, or a matrix printer for speed. Both have major drawbacks: daisywheels are slow, noisy and inflexible, while matrix printers generate output of indifferent quality. What the typical PC user wants, of course, is both quality and speed — and maybe the ability to print graphics as well.

A brief look at the sort of software packages people are using gives a good idea of the tasks today's printers should be able to tackle. The top-selling software packages are now almost all integrated, and increasingly have sophisticated graphics. The major spreadsheets all incorporate charting facilities, while many word-processing packages now support multiple founts and type sizes. Some even let you incorporate pictures and charts.

To get the best from this kind of software you need printers with a great deal of flexibility. Laser printers and matrix printers are the types most likely to fit the bill — and it is lasers that have been the sales success of the past year. They have rapidly established themselves as high-speed replacements for daisywheels for correspondence work, and are also carving out a niche in the entirely new personal-publishing market. They are supremely flexible in the way they allow you to mix text in different sizes and founts on the same page. And they offer excellent print quality in near silence, at speeds equal to the faster matrix printers.

Problems are the initial price, which has tended not to be much below £2,000 for even the most basic laser, and questionable reliability and serviceability. Laser printers are descended from the office photocopier, which means you cannot assume they will work untended. You have to change the paper, occasionally replace toner and so on. On page 99 we focus on these two aspects of laser printers, looking first at the cheapest models on offer, and secondly at the new generation of machines designed for a heavier workload with less human intervention.

Matrix printers have always been well suited for producing quick drafts of documents or printing out spreadsheets, and most of them can handle graphics and special character sets with the right software. But the output quality has tended to look a bit rough. Many business users have therefore been reluctant to rely on matrix printers for producing material for external distribution where a good impression counts. This attitude may to some extent now be changing — the ubiquity of the personal computer in business may itself be partly responsible.

But in any case, the printers themselves are improving. Most matrix-printer manufacturers now offer models which work at more than one speed, giving you better-quality output when you want it by making several passes over the paper. A typical nine-pin matrix printer will drop to a quarter the speed when switched from printing in draft mode to near letter quality (NLQ): from say 200 characters per second (cps) to about 50.

These machines are fine for low-volume users, but for many business applications they are too slow. A quicker way of achieving improved quality is to have more than one bank of pins in the matrix print head. We investigate such printers on page 94. As well as producing high-quality text, the fastest of these machines can get up to speeds of around 400cps when printing in draft mode.

While these developments have been taking place in the techniques for producing monochrome text and graphics, colour printing has been marking time. There is still no cheap way of photocopying in colour, and this tends to limit the usefulness of producing multi-coloured documents from your computer. Most business packages for the IBM PC make extensive use of colour, so on the face of it the situation seems unsatisfactory. But it is fair to say that most of the time the real function that colour serves on a computer screen is to improve the readibility and attractiveness of the display. There is not usually much information tied up in the colour as such.

Sales of colour printers to business users have therefore generally tended to be slow. The one big exception is machines suitable

(continued on next page)

Quality matrix printers page 94

Lasers page 99

Plotters page 103

(continued from previous page)

for producing images of sufficient quality for presentation purposes. Here users often want their output to be on overhead projector (OHP) film rather than paper, and quality is likely to be of more interest than speed.

Colour printing tends to form a rather specialised segment of the market, where a different range of technologies are employed. Users have been prepared to shell out for separate machines for colour work, buying plotters, thermal-transfer printers or ink-jet machines to do the job. On page 103 we compare the options available for presentation work, and discover whether colour printing is about to join the mainstream printer market.

Taking the printer market as a whole, what is most striking is the huge number of models available, employing several different ways of marking the paper. We concentrate in this survey on what look to be the best options for PC users now. But it is worth making a couple of points about the technologies which now appear to be on the way out, or which are not yet fully ready for routine business use.

DAISYWHEELS

Daisywheel printers appear to have a limited future. They give very fine quality for word-processing work, but their main problem is that they are not at all flexible. You can only print in a limited range of type sizes, one typeface at a time, with the characters on your chosen printwheel. They have only a very limited ability to handle graphics, and are painfully slow for those occasions when output quality does not matter. They are also incredibly noisy. But to conclude that this formidable list of drawbacks means instant oblivion for the daisywheel would be wrong. If all you want to do is write letters, they do the job, and can do it quite cheaply. There is massive production overcapacity in this sector, and so daisy manufacturers are likely to continue to cut prices to levels that barely cover their costs. All the same, daisywheel printers make increasingly less sense for the majority of users, as they are too inflexible to get the best from modern software.

Ink-jet and thermal-transfer printing do not feature much in this survey except in the discussion of colour. To get good results from these printers you need to use the right paper. Although the range of papers you can print on is not as restricted as it once was, this limitation is not acceptable for general business use.

IBM's variant on the thermal-transfer technique, employed in the Quietwriter, goes some way towards overcoming this limitation. The Quietwriter uses a special aluminium-based ribbon which heats up from the inside when it passes under the electrodes in the print head. This seems to give good results across a much broader range of types of paper, but there are problems, principally in the cost of the ribbon. The Quietwriter remains a unique machine.

DOT-MATRIX WITH CLASS

Matrix printers seem set for a new lease of life with the arrival of 18- and 24-pin designs offering improved print quality and greater speed.

Over three-quarters of the office printers sold in Western Europe in 1985 were impact dot-matrix printers. Daisywheels had about 11 percent of the market, non-impact technologies such as ink jet and thermal transfer nine percent, and the glamorous laser-based page printers just two percent.

But that was last year. The question now is whether the matrix printer can retain its position as the undisputed workhorse of the PC-equipped office. Perhaps its main problem compared to competing technolgies is poor print quality: the obvious solution is to increase the number of dots going down on to the paper.

Matrix printers work by building up characters from a pattern of dots. Obviously, the smaller the dots and the more of them you have in a given area, the better the output will look. The very first matrix printer — the Centronics 101 introduced in 1971 — had seven pins arranged in a vertical row. Each character was built up on a seven-by-five or seven-by-seven matrix as the print head scanned horizontally across the paper. Modern matrix printers work in much the same way, but most have nine pins and use a nine-by-nine character matrix.

To increase print quality further many nine-pin machines now also have a near letter quality (NLQ) print mode. For this the print head makes a second or even a third pass, with the paper advanced slightly between passes so that the second set of dots overlaps and falls between the first set to give something approaching an 18-dot vertical resolution. But you obviously reduce speed pretty dramatically by making the extra pass — at least halving it.

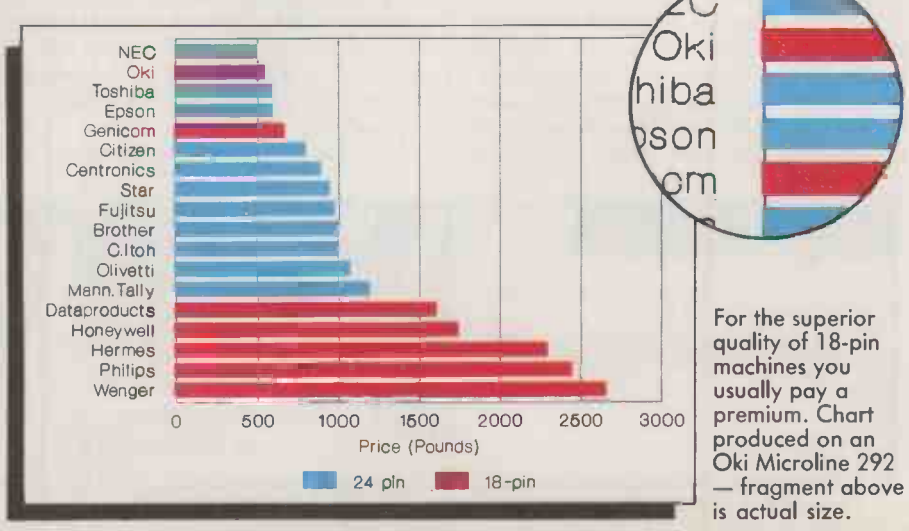
To achieve improved quality without such a drop in speed you need to add more pins to the print head. Printers with 18- or 24-pin print heads are becoming increasingly common. Such machines have been around for several years, but they have generally been rather expensive and so have sold more to data-processing departments with mini and mainframe systems rather than to office PC users. Epson's introduction of the LQ-1500 in early 1984 marked a turning point. This 24-pin printer was aimed at the office PC user, and it has since become a standard machine for PC software houses to write for.

This year the matrix market has entered a new phase. Epson is probably about to replace the LQ-1500, as it has brought out two new, cheaper models: the LQ-800 and LQ-1000. At the same time a large number of new players have entered the market: 10 out of the 18 machines in our survey are very new. Prices too are falling, and most of the new machines are in the £500 to £1,000 range.

TWO ROWS OF PINS

The 18- and 24-pin machines are more complicated than nine-pin ones. Instead of being arranged in a single row, the pins in the print head are arranged in two parallel rows of nine or 12 pins each. The two rows are usually staggered slightly so that dots put down by the second row fall between those put down by the first. This staggered arrangement makes a great deal of sense for achieving the best quality, and is the most common.

Where heavy-duty draft printing is a more important requirement than high quality, a few manufacturers have opted for an arrangement with the two rows of pins placed exactly side by side. As the print head moves across the paper the two sets of pins can fire at alternate horizontal positions, giving the first set of pins time to recover while the second set fire. This allows the head to print much more rapidly across the



For the superior quality of 18-pin machines you usually pay a premium. Chart produced on an Oki Microline 292 — fragment above is actual size.

Good paper handling contributes to the Centronics Printstation 240's high work rate.

Epson's latest, the LQ-800, benefits from plenty of compatible software.

The IBM-compatible Hermes PC4 features colour and an adjustable pin configuration.

Good for graphics and cheap, the Oki Microline 292 has colour as standard.

A 132-column carriage is standard on many models, including the Olivetti DM-600.

The Toshiba P-341 and its 80-column sister have a wide variety of fount options.

paper for the same degree of mechanical stress, but obviously at only nine or 12 dots vertical resolution.

The very fastest printers in this survey generally use the in-line arrangement, achieving speeds of 400cps or more. To get high-quality print they have to make more than one pass, so the speed difference between draft and top-quality modes is quite large: typically, quality printing takes four times as long as draft.

Two of the most expensive machines in this survey, from Wenger and Hermes, have extremely sophisticated print heads. The two rows of pins can actually move in relation to each other to assume either the staggered or the in-line configuration. This allows the printers to achieve fast draft speeds and still print fairly quickly in quality mode.

The other fundamental issue dividing manufacturers is whether to go for 18 or 24 pins. On the face of it 18 pins arranged in two banks of nine makes the most sense. It is a natural progression from nine pins, making it easier to get the machines to work with packages originally written for standard nine-pin printers. Most 24-pin printers will work with an equally wide range of packages, but the results can look rather odd when you are printing graphics. A common problem with some printer/software combinations is that the aspect ratio is not right, so what should be a circle is squashed into an ellipse.

Only a minority of the printers in this survey use 18-pin heads, and they are generally the more expensive ones. The majority of the new, lower-cost entrants use 24-pin heads; Oki and Genicom are notable 18-pin exceptions. The reason for this is not at all obvious until you remember that printer manufacture is dominated by Japanese companies. While the Roman alphabet looks quite acceptable when printed by a matrix nine dots high, the Japanese Kanji script requires 12 dots, so when Japanese printer companies go for higher quality, the obvious choice is the 24-pin head. Much of the new printer technology was originally developed in Japan. But most of the 18-pin printers are not Japanese; they are also more expensive.

(continued on page 98)

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DX2200 (9-dot)

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We also know that printers are like eyes: you never notice them unless they fail or become a bother. To make sure our DX and DL Series printers never become a bother, we paid close attention to the little things: like making it possible to print single sheets without removing continuous forms, and adding an LCD display to our DL models to give an English display of the selected operation mode.

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You won't find 9-dot printers that give a better output than our DX models, and our 24-dot DL models have taken the visible dots out of dot-matrix printing. You can also print colour graphics with our colour ribbon. With maximum printing speeds of 180 CPS in draft mode and 60 CPS in letter-quality mode, you will spend only a little time twiddling your thumbs waiting for a printout. And because all models generate less than 55 dB acoustic noise, you will be able to print and talk on the phone at the same time.

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DL2400C	(24 pin dot-matrix, colour)
DPMG9	(9 pin dot-matrix, 80 col.)
DX2100	(9 pin dot-matrix, 80 col.)
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circle 153 on enquiry card

QUALITY DOT-MATRIX

	TYPE	PRICE	SPEED*	FEATURES	SIMILAR MODELS
Brother 2024L	24-pin	£995	96/160	wide carriage; optional sheet feeder	none from Brother; Centronics P-240 very similar
C. Itoh 1570	24-pin	£1,000	66/200	wide carriage; optional colour and sheet feeder	80-column C-310, £600; wide-carriage C-315 on the way, £750
Centronics Printstation 240	24-pin	£895	96/160	wide carriage; optional sheet feeder £227	358 is 18-pin 100/400cps colour model, £2,174
Citizen MSP-35	24-pin	under £800	66/200	wide carriage; optional sheet feeder but no colour option	
Dataproducts 8070	18-pin	£1,615	100/400	wide carriage; colour option £180	8072 is IBM PC version; range sometimes goes under name of Paper Tiger
Epson LQ-800	24-pin	£595	60/180	80-column; optional sheet feeder, large range of compatible software; new model	LQ-1000 wide carriage, £795; LQ-1500 older model
Fujitsu DL-2400	24-pin	£978	60/180	wide carriage, good paper handling, emulates 18-pin to do IBM graphics	DL-2400C colour £1,110; faster DPL-24 £1,350; DPL-24C colour £1,544
Genicom 1020	18-pin	£670	100/200	80-column; optional colour kit and sheet feeder promised	1020 wide carriage, £840
Hermes 616	18-pin	£2,300	100/400	wide carriage, colour as standard; optional sheet feeder; unusual print head	PC4 is IBM-compatible with colour graphics, £1,995
Honeywell HISI 4/66	18-pin	£1,750	90/480	wide carriage, colour as standard, generally good paper handling; optional sheet feeder; new model	
Mannesmann-Tally MT-330	24-pin	£1,195	75/300	wide carriage; optional colour and sheet feeder; new model	MT-490 is heavy-duty 18-pin model, about £2,000
NEC P6	24-pin	£496	65/216	80-column, unusually quiet; optional sheet feeder; new model	P7 wide carriage, £595, P5XL colour and carbon ribbon version, £1,083
Oki Microline 292	18-pin	£549	100/200	80-column, colour as standard, good for graphics; new model	Microline 293 wide carriage, £749; 294 high speed, £995
Olivetti DM-600	24-pin	£1,069	70/200	wide carriage; optional sheet feeder, but no colour; new model	
Philips GP-300	18-pin	about £2,450	80/300	wide carriage; optional sheet feeder	GP-300PX1 is IBM PC compatible; GP-300L has even wider carriage
Star NB-15	24-pin	£949	100/300	wide carriage; optional sheet feeder; new model	
Toshiba P-321	24-pin	£590	72/216	80-column; optional sheet feeder; new model	P-341e wide carriage; P-351 high speed; P-351c colour, £1,395
Wenger 4/1	18-pin	£2,663	130/400	wide carriage, uses the Hermes print head; colour optional	3/1 is slower in quality mode but same speed in draft, £2,000

*Speed is quoted in characters per second for the highest-quality mode and for the fastest draft mode.

SUPPLIERS

Brother Computer Peripherals Division Shepley Street, Audenshaw, Manchester M34 5JD. Telephone: 061-330 6531
C. Itoh Electronics Co Beacon House, 26-28 Worple Road, London SW19 4EE. Telephone: 01-946 4960
Centronics Data Computer U.K. Petersham House, Harrington Road, London SW7 3HA. Telephone: 01-581 1011
Citizen Europe Wellington House, 4-10 Cowley Road, Uxbridge, Middlesex UB8 2XW. Telephone: (0895) 72621
Dataproducts Heron Industrial Estate, Spencers Wood, Reading, Berkshire RG7 1PJ. Telephone: (0734) 884777
Epson (U.K.) Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH. Telephone: 01-902 8892
Fujitsu Europe 54 Jermyn Street, London SW1Y 6NQ. Telephone: 01-408 0043
Genicom Summit Centre, Summit Avenue, Southwood, Farnborough, Hampshire GU14 0LU. Telephone: (0252) 521555
Hermes Langs Computer Products Ltd, Hanworth Lane Trading Estate, Chertsey, Surrey KT16 9LZ. Telephone: (09328) 61241
Honeywell Information Systems Italia Maxted Road, Hemel Hempstead, Hertfordshire HP2 7DZ. Telephone: (0442) 42291
Mannesmann-Tally Molly Millar's Lane, Wokingham, Berkshire RG11 2QT. Telephone: (0734) 788711
NEC Business Systems (Europe) 35 Oval Road, London NW1 7EA. Telephone: 01-267 7000
Oki X-Data Ltd,750-751 Deal Avenue, Slough Trading Estate, Slough, Berkshire SL1 4SH. Telephone: (0753) 72331
British Olivetti PO Box 89, 86-88 Upper Richmond Road, London SW15 2UR. Telephone: 01-786 6666
Philips Business Systems Elektra House, 2 Bergholt Road, Colchester, Essex CO4 5BE. Telephone: (0206) 575115
Star Micronics U.K. Craven House, 40 Uxbridge Road, London W5 2BS. Telephone: 01-840 1800
Toshiba Information Systems U.K. International House, Windmill Road, Sunbury-on-Thames, Middlesex TW16 7HR. Telephone: (0932) 785666
Wenger Printers Unit 10, The Valley Centre, Gordon Road, High Wycombe, Buckinghamshire HP13 6EQ. Telephone: (0494) 450941

(continued from page 95)

Whatever the number of pins, all the high-density matrix printers have a number of characteristics in common. Generally you get a choice of draft and letter quality (LQ). Epson's LQ-800 for example goes at 180cps in draft mode and at 60cps in LQ. It uses a 23-by-9 matrix in draft mode and 23-by-29 in LQ. The print head moves more slowly across the paper to achieve the greater horizontal resolution in LQ mode.

Some printers offer three speeds. The 18-pin Oki Microline 292 offers 200cps in draft mode, 100cps in NLQ and 50cps in enhanced mode. Draft characters are formed on a nine-by-nine matrix, NLQ on a 17-by-17 matrix, while enhanced mode involves a second pass with the dots put down in the same pattern but slightly offset.

As these printers are inherently more expensive than conventional nine-pin units they generally include other features which would be unusual on cheaper machines. Many can take wide paper, allowing them to print across 132 or 136 columns at 10 characters per inch; this is particularly useful for tasks like printing spreadsheets. Some manufacturers also offer 80-column models, but for many the wide-carriage model is standard.

On the 18-pin machines colour is usually a standard feature, and it is available as a cheap option on virtually all the others. To turn any of these machines into a colour printer involves little more than modifying the ribbon carrier to take a horizontally striped multi-coloured ribbon. Typically it will have stripes of yellow, cyan, magenta and black. By overstriking combinations of

these you can get seven solid colours, with more shades obtainable by printing patterns of dots under software control. The colour lacks the saturation achieved by some of the other colour-printing technologies discussed on page 103, but it would be acceptable for many applications.

As befits premium products, most high-density matrix printers have good paper handling. Traction and friction feed are usually standard, with automatic single-sheet feeders available as options. You also get a choice of type fount. If you do not like the built-in type fount or founts, you can generally select from a range of plug-in replacement cartridges.

Selecting between different resident founts or between draft and quality mode is generally made easy. DIP switches — a long-standing irritation to printer users — have been replaced by easy-to-use front panels. On most of the printers we tried, selecting the desired quality and fount was simply a matter of pressing a few buttons on the front panel and, at worst, changing a cartridge.

DOTS STILL SHOW

The general standard of output in letter-quality mode is very good, though still inferior to a daisywheel or laser printer. These matrix printers typically give you a resolution of 120 dots to the inch at maximum quality, as compared to a laser printer's 300. More important, just from looking at the output you can tell that it was produced with some kind of computer printer, and this still worries some people. It is not the case with either daisyweheel or laser output. That said, the output is very legible, and you gain the advantage over a daisywheel of being able to print graphics and special characters without difficulty.

High-density matrix printers come off well in comparison with laser printers, especially when you start considering the requirements of high-volume printing. In terms of real work done, the 18-pin matrix printers may actually be faster in draft mode than a typical eight-page-a-minute laser printer. Any impact printer is obviously much noisier than the near-silent lasers, but these machines have much more flexible paper handling.

The cheaper 24-pin matrix printers may not be able to keep up with the work rate of a laser printer, but they still offer a good compromise between output quality and speed. And you can generally get them to print in colour, something a laser printer cannot do.

A likely outcome for the future is for lasers to cream off the top end of the office market, with the flexible 24-pin matrix printers taking on the utility role of the present-day nine-pin matrix printer. Daisywheels could still compete on price for the lower end of the office market. The 18-pin printers will probably come to occupy a specialist niche, appealing to high-volume users, while nine-pin matrix printers, lacking the ability to produce letter-quality output at speed, will be increasingly relegated to the home.

LASERS: QUICK AND QUIET

The struggle for control of the rapidly growing laser-printer market finally looks like producing real benefits for the user.

Hewlett-Packard's Laserjet and the Canon LBP A1 were launched in mid-1984 and at the start of 1985. They were the first laser printers cheap enough to appeal to personal-computer users, and these two companies have dominated the market for low-cost laser printers ever since. Last year they took over three-quarters of the sales in Western Europe.

But other companies are attempting to break into this very rapidly growing sector, and most predictions are that the PC laser market will more than double in size during 1986. The question is whether this assault can bring real benefits to the user, either in terms of lower laser-printer prices or in improved performance.

In their basic configurations the Canon and HP machines both cost around £2,600. Discounting is fairly widespread though, especially on the Canon machine, so that in practice the price is around £2,000. Both companies also offer enhanced models in the form of the Laserjet Plus and the Canon A2, which sell for around £1,000 more than the basic models.

A basic laser printer makes a good replacement for a daisywheel: it is far quicker and very much quieter, while offering output quality which is almost as good. Lasers can put a good, solid black on to overhead-projector film as well as paper, which means you can also use them to create good-quality transparencies using the larger text sizes.

The enhanced models offer a greater choice of type fount and the ability to mix high-quality graphics in with the text on the page. This makes them suitable for the whole range of PC printing tasks, not just word processing. You can print out charts from Lotus 1-2-3 for example, and in most cases you could just dump whatever is on the screen to the printer.

The Canon-based QMS Kiss: by far the cheapest laser yet available.

Both Hewlett-Packard and Canon have built their machines around the same print engine, the LBP-CX made by Canon. This means they all have much in common: they use the same consumables and have the same top speed of eight pages a minute (ppm).

Initially, other manufacturers wishing to bring out laser printers also went to Canon for this basic component, adding their own controllers, interfaces and casing. This produced a crop of rather dull machines in the first generation of PC laser printers. They generally had little to recommend them in either features or price over the HP and Canon originals, so we have ignored them in this survey.

The only really outstanding machine in the first generation of Canon-derived units was Apple's Laserwriter. It was designed originally for use with the graphics-based Macintosh computer, and it has exceptional versatility in handling graphics and a wide variety of different type founts.

The arrival of this machine almost by itself created a new use for personal computers in producing things like newsletters, catalogues and reports in a near finished form. Apple's success in developing this concept of personal publishing has helped fuel the demand for laser printers generally.

Most machines with enhanced graphics have some potential for personal-publishing use. But some are particularly suitable because they have the ability to interpret specialised page-description languages used by the more ambitious personal-publishing software. For instance, the Laserwriter can interpret Postscript, the most popular of these languages.

Apple's strategy for competing with HP

(continued on next page)

CONTROLLERS, ENGINES AND PRINTERS

Laser printers consist of two main parts: a large photocopier-like engine and a small built-in controller. The controller takes the form of one or more circuit boards, complete with a powerful microprocessor. It turns the data arriving from the PC into an image of a page in the printer's own memory buffer, and then gets the engine to transfer the image on to paper. Printer manufacturers usually make their own controllers, but generally buy in the engine from a company specialising in photocopier technology.

The basic physical attributes of the complete printer — such as its size, maximum speed, output quality and the life of the consumables such as the toner and drum — depend mainly on the sort of engine used. More subtle characteristics, such as the range of type founts available, the degree of graphics support, compatibility with software and the actual speed achieved in practice by the printer, depend on the controller.

(continued from previous page)

and Canon was to create a fairly specialised upmarket niche for itself. A more direct approach is to compete on price. At the moment the typical laser printer is roughly the same price as the computer it attaches to, which is probably a barrier to sales.

But beating the Canon and HP machines on price has proved difficult. QMS looks like being the first company to get much below the £2,000 barrier, with its new £1,368 Kiss laser printer. This irritating if easily remembered name is an acronym dating back to the early days of computing. Keep It Simple, Stupid is the version most people are familiar with, though QMS claims it stands for Keep It Simple and Smart.

QMS has kept down cost by keeping the controller simple. The printer is designed strictly for the daisywheel-replacement market, and lacks graphics enhancements. It is a little slower than most other straightforward lasers, despite using the same Canon engine, but this probably does not matter much.

Dropping the price any further will depend on getting the price of the engine down. The Canon engine is sold in such large numbers that it probably already has the lowest production costs of conventional laser engines. And Canon is unlikely to reduce the price it charges any more than it has to.

But the arrival of a radically different type of engine from NEC is a promising development. The NEC unit does not use a laser or the complicated optical system needed to scan the beam across the photo-sensitive drum. Instead, an array of light-emitting diodes does the job.

Theoretically this type of LED engine should be cheaper to produce once production has reached the right scale because it is fundamentally simpler. However, the print quality of the LED output we have seen does not look quite as good as conventional laser output, and as yet LED printers are not available in large numbers or at particularly competitive prices.

CHEAPER CONSUMABLES

Attempts to improve on the Canon/HP type of printer in terms of cost of ownership look like being more successful. Centronics' £1,995 Laser 8 is based on a compact new Sharp laser engine that gives it the same 8ppm top speed and 300 dots to the inch printing resolution as the Canon. Where it scores is in its longer-lasting and cheaper consumables.

There are three parts of a laser printer which the user has to replace periodically: the toner, which is the soot-like ink; the developer, which is a metallic powder used to distribute the toner more evenly; and the photo-sensitive drum.

On the Canon engine the toner and drum come in a single cartridge which you replace every 3,000 pages. The new cartridge costs between about £75 and £90 depending on your source. On the Sharp engine the toner and drum are separate. The toner lasts 5,000 pages, the replacement costing £40. The drum lasts 15,000 copies and costs £50. This works out at something less than half the cost per page.

There is another benefit to choosing the Sharp machine. The Canon drum is made of selenium, which is toxic. This means you really should not dispose of it by tossing it casually into a waste bin. Copier and laser-engine manufacturers are moving towards using a safer substance called organic photo-conductor (OPC). This is what Sharp and most of the other new laser engines use.

Canon-based printers really make most sense for users producing from 500 to no more than about 3,000 pages a month. But

Daisywheel-maker Qume has chosen the Hitachi engine for its 10ppm Laser 10 printer.

MANNESMANN TALLY's

The compact Kyocera-based Mannesmann-Tally MT-910.

CENTRONICS

Running costs are low on the Centronics Laser 8.

many users produce more, and this creates probably the most promising gap of all in the market for other laser suppliers.

Several improvements can be made to the Canon/HP type of printer to make it more suitable for heavier use. Greater speed always helps, and better paper handling and longer-lasting consumables would enable to the machine to run with less attention.

Paper handling was a particular weakness on the original machines. The Canon and HP laser printers have one 100-sheet paper input cassette, but 250-sheet cassettes are more desirable, with perhaps the option of adding a second cassette, photocopier-style, for a different type of paper. As yet no one seems to have thought of offering the user a way of using the familiar fanfold paper found on traditional computer printers.

New machines are now coming on to the market with precisely these heavy-duty features. Qume's Laser 10 and Mannesmann-Tally's 910SL are good examples. Both machines cost just under £3,000 and run at a top speed of 10ppm. They have good paper handling and come from well-established printer manufacturers with strong existing distribution networks and well-recognised brand names. The Qume machine is based on a Hitachi engine, which has a drum life of 30,000 pages, while the MT-910SL uses a new engine from Kyocera.

One or two manufacturers are bringing out even quicker laser printers, including IBM itself with its 12ppm Pageprinter based

(continued on next page)

PAGE PRINTERS

	TYPE	PRICE	SPEED	PRINT ENGINE	COMPATIBILITY	PAPER FEED	COMMENTS	SIMILAR MODELS
Canon LBP-8 A1	laser	£2,600	8ppm	Canon	Diablo	100	the standard laser against which others are judged	A2 hos full-page graphics, £3,850
Centronics Laser 8	laser	£1,995	8ppm	Sharp	Diablo, Epson, IBM	100	low price and consumables costs, fairly compact	none as yet
Corona LP-300	laser	£2,995	8ppm	Canon	Epson, IBM	100	connects via IBM card slot, comes with range of founts on disc	none
Dataproducts LZR-1230	laser	about £3,000	12ppm	Toshiba	Diablo, Epson, HP, IBM	250	high speed and good paper handling	LZR-1260 and 26ppm LZR-2660 support Postscript
Datasouth Pagewriter 8	LED	£2,850	8ppm	NEC	Diablo, HP, Epson	250	good paper handling and low consumables costs; slightly inferior print quality	NEC machine coming soon
Document Technology DL-20	LED	£6,500	12ppm	Kontek	Diablo, HP, Epson	2 x 250	fast, good paper handling, disc drive, founts on disc; slightly inferior print quality	IBM Pagewriter is virtually identical; DL-40 is faster
Facit Opus 2	laser	£3,695	8ppm	Ricoh	Diablo	250	good paper handling, below-average consumables costs	Opus 2E has better graphics, £3,895; Opus 1 runs at 12ppm, £6,495
Genicom 5010	laser	about £2,800	10ppm	Hitachi	Diablo, IBM, HP		low consumables costs, wide range of optional founts	none yet
Hewlett-Packard Laserjet Plus	laser	£3,518	8ppm	Canon	HP	100	probably the industry standard for graphics, with large software base	Laserjet has more limited graphics, £2,664
IBM 3812 Pageprinter	LED	£6,408	12ppm	Kantek	Diablo, Epson	2 x 250	fast, good paper handling, disc drive, founts on disc; slightly inferior print quality	almost identicol to Document Technology DL-20; other IBM lasers are expensive
Mannesmann-Tally MT-910SL	laser	£2,995	10ppm	Kyocera	Diablo, Qume, HP, Epson, IBM	250	good paper handling, low consumables costs	none yet
Minolta SP-124	laser	n/a	12ppm	Minolta		100	fast, compact, but with slightly inferior print quality; not available till end of 1986	22ppm SP-324 will be aimed at network users
QMS Kiss	laser	£1,368	6ppm	Canon	Diablo, Qume, Epson	100	sacrifices speed for price	8ppm graphics-orientated Lasergrafix 800, £7,437
Qume Laser 10	laser	£2,880	10ppm	Hitachi	HP, Qume, IBM, Epson, Diablo	250	good paper handling, low consumobles costs, compact	Laser 10 Plus has better grophics, £3,499
Ricoh LP-4080	laser	about £3,000	8ppm	Ricoh	Diablo	250	good paper handling, below-average consumables costs	12ppm LP-4120
Xerox 4045CP	laser	£4,565	10ppm	Xerox		250	optional adaptor converts it to photocopier	also available under Zygal and EPS brand names

SPEED is quoted in pages per minute and corresponds to the maximum speed for each unit.
PAPER FEED quotes the maximum number of sheets that the paper feed hopper(s) will hold.

SUPPLIERS

Canon U.K. Canon House, Manor Road, Wallington, Surrey SM6 0AJ. Telephone: 01-773 3173
Centronics Data Computer U.K. Petersham House, Harrington Road, London SW7 3HA. Telephone: 01-581 1011
Corona Cordata, Templar House, 82 Northolt Road, South Harrow, Middlesex HA2 0YL. Telephone: 01-864 1744
Dataproducts Heron Industrial Estate, Spencers Wood, Reading, Berkshire RG7 1PJ. Telephone: (0734) 884777
Datasouth Datotrade Ltd, 38 Billing Road, Northampton NN1 5DQ. Telephone: (0604) 22289
Document Technology Quest International Computers Ltd, School Lane, Chandlers Ford, Hampshire SO5 3YY. Telephone: (04215) 66321
Facit Data Products Maidstone Road, Rochester, Kent ME1 3QN. Telephone: (0634) 401721
Genicom Summit Centre, Summit Avenue, Southwood, Farnborough, Hampshire GU14 0LU. Telephone: (0252) 521555
Hewlett-Packard Literature Section, Eskdale Rood, Winnersh Triangle, Wokingham, Berkshire RG11 5DZ. Telephone: (0734) 784774
IBM U.K. PO Box 32, Alencon Link, Basingstoke, Hampshire RG21 1EJ. Telephone: (0256) 56144
Mannesmann-Tally Molly Millar's Lane, Wokingham, Berkshire RG11 2QT. Telephone: (0734) 788711
Minolta U.K. Office Automation Division, 1-3 Tanners Drive, Blakelands, Milton Keynes MK14 5BU. Telephone: (0908) 617965
QMS Pragma Ltd, Pragma House, Radlett Road, Colney Street, St. Albans, Hertfordshire AL2 2EP. Telephone: (0927) 63411
Qume (U.K.) Qume House, Parkway, Newbury, Berkshire RG13 1EE. Telephone: (0635) 31400
Ricoh Nexel Ltd, 3 Jefferson Way, Thame, Oxfordshire OX9 3SU. Telephone: (084421) 3151
Xerox Rank Xerox (U.K.) Ltd, Bridge House, Oxford Road, Uxbridge, Middlesex UB8 1HS. Telephone: 01-380 1418

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on a fast LED engine from Kantek. But there is some doubt whether speeds much above 10ppm make much sense since it is beyond the ability of most personal computers to send information to the printer this fast. One PC designated as print server on a network, with nothing else to occupy it, might just be able to keep up, but the typical stand-alone PC will not.

The IBM Pageprinter and the similar Document Technology DL-20 are offered with a range of interfaces, the PC just being one option, so they may really be designed for connecting to something like a System 36 or System 38 minicomputer. They are also quite expensive, costing over £6,000.

Financially these machines make most sense for users printing as many as 24,000 pages a month, taking into account both the cost of consumables and amortisation of the purchase price. Cheaper 10ppm printers such as the Qume Laser 10 and Mannesmann-Tally 910SL make more sense at or below 5,000 pages a month.

Given the price of laser printers and their relatively high speed, using a network to share one printer between several users makes a great deal of sense on the face of it. The drawback is that which applies to networking generally: you lose the simplicity of the original one-to-one personal-computing concept.

Giving each person their computer and printer is both technically simpler and easier to get through without bureaucratic complications. Kiss may not be much of a name for a printer, but it is a good principle to bear in mind when attempting to spend the company's money on computing kit. Although it makes sense to attach a laser printer to a network if you already have one, it is not worth getting involved in the complexity of networking just to make the printer bill look smaller.

For software support the HP Colorpro is hard to beat.

Epson's HI-80 is cheaper but has only four pens.

DRAWING THE LINE

When it comes to printing out top-quality graphics the pen plotter is hard to beat, but for speed and versatility there are other options too.

As business graphics has grown in popularity so plotters have increasingly been showing up in ordinary offices. Business users turn to them when they need higher-quality output than other types of printer can offer. But as the preceding articles have shown, these other types of printer are themselves offering increasingly good graphics. So is a special-purpose device like a plotter still necessary?

The main drawback with a plotter is that it is not much good for anything other than drawing things. For day-to-day text work you need another printer. And even when confined to graphics, plotters are very slow.

Plotters originated in the laboratory, and are descended in a fairly direct way from chart recorders. They work by moving a pen across the surface of the paper, sometimes moving the paper as well. This produces far smoother lines and curves than the average matrix printer can achieve. For business users an important advantage of the plotter is its ability to give good results on overhead projector transparency film as well as on paper. You generally have to change pens, using quick-drying ones for plotting on to film, but the results then project well.

Most matrix printers have some graphic capacity, and because they are the most common type of office printer they are usually well supported by software. Matrix printers have traditionally fallen down on quality, but it is now steadily improving. Few people seem to realise that you can produce transparencies using a matrix printer. You need a matt-surfaced film to get acceptable results, and this is hard to get hold of. Also, the transparencies look thinner, with paler colours than a plotter would produce, but the results are still perfectly usable. Resolution depends on the printer you are using, but individual dots obviously show up when you enlarge the image by projecting it. The advantages are that you are using the same printer both for graphics and for more routine work, and you generally get your output a good deal faster than a plotter could manage.

Many people would be prepared to get a special-purpose device solely for graphics use, providing the price is low enough. Oki has therefore had great success with its Okimate 20 printer, partly because it is astoundingly cheap. This £169 thermal-transfer machine gives highly saturated colour prints on both paper and transparency film.

The price suggests that the Okimate is aimed at the home user, but it is not. For one thing, running costs are probably too high: as with most thermal-transfer printers the ribbons do not last long, and they are quite expensive. This is unlikely to matter much for business users because the traditional manual ways of producing transparencies of the same quality are a great deal higher. The Okimate is also pretty slow, taking about 10 minutes to dump an IBM PC screen.

Thermal transfer has considerable potential as a general-purpose printing technology, but it has not yet reached the stage where you can print on a broad range of different types of paper. This rules it out for general business use, but it is not a problem when you are using the printer in a specialist role anyway. More expensive thermal-transfer printers such as the £3,933 Mitsubishi G-500 may appeal to high-volume specialist graphics users, but do not make much sense for the general office.

If you already have a laser printer for general office use most of the discussion so far is academic. These machines print equally well on most types of transparency film and paper. For producing text charts almost any laser printer is excellent, as you can use large-size type easily, and the quality

(continued on next page)

Overhead Options

Ways of printing transparencies

THE OPTIONS	FOR	AGAINST
Matrix printer	Quick Cheap Low costs	Poor quality
Thermal transfer	Good quality Cheap	Often slow High costs
Laser printer	Quick Good quality Low costs	Expensive No colour
Plotter	Good quality Av. costs	Slow Mid-hi price Inflexible

The pros and cons of alternative techniques for printing on transparency film; different considerations apply for paper. Chart produced by HP Colorpro plotter — the fragment above is actual size.

BUSINESS PLOTTERS

	TYPE	PRICE	SIZE	FEATURES	SIMILAR MODELS
Epson HI-80	4-pen	£400	A4	direct support for Lotus 1-2-3 and Symphony	
Facit 4550	6-pen	£595	A4	Facit is part of Ericsson group	A3 4551, £795
Hewlett-Packard 7440 Colorpro	8-pen	£1,160	A4	the industry standard, supported by plenty of software	A3 6-pen 7475, £1,796; A3 8-pen 7550 with sheet feeder, £3,813
Sekonic SPL-430	6-pen	£899	A3	clone of HP 7475	
Sweet P 6-Shooter	6-pen	£1,095	A3	good software support	A4 single-pen Sweet P 10, £399

SUPPLIERS

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

Facit Data Products Maidstone Road, Rochester, Kent ME1 3QN. Telephone: (0634) 401721

Hewlett-Packard Literature Section, Eskdale Road, Winnersh Triangle, Wokingham, Berkshire RG11 5DZ. Telephone: (0734) 696622

Sekonic Micro Peripherals Ltd, Intec 2, Basingstoke, Hampshire RG24 0NE. Telephone: (0256) 473232

Sweet P First Software, Intec 1, Basingstoke, Hampshire RG24 0NE. Telephone: (0256) 463344

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of the printed results is very good. Enhanced models with more memory, such as the Canon A2 and HP Laserjet Plus, offer extensive graphics features. The only problem with the laser printer is that it prints only in monochrome.

Ink-jet printers have a reputation for good graphics capability, but they are not ideal for office use. The main problem is again paper, since results tend to be poor on ordinary stationery. And because ink-jets like absorbent paper they are no good for producing transparencies.

FILM RECORDER

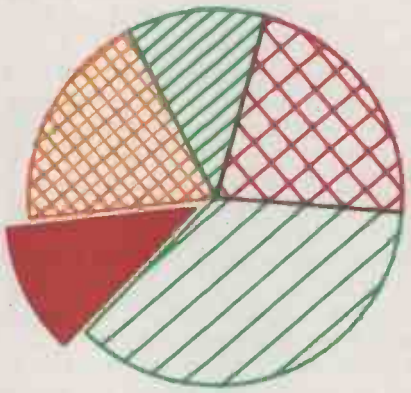
Another output option favoured by business-graphics specialists is the film recorder. It is based on a camera-like technology and gives you output in the form of 35mm. colour slides. The results are quite good, but both running costs and the purchase price of these systems are high. It is also possible to have slides made up for you on a bureau basis from some standard graphics packages.

After looking at the alternatives, some users still come back to the plotter as the most appropriate solution. We borrowed a Hewlett-Packard Colorpro for this feature as it is rapidly becoming established as an industry-standard machine, appearing in the installation menus of most graphics packages. Hewlett-Packard has a long history of making plotters, and its HP Graphics Language (HPGL) is the established standard. Many rival plotters also accept HPGL commands in order to get access to the same software base.

The flat-bed Plotmate from Linear Graphics of Rochford, Essex is cheap but for multi-colour plotting the pen must be changed by hand.

transparency

Above: Output from Oki Microline 292 dot-matrix (top half) and HP Colorpro plotter (lower half), both printed on paper and enlarged ×2.
Below: The Colorpro does solid colours well — sample is actual size.



Many of HP's plotters are aimed at scientists and engineers, but the Colorpro is designed specifically to meet the rather different requirements of business users. While technical users want accurate and repeatable results above all, absolute accuracy is not so important when producing business charts. It is speed and a good range of colours that are at a premium, and the business plotter must be good at drawing solid colours, which look better than hatched patterns, especially when projected.

Plotters in the price range we are discussing draw with only one pen at a time. The Colorpro has a rotating eight-pen carousel from which the plotting arm automatically picks up a pen of the appropriate colour as it requires it. This allows you to leave it to plot in up to eight different colours without intervention.

The Colorpro plots on to A4 sheets of paper or transparency film, which you insert into the front of the machine. The paper is gripped on either side by two small cylinders, coated with sandpaper-like aluminium oxide, which rotate to move the paper forwards and backwards. The plotting arm then moves the pen to and fro along the left-to-right axis, thus drawing the required shapes on the paper.

The grip-wheel system, which was developed by HP, is very accurate and fast. It has since been taken up by other manufacturers such as Epson, and in general grip-wheel plotters are probably the most appropriate type for business users. The two other main types are flat-bed plotters, which have an arm that moves along both axes over a stationary piece of paper, and drum plotters which move the paper by winding it around a cylinder. They are generally slower or less accurate until you get into very high price ranges.

SLOW FOR LETTERING

Plotting on the Colorpro is quick by plotter standards, but still takes some time. The exact timing obviously depends on what you are trying to do and the software you are using. We found we could get a draft copy of a fairly complicated bar chart from the Harvard Presentation Graphics package in under two minutes, with the full-quality version taking more like 10 minutes. The results with the Colorpro are also generally good compared to many other plotters, and it does particularly fine lettering — although this was responsible for much of the time our example charts took.

To find out how the Colorpro compares to a matrix printer we tried the same charts on the Oki Microline 292 18-pin matrix machine. In its top quality the Oki too was slow, though still quicker than the plotter, but drafts were very much quicker. On paper, text charts were equally acceptable from both machines, but the HP came off best when producing multi-coloured charts on transparency film. If you will never want to print on to anything but paper the cheaper and more generally useful matrix printer clearly has the advantage. PC

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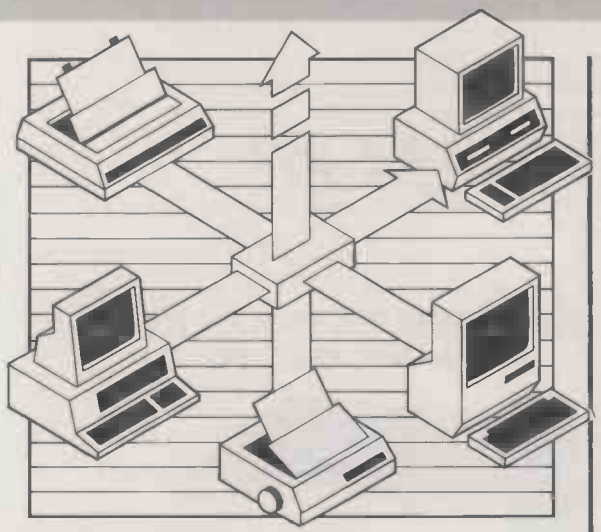

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Devices Ltd
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▪ O P E N F I L E ▪

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.

TELECOM GOLD

MORE ECONOMAIL

Jack Schofield offers some more tips on using BT's electronic-mail service, and looks at the most recent changes to the system.

IN THE four months since I last wrote in *Practical Computing* about the Telecom Gold electronic-mail system I have had a number of enquiries and tips about the system from readers. There have also been some new additions, including Info files on storage and PCMail.

There is also a new database, World Reporter, which offers the full text of the *Guardian*, *New Scientist* and Tass, and BBC summaries of world broadcasts. Typing WR at the prompt takes you to it through a gateway. The only point to watch is that Como cannot be used to create an on-line file of your search inside Telecom Gold. If you need such a file you must answer Y when prompted for this. There is a surcharge for the use of World Reporter of £1.15 per minute.

With storage costs of 20p per 2K per month, keeping files can easily add £20 a month to your bill. Until recently this was not explained on-line, but now there are two Info files, called Info Storage and Info Telex Storage, which are well worth reading.

There is also an Info file on PCMail, which has extra features over WPMail, described on page 103 of the March issue. PCMail's major advantage is that it does not crash if one letter in your batch is wrongly addressed. It does not echo back texts as they are uploaded unless you use the parameter -Echo, but in other respects CMail works just like WPMail. Letters are addressed as usual, though it is possible to send texts without previously inserting the hard Carriage Returns that are required by WPMail.

PCMail will send correctly addressed leters while not sending incorrectly addressed ones. Using the parameter

PCMAIL -STOP

causes the system to handle incorrectly addressed messages by stopping and asking you to respecify.

```
>MAIL SCAN OUT DA 3/6/86

       To:  EL0010
       Bc:  J.SCHOFIELD   (JNL020)
1    From:  J.SCHOFIELD   (JNL020)
  Posted:   Tue  3-June-86  1:53 BST Sys 83  (22)
 Subject:   CRASHED WPMAIL

       To:  NTG309
2    From:  J.SCHOFIELD   (JNL020)
  Posted:   Tue  3-June-86  20:45 BST Sys 83  (0)
 Subject:   Acknowledgment of:  CES/Chicago

Read or Scan:  RCHECK

   From:  J.SCHOFIELD   (JNL020)
 Posted:  Tue  3-June-86  1:53 BST Sys 83  (22)
Subject:  CRASHED WPMAIL

EL0010 -- Read.
J.SCHOFIELD -- Deleted.


   From:  J.SCHOFIELD   (JNL020)
 Posted:  Tue  3-June-86  20:45 BST Sys 83  (0)
Subject:  Acknowledgment of:  CES/Chicago

NTG309 -- Unread.

Read or Scan:  Q
```

The Out Tray, showing date activation, DA, and the RCheck command.

However, PCMail has not yet been announced by Telecom Gold, so I presume I have stumbled on a beta-test version of the software. I have tried it and it does work, but not reliably enough for me to abandon the use of WPMail yet. Use it at your own risk.

The basic Mail system itself is well prompted and easy to use, but the following hints may be useful. First, line noise and typing errors in letters are time-consuming to correct using the built-in line editor. Instead just type

.SP

to invoke the spelling checker. This will find and help eliminate most of the corrupted words quickly. It will offer near misses for acceptance or rejection, and allow you to build up your own personal dictionary. You can check files by using Spell as a system-level command.

Second, if you have forgotten someone's box number and they are in your group, you can search the directory using ? as a wild card. For example, to find my own box I can type

>MAIL DIS DIR ?SCHO?

and get the response

J.SCHOFIELD 83:JNL020

Third, if you have allowed your mailbox to get clogged up with undeleted mail, thus degrading system performance, you can get at your letters in reverse order using Back in a command such as

MAIL SCAN BACK

at the system prompt. The Date Activate facility is another option. For example.

MAIL SCAN DA 1/8/86

will get mail only for that date. Alternatively, you can search for a particular word in the Subject line or even in the text of a letter: for example

MAIL SCAN SU FRED

or

MAIL SCAN TEXT FRED

You can even use And and Or as logical operators.

If you have ever sent or forwarded a letter and regretted it, you will be delighted to learn that you may be able to delete it before the recipient reads it. This is thanks to the Out Tray whereby

(continued on next page)

(continued from previous page)

you can scan letters you have already sent and reread them if you forgot to keep a copy. Just use the command

MAIL SCAN OUT

at the > prompt. After that it is just like incoming mail, right down to the Action Required prompt.

If you have mailed someone in your own user group you will be able to Del or delete a letter at this point. If it is to someone else on the same computer system, you should be able to delete it. If it is to someone on a different system — say, 79 when you are on 83 — then you will not be able to delete it. If my explanation is rather vague it is because this is not a documented feature. The more quickly you act, the better your chance of killing a letter. Of course, once the recipient has read it them it is too late. If you scan your Out Tray you can type RCheck to be told which letters have been read and/or deleted. The example reproduced on the previous page gives the details.

People have asked why you cannot find out who else is on-line at the same time so that you can use Chat IDNumber to link your terminal to theirs. Unlike The Source, typing

ONLINE

does not tell you this, as it only lists people on-line in your own group. There are a range of other options such as Users, Status Users, SY and UG, but what you get in return depends very much on your security level. Users is even less help than Online as it also lists phantoms or system task robots, which are not real people but jobs being run.

For telex users, it is still worth uploading each text as a separate file before switching to the telex system. This can be done with texts that do not have hard Carriage Returns via the XMit facility, which is prompt-driven and easy to use. My technique is to edit the uploaded file and split it into lines that are 68 characters long by using the following commands in turn

```
ED FILENAME
JU 68
SA
```

The last command saves the new file, overwriting the old one, though you could keep both by using different file names.

It is possible to use JU as a system-level command just by typing it at the > prompt. Again, JU is menu-driven and needs no explanation. But I have found it does not always work: it is sometimes unable to cope with such long lines as XMit. Using JU in the editor always works.

```
>ONLINE

JNL020       JNL041

>USERS
Users = 21

>SY
21 Users on sys 83

     Names              use idle mem State command    object     devs

  JNL020                *03    0   39   R1   SY                      10  from
Dial-up via X.25

>UG
UG VERSION 001.200

3 users logged on SYS83 at 2:14
Users logged on in account group JNL=2

>STATUS USERS

USR=JNL020  SYS83

File   File      Open     File
Unit   Position  Mode     Type  RWlock  Treename
  62         15     R      SAM   NR&1W  <S83-10>JNL020>PARAM.INI

User         NO  Line Disks
JNL020        3*  REM <S83-10> (FROM X.25)
```

SY shows what is happening on-line, including the last command entered, the file being accessed and the number of minutes since the last command was entered.

In the editor, JU has a default value of 60. You can change this to, say, 68 by including the line

MODE JWIDTH 68

in your Param.Ini file.

As I described in the April issue, there is no easier way to send telexes than using short codes — such as PCom for Practical Computing, for example — to mail uploaded files. To send a text called Filename from the Telex Command prompt you only need type

SEND FILENAME PCOM

and it is done.

However, it is occasionally necessary to send one-off telexes to people, and you do not want to keep adding new short-codes to your .RF. file. The answer to this to use

SEND FILENAME

and the system will prompt you for the missing bits it still needs. In fact you can include all the information in a single line, using T as an abbreviation for Telex and G as the code for the U.K. So to telex an existing text file called Fred to a U.K. number such as 12345, you would type

SEND FRED T G 12345

and the system will prompt for the Attn line and Other recipients; you could even add Attn Fred Smith to your one-liner. Obviously for other countries you would have to use the appropriate nationality code.

A Telecom Gold executive has pointed out that saving money by deleting telexes after they have been sent using

TELEX DEL SENT

does not dispose of any aborted or abandoned ones that may still be stored in the system. Therefore you should use

TELEX DEL ALL

to dispose of everything, before doing what I originally suggested.

The *Guardian*, where I normally work, now has a mailbox which provides fully automatic telex. When someone logs on they are prompted to upload their text. When they type .End it is automatically telexed to the *Guardian*; it is then deleted and they are logged off. Users cannot get to the command prompt, and cannot use Mail or other Telecom Gold facilities. This enables non-computerate users to file copy easily using just one mailbox. The installation was done by Telecom Gold support using C__ID, C__DO, XMit, an abbreviation file and a program written in the native command language CPL.

Finally, someone has asked about the information you get when logging off the system. You can explore this using the command

TIME

at the system prompt. This yields three numbers in the form

X Y Z

where X is the amount of time you have been logged on to Telecom Gold, Y is the amount of CPU time you have used, and Z is the amount of disc input/output. Normally you would expect these to be roughly the proportions 2:2:1.

When you see the log-off information in the form

```
>lo
Off At 20:59 18/05/86 BST
Connect Mins = 3
Compute Secs = 6/1
```

this actually corresponds to the data fished out by Time, but displayed in the format

```
>lo
Off At 20:59 18/05/86 BST
Connect Mins = X
Compute Secs = Y/Z
```

As Telecom Gold does not charge for CPU or disc I/O time this is mainly of academic interest.

If you have any tips or gripes about Telecom Gold I would be interested to hear about them. My mailbox number is 83:JNL020.

FIGURE 6

	A	B	C	D	E
151	UNITAX: Unified Personal Tax Computation 1985/86				
152					
153	Computation without wife's earnings election				
154					
155			Self		Wife
156			====		====
157	EARNED INCOME				
158	Trading profit (less losses b/f)	29500		0	
159	Earnings (including benefits)	0		8750	
160	Pensions, etc.	0		0	
161		---------		---------	
162		28500		8750	
163	Less: Allowable pension contributions	1560		0	
164		---------		---------	
165		26940		8750	
166	Less: Trading losses				
167	-own	3460		0	
168	-spouse's	0	23480	0	8750
169		---------		---------	
170					
171	INVESTMENT INCOME				
172	Schedule A (property income)	1245		0	
173	Schedule D Case III (untaxed interest etc)	0		0	
174	Dividends (including tax credit)	1064		500	
175	Building society interest (gross)	314		0	
176	Bank interest (gross)	0		0	
177	Other income	0		0	
178		---------		---------	
179		2623		500	
180	Less: Trading losses				
181	-own	0		0	
182	-spouse's	0	2623	0	500
183			---------		---------
184	TOTAL INCOME BEFORE ALLOWANCES, ETC.		26103		9250
185			=========		=========
186					
187	Earned income as above		32230		
188	Investment income as above		3123		
189			---------		
190			35353		
191	DEDUCTIONS				
192	Capital allowances by discharge or repayment	0			
193	Mortgage interest	2750			
194	Charges allowable at all rates	250	3000		
195		---------			
196	TOTAL INCOME		32353		
197					
198	ALLOWANCES				
199	Personal allowance	3455			
200	Wife's earned income allowance	2205			
201	Business expansion scheme	0			
202	Other	0			
203		---------			
204	Total available	5660			
205		=========			
206	Used		5660		
207			---------		
208	TAXABLE INCOME		26693		
209			=========		
210					
211	Computation without wife's earnings election (continued)				
212					
213	TAX DUE ON TAXABLE INCOME	Income	Tax		
214		======	===		
215	Income up to	24400	8400		
216	Marginal rate on remaining	2293	1146.5		
217		---------	---------		
218		26693	9546.5		
219		=========			
220	Marginal rate of tax (%)	50			
221		=========			
222					
223	ADJUSTMENTS (CHARGES, ETC.)				
224	Recoupment re MIRAS	825			
225	Recoupment re retained charges (all rates)	75			
226	Recoupment re retained charges (basic rate)	0			
227	Relief for non-retained charges (basic rate)	0	900		
228			---------		
229	TAX PAYABLE 1985/86		10446.5		
230					
231	TAX PAID				
232	Tax credit on dividends	469.28			
233	Notional tax on building society interest	94.28			
234	Notional tax on bank interest	0			
235	Tax on taxed income	0			
236	PAYE	1200			
237	Other tax paid	0			
238		---------			
239		1763.56			
240	Less: Notional tax lost	0	1763.56		
241			---------		
242	PAYMENT/-REPAYMENT DUE		8682.94		
243			=========		

UNITAX

Chris Allen completes his spreadsheet template designed to calculate your income tax liability.

IN THE FIRST part of this article, published in last month's issue, I showed how the principles of structured programming applied just as much to the construction of a template to run on a spreadsheet package as to a program written in any other high-level language. The example used to exemplify these principles was the Unitax template, designed to run on Supercalc 1 and to calculate your liability for U.K. income tax.

This month's article completes the picture with the output generated by Unitax. Figure 6 shows sample output from Unitax when there is no wife's earnings election, using the information from figure 4, published last month. A wife's earnings election is available to a married couple where the wife has earnings. Its effect is to treat the couple as two single people. The husband is deemed to have all of his own income plus his wife's investment income, while the wife is treated as having received her own earnings only.

A wife's earnings election can reduce the couple's joint tax bill if they have a high joint income and the wife's earnings are also high. The precise breakpoint depends on a number of factors, and it is really necessary to carry out the calculations to see whether an election will save or lose money. Figure 7 shows the second page of output from the data in figure 4, this time assuming that a wife's earnings election is made. In this case making an election will give rise to a saving of several hundred pounds in the couple's total tax liability.

Possible improvements to the template might include more extensive user instructions, more error checking and an error-report section, and a planning report to show comparative tax liabilities and the use or wastage of allowances and losses.

Chris Allen is a chartered accountant.

FIGURE 7

	F	G	H	I	J
201	Computation with wife's earnings election (continued)				
202					
203			Self		Wife
204			====		====
205	TAX DUE ON TAXABLE INCOME	Income	Tax	Income	Tax
206		======	===	======	===
207	Income up to	19200	6060	0	0
208	Marginal rate on remaining	2198	989.1	6545	1963.5
209					
210		21398	7049.1	6545	1963.5
211		=========		=========	
212	Marginal rate of income tax (%)	45		30	
213		=========		=========	
214					
215	ADJUSTMENTS (CHARGES, ETC.)				
216	Recoupment re MIRAS	825		0	
217	Recoupment re retained charges (all rates)	75		0	
218	Recoupment re retained charges (basic rate)	0		0	
219	Relief for non-retained charges (basic rate)	0	900	0	0
220					
221	TAX PAYABLE 1985/86		7949.1		1963.5
222					
223	TAX PAID				
224	Tax credit on dividends	469.28			
225	Notional tax on building society interest	94.28			
226	Notional tax on bank interest	0			
227	Tax on taxed income	0			
228	PAYE	0		1200	
229	Other tax paid	0		0	
230		---------		---------	
231		563.56		1200	
232	Less: Notional tax lost	0	563.56	0	1200
233					
234	PAYMENT/-REPAYMENT DUE		7385.54		763.5
235			=========		=========

UNITAX

```
A151    P= "UNITAX: Unified Personal Tax Computation 1985/86
F151    P= "UNITAX: Unified Personal Tax Computation 1985/86
A152    P= '=
F152    P= '=
A153    P= "Computation without wife's earnings election
F153    P= "Computation with wife's earnings election
A154    P= '-
F154    P= '-
C155    P= "  Self
E155    P= "  Wife
H155    P= "  Self
J155    P= "  Wife
C156    P= "  ====
E156    P= "  ====
H156    P= "  ====
J156    P= "  ====
A157    P= "EARNED INCOME
F157    P= "EARNED INCOME
A158    P= "  Trading profit (less losses b/f)
B158    P= B26
D158    P= C26
F158    P= "  Trading profit (less losses b/f)
G158    P= B26
I158    P= C26
A159    P= "  Earnings (including benefits)
B159    P= B27
D159    P= C27
F159    P= "  Earnings (including benefits)
G159    P= B27
I159    P= C27
A160    P= "  Pensions, etc.
B160    P= B28
D160    P= C28
F160    P= "  Pensions, etc.
G160    P= B28
I160    P= C28
B161    P= "---------
D161    P= "---------
G161    P= "---------
I161    P= "---------
B162    P= SUM(B158:B160)
D162    P= SUM(D158:D160)
G162    P= SUM(G158:G160)
I162    P= SUM(I158:I160)
A163    P= "  Less: Allowable pension contributions
B163    P= B51
D163    P= C51
F163    P= "  Less: Allowable pension contributions
G163    P= B51
I163    P= C51
B164    P= "---------
D164    P= "---------
G164    P= "---------
I164    P= "---------
B165    P= B162-B163
D165    P= D162-D163
G165    P= G162-G163
I165    P= I162-I163
A166    P= "  Less: Trading losses
F166    P= "  Less: Trading losses
G166    P= D95
H166    P= G165-G166
I166    P= E95
J166    P= I165-I166
A167    P= "          -own
B167    P= B95
D167    P= C95
G167    P= "---------
I167    P= "---------
A168    P= "          -spouse's
B168    P= C101
C168    P= B165-B167-B168
D168    P= B101
E168    P= D165-D167-D168
B169    P= "---------
D169    P= "---------
F169    P= "INVESTMENT INCOME
F170    P= "  Schedule A (property income)
G170    P= B31+C31
A171    P= "INVESTMENT INCOME
F171    P= "  Schedule D Case III (untaxed interest etc)
G171    P= B32+C32
A172    P= "  Schedule A (property income)
B172    P= B31
D172    P= C31
F172    P= "  Dividends (including tax credit)
G172    P= B88+C88
A173    P= "  Schedule D Case III (untaxed interest etc)
B173    P= B32
D173    P= C32
F173    P= "  Building society interest (gross)
G173    P= B89+C89
A174    P= "  Dividends (including tax credit)
B174    P= B88
D174    P= C88
F174    P= "  Bank interest (gross)
G174    P= B90+C90
A175    P= "  Building society interest (gross)
B175    P= B89
D175    P= C89
F175    P= "  Other income
G175    P= B36+C36
A176    P= "  Bank interest (gross)
B176    P= B90
D176    P= C90
G176    P= "---------
A177    P= "  Other income
B177    P= B36
D177    P= C36
G177    P= SUM(G170:G175)
B178    P= "---------
D178    P= "---------
F178    P= "  Less: Trading losses
G178    P= D97+D103
H178    P= G177-G178
J178    P= 0
B179    P= SUM(B172:B177)
D179    P= SUM(D172:D177)
G179    P= "---------
H179    P= "---------
J179    P= "---------
A180    P= "  Less: Trading losses
F180    P= "TOTAL
H180    P= H166+H178
J180    P= J166
A181    P= "          -own
B181    P= B97
D181    P= C97
A182    P= "          -spouse's
B182    P= C103
C182    P= B179-B181-B182
D182    P= B103
E182    P= D179-D181-D182
F182    P= "DEDUCTIONS
B183    P= "---------
C183    P= "---------
D183    P= "---------
E183    P= "---------
F183    P= "  Capital allowances by discharge or repayment
G183    P= D112
I183    P= E112
A184    P= "TOTAL INCOME BEFORE ALLOWANCES, ETC.
C184    P= C168+C182
E184    P= E168+E182
F184    P= "  Mortgage interest
G184    P= MIN(B39+B40,D117)
I184    P= MIN(C39+C40,E117)
C185    P= "=========
E185    P= "=========
F185    P= "  Charges allowable at all rates
G185    P= D117-G184
H185    P= SUM(G183:G185)
I185    P= E117-I184
J185    P= SUM(I183:I185)
G186    P= "---------
H186    P= "---------
I186    P= "---------
J186    P= "---------
A187    P= "Earned income as above
C187    P= C168+E168
F187    P= "TOTAL INCOME
H187    P= H180-H185
J187    P= J180-J185
A188    P= "Investment income as above
C188    P= C182+E182
C189    P= "---------
F189    P= "ALLOWANCES
C190    P= C187+C188
F190    P= "  Personal allowance
G190    P= D123
I190    P= E123
A191    P= "DEDUCTIONS
F191    P= "  Business expansion scheme
G191    P= B50
I191    P= C50
A192    P= "  Capital allowances by discharge or repayment
B192    P= B112
F192    P= "  Other
G192    P= B23
I192    P= C23
A193    P= "  Mortgage interest
B193    P= MIN(B39+B40+C39+C40,B117)
G193    P= "---------
I193    P= "---------
A194    P= "  Charges allowable at all rates
B194    P= B117-B193
C194    P= SUM(B:92:B194)
F194    P= "  Total available
G194    P= SUM(G190:G192)
I194    P= SUM(I190:I192)
B195    P= "---------
C195    P= "---------
G195    P= "=========
I195    P= "=========
A196    P= "TOTAL INCOME
C196    P= C190-C194
F196    P= "  Used
H196    P= D126
J196    P= E126
H197    P= "---------
J197    P= "---------
A198    P= "ALLOWANCES
F198    P= "TAXABLE INCOME
H198    P= D130
J198    P= E130
A199    P= "  Personal allowance
B199    P= B123
H199    P= "=========
J199    P= "=========
A200    P= "  Wife's earned income allowance
B200    P= B124
A201    P= "  Business expansion scheme
B201    P= B50+C50
F201    P= "Computation with wife's earnings election (continued)
A202    P= "  Other
B202    P= B23+C23
F202    P= '-
B203    P= "---------
H203    P= "  Self
J203    P= "  Wife
A204    P= "  Total available
B204    P= SUM(B199:B202)
H204    P= "  ====
J204    P= "  ====
B205    P= "=========
F205    P= "TAX DUE ON TAXABLE INCOME
G205    P= " Income
H205    P= "   Tax
I205    P= " Income
J205    P= "   Tax
A206    P= "  Used
C206    P= B126
G206    P= " ======
H206    P= "   ===
I206    P= " ======
J206    P= "   ===
C207    P= "---------
F207    P= "  Income up to
G207    P= LOOKUP(H198,B75:B80)
H207    P= LOOKUP(H198,B68:B73)
I207    P= LOOKUP(J198,B75:B80)
J207    P= LOOKUP(J198,B68:B73)
A208    P= "TAXABLE INCOME
C208    P= B130
F208    P= "  Marginal rate on remaining
G208    P= H198-G207
H208    P= INT(G208*LOOKUP(H198,D68:D73))/100
I208    P= J198-I207
J208    P= INT(I208*LOOKUP(J198,D68:D73))/100
C209    P= "=========
G209    P= "---------
H209    P= "---------
I209    P= "---------
J209    P= "---------
G210    P= G207+G208
H210    P= H207+H208
I210    P= I207+I208
J210    P= J207+J208
A211    P= "Coeputation without wife's earnings election (continued)
G211    P= "=========
I211    P= "=========
A212    P= '-
F212    P= "  Marginal rate of income tax (%)
G212    P= LOOKUP(H198,D68:D73)
I212    P= LOOKUP(J198,D68:D73)
A213    P= "TAX DUE ON TAXABLE INCOME
B213    P= " Income
C213    P= "   Tax
G213    P= "=========
I213    P= "=========
B214    P= " ======
C214    P= "   ===
A215    P= "  Income up to
B215    P= LOOKUP(C208,B75:B80)
C215    P= LOOKUP(C208,B68:B73)
F215    P= "ADJUSTMENTS (CHARGES, ETC.)
A216    P= "  Marginal rate on remaining
B216    P= C208-B215
```

(continued on next page)

UNITAX

(continued from previous page)

```
C216    P= INT(B216*LOOKUP(C208,D68:D73))/100
F216    P= "  Recoupment re MIRAS
G216    P= INT(D129*B64)/100
I216    P= INT(F129*B64)/100
B217    P= "---------
C217    P= "---------
F217    P= "  Recoupment re retained charges (all rates)
G217    P= INT(B42*B64)/100
I217    P= INT(C42*B64)/100
B218    P= B215+B216
C218    P= C215+C216
F218    P= "  Recoupment re retained charges (basic rate)
G218    P= INT(D133*B64)/100
I218    P= INT(E133*B64)/100
B219    P= "=========
F219    P= "  Relief for non-retained charges (basic rate)
G219    P= -INT(D135*B64)/100
H219    P= SUM(G216:G219)
I219    P= -INT(E135*B64)/100
J219    P= SUM(I216:I219)
A220    P= "  Marginal rate of tax (%)
B220    P= LOOKUP(C208,D68:D73)
G220    P= "---------
H220    P= "---------
I220    P= "---------
J220    P= "---------
B221    P= "=========
F221    P= "TAX PAYABLE 1985/86
H221    P= H210+H219
J221    P= J210+J219
A223    P= "ADJUSTMENTS (CHARGES, ETC.)
F223    P= "TAX PAID
A224    P= "  Recoupment re MIRAS
B224    P= INT(B129*B64)/100
F224    P= "  Tax credit on dividends
G224    P= D85+E85
A225    P= "  Recoupment re retained charges (all rates)
B225    P= INT((B42+C42)*B64)/100
F225    P= "  Notional tax on building society interest
G225    P= D86+E86
A226    P= "  Recoupment re retained charges (basic rate)
B226    P= INT(B133*B64)/100
F226    P= "  Notional tax on bank interest
G226    P= D87+E87
A227    P= "  Relief for non-retained charges (basic rate)
B227    P= -INT(B136*B65)/100
C227    P= SUM(B224:B227)
F227    P= "  Tax on taxed income
G227    P= B55+C55
B228    P= "---------
C228    P= "---------
F228    P= "  PAYE
G228    P= B54
I228    P= C54
A229    P= "TAX PAYABLE 1985/86
C229    P= C218+C227
F229    P= "  Other tax paid
G229    P= B56
I229    P= C56
G230    P= "---------
I230    P= "---------
A231    P= "TAX PAID
G231    P= SUM(G224:G229)
I231    P= I228+I229
A232    P= "  Tax credit on dividends
B232    P= B85+C85
F232    P= "  Less: Notional tax lost
G232    P= IF(G231)H221,MIN(G231-H221,G225+G226),0)
H232    P= G231-G232
I232    P= 0
J232    P= I231
A233    P= "  Notional tax on building society interest
B233    P= B86+C86
G233    P= "---------
H233    P= "---------
I233    P= "---------
J233    P= "---------
A234    P= "  Notional tax on bank interest
B234    P= B87+C87
F234    P= "PAYMENT/-REPAYMENT DUE
H234    P= H221-H232
J234    P= J221-J232
A235    P= "  Tax on taxed income
B235    P= B55+C55
H235    P= "=========
J235    P= "=========
A236    P= "  PAYE
B236    P= B54+C54
A237    P= "  Other tax paid
B237    P= B56+C56
B238    P= "---------
B239    P= SUM(B232:B237)
A240    P= "  Less: Notional tax lost
B240    P= IF(B239)C229,MIN(B239-C229,B233+B234),0)
C240    P= B239-B240
B241    P= "---------
C241    P= "---------
A242    P= "PAYMENT/-REPAYMENT DUE
C242    P= C229-C240
C243    P= "==========
```

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THE 2-SAMPLE RUNS

Owen Bishop and **Daniel Bishop**

describe a method of distinguishing two sets of data which do not conform to the normal distribution.

IN THE June issue of *Practical Computing* we described how the t-test can be used to test if two samples of data show significant differences. The t-test depends on data being normally distributed and so is particularly suited to biological data, which is very often distributed in this way.

The t-test is less suitable for analysing data distributed in other ways, or when the amount of available data is small. For this the so-called runs tests are a better method. Runs tests do not require the data to have any particular kind of distribution. In addition, they can be applied to small amounts of data.

An example of data that is not likely to be suitable for the t-test is shown in table 1. It shows the weekly sales figures of two sales representatives, A and B. It seems from the averages that B sells more than A, yet there is a considerable amount of overlap. This is shown clearly when the sales figures are written out in numerical order as in table 2, with A or B written next to each one to indicate to which representative it refers. If you count the number of runs in the sequence — a run being a consecutive group of As or Bs — you will find that there are six runs in the sequence.

What can be inferred from this? If there were really no difference between the two representatives you might expect that the As and Bs would be well mixed together. The sequence might have been

AABABBABABABBBABAAB

for example, which has 16 runs. The greatest possible number of runs is 20, which is what you get when the As and Bs alternate all along the sequence. Having 16 runs suggests that there is no difference between A and B.

On the other hand, if all of B's sales were better than A's sales, the sequence would be

AABABBABABABABBBABAAB

This is only two runs, the minimum number possible. Clearly, the more runs that occur in the sequence, the less likely it is that the two sets of data differ significantly; the fewer the number of runs, the more likely it is that they differ.

The figures from two equally successful sales representatives might produce As and Bs scattered randomly along the sequence. It would be possible to obtain by chance any number of runs between two and 20. However, there are many ways of obtaining large numbers of runs and relatively few ways of obtaining a small number. Obtaining only a small number of runs is an event that should arouse interest. The problem is to work out how likely you are to obtain only six runs if A and B are equally good at selling.

Using the mathematics of permutations and combinations it is possible to calculate the probability of obtaining a given number of runs in a sequence of a given number of As and Bs. These probabilities can then be used to work out how likely it is that you could get six runs when the As and Bs are scattered at random along the sequence. If the calculation shows such a happening to be unlikely you can assume that the As and Bs of the sales data are not randomly scattered; in other words, B really is better than A.

The calculations are performed by the computer, using the program listed here. It takes the two sets of data, combines them into one and sorts them in numerical order, remembering which item refers to which representative. It then counts the number of runs and works out the probabilities.

In the example, the program calculates that the probability of obtaining only six runs or fewer is between one and two percent. Unless this fairly remote chance has occurred you can state with 98 percent to 99 percent chance of being right that representative B sells more than representative A. In terms of runs, A's sales tend to occur at the lower end of the sequence, while B's tend to occur at the upper end. There is thus a greater chance of obtaining long runs at the ends of the sequence, reducing the total number of runs significantly.

The test can detect differences of another kind. Table 3 shows the sales figures of representatives C and D. Their averages are very close, so there is no question of suggesting that either representative is better, on average, than the other. Yet, if the data is reorganised as in table 4 you find that there are only five runs. The program calculates that as few as five runs are obtained at random only 0.5 percent to 0.6 percent of the time. There is a 99.4 percent to 99.5 percent chance that the two sets of sales figures differ.

This is certainly not a difference of average, as in the case of A and B. But examination of table 4 reveals that C has runs both at the lower end and at the top end of the sequence: C's figures are more widely spread than D's. You could say that D's performance is steady, while C's is erratic. Maybe this reflects the areas they work in, or their personality differences.

The data table for this program must be in a file prepared by the Data Maker program, described in the February issue of *Practical Computing*. The table can have more than two columns. Load and run the program 2Sample. Key in the data file name when requested. When the file is loaded the data is displayed.

Key T when you are ready to test. If there are more than two columns in the table, select the two to be tested. The probability is then calculated and displayed. Key R to rerun the program.

The statistics programs and tests covered in this series include histograms, scattergrams, essential statistics, chi-square test, runs test, variant ratio test, analysis of variants and binomial test. All the programs, along with five others, are available in BBC Basic on a single-sided 40-track 5.25in. disc. The price is £20 including postage and 15 percent VAT. Please send your order to Owen Bishop, c/o Practical Computing; cheques should be made payable to Owen Bishop.

TABLE 1

A	B
107	117
123	128
95	100
91	130
127	103
124	104
92	112
97	109
126	101
94	118
Av.108	112

TABLE 2

91	A	109	B
92	A	112	B
94	A	117	B
95	A	118	B
97	A	123	A
100	B	124	A
101	B	126	A
103	B	127	A
104	B	128	B
107	A	130	B

TABLE 3

C	D
103	95
131	127
92	97
111	102
128	100
106	101
91	120
130	123
94	99
118	126
Av.110	109

TABLE 4

91	C	106	C
92	C	111	C
94	C	118	C
95	D	120	D
97	D	123	D
99	D	126	D
100	D	127	D
101	D	128	C
102	D	130	C
103	C	131	C

RUNS TEST

```
   10 REM- RUNS TEST FOR TWO-SAMPLE
DIFFERENCES
   20 REM- A Statistical Utility
   30 REM- ------------------------
   40 REM- by Owen and Daniel Bishop
   50 REM- ------------------------
   60 REM- Version 1.0 - 30/12/85
   70 REM- For the BBC Micro Model B
   80 REM- ------------------------
   90 *FX4,1
  100 *TV 255,1
  110 L$=STRING$(10,CHR$32)
  120 MODE7:PROCcol:PRINT"TWO-SAMPLE"
  130 PROCbtm:PROCcol:PRINT "Enter name
of file to be loaded":PROCalpha("(max 7
letters): ",7)
```

(continued on next page)

RUNS TEST

(continued from previous page)

```
  140 ON ERROR PROCfserror:VDU31,15,0:PR
OCcls:GOTO 130
  150 FILE$=QR$:A=OPENIN FILE$
  160 VDU31,15,0:PRINT FILE$
  170 INPUT#A,DF$:VDU31,24,0:PRINT"DATE:
";DF$
  180 INPUT#A,NC,NR:VDU31,0,1:PROCcol:PR
INT"COLS: ";NC;" ROWS: ";NR
  190 IF NC<2 THEN CLOSE#0:ON ERROR OFF:
PROCbtm:PROCcol:PRINT"This test requires
 at least two":PROCcol:PRINT"columns of
data!":PROCpause:RUN
  200 DIM SC(NC,NR),CL$(NC),RL$(NR),DP(1
2),R%(NR*2+1),S(NR*2+1),N%(2)
  210 INPUT#A,CW,LC
  220 IF LC=0 THEN 240
  230 FOR J=1 TO NC:INPUT#A,CL$(J):NEXT
  240 INPUT#A,LR
  250 IF LR=0 THEN 270
  260 FOR J=1 TO NR:INPUT#A,RL$(J):NEXT
  270 FOR J=1 TO NR:FOR K=1 TO NC:INPUT#
A,SC(K,J):NEXT:NEXT
  280 FOR J=1 TO NC:INPUT#A,DP(J):NEXT:I
NPUT#A,DP$
  290 CLOSE#0:ON ERROR OFF
  300 SW=36-7*LR:CC=INT(SW/CW):IF NC<CC
THEN CC=NC
  310 CS=0:RS=0:HB=4+7*LR
  320 IF LR=0 AND NR>=100 THEN HB=5
  330 RB=NR+4:IF NR>16 THEN RB=24
  340 FR=0:FOR J=1 TO NC:IF DP(J)>0 THEN
 FR=1
  350 NEXT
  360 VDU31,0,2:PROCcls
  370 PROCbtm
  380 RD=16:IF NR-RS<RD THEN RD=NR-RS
  390 CD=CC:IF NC-CS<CD THEN CD=NC-CS
  400 PROCcolumns:PROCrows:PROCdata
  410 PROCbtm
  420 *FX21,0
  430 VDU31,39,22:K$=GET$
  440 IF K$=CHR$139 AND RS>0 THEN RS=RS-
16:GOTO 380
  450 IF K$=CHR$136 AND CS>0 THEN CS=CS-
CC:GOTO 380
  460 IF K$=CHR$137 AND CS+CD<NC THEN CS
=CS+CD:GOTO 380
  470 IF K$=CHR$138 AND RS+RD<NR THEN RS
=RS+RD:GOTO 380
  480 IF K$="R" THEN RUN
  490 IF K$="T" THEN 510
  500 VDU7:GOTO 420
  510 IF NC=2 THEN C1%=1:C2%=2:GOTO 560
  520 PROCbtm
  530 PROCnum("Enter first column (1-"+S
TR$(NC)+") ",1,1,1,NC):C1%=QN
  540 PROCbtm:PROCnum("Enter second colu
mn (1-"+STR$(NC)+") ",1,1,1,NC):C2%=QN
  550 IF C1%=C2% THEN PROCbtm:PROCcol:PR
INT"Different columns please!":GOTO 530
  560 PROCbtm:PROCcol:PRINTSPC(4)"Please
 wait while calculating."
  570 N%(1)=0:FOR J%=1 TO NR:IF SC(C1%,J
%)<>1E-29 THEN N%(1)=N%(1)+1:S(N%(1))=SC
(C1%,J%):R%(N%(1))=0
  580 NEXT
  590 N%(2)=0:FOR J%=1 TO NR:IF SC(C2%,J
%)<>1E-29 THEN N%(2)=N%(2)+1:S(N%(1)+N%(
2))=SC(C2%,J%):R%(N%(1)+N%(2))=1
  600 NEXT
  610NT%=N%(1)+N%(2)
  620 IF N%(1)<5 OR N%(2)<5 THEN 970
  630PROCquicksort(1,NT%)
  640TS%=1:RS%=0:RF%=0:FT%=0
  650IF TS%>NT% THEN 810
  660IF S(TS%)<>S(TS%+1) THEN TS%=TS%+1:
GOTO 650
  670TF%=TS%+1
  680IF TF%>NT% THEN 810
  690IF S(TF%)=S(TF%+1) THEN TF%=TF%+1:G
OTO 680
  700NZ%=0
  710FOR J%=TS% TO TF%
  720IF R%(J%)=0 THEN NZ%=NZ%+1
  730NEXT
  740IF NZ%=0 OR NZ%=TF%-TS%+1 THEN TS%=
TF%+1:GOTO 650
  750RS%=TS%:RF%=TF%
  760FOR J%=TS% TO TS%+NZ%-1:R%(J%)=FT%:
NEXT
  770IF FT%=0 THEN FT%=1:GOTO 790
  780FT%=0
  790FOR J%=TS%+NZ% TO TF%:R%(J%)=FT%:NE
XT
  800TS%=TF%+1:GOTO 650
  810IF FT%=0 OR RS%=0 THEN 880
  820IF RND(1)<.5 THEN 880
  830NZ%=0:FOR J%=RS% TO RF%
  840IF R%(J%)=0 THEN NZ%=NZ%+1
  850NEXT
  860FOR J%=RS% TO RF%-NZ%:R%(J%)=1:NEXT
  870FOR J%=RF%-NZ%+1 TO RF%:R%(J%)=0:NE
XT
  880R%(NT%+1)=R%(NT%)+1
  890U%=0:FOR J%=1 TO NT%
  900IF R%(J%)<>R%(J%+1) THEN U%=U%+1
  910NEXT
  920UU=2*N%(1)*N%(2)/(N%(1)+N%(2))+1
  930S=SQR(2*N%(1)*N%(2)*(2*N%(1)*N%(2)-
N%(1)-N%(2))/(N%(1)+N%(2))^2/(N%(1)+N%(2
)-1))
  940Z=(ABS(UU-U%)-.5)/S
  950IF Z<0 THEN Z=.001
  960IF NOT N%(1)*N%(2)<18 THEN 980
  970 PROCbtm:PROCcol:PRINT"There is ins
ufficient data for the":PROCcol:PRINT"te
st to be valid.":PROCpause:GOTO360
  980R%=0
  990R%=R%+1:READ ZL
 1000IF ZL=Z THEN 1020
 1010IF ZL>Z THEN 990
 1020IF R%<10 THEN P=R%/10
 1030IF R%>9 AND R%<19 THEN P=R%-9
 1040IF R%>18 THEN P=10+5*(R%-19)
 1050IF ZL<Z THEN 1090
 1060VDU31,0,2:PROCcls:PRINT'"There is a
 ";100-P;"% chance that the"
 1070PRINT "column ";C1%;" data differs
from the"'"column ";C2%;" data."
 1080GOTO 1130
 1090IF R%<11 THEN PL=(R%-1)/10
 1100IF R%>10 AND R%<20 THEN PL=R%-10
 1110IF R%>19 THEN PL=10+5*(R%-20)
 1120VDU31,0,2:PROCcls:PRINT'"There is a
 chance between ";100-P;"%"'"and ";100-P
L;"% that the"'"column ";C1%;" data diff
ers from the"'"column ";C2%;" data."
 1130 PROCbtm:PROCpause:RESTORE:GOTO 360
```

RUNS TEST

```
 1140DATA 3.085,2.88,2.75,2.65,2.575,2.5
1,2.455,2.41,2.365
 1150DATA 2.327,2.052,1.881,1.751,1.645,
1.555,1.476,1.405
 1160DATA 1.341,1.282,1.037,.842,.675,.5
24,.385,.253,.126,0
 1170DEF PROCquicksort(P%,R%)
 1180LOCAL I%,J%,V%,W,X
 1190I%=P%:J%=R%:X=S((P%+R%)DIV2)
 1200REPEAT
 1210IF S(I%)<X I%=I%+1:GOTO 1210
 1220IF X<S(J%) J%=J%-1:GOTO 1220
 1230IF I%<=J% W=S(I%):S(I%)=S(J%):S(J%)
=W:V%=R%(I%):R%(I%)=R%(J%):R%(J%)=V%:I%=
I%+1:J%=J%-1
 1240UNTIL I%>J%
 1250IF P%<J% PROCquicksort(P%,J%)
 1260IF I%<R% PROCquicksort(I%,R%)
 1270ENDPROC
 1280 DEF PROCpause
 1290 LOCAL K$
 1300 PROCcol:PRINTSPC(6)"Press SPACEBAR
 to continue":*FX21,0
 1310 K$=GET$:IF K$<>" " THEN VDU7:GOTO
 1310
 1320 ENDPROC
 1330 DEF PROCdata:LOCAL J,K:VDU23,1,0;0
;0;0;:FOR J=5 TO 20:VDU31,HB-1,J-1:PROCc
ll:NEXT
 1340 FOR J=1+CS TO CD+CS:HH=HB-1+(J-CS-
1)*CW
 1350 FOR K=1+RS TO RD+RS
 1360 IF SC(J,K)=1E-29 THEN 1380 ELSE @%
=&0102000A+(DP(J)*&100):A$=STR$(SC(J,K))
:IF RIGHT$(A$,1)="."THEN A$=LEFT$(A$,LEN
(A$)-1)
 1370 VDU31,HH-1,3+K-RS:PRINT RIGHT$(L$+
A$,CW):@%=&90A
 1380 NEXT:NEXT
 1390 VDU23,1,1;0;0;0;
 1400 ENDPROC
 1410 DEF PROCcolumns:LOCAL J:VDU23,1,0;
0;0;0;:VDU31,0,2:PROCcll:VDU31,0,3:PROCc
ll
 1420 VDU31,0,2:FOR J=1 TO CD
 1430 VDU31,(HB-1+(J-1)*CW),2:PRINT;J+CS
;
 1440 NEXT
 1450 IF LC=0 THEN VDU23,1,1;0;0;0;:ENDP
ROC
 1460 VDU31,0,3:FOR J=1 TO CD
 1470 VDU31,(HB-1+(J-1)*CW),3:PRINTCL$(J
+CS);
 1480 NEXT:VDU23,1,1;0;0;0;:ENDPROC
 1490 DEF PROCrows:LOCAL K:VDU23,1,0;0;0
;0;:FOR K=5 TO 20:VDU31,0,K-1:PROCcll:NE
XT
 1500 FOR K=1 TO RD:VDU31,0,K+3:PRINT;K+
RS:NEXT
 1510 IF LR=0 THEN VDU23,1,1;0;0;0;:ENDP
ROC
 1520 FOR K=1 TO RD:VDU31,3,3+K:PRINT RL
$(K+RS)
 1530 NEXT:VDU23,1,1;0;0;0;:ENDPROC
 1540 DEF PROCnum(Q$,Q1,Q2,Q3,Q4)
 1550 *FX21,0
 1560 PROCcol:PRINT Q$;:INPUT""QN$
 1570 QN=VAL(QN$)
 1580 IF QN=0 AND QN$<>"0" THEN 1610
 1590 IF QN<>INT(QN) THEN 1610
 1600 IF (Q3=0 OR QN<=Q4) AND (Q1=0 OR Q
N>=Q2) THEN ENDPROC
 1610 PROCline
 1620 GOTO 1550
 1630 ENDPROC
 1640 DEF PROCalpha(Q$,Q1)
 1650 *FX21,0
 1660 PROCcol:PRINT Q$;:INPUT""QR$
 1670 IF LEN(QR$)<=Q1 OR Q1=0 THEN ENDPR
OC
 1680 PROCline:GOTO 1650
 1690 DEF PROCline:VDU11:PROCcll:VDU7:EN
DPROC
 1700 DEF PROCbtm:VDU31,0,20:PROCcls:VDU
31,0,20:ENDPROC
 1710 DEF PROCcol
 1720 PRINT CHR$130;
 1730 ENDPROC
 1740 DEF PROCcls
 1750 LOCAL CRS%,V,H
 1760 V=VPOS:H=POS
 1770 CRS%=999-H-(40*V)
 1780 VDU23,1,0;0;0;0;
 1790 REPEAT:IF CRS%<255 THEN 1810
 1800 CRS%=CRS%-255:PRINTSTRING$(255,CHR
$32);
 1810 UNTIL CRS%<255
 1820 PRINTSTRING$(CRS%,CHR$32);
 1830 VDU31,H,V
 1840 VDU23,1,1;0;0;0;
 1850 ENDPROC
 1860 DEF PROCcll
 1870 LOCAL V,H
 1880 V=VPOS:H=POS
 1890 PRINT STRING$(40-H,CHR$32);
 1900 VDU31,H,V
 1910 ENDPROC
 1920 DEF PROCfserror
 1930 ON ERROR OFF
 1940 CLOSE#0
 1950 VDU7
 1960 IF ERR>44 OR ERR=6 THEN 2000
 1970 CLS:VDU11:REPORT:PRINT " at line "
;ERL
 1980 *FX4,0
 1990 END
 2000 PROCbtm:IF ERR=222 THEN PRINT"No s
uch file";:PROCcol ELSE VDU11:REPORT:PRO
Ccol
 2010 PRINT" error. ":PROCcol:PRINT"Pres
s SPACEBAR, when you are ready "
 2020 *FX21,0
 2030 REPEAT:A=GET:UNTIL A=32
 2040 VDU11,11:PROCcls
 2050 ENDPROC
>
```

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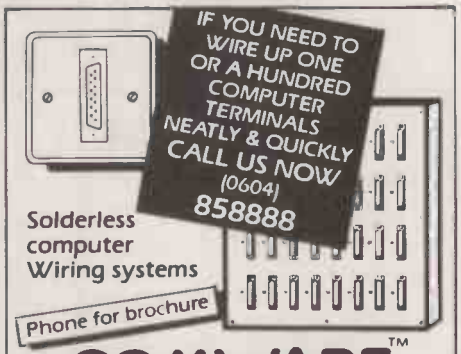

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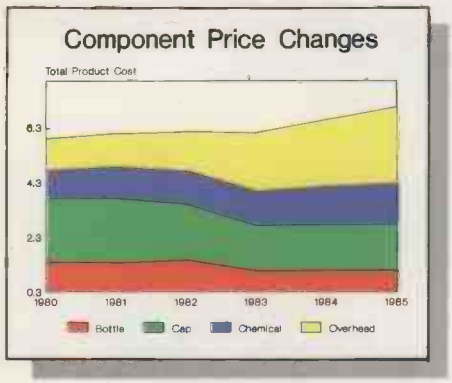

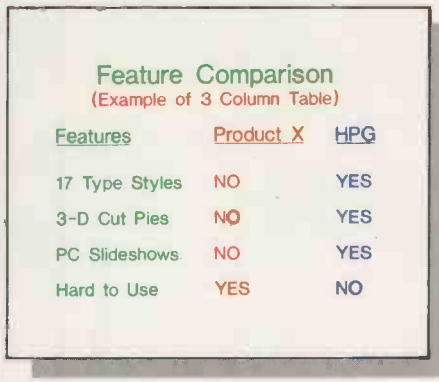

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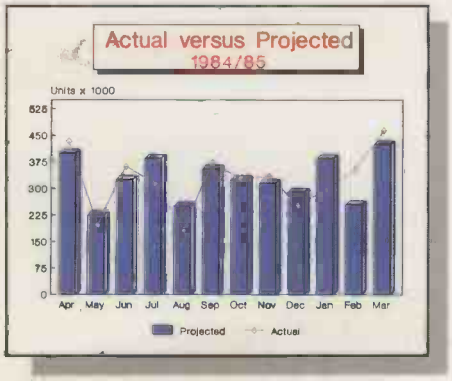

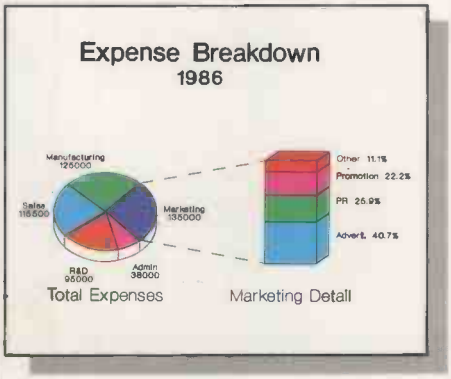

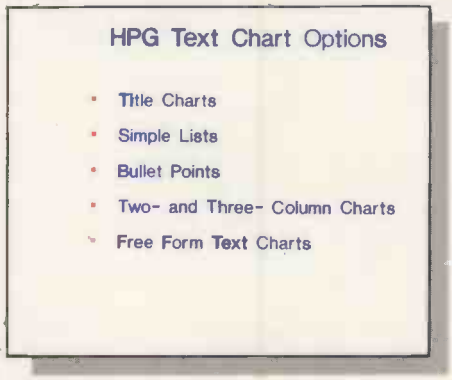

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